MEHL Integrated Waste Management Facility

Hollywood Great, Nag's Head, Naul, Co Dublin

EIS Main Text

December 2010

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environmental solutions

MANAHAN PLANNERS
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MEHL

MEHL Integrated Waste Management Facility

Environmental Impact Statement

D 6877.40

Issue 1 | December 2010

Ove Arup & Partners Ireland

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Job number D 6877.40

ARUP

Document Verification

ARUP

Job title	MEHL Integrated Waste Management Facility	Job number D 6877.40
Document title	Environmental Impact Statement	File reference
Document ref	D 6877.40	

Revision	Date	Filename	Environmental Impact Statement_D6877.40 - Issue 1.docx		
Issue 1	06/12/10	Description	First issue		
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		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
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		Signature			

Issue Document Verification with Document ✓

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This Environmental Impact Statement (EIS) describes the predicted environmental effects of the proposed MEHL integrated waste management facility. It was prepared by and its sub consultants. The Arup study team drew on in-house resources including environmental and earth sciences, geological and hydrogeological assessments, traffic engineering and graphics.

The following sub consultants, working in accordance with specifications prepared by Arup, supplemented these resources:

AWN Consulting –Noise and Vibration Studies

Brady Shipman Martin – Landscape and Visual Impact Study, including the preparation of photomontages

Natura Environmental Consultants and R & D Avian Ecology – Flora and Fauna Impact Study

Eugene Daly Associates – Hydrogeology Impact Assessment

Employment Health Advisers Ltd – Human Health Impact Assessment

Moore Associates – Archaeology, Architectural and Cultural Heritage Impact Study

White Young Green (WYG) were appointed directly by MEHL as the design engineers for the project.

Patel Tonra Limited acted as Project Managers for the project and Manahan Planners acted as planning consultant and both contributed to the preparation of the EIS.

Glossary

This glossary is not exhaustive and the definitions are solely as an aid to the non-technical reader.
This glossary is not exhaustive and the definitions are solely as an aid to the non-technical reader.

AADT	Annual Average Daily Traffic
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
ADR	International Carriage of Dangerous Goods by Road
AER	Annual Environmental Report
Alkalinity	Is a measure of the ability of a solution to neutralize acids.
AOD	Above Ordnance Datum (Malin).
AQS	Air Quality Standards
Aquiclude	A rock which limits or prevents the movement of water across it.
Aquifer	Rocks and Soils which transmit water with ease through their pores and fractures.
Aquifer Storage	The ability of an aquifer to store water.
Baseflow	The background level of flow in a stream or other surface water feature during dry periods (which in many cases will be due solely to groundwater discharge).
BAT	Best Available Technology
BRE	Building Research Establishment
C&D	Construction & Demolition
CAE	Centre for Advanced Engineering
Carboniferous	The geological time period from 355 to 290 million years ago when most of our limestones were laid down.

Catchment	A catchment is a drainage basin covering an extent of land where water from rain or snow melt drains downhill into a body of water, such as a river, lake, reservoir, estuary, wetland, sea or ocean.
CH_4	Methane
CIRIA	Construction Industry Research and Information Association
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Conductivity	Conductivity (or specific conductance) of a solution is a measure of its ability to conduct electricity. It is linked directly to the total dissolved solids in the solution.
Conduit Flow	Groundwater flow though large conduits within the rock mass typical of karstic aquifers.
Confined Aquifer	An aquifer in which the groundwater is overlain by impermeable geological strata; confined groundwater is generally subject to pressure greater than atmosphere.
CQA	Construction Quality Assurance
CRTN	Calculation of Road Traffic Noise
cSAC	Candidate Special Areas of Conservation
CSO	Central Statistics Office
DAC	Dense Asphaltic Concrete
dB	Decibels
dB(A)	The "A" suffix denoted the fact that the sound levels have been "A-weighted" in order to account for the non – linear nature of human hearing.
DEFRA	Department for Environment Food and rural Affairs (UK)

Diffuse Flow	Laminar groundwater flow which takes place through the aquifer matrix or grains.
DMRB	Design Manual for Roads & Bridges
DOEHLG	Department of Environment, Heritage & Local Government
DWS	Drinking Water Standard
EC	European Commission
EEC	European Economic Community
EFTEC	Economics for the Environment Consultancy Ltd
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management Systems
Environmental Quality Standard (EQS)	An EQS is a pre-determined scientific standard assigned by the EPA or other scientific administrative authority to assess pollution against.
EPA	Environmental Protection Agency
ERBD	Eastern Region Basin District
ERBDA	Eastern River Basin District Authority
ERFB	Eastern Regional Fisheries Board
ESB	Electricity Supply Board
EU	European Union
EWC	European Waste Catalogue
Fault	A planar fracture in rock in which the rock on one side of the fracture has moved with respect to the rock on the other side.
FCC	Fingal County Council

FGT	Flue Gas Treatment
Fissure	Natural crack in rock which allows rapid water movement.
Fracture	A discontinuity across which there has been separation.
GDSDS	Greater Dublin Strategic Drainage Study
GDTE's	Groundwater Dependent Terrestrial Ecosystems
Geophysics	A non-disturbance survey method involving one or more of the following: Electrical resistivity, various types of magnetometry and ground penetrating radar.
GHA	Geological Heritage Area
GHG	Greenhouse Gas
GIS	Geographic Information System
Glacial Sand & Gravel	Sands and gravels deposited in glacial environments by glacial or sub-glacial streams (see also fluvio-glacial deposits).
GPS	Global Positioning System
Groundwater	Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material, (see aquifer). That part of the subsurface water that is in the saturated zone, i.e. below the water table.
Groundwater Vulnerability	Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities.
GSI	Geological Survey of Ireland
GWB	Groundwater Body
HA	Hydrometric Area
HDPE	High Density Polyethylene

HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IFI	Inland Fisheries Ireland
IGH	Irish Geological Heritage Programme
IGI	Institute of Geologists of Ireland.
Intergranular Flow	Flow through the matrix of a deposit which moves through available pore-spaces between grains.
IPPC	Integrated Pollution Prevention and Control
ISO	International Organisation for Standardisation
ISWA	International Solid Waste Association
IWMA	Irish Waste Management Association
Karstic	Descriptor for bedrock conditions in limestone that contain solution features such as fissures and caves, and potentially, underground watercourses.
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.
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.

Landuse	The activities which take place within a given area of space[1].
Leachate	Liquids that have percolated through a soil and that carry substances in solution or suspension.
LI	Locally Important Aquifers
Lithology	The study/definition of rocks' physical and chemical characteristics.
MBT	Mechanical Biological Treatment
MCM	Murphy Concrete Manufacturing
MEHL	Murphy Environmental Hollywood Limited
Morphology	Morphology is the science of the forms of natural water bodies such as rivers, lakes, estuaries, lagoons, coastal zones and seas, as well as with the processes that create and modify these forms.
MSW	Municipal Solid Waste
NaDWaF	National Difficult Waste Facility
NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NO_2	Nitrogen dioxide
NO_X	Nitrous Oxides
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
OD	Ordnance Datum
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
PBS	Padraig Briody & Sons Ltd

[1] Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.

Permeability	A measure of the ability of a given rock to transmit water.
pH	The measure of the acidity or alkalinity of a substance.
Physico-chemical	Relating to both the physical and chemical properties of water.
PM_{10}	Particle matter less than 10µg (dust)
$PM_{2.5}$	Particle matter less than 2.5µg (dust)
pNHA	Proposed Natural Heritage Areas
PPV	Peak Particle Velocity
PRTR	Pollutant Release and Transfer Register
QRA	Quantitative Risk Assessment
RBDs	River Basin Districts
RBMP	River Basin Management Plan
RC	Roman Catholic
Recharge	The addition of water to the zone of saturation; also, the amount of water added.
RI	Regionally Important Aquifers
River Basin District (RBD)	An authoritative area defined by the Water Framework Directive covering an array of Hydrometric Areas and a range of catchments.
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
Runoff	Water draining across a surface usually following precipitation.
Saturated Zone	The zone below the water table in which all pores and fissures are full of water. Also known as the phreatic zone.

Secondary Permeability	Permeability derived from fissures, faults and conduits in the rock rather than that provided by the rock matrix itself.
SMR	Sites and Monuments Record
SO_2	Sulphur Dioxide
SPAs	Special Protection Areas
SuDS	Sustainable Drainage Systems
TA	Transport Assessment
TDS	Total Dissolved Solids
TFS	National Transfrontier Shipment of Waste
Total Hardness	The total water hardness is the concentration of both Ca_2+ and Mg_2+ ions as a measure of calcium carbonate ($CaCO_3$) in the water. It provides an indication of the effect of bedrock on water.
Total Suspended Solids (TSS)	The quantity of solid particles suspended in the water.
TPA	Tonnes of Waste per Annum
Transmissivity	The product of the hydraulic conductivity and the saturated thickness. It represents the ability of a given thickness of aquifer under a given gradient to transmit fluids.
UN	United Nations
Unconfined Aquifer	An aquifer where the water table is exposed to the atmosphere through openings in the overlying material.
UNESCO	United Nations Educational, Scientific and Cultural Organization
Unsaturated zone	The zone between the land surface and the water table, in which pores and fissures are only partially filled with water. Also known as the vadose zone.

uPVC	Unplasticized polyvinyl chloride
VOCs	Volatile Organic Compounds
WAC	Waste Acceptance Criteria (in accordance with the Council Decision of 19 December 2002, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC)
Water Framework Directive (WFD)	European Union Legislation for the improvement and maintenance of all water within its jurisdiction.
Water table	The uppermost level of saturation in an aquifer at which the pressure is atmospheric.
WFD	EU Water Framework Directive
WHO	World Health Organisation
WL	Waste Licence
W-t-E	Waste to Energy
Zone of Contribution	The groundwater catchment area that contributes water to a well.

1 Introduction

1.1 Introduction

Murphy Environmental Hollywood Ltd (MEHL) owns and operates a licensed inert landfill located at Hollywood Great, Nag's Head, Naul, County Dublin. The facility is licensed by the Environmental Protection Agency (EPA), licence reference number W0129-02. The site has been EPA licensed and operational since 2003. It was formerly a quarry from which limestone and shale were extracted. The site is located approximately 32 km north of Dublin city centre, as shown on **Figures 1.1 and 1.2**.

MEHL propose to develop the current activities through the construction of an integrated waste management facility within the present boundaries for the acceptance of non-biodegradable waste, including hazardous and non-hazardous waste-to-energy incineration residues, hazardous and non-hazardous soils and inert soils, and other compatible waste streams.

This Environmental Impact Statement (EIS) has been prepared to provide information on the possible environmental effects of the construction and operation of the integrated waste management facility. The EIS has been prepared on behalf of MEHL by Arup and their environmental specialists. MEHL appointed White Young Green (WYG) as the master planning and design consultants for the project. A full list of all contributors to the EIS is provided at the beginning of this report.

The EIS comprises four volumes of which this is the second. The four are as follows:

Volume 1 – Non Technical Summary

Volume 2 – Environmental Impact Statement (Main Text)

Volume 3 – Figures

Volume 4 – Appendices

This chapter outlines the background to the project and presents a profile of MEHL. In addition, this chapter summarises the planning procedure required for the project. This chapter also describes the methodology used to prepare this EIS and the consultation process that has been carried out to date.

