Waste Licence Application for MEHL Integrated Waste Management Facility (Existing Licence W0129-02) - ATTACHMENTS DOCUMENT

December 2010

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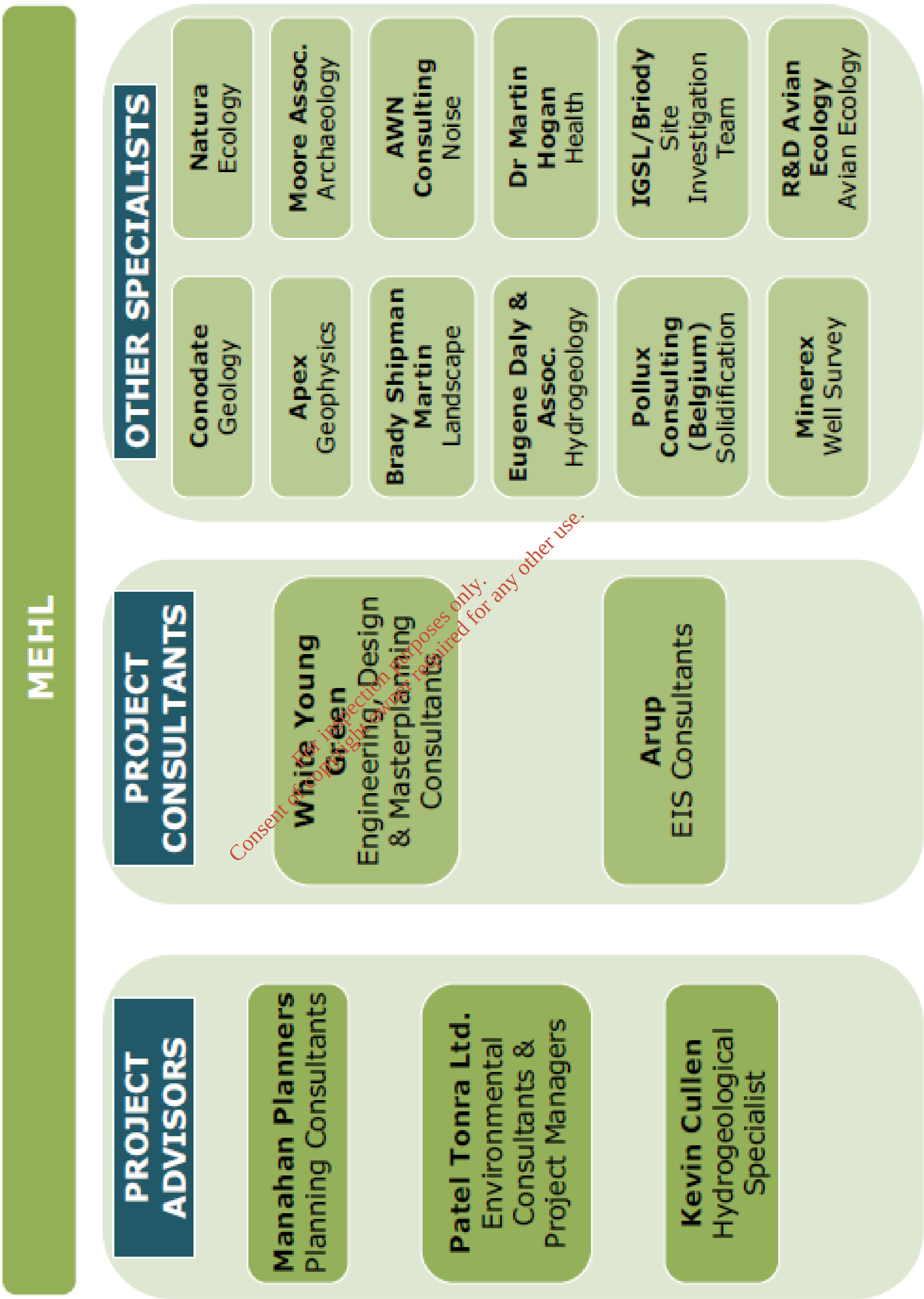
Figure: Study Team Schematic



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Non-technical Summary (NTS)

Attachment A: Non-technical Summary (NTS)

A.a NTS: Contents

A.a.1 This non-technical summary (NTS) comprises the following:

- A.a: Contents
- A.b to A.l: Non-technical summary of each section of the Waste Licence Application (includes relevant extracts from the Environmental Impact Statement (EIS)[1] in Section I)
- A.m: Selected Waste Licence Application drawings to accompany the non-technical summary, to identify and describe the activity

A.b NTS: Section B - General

A.b.1 This Waste Licence application is being made by Murphy Environmental Hollywood Limited (MEHL) for an integrated waste management facility at its site at Hollywood Great, Nag's Head, Naul, Co. Dublin (National Grid Reference National Grid Reference E315810, N258015), approximately 32km north of Dublin City Centre. The site is bounded to the west and south by local primary roads LP01090 and LP01080. The regional road, R108, runs in a north-south direction approximately 1km west of the site. The M1 runs in a north-south direction, approximately 2.5km east of the site.

A.b.2 The site is a former quarry from which limestone and shale was extracted. The facility is a fully operational inert[2] landfill regulated by the Environmental Protection Agency (EPA; also referred to as 'the Agency') under Waste Licence No. W0129-02 and Fingal County Council Planning Permission reference numbers F04A/0363 and F07A/0262. It provides a

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[1] Authored by Arup (December 2010)

[2] 'Inert waste' means waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater.

strategically located waste disposal facility for inert wastes and mildly contaminated soils. The facility is operated to the highest standards in environmental management and control.

A.b.3 For the purpose of this application, the area of land in the ownership and control of MEHL is 54.4 hectares; of which the proposed planning application and EPA waste licence application covers 39.8 hectares.

A.b.4 Please see attached the following drawings attached to this NTS:

- Site Location Map (Drawing Ref. WLA-04)
- Existing Site Layout Drawing (Drawing Ref. WLA-02)
- Proposed Site Layout Drawing (Drawing Ref. WLA-03)

A.b.5 A Planning Application and EIS for the proposed development were submitted to An Bord Pleanála on the 10th December 2010 (An Bord Pleanála Ref. 06F.PC0087). It is noted that the site falls within the functional area of Fingal County Council, and previous planning applications have been lodged with Fingal County Council. The Planning Authority for the purposes of this application is An Bord Pleanála, as the proposal is deemed 'Strategic Infrastructure' under the relevant planning legislation.

A.b.6 This Waste Licence Application was advertised in the Fingal Independent and the Irish Independent on 14th December 2010. A site notice was also erected at two locations on site. An extensive consultation exercise was conducted in relation to the proposed development, in advance of lodging planning and waste licence applications to An Bord Pleanála and the Agency, respectively.

Proposed Activity

A.b.7 MEHL proposes to develop an integrated waste management facility within the existing boundaries of its existing facility for the acceptance and landfilling of non-biodegradable[3] inert, non-hazardous and hazardous wastes, including waste-to-energy residues. The proposed development will allow the former quarry to be restored to a natural landform. The proposed development involves the construction of:

[3] 'Biodegradable waste' means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard. No such waste will be accepted at MEHL.

- a) specially engineered landfill cells for inert, non-hazardous and hazardous wastes,
- b) a solidification plant with associated storage tanks and silos,
- c) a storage building,
- d) an administration office building,
- e) new weighbridges,
- f) car parking,
- g) an ESB substation/switch room,
- h) internal haul routes,
- i) surface water ponds and leachate management facilities,
- j) a temporary viewing platform for visitors from which the geology of the quarry faces can be viewed, and
- k) ancillary site works and landscaping.
- A new facility entrance is also proposed from the County Road LP1080.

A.b.8 The following classes of activity are proposed for the MEHL integrated waste management facility application:

Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Acts 1996 to 2010

- **Class 1: Deposit on, in or under land (including landfill):** This activity relates to the deposition of inert material.
- **Class 5: Specially engineered landfill, including placement into lined discrete cells, which are capped and isolated from one another and the environment:** This is the principal activity. It is proposed that the facility will accept a range of non-biodegradable waste streams which fall within the following classes of landfill: landfill for hazardous waste, landfill for non-hazardous waste and landfill for inert waste, as specified under the EU Landfill Directive (1999).
- **Class 7: Physico-chemical treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 5 or paragraphs 8 to 10 of this Schedule (including evaporation, drying and calcinations):** This activity relates to the proposed Solidification Plant, which will pre-treat (by means of a solidification process) certain hazardous wastes prior to landfilling.

- **Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced:** This activity includes temporary storage of incoming wastes pending Third Schedule, Class 7 activity; and the storage of unacceptable wastes in a designated area pending their dispatch to appropriate disposal facilities.

Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Acts 1996-2010

- **Class 3: Recycling or reclamation of metals and metal compounds:** This activity provides for the recovery of metal within wastes delivered to the facility.
- **Class 4: Recycling or reclamation of other inorganic materials:** This activity includes the recovery of inert material for use in site development and site restoration works.
- **Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:** This activity includes the storage of wastes for recovery purposes at this facility (e.g. stockpiles of soil) and the temporary storage of materials (e.g. metals), pending their dispatch to appropriate off-site recovery facilities.

A.b.9 It is proposed that the principal activity licensed under the current EPA Waste Licence will remain the same for the purpose of this Waste Licence Application, i.e. Class 5, specially engineering landfill. The application proposes engineered landfill disposal capacity for non-biodegradable inert, non-hazardous and hazardous wastes. Third Schedule, Class 7 (physico-chemical treatment) is proposed for the purpose of operation of a solidification plant on site – this is the only additional class of activity proposed, which is not already licensed under W0129-02.

Maximum Annual Tonnage

A.b.10 The existing EPA licence for the facility, W0129-02, allows for the acceptance of a maximum of 500,000 tonnes of inert waste per annum. The current application seeks to maintain this upper limit of 500,000 tonnes per annum (total for all incoming waste types); however current projections indicate that the likely annual tonnage will be in the range of approximately 250,000 to 350,000 tonnes per annum.

A.b.11 The retention of an upper threshold of 500,000 tonnes per annum, which is currently allowed under planning permission and EPA licence, would facilitate 'unusual events' within any given year, e.g. if there was a peak in the generation of contaminated soils in the country, due to intensive excavation/development works, which would require disposal in hazardous landfill, the MEHL strategic facility would have the capacity for such volumes (up to a maximum of 500,000 tonnes per annum), thereby avoiding the necessity for trans-frontier shipment of these materials. In addition, the retention of the currently licensed maximum annual input would act as security of capacity in the event that any issue might arise in the future, which could give rise to the need for immediate disposal of materials as a result of any accidental occurrence in the country through failure or natural disaster (materials arising from such an event would be demonstrated as meeting the facility's Waste Acceptance Criteria prior to disposal at MEHL).

A.b.12 As the proposed maximum tonnes per annum acceptable into the facility remains as per the existing EPA Licence W0129-02 (and planning permission), there will be no intensification of waste activity.

Seveso II Directive

A.b.13 The Seveso II Directive is an EU directive, which applies to thousands of industrial establishments where dangerous substances are present in quantities exceeding the thresholds in the directive. The related Irish regulations are the European Communities (Control of Major Accident Hazards involving Dangerous Substances) Regulations, 2000.

A.b.14 The amount of flue gas treatment resides (from energy-from-waste facilities) to be stored at the MEHL site prior to solidification means that the facility qualifies as a lower tier Seveso site. Operators of such facilities are required to take all necessary measures to prevent the occurrence of major accidents and to limit the consequences of accidents for people and the environment. The regulations impose duties in respect of safety management systems, preparation of safety reports and emergency preparedness.

A.c NTS: Section C - Management of the Facility

A.c.1 Murphy Concrete Manufacturing Ltd. (MCM) began quarrying at the Hollywood site in 1975 (the site has operated as a quarry since the 1940s). In 2003, Murphy Environmental was established as a trading division of MCM Ltd., to serve as the waste management division of the company, with responsibility for all aspects of the management and operation of the landfill and compliance with the Waste Licence. *Murphy Environmental Hollywood Ltd.* (MEHL) was established on 1st October 2008 as a separate legal entity in the form of a limited company. On this date also, the EPA accepted the Transfer of Waste Licence W0129-02 from *Murphy Concrete Manufacturing Limited* to *Murphy Environmental Hollywood Limited*.

A.c.2 In operating the site as an EPA-licensed inert landfill since 2002, the company has developed dedicated and efficient management and staffing structures. Seamus Murphy is the Managing Director of MEHL and Patricia Rooney is the General Manager & Director. The Facility Manager at Hollywood is Ken Rooney. The Assistant Facility Manager at the facility is Kathryn Moonan. The facility has an administration team, who has responsibility for the weighbridge, site office and data management, and a landfill operations team, who direct and control incoming vehicles and waste placement in restoration areas. The company is further supported by its consultant teams for specific engineering, technical and scientific requirements.

A.c.3 It is estimated that the development of an integrated waste management facility at Hollywood would create 50 temporary construction jobs and 15 full-time, long-term additional positions.

Environmental Management System (EMS)

A.c.4 MEHL has implemented an Environmental Management System (EMS) at the site to help manage its environmental matters and records. A documented EMS is required under the Waste Licence W0129-02; however, MEHL is going beyond these requirements and has developed the EMS in line with the international environmental standard, ISO14001:2004. The landfill at Hollywood was the first privately-operated landfill to achieve an ISO14001 certification. MEHL will extend its EMS and ISO14001 accreditation to include the scope of activities proposed for its integrated waste management facility.

Hours of Operation

Proposed hours of operation

A.c.5 The proposed hours of operation for the integrated waste management facility are as per those currently licensed under W0129-02:

Hours of Operation:	07:00 to 19:00 Monday to Friday
	07:00 to 17:00 Saturday

A.c.6 It is proposed that construction works may extend beyond these times for certain prescribed construction activities.

Proposed hours of waste acceptance/handling

A.c.7 The proposed hours of waste acceptance for the integrated waste management facility are as per those currently licensed under W0129-02:

Waste Acceptance Hours:	08:00 to 18:00 Monday to Friday 07:00am to 16:00 Saturday No waste acceptance on bank holidays.

Proposed hours of construction and development works at the facility and timeframes

A.c.8 It is proposed that the hours of construction and development works at the integrated waste management facility be extended slightly beyond the proposed hours of operation to facilitate the specialist techniques applied to construct the hazardous landfill cells. The preferred contractor for this activity will transport plant and equipment from its base in Switzerland to the development site, and will include specialist staff and operations. Due to the nature of the technology applied and the staff requirements, working days are proposed to be long and beyond normal working hours.

A.c.9 The proposed hours of construction and development works at the facility for the hazardous cells are:

Hours of DAC-cell construction:	06:00 to 21:00 Monday to Friday 06:00 to 21:00 Saturday

A.c.10 The hazardous cell construction activities will take place in the quarry 'basin', thereby mitigating against any potential environmental nuisances (e.g. noise).

A.c.11 The duration of hazardous cell construction activities is expected to last for a number of weeks at a time for each of the three hazardous cells.

A.d NTS: Section D - Infrastructure & Operation

A.d.1 In accordance with EPA licence conditions (W0129-02) and EPA Landfill Manuals, a range of infrastructural works have been completed at the site since Waste Licence W0129-01 was issued in December 2002. The proposal for an integrated waste management facility will require a number of additional and significant infrastructural requirements.

Site security arrangements including gates and fencing

A.d.2 Site security and perimeter fencing is in place at the site in accordance with the current Waste Licence (W0129-02). This infrastructure will be maintained and adapted to meet the requirements of the proposed integrated waste management facility.

A.d.3 The planning application for the integrated waste management facility seeks to relocate the existing site entrance (on the western boundary) to a new purpose-built facility entrance and facility control area in the south-east of the site, off the LP01080. New weighbridges and site offices are proposed, which will control all incoming vehicles movements.

A.d.4 The existing facility entrance is located on the western boundary of the site. It is proposed to retain this entrance for emergency access/egress only (once the new facility entrance has been constructed).

A.d.5 The site is covered by CCTV, with secure back-up of recorded data. New CCTV cameras will be installed at strategic locations across the site in line with the proposed integrated waste management facility.

Designs for site roads

A.d.6 The existing haul road through the central portion of the site will be developed to provide access to the proposed landfill cells. Secondary haul roads with access control will be constructed to ramp down into each of the cells. By having only one controlled access point to each cell, waste placement can be controlled.

Design of hardstanding areas

A.d.7 Hardstanding areas are in place at the site currently in accordance with the Waste Licence W0129-02. The site entrance, site office, garage and staff car park area are constructed on concrete hardstanding. These hardstanding areas will be retained.

A.d.8 It is proposed that the new facility control area (in line with the new facility entrance) will comprise concrete hardstanding, surrounding the administration building and providing a car parking area.

Solidification Plant

A.d.9 It is proposed that a solidification plant will be constructed at the facility, primarily for the pre-treatment of hazardous flue gas treatment (FGT) residues from waste-to-energy facilities, prior to their deposition at the hazardous landfill cells.

A.d.10 The level of the solidification plant will be screened by excavating the side slope and constructing the plant at a lower level than the administration building. A storage building for solidified material will be constructed directly beside the solidification plant, as will a bunded compound to store diesel for machinery and plant.

A.d.11 The design of the solidification plant has been developed with reference to similar plants in operation in Europe. The proposed design of the solidification plant is shown on drawing:

- Proposed Solidification Plant (Drawing Ref. WLA-09)

A.d.12 The design of the proposed solidification plant comprises the following key aspects:

- An enclosed process building with process area, storeroom, process control room and welfare facilities (showers, canteen, toilets, changing room, etc.) (floor area 398 m^2)
- Process area which will house a mixing unit and weighing scales
- 4 x storage silos will be provided to store FGT residues awaiting solidification (4 x 78 m^3)
- 1 x cement silo will be provided (1 x 78 m^3)
- 2 x 30m^3 bunded acid tanks will be provided

Storage Building (for solidified material)

A.d.13 The storage building proposed will have a finished floor level of 119.25 m OD and a height of 9 metres. The maximum roof level of 128.25m OD Malin will match the access road level east of the building. The ridge level is below the surrounding ground levels and the building will be screened by the quarry lip. The storage building plans, elevations and sections are shown on Drawing **WLA-10**. The floor area of the storage building will be 1,285 m^2 with overall (external) dimensions of 31.26 m x 43.10 m x 9.00 m high.

- Proposed Storage Building drawing (Drawing Ref. WLA-10)

Weighbridge

A.d.14 It is proposed to install 2 No. new surface mounted weighbridges weighbridges at the facility control area, i.e. one ‘in’ weighbridge and one ‘out’ weighbridge.

Wheelwash

A.d.15 It is proposed to install two wheel washing units, which drivers will be required to pass through. Trucks will first pass through a bath wheel wash, constructed in reinforced concrete; water supplied to the wheelwash will be by means of a pressure main. The second wheelwash will be a spray-type wash with water recycling.

A.d.16 MEHL owns a roadsweeper, which is dedicated for use at the site.

Laboratory facilities

A.d.17 Floor space for laboratory facilities for the new integrated waste management facility is available within the solidification plant building (second floor); MEHL will develop on-site laboratory facilities if commercially viable.

Design and location of fuel storage areas

A.d.18 It is proposed to construct a new fuel storage location; a 7,500 litre diesel tank for site machinery will be stored in a bunded and roofed storage area, constructed adjacent to the solidification yard.

Waste Quarantine Areas

A.d.19 A segregated quarantine area will be provided within the active hazardous cell to accommodate non-hazardous or hazardous waste that will require further testing.

Waste Inspection Areas

A.d.20 An inspection platform is proposed at the administration building to inspect accessible loads.

Traffic Control

A.d.21 New traffic control measures are required in line with the proposed new facility entrance. All incoming traffic will be required to stop at the weighbridge. Vehicles and visitors other than those delivering waste will be required to sign the 'Visitors' Book' and park in the designated parking areas. Staff will use the designated staff parking areas.

A.d.22 Waste delivery vehicles will be weighed in at the weighbridge. It is recognised that a superior level of control is required to ensure that vehicles access the correct tipping area on site: (a) Active Waste Recovery Area; (b) Solidification Plant, (c) Active Hazardous Cell, (d) Active Non-hazardous Cell, (e) Active Inert Cell.

A.d.23 A bespoke access control system will be developed to ensure that the correct tipping or discharge area is used. It is proposed that each of the tipping areas identified above are barrier-controlled. Following weighing in and inspection at the weighbridge, the driver will be assigned a device which permits access only to the designated tipping/discharge area. The banskman will do a final check of the material prior to discharge.

Surface Water Management

A.d.24 The primary aim of the proposed surface water management system for the integrated waste management facility is to avoid potential adverse impacts on the receiving watercourse in terms of water quality and flow. Runoff will be captured close to its source and released slowly into a local stream along the northern site boundary.

A.d.25 Surface water runoff during construction will be contained within the void and this will be managed in the same way as it is currently being managed, which consists of pumping out to the settlement ponds as necessary.

A.d.26 It is proposed to manage surface water by using a combination of elements including filter drains and swales, a wetland pond, a detention basin, and rainwater harvesting.

Wetland System

A.d.27 The proposed wetland treatment system (in the north-east of the site) consists of a sedimentation basin prior to conveyance through the extended detention wetland, which is designed for water quality control and flow attenuation to protect the receiving water system from increased runoff, erosion and otherwise potential flooding.

Foul Water Management

A.d.28 It is proposed to collect all foul water generated on the site by means of a separate foul sewer system. The effluent will be domestic type from toilet and canteen facilities. All effluent will be collected in a sealed underground pipework system and discharged to a domestic type treatment plant with treated effluent percolated to ground. The onsite wastewater packaged treatment plant and raised bed percolation will be located to the east of the administration building.

Water supply

A.d.29 A new watermain is to be connected to existing watermain on the public road L01080.

Electrical and Telecoms

A.d.30 The electrical and telecommunication infrastructure will be located in consultation with the relevant service provider. The construction of the new entrance and access road will require the undergrounding and diversion of overhead electrical lines within the landownership boundaries.

Lighting

A.d.31 The lighting proposal has been considered with regard to the rural nature of the site. The site lighting has been designed to meet the required safety standards for the site, while minimising overspill and excess lighting. It is proposed to install 1m high lighting bollards from the entrance, along the proposed access road as far as the solidification area. At the solidification plant and storage building 6m high lighting standards will be provided.

Plant sheds, garages and equipment compound

A.d.32 A maintenance building is in place adjacent to the existing site entrance. It is proposed to retain this maintenance building until the final restoration phase. It is also proposed to construct a storage building for solidified material adjacent to the solidification plant.

Site Accommodation

A.d.33 A site office is in place at the site in accordance with the current Waste Licence (W0129-02). It is proposed to relocate the site offices adjacent to a proposed new site entrance in the southeast of the site. The administration building will include reception area, offices, canteen, filing room, meeting room, showering and toilet facilities. The building will be a single storey building with flat roof. The proposed finished floor level is 129.95m OD and maximum roof level of 134m OD. The floor area of the building is 128 m^2 with overall dimensions 16.69m x 9.25m x 6.0m high. Ten car parking spaces will be provided near the administration building.

A.d.34 Office accommodation and welfare facilities are also proposed to be located at the Solidification Plant. It is proposed to decommission the existing site office and archive unit once new facilities have been established at the facility control area.

Fire Control System, including water supply

A.d.35 A fire control system is in place at the site in accordance with the current Waste Licence (W0129-02). A mains supply of water is available along road LP01090. Proposed new buildings will be subject to fire regulations and will be required to obtain a Fire Certificate. Appropriate fire safety systems and fire-fighting equipment will be installed.

Civic Amenity facilities

A.d.36 There will be no civic amenity facilities provided on the site.

Other waste recovery infrastructure

A.d.37 Recovery infrastructure proposed includes provision for Classes 3, 4 and 13 of the Fourth Schedule of the Waste Management Acts 1996-2010 (as per existing licence), as follows:

- the recovery of metal within wastes delivered to the facility; recovered metals shall be dispatched onwards to appropriate reprocessing facilities.
- the recovery of inert material for use in site development and site restoration works; this may involve the use of temporary crushers and screeners on site, as per existing and historic operations.
- the storage of wastes for recovery purposes at this facility (e.g. stockpiles of soil) and the temporary storage of materials (e.g. metals), pending their dispatch to appropriate off-site recovery facilities.

Composting infrastructure

A.d.38 There will be no composting infrastructure on-site.

Construction & Demolition waste infrastructure

A.d.39 As a previous quarry and existing inert landfill site, the facility has mobile and fixed crushing, screening, grading and conveyor equipment on site. It is proposed to retain this infrastructure for ongoing recovery activities.

Incineration infrastructure

A.d.40 There will be no incineration infrastructure on-site.

Any other infrastructure

A.d.41 Other infrastructure includes:

- Monitoring infrastructure, existing and proposed is described in Section **F**.
- Leachate management infrastructure is described in Section **D**.
- Following consultation with the Geological Survey of Ireland (GSI), MEHL has agreed to provide a viewing platform (close to the existing site entrance in the west of the site) from which the quarry faces can be viewed in a safe environment.

MEHL will also provide an information panel relating to the geological features of interest in the site. These are recommended mitigation measures outlined in the *Geology* section of the EIS.

- During specific phases of development, alternative natural or artificial ledges will be installed on the south-western side of the limestone cliff face as roosting or potential nest sites for peregrine falcons, as a recommended mitigation measure of the *Flora and Fauna* section of the EIS.

Facility Operation

A.d.42 Unit operations at the site may be identified as:

1. Construction activities
2. Facility control area and related operations
3. Waste recovery activities
4. Solidification process (pre-treatment, prior to landfilling, for certain hazardous wastes)
5. Landfill operations: hazardous landfill cells
6. Landfill operations: non-hazardous landfill cells
7. Landfill operations: inert landfill cells
8. Ancillary activities, e.g. garaging and maintenance, leachate management, surface water management
9. Management of restored areas

Landfill Cells

A.d.43 It is proposed to construct hazardous (1,735,500 m^3), non-hazardous (1,324,000 m^3) and inert (755,500 m^3) landfill cells. The hazardous waste cells will be sited in the northern part of the existing quarry. The non-hazardous cell will be located in the southern part of the site and the inert cells to the west. The layout is shown on the attached site layout Drawing **WLA-03**.

Phasing

A.d.44 The proposed life span of the facility will be 25 years with construction, operation and restoration undertaken on a phased basis. Construction is expected to commence in 2011. Final restoration will be completed by 2036. The landfill will be constructed in four phases over a 25 year period. The actual phasing will depend on the volumes of appropriate waste generated over the lifespan of the project, which is influenced by a number of factors, including waste policy and economic conditions.

A.d.45 The hazardous cells will be constructed and restored over three phases. The construction works will be phased moving from the north to the south of the site. The final restoration of each hazardous cell will commence when filling is completed. As each phase is developed the leachate management and surface water management systems will be extended to connect new cells to the existing infrastructure.

Final Restoration

A.d.46 The final restoration will comprise the demolition and recycling of the administration building, electrical substation, carparking area, lighting standards and road pavement. During the final restoration, non-hazardous waste cell NH2 and inert waste cell IN1 will be capped and restored.

A.d.47 The maximum restored level will be 148m OD Malin near the existing entrance on the western boundary. Restoration levels will slope from the east and north of the highest point to match the surrounding ground levels.

Liner System

A.d.48 The function of a lining system is to protect groundwater, surface water and soils by containing leachate within the landfill; preventing/controlling groundwater ingress and assisting in controlling landfill gas migration.

Inert Cell Liner

A.d.49 MEHL operates as an inert landfill under Waste Licence W0129-02. It is proposed to continue inert operations as part of the proposed integrated waste management facility. In relation to the liner, W0129-02 requires a base and side-wall lining system, comprising "*…a mineral layer of a thickness of 1m with a hydraulic conductivity*[4] *less than 1x10^{-7} m/sec or similar with equivalent protection to the foregoing*[5]".

[4] 'hydraulic conductivity' describes the rate at which a fluid can move through a permeable medium

[5] As per Landfill Directive 1999/31/EC Annex 1

A.d.50 Fill material sourced on-site was used to provide a level surface, upon which a clay lining was laid to a thickness of over 1m. The clay lining material (glacial overburden till) that overlies the bedrock formations was sourced on site.

A.d.51 It is proposed that the inert lining system will be constructed as follows:

- **Waste** will be placed on top of:
- **Barrier Layer** - A compacted clay layer of a minimum thickness of 1m with a hydraulic conductivity $\leq 1.0 \times 10^{-7}$ m/s, or similar with equivalent protection; which is laid over:
- **Formation** - Prepared existing ground

Non-hazardous Cell Liner

A.d.52 For non-hazardous cells proposed as part of the integrated waste management facility, it is proposed that a composite clay and geomembrane liner will be installed on both the base and side walls of the proposed non-hazardous cells.

A.d.53 It is proposed that the non-hazardous lining system will be constructed as follows:

- **Waste** will be placed on top of:
- **Filtration Layer** (geotextile), which is laid over:
- **Leachate Collection Layer** - 500mm thick drainage stone layer incorporating a herringbone system of leachate collection pipework, which is laid over:
- **Protection Layer** (geotextile), which is laid over:
- **Barrier Layer** - Min 2mm thick welded HDPE Geomembrane liner, which is laid over:
- **Barrier Layer** - Compacted mineral layer equivalent to a 1m thick layer [*NOTE*] , which is laid over:
- **Formation** - prepared existing ground

[*NOTE:* Beneath this barrier layer, an additional bentonite-enhanced soil (BES) mineral liner will be placed, as a mitigation measure recommended in the Hydrogeological Section of the Environmental Impact Assessment.]

Hazardous Cell Liner

A.d.54 In selecting a lining system for the proposed facility, a number of lining system solutions was considered to line the hazardous cells in line with the requirements of the Landfill Directive 99/31/EC. The design options appraisal for this facility considered both single composite and double composite HDPE liners, as well as an alternative lining system comprised of Dense Asphaltic Concrete (hereinafter referred to as 'DAC'), which is commonly used in Europe.

A.d.55 Having considered the three options, the DAC lining system was considered superior to the single and double composite liners for use as a landfill liner for the hazardous cells. A DAC lining system is engineered to provide complete containment rather than controlled seepage thus making it a more effective landfill barrier than the single, composite or multiple lining systems traditionally used.

A.d.56 DAC systems are commonly used in Europe in rail, road, tunnel, dam and reservoir construction as well as landfills. Information from WALO UK (and parent WALO Bertschinger AG), one of the leading suppliers of DAC in Europe, indicates that 13 landfill cells in the UK have been lined with DAC. WALO have also lined a number of landfill sites in Europe principally in Switzerland, Germany and more recently in Italy, Spain and Poland.

A.d.57 The proposed construction of hazardous waste cells will comprise the following components;

- **Waste** will be placed on top of:
- **Filtration Layer** (geotextile), which is laid over:
- **Leachate Collection Layer** - 500mm thick stone layer incorporating a herringbone system of leachate collection pipework, which is laid over:
- **4 DAC Barrier Liners**, comprising: (i) Mastic Sealant, (ii) 80mm thick Dense Asphaltic Concrete , (iii) 60mm thick Asphaltic Binder Layer, (iv) 200mm thick Granular Stabilising Sub-base / Leak Detection Layer, which is laid over:
- **Basal Barrier Layer -** Compacted mineral layer equivalent to a 500mm thick layer under the cell base and extended 3m up the sidewalls on, which is laid over:
- **Formation -** prepared existing ground

Quality Control, Quality Assurance & Third-party Supervision

A.d.58 MEHL will employ suitably skilled and experience personnel for cell construction works, as well as independent third-party supervision and Construction Quality Assurance (CQA).

Leachate Management

A.d.59 Three leachate types will be generated on site from the inert, non-hazardous and hazardous waste cells. The leachate generated in the non-hazardous and hazardous cells will be pumped to dedicated holding tanks and will be reused or disposed off site. Current and established practice will be continued with regard to inert leachate management.

Leachate from hazardous cells

A.d.60 The leachate collection will be achieved by constructing a 500mm thick layer of drainage stone with herringbone collection pipework placed above the liner. The fall of the basal liner will be towards a sump at the cell perimeter. The leachate in the sump will be pumped to a HDPE lined, concrete leachate holding tank. The collected leachate will be utilised in the solidification process, as described in the solidification section. The leachate will be used in place of process water, as commonly practised in Europe.

Leachate from non-hazardous cells

A.d.61 The management of the non-hazardous leachate will be the same as for the management of hazardous leachate mentioned above. As required, non-hazardous leachate may be disposed off-site to an EPA-licensed waste water treatment plant. The non-hazardous leachate will be stored in a HDPE- lined concrete tank beside the administration building.

Landfill Gas Management

A.d.62 It is proposed that the integrated waste management facility will accept only non-biodegradable wastes, which will be subject to Waste Acceptance Criteria. There will, therefore, be no generation of landfill gases; landfill gas infrastructure is not proposed.

Capping System

A.d.63 The capping systems will be designed to meet the requirements of the EPA Landfill Site Design Manual and comply with Best Available Techniques (BAT) and the Landfill Directive 1999/31/EC for inert, non-hazardous and hazardous landfill cells. The capping of the waste cells will be undertaken on a phased basis.

A.e NTS: Section E - Emissions

Emissions to Atmosphere

A.e.1 In relation to solidification operations, all operations will be contained and enclosed. The ground floor area will allow for the unloading of two bulk tankers inside the building. The unloading process will be undertaken after closing the roller shutter doors, fixing an exhaust extractor to the bulk tanker and connecting to the manifold to pump material into the silos.

A.e.2 The solidification plant will be fully enclosed with roller shutter doors and mechanical ventilation and filters preventing dust emissions. Silos will also be equipped with High Efficiency Particulate Abatement (HEPA) filters to prevent emissions.

A.e.3 Bottom ash will be delivered to the facility in a dampened form and operational procedures will be employed to prevent the potential for dust-blow.

A.e.4 No landfill gas will be generated at the facility.

Emissions to Surface Waters

A.e.5 A number of discharge points to surface water for the proposed integrated waste management facility are proposed in the waste licence application. All surface water discharges will be controlled.

Emissions to Sewers

A.e.6 No emissions to sewer are proposed. It is proposed that any excess leachate generated, which is not reused on-site, will be tankered to an appropriate off-site facility.

Emissions to Groundwater

A.e.7 It is proposed to install an on-site effluent treatment system for wastewater from the proposed new office buildings/toilets, including percolation area.

Excavations below the water table

A.e.8 There have been previous excavations below the water table, which will be backfilled, such that the minimum cell formation level will be 102.5m above Ordnance Datum (OD).

Waste disposal in, on and under the ground

A.e.9 Waste will be landfilled in specially engineered landfill cells. A full leachate containment and management system is proposed.

Discharge of clean surface water runoff from roads and hardstands into the ground

A.e.10 All surface water runoff from paved areas, car park, etc. will be filtered through a silt trap and oil interceptor prior to discharge.

Accidental spills

A.e.11 Potential spills such as fuel spills will be immediately managed by containment of liquids and excavation of contaminated materials. Fuel storage areas will be bunded, with spill kits dispersed around the site for use in an emergency.

Noise Emissions

A.e.12 The noise assessment completed as part of the EIS showed that the predicted noise levels at the nearest sensitive locations, due to emissions from the proposed development, are within the sites operational noise limits in all instances. A temporary slight increase in noise levels during the construction phase is predicted, for which the EIS specified a number of mitigation measures.

Environmental Nuisances

A.e.13 As the proposed facility will accept non-biodegradable waste only, the typical impacts which can be associated with municipal landfills such as landfill gas, odours, birds, litter and vermin will not be an issue in this case.

A.e.14 The following dust mitigation measures will be undertaken:

- Water sprays will be used, as required, during dry or windy conditions.
- Restricting operations during windy weather conditions.
- Water sprays will be used, as required, to ensure that bottom ash does not dry out. Bottom ash will be quenched in the waste-to-energy facilities and will be delivered to site damp.
- All vehicles will be required to use the wheelwash prior to exiting the facility.

- Waste cells, particularly hazardous and non-hazardous cells, will be covered, as necessary.
- The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors.

A.f NTS: Section F - Control & Monitoring

A.f.1 A quarterly monitoring regime is well established at the facility, under the terms of EPA Licence W0129-02. The Waste Licence application recommends locations and frequencies for monitoring of noise, dust, surface water, surface water discharge, leachate and groundwater.

- Proposed Monitoring Locations Drawing (Drawing Ref. WLA-27)

Treatment, Abatement and Control Systems

To Atmosphere

A.f.2 Potential fugitive dust, landfill gas, noise and VOC emissions were assessed and no treatment, abatement or control measures were considered necessary.

A.f.3 All operations at the solidification plant will be contained and enclosed, with roller shutter doors and mechanical ventilation and filters preventing dust emissions. Silos will also be equipped with High Efficiency Particulate Abatement (HEPA) filters to prevent emissions.

To Surface Water

A.f.4 The drainage system proposed for managing surface water runoff from the proposed development will follow the principles of Sustainable Drainage Systems (SuDS) as detailed in Chapter 6 of Volume 3 Environmental Management, of the Greater Dublin Strategic Drainage Study (GDSDS).

To Sewer

A.f.5 It is not proposed to discharge to sewer.

To Ground(water)

A.f.6 Waste will be landfilled in specially engineered landfill cells. A full leachate containment system is proposed.

A.f.7 It is proposed to collect all foul water generated on the site (from kitchen, toilets and washing facilities) by means of a separate foul sewer system. Effluent will be discharged to a domestic type treatment plant with treated effluent percolated to ground. The onsite wastewater packaged treatment plant and raised bed percolation will be located to the east of the administration building.

Air Monitoring and Sampling Points

A.f.8 Proposed dust monitoring locations include the 4 No. existing monitoring locations as per W0129-02, plus an additional monitoring point (D6) on the eastern licence boundary.

Surface Water Monitoring and Sampling Points

A.f.9 Proposed surface water (upstream and downstream) monitoring locations remain as per W0129-02. 5 No. surface water discharge (SWD) monitoring locations are proposed.

Sewer Monitoring and Sampling Points

A.f.10 No discharge to sewer is proposed; thus no monitoring is proposed.

Groundwater Monitoring and Sampling Points

A.f.11 Groundwater monitoring at 10 No. groundwater monitoring boreholes is proposed, on a quarterly basis.

Noise Monitoring and Sampling Points

A.f.12 It is proposed to monitor noise at 4 No. specified noise monitoring locations.

Meteorological Data Monitoring and Sampling Points

A.f.13 It is proposed that a daily record of representative meteorological data will be obtained from the nearest weather station (Dublin Airport), as per existing arrangements under W0129-02.

Leachate Monitoring and Sampling Points

A.f.14 Leachate monitoring is proposed at 13 No. locations, i.e. at 6 No. locations within the hazardous cells, at 3 No. locations within the non-hazardous cells and at 4 No. locations within the inert cells.

A.f.15 In addition to leachate monitoring within individual cells, it is proposed to install a leak detection system under the hazardous cell liner. 6 No. leak detection monitoring points are proposed.

Landfill Gas Monitoring and Sampling Points

A.f.16 Non-biodegradable wastes only will be acceptable at the facility; therefore landfill gas will not be generated. No landfill gas monitoring points are proposed; however all leachate monitoring boreholes will be designed to also facilitate landfill gas monitoring.

A.g NTS: Section G - Resources Use & Energy Efficiency

Raw Materials and Product

Material Balance

A.g.1 The material types and estimated quantities required to construct the proposed landfill have been estimated. Existing stockpiles of low permeability clays and subsoils on site will be used in the lining and capping systems. Granular and other liner construction materials required will be sourced off-site and imported.

Raw Material Use

A.g.2 It is envisaged that the solidification process will use cement (or replacement binding materials, as appropriate), acid and water.

Water Use

A.g.3 Mains water is currently piped onto site. A new watermain will supply potable water to the welfare facilities in the administration and solidification buildings. Rainwater will be harvested.

Diesel Use

A.g.4 It is proposed to install a 7,500 litre diesel tank for site machinery, to be stored in a bunded and roofed storage building, adjacent to the solidification yard. The existing fuel storage area will be decommissioned when the new fuel storage area has been installed.

Energy Efficiency

A.g.5 A new electricity connection will be brought to the new site office/weighbridge, solidification plant and storage building. It is proposed to construct an ESB substation at the facility control area. MEHL will specify energy-efficient design, construction, plant and equipment at detailed design phase. Records of energy usage will continue to be maintained on site and reported to the EPA in the Annual Environmental Report (AER) in accordance with licence conditions.

A.h NTS: Section H - Materials Handling

Waste Types

A.h.1 This proposal is for the construction of fully engineered landfill cells, designed to international best practice standards, suitable for the acceptance of:

- hazardous ash and soils and other compatible non-biodegradable waste streams;
- non-hazardous, non-biodegradable wastes; and
- inert wastes.

A.h.2 The facility will not accept asbestos.

A.h.3 The facility will not accept liquid or biodegradable wastes.

A.h.4 It is proposed that the facility will accept residues from waste-to-energy (incineration) facilities; this includes Flue Gas Treatment (FGT) residues, Incinerator Bottom Ash (IBA) and boiler ash.

A.h.5 It is also proposed to accept contaminated soils, sludges and residues, and other compatible wastes. Materials for recovery will be accepted, as per existing licensed activities (under W0129-02).

A.h.6 The proposed integrated waste management facility at MEHL will be in the unique position of offering landfill disposal capability under all classes of landfill: inert, non-hazardous and hazardous. Incoming wastes will be subject to WAC (Waste Acceptance Criteria) control/testing and will be diverted to the appropriate class of landfill cell on that basis, in accordance with the conditions of the Waste Licence as applied or varied from time to time by EPA to address any changes in law or policy.

Residues from Waste-to-Energy Facilities

A.h.7 In compiling the list of proposed waste types, MEHL was cognisant of the imminent commencement of operations at the Indaver waste-to-energy facility at Carranstown, Duleek, Co. Meath (EPA Licence W0167-01). There are a number of other waste-to-energy facilities pending nationally, at various stages of planning/development. Three primary residues will be produced by waste-to-energy facilities in Ireland: 'bottom ash', 'Flue Gas Treatment (FGT) residues' and 'boiler ash'. Based on international experience, FGT residues are generally classified as hazardous wastes, and bottom ash and boiler ash are non-hazardous wastes.

Waste Quantities

A.h.8 The existing EPA licence for the facility, W0129-02, allows for the acceptance of a maximum of 500,000 tonnes of inert waste per annum. The current application seeks to maintain this upper limit of 500,000 tonnes per annum (total for all incoming waste types); however current projections indicate that the likely annual tonnage will be in the range of approximately 250,000 to 350,000 tonnes per annum.

A.h.9 As the proposed maximum tonnes per annum acceptable into the facility remains as per the existing EPA Licence W0129-02 (and planning permission), there will be no intensification of waste activity. Incoming waste tonnages are expected to be lower during Phase 1 of the project. Further details in relation to phasing are provided in Attachment **D.2**.

Waste Acceptance Procedures

A.h.10 Detailed Waste Acceptance Procedures (for inert waste) have been developed for Hollywood Landfill, in accordance with Waste Licence W0129-02 and Council Decision (2003/33/EC) Establishing Criteria and Procedures for the Acceptance of Waste at Landfills. Procedures have been agreed with the Agency (and subject to ISO14001:2004 auditing and inspection) and are reviewed on an annual basis.

A.h.11 The application outlines the proposed waste acceptance framework for the integrated waste management facility.

A.h.12 The Landfill Directive 1999 describes general principles for acceptance of waste at the various classes of landfill and requires testing of waste as follows:

- **Level 1: Basic Characterisation.** This constitutes a thorough determination, according to standardised analysis and behaviour-testing methods, of the short and long-term leaching behaviour and/or characteristic properties of the waste.
- **Level 2: Compliance Testing.** This constitutes periodical testing by simpler standard analysis and behaviour-testing methods to determine whether a waste complies with permit condition and /or specific reference criteria. The tests focus on key variables and behaviour identified by basic characterisation.
- **Level 3: On-site verification:** This constitutes rapid check methods to confirm that a waste is the same as that which has been subjected to compliance testing and that which is described in any accompanying documents. It may consist of a visual and odour inspection of a load of waste before and after unloading at the landfill site."

Council Decision 2003/33/EC

A.h.13 EU Council Decision of 19 December 2002 (2003/33/EC) *establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC* establishes the criteria and procedures for the acceptance of waste at landfills. The Annex lays down a uniform waste classification and acceptance procedure, and provides further detail on Basic Characterisation, Compliance Testing and On-site Verification, outlined above.

Waste Acceptance Criteria (WAC) Testing and Limit Values

A.h.14 MEHL has been a forerunner in Ireland in the development and application of the Waste Acceptance Criteria (WAC) testing regime for inert waste acceptance, and will draw on this experience for the WAC testing to be applied at the integrated waste management facility.

Waste Handling

Waste recovery operations

A.h.15 The facility is currently licensed (under W0129-02) for Fourth Schedule, Classes 3, 4 and 14 activities, i.e. recycling or reclamation of metals and metal compounds; recycling or reclamation of other inorganic materials; and storage of waste intended for recovery. No change is proposed as part of this application.

A.h.16 Mobile recovery equipment is used on site currently and it is intended to maintain this activity as part of the integrated waste management facility. Standard crushing, screening and grading technologies are used for the recovery of construction-type materials. Magnetic separation may be applied for recovery of metals.

Solidification of Flue Gas Treatment (FGT) residue

A.h.17 Cement solidification involves the mixing of wastes with cement (or alternative materials) and additives (to control the properties of the cement), and enough water to ensure that hydration reactions will take place to bind the cement. The wastes are thereby incorporated into the cement matrix.

Bottom Ash Handling Procedures

A.h.18 Bottom ash will be subject to Waste Acceptance Criteria testing before arriving on site. Testing will determine the appropriate class of landfill for disposal.

A.h.19 The phasing timeline for the MEHL integrated waste management facility indicates that non-hazardous landfill capacity will not be constructed at the facility until Phase 2 operations. During Phase 1, any incoming incinerator bottom ash received at the facility will be directed to the active hazardous landfill cell.

A.h.20 Bottom ash will be transported in covered containers and deposited directly onto the cell floor. A detailed deposition plan for bottom ash will be developed and agreed with the Agency, to act as a comprehensive record of waste placement.

A.h.21 International experience shows that bottom ash recovery options are technically feasible; however there are currently no provisions for reuse/recovery of bottom ash in Ireland, largely relating to market conditions and lack of economic or regulatory drivers. Recovery of bottom ash may be possible in the future and it is proposed that waste placement at MEHL is controlled and recorded in a manner which could facilitate its future extraction from the site. This principle is sometimes referred to as 'Design to Mine'.

Proposed outline solidification procedure at MEHL

A.h.22 Flue gas treatment (FGT) residue will be delivered to the site in fully enclosed tankers only.

A.h.23 The operational process around solidification includes:

i. Unloading of FGT residue
ii. Weighing
iii. Mixing
iv. Discharging to IBC[6] bags
v. Labelling of each bag/block
vi. Conveying/transportation to the storage building
vii. Storage of solidified blocks/IBC bags
viii. Placement of solidified blocks/IBC bags to temporary storage area within landfill cell
ix. WAC testing
x. Placement of solidified blocks/IBC bags in landfill cell

Landfilling: Landfill Tipping Zones

A.h.24 MEHL has developed a bespoke and effective management tool for recording the location of waste placement under W0129-02, which is proposed to be employed and further developed for the proposed inert, non-hazardous and hazardous landfill cells going forward.

Waste Arisings

A.h.25 Any excess spoil generated as a result of proposed construction activities will be reused on site insofar as possible, stockpiled for restoration activities, or removed off-site to an appropriately permitted/licensed facility.

A.h.26 General municipal-type waste and recyclables will be generated as a result of office and staff mess facilities. Only permitted/licensed waste collectors and facilities, with EPA pre-approval, will be used for removal off-site.

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[6] IBC = intermediate bulk container; for the this purpose, it effectively means large bags

A.h.27 It is proposed that leachate generated on-site will be re-used within the solidification plant, with excess to be removed off-site to an appropriately licensed facility, as required.

A.i NTS: Section I - Existing Environment & Impact of the Facility

Assessment of atmospheric emissions

A.i.1 The likely impact of the proposed MEHL development on air quality was assessed.

A.i.2 The assessment of the impacts of the construction phase on air quality considered the impact of construction activities associated with the construction of the solidification plant, new entrance and other site infrastructure and landfilling activities and construction traffic. The assessment of the operational phase considered the impact on air quality of operational traffic, fugitive emissions and odour from landfilling.

Existing Environment

A.i.3 MEHL undertakes dust deposition monitoring biannually at four locations in accordance with the current Waste Licence.

A.i.4 According to the 2009 Annual Environmental Report for the existing facility, dust deposition monitoring results were significantly below the licence limit during both monitoring rounds.

A.i.5 Previously, under Waste Licence No. W0129-01, when quarrying activity was also underway at the site, MEHL was obliged to undertake dust deposition monitoring once per quarter. The overall exceedance rate for all dust deposition monitoring rounds was 4% with a compliance rate of 96% since operations at the site began in 2003.

A.i.6 It is not proposed to accept any biodegradable waste materials. Hence the odour potential presented by, for example, municipal landfill facilities, will not occur at the MEHL facility.

Emissions from the MEHL Facility

A.i.7 During the construction phase, dust and traffic will be the main potential emissions to air. The Contractor will be obliged to comply with the dust deposition limits set by the existing EPA Waste Licence No. W0129-02 or any future licence.

A.i.8 The Contractor will compile a Dust Minimisation Plan which will be implemented. At all times, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented by the Contractor to rectify the problem.

A.i.9 The UK Highways Agency 'Design Manual for Roads and Bridges' states that if daily traffic flows change by less than 1,000 annual average daily traffic or Heavy Duty Vehicle (trucks) flows change by less than 200 annual average daily traffic, then the impact on air quality can be considered neutral. During the construction phase, no routes are predicted to achieve an increase in truck numbers of this significance.

A.i.10 The main potential operational sources of emissions to air are operational site traffic, and fugitive emissions.

A.i.11 It is only proposed to accept non-biodegradable material at the MEHL facility, therefore impacts associated with the generation of odours from the decomposition of organic materials will not arise.

A.i.12 Hydrocarbon contaminated soils may have the potential to release fugitive odorous emissions. Operational control procedures will be implemented to ensure that such wastes are covered as appropriate to prevent potential odour emissions of this kind.

A.i.13 Non-hazardous wastes will be transported in either enclosed containers or covered vehicles and deposited directly into the waste cell. The distance to the closest residential dwelling is approximately 85m from the proposed non-hazardous waste cell. No significant odour impact as a result of the landfilling of non-hazardous waste is therefore anticipated.

A.i.14 Hazardous wastes will either be transported directly to the solidification plant or to the hazardous waste cells according to the waste type and characterisation. Hazardous waste in the form of flue gas treatment residues specified for pre-treatment in the solidification plant will be transported in fully enclosed tankers to the site and will be pumped via an enclosed system into a steel silo, inside an enclosed building. From the silo the residues will be pumped directly into the mixing unit. The residues will then be mixed, bagged, cured and deposited into the cell. There will be no odour potential from the flue gas treatment residues or the solidification process.

A.i.15 Hazardous wastes which do not require pre-treatment in the solidification plant will be transported to the site in covered or fully enclosed containers, in accordance with regulatory requirements. The wastes will then be deposited directly onto the hazardous cell floor. The closest residential dwelling is located at a distance of approximately 284m from closest hazardous waste cell therefore no significant odour impact is anticipated.

A.i.16 As both hazardous and non hazardous leachate will be stored in closed concrete tanks, no odour impact from the storage of leachate is likely to occur.

Assessment of impacts of surface water discharges on the receiving waters

A.i.17 As a consequence of compliance with the construction and operational mitigation measures there will be no significant negative effects to nearby surface watercourses or the downstream catchment arising from the proposed MEHL facility. At all times, the MEHL facility will be operated in accordance with the conditions as set out in the waste licence.

A.i.18 The proposed development has been assessed in accordance with the requirements of the DEHLG/OPW[7] guidelines on *'The Planning System and Flood Risk Management'* and it has been determined that the proposed development will neither create nor increase flood risk and is therefore deemed appropriate development in the context of flood risk.

Assessment of impact on receiving sewer

A.i.19 No discharge to sewer is proposed.

Assessment of impact to groundwater and soils

A.i.20 An assessment of the potential impacts to the soils, geology and hydrogeology from the proposed development was undertaken for the site and the surrounding area. Potential impacts from the development were established and mitigation measures were developed. Due regard was had to guidance from the Geological Survey of Ireland, the Institute of Geologists of Ireland and the National Roads Authority.

[7] DEHLG = Department of Environment, Heritage and Local Government. OPW = Office of Public Works

Existing Environment

A.i.21 The existing environment was assessed from publically available literature, historic site specific information and the extensive field investigations carried out as part of this assessment.

A.i.22 The existing baseline is summarised below:

- Bedrock beneath this former quarry site can be divided into an aquifer unit and an aquitard unit. An aquifer is a permeable layer of rock or soil that can both store and transmit water in significant quantities. An aquitard is a layer of rock or soil of low permeability that can store groundwater, but is only capable of transmitting water slowly between aquifers. Permeability is the ease with which water can pass through a material.
- The aquifer unit is classified by the GSI as a Locally Important Aquifer and the aquitard as a Poor Aquifer.
- The majority of the site is underlain by the aquitard. The aquifer outcrops in the southern part of the MEHL site and then dips to the north, where it is covered by at least 60 m of the aquitard strata in the northern parts of the site.
- The permeability of the aquifer unit is much higher than that of the aquitard. The aquitard confines or isolates the groundwater within the aquifer.
- There are at least two faults in the central part of the site, a north-south aligned fault which appears to restrict groundwater movement and an east-west aligned fault which does not.
- Groundwater flows in a generally south easterly direction from the site.

A.i.23 The Bog of the Ring collection of groundwater wells to the north east of the site was highlighted by consultees as an important water supply. The MEHL site lies approximately 1 km outside the Source Protection Area for the Bog of the Ring and approximately 3km from the well locations. The source protection area is the area around a well, or wells, which has tighter controls on activities which can take place in it, in order to avoid contamination of the well or wells. As groundwater beneath the site is flowing to the south east away from the Bog of the Ring well-field it is not believed to be at risk from any potential contamination arising from the proposed development.

A.i.24 Geological Heritage Areas are designated as part of the Irish Geological Heritage Programme as part of a partnership with the Geological Survey of Ireland (GSI) and the Department of The Environment, Heritage and Local Government. The MEHL quarry has been designated a Geological Heritage Area.

Potential Impacts

A.i.25 The main potential impacts to geology and hydrogeology from the proposed development are:

- Potential contamination of the aquifer and local wells - Potential contamination of the aquifer may arise from both general accidents such as leaking fuel containers kept on the site and from leaking leachate from the placement of the waste.
- Loss of the Geological Heritage Area - The MEHL quarry is to be back filled as part of its current planning permission and therefore the exposed quarry faces will eventually disappear in a 20 to 30 year period.

Proposed Mitigation Measures

A.i.26 A number of mitigation measures have been developed and incorporated into the design of the proposed development.

A.i.27 To minimise the risk of aquifer contamination the placement of the waste with regard to the distribution of the aquifers on the site will be as follows:

- The inert and non-hazardous waste cells will be located in the part of the site underlain by the Locally Important Aquifer.
- The hazardous waste cell will be located in the part of the site underlain by the Poor Aquifer.

A.i.28 The following mitigation measures will be employed:

- All waste will be placed above the water table.
- The waste streams of inert, hazardous and non-hazardous waste will be segregated to ensure that hazardous waste cannot enter the inert or non-hazardous cells.
- The inert material will be placed in cells lined with low permeability clay 1 m thick which will be designed in line with EU regulations and EPA guidance.

- Non-hazardous waste cells will be lined with a 2 mm thick high density polyethylene liner and 1 m thick low permeability clay which will be designed in line with EU regulations and EPA guidelines.
- An additional 1 m of low permeability material will be placed beneath the liner of the cell for non hazardous waste to further enhance the natural protection
- A Dense Asphaltic Concrete liner will be constructed for the cells in which hazardous waste is to be placed. The liner will be designed to meet EU Landfill Directive requirements.
- Flue gas treatment residues will be solidified before being placed in the cells to lock in certain heavy metals.
- Temporary covers will be installed on the hazardous cells, as required, in order to minimise leachate generation.
- A leak detection system will be provided below the Dense Asphaltic Concrete liner to ensure that in the unlikely event of a leak, the leak will be detected early.
- As part of the waste licence conditions, groundwater will be monitored on site.

A.i.29 A detailed risk assessment was undertaken to quantify the potential risks to groundwater. For the purposes of the assessment, an imaginary receptor well was located downstream of the proposed MEHL facility on the MEHL land ownership boundary. The assessment demonstrated that when the proposed mitigation measures are put in place, water quality at the imaginary well would meet drinking water standard.

A.i.30 The MEHL quarry is to be back filled as part of its current planning permission. However, given that the restoration of the MEHL facility will be phased over a 25-year timeframe, the rock outcrops in the quarry wall will remain exposed for maximum duration. Following consultation with the GSI, MEHL will:

- provide a viewing platform from which the quarry faces can be viewed in a safe environment
- provide an information panel to explain the geological features
- maintain the exposures for as long as is practical and
- allow for professional and/or student access where the necessary insurances are in place

Ground and/or groundwater contamination

A.i.31 There have been no known historical pollution incidents at the site and there is no evidence of contaminated ground or groundwater.

Noise Impact

A.i.32 A noise and vibration impact assessment of the proposed facility has been carried out.

A.i.33 A noise survey was conducted in order to quantify the existing noise environment in the vicinity of the MEHL facility. Three measurement locations were selected. The first location was in the front garden of a residential property which borders the southeast of the facility. This property is now in the control of MEHL. The range of noise levels measured at this property is representative of the noise experienced at residential dwellings to the east of this location and immediately south. The second location was at the top of a laneway to a farm house located to the south west of the facility. This location was chosen to represent the noise levels at sensitive receptors to the west of the facility. And the final location was between two residential properties located to the north west of the site, representing noise levels at receptors along this boundary of the facility.

A.i.34 The existing MEHL facility is currently operated in accordance with EPA waste licence (W0129-02). It is expected that the new waste licence will have the same noise limits as the current licence.

A.i.35 The noise levels of each phase of development were predicted and are expected to be within the EPA waste licence limits.

A.i.36 Traffic noise emissions were calculated from the traffic generation figures derived in Chapter 8 of the EIS and the predicted noise levels from construction and operational traffic are within the waste licence daytime limit of 55dB $L_{Aeq,\ 1hr}$.

A.i.37 Noise emissions from operational plant items at the closest noise-sensitive property are expected to be insignificant. The increase in traffic noise levels for 2011 in the vicinity of the roads and junctions assessed surrounding the MEHL site is less than 1dB(A). This increase will not be perceptible.

A.i.38 Mitigation measures will be implemented during the construction and operational works to ensure that noise from the facility will be within the waste licence limits, including:

- Limiting the hours during which site activities likely to create higher levels of noise or vibration are permitted;
- All site access roads will be kept even so as to mitigate the potential for vibration from lorries;
- Selection of plant with low potential for generation of noise and/ or vibration;
- Erection of temporary barriers as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors, and;
- Placing of noisy plant machinery as far away from sensitive properties as permitted by site constraints.
- The predicted noise levels at the nearest sensitive locations, due to emissions from the development, are within the sites operational noise limits in all instances and no significant impacts are expected.

Assessment of Ecological Impacts & Mitigation Measures

A.i.39 A flora and fauna impact assessment of the proposed development was carried out.

A.i.40 There are no environmental designations pertaining to the site nor is the site likely to be designated in the future. There are four designated conservation areas within 10km of the site. However these sites are some distance away and direct impacts on these sites are unlikely to occur as a result of the proposed development.

A.i.41 As there will be no discharge of contaminated waters from the landfill site into surface water network or seepage into groundwater system, there will be no direct or indirect impact on Rogerstown Estuary cSAC and SPA, which is the nearest designated conservation area located 7.5km to the east.

A.i.42 A survey of flora and fauna on the site was carried out by Natura Environmental Consultants on the MEHL site on 17 May 2010. A survey of peregrine falcon on the site was undertaken by R and D Avian Ecology over the summer of 2010.

A.i.43 Two hare were observed on site. Other mammals not seen but likely to use the site include fox and rabbit. Otters occur on many Irish watercourses and are likely to occur along the stream on the northern site boundary as it is a tributary of a salmonid watercourse. The woodland edge along the stream would be suitable for badger and other small mammals, including rabbit and hedgehog.

A.i.44 The following habitats were found on the site:

- Spoil and Bare Ground
- Exposed Calcareous Rocks
- Recolonising Bare Ground
- Eroding Upland Streams
- Mixed Broadleaved Woodland/Scrub
- Artificial Lakes & Ponds

A.i.45 During a site visit on 18th June 2010, a female falcon was recorded roosting on the southern perimeter of the quarry, whilst the male was observed roosting on the western quarry face. Both birds were observed from a vantage point within the quarry and no breeding behaviours and activity were recorded. A second site visit took place during the 29th June 2010 where a single adult peregrine was observed perched on the southern perimeter of the quarry, this bird took flight and flew south away from the quarry following 20 minutes of observation from the cliff top. No breeding behaviours or activity were recorded and no young peregrines were recorded.

A.i.46 Overall, the MEHL site is evaluated to be of county ecological importance as per the National Roads Authority Ecological Evaluation Scheme due to the presence of peregrine falcon and the exposed limestone cliff face.

A.i.47 The open water bodies on the site and exposed glacial material with vegetation, created as a result of previous quarrying activity have potential to significantly expand the local biodiversity over time.

A.i.48 Mitigation measures as described below will be implemented to reduce the impact on flora and fauna of the development.

A.i.49 There will be no permanent development works, other than the removal (in a controlled manner) of an existing temporary stockpile of soil, or any disturbance of existing ground within 10m of the edge of the stream flowing along the northern boundary of the site. This will preserve into the future a 10m wide (minimum) riparian corridor or ‘leave strip’ which is important to the protection of local aquatic ecological integrity and general biological diversity.

A.i.50 Alternative natural or artificial ledges will be installed on the south-western side of the limestone cliff face as peregrine roosting or potential nest sites, as far away from the landfill construction as possible, to minimise any potential disturbance to peregrine.

A.i.51 A constructed wetland system associated with the attenuation ponds will over time provide habitat to add to the local habitat and species diversity. A wetland area at the southern end of the site, which includes an open water body fringed with vegetation will be retained. This will help to increase local biodiversity.

A.i.52 In the longer term, if monitoring results determine it necessary, the creation of an additional nest site away from the location of the MEHL site will be investigated in consultation with landowners and the National Parks and Wildlife Service. This additional site could be located in another quarry or on a man-made structure such as a church/cathedral. Prior to the selection of an alternative nest site location, further monitoring of the peregrine within nearby quarries will be required to better understand their distribution and breeding behaviour. This will help inform the selection of the best locations for alternative peregrine breeding sites.

A.i.53 A constructed wetland system associated with the attenuation ponds will, over time, provide wetland habitat and add to the local habitat and species diversity. Details of the constructed wetland system will be finalised at the detailed design stage in consultation with a suitably qualified wetland ecologist and the Board of Inland Fisheries Ireland.

A.i.54 The construction and operation of the proposed MEHL integrated waste facility will not result in any additional direct loss of habitat. If considered necessary, following monitoring, the creation of an alternative peregrine nest site away from the quarry at a suitable location within 5km of the site will compensate for adverse impacts to this species.

A.i.55 The retention of an existing wetland area near the southern boundary of the site into the MEHL site will add to the biodiversity of the site. The constructed wetland area will provide habitat for a range of wetland species over time.