1.2 Murphy Environmental Hollywood Ltd Profile

1.2.1 MEHL Landfill Facility

The MEHL facility at Hollywood Great, Nag's Head, Naul, Co. Dublin is a fully operational inert landfill regulated by the EPA under waste licence W0129-02 and Fingal County Council Planning Permission F07A/0262 and F04A/0363. It provides a strategically located waste disposal facility to the major urban population centres on the east and north east coast of Ireland. The facility is operated to the highest standards in environmental management and control.

The site is licensed to accept up to 500,000 tonnes of inert waste per annum, comprising various forms of construction and demolition waste, soils and stone and other inert wastes. This includes mildly contaminated soils, which comply with the limit values for waste acceptable at landfills for inert waste as set out in Section 2.1.2 of EU Council Decision of 19 December 2002 (2003/33/EC) establishing criteria and procedures for the acceptance of waste at landfills. A copy of EPA waste licence W0129-02 is provided in **Appendix A1.1**.

The Hollywood site has a dedicated Facility Manager and an Assistant Facility Manager. They are supported by an office team which has responsibility for operating the weighbridge, and additional office and data management duties, and an operations team, which directs and controls incoming vehicles to waste deposition areas.

MEHL was the first privately-operated landfill facility in Ireland to attain the ISO14001 standard for Environmental Management Systems (EMS) in November 2004. An EMS requires the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures and processes to improve environmental performance.

The site also operated as a quarry until 2007. Quarrying began at the Hollywood site in the late 1940s and Murphy Concrete Manufacturing (MCM) Ltd took over operations in 1975. MCM Ltd was formed by Seamus Murphy in 1969 and he remains as the Company Managing Director. In 2003, Murphy Environmental was established as a trading division of MCM Ltd to serve as the waste management division of the company. The sale of aggregate product on a commercial basis from MCM Ltd at the Hollywood facility ceased at the end of 2007. 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 is responsible for all aspects of the management and operation of the landfill and compliance with the Waste Licence.

1.2.2 MEHL in the Community

MEHL launched an environmental sponsorship programme of thirteen local primary schools in December 2005 with a commitment to maintaining the initiative for a minimum of five years, with the objective of fostering long-term projects. Projects which promote and encourage the preservation and protection of the environment are rewarded, with the specifics of the selected projects entirely at the schools' discretion.

Many of the sponsored schools are new 'Green Flag' holders, a demonstration of their hard work and commitment to sustainability projects. MEHL continue to support a range of local charity and sports initiatives also.

MEHL maintain a commitment to providing information and transparency in their operations by making all monitoring results and other company information available at their website, **www.mehl.ie**. MEHL has developed a communications procedure to allow the public access to information on the facility. The main methods are:

- The company website, **www.mehl.ie**, which is updated regularly with company news, monitoring results and licence information.

- Annual Environmental Reports, available on the MEHL website.
- Site notice board.
- An information pack is available to customers and interested parties.
- Site documentation is available for inspection at the site office.
- MEHL Facility Managers are available to answer any queries.

1.2.3 MEHL Planning and Licensing History

Dublin County Council granted the first planning permission for restoration of the quarry in July 1988 and in 1993 they issued a permit for landfilling under the European Communities (Waste) Regulations, for a three-month period. This permit was not used by the company and no waste activity took place at that time. When new waste legislation was introduced, MCM Ltd applied for a waste licence from the EPA. MCM Ltd made its first application for a waste licence in April 1999. A waste licence (reference 129-1) was issued by the EPA in December 2002 and preparatory works for the new landfill operation, in accordance with the licence got underway at the site immediately.

An application to extend the duration of planning permission, lodged in June 2003, was granted in August 2003 for a period of 18 months. 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.

In 2004, an application was made to Fingal County Council to renew the planning permission for restoration of the quarry (Planning Ref. F04A/0363). The Grant of Permission was made in October 2004. The planning permission is for a period of 15 years at an acceptance rate of 340,000 tonnes per annum.

An application was lodged in February 2007 to vary the planning permission to permit the infilling of an extended quarry area, and to increase the rate of filling to 500,000 tonnes per annum. Planning permission for this development, ref. F07A/0262, was granted on 19th July 2007.

In July 2007, MEHL lodged an application with the EPA for a Waste Licence Review. The review application sought permission to extend the landfill footprint of the facility, in line with the quarry footprint, and to increase the rate of infill to 500,000 tonnes per annum. A revised licence, W0129-02, was issued by the EPA on 21st May 2008 (W0129-02 thereby superseded W0129-01).

An application was lodged with Fingal County Council in October 2007 (Planning Ref. F07A/1241) to relocate the primary entrance to the facility by creating a new entrance from the County Road LP01080 Walshestown Road. It was intended that the existing entrance on the Local Road LP01090 would be used for emergency access only. Permission was refused on the basis of visual impact, impacts of noise, dust and traffic generation on resident amenity and unacceptable proposals for treatment of foul sewer and the proposed surface water arrangements. In response to the refusal, a second application (F08A/0749) was lodged on June 16th 2008 with Fingal County Council explaining the need.

It was refused permission by Fingal County Council on 7th August 2008 for three reasons relating once again to zoning, impact on residential amenities and unacceptable drainage proposals. However, the report of the Transportation

Department again stated that it had no objection to the proposal, and on safety grounds considered the new access to be preferable to the existing one.

1.3 Outline of Proposed Development

The proposed MEHL facility will comprise of the following:

- 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.
    - Inert wastes.
- Construction of administration building, car park and ancillary infrastructure.
- Provision of a new facility entrance and access road.
- Construction of a solidification plant, associated storage building and staff welfare facilities.
- Installation of leachate, surface water and other associated landfill management infrastructure.
- Development of landscaping, wetlands and biodiversity area.

The new entrance will cater for all construction and customer traffic into both the landfill and solidification plant. It is proposed to retain the existing entrance as an emergency entrance/exit only. Full details of the proposed development can be found in **Chapter 4** *Proposed Site and Project Description*.

1.4 Proposed Facility Capacity

The total waste input will be up to 500,000 tonnes per annum, which is consistent with the existing planning permission and EPA licence and does not therefore represent an increase from that already approved.

It is anticipated that the hazardous waste cells will have a capacity of approximately 1,735,500m^3, the non hazardous waste cells will have an estimated capacity of 1,324,000m^3 and the inert waste cells will have a capacity of approximately 755,500m^3.

1.5 Planning Procedure for the Proposed Integrated Waste Management Facility

1.5.1 Introduction

This section describes the planning procedure required for the proposed integrated waste management facility.

The Planning and Development (Strategic Infrastructure) Act 2006 has been operational since 31 January 2007. The purpose of the 2006 Act is to provide a streamlined procedure for planning applications for prescribed classes of infrastructure development. The Act amends the Planning and Development Act

2000 (the 'Principal Act'). New regulations have been introduced: the Planning and Development Regulations 2006 (S.I. No. 685 of 2006) (the '2006 Regulations').

The essence of the new procedure is that applications for major infrastructural projects require an application to be made directly to An Bord Pleanála rather than to the local planning authority (in this case, Fingal County Council) as would have previously been the case.

Section 3 of the 2006 Act inserts a new Section 37A into the Principal Act:

"*Section 37A – (1) An application for permission for any development specified in the Seventh Schedule shall, if the following condition is satisfied, be made to the Board under Section 37E and not to a planning authority*".

In order to fall within the provisions of the new Section 37A, a proposed development must be of a class specified in the Seventh Schedule to the Principal Act and the condition in Section 37A(2) of the Principal Act must be satisfied.

The conditions in Section 37A (2) is that:

37A(2) following consultations under Section 37B, the Board serves on the prospective applicant a notice in writing under that section stating that, in the opinion of the Board, the proposed development would, if carried out, fall within one or more of the following paragraphs, namely—

(a) the development would be of strategic economic or social importance to the State or the region in which it would be situate,

(b) the development would contribute substantially to the fulfilment of any of the objectives in the National Spatial Strategy or in any regional guidelines in force in respect of the area or areas in which it would be situate;

(c) the development would have a significant effect on the area of more than one planning authority.

The proposed development falls within the provisions of Section 37A as follows:

'Section 37A (3), *a waste disposal installation for the landfill of hazardous waste'*

An Bord Pleanála has notified MEHL that the proposed integrated waste management facility falls within these paragraphs. Accordingly, the condition in Section 37A (2) has been satisfied in relation to the proposed integrated waste management facility.

1.5.2 Pre-Application Stage

As required under the amended Principal Act, MEHL has had a number of pre-application consultation meetings with An Bord Pleanála in preparation for submitting the planning application and this Environmental Impact Statement. Records of these meetings are posted on An Bord Pleanála's website. **www.pleanala.ie**

As part of the consultations, An Bord Pleanála gave advice on the application process. An Bord Pleanála also listed the prescribed bodies which must be notified by MEHL of the application as a minimum.

1.5.3 List of Prescribed Bodies

The following statutory bodies were furnished with a scoping report which outlined the proposed structure and scope of the EIS and the environmental issues to be addressed within the EIS. A copy of the Scoping Report and responses received regarding scoping are provided in **Appendix A1.2**.

1. Fingal County Council
2. Meath County Council
3. National Roads Authority
4. Environmental Protection Agency
5. Health and Safety Authority
6. Health Service Executive
7. Development Applications Unit of the Department of Environment, Heritage and Local Government
8. Eastern Regional Fisheries Board
9. An Taisce

The following non-statutory bodies were furnished with the scoping report:

1. Geological Survey of Ireland (GSI)
2. The Arts Council
3. The Heritage Council

A copy of the scoping report was also furnished to An Bord Pleanála for information. In addition to this, consultation meetings were held with Fingal County Council, Meath County Council/North Eastern Region Waste Committee, Nevitt Lusk Action Group, Dublin City Council and the EPA,

1.5.4 Consultation with Local Community

All neighbouring premises (residential and commercial/industrial) within a 1km radius (approx 60 No.) of the MEHL site boundary were visited by MEHL on 18 and 19 May 2010. An information leaflet and letter from MEHL was prepared and presented to neighbours to inform them of the proposed development and to advise them of how they could engage in the process. Copies of the information leaflet and letter are provided in **Appendix A1.3**.

A Public Information Day was held on 1st September 2010 in the Bracken Court Hotel, Balbriggan, Co. Dublin. Neighbours within 1km of the site were issued with a postal invitation to attend the event, plus advertisements were placed in the local press to advise the neighbours and any other interested parties of the opportunity to view the project information and engage with the company and its appointed consultants. A summary of all consultations undertaken and key comments received are presented in **Appendix A1.4**.

1.6 Environmental Impact Statement Methodology and Consultation Process

1.6.1 Purpose and Screening

As discussed previously, MEHL has been notified by An Bord Pleanála that the proposed integrated waste management facility comes within the scope of Section 37A (2) of the Principal Act (as inserted by the 2006 Act). Under Section 37E any planning application for a development which comes within the scope of Section 37A must be made to An Bord Pleanála and must be accompanied by an EIS. Section 37E provides as follows:

37E.—(1) *"An application for permission for development in respect of which a notice has been served under Section 37B (4) (a) shall be made to the Board and shall be accompanied by an environmental impact statement in respect of the proposed development"*.

This EIS will be submitted with the application to An Bord Pleanála. The EIS will also accompany an application to the EPA for a waste licence.

1.6.2 Statutory Requirement for the Contents of an EIS

This EIS has been prepared in accordance with the relevant provisions set out in the Planning and Development Regulations 2001, ('the 2001 Regulations') as amended by the 2006 Regulations

Schedule 6 of the 2001 Regulations specifies the information to be contained in an EIS, including the following:

"A description of the proposed development comprising information on the site, design and size of the proposed development.

A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects.

The data required to identify and assess the main effects which the proposed development is likely to have on the environment.

An outline of the main alternatives studied by the developer and an indication of the main reasons for his or her choice, taking into account the effects on the environment".

Information is also required on the following matters:

"A description of the physical characteristics of the whole proposed development and the land-use requirements during the construction and operational phases.

A description of the main characteristics of the production processes, for instance, nature and quantity of the materials used.

An estimate, by type and quantity, of expected residues and emissions (including water, air and soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed development".

Aspects of the environment likely to be significantly affected by the proposed development are also to be described, including in particular:

"Human beings, fauna and flora

Soil, water, air, climatic factors and the landscape

Material assets, including the architectural and archaeological heritage, and the cultural heritage

The inter-relationship between the above factors."

A description is required of the likely significant effects (including direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative) of the proposed development on the environment resulting from:

"The existence of the proposed development

The use of natural resources

The emission of pollutants, the creation of nuisances and the elimination of waste"

and a description is required of the forecasting methods used to assess the effects on the environment.

A summary in non-technical language of this information is also to be included.

Finally, any difficulties encountered by the developer in compiling the required information should be indicated.

1.6.3 EPA Guidelines

This EIS has been prepared with due regard to the guidelines on the preparation of environmental impact statements published by the EPA. These are contained in '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*', published in 2003 and '*Guidelines on the Information to be contained in Environmental Impact Statements*' published in 2002.

Other discipline specific guidelines have been used in the preparation of the EIS. Please refer to individual chapters.

1.6.4 Scoping of the EIS

Key focus areas of the EIS were determined following:

- Consultation with An Bord Pleanála
- Consultation with the Environmental Protection Agency
- Consultation with Fingal County Council
- Consultation with Meath County Council
- Consultation with Department of Environment, Heritage and Local Government
- Review of all previous planning applications and EISs relating to the site.

- Responses from statutory consultees to the scoping document and or information letter.
- Responses from non statutory consultees to the scoping document and or information letter.
- Comments raised at public information sessions.
- Review of the topics which were raised in the Fingal County Council and An Bord Pleanála reports for the Fingal landfill project application.

All responses to the scoping document are presented in **Appendix A1.2.**

1.6.5 Mitigation Measures

The central purpose of the EIS is to identify potentially significant adverse impacts at the pre-application stage and to propose measures to mitigate these impacts. The primary mitigation will be by avoidance. Where potential adverse impacts are identified, the project design has been modified where feasible, to avoid the impact. If impacts cannot be avoided, measures have been incorporated into the project to reduce the adverse impacts to as low as is practicable. Where adverse impacts cannot be prevented, measures will be taken to restore the environment to an approximation of its previous condition or to a new equilibrium.

1.6.6 EIS Structure

There are two different EIS structures which are commonly used and which the EPA guidelines accept as equally valid. The structure Arup has employed is the grouped format structure.

Using this structure there is a separate chapter for each topic, e.g. air, flora and fauna, soils and geology. The description of the existing environment, the proposed development and the impacts, mitigation measures and residual impacts are grouped in the chapter. The grouped format makes it easy to investigate topics of interest and facilitates cross-reference to specialist studies.

1.7 Difficulties Encountered in Compiling Any Specified Information

No significant difficulties were encountered during the preparation of this EIS.

1.8 References

Environmental Protection Agency (2002) '*Guidelines on the information to be contained in Environmental Impact Statements*', EPA, Wexford

Environmental Protection Agency (2003) '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*', EPA, Wexford

Department of Environment Heritage and Local Government (2006) *Planning and Development (Strategic Infrastructure) Act*

2 Project Need

2.1 Introduction

This chapter explains the need for an integrated waste management facility for the acceptance of non-biodegradable waste including waste-to-energy residues (both hazardous and non-hazardous), hazardous and non-hazardous soils, non biodegradable inert waste and other compatible waste streams.

2.2 Summary of Project Need

The key piece of waste infrastructure missing in Ireland is a hazardous waste landfill. This need has been identified in multiple policy documents.

- The National Hazardous Waste Management Plan 2008-2012 recommends that at least one hazardous waste landfill be developed in Ireland, capable of accepting the wide range of hazardous wastes that would otherwise be exported for landfill.
- EU waste policy requires member states to achieve self-sufficiency in the management of waste. Currently there is no option but to export certain wastes.
- Waste management plans adopted in the Republic and Northern Ireland acknowledge the need for all island solutions to hazardous waste.
- Adequate waste management infrastructure is vital for economic development. Currently, Ireland's infrastructure for managing hazardous waste is deficient.
- Managing such waste in Ireland will give rise to economic opportunities and a beneficial spin-off for local industries and local employment, which are currently foregone because the waste is exported.
- Managing non-biodegradable wastes, residues and waste soils in Ireland will reduce the greenhouse gas emissions arising from the export of the waste and will reduce any risk associated with waste shipments.
- EU waste policy requires member states to implement the waste hierarchy, which ranks energy recovery from waste which cannot be recovered or recycled, higher than disposal of the waste. The MEHL facility will facilitate the development of modern and future waste management solutions in line with the waste hierarchy.

2.3 EU requirement for Self-sufficiency in Management of Wastes

2.3.1 EPA's National Hazardous Waste Management Plan 2008 - 2012

The National Hazardous Waste Management Plan 2008-2012 was prepared and published by the EPA.

The Plan recommends a policy of moving towards national self sufficiency by seeking to minimise the export of hazardous waste. In order to achieve this, Page IX of the Plan notes that *"if Ireland were to become fully self-sufficient, hazardous waste landfill and incineration are measures which would be required"*. Furthermore, Page 69 of the Plan states that *"It is recommended that at least one hazardous waste landfill be developed in Ireland, capable of accepting the wide range of hazardous wastes that would otherwise be exported for landfill. Such a facility would be expected to provide a key national service and should have an available capacity of at least 25,000 tonnes per annum. A national facility should facilitate good transport links with the main urban and industrial centres. The facility could be co-located with an existing or planned landfill facility with the objective of utilising existing infrastructure such as site roads, weighbridges and staff facilities, thereby saving costs."*

At present, there is no merchant landfill for hazardous waste in Ireland. The proposed MEHL facility meets the requirements of the National Hazardous Waste Management Plan in relation to the identified need for a hazardous waste landfill facility and this is the subject of this application.

In terms of the provision of infrastructure and self-sufficiency, the following recommendations made in the Plan apply to this objective (Page 86 of the Plan),

"20. Commission a study in 2009 to clarify the technical and economic aspects of providing hazardous waste landfill capacity. (Body responsible for this action: EPA).

"21. Keep under review the provision of hazardous waste landfill capacity and taking into account any recommendations that may be made by the EPA study (See recommendation 20 above), consider the use of appropriate, economic or other instruments to ensure such capacities are provided, whether by the private or public sector by 2012. (Body responsible: Department of the Environment, Heritage and Local Government)".

In pursuance of recommendation 20 above, the EPA issued a request for tenders in June 2009 to carry out a study in relation to the provision of a National Difficult Waste Facility. This study was published recently and is discussed in more detail in other sections of this EIS.

2.3.2 Proximity Principle

According to the European Environmental Agency, the proximity principle *"implies that waste should generally be managed as near as possible to its place of production, mainly because transporting waste has significant environmental impacts."*

The Minister for the Environment, Heritage and Local Government has issued guidance under Section 60 of the Waste Management Act (Circular WIR: 04/05) which clarifies that the inter-regional movement and treatment of waste should be provided for in appropriate circumstances, while ensuring that the facilities are provided primarily for the needs of the region in which they are located and in line with the proximity principle.

2.3.3 All Island Approach

Page 6 of the UK Plan for Shipments of Waste published in 2007 by the Department of Environment, Food and Rural Affairs states that *“shipments of hazardous waste for disposal are allowed between Northern Ireland and Ireland. Such shipments will be allowed in either direction provided that such waste is both generated and disposed of within Northern Ireland or Ireland. Both EU and UK policy allow for the provision of an all island approach to the landfill of hazardous waste”.*

Waste management plans adopted in Northern Ireland also acknowledge the need for all island solutions to hazardous waste. The Arc 21 Waste Management Plan published in 2006 by the Eastern Region Waste Management Group which covers eleven Councils in the east of Northern Ireland, states that *“in terms of all island cooperation, particular priorities might include utilising existing or planned treatment facilities on an all island basis”.*

2.4 Adequate Waste Management Facilities are Vital for Economic Development

Inadequate waste management facilities are recognised as a significant business cost. Many significant plans, policies and economic studies issued in Ireland in recent years have identified that adequate waste infrastructure is vital to economic competitiveness.

2.4.1 National Development Plan

Page 144 of the National Development Plan 2007-2013 recognises that enhancing *“the availability of a range of high quality waste management solutions is important for national competitiveness and balanced regional development, particularly for business in terms of cost and choice of investment location”.*

2.4.2 National Spatial Strategy 2002 - 2020

Page 13 of the National Spatial Strategy for Ireland 2002–2020 references *“promoting cost-effective provision of public services like roads, drainage, waste management facilities…”* as part of strategic spatial planning and sustainable development. Page 18 of the National Spatial Strategy states that *“efficient movement of people and goods, coupled with effective energy and communications networks, waste management facilities and other services will be essential to bring out the innate potential of places and promote balanced regional development”* and that *“waste management is a particular current priority.*

Page 56 of the Strategy goes on to state that *"Efficient, effective and cost competitive waste management facilities are essential if industrial and enterprise activity is to thrive and develop in a balanced way across Ireland"*.

Pages 41-43 of the National Spatial Strategy refers to the need for the physical consolidation of Dublin, and, in its hinterland areas, to *"concentrate development in strong towns with capacity for growth on well-served public transport corridors, such as Navan, Naas, Newbridge, Kilcullen, Arklow, Drogheda and Balbriggan"*. In relation to cross-border linkages, the Strategy notes an *"increasing interaction is emerging between Dublin and Belfast. This is a significant asset, in line with the European wide trend of increased cooperation between cities to enhance competitiveness. The interaction has major potential benefits for the whole of the island of Ireland"*.

2.4.3 Innovation Taskforce Report March 2010

Page 57 of the Government's Innovation Taskforce Report, March 2010 on Building Ireland's Smart Economy notes that "*a modern transport, telecom, energy, waste and water infrastructure is key to the ongoing competiveness of the Irish economy*".

2.4.4 Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022

The Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022 recognises on Page 73 of Volume I that "*an inter-regional solution should be sought through the liaison and cooperation between relevant parties to address the critical lack of waste disposal infrastructure within the greater Dublin area*".

Page 62 of Volume I of the Regional Planning Guidelines notes that "*the quality, availability and cost of waste management solutions continue to be a key competitiveness issue for enterprise in Ireland. Enterprises continue to have concerns in relation to the cost of waste management services and the lack of adequate waste infrastructure and services in Ireland to meet the demands from industrial, commercial and household waste generation"*.

Page 54 of Appendix A5 of Volume II of the Regional Planning Guidelines notes that *'there are currently no hazardous waste landfills in the region which has an economic and environmental impact on the sustainable development of the region as such waste has to be exported'*.