A.i.56 There will be no residual significant adverse impacts on the local surface watercourses or on the groundwater resource, provided the mitigation measures described in *EIS Chapter 14, Soils, Geology and Hydrogeology* and *EIS Chapter 15, Surface Water* are fully implemented and monitored. As a consequence, there will be no significant adverse impact on the Rogerstown Estuary cSAC/SPA located more than 7.5km to the east.

A.j NTS: Section J - Accident Prevention & Emergency Response

Accident Prevention and Emergency Response

A.j.1 MEHL has developed an Emergency Response Procedure as part of its Environmental Management System, which is independently certified in compliance with the ISO14001:2004 standard. The accident and emergency procedures will be fully and appropriately reviewed for the purposes of the integrated waste management facility, to include a complete review of the Site Safety Statement, in line with legislative and other requirements.

A.j.2 The existing Health & Safety training programme at MEHL will be extended to address requirements of operating the integrated waste management facility. Staff will be appropriately trained and qualified for the various elements of the operation. There will be ongoing and updated training, refresher programmes and extensive induction procedures for staff on site at all times, as well as routine and obligatory induction training for visitors regarding Health & Safety procedures for those who are necessarily visiting or entering the site.

Environmental Liabilities Risk Assessment

A.j.3 MEHL has completed an ELRA (Environmental Liabilities Risk Assessment) in line with the requirements of W0129-02 and EPA (2006) *Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision*. Environmental liability risk assessment (ELRA) considers the risk of unplanned events occurring during the operation of a facility that could result in unknown liabilities materialising. MEHL has invested significantly in its infrastructural, management and environmental management programmes to address potential risks. The ELRA will be fully re-assessed to address ELRA issues associated with the proposed development.

Potential points of contamination/areas most at risk

A.j.4 The waste activities deemed to be potentially high risk are landfilling of hazardous waste and solidification operations.

A.j.5 In relation to landfilling of hazardous waste, a superior lining system has been proposed for the hazardous waste cells. In addition, it is proposed to install a leak detection system under the hazardous cell liner. The leak detection system will demonstrate the ongoing integrity of the liner system during the lifetime of the facility, and in the aftercare phase. All liner systems proposed for the integrated waste management facility are in full compliance with the requirements of the EU Landfill Directive 1999.

A.j.6 In relation to solidification operations, the plant has been designed with reference to best practice and European experience. It is designed as a fully enclosed system.

Storage of raw materials, products and waste

A.j.7 Cement and acid will be imported to the site as raw materials for the solidification process. The materials will be delivered in contained vehicles and discharged directly to a dedicated storage silo and bunded acid storage tank, respectively. From here, the materials will used be directly in the solidification process.

A.j.8 Diesel will be stored in a bunded diesel storage tank.

A.j.9 Leachate will be stored in HDPE[8]-lined, concrete leachate holding tanks.

A.j.10 The proposed development is deemed to be a lower tier Seveso site based on the storage of Flue Gas Treatment residues on site.

Transport of material within the site

A.j.11 Incoming waste delivery vehicles may be directed to the appropriate and access-controlled tipping area for recovery materials, inert landfill, non-hazardous landfill, solidification plant or hazardous landfill. Operational control procedures and wheel-washing procedures will be implemented for all vehicles using the facility.

A.j.12 Design proposals make provision for conveying the IBC bags from the solidification plant to the adjacent storage building either at surface level by vehicle (e.g. forklift), or via an underground conveying system.

Bunding, surface treatment, collection systems

A.j.13 Bunded tanks are proposed for the diesel and acid storage tanks. Bunds will be designed with reference to appropriate EPA and quality assurance standards, and bund integrity tests will be completed as per EPA requirements (currently every three years).

[8] HDPE = High-density polyethylene

Spill/emergency containment

A.j.14 The site is currently equipped with emergency spill kits. New emergency containment equipment will be installed to address potential spillage at the bunded fuel and acid storage areas.

A.j.15 It is proposed to install emergency surface water shut-off valves prior to the discharge point from the wetland area in the north-east of the site, and at the detention basin outlet adjacent to the new facility control area in the south-east of the site.

Possible contamination of ground, groundwater, or surface water from firewater run-off

A.j.16 Although the risk of fire at the site will be low, the management of contaminated water arising from a fire has been included in the surface water management system.

Out-of-hours Incident

A.j.17 Emergency out-of-hours contact details will be provided on the site notice board. Duty staff will respond immediately to any incidents arising.

A.k NTS: Section K - Remediation, Decommissioning, Restoration and Aftercare

Restoration

A.k.1 The proposed development will effect the restoration of a worked-out quarry in keeping with the surrounding landscape, and in line with pre-quarrying levels. A phased restoration approach is proposed for the MEHL integrated waste management facility, which will allow the site to be restored progressively over the lifetime of the project.

A.k.2 As part of the restoration process, as each cell is filled to required restoration levels, capping layers will be applied, in line with requirements for inert, non-hazardous and hazardous cells.

Landscape Proposals

A.k.3 In order to minimise or reduce the potential visual impacts of the proposed development, the following mitigation measures are proposed (as part of the EIS) during the initial construction phase of the development:

- Screen planting to the east of the solidification plant, car park area and temporary storage compound
- Retention and thickening of existing hedgerows
- Scrub planting around the proposed wetlands in the north east of the site
- Retention of existing trees
- Progressive restoration
- Low level bollard lighting along the entrance road to avoid light spillage on adjoining properties
- Monitoring of planting

A.k.4 The landscape and visual assessment completed for the EIS concluded that, following final restoration of the site, the residual landscape and visual impacts will be positive.

After-use

A.k.5 It is anticipated that future after-use will be for low-impact amenity, nature area, or related uses. It is possible that different after-use options may be applied to the different classes of landfill. The position of both surface water drains and hedgerows on site mark the location of inert, non hazardous and hazardous areas. This will assist with the identification of inert, non hazardous and hazardous areas on site (in addition to site survey records).

A.k.6 Consultation with local residents, statutory and other relevant bodies will be undertaken approaching the latter restoration phases at the facility in relation to after-use activities.

Decommissioning

A.k.7 During the final restoration phase of the integrated waste management facility, Phase 4, when the hazardous cells have been completely filled, the solidification plant and storage building will no longer be required and will be decommissioned. The void remaining after removing the solidification plant will be lined as a non-hazardous cell (NH2), filled with non-hazardous waste and restored.

A.k.8 The final restoration will comprise the decommissioning of the administration building, car-parking area and paved areas (in the south-east of the site). These areas will be graded, finished with topsoil and landscaped.

A.k.9 The leachate and surface water collection infrastructure will be retained after the final restoration, as well as leachate monitoring wells, leak detection wells, leachate holding tanks and any other monitoring infrastructure to meet EPA requirements for aftercare and monitoring.

Closure, Restoration and Aftercare Management Plan

A.k.10 Under the terms of the existing Waste Licence (W0129-02), MEHL has completed and submitted to the EPA assessments of (i) 'CRAMP' (Closure, Restoration & Aftercare Management Plan), (ii) ELRA (Environmental Liabilities Risk Assessment) and (iii) FP (Financial Provision).

A.k.11 The amount of financial provision required for the existing MEHL inert facility (under W0129-02) was determined using the CRAMP and ELRA assessment protocol, and financial instruments were proposed. The ELRA, CRAMP and Financial Provision assessments will be fully re-assessed for the integrated waste management facility post-licensing, and in consultation with the Agency.

A.k.12 As per existing arrangements, any future or amended Financial Provisions will be 'ring-fenced' to ensure access only by agreement with the EPA. Funds would be used to address ELRA/CRAMP issues arising during the operation/aftercare of the facility.

Aftercare

A.k.13 MEHL will be responsible for the aftercare of the site up until the date when the Agency accepts the surrender of the Waste Licence.

A.k.14 Aftercare management of the integrated waste management facility once the lands have been restored, grassed and planted, as appropriate, will include:

- Maintenance of grassland, hedges and planted areas
- Leachate management
- Inspections and surveys of the drains, surface water management and land surface
- Maintenance of infrastructural installations, including pathways, access points and signposting, fencing and security
- Monitoring (detailed below)

A.k.15 The following pollution control systems will be maintained and protected during the aftercare period:

- the leachate management system
- the landfill capping system including drainage system
- surface water collection, storage and discharge systems
- groundwater monitoring boreholes
- leachate monitoring wells
- hazardous cell leak detection points
- surface water monitoring points
- any other items required by the Agency

A.l NTS: Section L - Statutory Requirements

Statutory Requirements

A.l.1 Section 40(4) of the Waste Management Acts 1996 to 2010 requires that the Agency shall not grant a waste licence unless it is satisfied that its requirements are met. Attachment L of the Waste Licence Application provides information to show that these criteria have been met in practice.

A.l.2 The integrated waste management facility has been designed to meet and exceed the requirements of the EU Landfill Directive 1999, the EPA Landfill Manual: Landfill Site Design (2000), and BAT requirements. A superior lining system is proposed for the hazardous waste cells, i.e. Dense Asphaltic Concrete (DAC), which offers complete containment. A leak detection system is also proposed for the hazardous cell lining system.

A.l.3 The solidification plant has been designed in line with best practice and European experience, and conforms with the European Commission Waste Treatment BREF.

A.l.4 The facility will be managed and operated to mitigate against any potential environmental impacts. Environmental monitoring will continue (and intensify, as appropriate) for dust, surface water, groundwater, leachate and noise.

A.l.5 The proposed development has been subject to full environmental impact assessment.

A.I.6 The facility holds ISO14001:2004 accreditation, the international standard for Environmental Management Systems (EMS). This system ensures legal compliance with all relevant legislation. The EMS will be reviewed and updated to include waste activities as per the proposed integrated waste management facility.

A.I.7 Full cognisance has been taken of the requirements of the Landfill Directive 1999 in facility design, monitoring requirements, facility operational issues, and related matters.

A.I.8 Murphy Environmental Hollywood Ltd. (and its previous 'parent' company) has held an EPA licence at Hollywood since December 2002. The licence was issued to Murphy Concrete Manufacturing (MCM) Ltd. In 2003, Murphy Environmental was established as a trading division of MCM Ltd to serve as the waste management division of the company. In October 2008, Murphy Environmental Hollywood Ltd (MEHL) was established as a separate legal entity to manage the landfill activity at the Hollywood facility. EPA Licence W0129-02 transferred to MEHL on 1st October 2008. MEHL has proved to be a proactive licensee committed to best environmental practice, an excellent track-record with the Agency, and a company which conducts its operations in an open and transparent manner.

A.I.9 Murphy Concrete Manufacturing Ltd. has a long history with the site, having taken over quarrying operations in 1975 (the site operated as a quarry from the late 1940s) Quarrying ceased at Hollywood at the end of 2007.

A.I.10 MEHL is deemed to be a 'fit and proper' person to hold a waste licence.

A.I.11 The company has no offences under the Waste Management Acts 1996 to 2010, the EPA Act 1992 and 2003, the Local Government (Water Pollution) Acts 1997 and 1990 or the Air Pollution Act 1987. All management staff are appropriately qualified and trained, with full support from the company Directors to operate the facility to the highest environmental standards.

A.I.12 MEHL will meet any and all financial commitments or liabilities which may arise.

A.m Selected Waste Licence Application Drawings to Accompany the Non-technical Summary

A.m.1 Please find attached:

- Site Location Map (Drawing Ref. WLA-04)
- Existing Site Layout Drawing (Drawing Ref. WLA-02) (Sheet 1)
- Proposed Site Layout Drawing (Drawing Ref. WLA-03) (Sheet 1)
- Proposed Solidification Plant (Drawing Ref. WLA-09) (Sheet 2)
- Proposed Monitoring Locations Drawing (Drawing Ref. WLA-27)
- Proposed Restoration Layout (Drawing Ref. WLA-15) (Sheet 1)

Attachment B
General

Attachment B: General

B.1 Applicant Details

B.1.1 This Waste Licence application is being made by Murphy Environmental Hollywood Limited (MEHL) for its site at Hollywood Great, Nag's Head, Naul, Co. Dublin. The site is currently licensed as an inert landfill under W0129-02.

Company Details

B.1.2 A Certificate of Incorporation is attached in:
Appendix B.1.1: Certificate of Incorporation

B.1.3 The Company Number is 448931, as shown on the Certificate of Incorporation.

B.1.4 The company directors are: Mr. Seamus Murphy, Ms. Patricia Rooney, Mr. Rory Murphy and Ms. Emma Murphy.

Ownership Plan

B.1.5 An ownership drawing for the site is attached as:
Drawing WLA-01 (Attachment B.1): Ownership Plan

B.1.6 The boundary showing MEHL's ownership is shown in blue ink.

B.2 Location of Activity

B.2.1 The site is located at Hollywood Great, Nag's Head, Naul, Co. Dublin (National Grid Reference National Grid Reference E315810, N258015) approximately 32km north of Dublin City Centre. The site is bounded to the west and south by local primary roads LP01090 and LP01080. The regional road, R108, runs in a north-south direction approximately 1km west of the site. The M1 runs in a north-south direction, approximately 2.5km east of the site. The site is located at Nag's Head hill, the highest point of which is approximately 151 m.OD.

B.2.2 The site is a former quarry from which limestone and shale was extracted. The area of land in the ownership and control of MEHL is 54.4 hectares (the 'blue line' area); of which the proposed planning application and EPA waste licence application covers 39.8 hectares (the 'red line' area). The facility is a fully operational inert landfill regulated by the EPA under Waste Licence W0129-02 and Fingal County Council Planning Permission F04A/0363 and F07A/0262. It provides a strategically located waste disposal facility for inert wastes and mildly contaminated soils. The facility is operated to the highest standards in environmental management and control.

Site Plan

B.2.3 An existing site plan of the facility is attached as:

Drawing WLA-02 (Attachment B.2): Existing Site Layout (Sheets 1 to 7)

B.2.4 The proposed facility layout is attached as:

Drawing WLA-03 (Attachment B.2): Proposed Site Layout (Sheets 1 to 7)

Location Map

B.2.5 The location map attached includes buildings, roads and streams within 500m of the boundary:

Drawing WLA-04 (Attachment B.2): Site Location Map (Sheets 1 to 2)

Services Plan

B.2.6 The Services Plan attached includes services within 250m of the proposed facility boundary:

Drawing WLA-05 (Attachment B.2): Services Plan (Sheets 1 to 2)

B.3 Planning Authority

Planning History

B.3.1 Quarrying commenced at the Hollywood site in the late 1940s (pre the 1963 Planning and Development Act).

B.3.2 Planning permission was initially granted in 1988 to infill, restore and reinstate that portion of the quarry which had been excavated at that stage. That planning application, lodged with Dublin County Council on 15th January 1988, was for a proposed infill and land reclamation works at an existing quarry at Hollywood Great, Naul, Co. Dublin. The Register Reference was 88A/32. Notification of Decision to Grant Permission was dated 13th June 1988. The Final Grant of Permission was issued on 27th July 1988; that Permission ceased to have effect on 27th July 2003.

B.3.3 An application for an extension of duration of planning permission was lodged on the 19th June 2003. The Register Reference was 88A/0032/E1. A Decision to extend the life of the permission was granted on 12th August 2003. The life of the permission was extended for a period of 18 months up to and including 31st December 2004. The extension period provided the time to complete a full EIS and new planning application for the restoration of the site, in line with requirements of the EPA Waste Licence.

B.3.4 A planning application was lodged by Murphy Environmental dated 18th March 2004 (Register Reference F04A/0363) to infill with inert material the existing quarry as part of the restoration and reinstatement of that quarry. Permission was sought for a period of 15 years to continue to infill the quarry at a maximum rate of 340,000 tonnes per year in accordance with the limits set in the EPA licence. A Decision to Grant Permission was made by Fingal County Council dated 1st September 2004 and a Final Grant was issued on 7th October 2004.

B.3.5 An application was lodged by Murphy Environmental dated 8th March 2007 (Register Reference F07A/0262) to vary the permission F04A/0363, to permit the infill of an extended quarry area, and at an increased rate per year of 500,000 tonnes per annum. The Planning Authority decided to grant permission for this variation on 31st May 2007 and the Final Grant issued on 18th July 2007.

B.3.6 A copy of the planning permissions granted in 2004 (Register Reference F04A/0363) and 2007 (Register Reference F07A/0262) are attached.

Appendix B.3.1: Planning Permissions (F04A/0363 and F07A/0262)

B.3.7 There were two further planning applications relating to a proposed new facility entrance in 2007-2008, which were refused planning permission.

Planning Permission for Proposed Development

B.3.8 A Planning Application and EIS were submitted to An Bord Pleanála on the 10th December 2010 (An Bord Pleanála Ref. 06F.PC0087). The application was submitted as 'Strategic Infrastructure Development'. The application relates to MEHL's proposal for an integrated waste management facility for non-biodegradable waste, including hazardous waste, at EPA Licence W0129-02, Hollywood Great, Nag's Head, Naul, Co. Dublin.

B.3.9 As a prescribed body for the planning application, full copies of the application (print and electronic copies) were delivered to the EPA on 10th December 2010 (further copies may be made available on request). The cover letter to accompany the planning application (Strategic Infrastructure Development) to An Bord Pleanála is attached:

Appendix B.3.2: Cover Letter to Accompany Planning Application (Strategic Infrastructure Development) to An Bord Pleanála

B.3.10 It is noted that the site falls within the functional area of Fingal County Council, and previous planning applications have been lodged with Fingal County Council. The Planning Authority for the purposes of this application is An Bord Pleanála, as the proposal is deemed 'Strategic Infrastructure' under the relevant planning legislation.

B.3.11 An Bord Pleanála and Fingal County Council have been informed, in writing (as well as at previous meetings/presentations), of MEHL's intention to submit an application to the EPA for the proposed development; please find correspondence attached:

Appendix B.3.3: Correspondence to An Bord Pleanála and Fingal County Council re. Notification of MEHL Application for a Waste Licence to the EPA

Waste Licence

B.3.12 The Applicant currently holds an EPA Waste Licence (No. W0129-02) for the facility, a copy of which is attached.

Appendix B.3.4: EPA Licence W0129-02

B.4 Sanitary Authority

B.4.1 As per application document.

B.5 Other Authorities

B.5.1 As per application document.

B.6 Notices and Advertisements

Site Notice

B.6.1 A copy of the text of the site notice is attached.

Appendix B.6.1: Site Notice

Location of Site Notice

B.6.2 The location of the site notice is shown on Drawing **WLA-01**.

Newspaper Advertisement

B.6.3 A copy of the newspaper pages containing the Waste Licence Application advertisements is attached as Appendix **B.6.2** and Appendix **B.6.3**. The original application includes the complete newspapers in which the advertisements were placed.

Appendix B.6.2: Newspaper Advertisement (Local Press)

Appendix B.6.3: Newspaper Advertisement (National Press)

Consultation Process

B.6.4 An extensive consultation exercise was conducted in relation to the proposed development, in advance of lodging planning and waste licence applications to An Bord Pleanála and the Agency, respectively. The consultation process and a summary of key issues raised by consultees are outlined in Appendix:

Appendix B.6.4: Summary of Consultation Process and Key Issues Arising

B.7 Type of Waste Activity

Existing Activity

B.7.1 MEHL is currently licensed by the EPA (Waste Licence No. W0129-02) for the operation of an inert landfill to effect the restoration of the Hollywood site into the surrounding landscape.

B.7.2 The following classes of activity are licensed under W0129-02:

Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Acts 1996-2007

- Class 1: Deposit on, in or under land (including landfill).
- Class 5: Specially engineered landfill, including placement into lined discrete cells, which are capped and isolated from one another and the environment.
- Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Acts 1996-2007

- Class 3: Recycling or reclamation of metals and metal compounds.
- Class 4: Recycling or reclamation of other inorganic materials.
- Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.

Proposed Activity

B.7.3 MEHL proposes to develop an integrated waste management facility within the existing boundaries of its existing facility for the landfilling of non-biodegradable inert, non-hazardous and hazardous wastes, including waste-to-energy residues. The proposed development will allow the former quarry to be restored to a natural landform. The proposed development involves the construction of:

- a) specially engineered landfill cells for inert, non-hazardous and hazardous wastes
- b) a solidification plant with associated storage tanks and silos

- c) a storage building
- d) an administration office building
- e) new weighbridges
- f) car parking
- g) an ESB substation/switch room
- h) internal haul routes
- i) surface water ponds and leachate management facilities
- j) a temporary viewing platform for visitors from which the geology of the quarry faces can be viewed, and
- k) ancillary site works and landscaping
- A new facility entrance is also proposed from the County Road LP1080

B.7.4 The design of the liner and capping systems for each landfill class varies according to international best practice and EPA guidance, and under the EU Landfill Directive 1999. The landfill cells are to be constructed from a minimum formation level of 102.5m within the existing quarried void. Higher ground levels surrounding the quarry void will screen the construction and landfill operations.

B.7.5 The following classes of activity are proposed for the MEHL integrated waste management facility application:

Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Acts 1996 to 2010

- **Class 1: Deposit on, in or under land (including landfill):** This activity relates to the deposition of inert material.
- **Class 5: Specially engineered landfill, including placement into lined discrete cells, which are capped and isolated from one another and the environment:** This is the principal activity. It is proposed that the facility will accept a range of non-biodegradable waste streams which fall within the following classes of landfill: landfill for hazardous waste, landfill for non-hazardous waste and landfill for inert waste, as specified under the EU Landfill Directive (1999).
- **Class 7: Physico-chemical treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 5 or paragraphs 8 to 10 of this Schedule (including evaporation, drying and calcinations):** This activity relates to

the proposed Solidification Plant, which will pre-treat (by means of a solidification process) certain hazardous wastes prior to landfilling.

- **Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced:** This activity includes temporary storage of incoming wastes pending Third Schedule, Class 7 activity; and the storage of unacceptable wastes in a designated area pending their dispatch to appropriate disposal facilities.

Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Acts 1996-2010

- **Class 3: Recycling or reclamation of metals and metal compounds:** This activity provides for the recovery of metal within wastes delivered to the facility.
- **Class 4: Recycling or reclamation of other inorganic materials:** This activity includes the recovery of inert material for use in site development and site restoration works.
- **Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:** This activity includes the storage of wastes for recovery purposes at this facility (e.g. stockpiles of soil) and the temporary storage of materials (e.g. metals), pending their dispatch to appropriate off-site recovery facilities.

B.7.6 It is proposed that the principal activity licensed under W0129-02 will remain the same for the purpose of this Waste Licence Application, i.e. Class 5, specially engineering landfill. The application proposes engineered landfill disposal capacity for non-biodegradable inert, non-hazardous and hazardous wastes. Third Schedule, Class 7 (physico-chemical treatment) is proposed for the purpose of operation of a solidification plant on site – this is the only additional class of activity proposed, which is not already licensed under W0129-02.

Maximum Annual Tonnage

B.7.7 The existing EPA licence for the facility, W0129-02, allows for the acceptance of a maximum of 500,000 tonnes of inert waste per annum. The current application seeks to maintain this upper limit of 500,000 tonnes per annum (total for all incoming waste types); however current projections indicate that the likely annual tonnage will be in the range of approximately 250,000 to 350,000 tonnes per annum.

B.7.8 The retention of an upper threshold of 500,000 tonnes per annum, which is currently allowed under planning permission and EPA licence, would facilitate 'unusual events' within any given year, e.g. if there was a peak in the generation of contaminated soils in the country, due to intensive excavation/development works, which would require disposal in hazardous landfill, the MEHL strategic facility would have the capacity for such volumes (up to a maximum of 500,000 tonnes per annum), thereby avoiding the necessity for trans-frontier shipment of these materials. In addition, the retention of the currently licensed maximum annual input would act as security of capacity in the event that any issue might arise in the future, which could give rise to the need for immediate disposal of materials as a result of any accidental occurrence in the country through failure or natural disaster (materials arising from such an event would be demonstrated as meeting the facility's Waste Acceptance Criteria prior to disposal at MEHL).

B.7.9 As the proposed maximum tonnes per annum acceptable into the facility remains as per the existing EPA Licence W0129-02 (and planning permission), there will be no intensification of waste activity. Incoming waste tonnages are expected to be lower during Phase 1 of the project. Further details in relation to phasing are provided in Attachment **D.2**.

B.7.10 MEHL seeks to remain licensed and operational at all times, whether under the terms of the existing EPA licence W0129-02 or under a new licence (e.g. during construction of hazardous/non-hazardous cells under new EPA licence, MEHL has ongoing inert landfilling capabilities).

B.8 Seveso II Directive

B.8.1 The Flue Gas Treatment (FGT) residue (ash) to be disposed of at the MEHL facility is classified as N, R51/53, principally because of the concentration of heavy metals in the ash. The composition of incinerator ash has been reported by various publications and operators. A report by the European Environment Agency (EEA) (Technical report No 38 Dangerous substances in waste, February 2000), gives information on the composition of solid wastes from Municipal Waste Incineration, and this forms the basis of the classification as N, R51/53.

B.8.2 There will be diesel oil stored onsite. The maximum quantity of diesel oil stored will be 7,500 litres (or 6.26 tonnes).

B.8.3 Calculations show that the total inventory of FGT residues present is sufficient for the MEHL Solidification Plant process to qualify as a lower tier site. A notification has been made to the Health & Safety Authority under the European Communities (Control of Major Accidents involving Dangerous Substances) Regulations 2006. Please find attached:

Appendix B.8.1: Notification to HSA re. European Communities (Control of Major Accidents involving Dangerous Substances) Regulations 2006

Attachment C

Management of the Facility

Attachment C: Management of the Facility

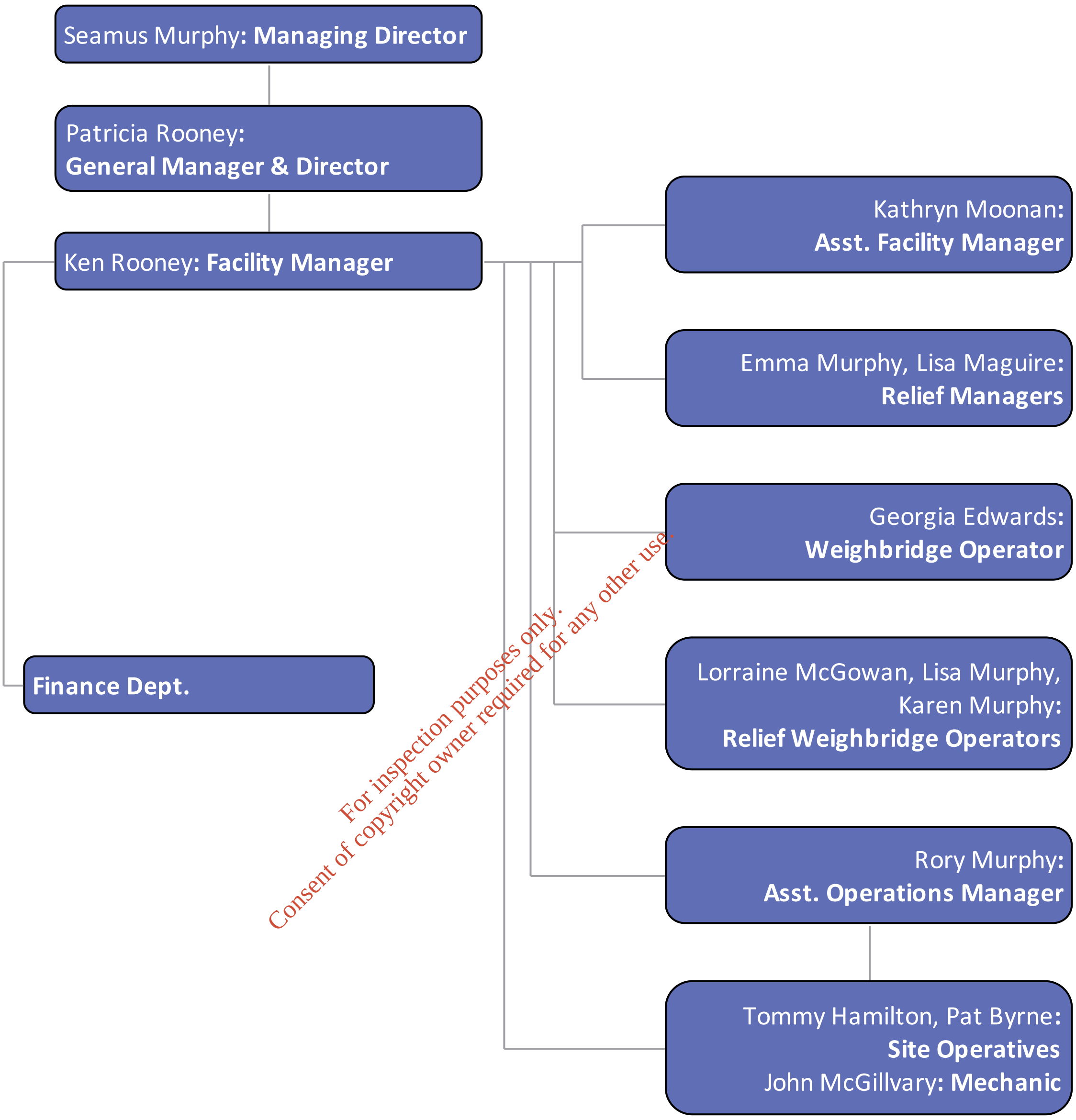
C.1 Technical Competence and Site Management

C.1.1 Murphy Concrete Manufacturing Ltd. (MCM) began quarrying at the Hollywood site in 1975 (the site has operated as a quarry since the 1940s). In 2003, Murphy Environmental was established as a trading division of MCM Ltd., to serve as the waste management division of the company, with responsibility for all aspects of the management and operation of the landfill and compliance with the Waste Licence.

C.1.2 *Murphy Environmental Hollywood Ltd.* (MEHL) was established on 1st October 2008 as a separate legal entity in the form of a limited company. On this date also, the EPA accepted the Transfer of Waste Licence W0129-02 from *Murphy Concrete Manufacturing Limited* to *Murphy Environmental Hollywood Limited*.

C.1.3 In operating the site as an EPA-licensed inert landfill since 2002, the company has developed dedicated and efficient management and staffing structures (see management organisation chart in Figure **C.1.1** overleaf). Seamus Murphy is the Managing Director of MEHL and Patricia Rooney is the General Manager & Director. The Facility Manager at Hollywood is Ken Rooney. The Assistant Facility Manager at the facility is Kathryn Moonan. The facility has an administration team, who has responsibility for the weighbridge, site office and data management, and a landfill operations team, who direct and control incoming vehicles and waste placement in restoration areas. The company is further supported by its consultant teams for specific engineering, technical and scientific requirements.

Figure C.1.1: MEHL Organisation Chart



C.1.4 MEHL is cognisant of the significant transition in terms of operations, control and management skill that will be required to change from an inert site to an integrated waste management facility, which operates inert, non-hazardous and hazardous landfill cells. To this end, MEHL will undertake specialist training (overseas, where required) for its existing staff, who will be retained as the core management team. Additional resources will be acquired, as necessary, including full-time staff members and specialist consultancy expertise, as appropriate.

C.1.5 It is estimated that the development of an integrated waste management facility at Hollywood would create 50 temporary construction jobs and 15 full-time, long-term additional positions.

C.1.6 Staff qualifications, experience and expertise for four key staff members at MEHL are outlined below.

Table C.1.1: Experience & Qualifications – Managing Director

Name	Seamus Murphy
Position	Managing Director, MEHL
Duties and Responsibilities	▪ Company Development ▪ Strategic Planning & Operations ▪ Sales & Marketing ▪ Budgeting, Financial & Resourcing Provisions ▪ Commitment to Environmental Management ▪ Conformance with Waste Licence, ISO14001 and all regulatory requirements
Experience /Qualifications	▪ Over 35 years' experience in management of quarries, business and commercial activities ▪ Over 10 years' experience in waste management and landfilling ▪ Safe Pass ▪ Numerous reference plant site visits to European waste management facilities

Table C.1.2: Experience & Qualifications – General Manager/Director

Name	Patricia Rooney
Position	Director & General Manager, MEHL
Duties and Responsibilities	▪ Business development and Strategic Planning ▪ Sales & Marketing; Company Advertising ▪ Budgeting, Financial & Resourcing Provisions ▪ Human Resources Management ▪ Line Management of site management team ▪ EPA Licensing & Liaison with the Agency ▪ Conformance with Waste Licence, ISO14001 and all regulatory requirements
Experience /Qualifications	▪ Fás/Fetac Waste Management Training Programme ▪ Business Management qualifications and 20 years' management experience ▪ 10 years' experience in waste management, EPA licensing and landfilling operations ▪ EMS Training Programme (Sligo IT) ▪ Safe Pass ▪ Numerous reference plant site visits to European waste management facilities

Table C.1.3: Experience & Qualifications – Facility Manager

Name	Ken Rooney
Position	Facility Manager, MEHL
Duties and Responsibilities	▪ Implementation of all operational requirements for the facility ▪ Liaison with the EPA ▪ Conformance with Waste Licence, ISO14001 and all regulatory requirements ▪ Implementation and maintenance of EMS for the site ▪ Environmental auditing and site inspections ▪ Technical and operational management of the landfill ▪ Control of abatement and on-site treatment systems ▪ Liaison with environmental consultants for the purpose of site monitoring ▪ Waste acceptance, inspections and sampling
Experience /Qualifications	▪ Chartered Engineer (CEng, MIEI) ▪ Post-graduate Diploma in Environmental Engineering ▪ Masters in Industrial Engineering (MIE) ▪ B.Eng in Polymer Engineering (BEng) ▪ Fás/Fetac Level 6 Waste Management Training Programme ▪ Fás/Fetac Level 6 Landfill Waste Management on site assessment ▪ 5 years' experience in waste management, EPA licensing and landfilling operations ▪ NETS Training & Coaching Fetac Level 6 ▪ Safe Pass ▪ CIWM UK - Management of Hazardous Waste Training Course ▪ Numerous reference plant site visits to European waste management facilities

Table C.1.4: Experience & Qualifications – Assistant Facility Manager

Name	Kathryn Moonan
Position	Assistant Facility Manager, MEHL
Duties and Responsibilities	▪ The implementation of all operational requirements for the facility ▪ Conformance with Waste Licence, ISO14001 and all regulatory requirements ▪ Implementation and maintenance of EMS for the site ▪ Environmental auditing and site inspections ▪ Liaison with environmental consultants for the purpose of site monitoring and the implementation of Environmental Management Systems ▪ Waste acceptance, inspections and sampling ▪ Management of site records ▪ Occupational First Aid ▪ Fire Marshal
Experience /Qualifications	▪ BBS HR Bachelor of Business Studies Human Resources ▪ Fás/Fetac Level 6 Waste Management Training Programme ▪ Fás/Fetac Level 6 Landfill Waste Management on site assessment ▪ 6 years' experience in waste management, EPA licensing and landfilling operations ▪ Occupational First Aider ▪ Fire Marshal ▪ Safe Pass

C.2 Environmental Management System (EMS)

C.2.1 MEHL has implemented an Environmental Management System (EMS) at the site to help manage its environmental matters and records. A documented EMS is required under the Waste Licence W0129-02; however, MEHL is going beyond these requirements and has developed the EMS in line with the international environmental standard, ISO14001:2004. The landfill at Hollywood was the first privately-operated landfill to achieve an ISO14001 certification.

Photograph C.1: Section of EMS filing system for current operations under W0129-02

C.2.2 The process of implementing an EMS at the site commenced in 2003. MEHL reached a milestone in November 2004 when the system was verified as meeting all the requirements of the International Standard by an external independent body, see overleaf for a copy of the ISO 14001:2004 Accreditation Certificate (Figure **C.2.1**). Mr. Dick Roche, T.D., Minister for the Environment, Heritage & Local Government presented Murphy Environmental with the ISO 14001 Award, in April 2005. Ongoing internal audits and continual improvements are key requirements of the Standard, as well as an annual 'Compliance Audit' by independent assessors to confirm compliance to the standard.

C.2.3 MEHL will extend its EMS and ISO14001 accreditation to include the scope of activities proposed for its integrated waste management facility.

Figure C.2.1: ISO 14001:2004 Accreditation Certificate

Certification Europe

This is to certify that the

Environmental Management System

Of

Murphy Environmental Hollywood Ltd.

At

Hollywood Great, The Nags Head, The Naul, Co. Dublin

Has been assessed by Certification Europe and deemed to comply with the requirements of

ISO 14001:2004

This certificate is valid for the activities specified below:

The management of the disposal of mildly contaminated inert waste materials into engineered lined cells in a monitored environment in the full restoration of a limestone and shale quarry.
(NACE Code 37)

Date of initial certification: *18th October 2006*

Chief Executive: Michael Brophy

Signature: M. Brophy

This certificate is valid until: *19th January 2012*

Chairman: Padraic A. White

Signature: Padraic A. White

ISO 14001 Certified by Certification Europe Ltd

INAB Accredited Management System Certification, Detailed in Scope Reg No 500G

Client Registration No.: 2006/346
Certificate Reference No.: A/2

C.3 Hours of Operation

Existing hours of operation

C.3.1 The following are the opening hours prescribed under the existing licence W0129-02 (Condition 1.9).

Waste Acceptance Hours:	08:00 to 18:00 Monday to Friday 07:00am to 16:00 Saturday No waste acceptance on bank holidays.
Hours of Operation:	07:00 to 19:00 Monday to Friday 07:00 to 17:00 Saturday

Proposed hours of operation

C.3.2 The proposed hours of operation for the integrated waste management facility are as per those currently licensed under W0129-02:

Hours of Operation:	07:00 to 19:00 Monday to Friday 07:00 to 17:00 Saturday

C.3.3 It is proposed that construction works may extend beyond these times for certain prescribed construction activities, as detailed in **C.3.5**.

Proposed hours of waste acceptance/handling

C.3.4 The proposed hours of waste acceptance for the integrated waste management facility are as per those currently licensed under W0129-02:

Waste Acceptance Hours:	08:00 to 18:00 Monday to Friday 07:00am to 16:00 Saturday No waste acceptance on bank holidays.

Proposed hours of construction and development works at the facility and timeframes

C.3.5 It is proposed that the hours of construction and development works at the integrated waste management facility be extended slightly beyond the proposed hours of operation to facilitate the specialist techniques applied to construct the Dense Asphaltic Concrete (DAC)-lined cells. The preferred contractor for this activity will transport plant and equipment from its base in Switzerland to the development site, and will include specialist staff and operations. Due to the nature of the technology applied and the staff requirements, working days are proposed to be long and beyond normal working hours.

C.3.6 The proposed hours of construction and development works at the facility for the DAC-lined cells are:

Hours of DAC-cell construction:	06:00 to 21:00 Monday to Friday
	06:00 to 21:00 Saturday

C.3.7 The DAC construction activities will take place in the quarry 'basin', thereby mitigating against any potential environmental nuisances (e.g. noise).

C.3.8 The duration of DAC construction activities is expected to last for a number of weeks at a time for each of the three hazardous cells. Phasing/construction details are provided in Attachment **D.2**.

C.3.9 All other construction and development works will be conducted within the proposed hours of operation detailed in C.3.2.

Any other relevant hours of operation expected

C.3.10 No other relevant hours of operation are anticipated.

C.4 Conditioning Plan

C.4.1 In accordance with Article 14 of the Landfill Directive (1999/31/EC), a Conditioning Plan is not required at the facility, as the original Waste Licence (W0129-01, previously '129-1'), was issued in 2002, post the transposition of the Directive.

Attachment D

Infrastructure & Operation

Attachment D: Infrastructure & Operation

D.1 Infrastructure

D.1.1 In accordance with EPA licence conditions (W0129-02) and EPA Landfill Manuals, a range of infrastructural works have been completed at the site since Waste Licence W0129-01 was issued in December 2002. The proposal for an integrated waste management facility will require a number of additional and significant infrastructural requirements. This section details the *existing* infrastructural controls which will be retained, the existing infrastructure proposed to be *decommissioned* and *new* infrastructure proposed.

D.1.2 A selection of photographs showing existing infrastructure in place at the facility is attached in the 'Photographs' section.

D.1.3 The following appendix contains product data sheets, which show samples of the types of products/equipment which MEHL would propose to install. The data sheets are for indicative purposes only, and variations may apply relating to specific products or suppliers:

Appendix D.1.1: Product Datasheets

D.1.a Site security arrangements including gates and fencing

D.1.4 Site security and perimeter fencing is in place at the site in accordance with the current Waste Licence (W0129-02). This infrastructure will be maintained and adapted to meet the requirements of the proposed integrated waste management facility.

D.1.5 The existing facility entrance, located on the western boundary of the site, on road L01090, is shown in Photograph **D.1**. This entrance comprises a heavy-duty, electric security gate and concrete walls constructed along both sides of the entrance gate. It is proposed to retain this entrance for emergency access/egress only (once the new facility entrance has been constructed, as detailed in Attachment **D.1.9**).

Photograph D.1: Existing Facility Entrance (existing infrastructure)

D.1.6 Perimeter fencing to prevent unauthorised access to the site is in place, and monthly site inspections are carried out to ensure no breaches in the boundary have occurred. This practice will be maintained for the proposed integrated waste management facility.

D.1.7 Access to the site is controlled. The public and contractors that are not pre-registered (or spot customers) are not allowed to use the site. Members of the public can inspect the EPA licence records providing the site is pre-notified and an appointment made. All visitors must sign the visitors' book upon arrival and wear a visitors' badge whilst on site. This practice will be maintained for the proposed integrated waste management facility.

D.1.8 The site is covered by CCTV, with secure back-up of recorded data. Photograph **D.2** shows a CCTV split-screen image available in the Weighbridge Office. New CCTV cameras will be installed at strategic locations across the site in line with the proposed integrated waste management facility.

Photograph D.2: CCTV image view from Weighbridge Office (existing infrastructure)

New Facility Entrance and Facility Control Area

D.1.9 The planning application for the integrated waste management facility seeks to relocate the existing site entrance (on the western boundary) to a new purpose-built facility entrance and facility control area in the south-east of the site, off the LP01080. The proposed new facility entrance is shown in:

Drawing WLA-06 (Attachment D.1): Proposed Access Entrance Layout

Drawing WLA-07 (Attachment D.1): Proposed Access Road Layout and Longitudinal

D.1.10 New weighbridges and site offices are proposed, which will control all incoming vehicles movements. The proposed new facility control area is shown in:

Drawing WLA-08 (Attachment D.1): Proposed Control Area Layout

D.1.11 The rural location of the site was considered in designing the new entrance; the entrance proposed is a simple road junction. There will be appropriate road safety signage and a site security gate will be erected 130m back from the public road; this will minimise the visual impact of the development from the roadside. A turning circle for vehicles will be provided in front of the security gate to assist drivers if the facility gates are closed.

D.1.12 It is proposed that all traffic entering and exiting the waste management facility including waste deliveries, staff, leachate collection, solidification process material, fuel deliveries, visitors, construction traffic, and construction operatives will enter from the proposed new southern boundary entrance off the L01080. Site security gates will be erected 130 lin.m from the site entrance, with a 2.4m high security fence.

D.1.13 The design of the new site entrance junction will be in accordance with NRA standards TD 41-42/09 and TD 09/07. It is proposed to construct a simple junction which will meet the sightline requirements for the 80 km/hr speed limit of the road. This will require the southern boundary around the access to be redefined. A stage 1/2 road safety audit was undertaken by Road Plan Ltd. The recommendations arising from the road safety audit report were incorporated into the proposed entrance design. The road safety audit report was submitted with the planning application (as an appendix to the Engineering Report) and is available on request.

D.1.14 It is proposed that access to tipping areas for inert, non-hazardous or hazardous cells will be access-controlled, as detailed in Attachment **D.1.j**.

D.1.b Designs for site roads

D.1.15 Appropriate site access roads are already in place at the site, in accordance with the current Waste Licence (W0129-02). The current site roads are constructed of hard-core gravel. The existing entrance and reception areas have been developed as a concrete hardstand. Traffic is managed on the site with one-way traffic flow systems for vehicles entering the landfill; this is achieved through direct instruction from the weighbridge staff and appropriate signage (see photograph). Adjustments to internal access road layouts will be required for the proposed integrated waste management facility, as shown on Drawing **WLA-03**.

Photograph D.3: Route Signs Inside the Facility (existing infrastructure)

D.1.16 The existing haul road through the central portion of the site will be developed to provide access to the proposed landfill cells, as shown on Drawing **WLA-03**. Secondary haul roads with access control will be constructed to ramp down into each of the cells. By having only one controlled access point to each cell, waste placement can be controlled.

D.1.17 The use of recycled/recovered materials will be encouraged for the purposes of road construction and related works, in line with relevant engineering requirements.

D.1.18 The access road construction will comprise a 7.5m wide road pavement from the new entrance to the administration building, a distance of approximately 200m. The distance from the public road to the weighbridge is 200 metres providing sufficient queuing for 12 articulated bulk tankers (15.5m long). There will be no queuing on the road outside the facility. There will be ten car parking spaces provided near the administration building with a further five car parking spaces provided beside the Solidification Plant.

D.1.19 The internal access road from the entrance to the Solidification Plant including the carparking will be paved. The general specification of the road materials will be in compliance with the requirements of National Roads Authority (NRA) Design Manual for Roads & Bridges. The proposed access road shall be comprised of 50mm hot rolled asphalt (HRA) clause 910, on 60mm dense bitumen macadam (DBM) on, binder course clause 906 on min. 150mm crushed stone sub-base clause 804, on min 300mm crushed stone clause 803 or as required by site levels. The yard slab around the solidification building will be 200mm thick reinforced concrete and will be fully lined with a 2mm HDPE liner on a 50mm sand blinding.

D.1.20 The haul roads forming the ramps and haul roads in the cells will comprise 300mm thick layer of clause 804 crushed stone sub-base or approved recovered construction and demolition waste.

D.1.c Design of hardstanding areas

D.1.21 Hardstanding areas are in place at the site currently in accordance with the Waste Licence W0129-02. The site entrance, site office, garage and staff car park area are constructed on concrete hardstanding (see photograph). These hardstanding areas will be retained.

Photograph D.4: Garage and Car Park Hardstandings (existing infrastructure)

D.1.22 It is proposed that the new facility control area (in line with the new facility entrance) will comprise concrete hardstanding (as shown on Drawing **WLA-08**), surrounding the administration building and providing a car parking area. Surface water management details are outlined in Attachment **D.1.k**.

D.1.d Plant

Solidification Plant

D.1.23 It is proposed that a solidification plant will be constructed at the facility, primarily for the pre-treatment of hazardous flue gas treatment (FGT) residues from waste-to-energy facilities, prior to their deposition at the hazardous landfill cells. The solidification plant will be located on the eastern side of the non-hazardous cell.

D.1.24 The level of the solidification plant will be screened by excavating the side slope and constructing the plant at a lower level than the administration building. A storage building for solidified material will be constructed directly beside the solidification plant, as will a bunded compound to store diesel for machinery and plant.

D.1.25 The design of the solidification plant has been developed with reference to similar plants in operation in Europe. The proposed design of the solidification plant is shown on drawing:

Drawing WLA-09 (Attachment D.1): Proposed Solidification Plant (Sheets 1 to 2)

D.1.26 The proposed solidification plant has been designed with an annual capacity of approximately 50,000 tpa to receive hazardous Flue Gas Treatment (FGT) residue produced by waste-to-energy facilities in Ireland. The solidification plant is, by its nature, a relatively modular plant which could be readily upscaled or downsized subject to demand and regulatory requirements.

D.1.27 The solidification process and related operational issues are detailed in Attachment **H.3**.

D.1.28 The preliminary design of the proposed solidification plant comprises the following key aspects:

- An enclosed process building with process area, storeroom, process control room and welfare facilities (showers, canteen, toilets, changing room, etc.) (floor area 398 m^2)
- Process area which will house a mixing unit and weighing scales
- 4 x storage silos will be provided to store FGT residues awaiting solidification (4 x 78 m^3)
- 1 x cement silo will be provided (1 x 78 m^3)
- 2 x 30m^3 bunded acid tanks will be provided

D.1.29 The solidification process will be undertaken within a fully enclosed building as shown on Drawing **WLA-09**. The building will have a finish floor level of 119.0 m OD Malin and a ridge height of 133.0 m. The overall dimensions of the proposed solidification building are 13.445m x 18.445m x 14m high. The building structure will comprise walls of blockwork, composite cladding and precast concrete. A 600mm thick reinforced concrete floor slab to resist overturning on a 2mm welded HDPE liner on 50mm sand blinding layer. The roof will comprise composite cladding panels on roof purlins.

D.1.30 The ground floor area of 242 m^2 will allow for the unloading of two bulk tankers inside the building. The unloading process will be undertaken after closing the roller shutter doors, fixing an exhaust extractor to the bulk tanker and connecting to the manifold to pump material into the silos. The first floor area comprises 78 m^2 of the building. The first floor will include an access stairs, control room, mixing unit and plant area. A second floor with a floor area of 78 m^2 is proposed to cater for the weighing scales, plant area and a storeroom. Materials stored in the silos will be pumped directly to the mixing unit with cement, water or leachate and acid will be added in a controlled manner by an electronic process control system.

D.1.31 The construction of the solidification building will comprise composite cladding which will reduce noise levels. In procuring the plant, due consideration to the noise rating of each piece of equipment will be considered and lower noise-generating equipment selected where possible. The solidification plant will be fully enclosed with roller shutter doors and mechanical ventilation and filters preventing dust emissions. It is proposed to locate a canteen to cater for approximately five staff, including a male and female toilet and shower facility at ground floor. An underground conveyor system will be installed to transport IBC bags from the solidification plant to the adjacent storage building, or surface-level transportation may also be applied.

Storage Building (for solidified material)

D.1.32 The storage building proposed will have a finished floor level of 119.25 m OD and a height of 9 metres. The maximum roof level of 128.25m OD Malin will match the access road level east of the building. The ridge level is below the surrounding ground levels and the building will be screened by the quarry lip. The storage building plans, elevations and sections are shown on Drawing **WLA-10**. The floor area of the storage building will be 1,285 m^2 with overall (external) dimensions of 31.26 m x 43.10 m x 9.00 m high.

Drawing WLA-10 (Attachment D.1): Proposed Storage Building (Sheets 1 to 3)

D.1.33 The structure will be a standard steel portal frame clad with a single skin cladding system, open on one side (front elevation) to ensure adequate air circulation and to enable free access and egress to the building by MEHL vehicles. The floor will be constructed of reinforced concrete 200mm thick over a 2mm HDPE liner. The floor will incorporate floor drains, which will remove any run-off collected via a sealed collection system to a HDPE lined pump sump for storage in the hazardous leachate holding tank, pending reuse in the solidification process. Natural lighting will be provided through 10% of the roof area.

Weighbridge

D.1.34 There is currently a weighbridge in place at the site in accordance with the Waste Licence W0129-02 (Photograph **D.5**). The weighbridge is an Avery Berkel L2 series with precision load cell. The Legal Metrology Service calibrated the weighbridge before use and re-calibrates on a regular basis. It is proposed to decommission the existing weighbridge (once the new facility control area is in place).

Photograph D.5: Weighbridge (existing infrastructure)

D.1.35 A specialist weighbridge software system has been developed specifically for the site by P&L Software Systems Ltd (UK) (Photograph **D.6**). It is proposed that the weighbridge software will be re-configured for the requirements of the integrated waste management facility to ensure full management and traceability of inert, non-hazardous and hazardous loads.

Photograph D.6: Weighbridge software (existing infrastructure)

D.1.36 The system records the following information for each waste load:

- Waste owner
- Source and origin of waste
- Description of the waste
- Waste type and EWC code
- Type of process producing the waste
- Amount of waste
- Existing data on the waste
- Physical form
- Colour
- Odour
- Tipping zone (detailed in Attachment **H.3**)

D.1.37 The software system has been specially adapted in order to track the testing requirements for incoming waste. Visual appearance and odour is checked and logged for each load. Only if both of these characteristics are satisfactory can the transaction proceed and the load be diverted to the landfill cell. The software displays a ‘pop-up’ reminder on screen whenever a random Level 2 waste sample is required to be taken. The weighbridge software is used to produce daily, weekly and monthly reports on types and volumes of material brought into the site.

D.1.38 It is proposed to install 2 No. new surface mounted weighbridges (Avery Berkel or similar approved) weighbridges at the facility control area, i.e. one 'in' weighbridge and one 'out' weighbridge. This is shown on Drawing **WLA-08**. The proposed weighbridges, having a maximum carrying capacity of 60,000 kg, will be 18m long by 3.35m wide.

Construction Plant

D.1.39 Standard construction and landfill development plant will be employed at the site. In addition, specialist plant will be used for construction of DAC-lined cells, to include a paving unit consisting of a slope finisher with main winch and several slope rollers, all supported by mobile winches.

D.1.e Wheelwash

D.1.40 A wheelwash is in place at the site in accordance with the current Waste Licence (W0129-02), to ensure thorough cleansing of all vehicles exiting the site. The water used for the wheelwash is recycled rainwater from the garage roof and wheelwash water is recycled within the self-contained unit. It is proposed to decommission the existing wheelwash.

Photograph D.7: Wheelwash (existing infrastructure)

D.1.41 Wheel washing facilities are proposed on the exit from the landfill site, as shown on Drawing **WLA-08**. It is proposed to install two wheel washing units, which drivers will be required to pass through. Trucks will first pass through a bath wheel wash, constructed in reinforced concrete; water supplied to the wheelwash will be by means of a pressure main. The wheelwash will be provided with an overflow into a sealed pipework for disposal to the leachate holding tank. The wheelwash will be drained as required to remove silt.

D.1.42 The second wheelwash will be a spray-type wash with water recycling (e.g. Wesley or similar approved); residual water will be disposed to the leachate holding tanks.

Road Sweeper

D.1.43 MEHL owns a roadsweeper, which is dedicated for use at the site.

Photograph D.8: Roadsweeper (existing infrastructure)

D.1.f Laboratory facilities

D.1.44 No laboratory facilities currently exist on site (under W0129-02). Analysis of samples of water and waste is carried out at a certified external third party laboratory, as agreed with the EPA.

D.1.45 A covered refrigerator unit is located adjacent to the site office, which was purchased to house the sample reference library of waste samples. All Level 2 "1 in 100" loads are sampled in duplicate, with 1 sample directed to the laboratory and 1 sample stored in the on-site refrigerator for a minimum duration of 3 months. It is proposed to relocate the refrigerator unit to the new facility control area.

Photograph D.9: Refrigerated Sample Storage Unit (existing infrastructure)

D.1.46 Floor space for laboratory facilities for the new integrated waste management facility is available within the solidification plant building (second floor). It is anticipated that some basic laboratory testing may be carried out here, e.g. pH, conductivity and proprietary test kits; however specification of the laboratory/equipment will be completed during later detailed design, and in consultation with the Agency. All laboratory testing may be conducted by an external accredited laboratory in the short-term; MEHL will develop on-site laboratory facilities if commercially viable.

D.1.g Design and location of fuel storage areas

D.1.47 Bunded fuel storage areas and spill control equipment are in place at the site in accordance with the current Waste Licence (W0129-02). The bunded tank area has been roofed, to prevent the ingress of rainwater. It is proposed to decommission the existing bunded and roofed fuel storage infrastructure.

Photograph D.10: Bunded and roofed fuel storage area (existing infrastructure)

D.1.48 It is proposed to construct a new fuel storage location adjacent to the solidification plant area. A 7,500 litre diesel tank for site machinery will be stored in a bunded and roofed storage area, constructed adjacent to the solidification yard. The reinforced concrete bund walls will be constructed to watertight standard BS8007 and sized to retain 110% of the total diesel volume. A steel and single skin cladding will be provided to roof the building and prevent water ingress into the bund.

D.1.49 In addition, the on-site maintenance building is fully equipped with spill control equipment, drip trays and bunded pallets. This infrastructure will be maintained.

Photograph D.11: Spill Control Equipment (existing infrastructure)

D.1.h Waste Quarantine Areas

D.1.50 A waste quarantine area is in place at the site in accordance with the current Waste Licence (W0129-02). The waste inspection and quarantine areas consist of two concrete bays, which are designed to contain runoff from these areas. It is proposed to decommission the existing waste inspection and quarantine areas.

D.1.51 Due to the large volumes of material which may be involved, agreement was received from the EPA in July 2003 to store quarantined material or material for testing on a 'sampling cell', on the active landfill cell. All material thereafter from that source site will be diverted to 'the sampling cell', until such time as laboratory analysis has been completed. Once laboratory results have been received and are acceptable, incoming material from that site will thereafter be diverted to the active tipping area. Unacceptable laboratory results will instigate a rejected load(s), which is reported to the EPA as an incident, and the waste being transferred off-site to a suitable licensed facility, or returned to the source site.

D.1.52 It is proposed to continue the practice outlined above for the quarantining of inert wastes.

D.1.53 A segregated quarantine area will be provided within the active hazardous cell to accommodate waste that will require further testing. After testing and provided the waste has not become contaminated in any way, it will be disposed of in the hazardous or non-hazardous cells or returned to source if necessary, and in agreement with the Agency, as required.

D.1.i Waste Inspection Areas

D.1.54 As above in D.1.h.

D.1.55 In addition, an inspection platform is proposed at the administration building to inspect accessible loads.

D.1.j Traffic Control

D.1.56 Traffic control measures are in place at the site in accordance with the current Waste Licence (W0129-02). Traffic is controlled on site by the use of signage, speed restrictions and a one-way system. Upon entrance to the site, landfill vehicles are directed towards the weighbridge. Directional signs are in place towards the landfill cell, where the vehicle is directed where to tip the waste. Prior to exiting the site, landfill vehicles are weighed out. All vehicles must use the wheelwash before leaving the site.

Photograph D.12: Traffic Control Signage (existing infrastructure)

D.1.57 New traffic control measures are required in line with the proposed new facility entrance, shown in Drawing **WLA-08**.

D.1.58 All incoming traffic will be required to stop at the weighbridge. Vehicles and visitors other than those delivering waste will be required to sign the 'Visitors' Book' and park in the designated parking areas. Staff will use the designated staff parking areas.

D.1.59 Waste delivery vehicles will be weighed in at the weighbridge. It is recognised that a superior level of control is required to ensure that vehicles access the correct tipping area on site: (a) Active Waste Recovery Area; (b) Solidification Plant, (c) Active Hazardous Cell, (d) Active Non-hazardous Cell, (e) Active Inert Cell.

D.1.60 A bespoke access control system will be developed to ensure that the correct tipping or discharge area is used. It is proposed that each of the tipping areas identified above are barrier-controlled. Following weighing in and inspection at the weighbridge, the driver will be assigned a device which permits access only to the designated tipping/discharge area. The banskman will do a final check of the material prior to discharge. MEHL will further develop the proposal, in consultation with the Agency, at detailed design stage.

D.1.k Sewage and Surface Water Drainage Infrastructure

Surface Water Management

D.1.61 The site is located in the catchment of the Ballough River which is classified as Salmonid habitat. Existing surface water drains are located along the site boundaries and discharge to a local stream, which flows from west to east. The surface water collected from the quarry is directed to sumps and removed by pumping, when required. The pump used on site is capable of discharging 12.5 l/s. This surface water is then passed through two inline settlement ponds with a volume of approximately 600 m^3. The ponds were designed and certified in accordance with a Construction Quality Assurance process by AWN Consulting Ltd. Sampling results of the treated surface water show suspended solids levels of less than 10 mg/l, prior to discharge to the local stream. The lands outside the quarry pit drains naturally to the stream at the north east via existing open drains along the boundaries.

Photograph D.13: Surface Water Management Inspection Chamber (existing infrastructure)

Photograph D.14: Settlement Ponds (existing infrastructure)

D.1.62 The primary aim of the proposed surface water management system for the integrated waste management facility is to avoid potential adverse impacts on the receiving watercourse in terms of water quality and flow. The drainage system proposed for dealing with surface water runoff from the proposed development will follow the principles of Sustainable Drainage Systems (SuDS) as detailed in Chapter 6 of Volume 3 Environmental Management, of the Greater Dublin Strategic Drainage Study (GDSDS).

D.1.63 Runoff will be captured close to its source and released slowly into a local stream along the northern site boundary. A treatment train approach will allow for effective reduction in pollutants from the site and the provision of storm water attenuation will allow the site to mimic greenfield runoff conditions thereby mitigation adverse flow impacts.

Construction Surface Water Drainage

D.1.64 The majority of the excavations that will be required to complete the construction of the proposed landfill cells will be undertaken within the existing quarried void. Surface water runoff during construction will be contained within the void and this will be managed in the same way as it is currently being managed, which consists of pumping out to the settlement ponds as necessary.

D.1.65 The discharge rate of surface water from the landfill footprint during construction will be regulated by controlled pumping. Existing settlement ponds will continue to provide sedimentation control during the construction phase for the areas currently served. The remaining areas that are associated with the proposed development consist of stockpiles, retention ponds, drainage and access roads. These areas will require the use of mobile sedimentation interceptors at various locations for water quality control.

Proposed SuDS Drainage Strategy

D.1.66 Sustainable Drainage Systems (SuDS) consist of a number of elements that may be suitable for the proposed development, such as ponds, basins, swales, infiltration techniques, etc. The suitability of these elements was examined in accordance with Section 6.5 of Volume 3 Environmental Management of the GDSDS and adopting the SuDS site evaluation website (www.irishsuds.ie). The findings are presented in Appendix **D.1.2**.

D.1.67 The characteristics of the site entered were as follows:

- Site Development includes: Industrial
- Drainage system: Private
- Catchment area: between 3ha and 50ha
- Soil Type: 1 & 2
- Site Type: Uplands site
- Development Type: Greenfield Development
- Groundwater level under systems: Greater than 3m below surface

D.1.68 It is proposed to manage surface water by providing a treatment train and using a combination of SuDS elements consisting of filter drains and swales, a wetland pond, a detention basin, and rainwater harvesting. The filter drain and swale will allow pollutant removal through filtration prior to discharging the attenuation feature. The wetland pond will form an integral part in offsetting both the hydraulic and water quality impacts of the development. The wetland pond will allow for an additional reduction in fine sediments, nutrients and toxicants and maintain the greenfield runoff characteristics by providing a 3-stage outlet for a return period of up to 1 in 100 years. Please refer to Appendix for relevant datasheets:

Appendix D.1.2: Surface Water Management Calculations and Datasheets

Proposed Surface Water Drainage

D.1.69 It is proposed to construct a number of segregated surface water management systems to ensure the necessary level of surface water management. The location of these systems is shown on Drawings **WLA-03, WLA-06** and **WLA-08**. The areas proposed for surface water management are as follows:

- Landfill footprint (25.5 ha)

- Entrance & site access road chainage 0 -160m, (0.15 ha)
- Site access road chainage 0 -170m B, chainage 0 – 70m C, car parking & administration area (2.032 ha)
- Solidification yard & buildings roofs (2,552 sq.m)
- Administration building roof (150 sq.m)

Landfill footprint (25.5 ha)

D.1.70 When the landfill is operational surface water from any constructed but as yet unfilled sub-cells, haul roads and the undeveloped landfill footprint will be collected in sumps and pumped up to a UPVC pipe network at the lip of the quarry. The surface water will discharge into a new constructed stormwater wetland system prior to discharging to the local stream along the northern boundary. Completed cells will be capped and surface water run-off diverted to reduce infiltration.

D.1.71 This wetland system will also attenuate surface water from the development after restoration and maintain Greenfield runoff for a return period of up to 100 years. A three-stage discharge arrangement together with gate valves will be installed on the outlet. The outlet can be sampled to monitor water quality and the gate valves closed in the event that there is a pollution incident. The outlet arrangement will consist of a hydro-brake and two orifice plates with valve control and this will be located in a manhole directly upstream of the stream discharge. The outflow is estimated by adopting QBar as Greenfield runoff rate as 2.64 l/s/ha. Design calculations detailing the predicted surface water storage and discharge from this system is provided in Appendix **D.1.2**.

Entrance & Site Access Road Chainage 0-160 (0.15 ha)

D.1.72 The surface water from the new entrance and main access road will be collected in french drains located in the road margins. The french drain is sized to accommodate the 100 year return period including allowance for climate change. The surface water will discharge to ground, site subsoil characteristics were identified in the site investigation as free draining shales with clays and silts. It is proposed to utilise the subsoil characteristic, any surplus surface water will discharge into the open drain south of the administration building.

Site Access Road Chainage 0B - 170B (included in next paragraph)

D.1.73 The surface water from the paved surface surrounding the administration building, car parking area, solidification plant access road, solidification plant roof and storage building roof will be collected and diverted via an underground UPVC pipework system to a new detention basin, which will discharge to the open drain south of the administration building. An approved class 1 bypass petrol/oil interceptor (Carlow CP33BP or similar), hydro-brake and gate valve will be installed on the detention basin outlet. Sampling can be undertaken from the hydrobrake chamber to monitor water quality. A hydro-brake valve control is to be installed in the manhole directly before the petrol interceptor and is to be designed to restrict the maximum discharge from the site to 2.64 l/s/ha.

Chainage 0C - 70C, Carparking & Administration Area (2.032 ha)

D.1.74 The surface water from the paved surface surrounding the administration building, car parking area, solidification plant access road, solidification plant roof and storage building roof will be collected and diverted via an underground UPVC pipework system to a new detention basin, which will discharge to the open drain south of the administration building.

D.1.75 An approved class 1 bypass petrol/oil interceptor (Carlow CP33BP or similar), hydro-brake and gate valve will be installed on the detention basin outlet. Sampling can be undertaken from the hydrobrake chamber to monitor water quality. A hydro-brake valve control is to be installed in the manhole directly before the petrol interceptor and is to be designed to restrict the maximum discharge from the site to 2.64 l/s/ha. A penstock valve will be installed to allow for closing the outfall. The predicted surface water storage and discharge from this system is in accordance with the attached Appendix **D.1.2**. Peak discharge via the hydrobrake will be 3 l/s.

Solidification Area

D.1.76 The runoff from the solidification yard, storage building roof and solidification building will be collected in underground pipework and pumped to the leachate holding tank. The surface water and the leachate will then be reused in the solidification plant.

Administration Building

D.1.77 The surface water on the roof of the administration building will be collected via an approved 1,000 gallon underground rainwater harvesting tank, Carlow precast or similar see Appendix **D.1.2**. The harvested rainwater will be reused as grey water within the administration building. The harvesting tank will have a high level overflow to the detention basin to safeguard against flooding. The detention basin has been sized to accommodate the administration building roof runoff.

Storage Evaluation

D.1.78 The rate of stormwater runoff discharged from the site will be restricted to the greenfield runoff and this has been estimated for the restoration phase, once the capping is in place. The greenfield runoff from the site has been calculated based on the site characteristics after restoration according to the CIRIA Report C697 'The SUDS Manual' (2007). Any flows in excess of the Greenfield runoff will be attenuated onsite for the design event of up to 1 in 100 years.

D.1.79 Several means of flow restriction will be employed and significant volumes of surface water will be stored within unused cells and on the undeveloped quarry floor during the filling phase of the landfill operation. These areas will be designated and will include pumps to lift stored surface water into the gravity drain and into the wetlands. Surface water discharge from the wetlands will be further restricted by a vortex flow control device in a monitoring chamber. The outfall will also contain a penstock valve for closing the outlet.

D.1.80 The area containing the site infrastructure on the eastern site boundary will be collected separately by gravity drainage and discharged through a detention basin and bypass petrol interceptor to an existing boundary drain. This boundary drain flows east and north to the stream on the northern boundary. Appendix **D.1.2** provides design calculations for the storage evaluation and the following parameters were used to estimate the storage volumes:

- 10% increase in rainfall depth to account for climate change (GDSDS);
- 30% runoff from grass areas;
- 90% runoff from grassed capping layer (allow 10% reduction due to attenuation effect of vegetated capping);
- 100 % runoff from all hardstanding areas;
- Flood Study Update Rainfall Data (see details below)

D.1.81 As part of the Flood Studies Update (FSU) Programme, Met Éireann, commissioned by the Office of Public Works (OPW), has developed a depth duration frequency model, which allows for the estimation of point rainfall frequencies for a range of durations for any location in Ireland. The model consists of an index (median rainfall) and a log-logistic growth curve, which provides a multiplier of the index rainfall. Rainfall station data were analysed and an index rainfall extracted, interpolated and mapped on a 2km grid. The model was fitted to series of annual maxima and the growth curve parameters were determined; these were also interpolated and mapped on a 2km grid, and these have been made available to practitioners in Ireland by the OPW and this is regarded as providing the most accurate design rainfall data to date.

Surface Water Sewers

D.1.82 The layout of the surface water sewers is shown in Drawing **WLA-11**. The pipework has been designed to provide capacity and adequate velocities for rainfall and pumping as per the attached calculations. The longitudinal surface water sewer sections are shown on the following drawing:

Drawing WLA-11 (Attachment D.1): Surface Water Sewer Sections (Sheets 1 to 3)

Site areas are in metres squared (m^2):

- Rainfall Intensity- 50mm/hr
- Roofs - Impermeability factor - 0.95
- Yards, parking, roads - Impermeability factor - 0.95
- Grassed areas, open space - Impermeability factor - 0.3

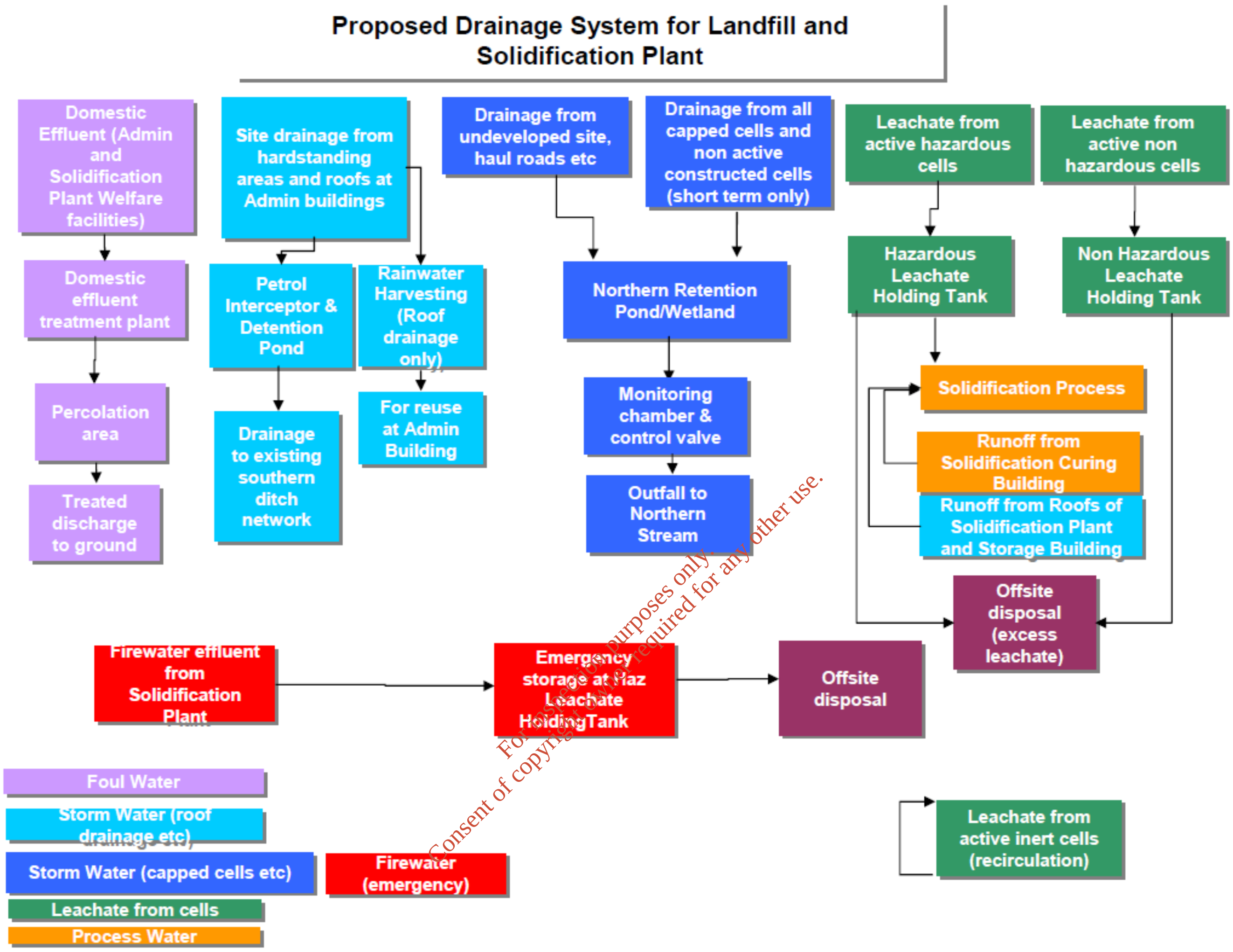
D.1.83 Peak discharge is calculated using the following formula:

$$\mathbf{Q(l/s)} = \frac{\text{Area } (m^2) \times 0.05 m/h \text{ rainfall} \times 1{,}000 \; l/m^3}{3{,}600 \text{ secs / hr}}$$

D.1.84 Calculations relating to the pipe sizes, runs for the site are attached Appendix **D.1.2**.

D.1.85 A schematic of the proposed drainage systems at the proposed facility is presented on Figure **D.1.2** below.

Figure D.1.2: Summary flowchart of proposed drainage system



Wetland System

D.1.86 The proposed wetland treatment system (in the north-east of the site) consists of a sedimentation basin (forebay) prior to conveyance through the extended detention wetland, which is designed for water quality control and flow attenuation to protect the receiving water system from increased runoff, erosion and otherwise potential flooding.

D.1.87 The purpose of the forebay is to capture sediments, which is of most concern during the landfill filling phase. The forebay provides a permanent pool, which offers better water quality treatment for the first flush of runoff and allows easy access for maintenance.

D.1.88 Once the landfill is capped, the wetland system will receive relatively clean storm water runoff from the grassed landfill capping. During this phase, the main purpose of the treatment system is to provide wildlife habitat and to enhance the local amenity value, as well as maintaining the site's greenfield runoff rate by providing flow attenuation. The attenuation volume is estimated to be 8,522m^3, which provides for a 100 year-storm event, following the policies from the Greater Dublin Strategic Drainage Study (GDSDS, 2005).

D.1.89 The wetland promotes the growth and propagation of emergent wetland plants due to shallow depth and reduced flow velocity. It provides an environment of intense biologic activity with high density of stems in the submerged zone and thereby maximising the contact between water and surfaces on which micro-organisms grow. The wetland also reduces flow velocity and thereby promoting settlement of fines. The system is designed with shallow (<1 in 3) side slopes, which shall be planted up with tall emergent plants to provide safety screening and restrict access to the water area, as well as reduce the risk of bank side erosion.

D.1.90 Planting density varies but typically ranges between four to eight plants per square metre. Planting will take place between early April and mid-June so that the plants have a full growing season to develop the root reserves they need to survive through winter. Vegetation will be established quickly once stormwater flows are introduced to the system. Dense planting of marginal floating-leaved and aquatic plants should be avoided, and the wetland will be left to colonise as naturally as possible.

D.1.91 Ideal species are those that offer a high density of stems in the submerged zone, maximising the contact between water and the surface on which micro-organisms grow, while providing uniform flow conditions. Details of particular plant types will be specified during the detailed design phase.

Construction

D.1.92 The excavation to the wetland bottom and side slopes of the system, including any benches, will be carefully prepared to ensure that they are structurally sound. The preparation will also ensure that the basin will satisfactorily retain the surface water runoff without significant erosion damage. Backfilling against inlet and outlet structures will be controlled so as to minimise settlement and erosion.

D.1.93 The soils used to finish the side slopes of the pond above the retained level will be suitably fertile, porous and of sufficient depth to ensure healthy vegetation growth. Clay-type material will be used to provide the impermeable layer of the basin, in order to retain the permanent water level of the wetland.

D.1.94 During the establishment phase, runoff from bare soils should be minimised and a vegetated cover on slopes will be rapidly established. A construction method statement and planting scheme will be established at detailed design phase.

Foul Water Management

D.1.95 It is proposed to collect all foul water generated on the site by means of a separate foul sewer system. The effluent will be domestic type from toilet and canteen facilities. It is expected that an additional fifteen staff will be employed at the facility and that a normal working day of 7am to 7pm Monday to Friday and 7am to 5pm Saturday as per the existing licence will be adhered to. Foul domestic water will be generated from the kitchen, toilets and washing facilities located in the administration building and in the solidification building.

D.1.96 All effluent will be collected in a sealed underground pipework system and discharged to a domestic type treatment plant with treated effluent percolated to ground. The foul effluent from the solidification plant will be pumped to the package treatment unit, as the treatment plant is at a higher level.

D.1.97 The onsite wastewater packaged treatment plant and raised bed percolation will be located to the east of the administration building. The main foul sewer drainage system for the proposed development is to be designed as a gravity system consisting of a 150mm diameter uPVC pipe laid underground at maximum gradients of 1 in 100.

D.1.98 The suitability of the site for an onsite domestic effluent treatment plant was assessed by EPA approved assessors Waste Water Maintenance Ltd in 2008 (see Appendix **D.1.3**). Their report concluded that the site was suitable for discharge to ground by providing a mechanical aerated treatment system and gravity type polishing filter constructed with imported fill.

Appendix D.1.3: Report Re. Suitability of the Site for an Onsite Domestic Effluent Treatment Plant

D.1.99 The design criteria for the proposed treatment system are as follows:

Estimated number of staff:	20
Hydraulic Loading:	60 Litre/day/person

Population Equivalent:	20 x 60/180 = PE 7
Maximum Hydraulic Loading:	900 Litres
Biological Loading:	30g/day/person
P value of onsite soil:	11

D.1.100 A Carlow Precast SBR or similar packaged treatment plant is proposed, meeting the required specification when installed in accordance with its Irish Agrement Certificate 08/318. The unit includes a precast septic tank and mechanical aeration system, prior to discharging to the percolation area. The proposed system will effectively treat a staff of 30 (PE 10).

D.1.101 The proposed treatment system will meet the following final effluent quality standards:

Volume:	2000 l / day
pH:	6.0 – 8.5
Biochemical Oxygen Demand (BOD):	< 20 mg/l
Suspended Solids:	< 30 mg/l
Ammonia as N:	<10 mg/l
Nitrate as N:	21 mg/l
Phosphorous:	12.5 mg/l

D.1.102 The location of the treatment system and percolation are shown on Drawing **WLA-08**. The treatment system and percolation area have been located to satisfy the required separation distances to receptors as follows:

Table D.1.1: Minimum separation distances for sewage treatment system

FEATURE	MINIMUM SEPARATION (m)	
	Carlow Precast SBR or Similar Packaged Treatment Plant	Carlow Precast SBR or Similar Packaged Treatment Plant Percolation Area
Dwelling served	7	10
Adjacent dwelling	7	10
Wall	3	3
Road	4	4
Site boundary	3	3
Potable water source	10	30-100
Watercourse	10	10

D.1.103 The percolation pipework for the proposed plant will be installed at approximately 126 mOD, which is 2m below the existing ground level at the proposed percolation area. A second percolation test to verify ground conditions will be undertaken once this area is lowered by 2m as part of the development works.

D.1.104 The site investigation, undertaken by Waste Water Maintenance Ltd found free-draining soils with no evidence of groundwater in the trial pit excavated.

Foul Sewer Design

D.1.105 Design criteria for this facility is to be as per BS 8301: 1985: Section 3. The following canteen/toilet facilities will be provided: -

- 4 No. Toilets
- 4 No. Wash hand basins
- 2 No. canteen sinks

Table D.1.2: Foul Sewer Discharge Units

	Number	Discharge Units	Total
Toilets	4	14	56
Wash hand basins	4	3	12
Sinks	2	14	28
TOTAL = 96 discharge units			

D.1.106 Using BS 8301: 1985 design flows for foul drains; conversion of discharge units to flow rates:

- Flow rate for 96 discharge units = 4 litres / sec.
- 4 no Showers x Flow of 0.1 l/s = 0.4 litres/sec
- Total foul discharge for site = 4.4 litres / sec. (peak discharge)
- Propose min 150mm diameter pipe @ 1:100 gradient (Ks= 0.06) = 22 litres / sec.

D.1.l All other services

D.1.107 Water and telecommunication services are in place at the site in accordance with the current Waste Licence (W0129-02), and are located along the public road just outside the site boundary. New connections will be required to service the new facility control area.

Water supply

D.1.108 A new 100mm diameter PE100 Class C watermain (EN 1452) is to be connected to existing watermain on the public road L01080 as shown on the attached Drawings **WLA-06**, **WLA-07** and **WLA-08**, and to be laid in the new access road. All new watermains will be overlaid with warning tape and tracer wire. This new watermain will supply potable water for human consumption to the welfare facilities in the administration and solidification building.

D.1.109 Water metering facilities together with sluice valves, air valves, stop cocks and 1 number fire hydrant will be installed on the new watermain as per the attached site layout drawings. A 12.5mm diameter watermain connection from this main water supply pipe will be laid to the solidification plant and wheelwash. This supply is only to be used as a back-up supply to the rainwater harvested. Sluice valves and non-return valves will be installed to regulate the water supply in conjunction with metering facilities to record the quantity of water draw down through this back-up system.

D.1.110 The water supply pipe is to feed directly to two sinks (1 in each building): pipes to rise to cold water storage tanks in both buildings. A non-return valve is to be fitted on all supply pipes to cold water tanks all in accordance with Fingal County Council and Building Regulations requirements.

D.1.111 Twenty-four hour water storage is to be provided at a rate of 60 litres per person, per day (minimum tank size 1,000 litres). All WCs, WHBs, urinals etc. to be fed from rainwater harvesting tank – all to Mechanical & Electrical Engineers details and specifications.

D.1.112 The process water required for solidification will be supplied from the leachate holding tank. Limited quantities of additional water may be required during extended dry periods.

Electrical and Telecoms

D.1.113 The electrical and telecommunications infrastructure will be located in consultation with the relevant service provider. The exact location of ESB mini-pillars, substation etc will be confirmed during the detailed design stage, prior to commencement of construction.

D.1.114 The construction of the new entrance and access road will require the undergrounding and diversion of overhead electrical lines within the landownership boundaries. The affected lines are one medium voltage line and two low voltage lines, see Drawing **WLA-05**. The electrical supply required for the facility and the diversion requirements will be undertaken in consultation with ESB Networks.

Lighting

D.1.115 The lighting proposal has been considered with regard to the rural nature of the site. The site lighting has been designed to meet the required safety standards for the site, while minimising overspill and excess lighting. It is proposed to install 1m high lighting bollards with a 35w halide lamp from the entrance, along the proposed access road as far as the solidification area. At the solidification plant and storage building 6m high lighting standards with 150w halide lamp will be provided. The 6m high lamps will be screened by the surrounding ground. The proposal for lighting the site is shown on drawing**:**

Drawing WLA-12 (Attachment D.1): Proposed External Lighting Layout

D.1.m Plant sheds, garages and equipment compound

D.1.116 A maintenance building is in place adjacent to the existing site entrance. It is proposed to retain this maintenance building until the final restoration phase. Servicing and maintenance of plant and equipment utilised in the landfilling operations are and will continue to be carried out on the site.

Photograph D.15: Maintenance Building (existing infrastructure)

D.1.117 Proposed plant and the storage building at the solidification plant are detailed in Attachment **D.1.d**.

D.1.n Site Accommodation

D.1.118 A site office is in place at the site in accordance with the current Waste Licence (W0129-02). The landfill site office consists of a 40 feet x 12 feet 'Sureguard Triple Office' (a 'portacabin' structure). An archive unit was established at the site in 2006, for the safe and secure retention of archive site documentation and records. It is proposed to decommission the existing site office and archive unit once new facilities have been established at the facility control area.

Photograph D.16: Site Office (existing infrastructure)

D.1.119 It is proposed to relocate the site offices adjacent to a proposed new site entrance in the southeast of the site, see Drawing **WLA-06**. A new administration building, with access control, twin weighbridges and car parking will be located on the eastern side of the site. The administration building will include reception area, offices, canteen, filing room, meeting room, showering and toilet facilities.

D.1.120 The building will be a single storey building with flat roof. The proposed finished floor level is 129.95m and maximum roof level of 134m. The floor area of the building is 128 m2 with overall dimensions 16.69m x 9.25m x 6.0m high. Ten car parking spaces will be provided near the administration building.

Drawing WLA-13 (Attachment D.1): New Office and Administration Building

D.1.121 Office accommodation and welfare facilities are also proposed to be located at the Solidification Plant, see Drawing **WLA-09**.

D.1.o Fire Control System, including water supply

D.1.122 A fire control system is in place at the site in accordance with the current Waste Licence (W0129-02). A mains supply of water is available along road LP01090.

D.1.123 Proposed new buildings will be subject to fire regulations and will be required to obtain a Fire Certificate. Appropriate fire safety systems and fire-fighting equipment will be installed.

D.1.124 Though the risk of fire at the site will be low, the management of contaminated water arising from a fire has been included in the surface water management system. Should a fire occur within a cell or at the waste quarantine area, any water used to fight the fire will be contained in the cell and the firewater will be managed within the leachate management system.

D.1.125 In the event that a fire occurs at the solidification plant, contaminated water generated in fighting the fire will drain to the leachate pumping sump. This sump and the kerbing around the hard paved area around the solidification plant will have sufficient capacity to store contaminated water for the duration of any likely fire. In the event of a major fire, any excess water arising would be temporarily pumped to leachate holding tanks. Any fires arising at the administration building will be dealt with in the same manner as a typical office development

D.1.p Civic Amenity facilities

D.1.126 There will be no civic amenity facilities provided on the site.

D.1.q Other waste recovery infrastructure

D.1.127 Recovery infrastructure proposed includes provision for Classes 3, 4 and 13 of the Fourth Schedule of the Waste Management Acts 1996-2010, as follows.

D.1.128 The application seeks to retain, as per W0129-02, '*Class 3: Recycling or reclamation of metals and metal compounds*'. This activity provides for the recovery of metal within wastes delivered to the facility. Recovered metals shall be dispatched onwards to appropriate reprocessing facilities.

D.1.129 The application seeks to retain, as per W0129-02, '*Class 4: Recycling or reclamation of other inorganic materials*'. This activity includes the recovery of inert material for use in site development and site restoration works. This may involve the use of temporary crushers and screeners on site, as per existing and historic operations.

D.1.130 The application seeks to retain, as per W0129-02, '*Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced*'. This activity provides for the storage of wastes for recovery purposes at this facility (e.g. stockpiles of soil) and the temporary storage of materials (e.g. metals), pending their dispatch to appropriate off-site recovery facilities.

D.1.r Composting infrastructure

D.1.131 There will be no composting infrastructure on-site.

D.1.s Construction & Demolition waste infrastructure

D.1.132 As a previous quarry and existing inert landfill site, the facility has mobile and fixed crushing, screening, grading and conveyor equipment on site. It is proposed to retain this infrastructure for ongoing recovery activities.

D.1.t Incineration infrastructure

D.1.133 There will be no incineration infrastructure on-site.

D.1.u Any other infrastructure

D.1.134 Monitoring infrastructure, existing and proposed is described in Attachment **F**.

D.1.135 Leachate management infrastructure is described in Attachment **D.4**.

D.1.136 Following consultation with the Geological Survey of Ireland (GSI), MEHL has agreed to provide a viewing platform (close to the existing site entrance in the west of the site) from which the quarry faces can be viewed in a safe environment. MEHL will also provide an information panel relating to the geological features of interest in the site. These are recommended mitigation measures outlined in the *Soils and Geology* section of the EIS.

D.1.137 During specific phases of development, alternative natural or artificial ledges will be installed on the south-western side of the limestone cliff face as roosting or potential nest sites for peregrine falcons, as a recommended mitigation measure of the *Flora and Fauna* section of the EIS.

D.2 Facility Operation

Unit Operations

D.2.1 Unit operations at the site may be identified as:

- Construction activities
- Facility control area and related operations
- Waste recovery activities
- Solidification process (pre-treatment, prior to landfilling, for certain hazardous wastes)
- Landfill operations: hazardous landfill cells
- Landfill operations: non-hazardous landfill cells
- Landfill operations: inert landfill cells
- Ancillary activities, e.g. garaging and maintenance, leachate management, surface water management
- Management of restored areas

D.2.2 Drawing **WLA-03** shows the location of these operations.

Landfill Cells

D.2.3 It is proposed to construct hazardous (1,735,500 m^3), non-hazardous (1,324,000 m^3) and inert (755,500 m^3) landfill cells. Landfill cells have been identified as follows in Table D.2.1. The hazardous waste cells will be sited in the northern part of the existing quarry. The non-hazardous cell will be located in the southern part of the site and the inert cells to the west. The layout is shown on the attached site layout Drawing **WLA-03**.

Table D.2.1: Proposed Void Capacities

	Cell Ref.	Phase	Void Capacity (m^3)	Subtotal (m^3)
Hazardous	H1	1	327,000	**1,735,500**
	H2	2	652,000	
	H3	3	756,500	
Non-hazardous	NH1	2	1,070,000	**1,324,000**
	NH2	4	254,000	
Inert	IN1	1	853,000	**755,500**
	IN2	2	271,500	
	IN3	3	165,500	
	IN1	-	- 534,500 *	
			TOTAL:	**3,815,000**

* 534,500m^3 to be re-located to IN1 from existing inert waste cells on site

Geotechnical Site Investigation

D.2.4 Site Investigation works, including a geotechnical ground investigation, were undertaken and completed in May 2010. No major geotechnical constraints have been identified. Further geotechnical investigations will be undertaken as part of pre-development construction works. Engineered ground improvement works to the base of the cells, to meet the cell design requirements, will be undertaken as part of the construction of the cells and will be assessed during the works to ensure that the criteria for the cell design is met.

Phasing

D.2.5 The proposed life span of the facility will be 25 years with construction, operation and restoration undertaken on a phased basis. Construction is expected to commence in 2011. Final restoration will be completed by 2036. The landfill will be constructed in four phases over a 25 year period. A detailed description of the works is provided in the sections below and summarised in Table **D.2.2**.

D.2.6 The preliminary proposed phasing of the facility is detailed in the following appendix and drawings:

Appendix D.2.1: Indicative Phasing Programme

Drawing WLA-14 (Attachment D.2): Proposed Phasing Layout (Sheets 1 to 5)

Drawing WLA-15 (Attachment D.2): Proposed Restoration Layout (Sheets 1 to 7)

Drawing WLA-16 (Attachment D.2): Proposed Restoration Details and Sections

Drawing WLA-17 (Attachment D.2): Site Cross Section A-A

Drawing WLA-18 (Attachment D.2): Site Cross Section B-B

Drawing WLA-19 (Attachment D.2): Site Cross Section C-C

Drawing WLA-20 (Attachment D.2): Site Cross Section D-D

Drawing WLA-21 (Attachment D.2): Site Cross Section E-E

Table D.2.2: Summary of Proposed Landfill Phasing Plan

(please note phases may overlap)

	Phase 1	Phase 2	Phase 3	Phase 4	Final Restoration
Approximate time-span:	2011-2016	2014-2024	2022-2034	2034-2036	2036
Construction:	H1 IN1	H2 NH1 IN2 IN3	H3	NH2	
Operation:	H1 C5 IN1	H2 NH1 IN2 IN3	H3 NH1 IN1 IN2	NH2 IN1	
Restoration:	C1 C2	H1 C5 IN3	H2 IN2	H3 NH1	NH2 IN1

H Hazardous Cell NH Non-hazardous cell IN/C Inert Cell

D.2.7 The actual phasing will depend on the volumes of appropriate waste generated over the lifespan of the project, which is influenced by a number of factors, including waste policy and economic conditions.

D.2.8 The hazardous cells will be constructed and restored over three phases. The construction works will be phased moving from the north to the south of the site. The final restoration of each hazardous cell will commence when filling is completed. As each phase is developed the leachate management and surface water management systems will be extended to connect new cells to the existing infrastructure. In the period between cell construction and commencement of waste placement, drainage from the unused cell will be uncontaminated and will therefore be suitable for disposal to the surface water drainage systems.

D.2.9 The hazardous quarantine area will be relocated into the next active cell each time a cell is approaching completion.

Phase 1 Construction & Operation (2011 -2016)

D.2.10 The first phase of construction and operation will comprise the establishment of a site construction compound followed by the construction and operation of site infrastructure and cells to accept inert and hazardous waste. See indicative phasing programme in Appendix **D.2.1** and Drawing **WLA-14**. Please note that the works outlined below may overlap and are not necessarily in sequential order.

New Site Entrance and Facility Control Area

- Construct new site entrance with access road at the southern boundary
- Install and commission services, electricity, telecommunications & water
- Initial landscaping works
- Construct new administration building, car parking and related works
- Install domestic foul treatment and percolation
- Install twin weighbridges and wheelwash
- Install surface water management infrastructure at Facility Control Area, to include attenuation basin, silt trap and petrol interceptor

Cell Construction, Operation and Restoration

Hazardous

- Construct Hazardous Waste Cell H1

- Construct and commission leachate management collection and storage infrastructure, including leachate holding tank for Hazardous Waste Cell H1
- Establish waste quarantine area in Hazardous Waste Cell H1
- Operate Hazardous Waste Cell H1
- Construct Hazardous Waste Cell H2 at the end of Phase 1/beginning of Phase 2
- Cap and restore Hazardous Waste H1 at the end of Phase 1/beginning of Phase 2

Non-Hazardous

- Construction of engineered bunds between Non-hazardous and Inert Waste Cells

Inert

- Construct Inert Waste Cell IN1
- Complete the capping & restoration of Inert Waste Cells C1, C2
- Remove inert waste from the existing Inert Waste Cell to Inert Waste Cell IN1
- Operate Inert Waste Cell C5
- Operate Inert Waste Cell IN1 - fill up to 125m OD Malin
- Construct Inert Waste Cell IN3 at the end of Phase 1/beginning of Phase 2

Solidification Plant

- Excavate natural ground from eastern slope for Solidification Plant
- Construct, commission and operate Solidification Plant and Storage Building

Other

- Construct and commission stormwater wetlands treatment area in the north of the site
- Remove and decommission existing site infrastructure, when new replacement infrastructure has been commissioned
- Recovery operations[9]

[9] As a previous quarry and existing inert landfill site, the facility has mobile crushing, screening, grading and conveyor equipment on site. It is proposed to retain this infrastructure for ongoing recovery activities. It is proposed to site this mobile equipment opposite the Solidification Plant during Phase 1 and Phase 2.

Phase 2 Construction & Operation (2014 -2024)

D.2.11 The construction of inert waste cell IN2 and hazardous waste cell H2 are co-dependent. The requirement for a stable western side wall for hazardous cell H2 requires the removal of existing inert waste to inert Waste Cell IN1. The removal of inert waste and the formation of a bund for the hazardous cell H2 will create the new inert waste cell IN2.

D.2.12 The proposed construction compound during Phase 2 will be located on the western boundary of the site on the existing concrete yard, separating the construction and operational activities however construction traffic will share the new entrance with operational traffic.

D.2.13 The construction and operational works which will be undertaken in the second phase are outlined below. See indicative phasing programme in Appendix **D.2.1** and Drawing **WLA-14**. Please note that the works outlined below may overlap and are not necessarily in sequential order.

Cell Construction, Operation and Restoration

Hazardous

- Construct a stable bund between the existing Inert Cell and Hazardous Cell H2,
- Excavate natural ground from the eastern slope to form Hazardous Cell H2
- Construct Hazardous Waste Cell H2 at the end of Phase 1/beginning of Phase 2
- Construct and commission the leachate collection infrastructure at Hazardous Cell H2
- Cap and restore Hazardous Cell H1 at the end of Phase 1/beginning of Phase 2
- Operate Hazardous Cell H2
- Relocate waste quarantine area to Hazardous Cell H2
- Cap and restore Hazardous Cell H2 (end of Phase 2/beginning of Phase 3)

Non-hazardous

- Construct Non-hazardous Cell NH1
- Construct and commission Non-hazardous Waste Cell NH1 leachate collection infrastructure
- Construct and commission leachate holding tank for Non-hazardous Cell NH1

- Operate Non-hazardous Waste NH

Inert

- Construct Inert Waste Cell IN3 at the end of Phase 1/beginning of Phase 2
- Construct Inert Waste Cell IN2
- Operate Inert Waste Cell IN3, followed by Inert Waste Cell IN2
- Cap and restore Inert Cell C5 and IN3

Solidification Plant

- Operate Solidification Plant and Storage Building

Other

- Recovery operations

D.2.14 The basal and side slope liner in the non-hazardous waste cell NH1 will be completed during the initial construction except for the southern rock face, which rises steeply. The southern slope of the non-hazardous landfill will be completed in lifts of 2m during the operational life of the landfill cell.

Phase 3 Construction & Operation (2022 -2034)

D.2.15 The construction of the last hazardous cell H3 will require removal of natural ground to form the cell walls. The construction compound will be located again on the western side of the site and construction traffic will access via the new entrance.

D.2.16 The construction and operational works which will be undertaken in Phase 3 are outlined below. See indicative phasing programme in Appendix **D.2.1** and Drawing **WLA-14**. Please note that the works outlined below may overlap and are not necessarily in sequential order.

Cell Construction, Operation and Restoration

Hazardous

- Excavate natural ground from the eastern slope to form Hazardous Waste Cell H3
- Construct Hazardous Waste Cell H3
- Relocate waste quarantine area to Hazardous Waste Cell H3

- Construct and commission Hazardous Cell H3 leachate collection Infrastructure
- Cap and restore Hazardous Cell H2 (end of Phase 2/beginning of Phase 3)
- Operate Hazardous Waste Cell H3
- Cap and restore Hazardous Cell H3 (end of Phase 3/beginning of Phase 4)

Non-Hazardous

- Operation of Non-hazardous NH1
- Cap and restore Non-hazardous NH1 (end of Phase 3/beginning of Phase 4)

Inert

- Operation of Inert Waste Cell IN1 and Inert Waste Cell IN2
- Cap and restore Inert Waste Cell IN2

Solidification Plant

- Operate Solidification Plant and Storage Building

Phase 4 Construction & Operation (2034 -2036)

D.2.17 The Solidification Plant is located adjacent to the non-hazardous cell NH1 below the restoration level. When the hazardous cells have been completely filled, the Solidification Plant and storage building will not be required and will be decommissioned. The void remaining after removing the Solidification Plant will be lined as a non-hazardous cell, filled with non-hazardous waste and restored.

D.2.18 The construction works which will be undertaken in Phase 4 are outlined below. See indicative phasing programme in Appendix **D.2.1** and Drawing **WLA-14**. Please note that the works outlined below may overlap and are not necessarily in sequential order.

Cell Construction, Operation and Restoration

Hazardous

- Cap and restore Hazardous Waste Cell H3 (end of Phase 3/beginning of Phase 4)

Non-hazardous

- Cap and restore Non-hazardous Waste Cell NH1 (end of Phase 3/beginning of Phase 4)
- Construct Non-hazardous Waste Cell NH2
- Construct Non-hazardous Waste Cell NH2 leachate collection infrastructure
- Operate Non-hazardous Waste Cell NH2

Inert

- Operation of Inert Waste Cell IN1

Solidification plant

- Decommission Solidification Plant and Storage Building

Other

- Remove paving, kerbing and recycle materials

Final Restoration

D.2.19 The final restoration will comprise the demolition and recycling of the administration building, electrical substation, carparking area, lighting standards and road pavement. During the final restoration, non-hazardous waste cell NH2 and inert waste cell IN1 will be capped and restored. It is anticipated given the nature of the waste which will be accepted, treated and disposed of at the facility that minimal settlement of the waste body will occur over time. It is therefore proposed that the settlement will not affect the final capping profile. The final restoration profile of the site is shown in Drawing **WLA-15**.

D.2.20 The maximum restored level will be 148m OD Malin near the existing entrance on the western boundary. Restoration levels will slope from the east and north of the highest point to match the surrounding ground levels and a typical slope of 1 in 10 is anticipated. It is proposed to restore the site to amenity / nature usage. The proposed landscaping of the site is shown on Drawing **WLA-15**. This landscape design was prepared by Brady Shipman Martin Landscape Architects.

D.2.21 The position of both surface water drains and hedgerows on site mark the location of inert, non-hazardous and hazardous areas. This will assist with the identification of inert, non-hazardous and hazardous areas on site in addition to site survey records.

D.2.22 The leachate and surface water collection infrastructure will be retained after the final restoration. This infrastructure consists of leachate monitoring wells, leak detection wells, leachate holding tanks and any other monitoring infrastructure in order to meet EPA requirements for aftercare and monitoring.

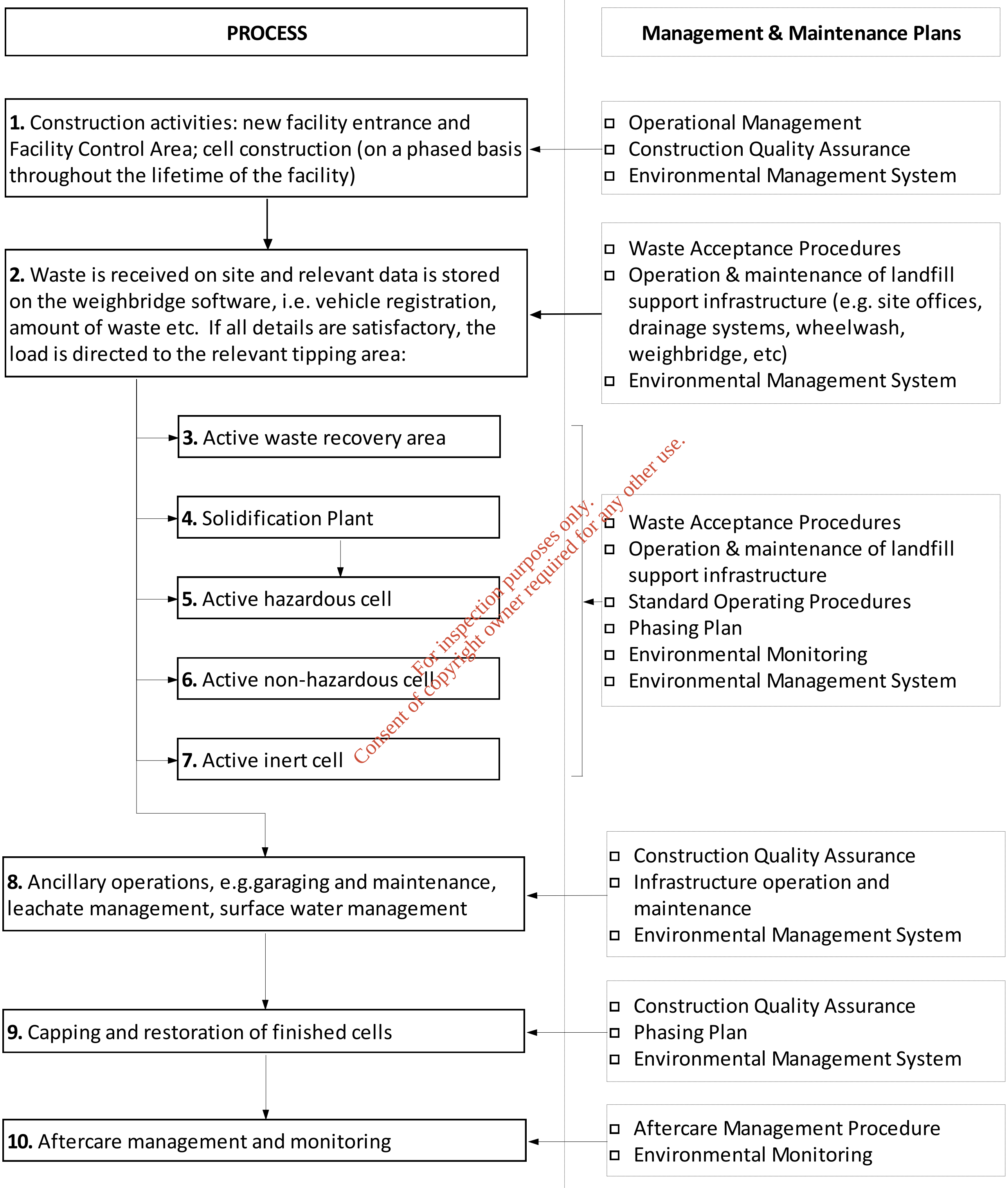
Timing of Phasing

D.2.23 The facility has been designed with sufficient capacity for an operational life of 25 years for acceptance of hazardous waste. At this stage, given that there are uncertainties around the timing of waste to energy facilities becoming operational, it is difficult to accurately estimate the rate at which each of the cells will fill. However, it is considered that each cell will fill at a rate proportional to its size. It is therefore estimated that Phase 1 will be completed in 5 years; Phase 2 will be completed in 11 years and Phase 3 in 13 years. The final Phase 4 and final restoration will be completed in the final three years (see Appendix **D.2.1** - Indicative Phasing Programme). It is important to note that there will be some overlap between phases as shown in the indicative phasing programme.

Flow Diagram of the Process

D.2.24 Figure **D.2.1** shows an outline of the proposed integrated waste management facility process, along with a brief description of related management and maintenance plans.

Figure D.2.1: Flowchart of proposed integrated waste management facility process



*For further details on the Waste Acceptance Procedure see Attachment **H.2**.*

Emissions to Environment

D.2.25 The main aspects of the operation, which may cause environmental emissions are summarised below and discussed in greater detail in Attachment **E**.

Table D.2.3: Summary of Potential Emissions

	Potential Emissions	
	Normal operating conditions [10]	**Abnormal operating conditions** [11]
Construction activities	▪ Dust/mud ▪ Noise	▪ Dust/mud ▪ Noise ▪ Surface water runoff
Facility control area and related operations	▪ Dust/mud ▪ Noise ▪ Surface water runoff	▪ Dust/mud ▪ Noise ▪ Surface water runoff ▪ Fuel spillage
Waste recovery activities	▪ Dust ▪ Noise	▪ Dust ▪ Noise ▪ Surface water runoff
Solidification process	▪ Noise ▪ Surface water runoff	▪ Noise ▪ Vibration ▪ Surface water runoff ▪ Dust
Landfill operations: hazardous landfill cells	▪ Leachate	▪ Leachate ▪ Dust ▪ Noise

[10] All emissions have been subject to environmental impact assessment, and no significant effects are anticipated.

[11] In the event of a malfunction or interruption of services.

	Potential Emissions	
	Normal operating conditions [10]	Abnormal operating conditions [11]
		▪ Odour
Landfill operations: non-hazardous landfill cells	▪ Leachate	▪ Leachate ▪ Dust ▪ Noise
Landfill operations: inert landfill cells	▪ -	▪ Dust ▪ Noise ▪ Leachate
Ancillary activities, e.g. garaging and maintenance, leachate management, surface water management	▪ -	▪ Noise ▪ Odour ▪ Leachate ▪ Fuel spillage
Management of restored areas	▪ Surface water runoff ▪ Leachate	▪ Surface water runoff ▪ Leachate

Laboratory Facilities

D.2.26 Floor space for laboratory facilities for the new integrated waste management facility is available within the solidification plant building (second floor), as shown in Drawing **WLA-09**. It is anticipated that some basic laboratory testing may be carried out here, e.g. pH, conductivity and proprietary test kits; however specification of the laboratory/equipment will be completed during later detailed design, and in consultation with the Agency. All laboratory testing may be conducted by an external accredited laboratory in the short-term; MEHL will develop on-site laboratory facilities if commercially viable.

Slope Stability

D.2.27 The existing slopes required to form the landfill side slopes will require regrading and excavation to meet the construction requirements for the lining systems proposed. The natural ground is composed primarily of soft rocks, comprising weathered shales and limestone. Findings from the site investigation suggest that groundwater levels will not affect slope stability.

D.2.28 Slope stability investigations undertaken as part of W0129-02 licence requirements, found the natural rocks and stiff clays forming the natural ground to be stable for slopes up to 70 degrees. The unstable slopes indentified were in the stockpiled and filled material. These unstable slopes have now been regraded.

Inert Cells

D.2.29 The existing slopes surrounding the proposed inert cells are mainly vertical rock faces comprising shales and limestone. It is not proposed to regrade this near vertical rock face. A minimum 1m thick mineral liner meeting the permeability requirements will be laid directly against the rock faces in 2m lifts. A removable protection net will be used to cover the entire rock face in order provide safe working environment under the rock face.

D.2.30 The inert cells will also require engineered slopes to separate the inert from the non-hazardous and hazardous waste cells. The design of these slopes will be undertaken as part of the detailed design. The slope will generally be formed with a 1 horizontal (H) in 3 vertical (V) or steeper utilizing geosynthetics reinforcement layers and suitable granular fill.

D.2.31 The western slope of the existing northern inert cell will be formed by regrading the inert waste deposited to a stable slope of at least 1H in 3V. A detailed site investigation will be required to confirm the gradient required for a stable slope and the need for additional improvement works, if any.

Non-hazardous Cell

D.2.32 The vertical rock face that forms the southern boundary of the non-hazardous cell will require minor regrading by excavation. A slope of 70 degrees or 2.75V to 1H is required. The non-hazardous liner will be carried up the slopes in lifts of approximately 2m after the initial 3m side wall liner has been laid along with the basal liner. A removable protection net will be used to cover the entire rock face and in order to provide a safe working environment under the rock face.

D.2.33 Two boundaries of the cell will be formed by engineered bunds approximately 10m high. These bunds will be constructed using imported granular fill and designed to be stable with a slope of 1V in 3H or 18.4 degrees or steeper with geosynthetics. These bunds will separate the non-hazardous waste from the inert and hazardous wastes.

D.2.34 The eastern slope of the cell comprising shale and limestone will be regraded to a slope of 1V in 3H to suit the construction requirements of the non-hazardous liner. This slope is currently stable with an existing slope of 1V in 1.5H.

Hazardous Cells

D.2.35 As part of the site investigation, preliminary slope stability assessments were undertaken by IGSL in May 2010 on the proposed side slopes of the hazardous cells. Two slope strips were completed on the northwestern slope of the existing quarry and three along the northern slope. Thinly bedded sandstone/siltstone overlain by a stiff clay were recorded. Current slope angles of around 60°C were recorded.

D.3.36 The results of Atterberg limit tests on cohesive material indicated a drained friction angle of 29-31°C. This suggests that a side slope of 1:2.25 should be stable subject to detailed stability analysis. The firm/stiff clays recorded are expected to be able to stand to much steeper angles as observed in the slope strips. As part of the detailed design slope stability analysis for the waste cell side slopes and liner systems will be undertaken utilising slope stability analysis software taking into account the effect of drained ground conditions.

D.3 Liner System

D.3.1 The EPA document '*BAT Guidance Notes for the Waste Sector; Landfill Activities*' (April 2003) and the EPA landfill manual '*Landfill Site Design*' (2000)[12] states that the function of a lining system is to protect groundwater, surface water and soils by containing leachate within the landfill; preventing/controlling groundwater ingress and assisting in controlling landfill gas migration. Any liner system must achieve consistent performance and be compatible with the expected leachate for the design life of the facility. When selecting a liner system for a proposed facility, applicants must as a minimum meet the requirements of the Landfill Directive 1999/31/EC and be able to demonstrate the performance of any proposed lining systems by appropriate QA testing during construction.

D.3.2 Proposed liner details are provided schematically in:

Drawing WLA-22 (Attachment D.3): Liner Details Sections A-A

[12] It is understood from discussions with the Agency that a review of the landfill design manual is currently being considered

Drawing WLA-23 (Attachment D.3): Liner Details Sections B-B

Inert Cell Liner

D.3.3 MEHL operates as an inert landfill under Waste Licence W0129-02. It is proposed to continue inert operations as part of the proposed integrated waste management facility. In relation to the liner, W0129-02 requires a base and side-wall lining system, comprising "*…a mineral layer of a thickness of 1m with a hydraulic conductivity less than $1x10^{-7}$ m/sec or similar with equivalent protection to the foregoing*[13]". This is also in accordance with Annex 1 of the 1999 Landfill Directive, which states "*The landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in term of protection of soil, groundwater and surface water at least equivalent to the one resulting from the following requirements – landfill for inert waste: $K \leq 1.0 \times 10^{-7}$ m/s; thickness ≥ 1m.*

D.3.4 Existing inert cells have been proposed to the Agency as Specified Engineering Works (SEW) and appropriately and independently CQA'd (Construction Quality Assurance) (results for permeability tests show containment levels significantly in excess of the licence and Landfill Directive). Fill material sourced on-site was used to provide a level surface, upon which a clay lining was laid to a thickness of over 1 meter. The clay lining material (glacial overburden till) that overlies the bedrock formations was sourced on site. This glacial material, commonly known as "blue clay", yielded a co-efficient of permeability of less than $1x10^{-10}$ m/sec.

Photograph D.17: First MEHL inert cell, prior to waste deposition (existing infrastructure)

Photograph D.18: Inert cell 4 (existing infrastructure)

D.3.5 The clay was placed in loose lifts of approximately 300mm each. Each lift was compacted by mechanical roller prior to the next lift being placed. A strict testing and engineering quality assurance regime was carried out on each layer to ensure that the mineral barrier met the specified requirements of the EPA Landfill Site Design Manual. The side-wall liner is placed in stages of approximately 2m (vertical) on the quarry slopes.

D.3.6 It is proposed to repeat this clay lining procedure for all new and additional inert cells to be engineered on the site. Full details on the construction of new cells will be agreed in advance with the Agency as an SEW. MEHL will employ a competent, independent

[13] As per Landfill Directive 1999/31/EC Annex 1) also

engineer to supervise construction. MEHL will submit results of permeability, testing, etc. to the Agency prior to filling.

Photograph D.19: Construction of a typical Non-hazardous Landfill Cell #1

Photograph D.20: Construction of a typical Non-hazardous Landfill Cell #2

D.3.7 It is proposed that the inert lining system will be constructed as follows:

- **Waste** - Inert waste on
- **Barrier Layer** - A compacted clay layer of a minimum thickness of 1m with a hydraulic conductivity $\leq 1.0 \times 10^{-7}$ m/s, or similar with equivalent protection to the foregoing on
- **Formation** - Prepared existing ground

Non-hazardous Cell Liner

D.3.8 For non-hazardous cells proposed as part of the integrated waste management facility, it is proposed that a composite clay and geomembrane liner will be installed on both the base and side walls of the proposed non-hazardous cells. A site-specific hydraulic risk assessment will be undertaken to specify the liner. The liner will meet minimum requirements set out in EC Directive 99/31/EC Annex 1 as follows; "*The landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to landfill for non-hazardous waste: K <=1.0 × 10^{-9} m/s; thickness >= 1 m*".

D.3.9 It is proposed that the non-hazardous lining system will be constructed as follows:

- **Waste** - Non-hazardous waste on
- **Filtration Layer** - Geotextile on
- **Leachate Collection Layer** - 500mm thick drainage stone layer with a hydraulic conductivity > 1.0×10^{-3} m/s incorporating a herringbone system of leachate collection pipework on
- **Protection Layer** - Non woven polyproplene geotextile on
- **Barrier Layer** - Min 2mm thick welded HDPE Geomembrane liner on

- **Barrier Layer** - Compacted mineral layer equivalent to a 1m thick layer with a hydraulic conductivity less than or equal to 1.0 x 10^{-9} m/s on [*NOTE*]
- **Formation** - prepared existing ground

[*NOTE:* Beneath this barrier layer, an additional bentonite-enhanced soil (BES) mineral liner will be placed, as a mitigation measure recommended in the Hydrogeological Section of the Environmental Impact Assessment. This layer will be 1m thick, with a permeability less than or equal to 6.6 x 10^{-10} m/s.]

Hazardous Cell Liner

D.3.10 The minimum requirements for hazardous landfills set out in EC Directive 99/31/EC Annex 1 are as follows: "*The landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to: landfill for hazardous waste: K <= 1.0 × 10^{-9} m/s; thickness >= 5 m. Where the geological barrier does not naturally meet the above conditions it can be completed artificially and reinforced by other means giving equivalent protection. An equivalent artificially established geological barrier not less than 0.5 meters thick.*"

D.3.11 For hazardous landfills the EPA landfill site design manual presents two options: a single composite HDPE liner and a double composite HDPE liner and states that the option to be used shall be selected dependent on the nature of the waste materials being deposited. The manual also clearly states that "*alternative lining systems may be considered for pre-treated hazardous wastes e.g. solidification, stabilisation and vitrification of hazardous wastes*".

D.3.12 In selecting a lining system for the proposed facility, a number of lining system solutions were considered to line the hazardous cells in line with the constraints of the requirements of the Landfill Directive 99/31/EC. The design options appraisal for this facility considered both single composite and double composite HDPE liners, as well as an alternative lining system comprised of Dense Asphaltic Concrete (hereinafter referred to as 'DAC'), which is commonly used in Europe. A comparison of three lining technologies is presented in Appendix:

Appendix D.3.1: Comparison of Hazardous Cell Lining Technologies

D.3.13 Having considered the three options, the DAC lining system was considered superior to the single and double composite liners for use as a landfill liner for the hazardous cells. A DAC lining system is engineered to provide complete containment rather than controlled seepage thus making it a more effective landfill barrier than the single, composite or multiple lining systems traditionally used.

D.3.14 A letter outlining how DAC can be considered as Best Available Technology (BAT) for hazardous landfill was submitted for the Agency's consideration in June 2010. A copy is attached.

Appendix D.3.2: Submission to EPA to consider DAC as BAT for hazardous landfill liner

D.3.15 In addition to having a much lower permeability the DAC liner has two other key features that made it preferable over the two alternative options which are:

- The DAC system can be constructed on slopes (up to a slope of 1:1.5) steeper than those achievable with standard HDPE and clay composite lining systems.
- The methods of installing DAC panels means that there is no weakness at the joint between panels as can be the case with HDPE and operationally no damage to the liner is caused when laying the drainage blanket.

D.3.16 In the development of the design and consideration of liner type, the project team met with the Environmental Protection Agency (23rd April 2010) and discussed the requirements of the Landfill Directive and in particular clause 3.2 of Annex I. The Agency confirmed that alternatives to the 5m of clay (as set out in the directive) could be considered provided they are equivalent in terms of their protection. The directive states that '*The landfill bases and sides for a hazardous landfill shall consist of a mineral layer…… **at least equivalent** to the one resulting from the following requirements i.e. for a hazardous landfill a mineral layer with a K value K<= 1 x10*$^{-9}$ *m/s with a thickness of >=5m*'. The proposed DAC liner containment is at least double that of the equivalent double composite liner and three times that of a single liner for a hazardous cell.

D.3.17 DAC systems are commonly used in Europe in rail, road, tunnel, dam and reservoir construction as well as landfills. Information from WALO UK (and parent WALO Bertschinger AG), one of the leading suppliers of DAC in Europe, indicates that 13 landfill cells in the UK have been lined with DAC. WALO have also lined a number of landfill sites in Europe principally in Switzerland, Germany and more recently in Italy, Spain and Poland.

Appendix D.3.3: List of Reference DAC sites

Photograph D.21: DAC liner photograph#1

Photograph D.22: DAC liner photograph#2

Photograph D.23: DAC liner photograph#3

D.3.18 The proposed construction of hazardous waste cells H1, H2 & H3 will comprise the following components;

- **Waste** - Hazardous waste on
- **Filtration Layer** – Geo-textile on
- **Leachate Collection Layer** - 500mm thick stone layer with a hydraulic conductivity >1.0 x 10^{-3} m/s incorporating a herringbone system of leachate collection pipework on
- **DAC Barrier Liner -** Mastic Sealant on
- **DAC Barrier Liner -** 80mm thick Dense Asphaltic Concrete on
- **DAC Barrier Liner -** 60mm thick Asphaltic Binder Layer on
- **DAC Barrier Liner -** 200mm thick Granular Stabilising Sub-base / Leak Detection Layer on
- **Basal Barrier Layer -** Compacted mineral layer equivalent to a 500mm thick layer with a hydraulic conductivity less than or equal to 1.0 x 10^{-9} m/s under the cell base and extended 3m up the sidewalls on
- **Formation -** prepared existing ground

Figure D.3.1: DAC Lining System

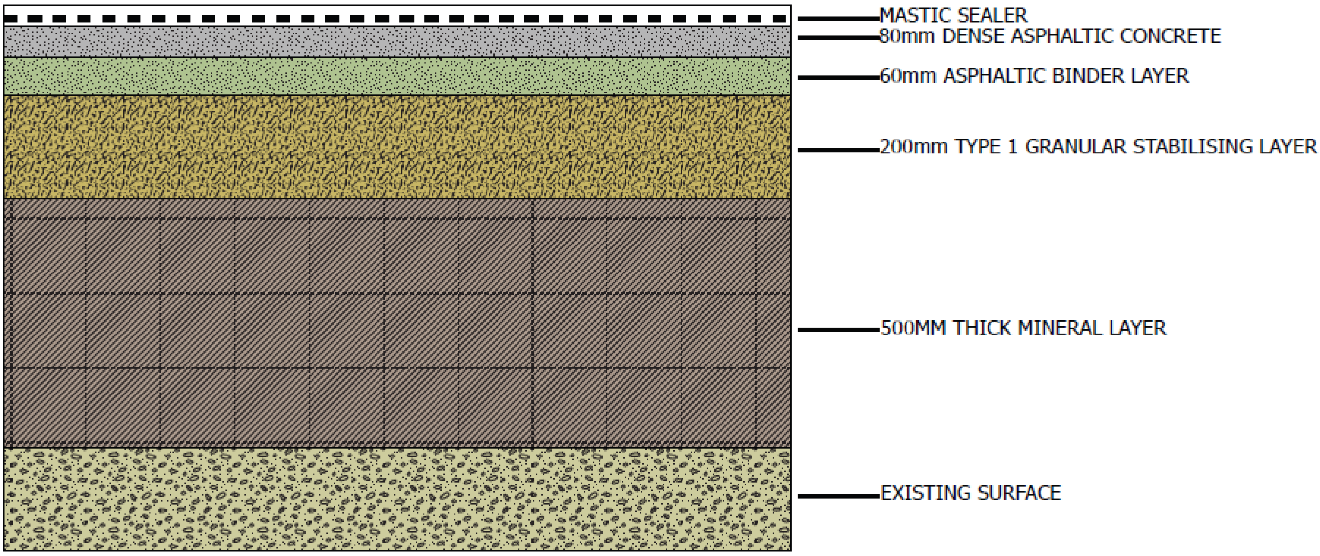
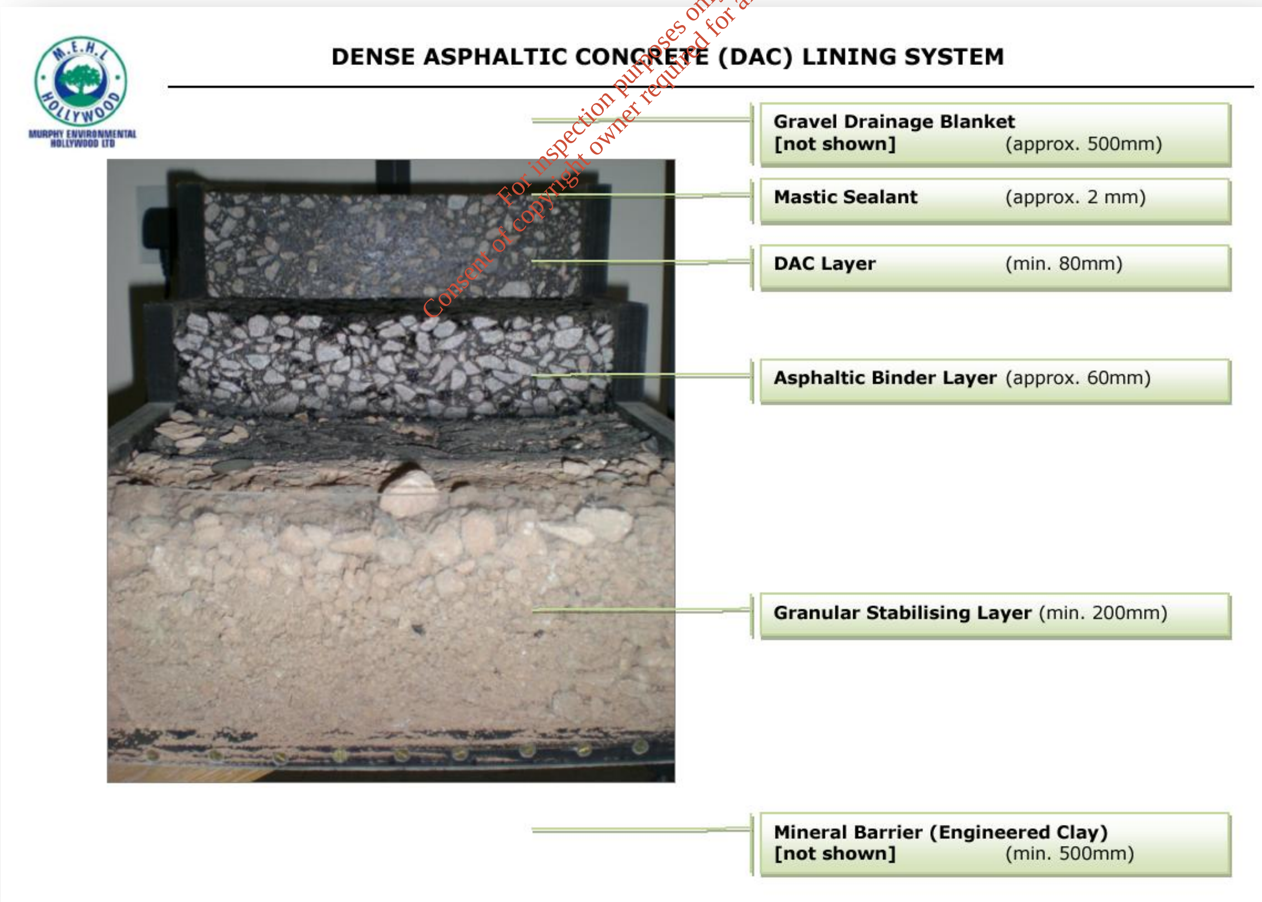


Figure D.3.2: Annotated Model of DAC layers (mineral layer not shown)



Engineered Clay (500mm)

D.3.19 Before any of the DAC layers can be constructed, a granular sub grade layer or engineered clay compacted to a stiffness of >50MN/m2 or a CBR of >20% is required. This will be a minimum of 500mm thick.

Granular Stabilising Layer (200mm)

D.3.20 The granular stabilising layer is the equivalent of the sub-base on a road. Its primary function is to provide a stable surface on which equipment required for the construction of subsequent layers can be used. It also serves the function of preventing pressure build-up from water beneath the liner whether from seepages or ingress around the edge of the liner. Once the stabilising layer is compacted into place, a bituminous emulsion is sprayed to bind together the fines in the upper layers whilst providing adhesion for the next layer.

D.3.21 For this project it is proposed to utilise the free draining properties of the granular stabilisation layer as a leak detection layer (see Drawing **WLA-22**). Though it is not common practice in Europe to include a leak detection system with a DAC lining system, it is proposed to provide a single leak detection well within each subcell to provide an additional level of confidence in the liner and to satisfy requests for consultees who indicated a preference for a leak detection system.

D.3.22 The leak detection system will comprise of a 250 mm HDPE detection standpipe which will be constructed below the liner on the sideslope and connected to the granular layer below the leachate collection sump. The leak detection system can be monitored on a regular basis by using a dip meter or pumped for sampling purposes.