2.4.5 Forfás Waste Management Benchmarking Report, 2009

Forfás is Ireland's national policy advisory body for enterprise and science. Page 2 of the Forfás Waste Management Benchmarking Report, 2009 states that "*the provision of integrated and cost effective waste management treatment options is both an important competitiveness challenge and a key environmental consideration for Ireland."* Page 12 of the report states that "*there is currently very limited hazardous waste landfill capacity in Ireland. As a consequence, large quantities of hazardous waste are exported for landfill to other countries (in 2007, 48 percent of Ireland's hazardous waste was exported)"*.

In relation to infrastructure deficits, Page 24 of the Forfás report says "*Ireland's limited waste management infrastructure options is resulting in a comparatively poor performance on issues such as costs and waste treatment capacity…Specific infrastructures that need to be developed include: Thermal treatment capacity to recover energy from municipal and industrial waste, Thermal treatment or landfill capacity for hazardous waste...*".

2.4.6 Forfás Waste Management Benchmarking Report – Update 2010

Page 22 of the Forfás Waste Management Benchmarking Update report issued in October 2010 states that *"it is vital from the perspective of jobs and growth that the final policy will give a stronger consideration to enterprise development and competitiveness objectives. In the context of the unprecedented challenges facing the Irish economy and the need to ensure that businesses operating in Ireland are competitive enough to support sustainable, export-led growth, it is vital that these waste management policy decisions support national competitiveness as well as environmental sustainability policy objectives."*

2.5 Reduction in Greenhouse Gas Emissions

The National Climate Change Strategy sets out a programme of actions for achieving limits to the production of greenhouse gases. The main focus is on reducing transport emissions, encouraging renewable energy, changes in agricultural practices and changes in waste disposal policies and plans.

Page 33 of the Strategy notes that *"emissions from the waste sector consist mainly of methane from the anaerobic decomposition of solid waste that has been deposited in landfill sites"*.

Page 34 of the Strategy notes that *"the main greenhouse gas emissions associated with hazardous waste arise from transportation, particularly in the case of exported wastes"*.

The MEHL facility will allow certain hazardous waste, currently exported, to be disposed of in Ireland. The reduction in shipping volumes of waste overseas will reduce greenhouse gas emissions and therefore help towards meeting Ireland's targets under the Kyoto Protocol. As only non-biodegradable wastes will be accepted at the MEHL facility, no greenhouse gases will be produced by the waste.

2.6 Facilitate the Implementation of the Waste Hierarchy

Modern waste management in accordance with the waste hierarchy is moving towards diversion of waste from traditional landfill. Six of the ten waste management regions, representing 29 of the 34 county and city councils in Ireland, propose to develop waste to energy infrastructure. Energy recovery from waste ranks higher than disposal on the waste hierarchy. Of those authorities not proposing to develop waste to energy capacity, some are proposing to use neighbouring capacity. Residual waste landfill capacity is an integral part of the waste hierarchy and facilitates the development of modern and future waste management infrastructure.

2.7 Current and Future National Waste Arisings

This section provides an overview of current and future waste arisings.

2.7.1 Current National Waste Arisings

2.7.1.1 Hazardous Waste (excluding contaminated soils)

The EPA National Waste Report 2008 (published 2009) states that the total reported quantity of hazardous waste managed in 2008 was 319,098 tonnes, an increase of 5% since 2007. This quantity includes biodegradable hazardous waste but excludes contaminated soils.

According to the EPA National Waste Report, 2008 *'there was a 7% increase in the quantity of hazardous waste exported abroad, which remained the dominant disposal option at 157,207 tonnes. Of the waste which was exported, 21,992 tonnes was landfilled in Germany'*. This excludes contaminated soils.

2.7.1.2 Contaminated Soil

Table 2.1 below presents the quantities of contaminated soil exported overseas for disposal between 2004 and 2008 as reported by the EPA. The EPA data do not distinguish between hazardous and non hazardous contaminated soil. The data showed a peak in 2006 not seen in previous years. There was another peak in the quantities of contaminated soil exported for disposal in 2008 (297,683 tonnes) which according to the EPA's National Waste Report 2008, largely arose from decommissioning and remediation works undertaken at a closed IPPC-licensed company. According to the EPA National Waste Report, 2008, Germany is the principal landfill disposal destination for contaminated soil exported overseas.

Table 2.1 Contaminated Soil Exported for Disposal, 2004 – 2008. Units = tonnes

	2004	2005	2006	2007	2008
Exported for Disposal	172,948	140,441	341,158	126,859	297,683

Source: EPA National Waste Reports

2.7.1.3 Non-hazardous Mining Waste and Flyash from Power Stations

The EPA National Waste Report states that the total projected generation of industrial waste, including non-process industrial waste, decreased by 31% from 9.2 million tonnes in 2006 to 6.4 million tonnes in 2008. The top ten sources of non hazardous industrial waste were from mines and power stations in 2008. Refer to **Table 2.2.** Many of these wastes could be accommodated in the proposed MEHL development.

Table 2.2 Top Ten Non-hazardous Industrial Wastes Generated in 2008 (excluding contaminated and inert soil and stone)

EWC code	Non-hazardous industrial waste description	Principal source(s)	NACE sector	Quantity (t)
01 03 06	Tailings from physical and chemical processing of metalliferous minerals	Tailings from Tara, Lisheen and Galmoy Mines	B 07	1,925,007
01 03 09	Red mud from alumina production	Red mud from Aughinish Alumina	C 24	1,148,738
02 02 02	Animal tissue waste	Slaughtering and rendering	C 10	216,184
10 01 02	Coal fly ash	ESB Moneypoint	C 35	147,400
10 01 03	Fly ash from peat & untreated wood	ESB peat burning power stations	C 35	113,316
02 07 99	Other wastes from the production of alcoholic & non-alcoholic beverages	Breweries	C 11	109,667
03 01 99	Other waste from wood processing and the production of panels and furniture	Timber processors	C 16	109,703
02 02 03	Materials unsuitable for consumption or processing	Slaughtering and rendering	C 10	102,388
01 03 99	Wastes from the physical and chemical processing of metalliferous minerals not otherwise specified	Aughinish Alumina, Gypsum Industries	C 14, B 07	101,739
02 02 99	Other waste from the preparation and processing of meat, fish and other foods of animal origin	Slaughtering and rendering	C 10	87,621
			Total	4,061,761

Source: EPA National Waste Report 2008

Most of the reported non hazardous industrial waste generated in Ireland was managed in the State, either on-site at industry (68%) or off-site at commercial waste facilities (28%).

2.7.1.4 Inert Construction and Demolition (C&D) Waste, including soil and stone

According to the National Waste Report 2008, the quantity of construction and demolition (C&D) waste collected in 2008, 13.5 million tonnes, showed a 24% decrease compared with 2007 data. The Dublin Region Waste Management Plan Annual Progress Report 2009, states that in 2008 4,892,312 tonnes of inert soil was generated in the Dublin region, 511,587 tonnes of which was sent to EPA licensed landfills.

Table 2.3 provides details a summary of the management of the soil and stone fraction of construction and demolition wastes in Ireland in 2008. The recovery rate has been estimated at 79%, based on the recovered tonnage expressed as a percentage of the tonnage collected.

Approximately 226,000 tonnes of inert waste was expected at Hollywood in 2008 which was almost all of the quantity of soil disposed of at EPA licensed landfills.

Table 2.3 Recovery and disposal of soil and stones fraction of construction and demolition waste, 2008

	Recovery (t)	Disposal (t)	Total (t)
EPA-licensed landfills	1,286,320	227,533	1,513,853
Local authority-permitted sites	7,068,543	1,480	7,070,023
EPA-licensed waste treatment facilities	11,197	0	11,197
Total	8,366,060	229,013	8,595,073
Recovery rate (%)[88]	79%	-	-

Source: EPA National Waste Report 2008

2.7.1.5 Unreported Inert Construction and Demolition Waste, including Soil and Stone

According to the National Waste Report 2008, there continues to be a large discrepancy between the reported collection of construction and demolition waste, as reported by waste collection permit holders, and its reported disposal and recovery, as reported by waste permit holders, EPA-licensed waste treatment facilities and EPA-licensed landfills. In 2008, there was a gap of 1.9 million tonnes (18%) for soil and stones fraction and a gap of 1.1 million tonnes (38%) for the non-soil and stones fraction, resulting in an overall gap of just over 3 million tonnes. Local authorities estimated that non-reporting waste collection permit holders collected approximately 58,098 tonnes of construction and demolition wastes in 2008 while non-reporting waste permit holders handled an estimated 477,174 tonnes. This still leaves a gap of 2.7 million tonnes.

2.7.2 Future Trends in Waste Arisings

2.7.2.1 Hazardous Waste Quantities

The EPA reported in the National Hazardous Waste Management Plan 2008 – 2012 that the general trend is for an increase in hazardous waste generation. The Environmental Report prepared as part of the Strategic Environmental Assessment of the National Hazardous Waste Management Plan indicated that hazardous waste generation in 2016 is expected to be 405,481 tonnes compared to 314,072 tonnes in 2006.

For the purposes of this project, an assessment was undertaken of the potential hazardous ash i.e. flue gas treatment residues from the major waste-to-energy projects which have been planned and are expected to come on-stream and be fully operational in the next six years approximately. This comprises the following four projects:

- Carranstown, Duleek, Co. Meath (currently under construction)
- Ringaskiddy, Co. Cork (currently at planning stage)
- Poolbeg, Ringsend, Dublin 4 (at construction stage)
- Provision for Waste-to-Energy in Northern Ireland

An estimated 86,640 tonnes per annum of flue gas treatment residues is expected to be generated from these four projects, as presented in **Table 2.5** below.

Table 2.5 Projected Hazardous Flue Gas Treatment Residue Arisings

Waste-to-energy Project	Flue Gas Treatment Residues (tonnes per annum)
Carranstown, Meath	10,000[1]
Poolbeg, Dublin	24,000[2]
Ringaskiddy, Cork	12,640[3]
Provision for Northern Ireland Facility	~ 40,000[4]
Total	86,640

[1]Indaver Carranstown Waste-to-Energy Facility EIS, 2006

[2]Dublin Waste to Energy Project EIS, 2006

[3]Indaver Ringaskiddy Waste-to-Energy Facility EIS, 2008

[4]Provision for Waste-to-Energy in Northern Ireland

The proposed MEHL development will be capable of accepting this hazardous waste. The EPA's Technical and Economic Aspects of developing a National Difficult Waste Facility (NaDWaF) document determines expected future arisings of hazardous waste, suitable for landfilling at a potential NaDWaF, through a desk-based assessment of historic hazardous waste data combined with economic forecast data. Refer to **Table 2.6** which presents predicted arisings of soil and stones containing dangerous substances.

Table 2.6 Hazardous Soils and Stones potentially suitable for Landfill, Ireland and Northern Ireland, Aggregated on 6 year basis, 2008-2025

Waste Type	2008-2013 Average Tonnes per Year	2014-2019 Average Tonnes per Year	2020-2025 Average Tonnes per Year
17 05 03* soil and stones containing dangerous substances	142,642	179,121	195,723

The quantities and sources of other non-biodegradable hazardous wastes are not possible to predict with any level of certainty.

2.7.2.2 Non Hazardous Non-biodegradable Waste

For the purposes of this project, an assessment was undertaken of the potential non-hazardous residues i.e. 'bottom ash' and 'boiler ash' from the four waste-to-energy projects referred to in Section 2.7.2.1.

An estimated 261,000 tonnes per annum of non-hazardous bottom and boiler ash is expected from these four projects, as presented in **Table 2.7** below.

Table 2.7 Projected Non-Hazardous Ash Arisings

Waste-to-energy Project	Bottom & Boiler Ash Generation (tonnes per annum)
Carranstown, Meath	53,000[1]
Poolbeg, Dublin	123,000[2]
Ringaskiddy, Cork	45,000[3]
Provision for Northern Ireland Facility	40,000[4]
Total	261,000

[1] Indaver Carranstown Waste-to-Energy Facility EIS, 2006

[2] Dublin Waste to Energy Project EIS, 2006

[3] Indaver Ringaskiddy Waste-to-Energy Facility EIS, 2008

[4] Provision for Waste-to-Energy in Northern Ireland

The quantities and sources of contaminated soils and other non-biodegradable, non-hazardous wastes other than non-hazardous incinerator ash are not possible to predict with any level of certainty. Likewise, the quantities and sources of non-biodegradable inert wastes are difficult to predict.

2.8 Summary

Currently Ireland has no merchant landfill for non-biodegradable hazardous waste and such wastes must be exported. The National Hazardous Waste Management Plan identifies the need for at least one landfill capable of accepting hazardous waste in Ireland. The MEHL facility will provide a long term and sustainable waste management solution to make good this deficiency and help comply with Ireland's policy of self-sufficiency in the management of hazardous waste on an all island basis. The sizing of the MEHL facility is appropriate in the context of the estimated future waste types over the life of the facility. This is supported by the EPA predicted data on wastes of this nature and the recognised costs of developing infrastructure for such a facility which would necessitate scales of economy in terms of size and lifespan.

The MEHL facility will fill a significant gap in critical waste management infrastructure on the island of Ireland and meet the future capacity requirements for disposal of the relevant wastes. This will reduce the waste management costs to industry and commerce and maximise the spin-off to Irish business by keeping this revenue stream in Ireland.

The acceptance of hazardous non-biodegradable wastes, including incinerator residues, at the MEHL facility will reduce the need to export waste overseas by ship, thereby reducing greenhouse gas emissions and revenue leaving Ireland. It will also support the regional waste management plans, which aspire to the development of waste to energy facilities.

2.9 References

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3 Site Suitability and Alternatives

3.1 Introduction

This chapter describes the site suitability assessment for the proposed MEHL integrated waste management facility. The suitability of the site has been validated using published criteria for waste landfills. The site layout and design alternatives considered are also outlined in this chapter.

3.2 Site Suitability Study

3.2.1 Introduction

The existing MEHL landfill facility has planning permission to infill at a rate of 500,000 tonnes per year with inert waste (Planning Register References F04A/0363 & F07A/0262). In granting this permission, the Planning Authority envisaged that the void space in the former quarry would be filled by 2019 and the land reinstated and landscaped at that time.

The existing MEHL landfill facility and the proposed integrated waste management facility is unique in so far as it is, and will remain, specifically and exclusively operated for the acceptance of non-biodegradable materials, and has been since landfill operations commenced at the site in 2003. It was also the first landfill in Ireland whose licence was issued directly from the criteria set out under the EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills and can equally claim itself the first to attain ISO 14001 certification for a privately-operated landfill in Ireland. As landfill is a restricted and finite resource in Ireland the best advantage should be taken of such facilities, taking into account the following:

- Infrastructural gaps in the Waste Sector to address modern waste management and the preferred waste hierarchy.
- Proximity to markets.
- Safe handling and materials management.
- Restriction and/or elimination of export of waste to other jurisdictions.
- Site suitability and capacity to address the identified need.

Modern waste management in accordance with the waste hierarchy is moving towards diversion of waste from traditional landfill. Residual waste landfill capacity is an integral part of the waste hierarchy and facilitates the development of modern and future waste management infrastructure.

MEHL is aware of the government policy to reduce or eliminate the present practice of exporting hazardous waste to landfills in other countries, as soon as suitable landfill and other waste management facilities are available within the island of Ireland. In light of government policy and the reducing demand for landfill capacity from the construction industry, MEHL decided to investigate whether its facility at Hollywood would be suitable for the acceptance of hazardous and non-hazardous waste.

A two part site suitability assessment was undertaken to determine if the MEHL site was suitable for the acceptance of hazardous waste. The following is a description of the site suitability assessment, which was undertaken for the proposed MEHL integrated waste management facility. It should be noted that the Site Suitability Study was the first step taken to ascertain the suitability of the subject site for consideration and was undertaken before any consultant group was considered or appointed to compile the EIS.

1. In September 2009 prior to the preparation of the EIS, MEHL commissioned Patel Tonra Ltd and Manahan Planners to carry out an assessment of the suitability of the existing landfill at Hollywood, Great Naul, County Dublin, for the acceptance of hazardous waste. A full copy of the Site Suitability report is contained in **Appendix 3.1**.
2. Subsequently, Arup undertook a site validation exercise using published criteria for waste landfills, as part of the preparation of the EIS.

The site suitability study examined the suitability of the MEHL site for the disposal of hazardous waste and assessed how the MEHL site compared with other landfill sites in the Republic of Ireland in terms of suitability for the acceptance of hazardous waste.

Overview of Site Suitability Assessment Approach

A systematic assessment approach was developed in the Patel Tonra Ltd - Manahan Planners report to allow the MEHL site to be compared with a shortlist drawn from all available landfill sites in Ireland of other potentially suitable sites and a ranking was established. A schematic of the assessment approach is provided in **Figure 3.1**.

Initially, consideration was given to developing hazardous landfill disposal infrastructure at a new greenfield or undeveloped site.

However, developing hazardous landfill disposal infrastructure at a new greenfield site was not considered appropriate for the following reasons:

1. Section 5.2.2 of the Department of Environment, Heritage and Local Government policy document on waste, *Waste Management, Changing Our Ways 1998*, states that: *"Where immediate landfill capacity problems exist, action to extend the life of existing landfill facilities, rather than to provide new landfill sites, should be a priority"*.
2. Section 6.5 of the EPA *National Hazardous Waste Management Plan 2008-2012* states the following: *"The facility could be co-located with an existing or planned landfill facility with the objective of utilising existing infrastructure such as site roads, weighbridges and staff facilities, thereby saving costs"*.
3. The advantages offered by developing hazardous landfill capacity at an established, operational and currently licensed landfill site versus a greenfield site option were identified as follows:
    - Lead-in time – established and operational sites offer significant advantages in terms of planning and licensing processes. The lead-in time to get new waste facilities 'off the ground' can be viewed as prohibitive.

- Financing – the investment requirements of establishing Ireland's first and only hazardous waste disposal facility is very substantial and the financial realities of such a project may prove prohibitive, particularly for greenfield sites.
- Land ownership – a company with full ownership and control over its site will have distinct advantages over companies which are required to identify, acquire and purchase an appropriate property.
- The co-location of hazardous waste disposal infrastructure with other appropriate landfilling activities offers advantages in terms of shared infrastructure, operation and management. Existing and operational landfill sites will have already invested in much of these requirements in order to comply with licence conditions.

Having determined that developing hazardous landfill disposal infrastructure at a greenfield site was not appropriate, the potential for developing hazardous landfill disposal infrastructure at a licensed landfill site was assessed using a staged approach as follows:

- Level 1 Assessment: The purpose of the Level 1 Assessment was to examine existing licensed sites and to exclude ones which were deemed wholly unsuitable in the context of the current proposal, due to severely limiting licensing factors relating to imminent site closure.
- Level 2 Assessment: For the existing landfill sites remaining after the Level 1 Assessment, a more detailed set of evaluation criteria were applied to each of the licensed sites and a shortlist of sites drawn up.
- Level 3a Assessment: Each of the shortlisted sites identified was assessed with regard to the WHO (World Health Organisation) criteria for site selection for new hazardous waste management facilities. The approach in the WHO guidelines has been adopted as a conservative benchmarking tool.
- Level 3b Assessment: For each of the shortlisted sites, the geographical location of the disposal site was examined with respect to the expected incinerator ash waste generation points in the country.

Following the Level 2 assessment three sites, including the MEHL site, were shortlisted.

As part of the Stage 1 Site Suitability Report produced by Patel Tonra and Manahan Planners in September 2009, an assessment of each of the shortlisted sites with respect to the WHO Guidelines was undertaken as part of the Level 3A assessment. Full details are provided in **Appendix 3.1**.

Screening (and exclusionary) criteria guide this process – these criteria aid in judging the overall suitability of a location and in differentiating candidate sites, but are not necessarily decisive in the choice of location. The assessment is a four-step process as follows:

Test 1 To eliminate generally unsatisfactory areas (geographically).

Test 2 To highlight promising areas (as per current use).

Test 3 To assess promising sites in detail (from health, community and environmental risk perspectives).

Test 4 To evaluate and rank sites (from the perspectives of community, environmental and social impacts).

The characteristics of the shortlisted sites, in terms of each of the four tests, are presented in Appendix 4 of the Site Suitability Report provided in **Appendix 3.1** to this Chapter.

In the Step 1 assessment, the MEHL site has a low sensitivity in seven of the eight relevant categories. It is of medium sensitivity in relation to areas with limestone deposits.

The Step 2 assessment shows that the MEHL site is a promising area as this site ranks highly in all three relevant categories, namely sites of existing waste management facilities, lands with major highway access and location close to waste generators.

In the Step 3 assessment, the MEHL site has a low sensitivity in seven of the ten relevant categories. It is of medium sensitivity in relation to existing developed areas, areas for which non industrial development are planned and agricultural districts.

In the Step 4 assessment, the subject site ranks highly in relation to eight out of the ten categories. It ranks medium in the two other categories.

Conclusion of Site Suitability Assessment

The assessment considered the suitability of the MEHL site for the secure disposal of hazardous and non-hazardous incinerator ash, hazardous and non-hazardous soils and inert soil arising on the island of Ireland.

Firstly, the capacity of the facility was reviewed in terms of the likely quantity of the target wastes that will arise over the 25-30 year period. The remaining licensed void space at MEHL was found to be substantial in comparison to other operating landfills and, most importantly, compared favourably with the likely volumes of the target waste arisings.

Secondly, the location and access to the site was considered in terms of the likely centres of the target waste arisings. Again, the Hollywood site scored highly in this regard as it is located on a national transport corridor and within the Greater Dublin Area. Its location in the Dublin-Belfast corridor is considered a significant advantage with regard to the generation of the target wastes within Northern Ireland.

A review of other landfills indicated that only two other existing landfills had the capacity to cater for the target wastes over the coming 25-30 years. However, one of these sites is somewhat less favourably located with respect to future target waste arisings, while the other site scores similarly in this matter to Hollywood.

In summary, the site suitability assessment concluded that the MEHL site has suitable capacity for the acceptance of the expected volumes of the target wastes that are likely to arise on the island over the future 25-30 years and that the MEHL site is ideally located regarding the likely centres of these waste arisings. Based upon the WHO Selection Criteria, the MEHL site enjoys a favourable rating.

3.2.2 Stage 2: Site Validation Using Published Alternative Criteria

The following two key documents were considered as part of the site validation exercise for the EIS. The Site Suitability study included an assessment of each of the shortlisted sites with respect to the WHO Guidelines. Refer to Section 3.2.2.3.