Asphaltic Binder Layer (60mm)

D.3.23 The Asphaltic Binder Layer is a high permeability layer designed to allow steam generated during the construction of the DAC layer to escape. It is an open textured asphaltic layer which also provides a strong stable base against which the DAC layer can be compacted.

Dense Asphaltic Concrete Layer (80mm)

D.3.24 The DAC layer is composed of an asphaltic mixture of continuously graded aggregate matrix, laboratory designed for each individual project so that the quantity and grading of each aggregate fraction fills the gaps left in the matrix formed by larger aggregates. Bitumen acts as the binding agent to bind the minerals together and add impermeability to the mixture. Once laid and compacted the material forms a completely impermeable layer that is resistant to deformation but sufficiently flexible. A fine coat of mastic sealant will be applied to the top surface of the DAC layer. This sealant provides additional protection against UV exposure and weathering for the period the DAC is exposed.

D.3.25 The Landfill Directive states that an artificially established barrier should be no less than 0.5 metres thick. For this project it is proposed that the DAC liner system will meet a minimum specification K value of 1.0×10^{-12} m/s though a K value of 1×10^{-15} m/s is expected. This will be demonstrated by laboratory testing. The maximum slope height will be 10m with a maximum gradient of 1 in 2. A stable formation with a CBR of 20% will be provided under the lining system.

D.3.26 The other components of the hazardous waste cell construction are as follows:

- Basal liner laid to minimum falls of 1 in 50
- Basal liner falling into a leachate collection sump
- Herringbone leachate HDPE collection pipework 315mm dia perforated
- Leak detection layer beneath the DAC liner
- Sidewall rising main 580mm dia for leachate collection
- Division of cells using 2m high DAC lined intercell bunds

Quality Control, Quality Assurance & Third-party Supervision

D.3.27 MEHL will employ suitably skilled and experienced personnel for cell construction works, as well as independent third-party supervision and Construction Quality Assurance (CQA). A detailed Specified Engineering Works (SEW) and CQA procedure has already been developed and agreed with the Agency for inert cell construction, under W0129-02, including:

- Testing of borrow source material
- Materials tests for soil liner materials sampled after placement in a loose lift
- Tests on compacted soil
- Backfilling of sampling locations in the liner system

D.3.28 CQA testing has been completed for parameters (e.g. moisture content, Atterberg limits, particle size distribution, compaction tests, hydraulic conductivity) and frequencies specified by the Agency, and as per the requirements of the EPA Manual on Landfill Site

Design. These practices and procedures will be followed for the integrated waste management facility also, as appropriate.

D.3.29 A clay/geomembrane liner is proposed for non-hazardous cells. A full and detailed quality assurance/quality control plan will be developed to meet Agency requirements.

D.3.30 Leak detection surveys are proposed for the non-hazardous and hazardous cells.

Compliance Testing of DAC

D.3.31 A number of field visits were undertaken by the Project Team to landfill sites where DAC cells had been, or were in the process of being, constructed. A range of CQA works were observed. A site visit was also conducted to a testing laboratory in Zurich, Switzerland. Photographs are attached, as follows:

Photograph D.24: DAC testing laboratory #1

Photograph D.25: DAC testing laboratory #2

Photograph D.26: DAC testing laboratory #3

Photograph D.27: DAC testing laboratory #4

Photograph D.28: DAC – a flexible material

Photograph D.29: DAC construction #1

Photograph D.30: DAC construction #2

Photograph D.31: DAC construction #3

D.3.32 The following testing regime is proposed for the DAC liner (further detailed below), in line with international best practice experience:

- Specification of DAC mix design
- Compliance testing of the raw materials
- DAC placement and construction
- DAC field trials

DAC Mix Design

D.3.33 Before commencement of the works on site, the Contractor shall select samples of possible aggregates, fillers, bitumens etc. to be tested to determine the suitability of the various materials to produce satisfactory mixes to enable the DAC to meet the requirements of the Specification. The testing will include the following:

- Particle size distribution of the coarse and fine aggregates to BS EN 933-1 and fillers to BS EN 933-10
- Flakiness index of coarse aggregates to BS EN 933-3
- Particle density of coarse and fine aggregates to BS EN 1097-6
- Water absorption of coarse and fine aggregates to BS EN 1097-6
- Magnesium sulphate soundness of coarse and fine aggregates to BS EN 1367-2
- Adhesion to bitumen to coarse aggregates to AASHTO – T182
- Penetration of bitumen to BS EN 1426
- Softening point of bitumen to BS EN 1427
- Marshall test to BS EN 12697-34 on DAC layer mix and asphalt binder layer to determine air voids in compacted mix. Test to be carried out with 2 x 10, 2 x 20, 2 x 30 blows;
- Specific gravity (Maximum density) of mixes to BS EN 12697-5 on DAC layer mix and asphaltic binder layer mix
- Bulk density of mixes to BS EN 12697-6 on DAC layer mix and asphaltic binder layer mix
- Swelling test on both DAC layer and asphalt binder layer in water at room temperature for 28 days
- Hydraulic conductivity of the design mix for both DAC layer and asphalt binder layer.

D.3.34 The design process will develop the optimum DAC mix based on the type of aggregate available locally. Sand and gravel from the site will be used wherever possible; however it is likely that the majority of materials will have to be sourced from elsewhere. During the mix design, suitability tests will be carried out on all the constituent materials. The results of these preliminary tests will be used to design the optimum mix proportions. As part of the mix design, placement criteria will be developed for the monitoring of DAC placement on site.

Materials

D.3.35 All aggregates and fillers in the DAC layer and the asphaltic binder layer shall conform with the requirements of BS EN 13043 when tested in accordance with:

- BS EN 932, General properties (including sampling)
- BS EN 933, Geometrical properties (size and shape)
- BS EN 1097, Physical properties (strength and surface characteristics)
- BS EN 1367, Thermal and weathering properties (often known as durability)

D.3.36 The maximum size of coarse aggregate in the DAC layer shall not exceed 16mm measured in any dimension. All aggregates and fillers used in the construction of the DAC layer shall not contain carbonate content in excess of 4%.

Bitumen

D.3.37 Bitumen shall comply with BS EN 12591.

Cationic Emulsion and Mastic Asphalt

D.3.38 Cationic emulsion shall be Class C40 B4 as specified in the National foreword to BS EN 13808 or equivalent. Mastic asphalt shall be laid to a minimum density of 1.5 kg/m^2 to 2.5 kg/m^2. It shall be capable of being laid on slopes up to 1 in 1.5 to the minimum thickness stated without excessive flow or thinning of the layer.

D.3.39 Neither cationic emulsion nor mastic asphalt shall contain volatile organic solvents or emulsifiers which may cause pollution of surface water or groundwater, or lead to any deterioration of the DAC layer or asphalt binder layer.

Compliance testing of raw materials

D.3.40 Compliance testing of the raw materials shall be carried out as follows:

Table D.3.2: DAC Materials Testing

Property	Test Method	Frequency
Aggregates and fillers:		
Particle size distribution	BS EN 933-1 for aggregate and BS EN 933-10 for filler	1 per 200 tonnes
Flakiness index	BS EN 933-3	1 per 200 tonnes
Relative density	BS EN 1097-3	1 per 200 tonnes
Magnesium sulphate soundness	BS EN 1367-2	1 per works
Bitumen:		
Penetration	BS EN 1426	1 per 100 tonnes
Softening point	BS EN 1427	1 per 100 tonnes

D.3.41 The results of all the testing shall be submitted to the Engineer for approval within 24 hours of the test being completed.

Temperature Testing

D.3.42 The temperature of the bituminous material in the batching plant shall be taken and recorded at regular intervals whenever the plant is operating. The temperature of materials within the batching plant, and the temperature of mixed materials coming out of the batching plant, shall comply with the requirements of BS EN 13108-1 Table 11. The temperature of bituminous material shall be taken and recorded on delivery to the placement area and during compaction.

Construction requirements

D.3.43 The DAC layer shall be constructed to meet the following requirements:

- A maximum hydraulic conductivity of 1 x 10^{-12} m/s for the range of hydraulic heads expected on site
- It shall be unaffected by landfill leachates
- It shall not contain mobile toxic compound which may pollute surface water or groundwater
- Total air voids content not exceeding 3%
- It shall be unaffected by sunlight, ambient temperatures, frost action and all weathering processes which may be experienced prior to covering with waste

- It shall remain stable on the landfill perimeter slopes both during and after construction
- It shall be sufficiently flexible to accommodate a differential settlement of the underlying formation amounting to up to 40 mm over a distance of 400 mm without cracking or increase in hydraulic conductivity

D.3.44 The asphaltic binder layer shall be constructed to meet the following requirements:

- A hydraulic conductivity not less than 5×10^{-6} m/s and not greater than 1×10^{-4} m/s
- An air voids content between 10% to 15%
- It shall not contain mobile toxic compounds which may pollute surface water or groundwater
- It shall be unaffected by sunlight, ambient temperatures, frost action and all weathering processes which may be experienced prior to covering with the DAC layer
- It shall remain stable on the landfill perimeter slopes both during and after construction
- It shall be sufficiently flexible to accommodate a differential settlement of the underlying formation amounting to up to 40 mm over a distance of 400 mm without cracking or increase in hydraulic conductivity

D.3.45 The sub-base layer shall be Type 1 sub-base material in accordance with SHW Clause 803 except that the sub-base material must not contain any plasticity or re-claimed materials whatsoever. Transport, laying, compaction and any trafficking of the granular material shall comply with SHW Clause 802. The sub-base material shall have a minimum CBR of 20%.

DAC Placement and Compaction

D.3.46 On the base of each cell, the 200 mm thickness of sub-base shall be placed to the lines and levels shown on the construction drawings, using a paving machine to achieve a firm and unyielding formation. The binder course and dense course will also be placed in pre-defined bays using a paving machine.

D.3.47 Where placement of the sub-base on the side slopes cannot be achieved by the use of a paving machine, standard construction plant may be used. Placement of the binder course and dense course shall be carried out by a paving machine attached to a winch at the top of the slope and slope rollers supported by mobile winches. The winch portals, which will be stationed on the crest of the slope, support and convey the finisher on the slope.

D.3.48 In order to ensure the integrity of joints, it is vital that all joints between panels are installed 'hot to hot'. As part of the laying process all joints are formed, cleaned and dried and a coat of bitumen is applied to prepare it for the laying of the next adjoining panel. All cold joints are heated using infrared heaters before placement of the adjoining section of DAC, to ensure complete bonding between adjacent panels. A wedge overlap is created and this is re-compacted to ensure full impermeability and durability to the required standards. The overlap is chamfered to ensure minimum density is achieved.

Field Trials

D.3.49 Before proceeding with placing DAC in the Permanent Works, field trials of the DAC shall provide field verification of the air voids/hydraulic conductivity relationships determined from laboratory testing. Two field trials shall be undertaken to evaluate the following aspects, one on the cell base and one on the perimeter side slopes:

i. Material handling and placement requirements
ii. Compaction equipment and procedures
iii. Number of passes of equipment necessary to achieve the specified air voids; (this is a nominal number of passes which may change during the construction works depending upon the temperature of the supplied DAC)
iv. Field testing procedures for compaction and thickness control
v. 'Hot' and 'cold' joints including a 'day' joint
vi. Hydraulic conductivity achieved

D.3.50 Each trial area shall provide a minimum prepared area of 100 m^2. Acceptance criteria for the compliance testing shall be determined from the results of the DAC mix design programme.

D.3.51 The air voids of the DAC layer at each designated position shall be determined by a nuclear density gauge (mean of four measurements at 90° intervals) after each pass of the compaction plant. The air voids measurements shall be continued for four passes of the compaction plant after the required air voids is achieved to fully establish the relationship between air voids and number of passes of the compaction plant. The trial area shall also be subjected to the compliance testing described below.

D.3.52 A report containing and summarising in a clear and concise manner the results of the Field Trials and field and laboratory testing undertaken during the Field Trials shall be made available to the EPA.

In Situ Testing

D.3.53 Typically upon completion of the compaction of each panel of the DAC liner, compliance testing is carried out by the Contractor to confirm that the plant and techniques have achieved a level of compaction established during the Field Trial to be necessary to obtain the specified hydraulic conductivity- tests are normally undertaken to assess:

- Temperature of material when laid and being rolled
- Air voids measurement using nuclear density gauge
- Vacuum testing of all joints
- Core sample taken for air voids and hydraulic conductivity measurement
- Depth profiling to predetermined markers

D.3.54 As requested by the EPA, compliance testing shall not be carried out on the final compacted panels but on 10m x 10m test pads to be constructed at the same time as the liner. The final details of these tests to include the number, spacing and type of tests undertaken will be agreed with the Agency in advance of works commencement.

D.4 Leachate Management

D.4.1 The characteristics of the leachate generated on site will depend on the type of waste through which rainwater percolates. Three leachate types will be generated on site from the inert, non-hazardous and hazardous waste cells. The leachate generated in the non-hazardous and hazardous cells will be pumped to dedicated holding tanks and will be reused or disposed off site.

D.4.2 The control of leachate will be a key requirement for the design and operation of the landfill. The primary aim will be to minimise the leachate generated and subsequently the collection, use and finally disposal of the leachate in an environmentally safe manner.

This will require the construction of sub-cells within the main cell. It is proposed to divide each cell H1, H2, H3, NH1 and NH2 in half to reduce leachate generation.

D.4.3 The leachate management system will be designed to minimise the leachate head on the basal liners to less than 1m. It is proposed to install a 0.5m thick drainage blanket with a herringbone drainage system over the basal liner of both the non-hazardous and hazardous waste cells.

D.4.4 Leachate sewer sections are shown in the following drawing:

Drawing WLA-24 (Attachment D.4): Leachate Sewer Sections (Sheets 1 to 2)

D.4.5 Hazardous waste sub-cells will contain one sump provided at the sidewall of the cell, at the lowest point of the cell. The liners will be constructed with a fall of 1:50 to the low point. Leachate will be pumped up the cell side wall through a sidewall rising main to a sealed collection system. The leachate will be stored in a holding tank near the administration building. The proposed arrangement provides for the construction of the leak detection system, beneath the hazardous cell liner. In accordance with good practice the lining system will be thickened under the sumps.

D.4.6 The non-hazardous sub-cells will each contain a sump located centrally. A manhole chamber will be formed and raised to the restoration level as the filling progress. The leachate will be pumped from the leachate collection sump to a leachate holding tank designated for the non-hazardous cells.

Leachate from hazardous cells

D.4.7 Leachate is generated by the percolation of rainfall through the waste. The leachate composition will be characterised by soluble and suspended material picked up from the waste deposited.

D.4.8 The leachate collection will be achieved by constructing a 500mm thick layer of drainage stone with herringbone collection pipework placed above the liner. The fall of the basal liner will be towards a sump at the cell perimeter. The leachate in the sump will be pumped through a sidewall rising main into sealed HDPE pipework to a HDPE lined, concrete leachate holding tank. The head of leachate on the liner will be monitored by using leachate monitoring wells.

D.4.9 The collected leachate will be utilised in the solidification process, as described in the solidification section. The leachate will be used in place of process water, as commonly practiced in Europe. The balancing of the requirement for leachate in the solidification process with rainfall and storage, may require excess leachate to be tankered off site to an EPA-licensed waste water treatment plant. A modular system of watertight storage tanks is proposed, whereby the leachate tank capacity will be sized based on the active cells.

D.4.10 It is intended to minimise the leachate generation by using rainfall deflectors on the sidewall (see photograph). These are temporary stainless steel channels which will be fitted to falls. The deflectors will collect surface water from the sidewall, divert it away from the waste to an inactive cell or temporary sump. The clean water will then be discharged through the wetlands to the northern boundary stream.

Photograph D.32: Rainwater deflectors commonly used on DAC-lined cells

D.4.11 The initial leachate holding tank is sized to allow for leachate storage from hazardous cell H1 during a 1 in 30 year storm event over a 48 hr period i.e. rainfall on Saturday and Sunday. It is normal practice to store some leachate in the cell, provided the leachate head does not exceed a 1m head on the liner. The leachate in excess of the 1m head will be stored in a 306 m^3 HDPE lined concrete holding tank designed to BS8007, near the administration building. A designated parking area will be provided near the tank for a road tanker.

D.4.12 A preliminary estimation of the leachate generation and storage capacity required was undertaken based on the current data and proposed site layout. The criteria and assumptions used provide a conservative estimate of leachate generation. This may be revised at detail design, when the waste management and leachate management practice are fully developed. The estimated capacity of the leachate holding tank is 499 m^3 based on the following assumptions and calculations:

- Precipitation rate
- Rainfall return period
- Active cell surface area
- Infiltration through restored layers
- Evaporation rate
- Surface water runoff

- Absorption capacity of waste
- Waste handling procedure
- Leachate handling procedures
- Waste type accepted

D.4.13 The assumption made in estimating the hazardous leachate generated are as follows:

- Rainfall return period: 1 in 30 year
- Rainfall duration 48 hr (1 in 30 year return) (source FSU): 74.4mm
- Average Annual Rainfall (source Dublin Airport): 732.7mm
- Plan Area active sub-cell of H1: 14,100 m^2 (Basal Area & Side Slopes)
- Plan Area sidewall surface water diverted 5m above base: 2,500 sq.m
- Unfilled subcell of H1- leachate storage volume below 1m head: 2,339 m^3
- No infiltration through double lined hazardous capping
- No evaporation due to shading provided by site topography
- No waste absorption due to solidified waste
- Porosity of Hazardous Waste 5%
- Porosity of Drainage Layer 30%

D.4.14 Hazardous leachate generation in sub-cell of hazardous cell H1 during a 1 in 30 year storm event over 48 hour duration:

- Effective Active Cell Plan area x Estimated Rainfall: (14,100 m^2 – 2,500 m^2) x 0.0744 m = 863 m^3
- Filled hazardous subcell of H1 leachate storage below 1m head: Waste Layer = 2,339 x 0.5 x 0.05 = 58 m^3; Drainage Layer = 2,339 x 0.75 x 0.3 = 526 m^3
- Total Leachate Storage within Sub Cell H1 under 1m head = 409 m^3
- Required hazardous sub-cell of H1 leachate holding capacity: 863 m^3 – 409 m^3 = 454 m^3
- Add 10% volume for free board = 499 m^3 required leachate tank capacity H1

- Annual Maximum Hazardous Leachate Generation subcell of H1: 14,100 m^2 x 0.7327 m = 10,331 m^3

Leachate from non-hazardous cells

D.4.15 A leachate holding tank and management of non-hazardous leachate is not required in the first construction phase. The construction of the first non-hazardous cell NH1 is not planned until 2014. The management of the non-hazardous leachate will be the same as for the management of hazardous leachate mentioned above and the location of leachate management pipework and holding tanks are shown on Drawing **WLA-03**.

D.4.16 During periods of intense rainfall it is likely that non-hazardous leachate will not be required for the solidification process, as the volume of hazardous leachate will fulfil the solidification process requirement. The non-hazardous leachate will be disposed off-site to an EPA-licensed waste water treatment plant.

D.4.17 The leachate volume generated in the non-hazardous cell is expected to be similar to the calculation for hazardous leachate. The non-hazardous leachate will be stored in a HDPE-lined concrete tank beside the administration building.

D.4.18 Rainfall deflectors may be employed on the sidewalls to divert rainwater/surface water away from the waste to an inactive cell or temporary sump. The clean water will then be discharged via the surface water management system.

D.5 Landfill Gas Management

D.5.1 Gases are generally generated in a landfill as a consequence of the anaerobic biodegradation of organic matter in the deposited waste. It is proposed that the integrated waste management facility will accept only non-biodegradable wastes, which will be subject to Waste Acceptance Criteria. There will, therefore, be no generation of landfill gases; landfill gas infrastructure is not proposed (the EU Landfill Directive 1999, Annex I, Part 4.2 states "*landfill gas shall be collected from all landfills receiving biodegradable waste…*").

D.5.2 In accordance with Licence Condition 3.19 of the current Waste Licence (W0129-02), all existing and new leachate monitoring boreholes will be designed to also facilitate landfill gas monitoring.

D.6 Capping System

D.6.1 The capping systems will be designed to meet the requirements of the EPA site Design Manual and comply with BAT. The minimum requirement of the specified capping systems will be as per the minimum requirements of the Landfill Directive 1999/31/EC as follows.

D.6.2 The capping of the waste cells will be undertaken on a phased basis. Significant settlement is not foreseen and the final restoration cap can be installed once the cell is complete.

Inert Cells Capping System

D.6.3 The inert waste cells will be capped and restored as follows:

- **Protection/Barrier Layer** - Topsoil and subsoil comprising a minimum 150mm layer of locally sourced general purpose organic topsoil conforming to BS3882 on 850mm thick layer of site sourced subsoil on,
- **Waste** - Inert waste.

Non-hazardous Cells Capping System

D.6.4 The proposed make-up of the restoration layer for non-hazardous waste cells is as follows:

- **Protection Layer** - Topsoil and subsoil comprising a minimum 150mm layer of locally sourced general purpose organic topsoil conforming to BS3882 on 850mm thick layer of site sourced subsoil on
- **Drainage Layer** - 500mm thick granular drainage layer having a minimum hydraulic conductivity of 1.0 x 10^{-4} m/s or equivalent geocomposite drainage layer on
- **Barrier Layer** - 1mm thick Geomembrane VFPE/LLDPE (Very Flexible Polyethylene) or similar on
- **Waste** – Non-hazardous Waste

Hazardous Cells Capping System

D.6.5 The proposed make-up of the restoration layer for hazardous waste cells is as follows:

- **Protection Layer** - Topsoil and subsoil comprising a minimum 150mm layer of locally sourced general purpose organic topsoil conforming to BS3882 on 850mm thick layer of site sourced subsoil on
- **Drainage Layer** - 500mm thick granular drainage layer having a minimum hydraulic conductivity of 1.0 x 10^{-4} m/s or equivalent geocomposite drainage layer on
- **Barrier Layer** –Min 1mm thick welded geomembrane VFPE (Very Flexible Polyethylene) or similar on
- **Barrier Layer** – Compacted mineral layer equivalent to a 600mm thick layer with a hydraulic conductivity less than or equal to 1.0 x 10^{-9} m/s on
- **Waste** - Hazardous Waste

Final Settlement Profile

D.6.6 It is anticipated given the nature of the waste which will be accepted, treated and disposed of at the facility that minimal settlement of the waste body will occur over time. It is therefore proposed that the final restoration profile will be the final settlement profile. The final restoration profile of the site is presented in Drawing **WLA-15**.

Serviceability and Settlement

D.6.7 The estimated long term creep and settlement under the basal lining systems due to the weight of the waste, lining and capping systems will be achieved by improvement work during construction to achieve a settlement within the allowable tolerance for the DAC liner of 10% depth to length i.e. max 40mm deflection in 400mm.

D.6.8 The nature of the wastes that will be accepted at this landfill will minimise settlement potential. Waste placement and operational procedures will assist in creating a settled waste mass. The solidification of the hazardous FGT residue prior to landfill will reduce settlement. There will be minimal settlement of the final capping.

Attachment E

Emissions

Attachment E: Emissions

E.1 Emissions to Atmosphere

Solidification

E.1.1 In relation to solidification operations, all operations will be contained and enclosed. The ground floor area will allow for the unloading of two bulk tankers inside the building. The unloading process will be undertaken after closing the roller shutter doors, fixing an exhaust extractor to the bulk tanker and connecting to the manifold to pump material into the silos.

E.1.2 The solidification plant will be fully enclosed with roller shutter doors and mechanical ventilation and filters preventing dust emissions. Silos will also be equipped with High Efficiency Particulate Abatement (HEPA) filters to prevent emissions. It is anticipated that each silo will be fitted with 1 No. vent, controlled via HEPA filtration.

E.1.3 An inspection and maintenance procedure shall be put in place as part of a preventative maintenance routine to ensure that all filters fitted to emission points to air for the purposes of dust abatement are functioning at all times. A log of such inspections and monitoring, as well as maintenance records shall be retained on site.

E.1.4 Once materials have passed through the solidification plant, the residues will have a high moisture content and resemble pre-set concrete. They will therefore not result in any dust emissions during transport or handling.

Bottom ash

E.1.5 Bottom ash will be delivered to the facility in a dampened form and operational procedures (see Attachment **H.3**) will be employed to prevent the potential for dust-blow.

Landfill gas

E.1.6 No landfill gas will be generated at the facility.

Plant/vehicle emissions

E.1.7 Air emissions from plant, equipment and vehicles are deemed to be insignificant.

Monitoring

E.1.8 Ambient dust monitoring is proposed, as detailed in Attachment **F**.

E.2 Emissions to Surface Waters

E.2.1 Under EPA Licence W0129-02, MEHL currently has 7 No. licensed surface water discharge points (see following drawing):

Drawing WLA-25 (Attachment E.2): Monitoring Locations as per W0129-02

- SWD1: Water discharge after flowing through silt trap/oil interceptor
- SWD2: Water pumped from base of quarry
- SWD3: Water discharge from settlement ponds
- SWD4: Quarry water discharge from rock cell at south of site
- SWD5: Quarry water pumped from the rock cell at the south of the site (discharge currently inactive at this point, but may be required in the future)
- SWD6: Quarry water pumped from the rock cell at the south of the site
- SWD7: Quarry water pumped from the rock cell at the south of the site: point of discharge from an underground pipe to an open drainage ditch

E.2.2 Historic monitoring results for surface water discharge are provided in Attachment **I**.

E.2.3 Emissions to surface water for the proposed integrated waste management facility are listed below and shown on Drawing **WLA-27**.

- **SWD1:** Water discharge after flowing through silt trap/oil interceptor located at existing site entrance area in west of site.
- **SWD2:** Water discharge of water pumped from base of quarry – this may be in operation intermittently in preparation for the construction phase of the integrated waste management facility.

- **SWD3:** Water discharge from settlement ponds – it is proposed to retain the existing settlement ponds in the north-west of the site, and the related surface water discharge point.
- **SWD4:** this point is no longer in use and it is proposed to remove it from the sampling regime.
- **SWD5:** this is the proposed surface water discharge from the new constructed stormwater wetland system prior to discharging to the local stream along the northern boundary. A 3-stage discharge arrangement together with gate valves will be installed on the outlet. The outlet can be sampled to monitor water quality and the gate valves closed in the event that there is a pollution incident. The outlet arrangement will consist of a hydro-brake and two orifice plates with valve control and this will be located in a manhole directly upstream of the stream discharge.
- **SWD6:** this point is no longer in use and it is proposed to remove it from the sampling regime; however a new SWD6A is proposed below.
- **SWD6A:** it is proposed to move SWD6 to SWD6A at the south-eastern corner of the licensed area. This point will address any surface water discharge to the open ditch from the access road, and discharge from a new detention basin, to the open drain south of the administration building. An approved class 1 bypass petrol/oil interceptor (Carlow CP33BP or similar), hydro-brake and gate valve will be installed on the detention basin outlet. Sampling can be undertaken from the hydrobrake chamber to monitor water quality. A hydro-brake valve control is to be installed in the manhole directly before the petrol interceptor and is to be designed to restrict the maximum discharge from the site to 2.64 l/s/ha.
- **SWD7:** this point is no longer in use and it is proposed to remove it from the sampling regime; furthermore any discharge to this ditch will be detected at the licensed boundary at SWD6A.

E.2.4 Further details on surface water collection and management systems are included in Attachment **D.1.k**. Drawings are included in **WLA-11**.

E.2.5 In relation to potential emissions to surface water during the construction phase, the following mitigation measures are proposed as part of the EIS:

- Use of settlement ponds, silt traps and bunds and minimising construction within watercourses.

- Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and surrounding stockpiles with cut-off ditches to contain runoff. Covering with an impermeable material can also be utilised to prevent rainfall interacting with stockpile material. No material stockpiles will be located near watercourses.
- All watercourses that occur in or adjacent to areas of land that will be used for site compound/construction facilities which have the potential for silt run-off will be fenced off at a minimum distance of 5m with silt fences. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse.
- Surface water flowing onto the construction area will be minimised through the provision of berms and diversion channels.
- All chemical/fuel fill points and hoses will be contained within bunded areas as per CIRIA C163.
- Foul drainage from all temporary site offices and construction facilities that are not connected to the site's waste water treatment facility (e.g. portable toilet facilities that may be required during construction) will be contained and disposed of in an appropriate manner to prevent pollution of rivers and local watercourses in accordance with the relevant statutory regulations.
- Proper construction management procedures will be put in place to ensure no contamination of surface water or exposed groundwater from concreting and concrete related activities.
- Protection measures will be put in place to ensure that all fuels used during the construction phase are appropriately handled, stored and disposed of.
- Routine monitoring of water quality will be carried out at appropriate locations during construction as per the monitoring requirements of the waste licence.

E.3 Emissions to Sewers

E.3.1 No emissions to sewer are proposed.

E.3.2 Wastewater from the proposed new office buildings/toilets is detailed in Attachment **D.1.k**. It is proposed to install an on-site effluent treatment system, including percolation area. Details of sewer sections are contained in:

Drawing WLA-26 (Attachment E.3): Foul Sewer Longitudinal Section

E.3.3 It is proposed that any excess leachate generated, which is not reused on-site, will be tankered to an appropriate off-site facility.

E.4 Emissions to Groundwater

Direct discharge of treated sewage effluent into the ground

E.4.1 The proposed treatment system will meet the following final effluent quality standards:

- Volume: 2000 l / day
- pH: 6.0 – 8.5
- Biochemical Oxygen Demand (BOD): < 20 mg/l
- Suspended Solids: < 30 mg/l
- Ammonia as N: <10 mg/l
- Nitrate as N: 21 mg/l
- Phosphorous: 12.5 mg/l

E.4.2 Full details are provided in Attachment **D.1.k**.

Excavations below the water table

E.4.3 There have been previous excavations below the water table, which will be backfilled, such that the minimum cell formation level will be 102.5mOD.

Waste disposal in, on and under the ground

E.4.4 Waste will be landfilled in specially engineered landfill cells. A full leachate containment and management system is proposed (outlined in Attachments **D.3** and **D.4**).

Discharge of clean surface water runoff from roads and hardstands into the ground

E.4.5 All surface water runoff from paved areas, car park, etc. will be filtered through a silt trap and oil interceptor prior to discharge, as detailed in Attachment **D.1.k**.

Accidental spills

E.4.6 Potential spills such as fuel spills will be immediately managed by containment of liquids and excavation of contaminated materials. Fuel storage areas will be bunded, with spill kits dispersed around the site for use in an emergency.

Groundwater monitoring

E.4.7 The monitoring regime for groundwater at present (under W0129-02) and proposed is discussed in Attachment **F**.

E.5 Noise Emissions

E.5.1 The following four activities are considered to be the primary sources of noise as a result of the proposed development:

- Site development and cell operation
- Traffic accessing the facility
- Building services plant, and
- Additional vehicular traffic on public roads

E.5.2 The noise assessment completed as part of the EIS showed that the predicted noise levels at the nearest sensitive locations, due to emissions from the proposed development, are within the sites operational noise limits in all instances. Further details are provided in Attachment **I.6**, and noise monitoring proposals are outlined in **F.6**.

E.5.3 A temporary slight increase in noise levels during the construction phase is predicted, which will be mitigated as follows:

- Noise aspects during the construction phase will be managed in accordance with BS5228: Noise control on construction and open sites and the facility's waste licence
- Hours during which site activities are likely to create high levels of noise or vibration will be limited
- All site access roads will be kept even so as to mitigate the potential for vibration from lorries

- Plant with low inherent potential for generation of noise and/ or vibration will be selected
- Temporary barriers will be erected as necessary around noisy processes and items such as generators heavy mechanical plant or high duty compressors
- Noisy / vibratory plant machinery will be kept as far away from sensitive properties as possible and vibration isolated support structures will be used where necessary

E.5.4 No significant vibration impacts are anticipated.

E.6 Environmental Nuisances

E.6.1 As the proposed facility will accept non-biodegradable waste only, the typical impacts which can be associated with municipal landfills such as landfill gas, odours, birds, litter and vermin will not be an issue in this case.

E.6.2 The following dust mitigation measures will be undertaken:

- Water sprays will be used, as required, during dry or windy conditions
- Restricting operations during windy weather conditions
- Water sprays will be used, as required, to ensure that bottom ash does not dry out. Bottom ash will be quenched in the waste-to-energy facilities and will be delivered to site damp
- All vehicles will be required to use the wheelwash prior to exiting the facility
- Waste cells, particularly hazardous and non-hazardous cells, will be covered, as necessary
- The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors

Attachment F

Control and Monitoring

Attachment F: Control & Monitoring

F.0 Background

F.0.1 A quarterly monitoring regime is well established at the facility, under the terms of EPA Licence W0129-02. A list of all current monitoring locations (as per W0129-02) for noise, dust, surface water discharge, leachate, surface water and groundwater water is attached. Drawing **WLA-25** shows the monitoring locations prescribed by W0129-02.

Appendix F.0.1: Existing Monitoring Locations prescribed under W0129-02

Photograph F.1: Example of existing groundwater monitoring borehole

F.0.2 A list of all monitoring locations proposed for the purposes of this Waste Licence Application is contained in the following appendix, and shown in the accompanying proposed monitoring locations drawing **WLA-27**).

Appendix F.0.2: Monitoring Locations proposed for Waste Licence Application

Drawing WLA-27 (Attachment F): Proposed Monitoring Locations

F.0.3 The EIS for the proposed integrated waste management facility recommends the following environmental monitoring:

- Dust monitoring - continue as per the existing waste licence or any revised waste licence issued by the Environmental Protection Agency
- Flora & Fauna - monitoring data on peregrine occupancy and breeding success
- Water - routine monitoring of surface water quality at appropriate locations during construction as per the monitoring requirements of the waste licence
- Water - ongoing monitoring to ensure no contaminating discharges to groundwater or surface water
- Noise - typical levels of noise and vibration will be monitored during critical [construction] periods and at sensitive locations
- Archaeology - groundworks with regards to undisturbed ground at the new access road be monitored by a suitably qualified archaeologist
- Daily site inspections

F.1 Treatment, Abatement and Control Systems

To Atmosphere

F.1.1 Potential fugitive dust, landfill gas, noise and VOC emissions were assessed and no treatment, abatement or control measures were deemed to be required.

F.1.2 As outlined in Attachment **E.1**, all operations at the solidification plant will be contained and enclosed, with roller shutter doors and mechanical ventilation and filters preventing dust emissions. Silos will also be equipped with High Efficiency Particulate Abatement (HEPA) filters to prevent emissions.

F.1.3 An inspection and maintenance procedure shall be put in place as part of a preventative maintenance routine to ensure that all filters fitted to emission points to air for the purposes of dust abatement are functioning at all times. A log of such inspections and monitoring, as well as maintenance records shall be retained on site.

F.1.4 Bottom ash will be delivered to the facility in a dampened form and operational procedures (see Attachment **H.3**) will be employed to prevent the potential for dust-blow.

F.1.5 Ambient dust monitoring is proposed, as detailed in Attachment **F.2**.

To Surface Water

F.1.6 The drainage system proposed for managing surface water runoff from the proposed development will follow the principles of Sustainable Drainage Systems (SuDS) as detailed in Chapter 6 of Volume 3 Environmental Management, of the Greater Dublin Strategic Drainage Study (GDSDS).

F.1.7 Surface water runoff will be captured close to its source and released slowly into a local stream along the northern site boundary. A treatment train approach will allow for effective reduction in pollutants from the site and the provision of storm water attenuation will allow the site to mimic greenfield runoff conditions thereby mitigation adverse flow impacts.

F.1.8 Full details are provided in Attachment **D.1.k**.

To Sewer

F.1.9 It is not proposed to discharge to sewer. Foul water from on-site toilets will be treated via an on-site treatment system (see Attachment **D.1.k** for further details). Excess landfill leachate, which cannot be reused in the solidification process, will be transported off-site to an appropriately-licensed treatment works.

To Ground(water)

F.1.10 Waste will be landfilled in specially engineered landfill cells. A full leachate containment system is proposed (outlined in Attachments **D.3** and **D.4**).

F.1.11 It is proposed to collect all foul water generated on the site (from kitchen, toilets and washing facilities) by means of a separate foul sewer system. All effluent will be collected in a sealed underground pipework system and discharged to a domestic type treatment plant with treated effluent percolated to ground. The onsite wastewater packaged treatment plant and raised bed percolation will be located to the east of the administration building. Full details are provided in Attachment **D.1.k**.

F.2 Air Monitoring and Sampling Points

Dust

F.2.1 Proposed dust monitoring locations include the existing monitoring locations as per W0129-02, plus an additional monitoring point (D6) on the eastern licence boundary, representative of potential ambient emissions resulting from south-westerly (prevailing) wind conditions. See Table **F.2.3** and the proposed monitoring locations drawing **WLA-27.**

Table F.2.3: Proposed Dust Monitoring Locations

Monitoring Location Ref.	Grid Ref.	Location
D1	315474E, 257927N	Within site – west; car park adjacent to maintenance building
D2	315896E, 258353N	Within site – adjacent northern boundary
D3A	315504E, 257700N	Within site – southern boundary
D5	315919E, 257627N	Within site – south eastern boundary
D6	316080E, 258096N	Within site – eastern boundary

F.2.3 The dust monitoring method employed is based on the Bergerhoff apparatus, derived from the German standard method VDI 2110. The gauges are set for a period of 30 consecutive days and samples taken for each location. The samples collected are transferred to an accredited laboratory for gravimetric analysis to determine the concentration of deposit material in each gauge bottle. Results are reported as $mg/m^3/day$, with reference to the licence emission limit value.

F.2.4 The frequency of dust monitoring prescribed by W0129-02 is six-monthly. It is proposed to increase the sampling frequency to quarterly for the period of construction works for the integrated waste management facility.

Odour

F.2.5 The nature of the proposed waste types (i.e. non-biodegradable) limits the potential for odour generation and odour impacts. Therefore, no significant impact is predicted. Odours will be assessed as part of the weekly site inspection (as per current practice under W0129-02).

F.3 Surface Water Monitoring and Sampling Points

F.3.1 Under the existing licence W0129-02, sampling and analysis of surface water and surface water discharge points is undertaken as per the parameters listed in Table C.2.2 of the licence, on a six-monthly basis.

F.3.2 Proposed surface water (upstream and downstream) monitoring locations remain as per W0129-02, as detailed in Table **F.3.1** below and shown on the proposed monitoring locations drawing **WLA-27.** Surface water discharge (SWD) monitoring locations include a number of variations versus those monitored under W0129-02, as per proposed surface water management and discharge proposals detailed in Attachments **D.1.k** and **E.2**. It is proposed to retain surface water monitoring frequency at six-monthly intervals.

Table F.3.1: Proposed Surface Water Monitoring Locations

Ref.	Grid Ref.	Monitoring Location
SW-1	315677E, 258518N	Clonany Bridge (North (upstream) of site, *ca.* 280m)
SW-2	317230E, 257820N	Joinery Bridge (East (downstream) of site, *ca.* 1630m)
SWD-1	315660E, 258522N	Discharge after flowing through silt trap/oil interceptor at existing site entrance area in west of site
SWD-2	315847E, 258415N	Water pumped from base of quarry – this may be in operation intermittently in preparation for the construction phase of the integrated waste management facility
SWD-3	315937E, 258366N	Water discharge from settlement ponds – it is proposed to retain the existing settlement ponds in the north-west of the site, and the related surface water discharge point
SWD-5	316138E, 258262N	The proposed surface water discharge from the new constructed stormwater wetland system prior to discharging to the local stream along the northern boundary
SWD-6A	316013E, 257661N	This point will address any surface water discharge to the open ditch from the access road, and discharge from a new detention basin, to the open drain south of the administration building

F.4 Sewer Monitoring and Sampling Points

F.4.1 No discharge to sewer is proposed; thus no monitoring is proposed.

F.5 Groundwater Monitoring and Sampling Points

F.5.1 Groundwater in the environs of the landfill site is currently monitored (as per W0129-02 requirements) on a quarterly basis at nine locations around the site as set out in Schedule C.2.1 of the Waste Licence.

F.5.2 A number of additional boreholes were drilled for the purpose of site investigation works for the proposed integrated waste management facility. Full details are included in Attachment **I.4**. All of the boreholes drilled for site investigation purposes will be decommissioned, backfilled and sealed with grout prior to commencement of construction operations.

F.5.3 The proposed monitoring locations for the integrated waste management facility are, therefore, as per the existing monitoring regime, at the locations detailed in Table F.5.1 below and shown on the proposed monitoring locations drawing **WLA-27.** The proposed groundwater monitoring frequency is quarterly.

Table F.5.1: Proposed Groundwater Monitoring Locations

Ref	Location	Easting	Northing	Top of Casing (TOC) elevation (in m AOD Malin)
BH-4A[14]	East of site – *ca.* 275m	316271	257891	91.96
BH-5	Within site – north	315796	258328	118.72
BH-6	North of site – *ca.* 240m	315644	258507	117.31
BH-8	Within site - west	315479	258069	136.73
BH-9	Within site – north west	315560	258280	128.81
BH-10A	Within the site – to the east of BH10	315522	257697	137.14
BH-11A	Within site –north east	316112	258249	100.01
BH12	Within site – west	315439	257925	146.994
BH13	Within site – west	315444	257925	146.922
BH14	Within site – south east	315938	257631	125.064

[14] Please note that BH4A replaced BH4 in Q4, 2008, in agreement with the Agency.

F.6 Noise Monitoring and Sampling Points

F.6.1 Under W0129-02, an annual noise survey is required annually at six noise monitoring locations (as per Table C.2.1 of the licence).

F.6.2 The proposed monitoring locations for the integrated waste management facility are detailed in Table F.6.1 below and shown on the proposed monitoring locations drawing **WLA-27.** It is proposed to discontinue monitoring at monitoring location N7, specified in W0129-02, as the dwelling is no longer occupied, and is in the control of MEHL. The proposed noise monitoring frequency is proposed to increase to six-monthly during the construction phase.

Table F.6.1: Proposed Noise Monitoring Locations

Ref.	Monitoring Location	Easting	Northing
N4	Close to a residential dwelling to the north of the MEHL facility.	315817	258637
N5	Close to a residential dwelling to the west of the facility	314900	257852
N6	Along the roadway beyond the southern boundary of the site at a point close to a residential dwelling	315571	257670
N8	Located south of the facility along the local roadway at an entrance driveway to an existing residential dwelling	315952	257527

F.7 Meteorological Data Monitoring and Sampling Points

F.7.1 Daily visual inspection of weather conditions (wind force/direction, precipitation) will be carried out to ensure that any adverse meteorological events are recorded.

F.7.2 It is proposed that a daily record of representative meteorological data will be obtained from the nearest weather station (Dublin Airport), as per existing arrangements under W0129-02.

F.8 Leachate Monitoring and Sampling Points

F.8.1 Currently there are four leachate monitoring points on site (see Table F.8.1). Leachate is monitored twice per annum, as prescribed in Table C.2.1 of the Waste Licence. Existing monitoring locations can be seen on Drawing **WLA-25**.

F.8.2 In line with proposed development works as part of the integrated waste management facility, it is proposed that the existing leachate monitoring locations LC1, L2 and L3 will be decommissioned. LC4 will be retained (but renamed in line with the proposed leachate monitoring locations notation).

Table F.8.1: Existing Leachate Monitoring Locations (under W0129-02)

Ref	Location	Easting	Northing	Top of Casing (TOC) elevation (in m AOD Malin)
LC1	Leachate monitoring borehole within Cell 1	315634	258153	133.69
LC2	Leachate monitoring borehole within Cell 3	315637	258162	119.5
LC3	Leachate monitoring borehole within Cell 3	315756	258156	123.9
LC4	Leachate monitoring borehole within Cell 5	315560	258058	124.9

F.8.3 The following leachate monitoring infrastructure is proposed:

Table F.8.2: Proposed Leachate Monitoring Locations

Ref	Location	Easting	Northing
LM1	Hazardous cell H1; Western subcell	315797	285234
LM2	Hazardous cell H1; Eastern subcell	315937	258169
LM3	Hazardous cell H2; Western subcell	315740	258139

Ref	Location	Easting	Northing
LM4	Hazardous cell H2; Eastern subcell	315940	258036
LM5	Hazardous cell H3; Western subcell	315675	258039
LM6	Hazardous cell H3; Eastern subcell	315898	257961
LM7		315653	257854
LM8	Non-hazardous cell NH1; Eastern subcell	315730	257828
LM9	Non-hazardous cell NH2	315837	257828
LM10[15]	Inert cell C5	315560	258058
LM11	Inert cell IN2	315604	258081
LM12	Inert cell IN3	315534	258027
LM13	Inert cell IN1	315536	257929

F.8.4 The density of the proposed leachate monitoring boreholes can be identified as follows:

Table F.8.3: Proposed Leachate Monitoring – Borehole Density

Cell	Area of cell footprint (m^2)	Area of cell footprint (Ha)	No. of leachate wells proposed	Density of leachate monitoring wells (per Ha)
Hazardous cell H1	16,771	1.68	2	1.19
Hazardous cell H2	22,962	2.30	2	0.87
Hazardous cell H3	16,417	1.64	2	1.22
Non-hazardous cell INH1	15,775	1.58	2	1.27
Non-hazardous cell INH2	1,279	0.13	1	7.82

[15] This is the existing leachate monitoring borehole LC4

Cell	Area of cell footprint (m^2)	Area of cell footprint (Ha)	No. of leachate wells proposed	Density of leachate monitoring wells (per Ha)
Existing inert cells C1, C2, C5 (to be retained)	15,811	1.58	1	0.63
Inert cell IN1	8,355	0.84	1	1.20
Inert cell IN2	650	0.07	1	15.38
Inert cell IN3	2,085	0.21	1	4.80

F.8.5 It is proposed that leachate levels in the non-hazardous and hazardous cells are monitored monthly. It is proposed that leachate levels in the inert cells are monitored quarterly. It is proposed that leachate quality is monitored quarterly.

F.8.6 In addition to leachate monitoring within individual cells, it is proposed to install a leak detection system under the hazardous cell liner (as detailed in Drawing **WLA-22**). The following leak detection monitoring points are proposed:

Table F.8.4: Proposed Hazardous Cells Leak Detection Monitoring Points

Ref	Location	Easting	Northing
DM1	Hazardous cell H1; Western subcell	315756	258254
DM2	Hazardous cell H1; Eastern subcell	315977	258162
DM3	Hazardous cell H2; Western subcell	315700	258157
DM4	Hazardous cell H2; Eastern subcell	316002	258022
DM5	Hazardous cell H3; Western subcell	315638	258057
DM6	Hazardous cell H3; Eastern subcell	315957	257936

F.8.7 It is proposed that leak detection wells are dipped monthly.

F.9 Landfill Gas Monitoring and Sampling Points

F.9.1 Non-biodegradable wastes only will be acceptable at the facility; therefore landfill gas will not be generated. No landfill gas monitoring points are proposed; however, in line with existing practice under W0129-02, all leachate monitoring boreholes will be designed to also facilitate landfill gas monitoring.

Attachment G

Resources Use and Energy Efficiency

Attachment G: Resources Use & Energy Efficiency

G.1 Raw Materials and Product

Material Balance

G.1.1 The material types and estimated quantities required to construct the proposed landfill have been estimated. Data gathered during the site investigation have been used to classify the on-site materials and assess their suitability for use in the construction of the development. Existing stockpiles of low permeability clays and subsoils on site will be used in the lining and capping systems. Other suitable natural site material may also be uncovered during the construction works. The on-site stockpiles of subsoil will be used to cap the landfill cells.

G.1.2 Granular material required for construction of the basal and capping layers will be sourced off-site and imported. Mixes such as DAC, concrete, and pavement macdam will be batched off-site and then delivered to site for use. All geomembranes, geosynthetics and geotextiles will be imported to site as required. Other materials to be imported include granular fill and low permeability clays, which will be imported on a phased basis and stockpiled on site. The material balance for the site has been calculated and is presented in the following Appendix:

Appendix G.1.1: Material Balance Calculations

Raw Material Use

G.1.3 It is envisaged that the solidification process will use cement (or replacement binding materials, as appropriate), acid and water, as detailed below.

G.1.4 1 No. cement silo will be provided at the solidification plant, with capacity of 78m^3; equivalent to approximately 117 tonnes. At a throughput of 50,000 tpa through the solidification plant, it is estimated that approximately 7,500 tonnes of cement will be used per annum (this may be subject to variation on the basis of mixing ratios to be applied at MEHL).

G.1.5 2 No. bunded acid tanks will be provided at the solidification plant, with capacity of 2 x 30m^3; equivalent to approximately 72 tonnes. Hydrochloric acid (HCl) is the preferred acid type. At a throughput of 50,000 tpa through the solidification plant, it is estimated that approximately 7,500 tonnes of HCl will be used per annum (this may be subject to variation on the basis of mixing ratios to be applied at MEHL).

G.1.6 Under normal use, cement is not expected to be hazardous to the environment[16]. If acid is accidently released to the environment, persons should wear appropriate protective clothing. Small spillages can be absorbed on an inert absorbent, transferred to a suitable container and removed to an appropriate off-site facility. For large acid spillages, liquids should be contained with sand or earth and both liquids and solids transferred to containers[17].

Water Use

G.1.7 Mains water is currently piped onto site for drinking water purposes. Water is also used for toilets, kitchen facilities, etc.

G.1.8 Water is used for dust and mud control purposes in water sprinklers, wheelwash, bowser and roadsweeper. Water is collected from rainwater runoff. Water used in the wheelwash is filtered and recycled to reduce water requirements.

G.1.9 A new 100mm diameter PE100 Class C watermain (EN 1452) is to be connected to existing watermain on the public road L01080, as detailed in Attachment **D.1.l**. This new watermain will supply potable water for human consumption to the welfare facilities in the administration and solidification building.

G.1.10 A 12.5mm diameter watermain connection from this main water supply pipe will be laid to the Solidification Plant and wheel wash. This supply is only to be used as a back-up supply to the rainwater harvested. Sluice valves and non return valves will be installed to regulate the water supply in conjunction with metering facilities to record the quantity of water draw down through this back-up system.

G.1.11 Twenty-four hour water storage is to be provided at a rate of 60 litres per person, per day (minimum tank size 1,000 litres). All WCs, WHBs, urinals etc. to be fed from rainwater harvesting tank.

G.1.12 The process water required for the solidification will be supplied from the leachate holding tank. Limited quantities of additional water may be required during extended dry periods. The use of leachate in the solidification plant (initially from the hazardous

[16] Irish Cement (2007) Safety Data Sheet for Cement
[17] VWR International (2006) Safety Data Sheet for Hydrochloric Acid

waste cells) is effectively an on-site 'closed loop' system. The practice of using leachate from hazardous landfill cells has been successfully applied at European reference plants.

G.1.13 Consumption of potable water will be minimised for non-essential uses. Records of water usage will continue to be maintained on site and reported to the EPA in the AER in accordance with licence conditions.

Diesel Use

G.1.14 There is a bunded and covered fuel storage area on site currently. It is proposed to install a 7,500 litre diesel tank for site machinery, to be stored in a bunded and roofed storage building. It is proposed to construct this building adjacent to the solidification yard. The reinforced concrete bund walls will be constructed to watertight standard BS8007 and sized to retain 110% of the total diesel volume. A steel and single skin cladding will be provided to roof the building and prevent water ingress into the bund.

G.1.15 The existing fuel storage area will be decommissioned when the new fuel storage area has been installed.

G.1.16 Diesel will be required for site machinery and plant. It is not considered that the facility will be an intensive fuel user.

G.1.17 Records of fuel usage will continue to be maintained on site and reported to the EPA in the AER in accordance with licence conditions.

G.2 Energy Efficiency

G.2.1 Energy is currently used on-site in terms of electricity for lighting (interior and exterior), heating and electronic equipment. Records of electricity usage are maintained on site. MEHL uses a green electricity provider.

G.2.2 In terms of the proposed integrated waste management facility, a new electricity connection will be brought to the new site office/weighbridge, solidification plant and storage building. It is proposed to construct an ESB substation at the facility control area.

G.2.3 The solidification plant will use electrical power for small motors to operate the dosing and mixing units.

G.2.4 MEHL will specify energy-efficient design, construction, plant and equipment at detailed design phase.

G.2.5 Records of energy use will continue to be maintained on site and reported to the EPA in the AER in accordance with licence conditions.

Attachment H
Materials Handling

Attachment H: Materials Handling

H.1 Waste Types and Quantities - Existing and Proposed

Waste Types

H.1.1 In summary, this proposal is for the construction of fully engineered landfill cells, designed to international best practice standards, suitable for the acceptance of:

- hazardous ash and soils and other compatible non-biodegradable waste streams;
- non-hazardous, non-biodegradable wastes; and
- inert wastes.

H.1.2 The facility will not accept asbestos.

H.1.3 The facility will not accept liquid or biodegradable wastes.

H.1.4 It is proposed that the facility will accept residues from waste-to-energy (incineration) facilities; this includes Flue Gas Treatment (FGT) residues, Incinerator Bottom Ash (IBA) and boiler ash. Further details on these waste streams are detailed overleaf.

H.1.5 It is also proposed to accept contaminated soils, sludges and residues, and other compatible wastes. Materials for recovery will be accepted, as per existing licensed activities (under W0129-02).

H.1.6 The proposed integrated waste management facility at MEHL will be in the unique position of offering landfill disposal capability under all classes of landfill: inert, non-hazardous and hazardous. Incoming wastes will be subject to WAC (Waste Acceptance Criteria) control/testing and will be diverted to the appropriate class of landfill cell on that basis, in accordance with the conditions of the Waste Licence as applied or varied from time to time by EPA to address any changes in law or policy.

H.1.7 An outline list of proposed waste types and European Waste Catalogue (EWC) codes is presented in the following Appendix:

Appendix H.1.1: Outline List of Proposed Waste Types and European Waste Catalogue (EWC) Codes

Residues from Waste-to-Energy Facilities

H.1.8 In compiling the list of proposed waste types, MEHL was cognisant of the imminent commencement of operations at the Indaver waste-to-energy facility at Carranstown, Duleek, Co. Meath (EPA Licence W0167-01). There are a number of other waste-to-energy facilities pending nationally, at various stages of planning/development[18]. Three primary residues will be produced by waste-to-energy facilities in Ireland: 'bottom ash', 'Flue Gas Treatment (FGT) residues' (sometimes referred to as 'Air Pollution Control (APC)' residues) and 'boiler ash' as described below.

Bottom Ash

H.1.9 In municipal waste incinerators, bottom ash (or 'Incinerator Bottom Ash' (IBA)) is approximately 10% by volume and approximately 20 to 35% by weight of the solid waste input. The proportions of solid residue vary according to the waste type processed and detailed process design.

H.1.10 Bottom Ash consists of the remnants of solid wastes after the incineration process. It is physically comprised of non-combustible aggregates such as glass, ceramics, and stone (80%); ferrous (5-13%) and non-ferrous metals (2-5% including 0.001% precious metals), organics (paper and textiles (1-5%)) and minerals. The average density is approximately 1.5-2.0t/m^3. Bottom ash typically has a moisture content of 20 – 25% due to quenching with water on exit from the waste-to-energy plant, which makes it non-dusty to handle. Ferrous and non-ferrous metals can be successfully recovered from bottom ash.

H.1.11 Table **H.1.1** overleaf outlines the chemical properties of Bottom Ash determined following a study of 95 samples of bottom ash from a reference waste-to-energy plant in Belgium[19]. These results indicate typical concentrations of bottom ash derived from a municipal waste feedstock. The results indicate that this bottom ash is generally within the Waste Acceptance Criteria (WAC) for non-hazardous landfill as outlined in Council Decision 2003/33/EC. It is expected that the Bottom Ash to be accepted by MEHL would be of a similar composition to that generated at the reference plant.

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[18] The EPA (2008) National Hazardous Waste Management Plan 2008-2012 (page 71) states: *"It should also be noted that the operation of hazardous and municipal waste incinerators will result in the generation of a hazardous ash that would require landfilling. The proposed capacity of any national landfill facility, particularly one established on foot of any initiative provided by a public authority, should take into account this capacity requirement".*

[19] Source: Indaver, Doel Waste-to-Energy plant, Flanders, Belgium

H.1.12 In the absence of an operational municipal waste-to-energy facility in Ireland, reference material has been sourced from reference plants in Belgium[20], where bottom ash is treated in an ash recovery plant to produce granulate fractions that meet reuse quality standards which have been developed by Belgian Authorities. Any remaining fractions are generally disposed to non-hazardous landfill subject to meeting non-hazardous landfill waste acceptance criteria. While there are currently no similar provisions for reuse of bottom ash in Ireland, it is proposed that waste placement of bottom ash at the MEHL landfill will be carefully recorded so that bottom ash could be excavated and reused at a future date in the event of such legislation being enacted or as economic/market conditions develop. This principle can be referred to as 'Design to Mine'.

[20] Indaver Belgium

Table H.1.1: Compositional analysis of Bottom Ash from Reference Waste-to-Energy Plant

Measurement	Parameter	Unit	WAC for Non-Hazardous Landfill	WAC for Hazardous Landfill	Bottom Ash mg/kg	Bottom Ash # samples
Leaching L/S = 10	As	mg/kg	2	25	<0.1	80
	Ba	mg/kg	100	300	2.8+/-0.8	15
	Cd	mg/kg	1	5	<0.02	86
	Cr	mg/kg	10	10	0.1+/-0.1	80
	Cu	mg/kg	50	100	13.1+/-2.5	96
	Mo	mg/kg	10	30	3.5+/-2.6	80
	Ni	mg/kg	10	40	0.1	80
	Pb	mg/kg	10	50	0.6+/-0.5	80
	Sb[21]	mg/kg	0.7	5	0.8+/-0.1	80
	Se	mg/kg	0.5	7	0.1	80
	Zn	mg/kg	50	200	0.5+/-0.4	80
	Cl	mg/kg	15000	25,000	5610+/-650	80
	F	mg/kg	150	500	8.0+/-4.0	96
	SO_4^{2-}	mg/kg	20000	50,000	4570 +/- 1190	80
	CN^-	mg/kg	-	-	0	14
	NO_2^{--}	mg/kg	-	-	0	80
Other	pH	pH Units	Minimum 5	-	11 +/- 1	100

Source: Indaver Waste-to-Energy Facility, Doel, Flanders, Belgium

[21] The non hazardous WAC used for Sb (Antimony) is for non-hazardous waste deposited together with hazardous (B1b-art 2,2) and not for normal non-hazardous waste.

Flue Gas Treatment (FGT) Residues

H.1.13 The structural and chemical properties of Flue Gas Treatment (FGT) residue depend on the treatment system used; typically residues are a mixture of fly ash, unreacted excess lime, and reaction products including calcium chloride. The residues are generally characterised as calcareous or chlorinated alumino-silicaceous materials having high soluble fraction. They primarily contain calcium as hydroxide, carbonate, sulphate and chloride/hydroxide complexes as a result of lime neutralisation of acid gases such as HCl and H_2SO_4. They also contain heavy metals liberated during combustion.

Figure H.1.1: 'Raw' Flue Gas Treatment Residue (from waste-to-energy facility)

H.1.14 The residues are generally pale grey to white in colour, often containing small black particles of activated carbon. They are fine-grained, free-flowing, granular and mostly dry (0.2% moisture). Properties may vary with variations in the composition of household waste, as well as social, economic, seasonal, weather and technical factors and incinerator operating parameters.

H.1.15 The typical composition of FGT residues from the most common forms of flue gas cleaning system are presented in Table **H.1.2** overleaf.

Table H.1.2: Typical Composition of FGT Residues

Component	Dry and semi-dry systems	Wet Systems
Fly Ash	Always	Always
Excess Lime	Always (usually included)	-
Reaction products (salts)	Always (usually included)	Always (in wastewater)
Dioxin sorbent	Optional (usually included)	Optional (usually handled separately)
Sludge		Always (sometimes mixed with fly ashes)
Gypsum	-	Optional (recovery possible)
Chloride Salts	-	Optional (recovery possible)

Source: Management of APC Residues from Waste-to-Energy Plants, ISWA 2008

H.1.16 The main environmental concern[22] with respect to FGT residues is leaching of:

- *Easily soluble salts such as Cl and Na. Although not toxic for humans in typical concentration levels these components may significantly affect ecosystems and spoil drinking water resources.*
- *Heavy metals such as Cd, Cr, Cu, Ni, Pb, and Zn. Heavy metals and trace elements can potentially be present in concentrations harmful for humans as well as for ecosystems. As such, leaching of these components has generally been the primary concern and has also received the greatest research focus.*
- *Dioxins. Although dioxins and furans do not easily leach, release of these contaminants is of major concern because of their toxicity.*
- *In order to minimize impacts on the environment, the release of the above contaminants should be reduced as much as possible. Ideally this means that these constituents should either be effectively bound in the residue matrix or simply removed leaving the remaining materials harmless.*

[22] ISWA-WG/Thomas Astrup, Technical University of Denmark (2008) *Management of APC residues from W-t-E Plants: An overview of management options and treatment methods*

Boiler Ash

H.1.17 Boiler ash is the coarse fraction of the particulate carried over by the flue gases from the combustion chamber and collected at the heat recovery section. As the velocity of the flue gas is lower in the boiler than in the furnace this coarse fraction settles out in the boiler. Experience in Europe has shown that boiler ash can be either non-hazardous or hazardous; however it is generally suitable for disposal to non-hazardous landfills, subject to testing at source.

H.1.18 It is anticipated that boiler ash accepted at the MEHL integrated waste management facility will be input to the solidification plant for pre-treatment prior to landfilling in the hazardous cell, due to the useful binding properties of the boiler ash in the solidification mix.

Other proposed Waste Streams

H.1.19 Other proposed waste streams, which are anticipated inputs to the MEHL integrated waste management facility, are outlined in Appendix **H.1.1**. The exact waste types and the waste characteristics are not yet known; however it is important to emphasise that all wastes (subject to limited exemptions as per the 2003 Council Decision) will be subject to rigorous Waste Acceptance Procedures, including Waste Acceptance Criteria (WAC) testing to determine their suitability for waste acceptance.

H.1.20 MEHL, under the terms of its existing EPA Licence, W0129-02, have built up an excellent understanding of, and experience in, the area of contaminated soils in Ireland. Site records would include extensive laboratory results (WAC testing against inert landfill criteria) for soils & stones which would have been rejected for acceptance under the terms of W0129-02; however it is anticipated that much of this waste stream would meet either non-hazardous or hazardous WAC criteria.

Waste Quantities

H.1.21 The existing EPA licence for the facility, W0129-02, allows for the acceptance of a maximum of 500,000 tonnes of inert waste per annum. The current application seeks to maintain this upper limit of 500,000 tonnes per annum (total for all incoming waste types); however current projections indicate that the likely annual tonnage will be in the range of approximately 250,000 to 350,000 tonnes per annum.

H.1.22 The retention of an upper threshold of 500,000 tonnes per annum, which is currently allowed under planning permission and EPA licence, would facilitate 'unusual events' within any given year, e.g. if there was a peak in the generation of contaminated soils in the country, due to intensive excavation/development works, which would require disposal in hazardous landfill, the MEHL strategic facility would have the capacity for such volumes (up to a maximum of 500,000 tonnes per annum), thereby avoiding the necessity for trans-frontier shipment of these materials. In addition, the retention of the currently licensed maximum annual input would act as security of capacity in the event that any issue might arise in the future, which could give rise to the need for immediate disposal of materials as a result of any accidental occurrence in the country through failure or natural disaster (materials arising from such an event would be demonstrated as meeting the facility's Waste Acceptance Criteria).

H.1.23 As the proposed maximum tonnes per annum acceptable into the facility remains as per the existing EPA Licence W0129-02 (and planning permission), there will be no intensification of waste activity. Incoming waste tonnages are expected to be lower during Phase 1 of the project. Further details in relation to phasing are provided in Attachment **D.2**.