3.2.2.1 EPA Landfill Manuals, Manual on Site Selection (Consultation Draft, 2006)

The purpose of the EPA manual on landfill site selection is to provide guidance on the selection of a landfill site and assist those involved in assessing the impact of a landfill on the surrounding environment including those involved in the decision making in respect of such proposals.

The guidance is primarily aimed at municipal, industrial and commercial waste landfills falling into the non-hazardous waste landfill category. With regard to the hazardous waste landfill category, the guidance may offer some assistance, but for additional screening and selection criteria appropriate to such a facility, consultation with the statutory authorities is advised as is the use of any relevant international best practice (e.g. Site Selection for New Hazardous Waste Management Facilities, WHO European Region Publication #46).

Part 5 of the manual states that "at an early stage in the site selection process exclusionary areas, i.e. areas considered to be generally unsuitable for landfill should be identified". The following factors must be considered:

- Landfill Directive
- Regionally Important Aquifers
- Geological Unstable Areas
- Flood Plains
- Airports
- Designated Areas for Conservation
- Archaeological Heritage
- Areas of High Amenity

These factors have been considered by the Planning Authority as part of previous planning approvals and by the EPA in the granting of the waste licence for the existing MEHL landfill facility. All of these factors will be reassessed in this EIS.

Part 6 of the manual outlines criteria for site assessment and selection, as shown in **Table 3.1** below.

3.2.2.2 Centre for Advanced Engineering (CAE) Landfill Guidelines Towards Sustainable Waste Management in New Zealand (2000)

These Guidelines provide guidance on siting, design and construction with respect to new landfills and lateral expansions of existing landfills on a site specific basis.

The Guidelines deal specifically with landfills intended to accept municipal solid waste. Chapter 3 of the Guidelines deals with Landfill Siting, in particular:

- Landfill siting philosophy
- Strategic planning
- Site selection process
- Landfill siting criteria

The Guidelines state that it is unlikely that any site will meet all siting criteria. Therefore the assessment of the suitability of a site for a landfill becomes a balance of trade-offs with respect to:

- Comparison of site characteristics with alternative locations
- The potential for engineered systems to overcome site deficiencies
- Methods of operation proposed for the site
- Social and cultural issues associated with the site

In order to minimise future risk to the environment from landfilling activities, primary considerations should be given to key issues and potential fatal flaws with respect to geology, hydrogeology, surface hydrology and site stability, as shown in **Table 3.1** below.

Table 3.1 EPA and New Zealand Site Assessment Criteria

Site Assessment Criteria	EPA Manual	NZ CAE Guidelines
Land Use/Compatibility with surrounding land use	✓	✓
Land Area Requirements/Availability	✓	✓
Local Community/Community Issues	✓	✓
Buffer Zones for Sensitive Receptors	✓	x
Geology and Hydrogeology	✓	✓
Geological Faults	✓	x
Hydrology and Surface Water Protection/Surface Hydrology	✓	✓
Topography	✓	✓
Site Visibility/Natural Screening	✓	x
Ecology/Environmentally Sensitive Areas	✓	✓
Archaeological Heritage/ Environmentally Sensitive Areas	✓	✓
Areas of High Amenity/Environmentally Sensitive Areas	✓	✓
Airports	✓	x

Site Assessment Criteria	EPA Manual	NZ CAE Guidelines
Meteorology/Climatic Conditions	✓	✓
Traffic/Access	✓	✓
Availability of Cover Material	✓	x
Services and Security	✓	x
Site Stability	x	✓
Leachate Management	x	✓
Landfill Gas Management	x	✓

✓ - Criterion is addressed in the EPA Manual / NZ CAE Guidelines
X - Criterion is not addressed in the EPA Manual / NZ CAE Guidelines

Each of the site assessment criterion listed in **Table 3.1** are considered in turn below with respect to the proposed MEHL integrated waste management facility.

Land Use/Compatibility with surrounding land use

The MEHL site is located within a rural and agricultural area where residential dwellings are dispersed throughout the surrounding areas. The predominant land use in the immediate vicinity of the proposed site is agricultural. To the north and south it is mainly pasture. There is a waste permitted facility located to the north-west of the MEHL facility, which has been in operation since January 2005. The waste facility permit (WPT 60) was issued on 30th June 2004 and was extended for a further three years on 30th June 2007. There is a second waste permitted facility to the south-west of the facility, operational since 2009. The waste facility permit for this facility was issued on 28th May 2008 (WPT 136). The Fingal County Council proposed landfill site (not yet commenced or operational) is located 1.4 km to the south-east of the MEHL site. Refer to **Figure 3.2**. To the south-east, east and west the land is predominantly used for tillage.

The site and its environs are zoned Objective HA (High Amenity) in the Fingal Development Plan 2005 – 2011 where the objective is '*to protect and improve high amenity areas*'. The zoning objective seeks to protect these highly sensitive and scenic locations from any inappropriate development. Only agricultural uses and low impact amenity uses will be considered, when it can be shown that the special qualities of these areas will not be eroded by any proposed development.

The MEHL landfill has been operating since 2003 within this zoning and previously the site operated as an active quarry for many decades. The site will, in time, once filled and restored, serve to enhance its scenic and amenity qualities.

Land Area Requirements/Availability

The proposed MEHL development will occur within the proposed waste licence site boundary with sufficient area available in the ownership and direct control of MEHL to allow a buffer zone to be maintained around the perimeter of the site. There is no proposed change to the licensed landfill area or red line planning boundary at the site.

The site is located in an area deemed sensitive in terms of landscape, due to its position at a high point within its surroundings. The visual impact during the operational stages of landfilling is deemed to be insignificant as the landfill operation will not be highly visible from surrounding areas. Only during the final stages of operations, when works are at or near the level of the surrounding ground will there be a potential for a visual impact.

A combination of imported materials and site deposits will be used to complete the capping layer and restore the site in accordance with the agreed final restorations plan. The quality and quantity of cover material will be in accordance with EPA and Landfill Directive requirements.

Local Community/Community Issues

Consultation is ongoing to ensure that the views of various stakeholders, including the local community and individuals are taken into account in the decision making process. A comprehensive public consultation process with neighbouring landowners, potential receptors and interested parties has been undertaken. Refer to **Chapter 1** *Introduction* for more details.

Buffer Zones for Sensitive Receptors

Buffers are intended to provide space or distance between an activity and a sensitive receptor for the purpose of mitigating an actual or potential environmental risk to that receptor. For example, in a landfill situation where potential impacts might include noise, dust, odour, visual, gas migration, etc., a buffer would be created by setting the active landfill back from adjoining sensitive receptors. MEHL has created buffer zones around the entire perimeter of the site where the perimeter could or might encroach on a neighbouring property.

The proposed waste types to be accepted are non-biodegradable, hazardous, non hazardous and inert wastes. These waste types do not generate landfill gas.

There is sufficient area available to allow a buffer zone to be maintained around the perimeter of the site and the hazardous cell will be located centrally on site to allow for additional buffering by the non hazardous and inert waste cells.

Geology and Hydrogeology

A detailed bedrock geology assessment carried out at the site indicated a complex sequence of lithologies. These range from Namurian interbedded sandstones and shales in the north of the site to Brigantian interbedded limestones and shales in the south-eastern corner of the site.

The majority of the site is underlain by the shales and sandstones belonging to the Donore, Balrickard and Walshestown Formations. These are classified as a Poor Aquifer (Pl) which is generally unproductive except for in local zones.

The Loughshinny Formation which is present in the south eastern corner of the site has been classified as a locally important aquifer (Lm) which is generally moderately productive. The groundwater in the Loughshinny aquifer is used for public water supply in Balbriggan, however the site is outside the Source Protection Zone for the abstraction.

The selection of landfill liner and the layout of the proposed cells have considered the local underlying geology in compliance with EPA guidelines. The hazardous waste cells will be sited on the Donore, Balrickard and Walshestown Formations in the northern part of the existing landfill. The non-hazardous cell will be located in the southern portion of the site with the inert cell to the west of the hazardous and non hazardous cells.

It is proposed to use dense asphaltic concrete (DAC) lining on both the base and side walls of the hazardous cells. The DAC lining system will be engineered to provide complete containment of leachate rather than controlled seepage, thus making it a more effective barrier than the single, composite or multiple lining system traditionally used for landfills.

A leachate management system is proposed for the MEHL facility. Leachate from the hazardous and non-hazardous cells will be collected separately and will be retained for use in the solidification process. If any excess leachate is generated, it will be tankered off site and disposed of at an appropriately licensed facility.

Geological Faults

Detailed geological mapping of the site along with geophysical surveys and intrusive site investigation information suggests that there are faults present on the site. The EPA Manual on Site Selection, Page 17 recommends that there should be no general prohibition of landfill siting on areas with geological faults. Faults are ubiquitous in Irish bedrock and the guidance suggests that they be fully investigated.

Hydrology and Surface Water Protection

The primary aim of the proposed surface water management system will be to restrict site runoff and prevent any potential pollutants entering the stream, located on the northern boundary of the site and surface water along the southern boundary. The surface water management system has been designed in accordance with Sustainable Drainage Systems (SuDS) principles and the requirements of the GDSDS (Greater Dublin Strategic Drainage Study) Regional Drainage Policies. It is unlikely that the proposed development will have any impact on surface water as there will be no uncontrolled runoff to surface waters. All surface water collected inside landfill cells which has not been in contact with waste will be collected and pumped to a retention pond. Surface water from haul roads will be collected and discharged with the surface water from undeveloped areas and unused cells. The surface water from the solidification plant hardstanding will be collected and pumped to the leachate holding tank and used in the solidification process.

The handling of leachate from the hazardous and non-hazardous cells is described above.

Topography

At the northern end of the landfill the excavations were deep into the native limestone units. Active extraction was carried out in the middle part of the site and the northern part of the site has been filled and restored with inert waste and another inert cell is nearing completion on the western side of the facility. Settlement ponds are also located at near land surface level to the north of the site.

As the existing site is a large former quarry void with steep faces, the landfilling operation within the void space will be screened by the side slopes for a large part of the operational phase.

Site Visibility/Natural Screening

The visual impact during the operational stages of landfilling is not expected to be significant as the site is not highly visible from surrounding areas. Only during the final stages of operations, when works are at or near ground level is there a potential for a notable visual impact. The locating of a solidification plant onsite may be deemed to have the potential to have a visual impact. However, the solidification plant will be located within a depressed area of the site in order to avail of natural screening by surrounding lands.

Overall, the restoration of the facility, given its former quarry activities, will have wholly positive impacts on the landscape and visual impact, by restoring it to its former levels and to possible alternative uses. Filling and restoration will be conducted such that contours similar to the pre-quarry activity (as per existing planning permission).

Ecology

There are no terrestrial habitats of Regional or National Importance in the vicinity of the site.

As part of the proposal, a new access road will be constructed onto County Road LP01080 Walshestown Road which will result in the removal of some existing hedgerows along the southern boundary of the site. Peregrine falcons have come to nest at the MEHL site and appropriate mitigation measures will be implemented for the proposed MEHL development. There are no significant additional impacts on flora and fauna associated with the change of material intake from inert to non hazardous and hazardous non biodegradable waste streams.

Archaeological Heritage

The ground in the quarried area of this site has already been disturbed during previous site works. However, there is undisturbed land lying to the north east of the site outside the boundary line of the licensed landfill footprint.