H.1.24 MEHL seeks to remain licensed and operational at all times, whether under the terms of the existing EPA licence W0129-02 or under a new licence (e.g. during construction of hazardous/non-hazardous cells under new EPA licence, MEHL has ongoing inert landfilling capabilities).

H.1.25 Waste input has been estimated over the four identified phases (detailed in Attachment **D.2.3**) of development/operation of the integrated waste management facility (**Table H.1.3**). Projections are estimates[23] only, and are subject to market demand (up to 500,000 tonnes per annum) during any given year.

[23] Bulk density conversion factors have been assumed.

Table H.1.3: Estimated Projected Tonnes per Annum Waste Input

	Estimated projected tonnes per annum (tpa)[24]					
	Phase 1	Phase 2a	Phase 2b	Phase 3	Phase 4a	Phase 4b
Approx. timeframe[25]	2012-2016	2014-2017	2018-2024	2022-2034	2034	2035-2036
Hazardous	122,600	122,600	122,600	122,600	122,600	0
Non-hazardous	0	0	102,300	102,300	102,300	206,400
Inert	60,400	60,400	60,400	60,400	60,400	60,400
Total	**183,000**	**183,000**	**285,300**	**285,300**	**285,300**	**266,800**

H.2 Waste Acceptance Procedures

H.2.1 Detailed Waste Acceptance Procedures (for inert waste) have been developed for Hollywood Landfill, in accordance with Waste Licence W0129-02 and Council Decision (2003/33/EC) Establishing Criteria and Procedures for the Acceptance of Waste at Landfills. Procedures have been agreed with the Agency (and subject to ISO14001:2004 auditing and inspection) and are reviewed on an annual basis.

H.2.2 This section outlines the proposed waste acceptance framework for the integrated waste management facility. Further detail surrounding the Waste Acceptance Procedure (WAP) and related forms will be agreed with the Agency post-licensing.

EU Landfill Directive (1999)

H.2.3 The EU Landfill Directive (1999) (Article 11) requires a landfill site to:

- Take measures to show, by means of appropriate documentation, that the waste fulfils the acceptance criteria set out in Annex II (of the Landfill Directive 1999)
- Upon reception of the waste, the operator must check waste documentation

[24] It is proposed that the existing planning and licensing permissions for up to 500,000 tpa is retained, which would facilitate such waste volumes in any given year; however it is anticipated that actual average tpa will be lower, as outlined in Table **H.1.3**.
[25] There may be overlapping between phases

- Upon reception of the waste, the operator must visually inspect waste at the entrance and at the point of deposit
- Upon reception of the waste, the operator must keep a register of the quantities and characteristics of the waste deposited (for hazardous waste, its precise location on the site must be recorded)
- Provide written acknowledgement of receipt of each delivery accepted on the site
- Notify the competent authority of the non-acceptance of the waste

H.2.4 Annex II of the Landfill Directive 1999 describes general principles for acceptance of waste at the various classes of landfill. It states that "*the general characterisation and testing of waste must be based on the following three-level hierarchy:*

- **Level 1: Basic Characterisation.** This constitutes a thorough determination, according to standardised analysis and behaviour-testing methods, of the short and long-term leaching behaviour and/or characteristic properties of the waste.
- **Level 2: Compliance Testing.** This constitutes periodical testing by simpler standard analysis and behaviour-testing methods to determine whether a waste complies with permit condition and/or specific reference criteria. The tests focus on key variables and behaviour identified by basic characterisation.
- **Level 3: On-site verification.** This constitutes rapid check methods to confirm that a waste is the same as that which has been subjected to compliance testing and that which is described in any accompanying documents. It may consist of a visual and odour inspection of a load of waste before and after unloading at the landfill site."

Council Decision 2003/33/EC ('the WAC Decision')

H.2.5 Council Decision of 19 December 2002 (2003/33/EC) *establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC* (hereinafter referred to as 'the WAC Decision') establishes the criteria and procedures for the acceptance of waste at landfills. The Annex lays down a uniform waste classification and acceptance procedure, and provides further detail on Basic Characterisation, Compliance Testing and On-site Verification, outlined above.

H.2.6 The WAC Decision outlines the fundamental requirements for Level 1 Basic Characterisation:

(a) Source and origin of the waste

(b) Information on the process producing the waste (description and characteristics of raw materials and products)

(c) Description of the waste treatment applied in compliance with Article 6(a) of the Landfill Directive, or a statement of reasons why such treatment is not considered necessary

(d) Data on the composition of the waste and the leaching behaviour, where relevant

(e) Appearance of the waste (smell, colour, physical form)

(f) Code according to the European waste list (Commission Decision 2001/118/EC)

(g) For hazardous waste in case of mirror entries: the relevant hazard properties according to Annex III to Council Directive 91/689/EEC of 12 December 1991 on hazardous waste

(h) Information to prove that the waste does not fall under the exclusions of Article 5(3) of the Landfill Directive

(i) The landfill class at which the waste may be accepted

(j) If necessary, additional precautions to be taken at the landfill

(k) Check if the waste can be recycled or recovered.

H.2.7 In relation to testing, the WAC Decision states that as "*a general rule waste must be tested to obtain the above information. In addition to the leaching behaviour, the composition of the waste must be known or determined by testing. The tests used for basic characterisation must always include those to be used for compliance testing. The content of the characterisation, the extent of laboratory testing required and the relationship between basic characterisation and compliance checking depends on the type of waste. A differentiation can be made between: (a) wastes that are regularly generated in the same process; (b) wastes that are not regularly generated.*"

Proposed Waste Acceptance Procedure

H.2.8 The proposed outline Waste Acceptance Procedure (WAP) for the integrated waste management facility is provided in Appendix **H.2.1**. It is proposed that further detail surrounding the WAP and related forms will be agreed with the Agency post-licensing.

Appendix H.2.1: Proposed (outline) Waste Acceptance Procedure for MEHL Integrated Waste Management Facility

H.2.9 The outline Waste Acceptance Procedure is explained as follows (to be read in conjunction with the flowchart provided in Appendix **H.2.1**):

1. Waste acceptance enquiry is received by MEHL.
2. As the first stage of collation of Level 1 Basic Characterisation information, the customer is required to complete available details regarding the waste, as outlined in H.2.6. The customer may or may not proceed with WAC testing before reverting to MEHL.
3. MEHL must be satisfied that the waste is an acceptable waste type, e.g. it is non-biodegradable, solid waste; no asbestos waste acceptable
4. If the enquiry relates to a waste type not 'in keeping' with the MEHL Waste Acceptance Procedure/licensed waste types, the customer is informed that the waste is not acceptable.
5. Full WAC testing will be required[26] to demonstrate the composition of the waste and its leaching behaviour (see Attachment **H.2.12**), prior to the waste being delivered to the MEHL facility. For the purposes of testing, the WAC Decision differentiates between: (a) wastes that are regularly generated in the same process, and (b) wastes that are not generally generated. This is further discussed in Attachment **H.2.11**.
6. Based on the Level 1 Characterisation (including WAC analysis, where required), MEHL will confirm the landfill class for disposal, or if the waste will be subject to recovery or pre-treatment/solidification processes. This is a critical stage of waste acceptance as the category assigned will be used on all weighbridge and associated waste records, and will determine the recovery/pre-treatment/disposal route when the waste is received on site. The available options are:
7. **Material for Recovery**
8. **Inert waste for Disposal**
9. **Non-hazardous waste for Disposal**
10. Waste which will be subject to Solidification/Pre-treatment (following solidification/pre-treatment, the waste will be handled internally and directed to either the hazardous or non-hazardous cell for disposal, as appropriate; it is anticipated that for the waste types proposed for solidification, that the solidified material will be destined for landfilling within the hazardous cell)

[26] Limited exemptions apply; as detailed in Attachment **H.2**

11. **Hazardous waste for Disposal**

12. The information is entered onto weighbridge software and all related Level 1 information is filed in site records, prior to the reception of the waste on-site. In this way, upon receiving waste on site, weighbridge operators will call up the key information based on the vehicle licence plate of the waste delivery vehicle. The Waste Acceptance Procedure will be supplemented by a source site docketing system at this point of the procedure, which cross-check the Level 1, weighbridge information and recovery/disposal option.

13. All other mandatory weighbridge waste records will be completed at the weighbridge, including an accurate weight reading.

14. As is current practice under W0129-02, weighbridge software will be programmed to 'flag' when a Level 2 sample is required to be taken.

15. Each and every load will be subject to a Level 3, on-site verification test, which requires the load to be visually inspected before and after unloading. If the member of staff is not satisfied with the findings of the Level 3 inspection, he/she will call on the Facility Manager to repeat Level 3 and takes steps accordingly to either confirm the suitability of the waste for acceptance, or instigate the Rejected Load Procedure.

    It may be not possible to complete a visual inspection, for example, for Flue Gas Treatment residue delivered to the site in fully contained units. In this instance, arrangements will be put in place with the source site of the waste to address requirements.

16. The waste delivery vehicle will then be directed to the relevant tipping area. To ensure that every waste load is delivered to the correct tipping area, an access-controlled system is proposed as detailed in Attachment **D.1.j**.

17. The waste load will be received by an MEHL 'banksman' who will cross-check that the load is in the correct tipping area, and will repeat the Level 3, on-site verification test upon discharge of the waste load. If the banksman is not satisfied with the findings of the Level 3 inspection, he/she will call on the Facility Manager to repeat Level 3 and takes steps accordingly to either confirm the suitability of the waste for acceptance, or instigate the Rejected Load Procedure.

18. After the waste load has been discharged, the waste delivery vehicle will return to the 'out' weighbridge, weigh out and complete the relevant documentation requirements, prior to exiting the site.

WAC Testing and Limit Values

H.2.10 MEHL has been a forerunner in Ireland in the development and application of the WAC testing regime for inert waste acceptance, and will draw on this experience for the WAC testing to be applied at the integrated waste management facility.

H.2.11 The WAC Decision (2003/33/EC) (Appendix B, Table 1) provides an overview of landfill classes, subcategories and identifies acceptance criteria (see Table **H.2.1**).

Table H.2.1 Landfill Classes, Subcategories and Acceptance Criteria

Landfill Class	Class/ Subcategory		WAC
Inert	*A*	-	Set at EU level
Non-hazardous	*B1a*	Landfill for inorganic non-hazardous waste with a low content of organic/ biodegradable matter, where the wastes do not meet the criteria set out in section 2.2.2. for those inorganic non-hazardous wastes that maybe landfilled together with stable, nonreactive hazardous waste	Not set at EU level
	B1b	Landfill for inorganic non-hazardous waste with a low content of organic/ biodegradable matter	Set at EU level for granular wastes; monolithic must be set at MS[27] level
	B2	Landfill for organic non-hazardous waste	Not set at EU level
	B3	Landfill for mixed non-hazardous waste with substantial contents of both organic/biodegradable waste and inorganic waste	Not set at EU level
Hazardous	*C*	-	Set at EU level for granular wastes[28]; monolithic must be set at MS level

H.2.12 The WAC Decision (2003/33/EC) outlines limit values for waste acceptable at landfills for:

[27] MS = Member State

[28] Additional criteria on content of contaminants can be set at MS level

- Inert waste
- Granular non-hazardous waste accepted in the same cell as stable, non-reactive hazardous waste (hereinafter referred to as 'granular non-hazardous waste')
- Granular hazardous waste acceptable at landfills for non-hazardous waste (hereinafter referred to as 'granular hazardous waste – non-hazardous landfill')
- Granular waste acceptable at landfills for hazardous waste (hereinafter referred to as 'granular hazardous waste')

H.2.13 The testing (exclusions apply) for the classes listed in **H.2.10** above includes the requirement for total pollutant content testing, and leachate testing. For leachate testing, limit values are applied, calculated at liquid to solid ratios (L/S) of 2l/kg and 10l/kg for total release and directly expressed in mg/l for C_0 (the first eluate of percolation test at L/S = 0.1l/kg)[29]. The testing procedure is consistent for the various classes of landfill, although there are some differences in parameters required to be tested under each class (see Table **H.2.2** below).

H.2.14 As the MEHL integrated waste management facility will operate inert, non-hazardous and hazardous landfill, WAC criteria for the three classes of landfill may be relevant. If the destination landfill class is known at the point of WAC sampling, testing criteria for that landfill class will be applied (e.g. if material is known to be inert, only the inert WAC testing suite will be required). If the destination landfill class is not know at the point of WAC sampling, it is proposed that one standardised Level 1 WAC testing procedure will apply based on a combined list of testing requirements for inert, non-hazardous and hazardous. The results of the WAC analysis will then determine if the waste is suitable for disposal to inert, non-hazardous or hazardous landfill.

H.2.15 The WAC limit values for various classes of landfill, as prescribed in the WAC Decision 2003/33/EC, are summarised in Appendix:

Appendix H.2.2: Summary of WAC limits prescribed by 2003/33/EC

[29] Of the L/S and C_0 ratios outlined in the WAC Decision, MEHL, in line with standard laboratory practice, has heretofore consistently used L/S = 10l/kg for leachate testing, and proposes to continue this practice going forward.

Table H.2.2: Testing required under WAC Decision

Component		Testing required under WAC Decision ☑ or ☒				Proposed combined inert/non-haz/haz WAC suite
		Inert	Granular non-hazardous waste	Granular hazardous waste – non-hazardous LF	Granular hazardous waste	
Leaching Test	As	☑	☑	☑	☑	☑
	Ba	☑	☑	☑	☑	☑
	Cd	☑	☑	☑	☑	☑
	Cr total	☑	☑	☑	☑	☑
	Cu	☑	☑	☑	☑	☑
	Hg	☑	☑	☑	☑	☑
	Mo	☑	☑	☑	☑	☑
	Ni	☑	☑	☑	☑	☑
	Pb	☑	☑	☑	☑	☑
	Sb	☑	☑	☑	☑	☑
	Se	☑	☑	☑	☑	☑
	Zn	☑	☑	☑	☑	☑
	Chloride	☑	☑	☑	☑	☑
	Fluoride	☑	☑	☑	☑	☑
	Sulphate	☑	☑	☑	☑	☑
	Phenol index	☑	☒	☒	☒	☑
	DOC	☑	☑	☑	☑	☑
	TDS	☑	☑	☑	☑	☑
Total Content	TOC	☑	☒	☑	☑	☑
	BTEX	☑	☒	☒	☒	☑
	PCBs	☑	☒	☒	☒	☑
	Mineral Oil (C10 to C40)	☑	☒	☒	☒	☑
	PAHs	☑	☒	☒	☒	☑
	pH	☒	☒	☑	☒	☑

Component	Testing required under WAC Decision ☑ or ☒				Proposed combined inert/non-haz/haz WAC suite
	Inert	Granular non-hazardous waste	Granular hazardous waste – non-hazardous LF	Granular hazardous waste	
ANC (acid neutralisation capacity)	☒	☒	☑	☑	☑
LOI (either LOI or TOC can be used)	☒	☒	☒	☑	☑

Cases where testing is not required

H.2.16 The WAC Decision specifies cases where testing is not required:

- the waste is on a list of wastes not requiring testing as laid down in section 2 of the Annex to the WAC Decision
- all the necessary information for the basic characterisation is known and duly justified to the full satisfaction of the competent authority
- certain waste types where testing is impractical or where appropriate testing procedures and acceptance criteria are unavailable. This must be justified and documented, including the reasons why the waste is deemed acceptable at this landfill class.

Wastes regularly generated in the same process

H.2.17 For the purposes of testing, the WAC Decision differentiates between: (a) *wastes that are regularly generated in the same process*, and (b) *wastes that are not regularly generated*. For wastes generated in the same process (e.g. bottom ash from the incineration of municipal waste), the basic characterisation will comprise the fundamental requirements listed in Attachment **H.2** of this application document and especially the following:

- Compositional range for the individual wastes
- Range and variability of characteristic properties
- If required, the leachability of the wastes determined by a batch leaching test and/or percolation test and/or a pH dependency test

- Key variables to be tested on a regular basis

H.2.18 It is proposed that bottom ash from the Indaver waste-to-energy Facility in Carranstown, Duleek, Co. Meath (EPA Licence W0167-01) will be accepted at the MEHL integrated waste management facility post construction and CQA of the new landfill cell(s) at MEHL. This waste stream is deemed to be one which is 'regularly generated in the same process'.

H.2.19 As the Indaver Meath facility (W0167-01) is still under construction, no waste outputs will be available for testing purposes until the post-commissioning stage (i.e. approximately Summer 2011). The composition and characteristics of the bottom ash residue will be determined at that time, in line with Agency requirements, and the compositional range will be determined based on an agreed number of samples (full WAC analysis to be completed).

H.2.20 In relation to '*the relevant hazard properties according to Annex III to Council Directive 91/689/EEC of 12 December 1991 on hazardous waste*', and in particular 'ecotoxicity testing', it is noted that Indaver has submitted to the Agency (13th August 2010) that, "*until more information has been gathered on different types of waste materials, and the EU has made a decision regarding testing methods or thresholds for different waste streams (possibly depending on their fate), any condition regarding* [testing for] *H14 in the* [Indaver W0167-01] *waste licence would be premature…"* Furthermore, the Indaver submission noted that it is intended to landfill the bottom ash, thereby containing any leachate, and preventing risk to the environment; as a result, ecotoxicity testing for the aquatic environment would be inappropriate. Alternative calculation methods for this assessment have been proposed based on historical data on the ecotoxicity of various elements and compounds on the environment.

H.2.21 Section 1.1.3 of the WAC Decision states that "*for wastes from the same process in the same installation, the results of the measurements may show only minor variations of the properties of the waste in comparison with the appropriate limit values. The waste can then be considered characterised, and shall subsequently be subject to compliance testing only, unless significant changes in the generation process occur*".

H.2.22 Schedule C.4 of the Indaver Meath licence (W0167-01) requires the monitoring of bottom ash and boiler ash on a quarterly basis. The following parameters must be tested: TOC, metals (Ba, Cd, Mo, Sb, Se, Zn, Tl, Hg, Pb, Cr, Cu, Mn, Ni, As, Co, V, Sn) and their compounds, chloride, fluoride, sulphate, dioxins/furans and dioxin-like PCBs.

H.2.23 In relation to compliance testing, the WAC Decision requires "*only a check on critical parameters (key variables), as determined in the basic characterisation*" and "*shall be carried out at least once a year*".

H.2.24 It is therefore proposed that quarterly monitoring of bottom ash as required by the Indaver Meath licence (W0167-01) is more than adequate to address compliance testing requirements at the destination landfill; and that monitoring results (by an accredited laboratory employing accredited procedures) will be used for the purposes of compliance testing at the MEHL integrated waste management facility. Testing should include leachate tests, as per WAC testing requirements.

H.2.25 If required by the Agency, MEHL, in addition to compliance testing outlined in H.2.18, will conduct random sampling of incoming bottom ash twice per annum for compliance testing against key parameters.

H.2.26 It is proposed that this testing regime (or similar to be agreed with the Agency and the operator) also be applied to bottom ash from the incineration of municipal waste from other future waste-to-energy facilities.

Acceptability of higher limit values

H.2.27 The WAC Decision (part 2 of the Annex) states that: "*In certain circumstances, up to three times higher limit values for specific parameters (other than dissolved organic carbon (DOC) in sections 2.1.2.1, 2.2.2, 2.3.1 and 2.4.1, BTEX, PCBs and mineral oil in section 2.1.2.2, total organic carbon (TOC) and pH in section 2.3.2 and loss on ignition (LOI) and/or TOC in section 2.4.2, and restricting the possible increase of the limit value for TOC in section 2.1.2.2 to only two times the limit value) are acceptable, if*

- the competent authority gives a permit for specified wastes on a case-by-case basis for the recipient landfill, taking into account the characteristics of the landfill and its surroundings, and
- emissions (including leachate) from the landfill, taking into account the limits for those specific parameters in this section, will present no additional risk to the environment according to a risk assessment."

H.2.28 In summary[30], up to three times limit values may be considered with the exception of the following parameters:

- DOC in class A, B and C landfills
- BTEX, PCBs and mineral oil in class A landfills
- TOC and pH in class B landfills in case of co-disposal
- LOI and/or TOC in class C landfills
- Possible increase of the limit value for TOC in class A landfills to only two times the limit value

H.2.29 Most of the Member States have fully implemented the WAC Decision provisions related to possibilities of higher limits and have incorporated provisions to establish registers about such permits in order to be able to report the information to the EU Commission[31].

H.2.30 In a number of EU states, including Belgium and the Netherlands, a derogation for a number of the WAC parameters has been granted to facilitate landfilling of solidified FGT residue in hazardous cells (particularly for total dissolved salts and lead).

H.2.31 MEHL, under its existing EPA Licence (W0129-02) has agreed with the Agency up to three times limits on certain inert waste parameters, and it is proposed that this arrangement is maintained.

H.2.32 As part of the application for an integrated waste management facility, MEHL is seeking to apply higher limit values for solidified FGT residues consigned to hazardous landfill.

H.2.33 As part of the hydrogeological Quantitative Risk Assessment (QRA), all contaminants which have leachate WAC defined have been modelled at three times the relevant WAC criteria for hazardous, non-hazardous and inert waste. No impact on groundwater was observed with the landfill liner in place (please see Attachment **I.4** for further details).

[30] European Commission/BIPRO (23/12/2009) *Assessing Legal Compliance with and Implementation of the Waste Acceptance Criteria and Procedures by the EU-15; page 27*

[31] European Commission/BIPRO (23/12/2009) *Assessing Legal Compliance with and Implementation of the Waste Acceptance Criteria and Procedures by the EU-15; page 27*

Granular versus Monolithic

H.2.34 The limit values prescribed under the WAC Decision are for granular wastes[32]. The WAC Decision states that "*Member States shall set criteria for monolithic waste*", in relation to non-hazardous and hazardous landfills. Monolithic criteria set by Member States should provide the same level of environmental protection as specified in the WAC Decision for granular wastes.

H.2.35 It is proposed that FGT residue which has been through the solidification process as a pre-treatment for landfilling at MEHL could be considered a monolithic waste, and monolithic criteria may apply.

H.2.36 European experience on this point varies: pre-treated FGT residues may be consigned to hazardous landfill as either granular or monolithic waste, depending on the criteria set by the relevant Member State. For example, in France pre-treated FGT residues are typically consigned as monolithic waste to hazardous landfill whereas in Flanders (Belgium), pre-treated residues are consigned as granular hazardous waste.

H.2.37 In addition to different waste acceptance criteria, monolithic and granular wastes are also tested differently:

- In the granular test, the sample is crushed; therefore the test does not take into account the physical binding of the FGT residues with cement during the solidification process.
- In the monolithic test, the sample is not crushed; therefore, it takes into account the physical binding of the FGT residues with cement during the solidification process.

H.2.38 A report on WAC implementation in the EU-15[33], in relation to criteria for monolithic waste, states that criteria have been defined by a number of Member States, and noted examples of good practice as follows:

- Specific limit values for parameters (heavy metals) to be tested (Belgium (Flanders));

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[32] We understand that this is currently under review at an EU level by a Committee for the Adaptation to Scientific and Technical Progress of EC-Legislation on Waste (TAC).

[33] European Commission/BIPRO (23/12/2009) *Assessing Legal Compliance with and Implementation of the Waste Acceptance Criteria and Procedures by the EU-15*

- The same criteria and test methods as for the same type of granular waste after the monolithic waste was crushed (e.g. UK Northern Ireland, Sweden, Finland, Denmark, Germany, Denmark);
- Limit values have to be met before the stabilizing process (Austria, Germany);
- Specific provisions for sampling, maturation and leaching test (64 days) as well as specific national leaching limit values are set in the legislation for stabilised hazardous inorganic waste (Netherlands);
- Definition of maturation time (e.g. France, Germany)
- Definition of pH (4 and 11) and size of particle (<10 mm) before the leaching test (Germany);
- Additional limit values such as electrical conductivity and certain pH level to be met by monolithic waste (UK England/Wales, UK Scotland).

H.3 Waste Handling

Waste recovery operations

H.3.1 The facility is currently licensed (under W0129-02) for Fourth Schedule, Classes 3, 4 and 14 activities, i.e. recycling or reclamation of metals and metal compounds; recycling or reclamation of other inorganic materials; and storage of waste intended for recovery. No change is proposed as part of this application.

H.3.2 Mobile recovery equipment is used on site currently and it is intended to maintain this activity as part of the integrated waste management facility. Standard crushing, screening and grading technologies are used for the recovery of construction-type materials. Magnetic separation may be applied for recovery of metals.

H.3.3 Recovery operations, comprising mobile crushing, screening, grading and conveyor equipment, are proposed to be retained. This activity will be located opposite the solidification plant in the east of the site, on the quarry 'floor' (see Drawing **WLA-03**), thereby mitigating any potential environmental impacts.

Solidification of FGT residue

H.3.4 The European Commission Waste Treatment BREF[34] contains the determined Best Available Techniques (BAT) for the waste treatment sector. It identifies a number of treatment options including stabilisation / solidification, vitrification or washing technologies for the pre-treatment of hazardous waste prior to landfill. Stabilisation and solidification processes are commonly used for the treatment of combustion ashes and flue-gas cleaning residues. A number of extracts from the BREF note, which relate to solidification, including a listing of a number of European reference solidification plants, are provided in the following Appendix:

Appendix H.3.1: Solidification extracts from European Commission Waste Treatment BREF

H.3.5 Cement solidification involves the mixing of wastes with cement (or alternative materials) and additives (to control the properties of the cement), and enough water to ensure that hydration reactions will take place to bind the cement. Both stabilisation and solidification processes take place. The wastes are thereby incorporated into the cement matrix.

H.3.6 The extent and nature of pre-treatment will depend on the residue properties and the acceptance criteria at the landfill. Typically, the process involves mixing cement/binders, water and the residues together on a continuous basis or in a batch process. Hydrochloric acid (HCl) is typically required to modify the pH.

[34] European Commission (August 2006) *Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for the Waste Treatments Industries*

Figure H.3.1: Solidified FGT Residue

Proposed outline solidification procedure at MEHL

H.3.7 FGT residue will be delivered to the site in fully enclosed tankers only.

H.3.8 A summary flowchart of the solidification process proposed at MEHL is provided in Figure **D.3.1** below. The operational process around solidification includes:

xi. unloading

xii. weighing

xiii. mixing

xiv. discharging to IBC bags

xv. labelling

xvi. conveying/transportation to the storage building

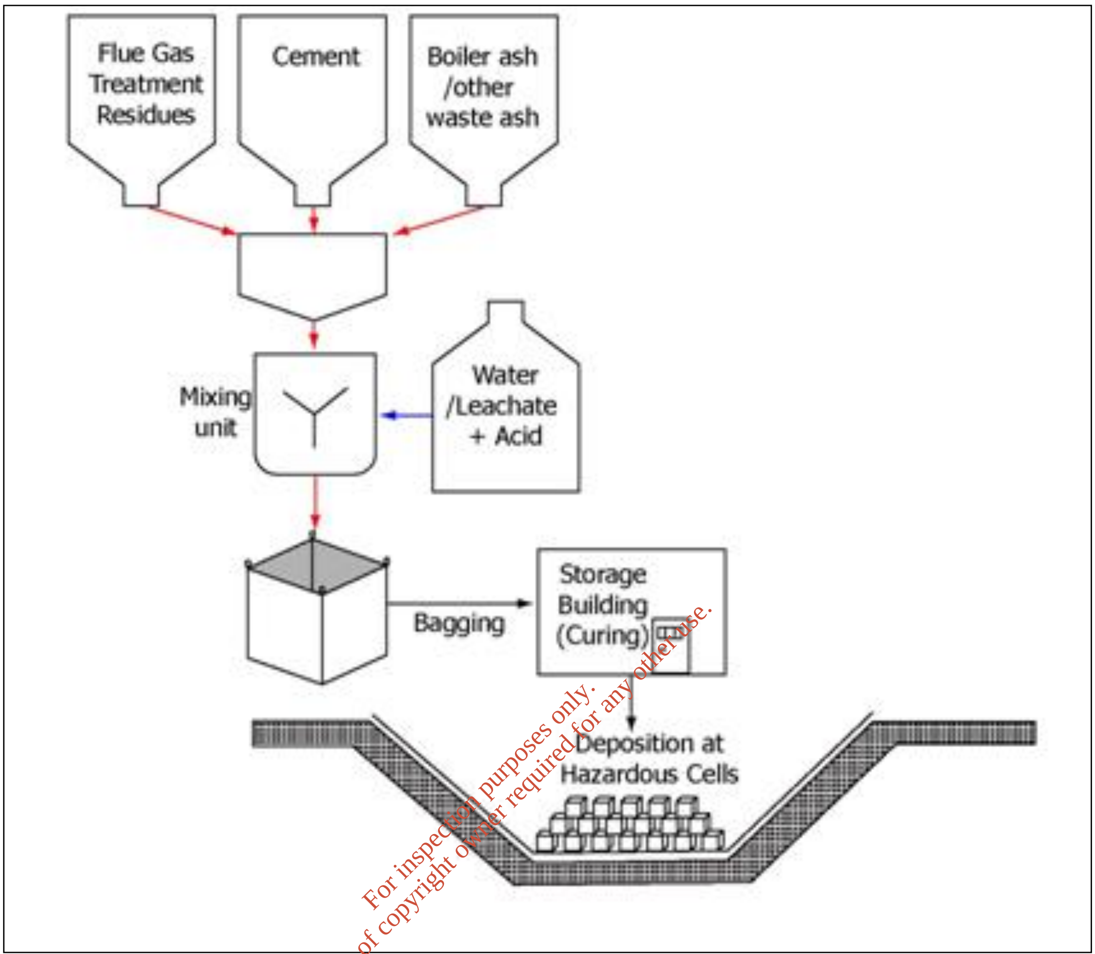
xvii. storage of solidified blocks/IBC bags

xviii. Placement of solidified blocks/IBC bags to temporary storage area within landfill cell

xix. WAC testing

xx. Placement of solidified blocks/IBC bags in landfill cell

Figure D.3.1: Summary Flowchart of Proposed Solidification Process



i. Unloading

H.3.9 Upon arrival at the MEHL facility, the enclosed tanker containing the FGT residue will be weighed in at the weighbridge and directed to the solidification plant for unloading. The tanker will drive into the solidification building and the doors of the building will automatically close once the vehicle is positioned inside the building. An exhaust extractor will be connected to the tanker tractor unit to ensure exhaust fumes are removed from the building. The tanker will directly pump the material (via a controlled manifold) into a stainless steel silo via a fully enclosed pumping system. This operation will be controlled and supervised by a MEHL trained member of staff.

H.3.10 The empty vehicle will then exit the site via the weighbridge and wheelwash.

ii. Weighing

H.3.11 From the silo, material will be pumped directly to the mixing unit where cement (or suitable replacement), water/leachate and acid will be added at a controlled rate using an electronic process control system.

iii. Mixing

H.3.12 The process undertaken at the proposed solidification plant will be similar to the one operated at an established reference plant in Belgium[35]. In Belgium, the solidification plant binds FGT residues and boiler ash with cement, acid and water in a batch process. The liquid added to the process is leachate from the nearby landfill.

H.3.13 While it is considered likely that the mixing ratios at the proposed MEHL facility will be similar to those at the reference plant in Belgium, the final ratios of residue to cement, water (leachate) and additives will be defined following a pilot study pre-operation, as the specific mixing ratio is dependent on the composition of the FGT residues, which can vary between individual waste-to-energy plants. As is the case in Europe, waste ash material from other sources, where available, could also be used in the solidification process, as the pozzolanic[36] properties of such ash material could reduce the quantities of cement required in the process.

iv. Discharging to IBC bags

H.3.14 The mixed material will be dispensed into IBC bags[37] at the solidification plant in order to form solidified blocks. At and from this point in the solidification process (output from the mixing unit), the FGT residue is effectively 'locked into' the mixed material, and there is no risk of ash particles becoming airborne.

v. Labelling

H.3.15 Each and every IBC bag will be labelled to denote date and batch number identification. A bespoke printing system will be used (already in use in industrial facilities) to print the traceability code on all sides of the IBC bags containing the solidified blocks, which means that during the holding time in the storage building and once placed in the landfill cell, the traceability code will be visible from every face of each IBC bag.

[35] Indaver facility in Antwerp
[36] Exhibits cementitious properties
[37] Intermediate bulk containers

vi. Conveying/transportation to the Storage Building

H.3.16 IBC bags will be conveyed from the solidification plant to the adjacent storage building, either via an underground mechanical conveying system, or the use of plant at surface level.

vii. Storage of Solidified Blocks/IBC bags

H.3.17 The solidified material will be held in the storage building for approximately 2-4 days to cure the material and to facilitate its handling for onward placement in the hazardous landfill cell. The retention time in the storage buildings may be extended beyond 2-4 days, where storage capacity is available.

H.3.18 Management procedures will be implemented, based on the traceability codes/dates printed on individual blocks/IBC bags, to ensure blocks are retained in the storage building for the appropriate retention time.

H.3.19 Stacking of IBC bags/blocks in the storage building will only be possible where blocks are sufficiently solid to do so, and in line with requisite safety requirements.

viii. Placement of Solidified Blocks/IBC Bags to Temporary Storage area within Landfill Cell

H.3.20 Solidified IBC bags/blocks will be transported from the storage building when the storage building capacity is full, by MEHL site vehicles, to a temporary storage area within the active hazardous landfill cell. It is proposed that MEHL plant required for this operation will include a teleporter and tractor-trailer, or suitable equivalent.

H.3.21 The temporary storage area will be covered in order to avoid the solidified material coming in contact with rain and thus prevent the generation of leachate. When the solidified plant is not operating at peak capacity and the available storage capacity in the storage building is significantly greater than 2 to 4 days it should be possible to move the solidified material directly from the storage building to the final destination in the hazardous landfill cell.

ix. WAC Testing

H.3.22 In line with European experience, it is proposed initially to undertake WAC testing of the solidified material at approximately 28 days after the material has been subject to the solidification process. Based on current guidance, this is the maximum length of time required to fully cure the solidified material and immobilise certain heavy metals and other parameters within the solidified mass.

H.3.23 Initially it is proposed to test the solidified material for compliance with WAC after 28 days; however it is envisaged that the material could comply with WAC sooner and therefore, in agreement with the EPA, the solidified material could be tested and deposited in its final destination in the hazardous landfill cell earlier than 28 days.

H.3.24 The waste placement procedure for the hazardous cell will make a very clear differentiation between material which is less than 28 days and yet subject to WAC testing, and that which has been subject to, and proven to meet, required WAC.

H.3.25 In the unlikely event (based on experience at reference site(s)) of the solidified material breaching WAC criteria, its traceability code can be used to identify the exact positioning of that IBC Bag/block within the cell (and its related batch, if necessary). It will be possible to remove the IBC Bag(s)/block(s) and relocate to the storage building for further curing, as necessary.

x. Placement of Solidified Blocks/IBC Bags in Landfill Cell

H.3.26 Where material has been placed in temporary storage after WAC testing has been completed the solidified blocks/IBC Bags will be moved from the temporary storage area to the active landfill cell.

H.3.27 A detailed waste placement plan tied into the software at the weighbridge will be maintained to ensure blocks are deposited in an appropriate and fully traceable manner in to the temporary storage area.

Conclusion: Solidification

H.3.28 The solidification proposals outlined, including containment of the mixed material in IBC bags and curing of the material prior to placement in landfill cell, are deemed to offer a superior level of operational control and environmental best practice.

Landfilling: Landfill Tipping Zones

H.3.29 MEHL has developed a bespoke and effective management tool for recording the location of waste placement under W0129-02, which is proposed to be employed and further developed for the proposed inert, non-hazardous and hazardous landfill cells going forward. A schematic showing the 'landfill tipping zones' is attached as the following Appendix:

Appendix H.3.2: Schematic of 'landfill tipping zones' (existing under W0129-02)

H.3.30 Under the waste placement procedure, each active landfill cell is subdivided into manageable areas or grids approximately 30m x 30m. Each grid is given a unique reference number, e.g. Cell 1 (C1) is subdivided into 6 grids: C1/A, C1/B, C1/C, C1/D, C1/E and C1/F. Furthermore the cell grids are identifiable on the vertical scale also: each vertical 'lift' is approximately 3m high and is denoted by a numbered suffix to the cell grid reference. The first lift (closest to the landfill liner) is denoted by '-1'. For example, the cell grid reference 'C1/A6' denotes: Cell 1, grid A, 6th lift; 'C4/K1' denotes: Cell 4, grid K, 1st lift.

H.3.31 The tipping zones drawing is held in both the weighbridge office and at the tipping face. The Facility Manager agrees the active tipping grid for a given day/week and informs the weighbridge staff and banksman. The appropriate tipping zone is recorded at the weighbridge for each incoming waste load.

Bottom Ash Handling Procedures

H.3.32 Bottom ash will be subject to WAC testing before arriving on site, as detailed in Attachment **H.2**. Testing will determine the appropriate class of landfill for disposal.

H.3.33 The phasing timeline for the MEHL integrated waste management facility (outlined in Attachment **D.2**) indicates that non-hazardous landfill capacity will not be constructed at the facility until Phase 2 operations. During Phase 1, any incoming incinerator bottom ash received at the facility will be directed to the active hazardous landfill cell. This arrangement facilities a superior level of control (within the hazardous landfill cell) and allows for a period of ongoing testing and verification of the classification and behaviour of incinerator bottom ash, as may be required.

H.3.34 Bottom ash will be transported in covered containers and deposited directly onto the cell floor. A detailed deposition plan for bottom ash will be developed and agreed with the Agency, to act as a comprehensive record of waste placement (waste placement procedures are further discussed above).

H.3.35 A number of studies have been conducted with reference to elevated temperatures in landfill sites[38], which can be a feature of landfills which accept incinerator bottom ash,

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[38] For example: R. Klein, T. Baumann, E. Kahapka and R. Niessner (1999) *Temperature development in a modern municipal solid waste incineration (MSWI) bottom ash landfill with regard to sustainable waste management*; and R. Klein , N. Nestle, R. Niessner and T. Baumann (2003) *Numerical modelling of the generation and transport of heat in a bottom ash monofill*

and, more generally, in municipal solid waste landfill sites, related to anaerobic biodegradation. The following procedures are proposed for the placement of the bottom ash, to mitigate against potential so-called 'exothermic reactions' within the landfill:

- Maintain a layer to a minimum of 1m thickness between the cell liner and the bottom ash layer, comprised of the 0.5m leachate collection layer and a 0.5m layer of waste soil and stones (or other suitable wastes).
- Bottom ash delivered from energy-from-waste facilities will have been quenched at the energy-from-waste facility, and will be delivered to the site in a dampened state.
- Place the bottom ash in a thin layer (approximately 0.5m in thickness) across the active landfill cell.
- Recirculate the leachate collected from the landfill cell over the waste body.
- Monitor the temperature of the incinerator bottom ash entering the site.

H.3.36 Furthermore, it is also proposed that temperature is monitored (by temperature probe) within the waste body during the first six months of waste acceptance of incinerator bottom ash; temperature monitoring will be continued on an ongoing basis, if required.

H.3.37 International experience shows that bottom ash recovery options are technically feasible; however there are currently no provisions for reuse/recovery of bottom ash in Ireland, largely relating to market conditions and lack of economic or regulatory drivers. Recovery of bottom ash may be possible in the future and it is proposed that waste placement at MEHL is controlled and recorded in a manner which could facilitate its future extraction from the site. This principle is sometimes referred to as 'Design to Mine'.

Contaminated Soil & Other General Waste Streams Handling Procedures

H.3.38 All waste types received at the facility will be subject to prior verification by MEHL in accordance with the licence requirements. Therefore only pre-approved materials will present at the facility for disposal. The classification of the material will be determined using appropriate waste characterisation testing and identification under the appropriate European Waste Catalogue (EWC Code) code reference.

H.3.39 Upon arrival of material at the site, the weighbridge operator will direct the vehicle to the appropriate cell depending on the determination and classification of the waste. Operatives trained to direct and handle waste will guide the waste delivery to the appropriate location within the cell for waste placement. Soils will be deposited directly into the cell. Where necessary, contaminated soils will be covered with a layer of clay directly after deposition to minimise any potential fugitive emissions.

H.3.40 No remediation of contaminated soils is proposed. Only contaminated soils which comply with the WAC testing will be accepted, for inert, non-hazardous or hazardous landfilling, as appropriate. The hydrogeological model, completed for the purpose of environmental impact assessment, has modelled the performance of the hazardous cell containment system in line with WAC limit values (and 'times 3' limit values). Further details are contained in Quantitative Risk Assessment, included in Appendix **I.4.3**.

Inert Waste Handling Procedure

H.3.41 Inert wastes generally do not require specialist handling. Inert waste handling processes will be as per existing established and agreed practices and procedures currently employed by MEHL under W0129-02; see following appendix:

Appendix H.3.3: W0129-02 Waste Placement Procedure (current)

H.3.42 Waste will be deposited directly on the landfill surface at the active tipping zone. Deposited waste will be spread in shallow layers on an inclined surface and compacted with a combination of waste delivery vehicles transporting waste to the landfill cells and a dozer. The dozer will operate on the gradient of the more shallow face, pushing thin layers of waste and applying compaction pressure to them.

Temporary Cover

H.3.43 As required, the working area at each cell will be covered with temporary capping material. At the non-hazardous cells this may comprise a quantity of suitable soil or other suitable temporary capping material. For the hazardous cell, in order to minimise the generation of leachate, the soils and ash wastes will be graded to falls and a reusable temporary landfill covers, i.e. geomembranes may be used which can be positioned over the working area at the end of each day and moved to a new location the next day. The impermeable cover will deflect the rainwater from the active cell to assist in minimising leachate volumes and/or improve the quality of leachate generated. Other alternative systems such as inflatable temporary cover systems or systems similar to those used in the construction of composting tunnels may also be considered as operational practices.

Biodegradable Waste Diversion Targets

H.3.44 Diversion targets for biodegradable waste are not deemed relevant to the proposed integrated waste management facility, as non-biodegradable wastes only will be accepted.

H.4 Waste Arisings

H.4.1 Any excess spoil generated as a result of proposed construction activities will be reused on site insofar as possible, stockpiled for restoration activities, or removed off-site to an appropriately permitted/licensed facility. Detailed materials balance calculations have been completed for the proposed development, as detailed in Attachment **G.1**.

H.4.2 Waste generation associated with operations of the proposed integrated waste management facility is anticipated to be minimal. General municipal-type waste and recyclables will be generated as a result of office and staff mess facilities. Only permitted/licensed waste collectors and facilities, with EPA pre-approval, will be used for removal off-site. Details of the off-site facilities approved under W0129-02 are included in the following appendix:

Appendix H.4.1: Off-site Recovery and Disposal Facilities, agreed with the Agency under W0129-02

H.4.3 Small volumes of non-acceptable waste/recyclables may be required to be removed off-site, comprising materials removed from incoming C&D-type waste (during the operation of the existing MEHL inert facility (under W0129-01 and -02), typically 1 to 2 small skip-loads of such material have been moved off-site per annum).

H.4.4 It is proposed that leachate generated on-site will be re-used within the solidification plant, with excess to be removed off-site to an appropriately licensed facility, as required (further detailed in Attachment **D.4**).

Attachment I

Existing Environment and Impact of the Facility

Attachment I: Existing Environment & Impact of the Facility

I.0 Background

I.0.1 The site is a former quarry and the facility is an existing and operational inert landfill (EPA Licence W0129-02). A full environmental impact assessment has been completed for the proposed integrated waste management facility. The EIS (authored by Arup (December 2010)) is attached to this Waste Licence Application; relevant text **extracts** are provided throughout Attachment I, as requested by the Agency.

I.1 Assessment of atmospheric emissions

I.1.1 Chapter 9 of the EIS presents the results of an assessment of the impact on air quality of the proposed MEHL integrated waste management facility during construction and during operation. Key extracts are provided here in the Waste Licence Application; the full EIS (authored by Arup) accompanies this application.

Receiving Environment

EPA Background Concentrations

I.1.2 The EPA is the designated Competent Authority in Ireland for the co-ordination of ambient air quality monitoring in accordance with EU Directives. The most recent report relating to the monitoring of ambient air at a number of locations around Ireland is 'Air Quality in Ireland 2009 – Key Indicators of Ambient Air Quality' (EPA, 2010). This report outlines the scope and range of monitoring carried out throughout the country during that period. A number of the parameters examined as part of this air quality assessment are reported by the EPA. The EPA carries out ambient air quality monitoring under the specific requirements of the Air Quality Standards Regulations, 2002.

I.1.3 The regulations require that the EPA provide the public with information on ambient air quality. The regulations are a result of the Air Framework Directive 96/62/EC. This Directive requires that Member States divide their territory into zones for the assessment and management of air quality. In Ireland's case there are four zones ranging from Zone A to Zone D. The areas covered by the Zones are as follows:

- Zone A: Dublin City and environs
- Zone B: Cork City and environs
- Zone C: 16 urban areas with population greater than 15,000
- Zone D: Remainder of State (excluding Zones A, B and C)

I.1.4 The extent of monitoring and assessment in each zone is determined by population size and air quality status. The proposed development falls within Zone D. Average values were obtained from monitoring stations within Zone D which collated one year of continuous monitoring data (refer to Table **I.1.1**). All measured values are easily in compliance with relevant limit values.

I.1.5 Fingal County Council has been granted planning permission for a landfill facility in Tooman-Nevitt, Lusk, Co. Dublin (Waste Licence W0231-01). As this facility is approximately 2km from the proposed site, no cumulative impacts are anticipated and it is not considered further.

Table I.1.1: Annual Mean Background Pollutant Concentrations for Zone D (EPA, 2010)

	Annual average NO2 µg/m³	Annual average NOx3 µg/m³	Annual average PM10 µg/m³	Annual average PM2.5 µg/m³	Annual average CO µg/m³	Annual average Benzene µg/m³
Measured	7.3	10.3	10.5	111	300	1.41
Limit value	40	30	20/402	253	2,0004	5
Applicable from	2010	2001	2010	2010	2005	2010

1 Measured values from Zone D data.
2 Existing/proposed limits
3 $PM_{2.5}$ has a proposed concentration cap rather than a limit value (CEC, 2005).
4 AQS for annual mean CO is guideline from UK Highways Agency (2003) and UK DEFRA (2003). Directive 2000/69/EC Limit Value of 10,000µg/m^3 is for 8-hour mean CO.

On Site Monitoring

I.1.6 MEHL undertakes dust deposition monitoring biannually at four locations in accordance with their current Environmental Protection Agency (EPA) Waste Licence (No. W0129-02).

I.1.7 According to the 2009 Annual Environmental Report (AER, Murphy Environmental Hollywood Ltd.), dust deposition monitoring results were significantly below the licence limit (350 mg/m^2/day) during both monitoring rounds.

I.1.8 Previously, under Waste Licence No. W0129-01, Murphy Environmental were obliged to undertake dust deposition monitoring once per quarter. The overall exceedance rate for all dust deposition monitoring rounds is 4% with a compliance rate of 96% since operations at the site began in 2003.

Evaluation of Air Quality Impacts

Construction Phase - Construction Activities

I.1.9 The bulk of the construction activities will be undertaken during Phase 1 site activities (refer to *EIS Chapter 5, Construction Activities*) and will comprise the following:

- Construct new site entrance with access road at the southern boundary
- Install and commission services, electricity, telecommunications & water
- Initial landscaping works
- Construct new administration building & site management infrastructure
- Construct and commission leachate management collection infrastructure
- Construct and commission leachate holding tank for hazardous cell H1
- Remove and decommission existing site infrastructure
- Construct and commission surface water management infrastructure
- Excavate natural ground from eastern slope for Solidification Plant
- Construct and commission Solidification Plant and Storage Building
- Construct engineered bund between Non Hazardous and Inert Waste cells
- Construct Hazardous Waste Cell H1
- Commence Operation of Hazardous Waste Cell H1

- Remove inert waste from the existing Inert Waste Cell to Inert Waste Cell IN1
- Construct & partially fill Inert Waste Cell IN1 up to 125m OD Malin
- Complete the capping & restoration of Inert Waste Cells C1, C2
- Cap and restore Hazardous Waste Cell H1 at the end of Phase 1/beginning of Phase 2
- Construct Hazardous Waste Cell H2 at the end of Phase 1/beginning of Phase 2
- Operate Inert Waste Cell C5
- Construct Inert Waste Cell IN3 at the end of Phase 1/beginning of Phase 2
- Construct and commission stormwater wetlands treatment area in the north of the site

I.1.10 During Phase 1, the site can be considered of moderate scale as specified in the NRA guidance (2006). This has the potential to result in significant soiling effects within 50m and significant PM_{10} and vegetation effects within 15m of the works.

I.1.11 Two private residential properties adjoin the southern boundary. Refer to *EIS Figure 9.1*. The closest is located approximately 210m from the main construction works associated with the solidification plant and new site management infrastructure. The receptor is also located approximately 284m from the closest hazardous waste cell. The closest inert cell will be located approximately 48m to the west and the closest non hazardous waste cell will be located approximately 85m to the north.

I.1.12 Based on the distance of the closest sensitive receptor to the proposed works no significant PM_{10} or vegetation effects are anticipated following the implementation of standard mitigation measures. However, the construction of inert cell IN1, at approximately 48m from the receptor has the potential to result in significant dust deposition at this receptor following the implementation of standard mitigation measures.

I.1.13 Given the scale of the works during the remaining phases, i.e. excavation of made ground, construction of waste cells and construction of permanent restoration caps and the proximity of these works to the closest sensitive receptor, no significant PM_{10}, vegetation or soiling effects are anticipated with standard mitigation in place.

I.1.14 It is proposed to use Dense Asphaltic Concrete (DAC) for lining of the base and walls of hazardous waste cells. Given the proximity of the closest sensitive receptor to the proposed hazardous waste cells (approximately 284m), no significant air quality impact is envisaged.

Construction Phase - Construction Traffic

I.1.15 During the construction phase, no routes are predicted to achieve a significant increase in traffic volumes.

Operational Phase - Operational Traffic

I.1.16 During the operational phase, no routes are predicted to achieve a significant increase in traffic volumes.

Operational Phase - Odour

I.1.17 The following material will be received at the landfill:

- Inert waste
- Non-biodegradable, solid non-hazardous wastes
- Suitable hazardous wastes

I.1.18 Odours from landfills are typically caused by the decomposition of waste.

I.1.19 The proposed MEHL facility will not accept any biodegradable waste materials. Hence the potential for odour nuisance presented by traditional municipal landfill facilities will not occur at the MEHL facility.

I.1.20 Hydrocarbon contaminated soils may have the potential to release fugitive odorous VOC emissions. Operational control procedures will be implemented to ensure that such wastes are covered or treated as appropriate to prevent fugitive odour emissions.

I.1.21 Inert waste and inert waste handling processes will be as per the established and agreed procedures currently specified under the existing waste licence W0129-02. MEHL have not received any odour complaints in relation to current operations at the site. No significant odour impacts are anticipated as a result of the continuation of these operations at the site.

I.1.22 Non-hazardous wastes will be transported in either enclosed containers or covered vehicles and deposited directly into the waste cell. Non-hazardous waste streams will typically comprise bottom ash and non-hazardous soils and stones. The closest receptor is located approximately 85m from the proposed non-hazardous waste cell. No significant odour impact as a result of the landfilling of non-hazardous waste is anticipated.

I.1.23 Hazardous wastes will either be transported directly to the solidification plant or to the hazardous waste cells according to the waste type and characterisation. Hazardous waste in the form of flue gas treatment residues specified for pre-treatment in the solidification plant will be transported by fully enclosed tankers to the site and will be pumped via an enclosed system into a steel silo, inside an enclosed building. From the silo the residues will be pumped directly into the mixing unit. The residues will then be mixed, bagged, cured and deposited within the cell. There will be no odour potential from the flue gas treatment residues or the solidification process.

I.1.24 Hazardous wastes which do not require pre-treatment in the solidification plant will be transported to the site in covered or fully enclosed containers, in accordance with regulatory requirements. The wastes will then be deposited directly onto the hazardous cell floor. The closest sensitive receptor is located approximately 284m from closest hazardous waste cell therefore no significant odour impact is anticipated.

I.1.25 As both hazardous and non hazardous leachate will be stored in closed concrete tanks, no odour impact from the storage of leachate is likely to occur.

Operational Phase - Fugitive Emissions

VOCs

I.1.26 Fugitive VOC emissions could potentially arise from the handling of contaminated soils on site. Where required by the Waste Acceptance Criteria, contaminated soils may be stored within the hazardous waste cells, the closest of which is located approximately 284m from the closest sensitive receptor.

I.1.27 Given the distance to the closest sensitive receptor and the insignificant amount of VOCs likely to be generated, no significant air quality impact is anticipated as a result of landfilling of contaminated soils.

I.1.28 As it is proposed to accept only wastes that are non-biodegradable, no other landfill gases, e.g. methane will be generated and landfill gas infrastructure is not required.

Heavy Metals

I.1.29 Flue gas treatment residues will be transported to the site using fully enclosed containers. Other approved hazardous wastes will be transported to the site in covered vehicles. The wastes will either be directed to the solidification plant or will be deposited directly into the waste cell.

I.1.30 Where heavy metals are present in FGT residues, they are retained within the solidified wastes and will not cause fugitive emissions. No significant air quality impact from heavy metals is anticipated.

Dust

I.1.31 Fugitive dust emission may arise during the normal day to day activities on site i.e. transportation, handling and processing of waste. The potential for fugitive dust emissions from each of the proposed waste streams is discussed below.

I.1.32 For inert wastes, dust deposition monitoring for the existing facility has demonstrated that monitored levels are generally well below the licensed limit. No significant dust impact is anticipated as a result of the continued acceptance of inert waste on site.

I.1.33 Non-hazardous wastes will be transported in either enclosed containers or covered vehicles and deposited in the non-hazardous cell in accordance with waste placement procedures and as required by a waste licence. Non-hazardous waste streams will typically comprise bottom ash and non-hazardous soils and stones. The closest receptor, R1, is located approximately 85m from the proposed non-hazardous waste cell. The ash has similar properties to those of wet earth/gravel. However, there is potential for dust to impact neighbouring properties if no mitigation is implemented and if the ash is allowed to dry out.

I.1.34 Flue gas treatment (FGT) residues will be disposed of at the facility. These residues are classified as dangerous to the aquatic environment. However they are not classified as toxic to humans. These materials will be transported to the facility in sealed containers and transferred pneumatically, within an enclosed building, to a storage silo provided with a vent filter. After processing to solidify the residue it no longer has the potential to generate fugitive emissions.

I.1.35 Hence no impact on the air quality environment is predicted to result from potential fugitive emissions.

I.1.36 Other hazardous wastes, not intended for the solidification plant will be placed directly in the cell. Given the distance to the closest sensitive receptor (approximately 284m, R1) and the containment measures proposed, no significant impact as a result of fugitive dust is anticipated.

Mitigation Measures

Construction Phase - Construction Activities

I.1.37 The Contractor will be obliged to comply with the dust deposition limits set by the existing EPA Waste Licence.

I.1.38 The Contractor will compile a Dust Minimisation Plan. The mitigation measures detailed below will form part of the Dust Minimisation Plan.

I.1.39 At all times, the procedures put in place will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, satisfactory procedures will be implemented by the Contractor to rectify the problem.

I.1.40 The Dust Minimisation Plan will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.

I.1.41 The following avoidance, remedial or reductive measures will be implemented as part of the Dust Minimisation Plan:

- In the unlikely event that stockpiled material dries out and has the potential to release dust, the stockpile will be covered entirely by impervious sheeting or sprayed with water.
- Any dust-generating material being removed from site will be transported in covered trucks.
- Exhaust emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be minimised by the Contractor; this will include an appropriate regime of planned preventative maintenance for machinery.
- Training will be completed by relevant personnel on how to control dust emissions from construction activities.
- The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors.

Construction Phase -Construction Traffic

I.1.42 No mitigation measures are required as no negative impacts on air quality are predicted.

Operational Phase - Operational Traffic

I.1.43 No mitigation measures are required as no negative impacts on air quality are predicted.

Operational Phase - Fugitive Emissions

I.1.44 Dust monitoring will continue as per the existing waste licence or any revised waste licence issued by the Environmental Protection Agency. In addition the following mitigation measures will be undertaken:

- Waste cells, particularly hazardous and non-hazardous cells, will be covered daily as necessary in order to minimise fugitive dust emissions.
- Water sprays will be used to ensure that boiler/bottom ash will not dry out and during dry or windy conditions to minimise the potential for dust dispersion. Bottom ash will be quenched in the facilities in which it arises and will be delivered to site damp.
- Water sprays will be used, as required, during dry or windy conditions.
- The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors.

Operational Phase - Odour Emissions

I.1.45 Routine walkovers of the site will be carried out to ensure that any odour emissions with off-site nuisance potential are identified and measures taken to minimise odour, e.g. covering.

Residual Impacts

Construction Phase

I.1.46 Following the implementation of all mitigation measures outlined above, no significant soiling effects will be experienced at the nearest sensitive receptors.

Operational Phase

I.1.47 The residual impact on air quality as a result of the proposed scheme will not be significant following the implementation of all mitigation measures.

I.2 Assessment of impacts of surface water discharges on the receiving waters

I.2.1 Chapter 15 of the EIS consists of a hydrological impact assessment of the proposed MEHL integrated waste management facility. This chapter provides a description of the existing hydrological environment and a statement of the likely significant hydrological impacts associated with both the construction and operational phases of the proposed scheme. Measures to mitigate the likely significant impacts are outlined, and residual impacts described. Key extracts are provided here in the Waste Licence Application; the full EIS (authored by Arup) accompanies this application.

Baseline Hydrological Environment

Introduction

I.2.2 A stream flows along the northern boundary of the MEHL facility (Refer to *EIS Figure 15.1*). This stream is a tributary of the Ballough Stream. (This tributary is referred to in this document as the "stream which flows along the northern site boundary") The Ballough Stream is a salmonid river of county significance. The Ballough Stream (sometimes referred to as the Corduff River) flows into the Ballyboghill Stream and forms part of the upper sections of the most northern sub-catchment of the Ballyboghill Streams catchment. The Environmental Protection Agency (EPA) designated codes for the Ballyboghill and Ballough Streams are 08B01 and 08B03 respectively.

I.2.3 The Ballyboghill Stream is the principal freshwater river system that flows into Rogerstown Estuary. This estuary is a protected ecological site designated as a candidate Special Area of Conservation (cSAC) (site code 000208) and a Special Protection Area (SPA) due to its status as a feeding ground for coastal bird populations.

Catchment Character

I.2.4 Ireland is divided into 40 hydrometric areas by the EPA for the purposes of hydrological monitoring. Each hydrometric area comprises a single large river basin, or a group of smaller ones and neighbouring coastal areas. The Ballyboghill Stream and its tributaries are included in Hydrometric Area 08 *Nanny/Devlin Coastal Catchment* and Hydrometric Area 08 is part of the Eastern River Basin District (ERBD). Although Hydrometric Area 08 (HA08) is called "*Nanny/Devlin Coastal Catchment*", the Ballyboghill Stream Catchment does not form part of the Nanny or Devlin catchments (i.e. it doesn't flow into either of these catchments). The Ballyboghill Stream is an independent catchment within HA08 (it flows directly into the Rogerstown Estuary). Refer to *EIS Figure 15.1*. Further details on hydrometric areas and catchments can be found on the EPA website.

I.2.5 The Ballyboghill Catchment is approximately 58km^2 in area of which the Ballough Stream sub-catchment comprises 32km^2. The Ballyboghill Catchment exhibits a dendritic drainage pattern in general. The Ballough Stream tributary that runs along the northern boundary of the proposed MEHL facility area has an upstream catchment of approximately 0.7km^2 inclusive of the proposed MEHL facility area (EPA, 2007).

I.2.6 The principal environmental pressures on the hydrological environment in HA08 are considered to be from the agricultural sector, with approximately 91% of the hydrometric area being utilised by this industry. Pasture land comprises approximately 45% of the total area, while 46% is utilised for arable land and crop cultivation including intensive market gardening to supply the Dublin and east coast markets (EPA, 2007).

I.2.7 HA08 does not contain any significant peatlands or managed forests, though there are significant tracts of broadleaf forest and beach/dune systems along the coast.

I.2.8 Other pressures on the hydrological environment consist of population growth (residential and tourists), industrial production and the transportation network.

I.2.9 Environmental pressures on the hydrological environment and consequently aquatic ecology arise through a range of sources. These sources include:

- Diffuse sources such as agriculture
- Point sources such as industry
- Waste disposal
- Recreation and tourism

I.2.10 These sources affect the status of surface water quality throughout this hydrometric area of the ERBD including the Ballyboghill Catchment (ERBDA, 2005). Within the Ballyboghill Catchment, agricultural runoff can be considered to be the dominant cause of poor water quality. The Ballyboghill Catchment features livestock farming and intensive arable and market gardening towards the coastline to the east. There are currently no IPPC or Waste Licensed facilities upstream of the proposed MEHL facility which could have an impact on surface water quality or flow. There are two waste facilities in the catchment area permitted to accept inert soil and stone.

I.2.11 It should be noted that in general, HA08 (which the Ballyboghill Catchment is part of), contains the least well drained soils in the ERBD with 52% of soil either imperfect or poorly drained, and a further 44% only moderately drained. Allied with the increased intensity of arable practices, which generally relies on higher inputs of fertiliser, the situation arises where increased polluting run off might be generated in this catchment.

I.2.12 The stream network adjacent to the proposed MEHL facility is fed by surface water runoff from the catchment as well as from groundwater. During the site visit, local landowners situated adjacent to the proposed MEHL facility indicated that groundwater levels have in the past affected surface water levels in the stream network and that groundwater springs feed the streams. The effect of groundwater on surface water levels is discussed in further detail in the *EIS Chapter 14: Soils, Geology and Hydrogeology.*

Flood Risk

I.2.13 The proposed MEHL facility is located in the north western section of the Ballough Stream catchment in the vicinity of its source. The Ballough Stream catchment is a sub-catchment of the Ballyboghill catchment. The MEHL facility site ranges from 92 to 148m OD and is located at the boundary between the Devlin catchment and the highest point of the Ballyboghill catchment. The proposed MEHL facility is thus located in the vicinity of the catchment divide and as such is not in an area conducive to flood risk. The surrounding topography does not favour retention of surface water on the site and the stream flowing along the northern site boundary does not demonstrate a capacity for significant flows which would overtop the channel and enter adjacent land.

I.2.14 There has been no previous record of flood risk in the vicinity of the proposed MEHL facility according to the OPW flood risk website. The proposed MEHL facility is located at the highest point of the Ballyboghill catchment. There has been one flood incident recorded on the Ballough Stream in 2008 however, the location of the flooding was approximately 5km south east and downstream of the proposed MEHL facility site. This flooding incident occurred during an exceptional rainfall event after a prolonged wet summer which prevented significant ground infiltration of rainfall. In summary, the proposed MEHL facility is not located in an area conducive to flood risk.

I.2.15 There are currently no OPW flow gauges present within the Ballyboghill Catchment or any of its sub-catchments. There was a gauging station on the main Ballyboghill Stream between 1980 and 1999 that fell under the jurisdiction of the EPA. This gauging station recorded nearly twenty years of data for the main channel. The 95% ile flow for the main stream for that period was 0.005 m^3/s with an average annual rainfall for that period of 799 mm / annum.

Surface Water Flow

I.2.16 The stream which flows along the northern site boundary was assessed for its flow in May 2010. In stream flow gauging indicated a flow of 2 l/s. Currently, the landholding area of the site is 54.4 ha, of which approximately 39.8 ha is currently licensed by the EPA as an inert landfill facility. The surface water collected within this licensed area is attenuated through two inline sedimentation ponds with a volume of approximately 600 m^3 and has a controlled discharge to the stream. The lands outside the active landfill drain to the stream via existing open drains along the boundary. Surface water discharged outside the active landfill is not controlled.

Water Quality - Biological Quality

I.2.17 The biological quality of both the Ballyboghill and Ballough Streams are assessed by the EPA. The most recent data arises from their 2005 River Water Quality Status Report. Table **I.2.1** provides the quality status of the Ballyboghill Stream while Table **I.2.2** provides the quality status of the Ballough Stream (EPA, 2007). Refer also to *EIS Figure 15.2* which shows the vulnerability of these streams.

Table I.2.1: Ballyboghill Stream Q-Ratings

Station No.	Station Location	Year				
		1991	1996	1998	2001	2005
1900	Br near Wyanstown	-	2	3	3-4	3
2200	Br at Ballyboghill	3	3	3	3/0	3

I.2.18 According to the 2005 report, the EPA classified the Ballyboghill Stream as having Poor status and that the complete absence of pollution sensitive species in the Ballyboghill Stream indicated that considerable ecological disruption was taking place along its course and that the most likely source of the disruption was due to agricultural runoff (EPA, 2007).

Table I.2.2: Ballough Stream Q-Ratings

Station No.	Station Location	Year				
		1991	1996	1998	2001	2005
1600	Corduff Br	3	3	3	3-4	3

I.2.19 The EPA classified the Ballough Stream in 2005 as poor also with a noted deterioration from the previous assessment. The stream exhibited an unbalanced and restricted faunal distribution which indicates significant water quality impairment. Agriculture is considered to be the source of the poor status as it accounts for 97% of the land use in this catchments area (EPA, 2007).

Water Quality - Physico-chemical Quality

I.2.20 As part of its environmental commitments, MEHL conducts monitoring of surface waters as an integral component of its waste licence requirements (W0129-02). (There is also a requirement under the waste licence for surface water discharge monitoring). Surface waters are monitored at two points (SW1 and SW2) along the stream which flows along the northern site boundary, upstream and downstream of the site. These sample points are illustrated on *EIS Figure 15.1*. Monitoring has been ongoing on a quarterly basis since 2003. The following data indicates the average, maximum and minimum water quality conditions assessed over the past seven years to provide an overview of the existing physico-chemical hydrological conditions. Table **I.2.3** indicates data at SW1 upstream of the site and Table **I.2.4** indicates data at SW2 downstream of the site. Table **I.2.5** indicates data at SW1 for the second quarter of 2010 while Table **I.2.6** indicates data at SW2 for the second quarter of 2010.

Table I.2.3: Summary of Water Quality at SW1 - 2003 - 2009

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
Chloride	mg/l	40.11	18.000	53.000
Conductivity	mS/cm	0.62	0.250	0.950
Calcium	mg/l	126.17	112.000	136.500
Dissolved Oxygen	mg/l	7.53	5.300	10.160
pH	pH	7.90	7.290	8.450

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
Ammoniacal Nitrogen	mg/l NH4-N	0.51	<0.20	2.500
Total Suspended Solids	mg/l	53.19	<10.00	284.000
Temperature	°C	9.46	5.600	12.200
Chemical Oxygen Demand	mg/l	19.77	<15.00	31.000
Sodium	mg/l	24.05	11.880	33.900
Magnesium	mg/l	14.92	<0.05	25.000
Manganese	mg/l	0.37	0.002	1.060
Orthophosphate	mg/l	0.22	<0.03	0.720
Sulphate	mg/l	152.03	31.000	299.000
Total Alkalinity	mg/l	205.19	160.000	280.000

Table I.2.4: Summary of Water Quality at SW2 – 2003-2009

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
Chloride	mg/l	37.36	28.900	47.000
Conductivity	mS/cm	0.87	0.457	3.400
Calcium	mg/l	142.93	134.000	160.000
Dissolved Oxygen	mg/l	8.06	5.300	10.450
pH	pH	7.96	6.910	8.500
Ammoniacal Nitrogen	mg/l NH4-N	0.19	<0.2	0.300
Total Suspended Solids	mg/l	36.44	<10	131.000
Temperature	°C	9.71	5.600	11.500

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
Chemical Oxygen Demand	mg/l	15.02	<15	18.000
Sodium	mg/l	19.48	12.040	32.500
Magnesium	mg/l	14.20	<0.05	19.500
Manganese	mg/l	0.03	0.001	0.123
Orthophosphate	mg/l	0.14	<0.03	0.290
Sulphate	mg/l	170.31	110.000	254.000
Total Alkalinity	mg/l	193.31	130.000	270.000

Water Quality - Surface Water Quality June 2010

Table I.2.5: Summary of Water Quality at SW1 - Q2 2010

Parameter	Unit	Average (7 yr) (2003-2009)	Q2 2010
Chloride	mg/l	40.11	30
Conductivity	mS/cm	0.62	0.86
Calcium	mg/l	126.17	120.7
Dissolved Oxygen	mg/l	7.53	48%
pH	pH	7.90	8.2
Ammoniacal Nitrogen	mg/l NH4-N	0.51	0.06
Total Suspended Solids	mg/l	53.19	18
Temperature	°C	9.46	15.1
Chemical Oxygen Demand	mg/l	19.77	NDP
Sodium	mg/l	24.05	33.2

Parameter	Unit	Average (7 yr) (2003-2009)	Q2 2010
Magnesium	mg/l	14.92	13.6
Manganese	mg/l	0.37	0.009
Orthophosphate	mg/l	0.22	1.31
Sulphate	mg/l	152.03	25.75
Total Alkalinity	mg/l	205.19	NDP

Table I.2.6: Summary of Water Quality at SW2 - Q2 2010

Parameter	Unit	Average (7 yr) (2003-2009)	Q2 2010
Chloride	mg/l	37.36	23.5
Conductivity	mS/cm	0.87	0.82
Calcium	mg/l	142.93	133
Dissolved Oxygen	mg/l	8.06	27%
pH	pH	7.96	8.4
Ammoniacal Nitrogen	mg/l NH4-N	0.19	<0.03
Total Suspended Solids	mg/l	36.44	<10
Temperature	°C	9.71	12.7
Chemical Oxygen Demand	mg/l	15.02	NDP
Sodium	mg/l	19.48	16.5
Magnesium	mg/l	14.20	11
Manganese	mg/l	0.03	0.004

Parameter	Unit	Average (7 yr) (2003-2009)	Q2 2010
Orthophosphate	mg/l	0.14	0.65
Sulphate	mg/l	170.31	8.09
Total Alkalinity	mg/l	193.31	NDP

Morphology

I.2.21 A river's morphology consists of a combination of physical characteristics including catchment drainage patterns, channel shape and size, channel features and sedimentary characteristics.

I.2.22 The stream flowing along the northern site boundary is contained within a small V-shaped river valley that is heavily vegetated. The drainage pattern of the valley exhibits a trellised formation on a small scale, i.e. a relatively straight main channel with tributaries entering at an angle between 70 and 90 degrees. Access to the stream channel itself adjacent to the proposed MEHL facility is difficult due to the density of the vegetation. The stream's morphology is that of a small stream with a sinuous channel that is heavily vegetated on both banks. At the time of the site visit, the stream itself was shallow (less than 30 cm deep at mid channel) with gravels and large clasts forming its bed. The stream does not exhibit extensive in stream vegetative growth. There were no indications of significant erosion or deposition along the stream channel.

I.2.23 The stream water was clear at the time of the site visit indicating low turbidity. Inflowing tributary streams to the main stream were also shallow and clear and exhibited gravel beds with little internal aquatic vegetation.

Aquatic Ecology

I.2.24 The Ballough Stream is classified as a salmonid water by the Regional Fisheries Board and is thus considered ecologically sensitive. Sea trout are endemic to the Ballyboghill Catchment and have been recorded in the Ballyboghill and Ballough stream sections of the catchment. Salmon were recorded in 2007. The stream flowing along the northern site boundary exhibits a dense foliage and woodland along its valley. Vegetation extends into the water of the stream which would provide habitat for amphibians and water borne species. Please refer to *EIS Chapter 13, Flora and Fauna* for greater detail on aquatic ecology.

Functional Value

I.2.25 The Ballough Stream can be classified as having a medium class of functional value based on its current biological and physico-chemical water quality conditions. Its ecological sensitivity as a salmonid water also adds functional value.

Predicted Impacts

Potential Construction Impacts

I.2.26 Chapter 5 Construction Activities describes the construction phase of the proposed development. Mitigation measures are outlined that will be provided to minimise any potential risk to the hydrological environment and consequently aquatic ecology and flood risk during the construction phase of the proposed MEHL facility. The mitigation measures outlined are based on a range of best practice guidance documents and from the consultation process with statutory bodies. Construction activities pose a potential risk to watercourses. In the absence of mitigation measures surface water runoff from construction activities is likely to be contaminated. The main contaminants arising from construction activities can include:

- Silt: elevated silt loading in surface water discharge may result from construction activities. Elevated silt loading leads to long term damage to aquatic ecosystems by clogging the gills of fish and smothering spawning grounds. Chemical contaminants bind to the organic particles attached to silt which can lead to increased bioavailability of these contaminants. Silt also stunts aquatic plant growth, limiting dissolved oxygen supplies and reducing the aquatic ecosystems quality and this is most critical during low flow conditions when the dilution capacity of the receiving watercourse is limited. During high flow or flood condition the receiving watercourse would naturally contain elevated silt loadings. Silt can also contribute to flooding when it deposits, reducing the carrying capacity of the system and potentially causing blockages
- Concrete, bentonite, grout and other cement-based products are highly alkaline and corrosive and can have significant negative effects on surface water quality. Cement-based products generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. The alkaline silt can also smother vegetation and the bed of watercourses and can mobilise pollutants such as heavy metals by altering the water's pH. Concrete and grout pollution is often highly visible.
- Hydrocarbons: accidental spillage from construction plant and storage depots.

- Faecal coliforms: contamination from inadequate containment and treatment of on-site toilet and washing facilities.

I.2.27 Construction activities within and alongside surface waters can also contribute to a deterioration of water quality. In-stream and bankside construction works can alter the bed and bank morphology of a river which can lead to downstream modification of erosion and deposition rates. The potential re-suspension of bottom sediment can also lead to a deterioration of water clarity, increase turbidity and potentially release contaminants that were locked in the sedimentary matrices. In-stream and bankside construction work is not required as part of the proposed development.

Potential Operational Impacts

I.2.28 Potential operational impacts which could arise from the proposed MEHL facility can be categorised as either affecting water quality and subsequently aquatic ecology and the alteration of flooding patterns within the catchments that the proposed MEHL facility is located within.

I.2.29 The quality and flow of surface water downstream and in close proximity to the proposed MEHL facility could potentially be impacted by a number of different sources in the absence of appropriate mitigation measures, these potential sources include:

- Accidental Spillage: spillages arising from accidents involving transportation of hazardous material are potentially the most serious source of contaminants to a watercourse from the hardstanding area of the proposed MEHL facility.
- Hardstanding Runoff: routine runoff from hardstanding associated with vehicular traffic generally contains a variety of contaminants. These arise from the degradation of road surfaces and vehicles, vehicle exhaust combustion by-products, soil erosion and aerial deposition. The primary contaminants known to occur in routine runoff include hydrocarbons, particulate matter and heavy metals.
- Winter Maintenance: applications of salt and grit to maintain safety during icy conditions on the hardstanding areas.
- Leachate: a potential leak of landfill leachate in the event of a puncture of the liner.
- Flood Risk: uncontrolled runoff from the site could lead to downstream flooding.

I.2.30 These potential sources are discussed in greater detail below.

Accidental Spillage

I.2.31 Spillages arising from accidents involving transportation of hazardous material are potentially the most serious source of contaminants to a watercourse from the hardstanding area of the proposed MEHL facility.

I.2.32 Certain wastes to be accepted at the facility are classified as hazardous as they are considered to be very toxic, toxic, harmful or may cause long term harmful effects to the aquatic environment. Refer to *EIS Chapter 7, Human Beings* for further details.

I.2.33 If an accidental spillage of hazardous waste entered the surface water system, this has the potential to have a deleterious effect on the receiving waters quality and could lead to similar downstream affects throughout the wider catchment. Should a spill occur that has the potential to affect the Ballyboghill catchment, the salmonid status of the catchment would be compromised. There would also exist the potential for downstream impacts to the Rogerstown cSAC and SPA.

Road Runoff

I.2.34 Contaminants arising from hardstanding runoff associated with vehicular traffic on site which may have the potential to impact aquatic ecosystems include suspended solids, hydrocarbons and heavy metals (Bibby & Webster-Brown, 2005). The primary hydrocarbons of concern are the petrochemical derived group which includes petrol, fuel oils, lubricating oils and hydraulic fluids. These are generally liquid and water insoluble.

I.2.35 A wide range of heavy metals are known to occur in road runoff, but the primary metals of concern are cadmium (Cd), lead (Pb), copper (Cu) and zinc (Zn). All of these metals are included in SI 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009.

I.2.36 Sediments are the dominant mass of pollutants from hardstanding and road runoff (Bruen et al 2006). While most of the sediment load is chemically inert, the increase in turbidity of a watercourse has detrimental impacts on the aquatic system's quality. The sediment load also acts as the primary transport mechanism for contaminants in the water column, contaminants bind to sulphides and organic matter particles that form suspended colloidal particles. Bound together in this fashion contaminants have the potential to become bioavailable.

Winter Maintenance

I.2.37 Salt applications to hardstanding surfaces to mitigate against icy conditions, will result in an increased salinity, pH, conductivity and total dissolved solids concentrations to the receiving aquatic system following application. Increasing the salinity of the watercourse can adversely affect the ecological balance of the aquatic system and increase the bioavailability of chemical contaminants.

Leachate

I.2.38 Leachate produced in the hazardous and non hazardous waste cells will be collected into modular concrete storage tanks prior to use in the solidification process as appropriate or excess leachate will be tankered off site to a suitable wastewater treatment facility. Refer to Chapter 14 Soils, Geology and Hydrogeology for further details on leachate management. While extremely unlikely to occur, there exists the potential for a leachate leak from the proposed MEHL facility arising from a failure of the landfill liner through a puncture. Should such a leak occur, groundwater would be contaminated with leachate which could then subsequently enter surface water systems fed by groundwater. However, the mitigation detailed in *EIS Chapter 4, Proposed Site and Project Description* will ensure that such a leak will not occur.

Flood Risk

I.2.39 The construction of new paved / hardstand areas could result in runoff of surface water. However, attenuation of surface water runoff to control flow entering the adjacent watercourse will be mitigated through the Surface Water Management Plan, which is discussed in *EIS Chapter 4, Proposed Site and Project Description*.

I.2.40 Further detail on the flood risk assessment is located at *EIS Section 15.4.4*.

Impact Assessment

"Do-Nothing"

I.2.41 The "Do-nothing" scenario is the current operation of the facility as an inert landfill under EPA licence to accept 500,000 tonnes per annum. Should the proposed MEHL integrated waste management facility not proceed with construction and operation, the surface water system of the Ballough Stream is not anticipated to be impacted upon under the terms of the existing EPA waste licence for the site and will remain in its current hydrological state.

Construction Impact Assessment

I.2.42 The construction impact of the proposed facility on the stream flowing along the northern site boundary, the Ballough Stream, the Ballyboghill catchment and its ecologically protected areas downstream at the Rogerstown Estuary is expected to be adverse and short-term if mitigation measures are not implemented. However, these impacts are expected to be imperceptible on the basis that the construction mitigation measures outlined will be implemented. Consequently, there are no anticipated negative hydrological impacts to the surface water network as a result of the construction of the proposed MEHL facility.

Operation Impact Assessment

I.2.43 The operational impact of the proposed facility on the stream flowing along the northern site boundary, the Ballough Stream, the Ballyboghill catchment and its ecologically protected areas downstream at the Rogerstown Estuary is expected to be adverse and permanent if mitigation measures are not implemented. However, these impacts are expected to be imperceptible on the basis that the surface water management plan designed for the proposed facility will be implemented.

I.2.44 Consequently, there are no anticipated negative hydrological impacts to the surface water network as a result of the operation of the proposed MEHL facility.

Flood Risk Assessment

I.2.45 In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public works jointly published a Guidance Document for Planning Authorities entitled "*the Planning System and Flood Risk Management*".

I.2.46 The guidelines are issued under Section 28 of the Planning and Development Act 2000 and Planning Authorities and An Bord Pleanála are therefore required to implement these Guidelines in carrying out their functions under the Planning Acts.

I.2.47 The aim of the guidelines is to ensure that flood risk is neither created nor increased by inappropriate development.

I.2.48 The guidelines require the planning system to avoid development in areas at risk of flooding, unless they can be justified on wider sustainability grounds, where the risk can be reduced or managed to an acceptable level.

I.2.49 They require the adoption of a Sequential Approach (to Flood Risk Management) of Avoidance, Reduction, Justification and Mitigation and they require the incorporation of Flood Risk Assessment into the process of making decisions on planning applications and planning appeals.

I.2.50 Fundamental to the guidelines is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability.

I.2.51 In preparing this EIS, an assessment has been undertaken of any potential flood risk arising from the proposed development as outlined below.

Staged Approach to Flood Risk Assessment

I.2.52 Section 2.21 of the guidelines recommends that a staged approach be adopted when considering flood risk.

I.2.53 Stage 1 – Flood Risk Identification should be undertaken to identify whether there may be any flooding or surface water management issues related to the proposed development site that may warrant further investigation.

I.2.54 As demonstrated below, the Stage 1 assessment has identified that there are no significant flooding or surface water management issues associated with the development which would warrant a more detailed assessment and therefore Stage 2 and 3 assessments are not deemed necessary.

I.2.55 Section 2.23 of the guidelines defines Flood Zones as geographical areas within which the likelihood of flooding is in a particular range. There are 3 types of flood zones defined as follows:

- Flood Zone A - Probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding).
- Flood Zone B - Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- Flood Zone C - Probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding).

I.2.56 Flood Zone C covers all areas of the plan which are not in zones A or B.

I.2.57 The Fingal East Meath Flood Risk Assessment and Management Study (FEM-FRAM) is currently being undertaken by Fingal County Council. The FEM-FRAM project has identified that a stretch of the Ballyboghill River to the south of the proposed site as "high priority water" however, there are no such priority status prescribed to the Ballough Stream. There are currently no flood risk maps available for the Ballyboghill Catchment from the FEM-FRAM project which would have facilitated the direct classification of the site. The classification for the EIS has been inferred based on site visit, topography, location within the catchment and the existing flood risk information from the OPW. The OPW flood risk mapping did not indicate any flooding incidents within a 5km radius of the site. As outlined earlier, the proposed development will be located at the highest point in the Ballyboghill Catchment and the level of the proposed site varies from approximately 92mAOD to 148mAOD and so it is clear that the proposed development site is significantly elevated in relation to adjacent watercourses, even allowing for any potential increase in flood levels which may arise due to the potential impacts of Climate Change.

I.2.58 It is therefore considered that the proposed development site lies within Flood Zone C.

Vulnerability Classification

I.2.59 Table 3.1 of the guidelines outlines the classification of vulnerability of different types of development.

I.2.60 The proposed development would be classified as being 'Less Vulnerable Development' under the guidelines as it would be considered a commercial enterprise.

I.2.61 Table 3.2 of the guidelines contains a matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

I.2.62 As the proposed development is classed as 'Less Vulnerable Development' and is located in 'Flood Zone C', the development is deemed to be appropriate in the context of flood risk and a Justification Test is therefore not required.

Assessment of all potential sources of Flooding

I.2.63 In addition to determining the appropriateness of any development in the context of the potential for fluvial or tidal flooding as detailed above, the guidelines also require that an appropriate assessment be carried out of all potential sources of flooding and that suitable mitigation measures be put in place to cater for any residual flooding risk.

I.2.64 Other sources of flooding would include:

- Groundwater flooding
- Surface water drainage flooding
- Pluvial flooding (direct rainfall) from localised storm water runoff from adjacent ground

I.2.65 Arup have reviewed any records of historic flooding available on the OPW National Flood Hazard Mapping website, www.floodmaps.ie. There is no evidence of historic flooding in the immediate vicinity of the site. Refer to *EIS Chapter 14, Soils, Geology and Hydrogeology* for information regarding groundwater levels on site.

I.2.66 A suitable internal surface water drainage system will be installed to cater for any surface water generated both from rainfall on hard standing areas. It is considered that an appropriately designed internal surface drainage system will adequately deal with any residual localised flood risk.

Mitigation Measures

Construction Phase

I.2.67 Prior to construction, the existing waste licence Environmental Management Plan (EMP) will need to be updated by the Contractor to include the construction practices. The following will be implemented as part of the updated EMP:

- Update the existing waste licence Emergency Response Plan detailing the procedures to be undertaken during the construction phase in the event of a spill of chemical, fuel or hazardous wastes, a fire, or non-compliance incident with any permit or license issues.
- Ensure staff have training in the implementation of the updated Emergency Response Plan and the use of any spill control equipment as necessary for the construction phase.
- Update the existing waste licence method statements for the control, treatment and disposal of potentially contaminated surface water to incorporate the construction phase.

I.2.68 All necessary temporary construction facilities will be incorporated (settlement tanks/ponds/oil/grit interceptors) to ensure that only clean surface water is discharged as per the existing waste licence criteria to the surface watercourses.

I.2.69 In addition, pollution of aquatic systems during the construction phase will be reduced by the implementation of the following best practice on site mitigation measures. Due cognisance will be paid by the Contractor to the following guidance documents for construction work that can potentially impact water:

- Eastern Regional Fisheries Board for use by all Regional Fisheries Boards - Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites
- Central Fisheries Board – Channels and Challenges, The Enhancement of Salmonid Rivers
- CIRIA – Guideline Document C532 Control of Water Pollution from Construction Sites. Guidance for consultants and contactors
- CIRIA – Guideline Document C648 Control of Water Pollution from Linear Construction Projects
- CIRIA – Guideline Document C697 The SUDS Manual
- CIRIA – Guideline Document C624 Development and flood risk - guidance for the construction industry
- CIRIA – Guideline Document C163 The Construction of Bunds for Oil Storage Tanks
- UK Environment Agency – PPG5 Pollution Prevention Guidelines Works and Maintenance in or near Water

I.2.70 Based on these guidance documents the following mitigation measures will be implemented for the proposed MEHL facility's construction phase to protect the Ballyboghill catchment, its associated watercourses and the downstream ecologically protected area of the Rogerstown Estuary cSAC:

- Use of settlement ponds, silt traps and bunds and minimising construction within watercourses. Mobile sedimentation interceptors will be utilised during the construction process to protect water quality. All water generated and collected during the construction phase will pass through the existing settlement ponds on the northern boundary or the proposed detention basin which will be constructed near the proposed administration building.
- Management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and surrounding

stockpiles with cut-off ditches to contain runoff. Covering with an impermeable material can also be utilized to prevent rainfall interacting with stockpile material. No material stockpiles will be located near watercourses.

- All watercourses that occur in or adjacent to areas of land that will be used for site compound/storage facilities will be fenced off at a minimum distance of 5m with silt fences. In addition, measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse.
- Surface water flowing onto the construction area will be minimised through the provision of berms and diversion channels.
- All chemical and fuel fill points and hoses will be contained within bunded areas as per CIRIA C163.
- Foul drainage from all temporary site offices and construction facilities that are not connected to the sites' waste water treatment facility (e.g. portable toilet facilities that may be required during construction) will be contained and disposed of in an appropriate manner to prevent pollution of rivers and local watercourses in accordance with the relevant statutory regulations.
- Protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of.
- Routine monitoring of water quality will be carried out at appropriate locations during construction as per the monitoring requirements of the waste licence.
- The quality of surface water discharge from the site will meet water quality targets specified in the waste licence for the facility.
- A 5m strip will be provided along the stream flowing along the northern site boundary and this will provide a suitable buffer zone.
- There will be no use of persistent herbicides, pesticides or artificial fertilisers in any landscaping or subsequent maintenance within 18m of a watercourse.

I.2.71 For further detail on mitigation measures required to protect ecology please refer to *EIS Chapter 13, Flora and Fauna.*

I.2.72 Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses. The following construction mitigation measures will be utilised to control concrete and cementicious material wash down water interaction with surface water;

- All batching and mixing activities will be located in areas well away from watercourses and drains.
- Surface water drainage around the batching plant will be controlled via the provision of perimeter bunding with runoff diverted to appropriate treatment facilities.
- There will be no hosing into surface water drains of spills of concrete, cement, grout or similar materials.

Operation Phase

I.2.73 It is proposed to manage surface water on site by using a combination of SuDS elements consisting of filter drains and swales, a wetland pond, a detention basin, and rainwater harvesting. This will be in compliance with the objectives and policies of the GDSDS. The filter drain and swale will allow pollutant removal through filtration prior to discharging to the attenuation feature. The proposed wetland treatment system will form an integral part in offsetting both the hydraulic and water quality impacts of the proposed development. The wetland pond will allow for an additional reduction in fine sediments, nutrients and toxicants and maintain the greenfield runoff characteristics (2.64 l/s/ha) by providing a hydrobrake attenuation mechanism for a return period of up to 1 in 100 years. Refer to *EIS Chapter 4, Proposed Site and Project Description* for a full description of the proposed surface water management plan. There will be a new waste licence for the proposed MEHL facility and all conditions in relation to the protection of surface water will be met.

I.2.74 This surface water drainage system will be sized to cater for any potential run-off which may enter the site in the event of surcharging of the existing stream along the northern boundary of the site.

Monitoring

I.2.75 Water quality monitoring shall be implemented as per the monitoring requirements of the waste licence to ensure that construction activities relating to the construction and subsequent operation of the MEHL facility do not have an adverse effect on water quality. Monitoring will identify any weaknesses in the construction phase and enable remedial action to be initiated where necessary.

Residual Impact

I.2.76 As a consequence of compliance with the construction and operational mitigation measures there will be no significant negative effects to nearby surface watercourses or the downstream catchment arising from the proposed MEHL facility. At all times, the MEHL facility will be operated in accordance with the conditions as set out in the waste licence. The project will be in compliance with the principles and objectives of the Eastern River Basin District Management Plan which apply to the study area and will assist in the Water Framework Directive principal objective of achieving "good status" in all waters by 2015.

I.2.77 The proposed development has been assessed in accordance with the requirements of the DEHLG/OPW guidelines on *'The Planning System and Flood Risk Management'* and it has been determined that the proposed development will neither create nor increase flood risk and is therefore deemed appropriate development in the context of flood risk.

I.3 Assessment of impact on receiving sewer

I.3.1 No discharge to sewer is proposed.

I.4 Assessment of impact to groundwater and soils

I.4.1 Chapter 14 of the EIS includes an assessment of the potential impact of the proposed MEHL development on the soils, geology and hydrogeology and where required, mitigating measures are put forward to reduce and/or remove the potential impact of the proposed development. Key extracts are provided here in the Waste Licence Application; the full EIS (authored by Arup) accompanies this application. A full set of appendices is included with the EIS; the following only are appended to this application:

Appendix I.4.1: Borehole Logs

Appendix I.4.2: Quantitative Risk Assessment

Existing Soils and Geology

Landscape and Topography of the Site and Surrounding Area

I.4.2 The broad study area generally incorporates the land from Naul in the northwest to Portrane and the Rogerstown Estuary in the southeast. The local or site-specific area of study incorporates the existing MEHL Facility including the completed cells and the immediate surrounding lands.

I.4.3 The area around the site is generally hilly with elevations falling steeply towards the coast where the area becomes flatter. The site is located on a significant bedrock feature that trends in a WNW-ESE direction. Knockbrack Hill to the north east of the site represents the highest elevation in the surrounding area at 176 mOD.

I.4.4 The MEHL site is on a hill with the natural elevations on the western boundary reaching up to 149 mOD and falling to 90 mOD on the eastern boundary. As the site is a former quarry the topography within the site is varied. A topographic map of the site and the surrounding area is shown in *EIS Figure 14.3*.

I.4.5 The land use in the area surrounding the MEHL site is predominantly agricultural with some low density housing. The majority of these houses are supplied by mains water.

I.4.6 To the east of the site, at Nevitt, Fingal County Council has received planning permission and an EPA licence for a landfill. The location of the Nevitt landfill in relation to the MEHL site is shown on *EIS Figure 14.3*.

Regional Soils and Geology information

Bedrock Geology

I.4.7 A detailed bedrock geology assessment carried out by Tara Prospecting Ltd. (1985) deals with the rocks in the immediate vicinity of the site and is based on their borehole database and local investigations. In summary, their assessment indicated a complex sequence of lithologies in the area, ranging from Namurian and Brigantian shales to Asbian limestones and volcanics to the north. The Namurian shales dominate the eastern part of the area and the Brigantian shales surround these on all sides.

I.4.8 Several lithologies are reported from the area around Hollywood (Geological Survey of Ireland – Geology of Meath, 2001) as shown on *EIS Figure 14.4*. The regional geology of Meath can be divided into Ordovician and Silurian Metasediments and Volcanics, granites and other igneous rocks, sedimentary rocks of Carboniferous age and sedimentary rocks which were deposited during the Permian and Triassic periods

I.4.9 The rocks underlying the area around the site can be described, from youngest to oldest formation, as belonging to the following formations within the Carboniferous Period:

- Walshestown Formation

- Balrickard Formation
- Loughshinny Formation
- Naul Formation
- Lucan Formation

I.4.10 Table **I.4.1** shows approximate ages for each formation.

Table I.4.1: Regional Formations

System	Series	Stage	Formation	Age
Carboniferous	Silesian	Namurian	Walshestown	313 - 326 ma
			Balrickard	
	Dinantian	Visean	Donore	Donore is thought to be situated in both the Visean and Namurian Stages
			Loughshinny	
			Naul	
			Lucan	326 - 345 ma

I.4.11 The Naul Formation is also a Visean age deposit and is similar to the older Lucan formation, but the limestones are paler and less argillaceous and contains less shale. The Lucan Formation, also known locally as Calp limestone is described as dark grey well bedded cherty, graded limestones and calcareous shales.

I.4.12 The next formation shown on the Regional Geology map is the Loughshinny formation. This is a Dinantian deposit from the Visean stage and is described by the GSI as consisting of limestone breccias formed by debris flows and turbidites Younger parts of this formation are made up of well graded limestones interbedded with argillaceous limestones and dark shales.

I.4.13 The Donore Formation underlies the Balrickard Formation. This is thought to be an erosional boundary which was formed during a time when sea levels were fluctuating. Geologically it resembles the Balrickard Formation in some places and the Loughshinny Formation in others due to the changing depositional environment. The changes from one formation to the next is difficult to definitively establish and was not directly observed anywhere on site. As can be seen above, the contact between the Visean/Namurian Stages is thought to occur within the Donore Formation. In addition this formation may not be present throughout the area.

1.4.14 The Balrickard Formation is a feldspathic micaceous sandstone with shale and argillaceous fossiliferous micrite of Pendleian age.

I.4.15 The Walshestown Formation is from the Namurian stage of the Silesian Series of the Carboniferous system. The rocks of this formation are described as black shales with ironstone and subordinate siltstone with rippled fine sandstone bands, calcareous mudstone and biosparite. The Walshestown Formation is described within the GSI Publication "Geology of Meath, Sheet 13" as "predominantly black shales with subordinate siltstones and/or fine sandstone bands with rippled lenses, calcareous mudstone and occasional limestone (biosparite) of Pendleian to Arnsbergian age."

I.4.16 This area is known as the North Dublin Basin. This is a composite basin of combined sedimentary and structural origin. The location of the MEHL site is at the northern margin of this basin. To the north of the site is the Balbriggan Block. This block was bounded by faults and thrown up relative to the nearby basins. The site is located at one of the transitional areas between a block and a basin. This means that the depositional environments affect the nature of the rocks. The muddier, shaley deposits such as the Walshestown Formation, would have been deposited in deeper waters (basins) as opposed to the Loughshinny Formation deposits which appear to be deposited in warm shallow waters (blocks). This would suggest that the Dublin Basin was becoming deeper with time.

I.4.17 From the GSI map of the area (Sheet 13), the Carboniferous rock units (Walshestown, Balrickard, Loughshinny and Naul formations) are folded into a gentle syncline (bowl-shaped fold), whose axis runs roughly WNW-ESE. The Walshestown Formation occupies the centre of the fold, surrounded in sequence by the Balrickard formation, Loughshinny formation and the Naul formation to the south.

I.4.18 The affect of this synclinal structure is to bury the Loughshinny Formation even deeper than would be expected had the rocks in the area not been folded. The Loughshinny Formation is dipping in towards the centre of the syncline, resulting in it becoming deeper as its traced northwards.

I.4.19 Along with the deformation features like the syncline, a number of faults are present in the locality, generally trending N-S or NE-SW. These faults in some cases form contacts between various formations. There are most likely more faults which have not been identified present in the area, as faulting is ubiquitous in Ireland.

Quaternary Geology

I.4.20 The Quaternary (subsoil) strata data is scarce for this area; a map compiled from pre-existing data was produced to accompany an investigation for the location of landfill sites by the Geological Survey of Ireland for Dublin County Council (1979). This provides a guide to the depth and type of Quaternary sediment in the area. The map classifies all the tills as limestone dominated. However, the information presented in the Teagasc Soil Maps presented on the GSI website appears to describe these soils as tills containing Namurian Shales and Sandstones

I.4.21 The ice depositing the tills was most likely extending from the Irish midlands, southwards and eastwards across the area and may contain some far travelled limestone clasts. This till deposit is quite common in this region and is typical of the till dominated by clasts of Namurian lithologies, found in north County Dublin.

Soils

I.4.22 The Gley group of soils cover most of the region in which the MEHL site is located, with the exception of Knockbrack Hill/ Nags Head area and the Palmerstown townland area where the soils are of the Brown Earth Group. A small isolated area of peat occurs around the Bog of the Ring Commons area.

I.4.23 The MEHL site is located in the Knockbrack Hill/ Nags Head area and is therefore characterised by the Brown Earth Group soils. These are a relatively mature soil. They are generally well drained mineral soil. The typical profile is uniform with little or no differentiation into horizons. These soils are not extensively leached or degraded and thus there is little evidence in the soil profile of removal and deposition of iron oxides, humus or clay. The soils of this group are generally good arable soils although sometimes low on nutrients. They have good drainage and structure characteristics with medium textures.

Site Specific Geological information

I.4.24 A detailed site investigation was undertaken as part of the investigative works at MEHL site. The locations of all investigations are shown on *EIS Figure 14.5* and the full factual report is presented in *EIS Appendix A14.3*. Due to the weathered/broken condition of the rocks exposed at the MEHL site intrusive boreholes were drilled and the details of these are presented in Appendix **I.4.1**. The cores obtained demonstrated that these rocks are weathered and broken too.

Results of the Geophysics

I.4.25 A field mapping exercise was undertaken by G. Ll Jones on the MEHL site and a report is presented in *EIS Appendix A14.1*. In this report a major fault was mapped running roughly N-S across the site. A geophysical survey was undertaken to gain further information about this fault and to establish if there were any other unmapped faults present.

I.4.26 A trial geophysical survey was carried out by Apex Geoservices in January 2010 and this was followed by a detailed geophysical survey. The aim of the main survey was to locate any further faults on the site and also to provide information on deep bedrock. The results of the full survey included a series of interim maps along with a number of cross sections.

I.4.27 The report highlighted another bedrock fault trending E-W through the site which intersects the N-S trending fault. It suggested that this fault had a down-throw on the northern side of up to 60m (see *EIS Figure 14.6*).

I.4.28 The results from the intrusive investigations were used by Apex to calibrate the results of the geophysical survey. The results of the full survey are presented in *EIS Appendix A14.2*.

Bedrock Geology

I.4.29 Based on the Jones Report (2009), the Apex Geoservices Geophysics Report (Apex, 2010) and the boreholes carried out during this study a revised geological map has been produced for the site (See *EIS Figure 14.6*). The revised bedrock geological map presented in *EIS Figure 14.6* is founded on significantly more detailed geological information than was available during the production of the GSI 1999 publication.

I.4.30 The principal difference between *EIS Figure 14.6* and the GSI Sheet 13 geological map for the area (*EIS Figure 14.4*) is that the Loughshinny Formation is now confined to the southwestern end of the site with the Donore, Balrickard and Walshestown Formations immediately underlying the greater part of the MEHL site.

I.4.31 The bedrock geology of the site is further influenced by the main North-South trending fault running through the site. The bedrock to the east of this fault appears to have been downthrown by some tens of metres. Folding was observed in the middle of the succession of rock types present on the site but the upper beds are mostly undisturbed.

I.4.32 Overall the geology of the site youngs to the north, starting with the Loughshinny formation passing upwards and eventually into the Walshestown formation.

I.4.33 A schematic cross section for the site is presented in *EIS Figure 14.7*.

I.4.34 A summary table of the information from the boreholes used to amend the geology map is presented in the following table, Table **I.4.2**.

Table I.4.2: Borehole Summary

Borehole ID	Date Drilled	Strata Encountered	Formation/ Description	Depth
BH4A	18/11/2008	Overburden	Clays	0.0 - 4.3
		Bedrock	Loughshinny	4.3 - 12.2
BH5	03/09/1998	Overburden	Clays	0.0 - 6.0
		Bedrock	Walshestown	6.0 - 35.0
BH6	03/09/1998	Overburden	Clays	0.0 - 4.0
		Bedrock	Walshestown	4.0 - 19.5
BH7	07/09/1998	Overburden	Clays	0.0 - 2.0
		Bedrock	Walshestown	2.0 - 26.0
BH8	17/08/2001	Overburden	Clays	0.0 - 3.0
		Bedrock	Walshestown	3.0 - 27.0
BH9	03/08/2001	Overburden	Clays	0.0 - 12.0
		Bedrock	Walshestown	12.0 - 50.0
BH10	04/08/2001	Overburden	Clays	0.0 - 4.0
		Bedrock	Loughshinny	4.0 - 84.0
BH10a	05/03/2007	Overburden	Clays	0.0 - 10.0
		Bedrock	Balrickard/Donore (?)*	10.0 - 21.0
		Bedrock	Loughshinny	21.0 - 68.0
B11a	02/05/2007	Overburden	Clays	0.0 - 2.0

Borehole ID	Date Drilled	Strata Encountered	Formation/ Description	Depth
		Bedrock	Walshestown	2.0 - 30.0
BH12	01/05/2007	Overburden	Clays	0.0 - 5.5
		Bedrock	Walshestown/Balrickard/Donore (?)*	5.5 - 46.0
		Bedrock	Loughshinny	46.0 - 65.0
BH13	15/04/2007	Overburden	Clays	0.0 - 5.5
		Bedrock	Walshestown/Balrickard/Donore (?)*	5.5 - 46.0
		Bedrock	Loughshinny	46.0 - 48.0
BH14	02/03/2007	Overburden	Clays	0.0 - 6.0
		Bedrock	Balrickard/Donore (?)*	6.0 - 30.0
		Bedrock	**Loughshinny**	30.0 - 38.0
BH15	06/04/2010	Overburden	Clays	0.0 - 3.2
		Bedrock	Balrickard (?)*	3.2 -10.0
		Bedrock	Possible Donore (?)*	10.0 - 26.1
		Bedrock	**Loughshinny**	26.1 - 31.9
BH16	12/04/2010	Overburden	Clays	0.0 - 0.8
		Bedrock	Walshestown	0.8 - 60.0
BH17	05/05/2010	Bedrock	Balrickard/Donore (?)*	0.0 -37.0
		Bedrock	**Loughshinny**	37.0 - 54.0
BH18	20/04/2010	Overburden	Clays	0.0 - 0.6
		Bedrock	Balrickard (?)*	0.6 - 5.1
		Bedrock	Donore (?)*	5.1 - 15.2
		Bedrock	**Loughshinny**	15.2 - 21.2
BH19	21/04/2010	Overburden	Clays	0.0 -5.0
		Bedrock	Balrickard (?)*	5.0 - 14.0
		Bedrock	Donore (?)*	14.0 - 18.0
BH20	22/04/2010	Overburden	Clays	0.0 - 7.0
		Bedrock	Walshestown	7.0 - 34.0

Borehole ID	Date Drilled	Strata Encountered	Formation/ Description	Depth
		Bedrock	Balrickard/Donore (?)*	34.0 - 43.0
		Bedrock	**Loughshinny**	43.0 - 48.0

***** (?) – Indicates that the geological strata were not easily identified. Formation named is most likely formation based on location, depth and observed rock types.

I.4.35 The oldest formation observed on site is the Loughshinny Formation. This is Dinantian in age and consists of limestone breccias formed by debris flows and turbidites. Younger parts of this formation are made up of well graded limestones interbedded with argillaceous limestones and dark shales.

I.4.36 The Namurian formations are encountered next and these are composed of shales with argillaceous limestones and sandstones. The oldest Namurian deposit on the site is the Donore Formation. It is thought to form an unconformity between the eroded older units of the Loughshinny Formation and the younger units of the Balrickard Formation. It is of Brigantian to Pendleian in age and is estimated to have a thickness of up to 250m. This formation was difficult to identify from both outcrops and core samples from the underlying and overlying units due it's similarity to both in different areas and the poor quality of much of the core and/or chippings. In BH18 core samples taken at 15 mbgl appeared to be the Loughshinny Formation but palynology proved them to be Namurian in age, indicating were from the Donore Formation.

I.4.37 The next formation encountered is the Balrickard Formation. This was described in the borehole logs as "Moderately strong to moderately weak, thickly laminated to thinly bedded (to structureless where clay-filled), interbedded fine-grained sandstone and mudstone with large amounts of orange/yellow/brown clay infill". It is assumed that the contact between the Walshestown Formation and the Balrickard formation is an erosional contact which follows the topography of the north-western corner of the site.

I.4.38 There is a possibility that the fault which runs roughly East-West which was identified during the geophysics extends further westward and forms the contact between the two formations. It should be noted that the contact was not directly observed anywhere on site.

I.4.39 In the north of the site, where the Walshestown formation is observed, the rocks are described as black shales with ironstone and subordinate siltstone with rippled fine sandstone bands, calcareous mudstone and biosparite. In the borehole logs it is described as "Moderately weak to moderately strong, thinly bedded to thinly laminated, dark grey/black, interbedded fine-grained sandstone and siltstone/mudstone with large amounts of black clay infill".

I.4.40 It should be borne in mind that the overall geological interpretation has been hindered by the weathered and broken nature of the site and the quality of the materials recovered from the boreholes.

Soils

I.4.41 Much of the naturally occurring soils on-site have been stripped and stockpiled during the quarrying operations. Some stockpiling of soils has been carried out for use in the restoration of the quarry, and for lining and capping activities associated with the landfilling activities.

Quaternary Geology

I.4.42 The Quaternary deposits on the site and in the immediate surrounding areas consist of a till. This varies in thickness and texture but is generally less than 5 m thick and has a clay/silt matrix with dispersed pebble clasts. The till contains weathered clasts of Namurian shale and sandstone, with some limestone. Where the till cover is thin it tends to have a coarser texture, being more silty to sandy.

Geological Heritage Areas

I.4.43 Geological Heritage Areas are designated as part of the Irish Geological Heritage Programme as part of a partnership with the Geological Survey of Ireland (GSI) and the Department of Environment, Heritage and Local Government. The aim of the programme is to identify, document and protect the wealth of the geological heritage in Ireland.

I.4.44 The MEHL quarry has been designated a County Geological Site. This designation reflects the exposure in the quarry walls of many of the bedding and structural features characteristic of the geological succession found in the region. Similar exposures are seen along the coast at Loughshinny where the bedrock is also exposed.

Summary of the Geology of the MEHL Site

- An extensive investigation was undertaken at the MEHL site to assess the local geology.

- Four formations have been identified on site. The Loughshinny and part of the Donore Formations are Dinantian in age, while the other part of the Donore Formation, along with the Balrickard and Walshestown Formations are Namurian in age.
- Where they occur within this former quarry, the Quaternary deposits consist of Glacial Tills.
- There is a large WNW-ESE trending syncline which means that the Loughshinny is dipping to the north and therefore becoming deeper in that direction. Furthermore, the Loughshinny appears to have been downthrown significantly by the E-W trending fault so that in the north of the site there is over 60m of Namurian deposits above it. This means that the Loughshinny is overlain by increasing thicknesses of the Donore, Balrickard and Walshestown formations moving northwards across the site.
- A number of faults were located across the site. The main fault appears to run roughly N-S through the site with another two faults running perpendicular to this aligned E-W. These faults may potentially form faulted contacts between Balrickard and Walshestown Formations. The strata in the Loughshinny and the lower parts of the Donore Formations are likely to therefore contain significant faulting and therefore significant permeability.

Description of Groundwater Baseline

Hydrology

I.4.45 A full description of the hydrology of the site and the surrounding area is included in *EIS Chapter 15: Surface Water*. Surface water features in the vicinity of the MEHL site are shown on *EIS Figure 15.1*. A small stream is present along the northern boundary of the site which flows from west to east. This stream is likely to be fed partially by shallow groundwater to the east of the MEHL site where the bedrock is shallow.

Rainfall

I.4.46 The closest weather monitoring station to the site is located at Dublin Airport, approximately 20 km south of the site. Rainfall levels are recorded on a daily basis and the results were used to assist with the analysis of the soakaway and pumping tests and also the interpretation of groundwater levels.

I.4.47 The 30-year average rainfall measured at Dublin airport is 750 mm. Monthly and annual total rainfall for 2003-2010 are presented in *EIS Appendix A14.7* and annual totals are summarised below in Table **I.4.3**.

Table I.4.3: Annual Rainfall and Potential Evapotranspiration (Penman) measured at Dublin Airport

Year	Rainfall (mm/yr)	Potential Evapotranspiration (Penman) (mm/yr)	Effective Rainfall (mm/yr)
2010	-	-	-
2009	920.2	521	399.2
2008	942.3	531	411.3
2007	784.4	531	253.4
2006	740.6	597	143.6
2005	680.3	526	154.3
2004	752.4	563	189.4
2003	643.2	558	85.2

I.4.48 This data shows that since 2005 annual rainfall levels have been increasing and that 2008 and 2009 were particularly wet years. The rainfall data measured in 2010 from January to September show rainfall levels were lower than normal in all months except September.

I.4.49 Monthly potential evapotranspiration (PE) data was collected (Penman method) at Dublin Airport to the south of the MEHL site. This monthly data is presented in *EIS Appendix 14.7* and summarised in Table **I.4.3**. The data shows that the rate of potential evapotranspiration has not changed much since 2003.

I.4.50 Potential or effective rainfall is the amount of rainfall which is available to infiltrate into the ground and which will not evaporate or be taken up by plants. It is determined by subtracting evapotranspiration from rainfall. The annual effective rainfall is also summarised in Table **I.4.3**.

I.4.51 The actual recharge is the measure of how much rainfall can actually be assumed to infiltrate into the ground and recharge the water table. It is based on the potential rainfall but also takes into account rainwater which does not enter the ground but becomes overland flow and enters streams. This occurs when the soil is saturated or has reached its field capacity which is common in Ireland. The Working Group for Groundwater in Ireland have determined that the actual recharge can be set at 95% of the effective rainfall.

I.4.52 This indicates that despite high levels of actual rainfall being measured, the amount of rainfall which may eventually enter groundwater is comparatively low.

Regional Hydrogeology

I.4.53 The site is located within the Eastern River Basin District which covers Dublin and the wider surrounding area as far north as Drogheda as shown in *EIS Figure 14.1*. The geology of the area is composed of different bedrock types and soil deposits which lead to a variety of hydrogeological regimes being present in the area.

I.4.54 The Geological Survey of Ireland has devised a system for classifying the aquifers in Ireland based on the hydrogeological characteristics, size and productivity of the groundwater resource. The three main classifications are Regionally Important Aquifers (RI), Locally Important Aquifers (LI) and Poor Aquifers (P).

I.4.55 Table **I.4.4** summarises the lithologies present on the MEHL site and their GSI aquifer classification. The geology of the MEHL site has been discussed in detail in the section *Site Specific Geological Information* and the work undertaken as part of this assessment has led to the boundaries of the lithologies on site being refined as indicated in *EIS Figure 14.6*. From this the aquifer classification has been refined and is presented in *EIS Figure 14.8*.

Table I.4.4: Summary of the GSI aquifer classification for lithologies present on the MEHL site.

Lithology	Age (Stage)	GSI Aquifer classification
Loughshinny Formation	Visean	Locally Important Aquifer
Donore Formation	Namurian	Poor aquifer
Balrickard Formation	Namurian	Poor aquifer
Walshestown Formation	Namurian	Poor aquifer

1.4.56 Based on the geological information for the area outlined above the hydrogeology of the area can be subdivided into an aquifer unit and an aquitard unit for the purposes of this report.

The Aquifer

I.4.57 The Loughshinny Formation comprises the aquifer in this region. Isolated gravel deposits have been mapped in the region directly above the Loughshinny and these may contribute to the resource of the aquifer.

I.4.58 The aquifer is part of the Lusk – Bog of the Ring Groundwater Body (GWB) as shown on *EIS Figure 14.1*.

I.4.59 The Loughshinny Formation is characterised as being moderately productive bedrock. Well records indicate that there are numerous wells which tap the Loughshinny Formation with yields of over 100m^3/day. These wells are often domestic or Council supplies. Typical specific capacities range from 5 – 150 m^3/day and transmissivities up to 1000 m^2/day have been recorded.

I.4.60 The rocks of the Loughshinny Formation are composed of Calp limestones although they are cleaner and more fractured than the typical Calp limestone seen for example in Dublin. The flow regime in this type of material will be dominated by fracture flow and movement through weathered zones with the majority of the storage being in the fractures. There will be little to no storage and groundwater movement though the matrix of the rock.

I.4.61 Weathered beds of the Donore Formation which were deposited in the same environment as the Loughshinny may also comprise part of the aquifer in places. As outlined in the section *Summary of the Geology of the MEHL Site* the Donore Formation is difficult to distinguish as it is similar to the Loughshinny Formation below it and the Balrickard Formation above it depending on the depositional environment it was formed in at any one location. For this reason parts of it will comprise the aquifer and parts will comprise the aquitard.

I.4.62 The quality of a groundwater source relates to both its productiveness (which includes how often it is renewed) and its chemistry. Testing undertaken on the Loughshinny Formation indicates that it is a productive groundwater resource with a quality suitable for water supply (with local variations).

I.4.63 Based on the NRA guidelines criteria, the aquifer would be given a Medium Importance.

The Aquitard

I.4.64 The aquitard is composed of the formations which were deposited during the Namurian period and is part of the Hynestown GWB (*EIS Figure 14.1*). As stated above the upper part of the Donore Formation is similar to the overlying Namurian strata and therefore is considered to be part of the aquitard. A geological description of these units is provided in the section *Landscape and Topography of the Site and Surrounding Area*.

I.4.65 The area defined as the aquitard is composed of a hill (i.e. it is topographically higher than the surrounding area) and is defined by the extent of Namurian rocks. It is characterised by poorly productive bedrock (except in local zones) and has the GSI classification of Pl (Poor Aquifer, Bedrock which is generally unproductive except in local zones). No detailed hydrogeological investigations have been undertaken in these deposits in this area and the GSI classification is based on the characteristics of the formation elsewhere.

I.4.66 The hydraulic characteristics of the Namurian deposits will vary depending on the lithologies present. Areas of low permeability material such as the siltstones of the Walshestown Formation will allow very little groundwater movement. However weathered or fractured zones in or around the material will allow some groundwater movement through the deposits and may hydraulically connect different lithologies.

I.4.67 Based on the NRA guidelines criteria, the aquitard would be given a Low Importance.

Groundwater Flow Direction

I.4.68 The regional groundwater flow direction is towards the south east. This is influenced by the underlying geological structure which traps water causing it to flow to the south east rather than directly east as would be expected.

Hydrochemistry

I.4.69 Water quality in the Loughshinny Formation is always hard (usually over 250 mg/l, often over 300 mg/l as $CaCO_3$). Generally the quality is good except for in areas where it is locally contaminated.

I.4.70 Groundwater samples are routinely collected at the Bog of the Ring water supply which abstracts water from the Loughshinny Formation. These are presented in monitoring reports and some data is quoted in the Source Protection Zone report for the Bog of the Ring.

I.4.71 The water data from Bog of the Ring is typical of what would be expected from a limestone source. High hardness, alkalinity and Electrical Conductivity (EC) values were observed. Sulphate and chloride values range from 22-82 mg/l and 23-31 mg/l, respectively. Chloride values of this concentration can sometimes indicate organic contamination however in this case they are more likely to be due to the proximity to the coast.

I.4.72 Elevated potassium levels of 0-7 mg/l were observed in the Loughshinny which may indicate organic contamination. However, the Na:K ratio are below the GSI guideline value of 0.3 and as such the elevated potassium levels were attributed to being naturally occurring in the bedrock.

I.4.73 Elevated manganese and iron concentrations were thought to originate from the shaly beds in the limestone.

Groundwater Vulnerability

I.4.74 The vulnerability of a groundwater body is the term used to describe the ease with which the groundwater in the area can be contaminated by human activities. The vulnerability is determined by many factors including the travel time, the quantity of contaminants and the capacity of the deposits overlying the bedrock to attenuate contaminants.

I.4.75 These factors in turn are based on the thickness and permeability of the subsoil deposits, e.g. groundwater in bedrock which has a thick cover of low permeability clay is less vulnerable than the groundwater in bedrock which is exposed at the surface. The criteria for determining groundwater vulnerability, as developed by the GSI, are shown in Table **I.4.5** below. The Extreme vulnerability class is further sub-divided into Extreme (X) – rock near Surface or Karst and Extreme (E) - subsoils <3m thick.

Table I.4.5: GSI Groundwater Vulnerability Mapping Guidelines (DoELG 1999)

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) & Thickness			Unsaturated Zone	Karst Features
	High Permeability (sand/ gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 – 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A
Notes: (1) N/A = not applicable (2) Precise permeability values cannot be given at present (3) Release point of contaminants is assumed to be 1-2m below ground surface					

I.4.76 The GSI groundwater vulnerability maps show different vulnerability ratings in the site and the surrounding area and these are displayed in *EIS Figure 14.9*. The vulnerability classification of the MEHL site is 'Extreme Rock near surface or karst'. This would be expected as the site is a former quarry and the natural overburden has been removed in the area.

I.4.77 However, it should be noted that the GSI criteria does not take the permeability of bedrock into account and the presence of low permeability Namurian material over most of the site is not factored into the vulnerability classification.

Groundwater Resources

GSI Well Records

I.4.78 *EIS Figure 14.10* shows the locations of all wells recorded by the GSI. However, as it is not a requirement for wells to be registered with the GSI the GSI list of wells is not necessarily complete.

Well Survey

I.4.79 A well survey was undertaken to establish if any wells were present in the area which were not identified on the GSI database.

I.4.80 The full details of the well survey are presented in *EIS Appendix A14.9*. The survey was undertaken for residential properties within a 1km radius down-gradient of the site and 0.5 km radius up gradient of the site. Properties which would potentially have larger abstractions such as businesses/agricultural enterprises were audited within 2 km down-gradient of the site and 1 km up-gradient of the site.

I.4.81 The well survey identified only 3 properties in the area which have wells abstracting from groundwater and their locations are shown on *EIS Figure 14.10*. As outlined, groundwater flow is to the south east. This means that two of these abstraction wells are up-gradient of the site and only one is down-gradient. The down-gradient well is used for watering gardens and is not used for a potable water supply. All three locations where wells were noted are also supplied by mains water.

I.4.82 In line with the significance criteria presented in *EIS Appendix Table A14.11.4*, these wells would have a Low importance as they are supplying less than 50 homes.

Bog of the Ring

I.4.83 Fingal County Council have developed a well field in the Loughshinny formation at the Bog of the Ring that supplies up to 4,000 m3/day to Balbriggan and its environs. It is located to the north east of the MEHL site as shown on *EIS Figure 14.10*. The GSI have defined a Source Protection Area (SPA) for this water supply composed of an Inner and Outer Protection Area. The MEHL site is located approximately 1 km outside the Outer Source Protection Area of the abstraction and approximately 3 km from the abstraction locations as shown in *EIS Figure 14.10*.

I.4.84 The GSI have also mapped a groundwater divide to the north east of the MEHL site on the basis of surface water features in that area. This indicates that groundwater from the MEHL site will not flow towards the Bog of the Ring.

I.4.85 Recent monitoring reports have suggested that the supply is in decline “the regional water table is in long term decline and has not reached a steady state at the end of 2005. This is consistent with the ERBD findings that the aquifer is currently at risk from potential over abstraction” (Collins and Herlihy, 2007).

I.4.86 This lowering in groundwater levels is likely due to the limited storage contained within faults, fractures and weathered zones in the Loughshinny Formation as outlined in the section *The Aquifer*. It is generally thought that sands and gravels in the vicinity of the Bog of the Ring wellfield provide significant additional storage.

I.4.87 Based on the NRA Guidelines criteria, the Bog of the Ring abstraction would have a resource valuation of a High Importance as it is supplying more than 1000 homes.

Features dependent on the groundwater regime

Groundwater Dependent Terrestrial Ecosystems (GDTEs)

I.4.88 A full review of ecological features and designated ecological heritage areas in the study area are discussed in detail in *EIS Chapter 13 Flora and Fauna*.

I.4.89 There are two designated areas which could be dependent on groundwater or which may be impacted by changes in the groundwater quality or the groundwater regime of the aquifer. These are the Rogerstown Estuary pNHA[39], SPA[40] and SAC[41] (site codes 000208 and 004015) and the Bog of the Ring pNHA (site code 001024). These features are shown on *EIS Figure 14.11* and their distance from the proposed development is below.

- Rogerstown Estuary: 7.5 km to the southeast
- The Bog of the Ring: 2.3 km to the northeast

I.4.90 However due to the distance of these features and the lack of any direct hydrogeological linkage with the MEHL site they are not be considered further in this assessment.

Surface Water Features

I.4.91 There is a stream to the north of the MEHL site (*EIS Figure 14.11*) which flows from west to east and is likely to be at least partially fed from shallow groundwater. Due to the confining conditions demonstrated by the boreholes adjacent to the stream (BH6 and BH11A) and the presence of the aquifer at a depth of greater than 60 m at this location, potential contamination generated from the site will not enter the stream at this location.

[39] pNHA: Proposed National Heritage Area
[40] SPA: Special Protection Area
[41] SAC: Special Area of Conservation

I.4.92 There is a tributary of this stream running parallel to the MEHL boundary, approximately 1.5 km from the site. In this area, the bedrock is likely to be hydraulically connected with the stream. This tributary maybe negatively impacted should groundwater become contaminated.

Site Hydrogeology

Introduction

I.4.93 The site work undertaken by Jones (2009) allowed assessment of the principal geological boundary and indicated the presence of a N-S trending fault as outlined in the section *Site Specific Geological Information*. Geophysical surveys were undertaken which identified further faulting on the site trending E-W and intersecting the N-S fault. The faults may influence the hydrogeology of the site by either acting as a conduit for flow or as a barrier to flow.

I.4.94 Many of the monitoring wells and new boreholes drilled on site were positioned in locations to investigate this. This is described in full in Appendix **I.4.1**

I.4.95 The final network of groundwater monitoring boreholes was developed on site as shown in *EIS Figure 14.12*. Extensive investigations were undertaken including:

- New monitoring wells
- New pumping wells
- Hydraulic testing
- Pump test
- Well development
- Groundwater level and quality monitoring

I.4.96 Detailed interpretation and data for these are presented in *EIS Appendices A14.3-A14.12*.

Table I.4.6: Summary Details of Monitoring Wells

Borehole ID	Depth (m)	Response zone lithology	Comments
BH4A	12.2	Loughshinny	Artesian well & topographically lower
BH5	34.9	Namurian	
BH6	19.5	Namurian	Artesian
BH9	19.01	Namurian	
BH10a	67	Loughshinny	
B11a	30	Namurian	Artesian
BH12	65	Loughshinny	
BH13	40	Namurian	
BH14	38	Loughshinny	
BH15a	30	Loughshinny	
BH16	24	Namurian	Weathered/fractured water bearing zone within Walshestown Formation
BH17	54	Loughshinny	Pumping well
BH18	21	Loughshinny	
BH19	18	Namurian	
BH20	43	Namurian/Aquifer	Possibly finishing in the Donore Fm which may be part of the aquifer here

I.4.97 The site is a former working quarry, however as it is located above the water table no dewatering has been undertaken in the past year.

Aquifer Characteristics

I.4.98 Both the aquifer and aquitard are old indurated rocks and therefore are dominated by secondary permeability. The permeability is likely to be related to particular horizons within the formations.

I.4.99 In order to establish vertical and horizontal permeability of the lithologies on the site, permeability testing was undertaken. Details are provided in the following paragraphs.

Infiltration Testing

I.4.100 Infiltration tests were undertaken in trial pits across the base of the excavation to assess the vertical permeability of the deposits.

I.4.101 Full details of the methodology for these tests, the calculations and the interpretation of the results are also included in *EIS Appendix A14.5*. The results of the infiltration tests are summarised below in Table **I.4.7**.

Table I.4.7: Summary of vertical infiltration calculation

Soakaway pit	Time period ending	Infiltration rate (m/s)
TP1	Test 1	4.22E-07
	Test 2	2.82E-08
TP2	Test 1	4.54E-07
	Test 2	1.53E-07
TP3	Test 1	Not conclusive*

* This test was inconclusive as water levels rose in the pit due to rainfall which did not allow calculations to be undertaken. However, it can be taken that this is an indication that the deposit has a low permeability.

I.4.102 These results indicate that the material at the base of the excavation has a low permeability and as such will provide natural protection to the groundwater resources beneath the site.

I.4.103 It should be noted that the calculations had to be modified as the soakaway pits did not drain over a full weekend. This in itself indicates that the material at the base of the excavation has a low permeability or at least a low vertical infiltration rate.

I.4.104 Furthermore, rain fell over the weekend causing TP3, which is located to the north of the site to over-flow as so little water had drained out of it. This indicates that the values may actually be lower than were calculated above.

Variable head testing

I.4.105 Variable head permeability tests were undertaken in many of the boreholes in order to estimate an approximate permeability of the response zone. The full details of these tests including calculations, interpretation and caveats are presented in *EIS Appendix A14.5*. Table **I.4.8** summarises the results obtained from those tests.

Table I.4.8: Summary Results from Variable Head Permeability Testing

Borehole ID	Response zone lithology	Method of Analysis	K (m/sec)	Comments
BH5	Namurian	Bouwer & Rice	5.4 x 10-5	
BH6	Namurian	Bouwer & Rice	5.7 x 10-4	Artesian*
BH8	Namurian	Bouwer & Rice	7 x 10-5	
BH11a	Namurian	Bouwer & Rice	5 x 10-5	Artesian*
BH15a	Loughshinny	Bouwer & Rice	1.04 x 10-6	
BH16	Namurian	Bouwer & Rice	6.95 x 10-6	
BH18	Loughshinny	Bouwer & Rice	-	Drawdown not achieved
BH19	Namurian	Bouwer & Rice	1.10 x 10-6	
BH20	Loughshinny	Bouwer & Rice	-	Drawdown not achieved

* Equations may not be valid for artesian wells

I.4.106 Of the three tests undertaken in the Loughshinny Formation, only one yielded results. This is because the groundwater levels in the other two recovered too quickly to allow a drawdown to be measured. This indicates that the Loughshinny Formation has a moderate to high permeability. The value calculated for BH15a should be treated with caution. A large amount of water was found in this monitoring well and such a small drawdown was achieved that the results may be too low and not reflective of the true permeability of the deposit.

I.4.107 The results of the tests undertaken in boreholes tapping the Namurian strata indicate a lower permeability than the Loughshinny Formation.