A field walking survey within the area of the MEHL site did not reveal any archaeological remains, neither within the boundary of the licensed landfill or on surrounding buffering lands held within the ownership of MEHL.

Areas of High Amenity

The proposed site is zoned Objective HA in the Fingal Development Plan 2005 – 2011, aiming to protect and improve high amenity areas.

However, the landfill has been operating for a number of years within this zoning and previously the site operated as an active quarry and will in time, once filled, provide a positive impact of landscape of its receiving environment.

Airports

The MEHL site is located 15 kilometres north of Dublin airport. As the waste type to be accepted at the landfill is non-biodegradable, it will not provide a food source for birds. Therefore, the anticipated numbers of birds that would be attracted to the site would be low.

Meteorology

The annual rainfall recorded at Dublin airport in 2009 was 918mm. Rainfall is an important factor when considering the collection and containment of any leachate generated at landfill facilities. The primary objective of the proposed leachate management system is to minimise the amount of leachate generated and subsequently collect and dispose of leachate in an environmentally safe manner. It is proposed that all leachate collected from the hazardous cells will be retained for use in the solidification process. If any excess leachate is generated, it will be tankered off site and disposed of at an appropriately licensed facility. Leachate generated in the inert cells will be re-circulated as is the current practice.

Mitigation measures will be employed to minimise leachate generation. Dust control measures will be continued at the facility including the use of wheel washes, sprinklers and road sweepers.

Flue gas treatment residues from waste to energy plants will arrive at the facility in sealed containers and will be pumped directly into silos for solidification.

Once solidified, the material will resemble a solid concrete block. It will be transferred to the hazardous waste cell and deposited directly to the cell for hazardous waste.

Traffic/Access

The proposed MEHL facility is at an existing and established waste facility, providing landfill services to customers on a nationwide basis. The site is located on a national transport corridor, and is conducive to North-South co-operation on strategic hazardous waste management, which otherwise would need to be exported overseas. Recommendations have been made to mitigate any potential traffic impacts on the local road network.

A Traffic Impact Assessment has been undertaken based on the proposed new entrance to the MEHL site from the County Road LP01080 Walshestown Road, and the new road that is part of the Fingal Landfill Project, granted planning permission by An Bord Pleanála in October 2009, which may be used by the MEHL traffic to access the M1.

Availability of Cover Material

Cover material is available onsite. Any additional cover material required will be sourced locally where viable and imported as required. As only non-biodegradable wastes will be accepted at the MEHL facility, there will be no odour, vermin or fly nuisances.

Services and Security

Water and telecommunication services are located along the public road just outside the site boundary. The proposed development works will not affect these services. The existing facility has a connection to both the mains water and telecommunication. The connection points will be relocated closer to the new entrance.

The construction of the new entrance and access road will require the diversion of overhead electrical lines, one a medium voltage line and the second a low voltage line. The electrical supply required for the facility control area and the requirements to divert power lines will be undertaken in consultation with ESB networks and in accordance with their specifications.

A new domestic effluent treatment plant is proposed for the MEHL facility. An assessment was undertaken by Waste Water Maintenance Ltd in 2008. The assessment 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.

Waste will not be accepted from the public or contractors that are not pre-registered (or spot customers). Members of the public will be able inspect the EPA licence records providing the site is pre-notified and an appointment made. All visitors will need to sign the visitors' book upon arrival and wear a visitors' badge whilst on site.

A new site entrance and security system will be installed and perimeter fencing, to prevent unauthorised access to the site, is in place.

Closed-circuit television cameras have been installed at the site entrance and reception area, which are monitored by the Weighbridge Operator. A split-screen system has been installed, which enables the operator to view a number of different camera views at any one time. CCTV data is recorded, stored and archived in conjunction with the office computer system. Similar systems will be in place in the proposed facility.

Site Stability

A geotechnical investigation of the site has been carried out and design proposals have taken into consideration stability and settlement issues. As mentioned previously, the landfill design proposal will take into consideration the location of the geological fault.

Given the nature of the waste which will be accepted, treated and disposed of at the facility, it is anticipated that minimal settlement of the waste body will occur over time.

Some of 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. Indications from the site investigation are that groundwater levels will not affect slope stability.

The expected settlement will be within the allowable tolerance for the DAC liner of 10% depth to length i.e. max 40mm deflection in 400mm. The nature of the wastes that will be accepted at this landfill will minimise settlement potential. The solidification of the hazardous residue prior to landfill will reduce settlement. There will be minimal settlement of the final capping.

Leachate Management

It is proposed to separately collect the leachate produced within the hazardous and non-hazardous cells into holding tanks and recycle it in the ash solidification process where appropriate, with any excess being removed off-site to an appropriately licensed facility.

Landfill Gas Management

The proposed waste streams will be non-biodegradable and therefore will not produce landfill gas.

3.3 Conclusion

In the foregoing site evaluation, no features of the MEHL site were identified which would render it unsuitable as a site of a hazardous waste landfill.

3.4 Alternatives Landfill Lining Technology Considered

3.4.1 Lining Technology for Hazardous Cells

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. Refer to **Figure 3.2**. 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".

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 DAC which is commonly used in Europe. Refer to **Figure 3.3**. A comparison of three lining technologies is presented in **Table 3.2**.

Table 3.2 Summary of Composition and Characteristics of Hazardous Cell Lining Technologies - Composite HDPE and DAC Lining Systems

	Single Composite Liner Note 1	Double Composite Liner Note 1	DAC Liner Note 2
Liner Characteristics	Upper component of the composite liner must consist of a flexible membrane liner (FML). This must be a minimum of a 2mm thick HDPE liner or equivalent (with the necessary flexibility to be robust but not prone to excessive cracking/construction difficulties).	Top composite liner must consist of a minimum 2mm HDPE or equivalent FML and a 1m thick layer of compacted soil having a hydraulic conductivity less than or equal to 1 x10^{-9} m/s constructed of compacted lifts no greater than 250mm thick when compacted. Alternatively a 0.5m thick artificial layer of	The DAC liner must comprise a multi layered lining system comprising (i) a mastic sealant which can be laid to a minimum density of 1.5 to 2.6 kg/m^2 on slopes up to 1 in 1.6 (ii) a minimum of 80mm thick dense asphaltic concrete having a maximum hydraulic conductivity of 1 x10-^{12} (iii) a minimum thickness of 60mm asphalt binder layer (hydraulic conductivity not less than 5 x 10^{-6} m/s and not greater than 1 x 10^{-4} m/s

	Single Composite Liner Note 1	Double Composite Liner Note 1	DAC Liner Note 2
		enhanced soil or similar giving equivalent protection as the foregoing (also constructed of compacted lifts no greater than 250mm thick when compacted) Bottom composite liner must comprise as a minimum of 2mm HDPE or equivalent FML upper component	(iv) a cationic emulsion tack coat as specified in the National foreword to BS EN 13808 or equivalent (v) a minimum 200m granular drainage layer in accordance with the requirements of SHW Clause 803, having a minimum CBR of 30%. The granular material must not contain any plasticity or reclaimed materials. (vi) a separating geotextile membrane
Leachate Collection Layer	Minimum 0.5m thick leachate collection layer having a minimum hydraulic conductivity of 1x 10^{-3} m/s	Minimum 0.5m thick leachate collection layer having a minimum hydraulic conductivity of 1x 10^{-3} m/s	Minimum 0.5 m thick leachate collection layer having a minimum hydraulic conductivity of 1 x 10^{-3} m/s
Mineral Layer- Base and Side Wall Characteristics	Base and Side Wall Mineral layer comprising a minimum of 5m thick having a hydraulic conductivity less than or equal to 1 x10^{-9} m/s	Base and Side Wall Mineral layer comprising a minimum of 4m thick having a hydraulic conductivity less than or equal to 1 x10^{-9} m/s	Base and Side Wall Mineral Layer comprising a minimum of 0.5m thick having a hydraulic conductivity less than or equal to 1 x 10^{-9} m/s. (Engineered clay is only required 3m up the side wall from the base - Full DAC system as specified above is otherwise continued to top of the cell wall.)

Note 1: Design criteria as per EPA Landfill Manual, "Landfill Site Design", EPA, 2000
Note 2: Design criteria provided by WALO UK

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. The permeability of the DAC was considerably lower when compared to alternative options, so low that it effectively provides total containment. 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 method of installing DAC panels means that there is no weakness at the joint between panels as can be the case with HDPE. The DAC liner is much more robust and no damage to the liner will occur when laying the drainage blanket.

In the development of the design and consideration of liner type, the project team met with the EPA and discussed the requirements of the Landfill Directive 99/31/EC and in particular Clause 3.2 of Annex I. The EPA 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 i.e. permeability, K<= 1 x10^{-9} m/s with a thickness of >=5m*". DAC performs markedly better than HDPE and clay lining as it typically has a superior permeability of up to $1x10^{15}$m/sec.

3.4.2 Lining Technology for Non Hazardous and Inert Cells

For non hazardous cells, it is proposed to employ standard HDPE and clay lining technologies as per the EPA Landfill Site Design Manual and in accordance with the requirements of the Landfill Directive 99/31/EC. The inert cells will be lined with clay. Standard HDPE and clay technologies have been used to line all of the major modern non hazardous landfills in Ireland to date and have been demonstrated to be highly effective in the protection of the local environment from the risks posed by landfill to groundwater surface water and soils. Clay lining systems have been employed effectively at Hollywood for existing inert waste cells.

3.5 Alternative Site Layouts

The primary consideration in the development of design options for this proposed MEHL facility has been the balancing of the relative proportions of hazardous, non hazardous and inert capacity within the constraints of the receiving environment and the operational requirements. As a starting point, four preliminary layout options were developed for the site based on the available environmental and design information from previous licence applications. The key constraints and operational requirements identified were:

- Suitability of topography and ground conditions for construction methods,
- Groundwater protection and management,
- A superior landfill lining system, providing full containment of hazardous landfill cells, where appropriate,
- Protection of the environment and minimisation of environmental nuisances,
- Public and employee health and safety,
- Visual impact,
- 25 year operational life,
- Surface water and leachate management,

- Waste acceptance for inert, non hazardous and hazardous non-biodegradable wastes within the parameters of prescribed Waste Acceptance Criteria (WAC),
- Construction costs,
- A practical and workable site from an operational viewpoint,
- Integration of existing inert waste cells and the requirements of EPA Licence W0129-02.

3.5.1 Preliminary Design Options Appraisal

The four preliminary design options produced (referenced Options 1 to 4 as presented in **Appendix 3.2**) comprised various cell configurations, for consideration by the design team. Though the initial layout options included some preliminary information on the locations of site infrastructure such as the solidification plant and the site entrance, these aspects were only fully considered and located during the development of the preferred layout.

From the outset, the steep slopes and confined south western corner of the site were considered unsuitable for the hazardous lining systems, otherwise the remainder of the site was initially considered suitable for any of the proposed landfill cell types subject to general environmental constraints. The site is to be developed to achieve a 25 year operational life. The intention is to infill the existing quarry, with additional excavation as required to allow construction of stable cell side slopes. The current site waste licence W0129-02 does not permit the formation of the landfill liner below a topographic level of 104.5 mOD. The formation level for the new application will be 102.5 mOD and is explained below.