I.4.108 The caveats associated with the equations and method of testing as outlined in *EIS Appendix A14.5* should be borne in mind when considering these results.

Packer Tests

I.4.109 Packer tests were developed for use to estimate the amount of grout which would have to be used to block a fracture.

I.4.110 Packer tests were undertaken in the open Geo-bore 'S' holes in BH15, BH16 and BH18 on the MEHL site.

I.4.111 In BH15, two tests were undertaken in an area which cores indicated was very fractured. The area where these tests were taken were between 30 - 31.9 mbgl and 30.5 – 31.5 mbgl at the top of the Loughshinny Formation.

I.4.112 The first test was abandoned as a pressure increase was not observed and indicated that the pressure seal was not functioning correctly. No results could be obtained from the second test as the pressure levels could not be increased. This indicated that the fracture encountered was quite large indicating high permeability.

I.4.113 Two tests were also undertaken in BH16. The first was in a shallow area within the Walshestown Formation between 18 - 21.2 mbgl which was highlighted as having a lot of water flow. The packer tests indicated a permeability value of 2.2×10^{-6} m/s.

I.4.114 The second packer test in BH16 was undertaken between 54 - 55 mbgl. This area was still within the Walshestown Formation but was highlighted as being more fractured than previously noted areas. The packer tests indicated a permeability value of 3.29×10^{-6} m/s for this fractured area in the Walshestown Formation.

I.4.115 The final packer test was undertaken in BH18 between 18-21.2 mbgl. This area was thought to be in the Loughshinny Formation based on the deposits encountered, however it may have also been the Donore Formation due to difficulties in distinguishing the strata in places.

I.4.116 The packer test yielded a permeability value of 2.2×10^{-6} m/s at this location.

I.4.117 The results of all packer tests are summarised in Table **I.4.9**.

Table I.4.9: Summary Results of Packer Testing

BH ID	Depth (mbgl)	Geology	K value (m/s)	Comments
BH15	30 - 31.9	Loughshinny Fm	-	No seal obtained
	30.5 – 31.5	Loughshinny Fm	-	Pressure did not increase indicating highly permeable fracture
BH16	18 - 21.2	Walshestown Fm	2.2 x 10-6	
	54 - 55	Walshestown Fm	3.29 x 10-6	
BH18	18-21.2	Loughshinny Fm	2.22 x 10-6	

Pumping test

I.4.118 A pumping test was undertaken in BH17 in order to estimate the horizontal permeability of the Loughshinny deposit and to assess the hydraulic interactions across the site. The full details of the pumping test including the methodology, data correction, raw data, calculations and interpretation are presented in *EIS Appendix A14.6*.

I.4.119 Step drawdown (& recovery) and constant rate (& recovery) tests were undertaken however data from the observation boreholes could not be used to obtain data on the aquifer characteristics. This is because the presence of faults and partially penetrating wells influenced the groundwater levels in the observation wells during the pumping test and made the data unreliable for these calculations.

I.4.120 The recovery data from BH17 (pumping well) from both the step drawdown and constant rate tests were used to obtain data on the aquifer characteristics. The drawdown data obtained in BH17 during Step 1 of the step drawdown test was also used in the calculations by treating the 60 minutes as a constant rate test.

I.4.121 These calculations indicated that the Loughshinny deposit has a high transmissivity of up to 300 m/d (indicating a permeability of approximately 1.74×10^{-4} m/s if the aquifer is 50 m thick). Specific capacity values of approximately 250 m^3/d/m were also calculated from the data available.

I.4.122 While the observation well data could not be used in the calculations, the data obtained from them was useful for undertaking distance-drawdown analysis of the hydraulic conditions.

I.4.123 The distance-drawdown analysis was used to gain information on the hydrogeological characteristics of the faulting on the site. The analysis demonstrated that the N-S trending fault is hindering the movement of water across it rather than acting as a conduit for flow. However, it is not working as a complete barrier to flow.

I.4.124 The E-W trending fault does not appear to have any influence on the flow in the groundwater beneath the site and it is likely to be bringing the aquifer into contact with permeable horizons within the Namurian.

I.4.125 The shape of a semi-log plot of drawdown versus time coupled with a log-log plot of drawdown versus time can often be a useful indicator of the type of aquifer the pump is abstracting water from. The full details of this are presented in *EIS Appendix A14.6* and are summarised below.

I.4.126 Based on the shapes of the curves in the graphs, the groundwater in the aquifer is confined by the overlying low permeability deposits.

I.4.127 The groundwater in BH19, BH16 and BH5 appear to be tapping a linear weathered area, fault or fracture zone.

I.4.128 The shapes of the curves on the graphs also indicated that the majority of the storage is in fractures. This indicates that although a high permeability value was observed over the length of the pumping test, the aquifer at this location may not be a good long term groundwater resource if the storage is only contained within fractures.

I.4.129 The results of the various hydraulic and well tests indicate that the permeability of the Loughshinny Formation (the aquifer) is moderate being of the order of 10^{-4} / 10^{-5} m/s. The permeability of the more permeable horizons in the Namurian appears to be of the order of 10^{-6} m/s. The permeability of the bulk of the Namurian start appear to be significantly lower and is of the order of 10^{-7} / 10^{-8} m/s.

Groundwater Levels

I.4.130 As part of the current EPA waste licence conditions, groundwater monitoring has been undertaken on the site since 2003. Groundwater levels in the new monitoring boreholes (constructed as part of this investigation in April and May 2010) have been measured since their construction. All records for groundwater levels in new and old boreholes, including hydrographs, are available in *EIS Appendix A14.7*.

I.4.131 Table **I.4.10** summarises the maximum, minimum and average groundwater levels recorded on site for all installations

Table I.4.10: Summary of Groundwater Monitoring Data

Borehole ID	Response zone	Comments	Groundwater level					
			Minimum		Maximum		Average	
			mbgl	mOD	mbgl	mOD	mbgl	mOD
BH4A	Aquifer	Artesian well & topographically lower	-0.70	91.96	-0.70	91.96	-0.70	91.96
BH5	Aquitard		27.08	91.12	14.38	103.80	20.03	98.17
BH6	Aquitard	Artesian	0.17	116.80	-0.31	117.30	-0.30	117.30
BH9	Aquitard		27.54	101.00	20.84	107.72	24.09	104.47
BH10a	Aquifer		48.45	88.39	36.43	100.40	40.70	96.14
B11a	Aquitard	Artesian	4.76	93.41	-0.34	98.51	0.49	97.68
BH12	Aquifer (partially penetrating)		53.85	93.14	46.16	100.83	48.36	98.63
BH13	Aquifer		38.80	108.12	33.50	113.42	35.45	111.47
BH14	Aquifer		32.29	92.56	26.03	98.82	28.04	96.81
BH15a	Aquifer		6.34	99.55	6.02	99.87	6.22	99.66
BH16	Aquitard	Weathered/ fractured water bearing zone within Walshestown Formation	4.44	100.30	3.04	101.70	3.18	101.61

Borehole ID	Response zone	Comments	Groundwater level					
			Minimum		Maximum		Average	
			mbgl	mOD	mbgl	mOD	mbgl	mOD
BH17	Aquifer	Pumping well	5.03	100.38	4.46	100.95	4.68	100.73
BH18	Aquifer (partially penetrating)		10.40	100.10	9.51	100.99	9.70	100.80
BH19	Aquitard		3.42	101.66	2.85	102.23	3.04	102.04
BH20	Aquifer		3.90	100.94	3.45	101.39	3.60	101.24

I.4.132 Graphs of groundwater levels with corresponding rainfall data are plotted in *EIS Appendix A14.7*. These show that groundwater levels have been higher in recent years which corresponds with the country-wide pattern seen due to higher rainfall levels in 2008 and 2009. The hydrographs indicate that recharge/infiltration is slow and relatively low responding to seasonal rainfall rather than individual rainfall events.

I.4.133 *EIS Figure 14.13* shows groundwater levels plotted spatially across the site on 20th May 2010. Groundwater levels recorded in installations in the Loughshinny and in the Namurian deposits are distinguished from each other. This shows that groundwater levels in the Loughshinny are fairly consistent across the whole site demonstrating levels of approximately 100 mOD.

I.4.134 The exception to this is BH4A which is 91.96 mOD, however this borehole is at a lower elevation than the rest of the boreholes and is artesian for that reason. The value quoted as the groundwater level is actually the top of the casing implying the actual level is higher.

I.4.135 There is a large pond in the south eastern corner of the excavation and this probably reflects the water table in this part of the site.

I.4.136 The groundwater levels recorded in the Namurian deposits exhibit more variation across the site. In general they are shallower than the levels recorded in the Loughshinny and the values are more dependent on topography than the values recorded in the Loughshinny indicating separation from the water in the aquifer. The values at the base of the excavation demonstrate the shallowest levels recorded in the Namurian while those outside of the excavation pit demonstrate higher levels. However, it is likely that some of the installations in the Namurian deposits which are demonstrating similar groundwater levels to the Loughshinny are part of the Donore Formation. As outlined previously, it is considered that parts of the Donore Formation are part of the aquifer.

I.4.137 The only pattern which can be seen in the groundwater levels in the Namurian is in BH5, BH16 and BH19 which all demonstrate levels of approximately 101.5 mOD. The distance drawdown analysis grouped these wells together as potentially harnessing the same fracture/weathered zone.

Hydraulic conditions

I.4.138 The water table map presented in *EIS Figure 14.13* shows groundwater in the aquifer flowing to the south east. This is in line with the regional pattern discussed in the section *Regional Hydrogeology*. The hydraulic gradient in the aquifer is approximately 0.02 – 0.04 indicating that the water table has a moderate gradient.

I.4.139 The groundwater velocity beneath the site is the product of the hydraulic conductivity and the hydraulic gradient divided by the effective porosity. The effective porosity is expected to be very low and estimated to be 1-5%. Using the maximum hydraulic conductivity outlined in the section *Aquifer Characteristics* the groundwater velocity would be approximately 1.48 x 10^{-5} m/s.

I.4.140 The site is located in the upper part of a groundwater catchment. This location, the general absence of large springs in the aquifer, the confined nature of much of the aquifer in the site area and the moderate gradient and velocity indicate that the natural groundwater throughput in the aquifer is relatively low. However, owing to the secondary nature of the permeability in the aquifer, significant volumes of water can be induced to flow under stressed (pumping) conditions.

I.4.141 The hydraulic boundaries of the aquifer in the vicinity of the MEHL site are the confined zone to the north, a groundwater divide to the west, and a small stream and a formation boundary to the south. Down-gradient and to the east the aquifer width narrows and probably discharges to a tributary of the small stream that adjoins the northern boundary of the site.

Hydrochemistry

I.4.142 As part of the current waste licence conditions MEHL has been collecting groundwater quality samples on a quarterly basis and the data from this is presented in *EIS Appendix A14.8*. Groundwater samples were collected from all the monitoring points on site, both the existing and the new ones and the detailed analysis of the water chemistry is discussed in *EIS Appendix A14.8* and summarised below.

I.4.143 The groundwater beneath the site is hard, with concentrations of approximately 200 mg/l $CaCO_3$. This is characteristic of limestone deposits and even higher readings would be realistic.

I.4.144 Elevated concentrations of manganese were detected in all boreholes. This is likely to be due to the shaly deposits present on the site and is in line with the regional data presented.

I.4.145 Elevated spot concentrations of iron and nitrite were found in BH20 and BH18 respectively.

I.4.146 Sulphate concentrations exceeded the Drinking Water Standard in BH10A in the most recent round. In previous monitoring rounds, the values were within guidelines values.

I.4.147 Elevated concentrations of arsenic were found in 4 boreholes, molybdenum and antimony were both found in BH's 5 and 9. It is likely that these metals are naturally occurring.

I.4.148 The potassium:sodium ratio can be used as indicator for organic contamination. The GSI criteria for this is that the ratio must be less than 0.35. BH17 in the centre of the site is the only sample which failed this analysis with a ratio of 1.64 due to the high potassium concentration detected. However, the potassium detected may be naturally occurring.

I.4.149 Ionic balances were used to assess the quality of the data provided by the laboratory.

Vulnerability

I.4.150 Based on the results of the site investigation, it can be stated that between 5-10 m of low permeability material overlie the aquifer over the majority of the site. This is a conservative estimate as it takes account of the shallowest water strikes in the boreholes as opposed to the larger water strikes indicative of the presence of the strata to be taken to be the aquifer.

I.4.151 The aquitard strata on-site act as a low permeability layer and confine/isolate groundwaters within the aquifer from the surface

I.4.152 Following the GSI vulnerability criteria outlined in Table **I.4.5** this would indicate that the majority of the site has a Moderate vulnerability rather than Extreme.

I.4.153 The exception to this is in the southern corner of the excavation where the bedrock is exposed. In this area the vulnerability will still be Extreme.

Site Conceptual Model

I.4.154 A summary of the hydrogeology of the MEHL site is presented here in the form of a site conceptual model. The conceptual model for the site has evolved through the various stages of the project from initial desk study through the final interpretation of site specific data:

- Bedrock beneath this former quarry site can be divided into an aquifer unit, the Loughshinny Formation and the lower part of the overlying Donore Formation and an aquitard unit which consists of the upper part of the Donore Formation and the overlying Balrickard and Walshestown Formations. The aquifer unit is classified by the GSI as a Locally Important Aquifer and the aquitard as a Poor Aquifer.
- The majority of the site is underlain by the aquitard. The limestones of the Loughshinny Formation crop out in the southern part of the MEHL site and dip to the to the north, where they are covered by at least 60 m of aquitard strata in the northern parts of the site.
- There are at least two faults in the central part of the site, a N-S fault which appears to restrict groundwater movement and an E-W fault which does not. The latter appears to bring permeable horizons in the aquitard unit in contact with the aquifer.
- Permeability in the strata beneath the site is predominantly secondary in the form of joints, fractures, weathered/broken zones and faults. Permeability in the aquifer unit is of the order of $10^{-4}/10^{-5}$m/s. In the permeable horizons of the aquitard, permeability is of the order of 10^{-6}m/s and in the remainder of the strata it is of the order of $10^{-7}/10^{-8}$m/s. Storage in all of these strata is low.
- The aquitard strata on-site act as a low permeability layer and confine/isolate groundwaters within the aquifer from the surface. The increasing thickness of these strata reduce the vulnerability to the north.
- The groundwater levels in the aquifer unit are relatively consistent across the site and lie below the floor of the quarry aside from the large pond in the extreme southern part of the site. Groundwater levels in the overlying aquitard strata are more variable, are elevated in relation to those in the underlying aquifer and are artesian in certain horizons. This confirms their position on-site as a confining layer.
- Groundwater flows in a generally south easterly direction from the site at a gradient of 0.02-0.05 and a velocity of approximately 1.48 x 10^{-5} m/s.

- Groundwater level monitoring indicate that recharge/infiltration is slow and relatively low responding to seasonal rainfall rather than individual rainfall events. This indicates that storage is low in these strata.
- The site is located in the upper part of a groundwater catchment. This location, the general absence of large springs in the aquifer, the confined nature of much of the aquifer in the site area and the moderate gradient and velocity indicate that the natural groundwater throughput in the aquifer is relatively low. However, owing to the secondary nature of the permeability in the aquifer, significant volumes of water can be induced to flow under stressed (pumping) conditions.

I.4.155 Based on the NRA Guidelines criteria, the majority of the site is of Low Importance due to the presence of a Poor aquifer and the southern part is of Medium importance due to the presence of a Locally Important Aquifer.

Description of Proposed Development

I.4.156 The main elements of the proposed MEHL facility will be as follows:

- Cells for the containment of solid non-biodegradable inert, non hazardous and hazardous waste,
- New site entrance and access road at the southern boundary,
- New administration building and site management infrastructure,
- Solidification plant,
- Surface water and foul water management systems,
- Leachate management system.

I.4.157 The proposed site layout is shown on *EIS Figure 4.4*. Refer to the planning application drawings for the details of the buildings and facilities. A description of the main elements of the proposed facility is provided in *EIS Chapter 4, Proposed Site and Project Description* section 4.5.

I.4.158 The different waste types proposed will each pose a different risk to identified aquifer beneath the MEHL site. Hazardous and non-hazardous wastes could potentially impact the groundwater quality with the hazardous posing the highest risk. The inert waste will pose little or no risk to groundwater.

I.4.159 The risk to groundwater from each waste type will be dependent on where the waste will be placed. Based on the assessment undertaken in the section *Regional Hydrogeology* waste located on the south-eastern corner of the excavation is the area with the highest potential risk to groundwater while waste located in the northern part of the site will be afforded the highest level of natural protection.

I.4.160 Faulting was identified on site in the course of this assessment, however the EPA manual on site selection (2006) states that '*It is recommended that there should be no general prohibition of landfill siting on areas with geological faults. Rather, attention should be drawn to them by noting firstly that they are ubiquitous in Irish bedrock, that they often increase the permeability somewhat, and that investigations should take account of their possible presence. Construction of potentially polluting landfills in direct contact with faults should be avoided in situations where investigations show that the fault zone is excessively permeable.'*

I.4.161 The placement of the waste with regard to the distribution of the aquifers on the site is as follows:

- Locally Important Aquifer: Inert waste and non-hazardous waste
- Poor Aquifer: Hazardous waste

I.4.162 Based on the GSI criteria and the redefinition of the aquifer and vulnerability classifications on the site assessment (described in previous sections), the site can be given the following response classifications:

- Northern part of the site where hazardous waste will be placed: $R2^1$
- Southern corner of the site where non-hazardous and inert waste will be placed: $R2^2$

I.4.163 In line with the responses outlined in *EIS Appendix A14.11*, the GSI responses for each of these are follows:

$R2^1$ Acceptable subject to guidance in the EPA Landfill Design Manual or conditions of a waste licence.

- Special attention should be given to checking for the presence of high permeability zones. If such zones are present then the landfill should only be allowed if it can be proven that the risk of leachate movement to these zones is insignificant. Special attention must be given to existing wells down-gradient of the site and to the projected future development of the aquifer.

R2[2] Acceptable subject to guidance outlined in the EPA Landfill Design Manual or conditions of a waste licence.

- Special attention should be given to checking for the presence of high permeability zones. If such zones are present then the landfill should only be allowed if it can be proven that the risk of leachate movement to these zones is insignificant. Special attention must be given to existing wells down-gradient of the site and to the projected future development of the aquifer.
- Groundwater control measures such as cut-off walls or interceptor drains may be necessary to control high water table or the head of leachate may be required to be maintained at a level lower than the water table depending on site conditions.

I.4.164 The impact assessment for the proposed development and the proposed mitigation measures are outlined fully in the sections *Evaluation of Potential Impacts* and *Mitigation Measures*.

Evaluation of Potential Impacts

I.4.165 The discussion of the potential impacts of the proposed integrated waste management facility at the MEHL site have been subdivided into potential impacts to soils and geology; and the potential impacts to hydrogeology. A discussion as to whether these impacts are likely is also presented and if significant impacts are likely then mitigation measures are proposed in the section *Mitigation Measures*. Any residual impacts which remain after the mitigation measures have been developed are discussed in the section *Residual Impacts*.

Potential Impacts to Soils and Geology

I.4.166 The potential effect of the proposal on the existing soils and geology of the site are likely to be minimal as the proposal is to redevelop areas of the MEHL site to accept certain waste streams. These new waste streams will be stored in dedicated, discrete engineered lined cells.

I.4.167 The aspects of the proposed MEHL development which have the potential to impact on the soils and geology of the site are:

- Loss of the Geological Heritage Area - The MEHL quarry is to be back filled as part of its present planning permission and therefore the exposed quarry faces will eventually disappear in a 20 to 30 year period.
- Disposal of Non-Hazardous Bottom Ash - Non-Hazardous bottom ash is to be placed in a dedicated cell for convenient recovery should it prove environmentally viable. This shall reduce the need to extract virgin materials from elsewhere.

Potential Impacts to Groundwater

I.4.168 A confined aquifer underlies the MEHL site with varying degrees of vulnerability as a result of quarrying. The aquifer deposits outcrop to the south of the site and then dip northwards until they are confined by over 60 m of low permeability Namurian deposits in the north of the site.

I.4.169 The potential impacts which could occur from activities at the MEHL site have been identified as:

- Impacts to the hydrogeological regime through the reduction of recharge.
- Contamination of the aquifer and dependent receptors such as wells or the stream to the east of the site.
- Groundwater resources: sterilisation of resource.
- Groundwater flooding

I.4.170 These impacts have the potential to occur both at the construction and operational phases of the site works.

Hydrogeological Regime

I.4.171 Impacts to the hydrogeological regime may occur through the placement of the waste which could potentially both act as a barrier and could also act to reduce the recharge to the aquifer reducing its resource potential.

I.4.172 The landfill will only act as a barrier to flow if the waste were placed significantly below the water table. The piezometric head of the aquifer is currently below the base of the open excavation and details of the design elevations are discussed below.

I.4.173 If the site currently provided a significant amount of recharge to the aquifer, placing impermeable cells over the site in the form of filled landfills would reduce the recharge to the aquifer and potentially reduce its overall resource. The reduction in infiltration could also increase overland flow to streams and potentially increase their flow.

I.4.174 Currently the majority of the site is formed of an open excavation. Infiltration testing undertaken on the base of the excavation showed that the material has a low vertical permeability.

I.4.175 This can be seen on site currently as rainfall ponds in lower areas of the site, before draining to a sump. This water is then discharged through settlement ponds to the stream to the north of the site. Because of this the majority of the site currently contributes little to no recharge to the aquifer.

I.4.176 In the southern corner of the site, the aquifer outcrops and standing water is observed. This pond may provide a small element of recharge to the aquifer, however it is expected that there will be limited connection between it and the aquifer due to the build up of sediment at the base over time. Also, the size of the area of outcrop when compared with the size of the Loughshinny deposit indicates that the recharge that this area would offer is insignificant.

I.4.177 This indicates that placing low permeability engineered waste cells over the site will have no impact on the recharge to the aquifer.

I.4.178 Infilling this area with waste will cause an imperceptible impact on the recharge potential to the groundwater body. For this reason, no mitigation measures will be required for this potential impact.

Contamination of the Aquifer and Groundwater Based Receptors

I.4.179 Contamination of groundwater could potentially arise from the proposed development from a number of sources. This has the potential to impact the quality of groundwater, local wells and the stream 1.5 km to the east of the site.

I.4.180 The impacts are outlined in full in the following sections.

General contamination/accidents

- The groundwater monitoring boreholes in the centre of the site installed as part of this investigation may act as a pathway for any vertical movement of contamination beneath the cells.

- The accidental spillage of potentially polluting materials such lubricant, oil etc could pollute groundwater resources if left unattended.
- Discharge of contaminated water to surface water bodies may eventually enter the aquifer
- The pond on site may potentially be contaminated as it accepts runoff from higher areas and this runoff may be contaminated.

I.4.181 The placement of waste is also a potential impact and this has been outlined further for each waste type.

Quantitative Risk Assessment

I.4.182 As previously outlined, a Quantitative Risk Assessment using the programme LandSim v2.5 was undertaken for the proposed development. Following consultation with the EPA a model was created which simulated the waste in place with no engineered barriers.

I.4.183 It should be noted that this is an over-conservative scenario as there will be a positive gradient upwards beneath the site due to the confining conditions but LandSim cannot take account of this.

I.4.184 Full details of the assessment including justifications for input parameters, detailed results and interpretation are included in the QRA report presented in Appendix **I.4.2**. A summary of the results of the supplementary model with no engineered barriers in place are presented below:

- ‘Hazardous substances’ and ‘non-hazardous substances’ (List 1 and List 2 from the Water Framework Directive) present in groundwater beneath the site
- ‘Hazardous substances’ and ‘non-hazardous substances’ (List 1 and List 2 from the Water Framework Directive) present in a phantom well receptor placed on the down-gradient boundary of the MEHL site

I.4.185 This is an unrealistic scenario and has been undertaken to highlight the level of protection offered by the liners which will be put in place.

Potential Impact of Inert Waste

- Inert waste is not expected to have a significant impact on groundwater quality due to the Waste Acceptance Criteria associated with it.

- It is proposed to re-grade the existing inert cells and this may disturb or remobilising contaminants within previously deposited fill by reworking the cells. However, all material accepted to the site under the current licence has been tested to ensure that no contaminants exceed the Waste Acceptance Criteria. This indicates that there will be no risk to groundwater from re-grading this material.
- If hazardous or non-hazardous material is accidently allowed to enter the inert cells, this may potentially impact groundwater quality.
- If leachate from the different waste streams were mixed then contaminated leachate may enter the inert cells and cause contamination to groundwater.

Potential Impact of Non-Hazardous Waste

- If non-hazardous waste is placed directly on the aquifer it may potentially contaminate groundwater resources and local receptors (wells and streams).
- If groundwater is contaminated, this may enter the stream 1.5 km to the east of the site with which it has a hydraulic connection.
- Mixing of waste could allow the hazardous materials to enter the wrong cells which may potentially contaminate groundwater.
- If leachate from the hazardous cell is allowed to enter the non-hazardous cell it may cause groundwater contamination.
- If the leachate head is allowed to rise too high it may compromise the competence of the liner and cause leakage which may result in contamination of groundwater.

Potential Impact of Hazardous Waste

- If hazardous waste is placed directly on the aquifer it may potentially contaminate groundwater resources. This could potentially impact groundwater quality at wells abstracting down-gradient of the site.
- If groundwater is contaminated, this may enter the stream 1.5 km to the east of the site with which it has a hydraulic connection.
- If the leachate head is allowed to rise too high it may compromise the competence of the liner and cause leakage which may result in contamination of groundwater.

Groundwater Resources

I.4.186 The impact of the proposed development at the MEHL site on groundwater resources at the MEHL site can beneath the site and the potential for contamination of the groundwater resource. The potential for contamination is covered in detail above and this section will deal solely on the potential impact to the sterilisation of resources.

I.4.187 The proposed development would mean that no groundwater wells can ever be installed on the site. The aquifers on the MEHL site are a Locally Important aquifer and a Poor Aquifer.

I.4.188 The significance of the impact to the aquifers in an unmitigated be considered both in terms of the sterilisation of the groundwater resource scenario in line with the criteria outlined in *EIS Appendix Table A14.11.5* is a Large Adverse impact. This leads to a significance of the impact to the Locally Important aquifer as being a 'Significant impact' and the significance of the impact to the Poor aquifer as being a 'Poor/Moderate impact'.

I.4.189 On the basis of the precautionary principal the presence of a hazardous waste landfill restricts groundwater development for a short distance down gradient. The MEHL land-ownership boundary is approximately 300m down-gradient of the nearest hazardous cell.

I.4.190 A well survey was undertaken to establish the location of down-gradient receptors in the area and only one was identified down-gradient of the site.

I.4.191 Mitigation measures proposed for these potential impacts are outlined below.

Groundwater Flooding

I.4.192 The potential impact from groundwater flooding was highlighted by one consultee as a particular concern. For this reason, the potential for groundwater flooding will be assessed.

- The site is currently an excavated former quarry with an existing EPA waste licence for the landfilling of inert waste.
- The piezometric head of the groundwater is below the base of the excavation, except for in the south eastern corner of the excavation where the excavation is below 100 m and the groundwater within the Loughshinny Formation is unconfined.
- The proposed formation level is above the piezometric level of the groundwater.

I.4.193 For this reason groundwater flooding will not cause an impact on the MEHL site and will not be considered further in this assessment.

Mitigation Measures

Mitigation Measures for Soils And Geology

I.4.194 The mitigation measures include:

- The MEHL quarry is to be back-filled as part of its present planning permission. However, given that the restoration of the MEHL facility will not be complete for some time, geological outcrops shall remain exposed for, at a minimum, the next 20 years. See *EIS Chapter 4, Proposed Site and Project Description* for details of the phasing of these works. Following consultation with the GSI, MEHL has agreed to:
    - provide a viewing platform from which the quarry faces can be viewed in a safe environment
    - To provide an information panel
    - To maintain certain exposures for as long as is practical and
    - To allow for professional and/or student access where the necessary insurances are in place

I.4.195 These proposals were accepted by the Irish Geological Heritage Programme and relevant correspondence are included in *EIS Appendix A1.3*.

- Any Earthworks and excavation of deposited inert wastes will be carried out in a controlled manner in compliance with the waste licence conditions for the site.

Mitigation Measures for Groundwater

I.4.196 The mitigation measures which have been developed are outlined below.

Hydrogeological Regime

I.4.197 As outlined above the only potential impact from the proposed development to the hydrogeological regime arise from the waste acting as a barrier to flow.

I.4.198 In order to ensure that the waste will not act as a barrier to groundwater flow, the following mitigation measures will be put in place:

- The formation level for the site will be set at 102.5 mOD and

- Sumps will be placed in localised areas at a level of 102 mOD

I.4.199 The current base of the excavation is at approximately 105 mOD which indicates that there will be a maximum further excavation of 2.5 m across the site and up to 3 m in places. However, these levels are above the piezometric head of the groundwater in the aquifer and are also above any of the major water strikes encountered in the weathered and faulted areas in the Namurian deposits on the site. This mitigation measure will ensure that the material will not act as a barrier to flow.

Groundwater Contamination

I.4.200 Mitigation measures have been prescribed for the potential impacts which may cause groundwater contamination as outlined above.

General contamination/accidents

- Monitoring boreholes drilled during this investigation which are within the footprint of the cells will be abandoned in line with standards set out in the IGI guidelines. They will be grouted to ensure that they do not allow a preferential pathway for contamination to develop.
- All potentially polluting materials such as lubricant or oil will be stored in bunds to ensure that in the event of an accidental spillage they will not enter groundwater.
- Contaminated water will not be discharged to surface water bodies.
- The water contained within the pond will be tested before disposal and will be appropriately treated and disposed of as required.

Mitigation Measures for Inert Waste

- The inert waste will be placed above the piezometric head of the water table.
- It is proposed to place inert waste on the area of the site where the aquifer outcrops. This area will be backfilled to 102.5 mOD to bring it above the water table
- The inert material will be placed in cells lined with low permeability clay 1 m thick which will be designed in line with EU regulations and EPA guidance.
- The waste streams of inert, hazardous and non-hazardous waste will be kept isolated to ensure that hazardous waste does not enter the inert or non-hazardous cells. Full details of this can be found in *EIS Chapter 4, Proposed Site and Project Description*.

- Separate leachate collection systems will be installed in the different waste cells to ensure that the leachate does not mix and be re-circulated in the wrong cell.
- As part of the waste licence conditions, an Environmental Monitoring Plan will be developed for the site to monitor groundwater.

Mitigation Measures for Non-Hazardous Waste

- Non-hazardous waste cells will be lined with a 2 mm thick HDPE liner and 1 m thick low permeability clay which will be designed in line with EU regulations and EPA guidelines.
- As the non-hazardous material is to be placed in the south of the site where the aquifer is shallower, an additional 1 m of low permeability natural material with a permeability of 6.6×10^{-10} m/s will be placed beneath the liner to further enhance the natural protection.
- The waste streams of inert, hazardous and non-hazardous waste will be kept isolated to ensure that hazardous waste does not enter the inert or non-hazardous cells. Full details of this can be found in *EIS Chapter 4, Proposed Site and Project Description*.
- Separate leachate collection systems will be installed in the different waste cells to ensure that the leachate does not mix and be re-circulated in the wrong cell.
- The head of leachate in the cells will be limited to 1m within the non-hazardous cells.
- As part of the waste licence conditions, an Environmental Monitoring Plan will be developed for the site to monitor groundwater.

Mitigation Measures For Hazardous Waste

- Hazardous waste will only be placed on the Poor Aquifer on the site and will not be placed on the Locally Important Aquifer.
- A Dense Asphaltic Concrete (DAC) liner will be constructed for the cells in which hazardous waste is to be placed. The details of the DAC liner are outlined in full in *EIS Chapter 4, Proposed Site and Project Description.* The liner will be designed to meet EU Landfill Directive requirements.
- In order to minimise leachate generation from the flue gas treatment residues, the waste will be solidified before being placed in the cells.
- To further minimise leachate generation, temporary cover options will be employed.

- The head of leachate in the cells will be limited to 1m within the hazardous cells.
- Leachate collected from the hazardous cells will be re-used in the solidification plant further reducing the possibility of surface and groundwater contamination.
- As part of the waste licence conditions, an Environmental Monitoring Plan will be developed for the site to monitor groundwater.
- As outlined in *EIS Chapter 4, Proposed Site and Project Description* the failure of the DAC liner is an unlikely event. However, as the failure of the liner has the potential to cause impacts to groundwater a mitigation measure has been developed for it.
- A leak monitoring and collection system will be provided below the DAC to ensure that leaks will be detected early. This detection system will be placed within the granular stabilisation layer of the liner. Due to the overall composition of the liner, there will be 0.5 m of low permeability clay beneath the leachate detection system to contain the movement of any leak in the DAC.
- Any liquid collected in this detection system will be pumped out of the collection sump and will be tested and disposed of or reused in the solidification plant as appropriate.

Validation of mitigation measures

I.4.201 A Quantitative Risk Assessment using the programme LandSim v2.5 was undertaken for the proposed development. Three scenarios were modelled following consultation with the EPA. The model with no liners in place was presented. This section presents the impact when all liners are in place and functioning correctly and also when one hazardous cell is leaking.

I.4.202 Full details of the assessment including justifications for input parameters, detailed results and interpretation are included in the QRA report presented in Appendix **I.4.2**. The scenario was modelled over a 20,000 year time span to assess any future mobilisation of contaminants.

I.4.203 A summary of the results of the primary model when all the liners are in place and functioning correctly are presented below:

- No 'hazardous substances' (List 1) in groundwater beneath the site (and therefore none detected at the phantom receptor well)
- 'Non-hazardous substances' (List 2), metals, chloride and sulphate present in groundwater beneath the site after 20,000 years above Drinking Water Standards

- No contaminants detected at the phantom well receptor above Drinking Water Standards
- When a supplementary model simulated failure of the liner in a single hazardous cell, the concentrations of contaminants modelled increased and 'hazardous substances' and 'non-hazardous substances' (List 1 and List 2) were detected in groundwater above Drinking Water Standards.

I.4.204 These results were obtained on the presumption that the mitigation measures outlined below will be put in place. The results highlight the level of protection that the liners offer to groundwater. Specific mitigation measures will be put in place as outlined above to mitigate against liner failure in the hazardous cells.

Groundwater Resources

I.4.205 The provision of suitably lined cells to receive the various waste types coupled with an EPA approved groundwater monitoring programme will ensure that existing or proposed down-gradient wells are suitably protected from contamination.

Residual Impacts

I.4.206 A summary of the impacts to each receptor and the residual impact once mitigation measures have been put in place is outlined in Table **I.4.11**. All residual impacts have a Significance rating of 'Imperceptible'.

I.4.207 The likely significant effects of the project on the soils and geology of the area is considered to be positive, given that the soils will be reused and the MEHL facility will be restored with its former landscape characteristics.

I.4.208 The residual impacts on groundwater are considered to be Imperceptible with the proposed mitigation measures in place.

Table I.4.11: Summary of Predicted Impacts and Mitigation Measures

Constraint		Impacts and mitigation					
Name	**Importance**	**Magnitude of Impact**	**Criteria for Impact Assessment**	**Significance of Impact**	**Mitigation Measure**	**Residual Impact**	**Residual significance of impact**
Geology							
Geological Heritage Area	Very High	Large Adverse	Infill of quarry will result in the loss of a number of outcrops of geological interest in the area. Quarry offers an opportunity to view a number of strata in close succession.	Profound	Through correspondence with the GSI an agreement has been reached. MEHL will provide a viewing platform for the site and will allow access once certain conditions as set out in the correspondence in *EIS Appendix A1.3* are met. However it should be noted that the conditions of the planning permission for the quarry require the quarry to be backfilled and restored.	Negligible	Imperceptible
Non-hazardous bottom ash	Low	Minor Beneficial	Disposal of non-hazardous bottom ash into dedicated cells within the landfill.	Imperceptible	None required.	Minor Beneficial	Imperceptible

Constraint		Impacts and mitigation					
Name	**Importance**	**Magnitude of Impact**	**Criteria for Impact Assessment**	**Significance of Impact**	**Mitigation Measure**	**Residual Impact**	**Residual significance of impact**
Hydrogeology							
Locally Important aquifer	Medium	Large Adverse	Infilling of waste may cause contamination of groundwater contained in the aquifer	Significant Impact	Employing engineered liners in line with EU legislation. Employ a leak detection system to serve as a warning for contamination. Maintain good site practices	Negligible	Imperceptible
Poor aquifer	Low	Large Adverse	Infilling of waste may cause contamination of groundwater contained in fractures etc	Slight/Moderate impact	Employing engineered liners in line with EU legislation. Employ a leak detection system to serve as a warning for contamination. Maintain good site practices	Negligible	Imperceptible
Wells identified during well survey	Low	Large Adverse	One well is down-gradient of the site and may be impacted by any contamination arising from the site.	Slight/Moderate impact	Employing engineered liners in line with EU legislation. Employ a leak detection system to serve as a warning for contamination. Maintain good site practices	Negligible	Imperceptible

I.5 Ground and/or groundwater contamination

I.5.1 The site is a former quarry and is currently an operational inert landfill site, under EPA licence W0129-02. Waste is placed in lined cells suitable for inert, in compliance with the EPA licence and the Landfill Directive 1999.

I.5.2 There have been no known historical pollution incidents at the site and there is no evidence of contaminated ground or groundwater.

I.6 Noise Impact

1.6.1 Chapter 11 of the EIS presents an assessment of the potential impacts of noise and vibration from the proposed MEHL integrated waste management facility. Key extracts are provided here in the Waste Licence Application; the full EIS (authored by Arup) accompanies this application.

Receiving Environment

I.6.2 The existing MEHL facility is located at Hollywood Great, Nag's Head, Naul Co. Dublin. The surrounding environment in the vicinity of the site is predominately rural with a small number of residential dwellings located in proximity to the site boundary.

I.6.3 The site is bounded to the north, south, east and west by agricultural land and a small number of residential properties. The closest noise sensitive building is a residential property located along the southern boundary, typically at a distance of the order of 0.5 to 1m from the immediate site boundary and a further 30 to 40m from any site operations separated by a buffer zone. The next nearest noise sensitive location is of the order of 36m south of the site boundary.

I.6.4 Environmental noise surveys were conducted in order to quantify the existing noise environment in the vicinity of the existing MEHL facility. The surveys were conducted in general accordance with IS0 1996: 2007 Acoustics – Description, Measurement and Assessment of Environmental Noise. Details of the surveys are set out below.

Measurement Locations

I.6.5 Three measurement locations were selected; each is described in turn below and is shown in *EIS Figure 11.1*.

- Location S01 - This measurement position was located within the front garden of a residential property which borders the southeast of the existing MEHL facility. This property is in the control of MEHL and is unoccupied. The range of noise levels measured at this property is representative of the residential dwellings to the east of this location and immediately south.

- Location S02 - This measurement position was located at the northern end of a laneway to a farm house located to the south west of the facility. This location was chosen to represent sensitive receptors to the west of the existing facility.
- Location S03 - This measurement position was located between two residential properties located to the north west of the existing MEHL facility, representing noise levels at receptors along this boundary of the facility.

Instrumentation

I.6.6 The noise measurements were conducted using a Brüel & Kjær Type 2260 Sound Level Meter. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. Please see *EIS Appendix A11.1* for Certificate of Calibration.

Survey Periods

I.6.7 Measurements were conducted over the course of the following survey periods:

- Daytime: 10:36hrs to 11:35hrs on 26 May 2010; and 14:59hrs to 17:00hrs on 27 May 2010
- Night-time: 23:00hrs on 15 June to 01:37hrs on 16 June 2010

I.6.8 The measurement periods were selected in order to provide a typical snapshot of the noise climate at nearby noise sensitive locations, with the primary purpose being to provide a typical range of noise levels that may be encountered during the day and night-time periods. It should be noted, the existing MEHL facility does not operate during night-time periods. Noise levels measured during this period represent noise levels in the absence of the site during night-time hours.

Procedure

I.6.9 Measurements were conducted on a cyclical basis at the locations noted above. Sample periods for the noise measurements were 15 minutes over three hours at each location which is considered suitable to obtain a snap shot of the existing environment for the purpose of the EIS study. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis. Survey personnel noted the primary noise sources contributing to noise build-up.

Weather

I.6.10 The weather during the daytime survey period was dry with temperatures of approximately 14°C and wind speeds were less than 2m/s.

I.6.11 The weather during the night-time survey period was dry and clear. Temperatures were approximately 6°C and wind speeds were less than 2 m/s.

Measurement Parameters

I.6.12 The noise survey results are presented in terms of the following five parameters:

- L_{Aeq} = the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. It is typically used as a descriptor for ambient noise.
- L_{Amax} = the instantaneous maximum sound level measured during the sample period.
- L_{Amin} = the instantaneous minimum sound level measured during the sample period.
- L_{A10} = the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
- L_{A90} = the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

I.6.13 The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Survey Results and Discussion

Location S01

I.6.14 The survey results for Location S01 are summarised in Table **I.6.1** below.

Table I.6.1: Summary of Noise Measurements at Location S01

Measurement Period (Date/Time)			Measured Noise Levels (dB re. 2x10^{-5} Pa)				
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	26/05/10	10:36 – 10:51	57	76	29	57	33
	27/05/10	14:59 – 15:14	57	76	32	55	37
		16:02 – 16:17	58	75	31	59	35
Night-time	15/06/10	23:01 - 23:16	51	76	34	45	37
	16/06/10	23:54 - 00:09	44	68	32	39	35
		00:46 - 01:01	38	66	30	39	34

I.6.15 During the daytime measurement period, the main source of noise was from occasional passing traffic along the local road. Birdsong and leaf rustle formed the background noise environment. No activities from the existing MEHL facility were audible during the survey. Noise levels were in the range 57 to 58dB L_{Aeq} and background noise levels were in the range 33 to 37dB L_{A90}.

I.6.16 During the night-time measurement period, the noise climate was influenced by distant road traffic noise and occasional local road traffic. An aircraft overhead was noted during the first measurement period. The existing MEHL facility was not in operation during the survey period. Noise levels were in the range 38 to 51dB L_{Aeq} and background noise levels were in the range 34 to 37dB L_{A90}.

I.6.17 No source of vibration was observed.

Location S02

I.6.18 The survey results for Location S02 are summarised in Table **I.6.2** below.

Table I.6.2: Summary of noise measurements at Location S02

Measurement Period (Date/Time)			Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	26/05/10	10:55 – 11:10	56	77	32	51	36
	27/05/10	15:18 – 15:33	60	83	34	55	37
		16:45 – 17:00	60	81	29	55	33
Night-time	15/06/10	23:19 - 23:34	55	80	32	46	34
	16/06/10	00:12 - 00:27	51	79	30	39	32
		01:04 - 01:19	34	64	27	33	29

I.6.19 During the daytime measurement period, the main source of noise was from intermittent passing traffic along the local road and distant noise from farmyard activities. Birdsong and leaf rustle formed the background noise environment. Occasional aircraft were also noted to be faintly audible. No activities from the existing MEHL facility were audible during the survey. Noise levels were in the range 56 to 60dB L_{Aeq} and background noise levels were in the range 33 to 37dB L_{A90}.

I.6.20 During the night-time measurement period, the noise climate was influenced by distant road traffic noise and occasional local road traffic. A Garda vehicle passed during the first measurement period. No passing traffic was noted during the third measurement. The existing MEHL facility was not in operation during the survey period. Noise levels were in the range 34 to 55dB L_{Aeq} and background noise levels were in the range 29 to 34dB L_{A90}.

I.6.21 No source of vibration was observed.

Location S03

I.6.22 The survey results for Location S03 are summarised in Table **I.6.3** below.

Table I.6.3: Summary of noise measurements at Location S03

Measurement Period (Date/Time)			Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Day-time	26/05/10	11:20 – 11:35	54	80	34	51	37
	27/05/10	15:38 – 15:53	57	80	29	51	33
		16:25 – 16:40	52	84	27	45	31
Night-time	15/06/10	23:37 - 23:52	53	79	34	40	36
	16/06/10	00:29 - 00:44	48	74	30	39	33
		01:22 - 01:37	36	66	28	35	31

I.6.23 During the daytime measurement period, the main source of noise was from passing traffic along the local road. Birdsong and leaf rustle formed the background noise environment. Occasional aircraft were also noted to be faintly audible. No activities from the existing MEHL facility were audible during the survey. Noise levels were in the range 52 to 57dB L_{Aeq} and background noise levels were in the range 31 to 37dB L_{A90}.

I.6.24 During the night-time measurement period, the noise climate was influenced by distant road traffic noise and occasional local road traffic. No passing traffic was noted during the third measurement. The existing MEHL facility was not in operation during the survey period. Noise levels were in the range 36 to 53dB L_{Aeq} and background noise levels were in the range 31 to 36dB L_{A90}.

I.6.25 No source of vibration was observed.

Annual Waste Licence Monitoring

I.6.26 A review of annual noise monitoring between 2008 and 2010 was conducted to assess the range of noise levels typically encountered in the vicinity of the existing MEHL site.

I.6.27 The results for five noise sensitive locations labelled N4 to N8, monitored during the annual surveys for 2008, 2009 and 2010 are summarised below. Refer to *EIS Figure 11.2* for annual monitoring locations.

Table I.6.4: Summary of Noise Monitoring during 2008, 2009 & 2010 Annual Surveys

Location		Daytime LAeq, 30mins			Night-time LAeq, 30mins		
		2010	2009	2008	2010	2009	2008
N4	Located along road; north of the facility	52	55	52	45	41	45
N5	Located along road; west of the facility	58	64	57	52	59	49
N6	Located along road; south-east of the facility	55	57	58	43	46	44
N7	Located along the local road; beyond southern boundary	57	66	63	42	57	52
N8	Located along the local road at southeast corner of the site	62	69	63	48	59	45

I.6.28 The main sources of noise noted during the previous surveys were from road traffic along the local road network, vehicular traffic accessing a nearby permitted waste facility, occasional overhead aircraft noise and leaf rustle. The report concludes that road traffic is the dominant source in the existing environment and the exiting MEHL facility does not contribute to the current noise climate.

Noise and Vibration Characteristics of the Proposed Development

I.6.29 The proposed MEHL integrated waste management facility will comprise the following key elements:

- Construction of new inert, non hazardous and hazardous waste cells.
- Construction of a solidification plant, associated storage building and staff welfare facilities.
- Installation of the necessary leachate, surface water and other associated landfill management infrastructure.

- Construction of the necessary administration, access and ancillary infrastructure to include a new entrance, administration building and two new weighbridges.

I.6.30 It is anticipated that the proposed MEHL facility will be developed over four phases during a 25 year lifespan. Due to the nature of the proposed facility, there is no distinct 'construction' or 'operational' phase as both will continue in tandem within each phase to develop the site over this time period. Further details of the proposed phasing are provide in *EIS Chapter 4, Proposed Site and Project Description.* The existing facility has mobile crushing, screening, grading and conveyor equipment on site. This will be retained as part of the proposed facility's operation.

I.6.31 On review of the proposed MEHL development, the following four activities are considered to be the primary sources of noise:

- Site development and cell operation
- Traffic accessing the facility
- Building services plant
- Additional vehicular traffic on public roads

I.6.32 Each of these activities is discussed in the following sections.

Evaluation of the Noise and Vibration Impacts

Site Development and Cell Operation

Phase 1

I.6.33 During Phase 1 of the proposed MEHL development, there will be an initial construction period where a new entrance and access road, new administration building and solidification plant will be constructed. This initial construction phase is separate to the normal 'construction' and 'operational' phases of the landfill cell development and management. Notwithstanding this, this initial construction work has been assessed against the waste licence limits.

I.6.34 In addition to the initial site works, construction of Hazardous cell 1 (H1) and Inert cell 1 (IN1) will occur during the first two years of Phase 1. A variety of items of plant will be in use, such as excavators, breakers, lifting equipment, dumper trucks, compressors, and generators. There will be vehicular movements to and from the site which will make use of the new site entrance, once constructed.

I.6.35 Table **I.6.5** presents the predicted noise levels assuming combined construction of IN1 and H1 cells in addition to activities associated with road work and building construction. Calculations have been made at the four noise sensitive locations along the north western and southern boundaries. *EIS Figure 11.3* illustrates the location of the assessment positions.

I.6.36 In order to assess a worst case scenario, the calculations assume that all construction plant is operating simultaneously within the various areas of the site. The calculations take account of the vertical screening between the assessment receptor locations and the working areas.

Table I.6.5: Phase 1 Site development and Cell Development Noise Calculations

Description (Plant Item and BS5228 Reference)	Predicted Noise Level dB $L_{Aeq,\,1\,hr}$			
	NSL1	NSL2	NSL 3	NSL 4
Road Works and Building Construction	Construction of site entrance, haul road & new buildings			
Pneumatic breaker C.2.11	44	32	35	49
Tracked excavator (loading dump truck) C1-10	42	30	33	47
Articulated dump truck (dumping rubble) C1-11	37	25	28	35
Dozer C.2.10	37	25	28	35
Vibratory Roller C5-24	41	29	32	46
Asphalt Paver & Tipping Lorry C5-31	34	22	25	39
Concrete Mixer Truck C4-27	34	24	27	34
Diesel Generator C4-84	29	19	22	29
Hand Held Circular Saw C4-72	34	24	27	34
Total	*49*	*37*	*40*	*52*

Description (Plant Item and BS5228 Reference)	Predicted Noise Level dB $L_{Aeq, 1 hr}$			
	NSL1	NSL2	NSL 3	NSL 4
Site Clearance & Cell Construction (per cell)	Combined Inert Cell IN1 & Hazardous Cell H1 Construction			
Pneumatic breaker C.2.11 (1 No.)	30	38	36	41
Tracked excavator (loading dump truck) C1-10 (2 no.)	50	43	40	45
Articulated dump truck (dumping rubble) C1-11 (5 no)	50	38	35	40
Wheeled loader C2-26 (2 no.)	45	38	35	40
Dozer C.2.10 (1 no.)	45	38	35	40
Roller C.2.38* (1 no.)	43	36	33	38
Total	*55*	*47*	*44*	*49*
Mobile Crushing & screening Equipment (C9.14)*	Operation of Crusher and screener adjacent to solidification plant			
Total	*42*	*36*	*42*	*43*
Combined Cell Construction and Screening/Crushing Activities	55	47	46	50
Hazardous Cell Lining	Lining of Hazardous Cell H1			
Asphalt Paver & Tipper Lorry (C5.31) (2 no.)	23	31	19	23
Vibratory Compactor (Asphalt) C.5.29 (2 no.)	34	42	30	34
Roller C.2.38* (2 no.)	30	38	26	30
Total	36	44	32	36

Note: *A noise level of 90dB L_{Aeq} at 10m from both the mobile crusher and screener have been used in the noise calculations.

I.6.37 The indicative calculated noise levels set out in Table **I.6.5** above are within the daytime operational noise limit of 55dB(A) at the closest locations to the works. In the case of the road works and building construction, the calculations assume the plant items are located along the new access road and at the location of the site buildings. In the case of the cell development, the calculated values assume that the plant items listed in the table are operating in each of the cells being developed.

I.6.38 During the normal operation involving filling cells, capping and restoration (typically between years 2012 and 2016), the level of activity within the MEHL facility will be no greater than that associated with the construction phases predicted in Table **I.6.5** and hence are expected to operate within the licence limits.

Phase 2

I.6.39 During Phase 2 of the proposed MEHL development, construction of hazardous cell 2 (H2), non hazardous cell 1 (NH1), inert cell 2 (IN2) and inert cell 3 (IN3) will take place over the first 2 to 3 years. In order to assess a worst case assessment, calculations have been conducted assuming all four cells are developed simultaneously. Spoil crushing and screening may also take place during this Phase and has been included in the noise calculations.

I.6.40 Table **I.6.6** presents the calculated noise levels based on the plant items and cell activity assumed as part of this phase. The same noise sensitive locations as illustrated in *EIS Figure 11.3* have been assessed.

Table I.6.6: Phase 2 Waste Cell Development Noise Calculations

Description (Plant Item and BS5228 Reference)	Predicted Noise Level dB $L_{Aeq, 1 hr}$			
	NSL1	NSL2	NSL 3	NSL4
Site Clearance & Cell Construction (per cell)	Combined construction of cell H2, NH1, IN2 &IN3			
Pneumatic breaker C.2.11 (1 No.)	45	38	36	41
Tracked excavator (loading dump truck) C1-10 (2 no.)	49	43	40	46
Articulated dump truck (dumping rubble) C1-11 (5 no)	44	38	35	41
Wheeled loader C2-26 (2 no.)	44	38	35	43
Dozer C.2.10 (1 no.)	44	38	35	41
Roller C.2.38* (1 no.)	42	36	33	39
Total	*53*	*47*	*44*	*50*
Hazardous Cell Lining	Lining of Hazardous Cell H2			
Asphalt Paver & Tipper Lorry (C5.31)	23	31	19	23
Vibratory Compactor (Asphalt) C.5.29	34	42	30	34
Roller C.2.38*	30	38	26	30
Total	*37*	*42*	*33*	*34*
Mobile Crushing & screening Equipment (C9.14)*	Operation of Crusher and screener adjacent to solidification plant			
Total	*42*	*36*	*42*	*43*
Combined Cell Construction, Hazardous Lining and Screening/Crushing Activities	54	48	47	51

I.6.41 The indicative calculated noise levels set out in Table **I.6.6** above are within the daytime operational noise limits of 55dB(A) at the closest locations to the works. The calculated values assume that the plant items listed in the table are operating in each of the cells being developed.

I.6.42 During the normal operation involving filling cells, capping and restoration (typically between years 2016 and 2024), the level of activity within the MEHL facility will be no greater than that associated with the construction phases predicted in Table **I.6.6** and hence are expected to operate within the licence limits.

Phase 3

I.6.43 During Phase 3 of the proposed MEHL development, construction of hazardous cell 3 (H3) will take place over the first 3 years. Simultaneous operation of cells NH1, IN1 and IN2 will take place during this phase also. In order to assess a worst case assessment, calculations have been conducted assuming the construction and operational phase of the cells detailed above are conducted simultaneously.

I.6.44 Table **I.6.7** presents the calculated noise levels based on the plant items and cell activity assumed as part of this phase. The same noise sensitive locations as illustrated in *EIS Figure 11.3* have been assessed.

Table I.6.7: Phase 3 Combined Construction and Operational Noise Calculations

Description (Plant Item and BS5228 Reference)	**Predicted Noise Level dB $L_{Aeq, 1\,hr}$**			
	NSL1	**NSL2**	**NSL 3**	**NSL 4**
Site Clearance & Cell Construction	Construction of Cell H3			
Pneumatic breaker C.2.11 (1 No.)	35	36	38	42
Tracked excavator (loading dump truck) C1-10 (2 no.)	39	38	39	43
Articulated dump truck (dumping rubble) C1-11 (5 no)	34	36	38	42
Wheeled loader C2-26 (2 no.)	34	36	38	42

Description (Plant Item and BS5228 Reference)	**Predicted Noise Level dB $L_{Aeq,\ 1\ hr}$**			
	NSL1	**NSL2**	**NSL 3**	**NSL 4**
Dozer C.2.10 (1 no.)	34	31	28	32
Roller C.2.38* (1 no.)	32	29	26	30
Total	*43*	*43*	*44*	*48*
Hazardous Cell Lining	Lining of Hazardous Cell H3			
Asphalt Paver & Tipper Lorry (C5.31)	28	24	21	26
Vibratory Compactor (Asphalt) C.5.29	39	36	33	37
Roller C.2.38*	35	32	29	33
Total	*41*	*37*	*34*	*39*
Combined Construction and Lining of Hazardous Cells	41	38	35	39
Operational Cells	Operation of Cells NH1, IN1 &IN2			
Dozer (C2.10)	47	34	37	42
Articulated dump truck (dumping rubble) C1-11	47	34	37	42
Tracked excavator (Spreading rubble) C1-13	47	34	37	42
Wheeled loader C2-26	47	34	37	42
Total	53	40	43	48
Combined Construction and Operation	53	42	44	48

I.6.45 The indicative calculated noise levels set out in Table **I.6.7** above are within the daytime operational noise limits of 55dB(A) at the closest locations to the works. The calculated values assume that the plant items listed in the table are operating in each of the cells being developed and during their operational phase.

Phase 4

I.6.46 During Phase 4 of the proposed MEHL development, construction of non hazardous cell 2 (NH2) will take place. Simultaneous operations of cells NH2 and IN1 will take place in addition to the restoration of cells H3 and NH1. In order to assess a worst case assessment, calculations have been conducted assuming the construction and operational phase of the cells detailed above are conducted simultaneously.

I.6.47 Table **I.6.8** presents noise calculations based on the assumptions noted above. The same noise sensitive locations as illustrated in *EIS Figure 11.3* have been assessed.

Table I.6.8: Phase 4 Combined Construction and Operational Noise Calculations

Description (Plant Item and BS5228 Reference)	*Predicted Noise Level dB $L_{Aeq,\,1\,hr}$*			
	NSL1	*NSL2*	*NSL 3*	*NSL 4*
Site Clearance & Cell Construction (per cell)	*Construction of Cell NH2*			
Pneumatic breaker C.2.11 (1 No.)	*39*	*28*	*30*	*39*
Tracked excavator (loading dump truck) C1-10 (2 no.)	*43*	*32*	*34*	*43*
Articulated dump truck (dumping rubble) C1-11 (5 no)	*38*	*27*	*29*	*38*
Wheeled loader C2-26 (2 no.)	*38*	*27*	*29*	*38*
Dozer C.2.10 (1 no.)	*38*	*27*	*29*	*38*
Roller C.2.38* (1 no.)	*36*	*25*	*27*	*36*
Total	*47*	*36*	*38*	*47*
Operational Cells	*Combined Operation of Cells NH2 &IN1*			
Dozer (C2.10)	*46*	*46*	*36*	*41*

Description (Plant Item and BS5228 Reference)	*Predicted Noise Level dB $L_{Aeq,\ 1\ hr}$*			
	NSL1	*NSL2*	*NSL 3*	*NSL 4*
Articulated dump truck (dumping rubble) C1-11	*46*	*46*	*36*	*41*
Tracked excavator (Spreading rubble) C1-13	*46*	*46*	*36*	*41*
Wheeled loader C2-26	*46*	*46*	*36*	*41*
Total	*52*	*52*	*42*	*47*
Combined Construction and Operation	*54*	*52*	*44*	*51*

I.6.48 The indicative calculated noise levels set out in Table **I.6.8** above are within the daytime operational noise limits of 55dB(A) at the closest locations to the works. The calculated values assume that the plant items listed in the table are operating in each of the cells being developed and during their construction and operational phases.

Traffic Accessing the Facility

I.6.49 The potential noise impact of vehicles entering and exiting the proposed MEHL facility is assessed through consideration of the cumulative noise level associated with a series of individual events. The noise level associated with an event of short duration, such as a vehicle drive-by, may be expressed in terms of its Sound Exposure Level (L_{Ax}). The Sound Exposure Level can be used to calculate the contribution of an event or series of events to the overall noise level in a given period. The appropriate formula is as follows:

$$L_{Aeq,T} = L_{Ax} + 10\log_{10}(N) - 10\log_{10}(T) - 10\log_{10}(r_2/r_1) - Att_{bar}\ \text{dB}$$

Where:

- $L_{Aeq,T}$ is the equivalent continuous sound level over the time period T (s)
- L_{Ax} is the "A-weighted" Sound Exposure Level of the event under consideration (dB)
- N is the number of events over the course of time period T
- r_2 is the distance from the edge of the entrance road to the facade of nearest property, and
- r_1 is the distance from vehicle to the point of original measurement
- Att_{bar} is the attenuation due to screening between the source and receiver

I.6.50 The mean value of Sound Exposure Level for a HGV drive by at low to moderate speeds (i.e. 15 to 50Km/hr) is of the order of 83dB L_{Ax} at a distance of 5m from the edge of the road. The mean value of Sound Exposure Level for a car or light vehicles drive by at low to moderate speeds is of the order of 67dB L_{Ax} at a distance of 5m from the edge of the road. These figures are based on a series of measurements conducted under controlled conditions.

I.6.51 For the purposes of this assessment, traffic accessing the proposed MEHL has been broken into the main construction and operational phases, which will generate differing traffic volumes.

Construction Phase Traffic

I.6.52 The construction works are expected to generate varying traffic volumes for each phase of construction. The peak construction period is 2011 when the earthworks stage will commence. This construction period will occur in advance of the proposed MEHL facility. Therefore, during this period it is assumed that there will be minimal operational traffic due to the existing inert waste facility, as the site footprint will be subject to significant reconfiguration and redevelopment.

I.6.53 At its peak, it is estimated that 240 trips (two-way) per day will be required. It is estimated there will also be 50 trips (two-way) for construction workers. Therefore, 290 trips daily (two-way) are estimated for the peak construction period. Considering a 10-hour day and applying a peak hour factor of 1.5 to take account of construction workers trips during the peak hour periods, 44 trips (two-way) has been assumed.

I.6.54 The proposed MEHL facility will be accessed via a new site entrance and access road along the southern site boundary. In this instance, the nearest residential property is to the south west of the new site entrance (NSL4) at a distance of approximately 120 metres. Refer to *EIS Figure 11.3*.

I.6.55 The predicted daytime noise level at the nearest residential property to the site entrance (NSL4) is 50 dB $L_{Aeq,\ 1hr}$ assuming 40 HGV and 4 light vehicles enter the site over a worst case one hour peak period.

I.6.56 Noise from vehicles driving past properties along the local road has also been considered using the same formulae and truck numbers detailed above. For properties at a distance of 20m from the road edge, the predicted noise level from passing light and heavy vehicles (assuming a total of 44 per hour) is 57dB $L_{Aeq,\ hr}$.

I.6.57 This scenario assumes that all construction traffic entering the site will pass by the assessment location. It should also be noted that this level is of the order of noise levels currently experienced at properties along the local road network in the vicinity of the site, as measured during the baseline surveys.

Operational Phase Traffic

I.6.58 The operational traffic figures include for staff, visitors, cement, acid, waste and leachate disposal. The trips generated during the operation of the MEHL facility are expected to be consistent, with infrequent peaks. It is assumed that daily operations will involve fifteen staff and five visitors, generating 51 car or light two way vehicle trips per day. When the facility is fully operational and all waste types are accepted the average daily HGV trips is estimated at 141 HGV/day.

I.6.59 Noise levels relating to traffic entering the site assuming the normal operation of 141 HGV and 51 light vehicles per day have been predicted at NSL 4. Assuming an average of 25 two-way movements per hour, the predicted noise level at NSL4 is 47dB $L_{Aeq, 1 hr}$.

I.6.60 Noise from vehicles driving past properties along the local road has also been considered using the same formulae and truck numbers detailed above. For properties at a distance of 20m from the road edge, the predicted noise level from passing light and heavy vehicles is 55dB $L_{Aeq, 1hr}$.

I.6.61 On a very conservative basis, there may be occasions where hourly traffic flows are higher than those assessed above. For a robust assessment, a peak hour factor of 2 has been assessed also. This would result in 58 two way movements per hour to and from the facility. Noise levels calculated at NSL4 from vehicles entering and existing the site during this worst case scenario is 51dB $L_{Aeq,1 hr,}$ which is within the noise limits set for the facility.

I.6.62 The predicted noise levels from vehicles driving past properties at a distance of 20m from the local road using the increased operational truck numbers is 58dB $L_{Aeq, 1hr}$. This value is marginally above the day-time noise criterion set for the facility however; this scenario assumes that all worst case peak hour traffic entering the facility passes by the assessment locations within one hour. This is considered to be a very worst case scenario. It should also be noted that this predicted noise level is similar to that currently experienced at properties along the local road networks as determined during the baseline noise survey.

Building Services Plant

I.6.63 The proposed MEHL facility includes the provision of an administration building, staff canteen with changing facilities and a solidification plant located along the south-eastern boundary of the facility. A variety of electrical and mechanical plant will be required to service these buildings. Most of this plant will be capable of generating noise to some degree.

I.6.64 The selection and location of plant items will be determined at the detailed design stage of the project. The operation of any installed plant items will be controlled such that the combined cumulative noise level from the facility does not exceed a level of 55dB $L_{Aeq,30mins}$ daytime and 45dB $L_{Aeq,30mins}$ night-time at a distance of 1m from the façade of the nearest noise sensitive locations. Noise from plant items will be broadband in nature and have no tonal or impulsive characteristics.

I.6.65 The closest noise-sensitive property to building services plant is located to the south of the proposed development some 300m from the proposed solidification plant and administration/canteen buildings. At this distance, noise emissions from operational plant items are expected to be insignificant.

Additional Vehicular Traffic on Public Roads

I.6.66 Traffic volumes along the surrounding road network with and without the planned MEHL development for the year 2011 has been assessed and presented in *EIS Chapter 8, Roads and Traffic*. These traffic flow values have been used to determine the predicted change in noise levels adjacent to various roads in the vicinity of the MEHL site with and without the planned development in place. The method for calculating the increase in noise is based upon the procedures within Calculation of Road Traffic Noise (CRTN). Table **I.6.9** below indicate resultant traffic flows and changes in noise levels associated with the MEHL site.

Table I.6.9: Calculated Change In Traffic Noise Levels for 2011

Road	Do Nothing (without planned development) 2011	Do Something (With planned development) 2011	% AADT Increase	Change in noise level
LP01090	1,220	963	-21%	-1.0
LP01080 West of LPO1090	1,780	1,774	0%	0.0
LP01080 East of LPO1090	2,338	2,087	-11%	-0.5
Ballyboghill Rd	344	344	0%	0.0
LPO1090 East of Tooman Rd	2,179	2,218	2%	+0.1
Tooman Rd	509	509	0%	0.0
Rowans Rd (West of M1 BPW)	2,932	2,932	0%	0.0
Rowans Rd (East of M1 BPW)	6,551	6,551	0%	0.0
M1 Overbridge	12,684	12,823	1%	0.0
Rowan Rd (East of Interchange)	19,363	19,402	0%	0.0
R132	10,249	10,288	0%	0.0
R132 Flyover	1,457	1,477	1%	+0.1
M1 North of Interchange	55,781	55,775	0%	0.0
M1 South of interchange	60,694	60,739	0%	0.0

1.6.67 The increase in traffic noise levels in the vicinity of the roads and junctions assessed surrounding the MEHL site is less than 1dB(A). Reference to **Table I.6.9** confirms that this increase is negligible and the resultant impact is imperceptible.

Mitigation Measures

Site Development and Cell Operation

I.6.68 With regard to initial construction activities and those associated with cell development, reference will be made to BS 5228: Part 1 and 2, which provide detailed guidance on the control of noise and vibration from construction activities. In particular, it is proposed that various practices be adopted during the construction and operational works, including:

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- All site access roads will be kept even so as to mitigate the potential for vibration from lorries;
- Selection of plant with low inherent potential for generation of noise and/ or vibration;
- Erection of temporary barriers as necessary around noisy processes and items such as generators, heavy mechanical plant or high duty compressors, and;
- Placing of noisy plant machinery as far away from sensitive properties as permitted by site constraints.

I.6.69 It is proposed that vibration from construction activities be limited to the values set out in *EIS Table 11.2*.

Traffic Accessing the Facility

I.6.70 The noise impact assessment has demonstrated that mitigation measures are not required.

Building Services Plant

I.6.71 Noise from plant items on site will be controlled in order to ensure that their operation, when combined with other site activities do not exceed a level of 55dB $L_{Aeq,30mins}$ daytime and 45dB $L_{Aeq,30mins}$ night-time at a distance of 1m from the façade of the nearest noise sensitive locations.

I.6.72 Proven noise control techniques will be employed where necessary to achieve these limits during the detailed design stage of the project. These will typically include:

- Duct mounted attenuators on the atmosphere side of air moving plant;

- Splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- Solid barriers screening any external plant.

Additional Vehicular Traffic along Public Roads

I.6.73 The noise impact assessment has demonstrated that mitigation measures are not required.

Residual Impacts

I.6.74 The assessments show that the predicted noise levels at the nearest sensitive locations, due to emissions from the development, are within the sites operational noise limits in all instances.

Site Development and Cell Operation

I.6.75 During the initial construction phase of the project, the impact to noise and vibration is predicted to be within the daytime noise limits values.

I.6.76 During the cell construction phase, the predicted noise levels are within the noise limit values, assuming a worst case scenario of combined cell construction activities. Once, the cells become operational, noise levels from the proposed MEHL facility are expected to remain below the licence noise limits.

Traffic Accessing the Facility

I.6.77 The predicted noise level due to traffic accessing the facility is within the proposed licence limits, therefore the impact is not significant.

Building Services Plant

I.6.78 Proprietary noise and vibration control measures will be employed where necessary, to achieve the recommended criteria at the nearest noise sensitive locations. The resultant noise impact is not significant at the closest noise sensitive locations to the facility.

Additional Vehicular Traffic Along Public Roads

I.6.79 The predicted increase in noise level associated with additional vehicular traffic post-development is imperceptible along the surrounding routes assessed.

I.7 Assessment of Ecological Impacts & Mitigation Measures

1.7.1 Chapter 13 of the EIS describes the existing flora and fauna within the site of the proposed MEHL integrated waste facility, the potential impacts of the proposed development on flora and fauna and proposes measures for the mitigation of these impacts, where appropriate. Key extracts are provided here in the Waste Licence Application; the full EIS (authored by Arup) accompanies this application.

Site Description

General Study Area

1.7.2 The proposed MEHL development site is located 3km south-east of Naul in north County Dublin and 7.5km north-east of Rogerstown Estuary on the east coast. The proposed site (planning/EPA licence boundary area) covers 39.8 hectares. It is a former quarry which operated until 2007 and is now a licensed inert landfill site.

I.7.3 The central 'floor' of the MEHL site includes a number of existing landfill cells containing inert waste. There are two open water bodies where the quarry excavation went below the water table. The walls of the former quarry include exposed rock cliffs, and sloped (benched) walls with unconsolidated overburden. The northern perimeter of the MEHL site is bounded by a stream, which is a tributary of the Ballough Stream, which ultimately discharges to Rogerstown Estuary.

Designated Areas for Nature Conservation

I.7.4 The site is not covered by any conservation designation such as Special Protection Area (SPA), Special Area of Conservation (SAC), Candidate Special Area of Conservation (cSAC), Natural Heritage Area (NHA) and Proposed National Heritage Area (pNHA). There are eight designated conservation areas within 15km as listed in Table **I.7.1** and some of which are shown on *EIS Figure 13.1*.

Table I.7.1: Designated Conservation Areas within 15km of the MEHL Site

Conservation Site Name	Site Code	Conservation status	Distance from MEHL Site
Rogerstown Estuary	000208	cSAC	7.5km east
Rogerstown Estuary	004015	SPA	7.5km east
Bog of the Ring	001204	pNHA	2.5km north-east

Conservation Site Name	Site Code	Conservation status	Distance from MEHL Site
Knock Lake	001203	pNHA	4.2 km north-east
Cromwells Bush Fen	001576	pNHA	8.3km north-west
Skerries Islands	004122	SPA	9.5km east
Malahide Estuary	000205	cSAC	10km south-east
Broadmeadow/Swords Estuary	004025	SPA	10km south-east
River Nanny Estuary and shore	004158	SPA	11.5km north-east

Protected Species of Flora and Fauna

I.7.5 There is a record of one rare protected plant species from the NPWS protected species database within the Ordnance Survey 10km square (O15), in which the MEHL site is located. The plant is red hemp nettle (*Galeopsis angustifolia*), an annual of cultivated or waste ground, which was recorded from 'Cardiff's Bridge' in 1886. There does not appear to be such a location in this 10k square. It may be a misnomer for Corduff Bridge located at grid ref. O 199 523. The species was not found on the MEHL site. The Flora of County Dublin (Doogue et al. 1998) describes this part of the county (which is included in District 1) as having *"the poorest flora of the eight botanical districts of County Dublin"* due to its inland nature and lack of habitat diversity. Quarries create new habitats for plants which colonise the exposed rock and subsoil material over time. Apart from the cliff area, most of the substrate is recently exposed and is only starting to be re-colonised by plants.

Description of Habitats

I.7.6 The habitats are described below and are shown in *EIS Figure 13.2*.

Spoil and Bare Ground

I.7.7 The main habitat on the MEHL site is spoil and unconsolidated material excavated from the former quarry. It includes the glacial overburden material, fragmented limestone rock and shale and a darker clay material excavated from the base of the quarry, which has been deposited on the eastern side of the site. In a few places, this material is beginning to be colonised with plants such as coltsfoot (*Tussilago farfara*), but it is largely unvegetated. For details of the soils and geology of the site, refer to *EIS Chapter 14, Soils, Geology and Hydrogeology.*

Exposed Calcareous Rocks (ER2)

I.7.8 At the southern end of the MEHL site, there is a limestone cliff face, exposed by the former quarrying activities. It is approximately 50m high and 300m long. It is comprised of layers bedded limestone with bands of shale which show folding, characteristic of the Loughshinny formation. For details of the soils and geology of the site, see *EIS Chapter 14, Soils, Geology and Hydrogeology*. The more-or-less vertical cliff face includes ledges with pockets of vegetation. The ledges are used by peregrine falcon as roosting and nest sites. Peregrine falcons hunt in the surrounding area.

Recolonising Bare Ground (ED3)

I.7.9 There are some spoil heaps and areas of exposed rock which have not been disturbed in recent years. These are being colonised with a good diversity of plants typical of calcareous substrates. The main species include: coltsfoot, clovers; (*Trifolium dubium, T. repens*), birds-toot trefoil (*Lotus corniculatus*), vetches (*Vicia sepium and V. sativa*) and a number of other species as listed below in Table **I.7.2**.

Table I.7.2: Lists of Plants Recolonising Quarry Spoil and Exposed Rocky Ground on the MEHL Site

Scientific name	Common name	Scientific name	Common name
Antohoxanthum odoratum	Sweet vernal grass	*Reseda luteola*	Weld
Catapodium rigida	Fern grass	*Sagina procumbens*	Procumbent pearlwort
Centauria nigra	Knapweed	*Scrophularia nodosa*	Common figwort
Chamomilla suaveolens	Pineappleweed	*Senecio jacobea*	ragwort
Cirsium vulgare	Spear thistle	*Senecio vulgaris*	Groundsel
Crepis capillaris	Smooth hawk's beard	*Sonchus asper*	Prickly sow thistle

Scientific name	Common name	Scientific name	Common name
Epilobium brunescens	New Zealand willowherb	*Sonchus oleraceus*	Smooth sow thistle
Holus lanatus	Yorkshire fog	*Trifolium dubium*	Shamrock
Hypochaeris radicata	Cat's ear	*Trifolium repens*	White clover
Lathyrum pratensis	Meadow vetchling	*Ulex europaeus*	Gorse
Lotus uliginosus	Greater bird's –foot trefoil	*Vicia sativa*	Common vetch
Matricaria discoides	Sea mayweed	*Vicia sepium*	Bush vetch
Medicago lupulina	Black medic	*Plantago lanceolata*	Plantain

Eroding Upland Streams (FW1)

I.7.10 The northern boundary of the MEHL site is defined by a watercourse that meanders through a small steeply sloping valley. The stream is up to 2m wide but mostly about 1m wide with a stoney gravely substrate. Water depth is shallow, rarely exceeding 10cms deep. Flow is a swift trickle. The water has a slight turbidity and the stones have a fine film of silt over them. There is no aquatic vegetation. The stream has cut into the bed rock in places. The southern bank of the stream is mostly fringed with mature trees forming a band of mixed broadleaved woodland (WD1). This watercourse is a tributary of the Ballough Stream which has a small but significant population of Atlantic salmon and sea trout (IFI). The stream is fed by groundwater springs as well as surface water flows (Refer to *EIS Chapter 14, Soils, Geology and Hydrogeology* and *EIS Chapter 15, Surface Water*). The Ballough Stream (sometimes referred to as the Corduff River) flows into the Ballyboghill Stream and forms part of the upper sections of the most northern sub-catchment of the Ballyboghill Streams catchment. Ultimately it flows into Rogerstown Estuary 7.5km to the east of the MEHL site.

Mixed Broadleaved Woodland (WD1)/Scrub (WS1)

1.7.11 The southern bank of the watercourse is steeply sloping up towards the northern edge of the MEHL site. It has a woodland cover of Scots pine (*Pinus sylvestris*), oak (*Quercus robur*), sycamore (*Acer pseudoplatanus*), birch (*Betula pubescens*), larch (*Larix decidua),* ash (*Fraxinus excelsior)* and alder (*Alnus glutinosa*). The shrub layer is sparse with elder *(Sambucus nigra*), hawthorn (*Crataegus nigra*) and bramble (*Rubus fruticosus agg.)* The ground flora is quite shaded with abundant ivy (*Hedera helix*) and ferns including; *Dryopteris dilatata, D. filix mas* and Hart's tongue (*Phyllitis scolopendrium*). Other typical woodland ground flora include: herb Robert (*Geranium robertianum*), violet (*Viola riviniana), (Veronica chamaedrys*) and ground ivy (*Glechoma hederacea*). Gorse (Ulex europaeus) is locally frequent at the edge dominating as scrub in places.

Artificial Lakes and Ponds (FL8)

I.7.12 There are two open water bodies on the site, one, at the southern end where the excavation went below the water table and the other in the central part of the site contains standing water from rainfall. There are two smaller attenuation ponds at the northern end of the site. The largest pond near the southern end of the site is approximately 100m x 100m. The smaller pond is ca. 50m in diameter. The edges are quite steep and depth is >5m. There is little fringing vegetation which includes occasional patches of soft rush (*Juncus effusus*), bottle sedge (*Carex rostrata*) horsetail (*Equisetum palustre*) and (*Alopecurus geniculatus*). There was no submerged aquatic vegetation. There were tadpoles in the water.

Mammals

I.7.13 Two hare were observed chasing on site. The Irish hare (*lepus timidus hibernicus*) is protected under the Wildlife Act (1976). The site offers good open spaces for hare and limited foraging due to the sparse vegetation cover. Therefore, hares are unlikely to breed on the site due to the limited cover. Other mammals not seen, but likely to use the site include fox and rabbit. Otters are protected under the Wildlife Act and the EU Habitats Directive. They are found on many Irish watercourses and are likely to occur along the stream on the northern site boundary as it's a tributary of a salmonid watercourse. The woodland edge along the stream would be suitable for badger and other small mammals, including rabbit and hedgehog.

Insects, Reptiles and Amphibians

I.7.14 Butterflies noted on the site include; the Common blue (*Polyommatus icarus*) and Wood white (*Leptidea sinapsis*). The food plants of these butterflies are bird's-foot trefoil and meadow vetchling respectively and are both locally common on the site. Tadpoles were seen in the attenuation ponds. There is potential habitat for the common lizard on the more vegetated parts of the site with exposed rock. Frogs (*Rana temporaria*), newts and lizards (*Lacerta vivipara*) are protected under the Wildlife Act 1976 (Protection of Wild Animals) Regulations, 1980 (S.I. 282 of 1980). Newts (*Triturus vulgaris*) can also be found in ponds where there are no fish predators. No newts were seen during the field survey.

The absence of submerged aquatic vegetation in the ponds makes the habitat less suitable for newts.

Birds

I.7.15 The cliff face, open water and recolonising bare ground, provide habitats for a range of birds. Birds noted on the site are listed in Table **I.7.3.**

Table I.7.3: List of Bird Species Recorded on Site and their Conservation Status**

Common name	Scientific name	Conservation status**	EU Birds Directive
Blackbird	*Tardus merula*	low	-
Black backed gull	*Larus ridibundus*	high	-
Cuckoo	*Cuculus canorus*	medium	-
House martin	*Delichon urbica*	medium	-
Meadow pippit	*Anthus pratensis*	low	-
Peregrine falcon	*Falco peregrinus*	Low,	Listed on Annex I EU Birds Directive
Raven	*Corvus corax*	low	-
Rook	*Corvus frugilegus*	low	-
Sand martin	*Riparia riparia*	medium	-
Swallow	*Hirundo rustica*	medium	-
Wood pigeon	*Columba palumbus*	low	-

** Birdwatch Ireland website
http://www.birdwatchireland.ie/Portals/0/images_large/BoCCI_Redlist.jpg

I.7.16 The conservation status refers to the Birds of Conservation Concern in Ireland as defined by the Royal Society for the Protection of Birds (RSPB) and BirdWatch Ireland so this is their status in Ireland only. Annex I refers to their status in European terms. Peregrine falcon is a species that has a low conservation status in Ireland, however, it is much less common in the rest of Europe and is listed on Annex I of the EU Birds Directive.

Peregrine Falcon

I.7.17 The peregrine falcon is the most important bird species associated with the MEHL site as it is listed on Annex 1 of the EU Birds Directive. A separate report by R and D Avian Ecology (2010) describes in detail the use of the site by peregrine for foraging, roosting and breeding as well as the distribution and occurrence of peregrine falcon within the vicinity and in north county Dublin. Refer to *EIS Appendix A.13.2*. The MEHL site is a known traditional nesting site for peregrine for the past 12 years, with successful breeding up to 2008 and unsuccessful since then although it continues to be a foraging and roosting site.

Site Evaluation

I.7.18 The proposed MEHL integrated waste management facility site is a former limestone and shale quarry now used as an inert landfill. The site is not covered by any conservation designation. The nearest pNHA is Bog of the Ring located 2.5km to the north-east. The nearest cSAC is Rogerstown Estuary, located 7.5km to the east. There is quite a diverse range of habitats on the site including open water bodies, exposed rock cliff face and calcareous spoil heaps. Although most of the site is not vegetated, the areas with re-colonising vegetation have a good diversity of plants and animals.

I.7.19 The watercourse that flows along the northern boundary of the site is a tributary of the Ballough Stream which is a salmonid river of county significance. The bedded limestone cliff face is located at the southern end of the site with bands of shale and the undulating folds are characteristic of the Loughshinny formation. This is of county geological importance and has been designated a Geological Heritage Site by the GSI for the duration of the quarry/landfill site. See *EIS Chapter 14, Soils, Geology and Hydrogeology.* The occurrence of a breeding peregrine falcon on the MEHL site is of county importance, as there are records of only three other breeding sites for peregrine in north county Dublin. Peregrine are also protected under the EU Birds Directive.

I.7.20 Overall, the MEHL site is of county importance due to the presence of peregrine falcon and the exposed limestone cliff face of the former quarry which provides suitable nesting habitat, and the occurrence of a salmonid stream along the site boundary. Also, the open water bodies on the site and the exposed glacial material recolonising with vegetation have potential to significantly expand the local biodiversity over time.

Potential Impacts of the Proposed Development

I.7.21 The existing landfill site has full planning permission to infill the former quarry site and restore it to its original grade and in so doing remove almost all the habitats on the site, including the traditional peregrine falcon nesting and roosting sites on the exposed limestone cliffs. Such a loss of habitats and species would have a significant adverse impact at a county level. The proposed MEHL development is not adding to the loss of habitats and species. The potential impacts of the proposed development on groundwater and surface water are discussed in EIS Chapters 14 and 15 respectively.

Potential Impacts of the Proposed Development on Designated Sites

I.7.22 There will be no direct impacts on any designated areas for conservation, due to the distance (>2.5km) of the nearest designated conservation areas from the MEHL site. The main potential impacts are in relation to contamination of surface or groundwater from the MEHL integrated waste management facility. Bog of the Ring pNHA is a groundwater fed wetland located 2.5km from the proposed development. Refer to *EIS Figure 13.1*. The ecological value of this pNHA has deteriorated considerably since the 1960s due to drainage and eutrophication from the locality (Doogue et. al.1998). Rogerstown Estuary cSAC/SPA is located 7.5km to the east of the proposed development and the watercourse that flows along the northern boundary of the site ultimately discharges into Rogerstown Estuary. Refer to *EIS Figure 13.1*.

I.7.23 The detailed design of the proposed MEHL integrated waste facility will ensure that there are no risks of leakage or contamination from the landfill cells into the groundwater (Refer to *Chapter EIS 14, Soils, Geology and Hydrogeology*). The drainage and surface water management systems proposed for the facility will ensure no likely significant impacts on the adjoining watercourse which is a tributary of the Ballough Stream, which flows into Rogerstown Estuary (Refer to *EIS Chapter 15*, *Surface Water*). Hence, there will be no likely significant adverse impacts on Rogerstown Estuary designated cSAC/SPA or on Bog of the Ring pNHA.

Habitats

I.7.24 Most of the proposed MEHL development site is comprised of quarry spoil and re-colonising bare ground. The loss of this habitat is significant at a local level. The removal/infilling of the limestone quarry at the southern end and hence the removal of the peregrine falcon nest site will be a significant adverse impact at a county level.

Fauna

I.7.25 The infilling of the former quarry and waterbodies will result in the displacement or loss of most of the fauna on the site including amphibians, mammals and birds. This is a significant adverse impact at a local level (higher value). There will be no direct impacts on the watercourse so no mitigation is required for otter.

I.7.26 The traditional peregrine nest site and roosting sites on the limestone cliff face at the southern end of the site will be impacted over time as the development progresses and the cliff face reduces with the licensed infilling of the site with waste. The foraging habitat for the peregrine within the site will also be lost. This is a significant adverse impact at a county level.

I.7.27 It should be remembered that the above impacts were already approved in the planning permission of the existing landfill. No additional impacts on peregrine are expected from the MEHL development.

Aquatic Environment and Fisheries

I.7.28 This watercourse flowing along the northern boundary of the site is a tributary of the Ballough Stream, a salmonid watercourse. The water supply for the stream is mainly from surface water flows and partially fed by groundwater springs (Refer to *EIS Chapter 15, Surface Water*). Any contamination of the surface water could have indirect adverse effects on the salmonid population in the Ballyboghill stream catchment and other species requiring high water quality. This would be a significant adverse impact at a county level. It is essential that only clean and uncontaminated surface water should be discharged from the landfill site to the watercourse at the northern boundary of the site.

I.7.29 Provided the mitigation measures outlined below are implemented and ongoing monitoring is undertaken during operation of the integrated waste management facility, there will be no likely significant adverse impacts on the watercourses.

Mitigation Measures

Mitigation by Avoidance

Designated Areas for Nature Conservation

I.7.30 Provided there is no discharge of contaminated waters from the proposed MEHL facility into the surface water network or seepage of contaminated waters into the groundwater system, there will be no direct or indirect impact on Rogerstown Estuary, which is the nearest designated cSAC and SPA located 7.5km to the east. Neither will there be any significant adverse impacts on Bog of the Ring pNHA.

Protected Species of Flora and Fauna

I.7.31 There are no records from the NPWS database of rare and protected plant species from this site and none were found during the field survey.

I.7.32 Peregrine falcon will be impacted during the construction phase of this project due to disturbance and noise. Alternative natural or artificial ledges will be installed on the south-western side of the limestone cliff face. These will serve as temporary roosting or potential nest sites, as far away from the landfill construction as possible, to minimise the disturbance to peregrine during the construction works. Refer to *EIS Appendix A13.2* for full details.

I.7.33 As tadpoles are present on the site in the existing attenuation ponds and frogs are protected under the wildlife Act, a Licence will be required from the National Parks and Wildlife Service to move them or destroy their breeding habitat. Infilling of the ponds on the site outside the breeding season January-June will avoid having to collect and move the frogs and tadpoles from the site during construction works.

Habitats

I.7.34 Any habitats on the MEHL site which will not be disturbed by the proposed development works will be left as they are, to recolonise naturally. This will increase local biodiversity over time as they become vegetated and provide habitat for a range of fauna also.

I.7.35 A wetland area at the southern end of the site, which includes an open water body fringed with vegetation will be retained within the MEHL site. This will help to increase local biodiversity.

Mitigation During Construction

I.7.36 Best available technology (BAT) mitigation measures will be implemented to ensure protection of the surface water and ground water systems during both construction and operational programmes. These measures are described in detail mainly in *EIS Chapter 14, Soils, Geology and Hydrogeology* and *EIS Chapter 15, Surface Water* of the EIS.

I.7.37 The implementation of a SUDS system (as advocated in the Greater Dublin Strategic Drainage Study) on the site will be part of the proposed development design in the short and long term. The maintenance of any attenuation structures (e.g. de-silting operations) will ensure no release of contaminated water to the surface water network. Class 1 petrol/oil interception, silt and grit trapping and hydro-brake controls will also be implemented during the construction stage.

I.7.38 There will be no development works or any disturbance of existing ground within 10m of the edge of the stream flowing along the northern boundary of the site. This will provide a 10m wide (minimum) riparian corridor or 'leave strip' which is very important to the protection of a local aquatic ecological integrity (and general biological diversity).

I.7.39 The discharge of clean surface waters to the Ballough Stream system and any construction works associated with the proposed development must in no way impact on the passage of salmonids thereby contravening Section 173 of the Fisheries (Consolidation) Act 1959 as amended.

I.7.40 The potentially highly polluting nature of the wastewaters generated at this facility highlights the need for implementation of comprehensive ground and surface water management in order to safeguard the ecological integrity of local ground and surface waters. Under no circumstances will there exist the possibility of contamination of the local surface and ground water system.

I.7.41 Details of the surface water drainage system design and mitigation measures to ensure no significant adverse impacts on the adjoining watercourses are described in *EIS Chapter 15, Surface Water*.

I.7.42 Potential impacts to Groundwater are dealt with in *EIS Chapter 14, Soils, Geology and Hydrogeology*. Design and mitigation measures are described in *EIS Section 14.8.2.2* regarding potential contamination of the groundwater resources and include the design and construction of the landfill cells, including liners. See *EIS Chapter 14, Soils, Geology and Hydrogeology* for full details.

Mitigation During Operation

I.7.43 On-site attenuation ponds will allow for the settlement of fine/particulate materials. Monitoring will be undertaken in accordance with the waste licence of surface water discharges in order to protect the receiving waters which are a tributary of the Ballough Stream.

I.7.44 A proposed wetland system associated with the attenuation ponds will, over time, provide wetland habitat and add to the local habitat and species diversity. Details of the constructed wetland system will be finalised at the detailed design stage in consultation with a suitably qualified wetland ecologist and the Board of Inland Fisheries Ireland.

I.7.45 Potential contamination to groundwater during operation of the landfill will be minimised due to the installation of an impermeable lining system and a leak detection and collection system as described in *EIS Chapter 14, Section 14.8.2.2*. Ongoing monitoring will be required to ensure no contaminating discharges occur to groundwater or surface water. A contingency plan will be in place in case of emergency.

I.7.46 Over time, the peregrine falcon will be displaced from this site. The cliff face will ultimately not be suitable for roosting or nesting sites as the height of the cliff face will diminish with the infilling of the quarry. In the longer term, if monitoring results determine it necessary, the creation of an additional nest site away from the location of the MEHL site within 5km -10km will be investigated in consultation with landowners and the NPWS. This additional site could be located in another quarry or on a man-made structure such as a church/cathedral. Prior to the selection of an alternative nest site location, further monitoring of the peregrine within nearby quarries will be required to better understand their distribution and breeding behaviour. This will help inform the selection of the best locations for alternative peregrine breeding sites. For full details of the proposed peregrine falcon mitigation, refer to *EIS Appendix A13.2*.

Residual Impacts

I.7.47 The existing landfill site has full planning permission to infill the former quarry site and restore it to its original grade and in so doing remove almost all the current habitats on the former quarry site, including the traditional peregrine falcon nesting and roosting sites on the exposed limestone cliffs. Such a loss of habitats and species is a significant adverse impact at a county level.

I.7.48 The construction and operation of the proposed MEHL integrated waste facility will not result in any additional direct loss of habitat in this former quarry site at Hollywood Great. If considered necessary, following monitoring, the creation of an alternative peregrine nest site away from the quarry at a suitable location within 5km of the site will compensate for adverse impacts to this species.

I.7.49 The incorporation of an existing wetland area near the southern boundary of the site into the MEHL site will add to the biodiversity of the site, as well as the constructed wetland area which will provide habitat for a range of wetland species over time.

I.7.50 There will be no residual significant adverse impacts on the local surface watercourses or on the groundwater resource, provided the mitigation measures described in *EIS Chapter 14, Soils, Geology and Hydrogeology* and *EIS 15, Surface Water* are fully implemented and monitored. As a consequence, there will be no significant adverse impact on the Rogerstown Estuary cSAC/SPA located over 7.5km to the east.

Attachment J

Accident Prevention and Emergency Response

Attachment J: Accident Prevention & Emergency Response

J.1 Accident Prevention and Emergency Response

Accident/Emergency Response Procedures

J.1.1 MEHL has developed an Emergency Response Procedure as part of its Environmental Management System, which is independently certified in compliance with the ISO14001:2004 standard. The procedure was designed to address emergency situations and minimise potential impacts on the environment. The procedure is attached as appendix:

Appendix J.1.1: Emergency Response Procedures (existing under W0129-02)

J.1.2 The accident and emergency procedures will be fully and appropriately reviewed for the purposes of the integrated waste management facility, to include a complete review of the Site Safety Statement, in line with legislative and other requirements.

J.1.3 The existing Health & Safety training programme at MEHL will be extended to address requirements of operating the integrated waste management facility. Staff will be appropriately trained and qualified for the various elements of the operation. There will be ongoing and updated training, refresher programmes and extensive induction procedures for staff on site at all times, as well as routine and obligatory induction training for visitors regarding Health & Safety procedures for those who are necessarily visiting or entering the site.

J.1.4 The licensee will engage with the local emergency services and HSA prior to the commencement of integrated waste management facility operations on site.

Environmental Liabilities Risk Assessment

J.1.5 MEHL has completed an ELRA (Environmental Liabilities Risk Assessment) in line with the requirements of W0129-02 and EPA (2006) *Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision*. Environmental liability risk assessment (ELRA) considers the risk of unplanned events occurring during the operation of a facility that could result in unknown liabilities materialising.

J.1.6 ELRA risks and approximate remediation costs were identified following the methodology outlined in *Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision*.

J.1.7 MEHL has invested significantly in its infrastructural, management and environmental management programmes to address potential risks, including the following:

- Cell construction SEW (Specified Engineering Works) and CQA (Construction Quality Assurance)
- Bunded fuel storage areas
- Use of bunded pallets and drip trays in maintenance building
- Annual slope stability assessments
- Quarterly environmental monitoring programme
- Emergency Response Procedure
- Fire training (fire marshals, First Aiders, etc)
- Silt trap/oil interceptor and regular maintenance of same

J.1.8 MEHL's current insurance certificates (for the purposes of W0129-02) are attached in the following appendix:

Appendix J.1.2: Copies of MEHL Insurance Certificates (existing for W0129-02)

J.1.9 The ELRA will be fully re-assessed to address ELRA issues associated with the proposed development.

Potential points of contamination/areas most at risk

J.1.10 As outlined in Attachment **H.2**, the available options for waste treatment/disposal at the MEHL integrated waste management facility will be:

(i) Recovery activities

(ii) Landfilling of inert waste

(iii) Landfilling of non-hazardous waste

(iv) Solidification pre-treatment prior to landfilling of

certain hazardous waste

(v) Landfilling of hazardous waste

J.1.11 The waste activities deemed to be potentially high risk are landfilling of hazardous waste and solidification operations. The importance of ensuring that incoming wastes are diverted to the appropriate recovery/inert/non-hazardous/hazardous treatment or disposal option is also highlighted, with reference to avoiding risk.

J.1.12 In relation to landfilling of hazardous waste, a superior lining system has been proposed for the hazardous waste cells, as detailed in Attachment **D.3**. In addition, it is proposed to install a leak detection system under the hazardous cell liner. The leak detection system will demonstrate the ongoing integrity of the liner system during the lifetime of the facility, and in the aftercare phase.

J.1.13 All liner systems proposed for the integrated waste management facility are in full compliance with the requirements of the EU Landfill Directive 1999.

J.1.14 In relation to solidification operations, the plant has been designed with reference to best practice and European experience. It is designed as a fully enclosed system, with delivery tankers discharging waste directly to dedicated storage silos, via a controlled manifold and fully enclosed pumping operation. The unloading operation will take place within the solidification plant building only when the building's automatic roller doors are closed. The operation will be controlled and supervised by a MEHL trained member of staff.

J.1.15 An inspection and preventative maintenance programme will be implemented at the solidification plant.

J.1.16 To ensure the correct and accurate direction of incoming wastes to the appropriate recovery/disposal area on site, incoming wastes will be subject to detailed Waste Acceptance Criteria and testing. Upon arrival on site, incoming wastes will be directed to the relevant access-controlled area, depending on the classification of the waste stream.

J.1.17 It is also recognised that there could be the potential for contamination of surface water, associated with discharges from the facility; however surface water management infrastructure, outlined in Attachment **D.1.k,** has been proposed to control all discharges to surface water, and mitigate against potential environmental impacts.

Storage of raw materials, products and waste

J.1.18 Cement will be imported to the site as a raw material for the solidification process[42]. The material will be delivered in contained vehicles and discharged directly to a dedicated storage silo. From here, the material will be used directly in the solidification process.

J.1.19 Acid (HCl) will be imported to the site as a raw material for the solidification process. The material will be delivered in contained vehicles and discharged directly to a bunded acid storage tank. From here, the material will be used directly in the solidification process.

J.1.20 Diesel will be imported to the site as a fuel for plant and vehicles. The material will be delivered in contained vehicles and discharged directly to a bunded diesel storage tank.

J.1.21 Leachate will be stored in HDPE-lined, concrete leachate holding tanks. There will be separate holding tanks for leachate from the hazardous cells and leachate from the non-hazardous cells.

J.1.22 The proposed development is deemed to be a lower tier Seveso site based on the storage of Flue Gas Treatment residues on site. This is further detailed in Attachment **B.8**.

J.1.23 The design of the solidification plant includes a 600mm thick reinforced concrete floor slab on a 2mm welded HDPE liner on 50mm sand blinding layer. The floor design of the storage building is reinforced concrete 200mm thick over a 2mm HDPE liner. The floor will incorporate floor drains, which will remove any run-off collected via a sealed collection system to a HDPE lined pump sump for storage in the hazardous leachate holding tank, pending reuse in the solidification process.

Transport of material within the site

J.1.24 Incoming waste delivery vehicles may be directed to the appropriate and access-controlled tipping area for recovery materials, inert landfill, non-hazardous landfill, solidification plant or hazardous landfill. Site roads have been designed accordingly, as detailed in Attachment **D.1.b**. Operational control procedures and wheel-washing procedures will be implemented for all vehicles using the facility.

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[42] As detailed in Attachment **H.3**, waste ash material from other sources, where available, could also be used in the solidification process, as the pozzolanic properties of such ash material could reduce the quantities of cement required in the process.

J.1.25 In relation to the flue gas treatment (FGT) residue waste stream, delivery vehicles will discharge to the silos in the solidification plant building and exit the facility via the wheelwash and weighbridge. The mixing of the FGT residue, cement and water/leachate will be automatically controlled and the mix will discharge to IBC bags, as detailed in Attachment **D.1.d**.

J.1.26 Design proposals make provision for conveying the IBC bags to the adjacent storage building either at surface level by vehicle (e.g. forklift), or via an underground conveying system.

J.1.27 MEHL vehicles, dedicated for use on this site, will be used to transport solidified material from the storage building to the landfill cell.

J.1.28 The transportation of diesel on site will be minimised by moving plant and vehicles to the bunded diesel storage area for refuelling, wherever feasible. Alternatively, a double-skinned mobile fuel bowser may be employed, to be stored at the bunded fuel storage area when not in use.

Bunding, surface treatment, collection systems

J.1.29 Bunded tanks are proposed for the diesel and acid storage areas. Bunds will be designed with reference to appropriate EPA and quality assurance standards, and bund integrity tests will be completed as per EPA requirements (currently every three years).

J.1.30 Surface water management proposals are detailed in Attachment **D.1.k**.

Catchment area for each spill or run-off collection system

J.1.31 The catchment areas for each spill/run-off collection system are detailed in Attachment **D.1.k**.

Spill/emergency containment

J.1.32 The site is currently equipped with emergency spill kits. New emergency containment equipment will be installed to address potential spillage at the bunded fuel and acid storage areas.

J.1.33 It is proposed to install emergency surface water shut-off valves prior to the discharge point from the wetland area in the north-east of the site, and at the detention basin outlet after the Class I interceptor adjacent to the new facility control area in the south-east of the site.

Wastewater drains

J.1.34 Wastewater drainage systems are detailed in Attachment **D.1.k**.

Possible contamination of ground, groundwater, or surface water from firewater run-off

J.1.35 Although the risk of fire at the site will be low, the management of contaminated water arising from a fire has been included in the surface water management system. Should a fire occur within a cell or at the waste quarantine area, any water used to fight the fire will be contained in the cell and the firewater will be managed within the leachate management system.

J.1.36 In the event that a fire occurs at the solidification plant, contaminated water generated in fighting the fire will drain to the leachate pumping sump. This sump and the kerbing around the hard paved area around the solidification plant will have sufficient capacity to store contaminated water for the duration of any likely fire. In the event of a major fire, any excess water arising would be temporarily pumped to leachate holding tanks. Any fires arising at the administration building will be dealt with in the same manner as a typical office development.

Out-of-hours Incident

J.1.37 Emergency out-of-hours contact details will be provided on the site notice board. Duty staff will respond immediately to any incidents arising.

Attachment K

Remediation, Decommissioning, Restoration and Aftercare

Attachment K: Remediation, Decommissioning, Restoration and Aftercare

K.1 Restoration

K.1.1 The proposed development will effect the restoration of a worked-out quarry in keeping with the surrounding landscape, and in line with pre-quarrying levels. A phased restoration approach is proposed for the MEHL integrated waste management facility, which will allow the site to be restored progressively over the lifetime of the project, as detailed in Attachment **D.2**, with phasing details attached as Drawing **WLA-14**. An outline phasing timeline is attached in Appendix **D.3.1**.

K.1.2 As part of the restoration process, as each cell is filled to required restoration levels, capping layers will be applied, in line with requirements for inert, non-hazardous and hazardous cells, as detailed in Attachment **D.2.6**.

K.1.3 The *EPA Landfill Manual on Landfill Restoration and Aftercare* (1999) lists the main landfill restoration considerations as:

- Settlement
- Landfill gas
- Leachate
- Elevated temperature
- Shallow soils and soil compaction
- Surface and groundwater flow patterns

Settlement

K.1.4 It is anticipated, given the nature of the waste which will be accepted and disposed of at the facility, that minimal settlement of the waste body will occur over time. It is therefore proposed that the final settlement profile will match the final capping profile. The final restoration profile of the site is presented in the restoration drawing , **WLA-15**. This will be verified by annual topographical monitoring during the operation of the site and post-closure.

Landfill gas

K.1.5 As it is proposed to accept only non-biodegradable wastes, landfill gases will not be generated and therefore it is not proposed to install landfill gas management infrastructure.

Leachate

K.1.6 Leachate management proposals are detailed in Attachment **D.4**.

Elevated temperature

K.1.7 Landfill sites accepting biodegradable waste may have elevated temperatures in comparison to other sites. As it is proposed to accept only non-biodegradable wastes at MEHL, this issue is not deemed relevant for the proposed facility. Potential temperature issues associated with incinerator bottom ash are discussed in Attachment **H.3**.

Shallow soils and soil compaction

K.1.8 Appropriate soil depth and soil quality will be specified to ensure successful restoration.

Surface and groundwater flow patterns

K.1.9 The restoration project will not impact on groundwater flow patterns. Proposals for surface water flow management are outlined in Attachment **D.1.k**.

Landfill Capping Details

K.1.10 Capping details are provided in Attachment **D.6**.

Landscape Proposals

K.1.11 In order to minimise or reduce the potential visual impacts of the proposed development, the following mitigation measures are proposed (as part of the EIS) during the initial construction phase of the development. The landscape and visual assessment completed for the EIS concluded that, following final restoration of the site, the residual landscape and visual impacts will be positive. Landscape drawings are attached as:

Drawing WLA-28 (Attachment K.1): Phase 1 Restoration Landscape Proposals

Drawing WLA-29 (Attachment K.1): Phase 2 Restoration Landscape Proposals

Drawing WLA-30 (Attachment K.1): Phase 3 Restoration Landscape Proposals

Drawing WLA-31 (Attachment K.1): Phase 4 Restoration Landscape Proposals

Drawing WLA-32 (Attachment K.1): Landscape Masterplan

Landscape Screen Planting

K.1.12 Screen planting is proposed to the east of the solidification plant, car park area and temporary storage compound. This planting will be implemented during the initial construction phase as shown in Drawing **WLA-28.** The planting will serve to screen views of the site buildings, from the east and long views from the LP01080 road to the south of the site and serve as an ecological habitat.

K.1.13 The proposed screen planting will comprise a mix of native species including Ash (Fraxinus excelsior), Sessile Oak (Quercus petraea), Common Oak, (Quercus robur), Wych Elm (Ulmus glabra), Black Alder (Alnus glutinosa), Wild Cherry (Prunus avium), Mountain Ash (Sorbus aucuparia). The scrub mix will comprise Hawthorn (Crataegus monogyna), Blackthorn (Prunus spinosa), Goat Willow (salix caprea) and Grey Willow (Salix atrocinerea. The proposed planting shown on Drawing **WLA-28** will generally be established in line with normal landscape planting techniques, i.e. 'bare-root transplants', 'whips' and 'feathered trees' (90cm to 120cm tall), which adapt readily to disturbed ground conditions. These will be planted at an average of 1.2m centres.

Retention and Thickening of Existing Hedgerows

K.1.14 All perimeter hedgerows will be retained with the exception of the boundary adjoining the site entrance area where a small section will be removed to facilitate construction works and sightlines. A hedge will be reinstated at the proposed entrance as shown in Drawing **WLA-28** and Hawthorn and Blackthorn scrub planting on the cutting. Species chosen will be similar to those currently within the existing hedgerow. New hedgerow planting will be carried out along the LP01080.

K.1.15 Where there are gaps in the existing hedgerow on the western boundary these will be thickened to maximise screening from the County road to the west. Boundary hedges will also be thickened along the southern boundary.

K.1.16 The site contains one internal hedgerow in the south east corner. This will be retained except for a small break in the hedge required for the construction of proposed site access road.

Scrub Planting

K.1.17 Scrub planting will be established around the proposed wetlands in the north east corner of the site to enhance the ecological benefits.

Retention of Existing Trees

K.1.18 A mature tree stand located along the eastern side of the northern site boundary will be retained and protected from site disturbance during the works.

Progressive Restoration

K.1.19 Progressive restoration is an integral part of the proposed development and is also the most appropriate and effective landscape and visual mitigation measure. Views of the site will improve particularly at the end of Phase 3, where the restored lands will be more apparent in views from the north. These views are illustrated in photomontage view 3, included in *EIS Figure 12.15.3* and photomontage view 4, *EIS Figure 12.16.3*. The site will be progressively restored in four phases from north to south.

K.1.20 Phase 2 – cells H1 and C5 will be capped using soil stockpiled in the north-west boundary. The lands will be seeded. This will be carried out after approximately 8 years.

K.1.21 Phase 3 – cells H2 and IN3 will be restored and a Hawthorn hedge planted to define a new field boundary. This will be carried out after approximately 10 years.

K.1.22 Phase 4 – Restoration will move further south with capping and seeding of cells H3 and NH1. Additional hedgerows will be planted to define field boundaries. Generally the proposed final surface water drainage pattern and hedgerow planting scheme will delineate the boundaries of the inert, non-hazardous and hazardous landfill areas.[43] The solidification plant will be decommissioned and a non-hazardous cell NH2 constructed.

K.1.23 Phase 5 – At the end of the operation of the site after 25 years, cell NH2 and cell IN1 will be capped and seeded and the car park and administration building removed. At this stage most of the landscape planting will be in place and established.

K.1.24 Proposals showing the restored site are shown in Drawing **WLA-32**. The profile of the ridgeline before quarrying commenced will be reinstated leaving a natural contoured site that fits the site context. This is illustrated in photomontage view 3, included in *EIS Figure 12.15.4* and photomontage view 4, *EIS Figure 12.16.4*. The impact will be positive and long term and the lands will be used for low-impact amenity, nature area or related uses. Consultation with local residents will be undertaken approaching the latter restoration phases at the facility in relation to after-use activities.

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[43] This will assist with the identification of inert, non hazardous and hazardous areas on site, post-closure (in addition to site survey records).

Lighting

K.1.25 Low level bollard lighting will be used along the entrance road to avoid light spillage on adjoining properties on the LP01080. The higher 6m light columns will only be used around the solidification plant and fitted with horizontal cut off cowled light fittings. In addition this lighting will be set below existing ground levels and will not give rise to a significant impact.

Monitoring Measures

K.1.26 The planting will be monitored to check establishment and growth during the first two years. Plants that fail during this time will be replaced within the following planting season. Aftercare of the soft works will be an integral part of the on-going site management.

After-use

K.1.27 It is anticipated that future after-use will be for low impact amenity, nature area, or related uses. Any proposals for alternative use would be subject to planning permission, and with cognisance of the inert, non-hazardous and hazardous classes of landfill within the designated areas of the site.

K.1.28 The Fingal County Development Plan (2005-2011) states the Council's vision for this area: "*In recognition of the amenity potential of these areas, opportunities to increase public access will be sought*". The integrated waste management facility has been designed so that the remaining roadway could be taken in charge by the Council who could develop an amenity viewing area on this road. This would allow the public to enjoy views eastwards to the coast and sea from this upland area. Such a proposal would be consistent with the zoning objective and with the County Plan objectives to preserve views along the county road.

K.1.29 It is possible that different after-use options may be applied to the different classes of landfill. The position of both surface water drains and hedgerows on site mark the location of inert, non hazardous and hazardous areas. This will assist with the identification of inert, non hazardous and hazardous areas on site (in addition to site survey records).

K.1.30 Consultation with local residents will be undertaken approaching the latter restoration phases at the facility in relation to after-use activities. It is proposed that a local Environmental & Community Projects Scheme be established. The Scheme and its administrators will be engaged to propose and evaluate land-use options. Consultation with statutory and other relevant bodies will also be undertaken, to include EPA, the local authority, An Bord Pleanála, Dúchas, Fisheries Boards, etc. Opportunities for public access (in line with County Development Plan zoning objectives) will be considered in conjunction with the Local Authority.

K.1.31 Reference will also be made to the prevailing County Development Plan, Waste Management Plan and any EPA guidelines on after-use at landfill facilities in determining after-use proposals.

K.2 Decommissioning

K.2.1 The proposed development includes proposals for a new facility entrance and facility control area, to include site administration office, weighbridges, etc. in the south-east of the site, as shown on Drawing **WLA-08**. It is proposed that construction of this infrastructure will commence at the beginning of Phase 1 of the development of the integrated waste management facility. When the new infrastructure is in place to meet required standards, the existing site office weighbridge and wheelwash (located in the west of the site) will be decommissioned and deconstructed.

K.2.2 During the final restoration phase of the integrated waste management facility, Phase 4, when the hazardous cells have been completely filled, the solidification plant and storage building will no longer be required and will be decommissioned. The void remaining after removing the solidification plant will be lined as a non-hazardous cell (NH2), filled with non-hazardous waste and restored.

K.2.3 The final restoration will comprise the decommissioning of the administration building, carparking area and paved areas (in the south-east of the site). These areas will be graded, finished with topsoil and landscaped.

K.2.4 Buildings and structures will be deconstructed with the objective of maximising reuse and recovery of materials.

K.2.5 The leachate and surface water collection infrastructure will be retained after the final restoration, as well as leachate monitoring wells, leak detection wells, leachate holding tanks and any other monitoring infrastructure to meet EPA requirements for aftercare and monitoring.

K.3 Closure, Restoration and Aftercare Management Plan

K.3.1 The EPA Manual on Landfill Restoration and Aftercare (1999) states that the length of the aftercare period will vary from site-to-site.

K.3.2 Upon facility closure, the EPA will carry out a final on-site inspection, assess all reports submitted by the operator, and communicate to the operators its approval for closure.

K.3.3 After landfill closure, MEHL will be responsible for maintenance of the site, monitoring and control in the after-care phase, for as long as may be required by the EPA, taking into account the time during which the landfill could present hazards. [44] [45]

K.3.4 Under the terms of the existing Waste Licence (W0129-02), MEHL has completed and submitted to the EPA assessments of (i) 'CRAMP' (Closure, Restoration & Aftercare Management Plan), (ii) ELRA (Environmental Liabilities Risk Assessment) and (iii) FP (Financial Provision). The assessment was prepared with reference to EPA (2006) *Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision*. A systematic step-wise approach is outlined in the EPA guidance document, as follows:

- Step 1: Initial Screening & Operational Risk Assessment
- Step 2: Preparation of a Closure, Restoration and Aftercare Management Plan (CRAMP) for known Liabilities.
- Step 3: Environmental Liability Risk Assessment (ELRA) for unknown Liabilities.
- Step 4: Identification of Financial Provision (FP) and Instruments

K.3.5 The amount of financial provision required for the existing MEHL inert facility (under W0129-02) was determined using the CRAMP and ELRA assessment protocol, and

[44] Adapted from the EU Landfill Directive 1999

[45] As part of the pre-application consultation phase, as directed by the Agency, MEHL consulted with Galmoy Mines in relation to their CRAMP and Closure Plan. The parallels between the mine closure and the closure of the proposed MEHL integrated waste management facility (specifically the hazardous landfill cells) were noted, in terms of short, medium and long-term aftercare management requirements. It is suggested that best practice garnered through the mine closure programme could be applied, as appropriate, to closure principles at the MEHL integrated waste management facility, in line with Agency requirements and guidance.

financial instruments were proposed. Both 'known liability' (closure, restoration and aftercare management) and 'unknown liability' provisions were assessed.

K.3.6 The ELRA, CRAMP and Financial Provision assessments will be fully re-assessed for the integrated waste management facility post-licensing, and in consultation with the Agency.

K.3.7 As per existing arrangements, any future or amended Financial Provisions will be 'ring-fenced' to ensure access only by agreement with the EPA. Funds would be used to address ELRA/CRAMP issues arising during the operation/aftercare of the facility. In the event of MEHL ceasing to trade for any reason, prior to the satisfactory conclusion of the restoration of the lands at Hollywood and related aftercare provisions, funds would be wholly assigned to the EPA.

K.3.8 It is proposed that, as per existing arrangements, financial provision will be allocated, and agreed with the Agency, on the basis of a combination of: cash-based deposit account, bond(s) and insurance cover.

K.4 Aftercare

K.4.1 The length of the aftercare period will vary from site to site; however, the holder of a landfill waste licence will be responsible for the aftercare of the site up until the date when the Agency accepts the surrender of the waste licence as specified under section 48 of the Waste Management Act, 1996.[46]

K.4.2 Aftercare management of the integrated waste management facility once the lands have been restored, grassed and planted, as appropriate, will include:

- Maintenance of grassland, hedges and planted areas
- Leachate management
- Inspections and surveys of the drains, surface water management and land surface
- Maintenance of infrastructural installations, including pathways, access points and signposting, fencing and security
- Monitoring (detailed below)

[46] EPA (1999) Landfill Manual: Landfill Restoration and Aftercare

K.4.3 The following pollution control systems will be maintained and protected during the aftercare period:

- the leachate management system
- the landfill capping system including drainage system
- surface water collection, storage and discharge systems
- groundwater monitoring boreholes
- leachate monitoring wells
- hazardous cell leak detection points
- surface water monitoring points
- any other items required by the Agency

K.4.4 It is proposed that the aftercare programme at MEHL will be focused on a performance-based assessment of site conditions, i.e. using the aftercare monitoring programme to determine any potential facility-related environmental impacts. On the basis of favourable results of the aftercare the monitoring programme, it would be proposed to reduce the monitoring frequencies throughout the aftercare period, in line with after-care control and monitoring procedures specified by the Landfill Directive 1999.

K.4.5 Aftercare monitoring requirements will be agreed with the EPA as part of a final closure plan. Monitoring will include:

- Meteorological
- Groundwater levels
- Groundwater composition
- Leachate volume
- Leachate composition
- Surface water emissions – volume and composition
- Topographical survey/reading of any settling behaviour of the level of the landfill body

K.4.6 It is proposed that annual meetings would be held between MEHL and all relevant interested parties, such as local community representatives, planning and local authorities, wildlife groups, etc. for 5 years post-closure, as a minimum. Depending on aftercare reporting and consultation with the Agency, this consultation period may be extended.

Attachment L

Statutory Requirements

Attachment L: Statutory Requirements

L.1 Statutory Requirements

Information Required under the Waste Management Acts, 1996 to 2010

L.1.1 Section 40(4) of the Waste Management Acts 1996 to 2010 states that the Agency shall not grant a waste licence unless it is satisfied that the following points have been complied with:

(a) any emissions from the recovery or disposal activity in question ("the activity concerned") will not result in the contravention of any relevant standard, including any standard for an environmental medium, or any relevant emission limit value, prescribed under any other enactment,

(b) the activity concerned, carried on in accordance with such conditions as may be attached to the licence, will not cause environmental pollution,

L.1.2 The integrated waste management facility has been designed to meet and exceed the requirements of the EU Landfill Directive 1999, the EPA Landfill Manual: Landfill Site Design (2000), and BAT requirements[47]. A superior lining system is proposed for the hazardous waste cells, i.e. Dense Asphaltic Concrete (DAC), which offers complete containment. A leak detection system is also proposed for the hazardous cell lining system. See Attachment **D.3**.

L.1.3 The solidification plant has been designed in line with best practice and European experience, and conforms with the European Commission Waste Treatment BREF. See Attachment **D.1**.

L.1.4 The facility will be managed and operated to mitigate against any potential environmental impacts. Environmental monitoring will continue (and intensify, as appropriate) for dust, surface water, groundwater, leachate and noise; see Attachment **F**.

L.1.5 The proposed development has been subject to full environmental impact assessment.

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[47] EPA (April 2003) *BAT Guidance Note - Waste Sector (Transfer)*; BAT (April 2003) *Guidance Note - Waste Sector (Landfill)*

L.1.6 The facility holds ISO14001:2004 accreditation, the international standard for Environmental Management Systems (EMS). This system ensures legal compliance with all relevant legislation. The EMS will be reviewed and updated to include waste activities as per the proposed integrated waste management facility.

L.1.7 All proposals, SEWs etc. made to the Agency in relation to site development works and/or operational issues are referenced to the EPA requirements and those of the Landfill Directive.

(bb) if the activity concerned involves the landfill of waste, the activity, carried on in accordance with such conditions as may be attached to the licence, will comply with Council Directive 1999/31/EC on the landfill of waste

L.1.8 Full cognisance has been taken of the requirements of the Landfill Directive 1999 in facility design, monitoring requirements, facility operational issues, and related matters. The various articles of the Landfill Directive 1999 are considered below.

L.1.9 In relation of *Article 1, Overall objective*, the proposed development outlines stringent operational and technical requirements to prevent environmental effects.

L.1.10 There are no immediate requirements of *Article 2, Definitions*, on the proposed development.

L.1.11 There are no immediate requirements of *Article 3, Scope*, on the proposed development.

L.1.12 In relation to *Article 4, Classes of landfill,* the proposed development makes provision for all three classes of landfill: landfill for hazardous waste, landfill for non-hazardous waste, and landfill for inert waste.

L.1.13 *Article 5, Waste and treatment not acceptable in landfills,* limits the amount of biodegradable waste consigned to landfill and precludes the acceptance of liquid waste, explosive/flammable wastes and waste tyres. The Waste Acceptance Procedure for the proposed integrated waste management facility will ensure that none of these wastes are accepted at MEHL (see Attachment **H.2**).

L.1.14 *Article 6, Waste to be accepted in the different classes of landfill*, requires waste to be pre-treated prior to landfill. The proposed development will cater for pre-treated waste, insofar as possible, e.g. residues from energy-from-waste. There may not be a feasible pre-treatment option for certain waste streams, e.g. soils & stones. Article 6 acknowledges that pre-treatment may not be feasible in all instances. Incoming wastes will be subject to Waste Acceptance Criteria and, upon arrival on site, will be directed to the relevant access-controlled class of landfill, depending on the classification of the waste stream.

L.1.15 Articles 7, 8 and 9 relate to *Application for a permit*, *Conditions of the permit* and *Content of the permit*, respectively, which are addressed by the waste licensing process.

L.1.16 *Article 10, Cost of the landfill of waste*, requires that the costs involved in the setting up and operation of a landfill site and 30-year closure and aftercare costs (at a minimum) are covered by the price charged by the operator for the disposal of waste. MEHL is cognisant of this requirement in setting and reviewing landfill charging mechanisms.

L.1.17 Article 11 sets down requirements relating to waste acceptance procedures, proposals for which are addressed in detail in Attachment **H.2**.

L.1.18 Article 12 sets down requirements relating to control and monitoring procedures in the operational phase, proposals for which are addressed in detail in Attachment **F**.

L.1.19 Article 13 relates to closure and after-care procedures. MEHL will conduct closure procedures when appropriate, under the authorisation of the Agency. Closure and aftercare will be managed as detailed in Attachment **K**.

L.1.20 Article 14 relates to existing landfill sites [pre-1999], and is deemed to be not relevant to this application.

L.1.21 Articles 15, 16, 17, 18 and 19 relate to requirements on Member States and are not deemed to be directly relevant to the MEHL application at this point.

L.1.22 The requirements *of Annex I, General requirements for all classes of landfills,* are addressed throughout this waste licence application document, and as part of facility outline design and environmental impact assessments.

L.1.23 The requirements of *Annex II, Waste acceptance criteria and procedures*, were considered in drafting proposed waste acceptance procedures, as well as requirements of Council Decision 2003/33/EC.

L.1.24 Monitoring proposals contained in this application (Attachment **F**), comply with requirements as per *Annex III, Control and monitoring procedure in operation and after-care phase*.

(c) the best available techniques will be used to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned,

L.1.25 Under the terms of the existing and previous Waste Licences for the facility, W0129-02 and 129-1, a significant capital investment has already been made at the facility to eliminate or control potential environmental emissions, e.g. surface water management system, concrete hardstanding, wheelwash, bowsers, sprinkler systems, settlement ponds, etc.

L.1.26 BAT has also been applied to the design proposals for the integrated waste management facility, to ensure the highest levels of engineering and operational control.

(cc) the activity concerned is consistent with the objectives of the relevant waste management plan and will not prejudice measures taken or to be taken by the relevant local authority or authorities for the purpose of the implementation of any such plan.

L.1.27 The Waste Management Plan for the Dublin Region has been developed jointly by Dublin City Council, Fingal County Council, Dun Laoghaire-Rathdown County Council and South Dublin County Council and runs over a period of five years from 2005 to 2010 and is due for review by November 11th 2010. By virtue of section 22(10)a of the Waste Management Acts 1996-2008 the objectives of the Waste Management Plan are deemed to be included in the Development Plan. Where the objectives of the Development Plan and the Waste Management Plan are in conflict the objectives in the Waste Management Plan shall prevail. The adoption of the Waste Management Plan is an executive function.

L.1.28 The Plan states that *"the EPA's National Hazardous Waste Management Plan requires further action by the Local Authorities to examine the need for hazardous waste disposal capacity"*. The Plan's Policy on Hazardous Waste Disposal Requirement, states:

- The Dublin Local Authorities have no role in Planning for hazardous waste disposal. However, in Section 9.3 (p.89) of the 2001 National Hazardous Waste Management Plan, the EPA recommends the establishment of at least two engineered landfill disposal cells for hazardous waste, one of which should be in the 'Dublin area'.
- The Dublin Local Authorities will consider the feasibility of establishing a hazardous waste landfill cell in the Region.

L.1.29 The Dublin Region Waste Management Plan (and with cross-reference to the EPA National Hazardous Waste Management Plan) makes reference to the feasibility of establishing a hazardous waste landfill cell in the Region. The proposal would play a key role in the hazardous waste management solution for the Dublin Region and the entire island of Ireland.

(d) if the applicant is not a local authority, the corporation of a borough that is not a county borough, or the council of an urban district, subject to subsection (8), he or she is a fit and proper person to hold a waste licence,

L.1.30 Murphy Environmental Hollywood Ltd. (and its previous 'parent' company) has held an EPA licence at Hollywood since December 2002. The licence was issued to Murphy Concrete Manufacturing (MCM) Ltd. In 2003, Murphy Environmental was established as a trading division of MCM Ltd to serve as the waste management division of the company. In October 2008, Murphy Environmental Hollywood Ltd (MEHL) was established as a separate legal entity to manage the landfill activity at the Hollywood facility. EPA Licence W0129-02 transferred to MEHL on 1st October 2008. MEHL has proved to be a proactive licensee committed to best environmental practice, an excellent track-record with the Agency, and a company which conducts its operations in an open and transparent manner.

L.1.31 Murphy Concrete Manufacturing Ltd. has a long history with the site, having taken over quarrying operations in 1975 (the site operated as a quarry from the late 1940s) Quarrying ceased at Hollywood at the end of 2007.

L.1.32 MEHL is deemed to be a 'fit and proper' person to hold a waste licence.

(e) the applicant has complied with any requirements under section 53.

L.1.33 The Applicant has addressed financial commitments and liabilities, as detailed in Attachment **J**.

(f) energy will be used efficiently in the carrying on of the activity concerned

L.1.34 MEHL is committed to energy-efficient plant and buildings, which will specified in the procurement process. Energy use will continue to be monitored and reported to the Agency on an annual basis as part of the AER.

(g) any noise from the activity concerned will comply with, or will not result in the contravention of, any regulations under section 106 of the Act of 1992

L.1.35 MEHL is committed to noise-reducing plant and buildings, which will be specified in the procurement process. Regular noise monitoring will continue to be conducted to ensure that noise emission limits are complied with, as detailed in Attachment **F.6**.

L.1.36 Measures will be taken to control and minimise potential noise emissions associated with construction operations.

(h) necessary measures will be taken to prevent accidents in the carrying on of the activity concerned and, where an accident occurs, to limit its consequences for the environment

L.1.37 Appropriate accident and environmental accident prevention procedures will be put in place, see Attachment **J**.

(i) necessary measures will be taken upon the permanent cessation of the activity concerned (including such a cessation resulting from the abandonment of the activity) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state.

L.1.38 Appropriate closure and aftercare plans are detailed in Attachment **K**.

L.2 Fit and Proper Person

L.2.1 Murphy Environmental Hollywood Ltd. (and its previous 'parent' company) has held an EPA licence at Hollywood since December 2002 (see Attachment **L.1** above). MEHL has proved to be a proactive licensee committed to best environmental practice, an excellent track-record with the Agency, and a company which conducts its operations in an open and transparent manner.

L.2.2 The Hollywood facility was the first privately-operated landfill facility in Ireland to achieve ISO14001 certification, the international standard for Environmental Management Systems (EMS). The EMS will be developed and expanded to include operations as part of the integrated waste management facility.

L.2.3 The company has no offences under the Waste Management Acts 1996 to 2010, the EPA Act 1992 and 2003, the Local Government (Water Pollution) Acts 1997 and 1990 or the Air Pollution Act 1987. All management staff are appropriately qualified and trained, with full support from the company Directors to operate the facility to the highest environmental standards (please refer to Attachment **C.1**).

L.2.4 MEHL will meet any and all financial commitments or liabilities which may arise, as detailed in Attachment **K**.

L.2.5 MEHL is deemed to be a 'fit and proper' person to hold a waste licence.