The facility will be restored to match surrounding ground levels and previously agreed restoration profiles with levels no higher than 149 mOD.

Layout Option 1

This layout provides for hazardous void space of 1.52M m^3 and non hazardous void space of 1.42M m^3 waste within the main quarried section of the site. A lesser void capacity is provided for inert waste (0.694M m^3) along the edge of the existing inert cells, along the north western boundary. This layout is based on a formation level of 104.5mOD. The hazardous cell was located across the majority of the quarried site from north to south, with the non hazardous cell located in the south western corner of the site.

Layout Option 2

With this option the size of the hazardous waste cell was maximised to 2.25M m^3 within the excavated area, and no non hazardous cell was provided. As outlined above the south western corner was considered unsuitable for the construction of a hazardous cell and therefore provides inert waste capacity (1.59M m^3). This layout is based on a formation level of 104.5mOD.

Layout Option 3

The non-hazardous cell (0.64M m^3) was located in the north eastern corner of the quarry, extending approximately half way down the length of the site towards the south. A central bund would separate the non hazardous from hazardous cells (1.4M m^3) running from east to west across the middle of the site. The inert waste cell (1.59 m^3) was located in the steep sided south western corner and along the southern edge. This layout is based on a formation level of 104.5mOD.

Layout Option 4

The hazardous waste cell (0.64M m^3) was located in the same location as the non hazardous cell shown in Layout Option 3 extending approximately half way down the length of the site towards the south. The non hazardous cell (2.1M m^3) was located in the south and south western corner of the site. Limited capacity was provided for inert waste (0.694M m^3) along the edge of the existing inert cells on the north western boundary of the site. This layout is based on a formation level of 104.5mOD.

3.5.1.1 Preliminary Options Appraisal Conclusions

Having considered the preliminary layout options in the context of the key environmental constraints and operational requirements, Options 2 and 3 were eliminated as the hazardous cell was located on a locally important aquifer i.e. the Loughshinny formation and this was considered unacceptable. It is proposed that the hazardous cells will be constructed on poor aquifers only, i.e. the Donore, Walshestown and Balrickard formations. In addition, Option 2 was also considered undesirable as one of the key requirements is that the facility must provide capacity for inert, non hazardous and hazardous cells and Option 2 did not include a non hazardous cell.

Of the preliminary options, Options 1 and 4 were therefore preferable. However, ultimately neither Option 1 nor Option 4 were considered to meet all of the necessary requirements. Option 5 was therefore developed (as described below) from Option 4 and incorporating aspects of some of the other eliminated options. Further revisions of this preferred layout are described below and shown in **Appendix 3.2**.

3.5.2 Preferred Layout Options Development

Layout Option 5

This layout consisted of a reduced non hazardous waste cell, with an inert cell of 203,000 m^3 replacing a portion of the non hazardous cell in the southwestern corner. This layout is based on a formation level of 104.5mOD.

The layout includes the site infrastructure, access road, and administration area and solidification plant. The main entrance, access and facility control area are located on the north western boundary. The solidification plant is located within the hazardous cell in the middle of the site.

Layout Option 6

This layout has primarily the same distribution of the cells as Option 5 though the size of the non hazardous (1.89M m^3) and hazardous cells (0.979M m^3) were adjusted slightly. This layout is based on a formation level of 104.5mOD. The administration building was located on the eastern side of the site. The main access was provided off the LP0 1090 road. The solidification plant was located on the opposite side to the entrance on western side of the site, where the inert quarantine area is currently located.

Layout Option 7

This layout represents a combination of the preferred aspects of Option 5 and Option 6.

Layout Option 8 (Preferred Option)

The current preferred site layout has been developed from Option 7. The entrance is to be constructed from the southern boundary off the LP0 1090 road and a new facility control area located on the eastern side of the landfill cells. Some minor modifications were required to the cell distribution. The site investigation clarified the northern boundary of the Loughshinny formation and the hazardous cell (1.735M m^3) was adjusted accordingly. The subsequent loss of void space required the widening of the hazardous cell to the east. The need for a stable embankment on the west of the hazardous cell necessitated the removal of inert waste from the existing cells on the west. To reduce the visual prominence of the solidification plant, the plant was located inside the cell, by widening out the non hazardous cell which now has a capacity of 1.324M m^3. The formation level of the final preferred site layout is 102.5 mOD which is 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. Refer to **Chapter 14** *Soils, Geology and Hydrogeology* for further details.

3.5.2.1 Preferred Layout Option Development Conclusion

The site layout for the proposed facility has been prepared having developed various iterations of configuration options ultimately concluding with the final preferred layout attached. The proposed layout meets all of the key environmental constraints and design requirements.

3.6 References

Centre for Advanced Engineering (CAE) Landfill Guidelines Towards Sustainable Waste Management in New Zealand (2000)

EPA Landfill Manuals, Manual on Site Selection (Consultation Draft, 2006)

EU COUNCIL DIRECTIVE 1999/31/EC Landfill of Waste

Sloan William M. (1993) Site Selection for New Hazardous Waste Management Facilities, WHO Regional Publications, European Series – No. 46, Copenhagen, Denmark

4 Proposed Site and Project Description

4.1 Introduction

This chapter describes the MEHL site and the neighbouring land uses. The design constraints and main features of the proposed MEHL integrated waste management facility are discussed including monitoring, facility management and restoration. Regulatory control of the facility is also addressed.

4.2 Site Location and Neighbouring Land Uses

The MEHL facility is located to the west of the M1 Dublin-Belfast Motorway in the townland of Hollywood Great, Nag's Head, Naul, County Dublin (refer to **Figures 1.1** and **1.2**). The site is bounded to the west and south by local primary roads LP01090 and LP01080 (refer to **Figure 4.1**). The existing entrance is located on the western boundary of the site on the minor road (LP01090). The regional road R108, runs in a north south direction approximately 1km west of the site. Site traffic can access the site via the R132 Balbriggan exit off the M1 and the minor road (LP101080). Refer to **Figure 4.1.**

The site currently operates as a licensed inert waste facility and, as the crow flies is approximately:

- 32 kilometres north of Dublin City Centre.
- 15 kilometres north of Dublin Airport.
- 17 kilometres south of Drogheda.
- 8 kilometres south west of Balbriggan.
- 3 kilometres south of Naul village.

The MEHL site has been licensed by the EPA to operate as an inert waste landfill since 2003. It is located in a rural and agricultural area, with dispersed dwellings. The predominant land use in the immediate vicinity of the proposed site is agricultural. To the north and south it is mainly pasture. There is a waste permitted facility located to the north-west of the MEHL facility, which has been in operation since January 2005. The waste facility permit (WPT 60) was issued on 30th June 2004 and was extended for a further three years on 30th June 2007. There is a second waste permitted facility to the south-west of the facility, operational since 2009. The waste facility permit for this facility was issued on 28th May 2008 (WPT 136). Refer to **Figure 4.1**. The site for the proposed Fingal County Council landfill is located 1.4 km to the south east of the MEHL site. Refer to **Figure 4.1**. To the south-east, east and west the land is predominantly used for tillage.

The site and its environs are zoned Objective HA (High Amenity) in the Fingal Development Plan 2005 – 2011 where the objective is '*to protect and improve high amenity areas*'. Refer to **Chapter 12** *Landscape and Visual* for further information. The MEHL landfill has been operating for a number of years in this zoning and previously the site operated as an active quarry.

4.3 Principal Design Objectives

The principal design objectives for the proposed MEHL facility are as follows:

- Provide an integrated waste management facility for the landfilling of solid, non biodegradable, hazardous waste, non-hazardous waste and inert waste, including waste-to-energy residues and ash.
- Provide for a strategic long term all island solution.
- Optimise the capacity of the facility consistent with providing for the protection of human health and the environment.
- Apply Best Available Techniques (BAT) to the facility's construction, operation and management.
- Provide a solidification plant and storage building for solidified material.
- Retain and reuse leachate on site, where possible.
- Provide all necessary ancillary facilities, including a new site entrance.
- Allow for phased development and restoration of cells, to match the potential Irish market requirements.
- Comply with the requirements of the EPA and of MEHL's ISO 14001 certified environmental management system.
- Minimise the disturbance to the existing operations.
- Minimise potential impact on neighbours.

4.4 Design Constraints

4.4.1.1 Geotechnical Constraints

A geotechnical ground investigation was undertaken on the MEHL site 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.

4.4.1.2 Hydrogeological Constraints

A hydrogeological assessment has also been completed as part of the site investigation and a detailed quantitative risk assessment has been undertaken. The locations of the proposed cells have been developed taking full cognisance of the geological and hydrogeological condition on site and in accordance with the guidance set out in the Groundwater Protection Schemes, DOELG/EPA/GSI (1999). It is proposed that hazardous waste cells will be located only on the parts of the site where the bedrock is classified as 'Pl' aquifer (poor aquifer moderately productive in local zones only, i.e. the Donore, Balrickard and Walshestown Formations).

While the guidelines referred to were developed to be used for the siting of non hazardous landfill cells, they state that the principles may also be applied to hazardous and inert waste.

4.5 Description of Project

The main elements of the proposed MEHL facility will be as follows:

- 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.
- Relocation of administration building, car park and ancillary infrastructure.
- Provision of a new facility entrance and access road.
- Construction of a solidification plant, associated storage building and staff welfare facilities.
- Installation of leachate, surface water and other associated landfill management infrastructure.
- Development of landscaping, wetlands and biodiversity area.

The proposed site layout is shown on **Figure 4.2**. 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 below.

4.5.1 Cells for Hazardous, Non Hazardous and Inert Waste.

The development, filling and restoration of the waste cells will be phased over the 25 year operational life of the proposed MEHL facility. The capacity of the facility should not exceed the existing planning and waste licence limit of 500,000 tonnes per annum. The proposed phasing of the MEHL facility is detailed on **Figures 4.3 to 4.7**.

4.5.1.1 Cells for hazardous waste

The cells for hazardous waste will be sited on the Donore, Balrickard and Walshestown Formations in the northern part of the MEHL site. Three cells for hazardous waste will be developed and restored over four phases. Refer to **Table 4.1** below for approximate capacities of the proposed waste cells and **Figures 4.3 - 4.7** which show the locations of the hazardous cells.

Table 4.1 Proposed Void Capacities

	Approx void capacity (m^3)
Hazardous	
Phase 1 Cell H1	327,000
Phase 2 Cell H2	652,000
Phase 3 Cell H3	756,500
Total Hazardous	**1,735,500**
Non Hazardous	
Phase 2 Cell NH1	1,070,000
Phase 4 Cell NH2	254,000
Total Non Hazardous	**1,324,000**
Inert	
Phase 1 Cell IN1	853,000
Phase 2 Cell IN2	271,500
Phase 3 Cell IN3	165,500
Existing inert waste relocated to IN1	-534,500
Total Inert	**755,500**

4.5.1.2 Lining system for cells for hazardous waste

It is proposed to use dense asphaltic concrete (DAC) to line the base and side walls of the cells for hazardous waste. 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. DAC systems are commonly used in Europe in rail, road, tunnel, dam and reservoir construction as well as landfills.

The proposed DAC system (as shown on **Figure 3.4**) will comprise the following components, from the bottom up:

- Engineered Clay (500mm).

  Before any of the DAC layers can be constructed, a granular sub grade layer or engineered clay compacted to a predefined stiffness is required. This will be a minimum of 500mm thick. The engineered clay layer will be provided under the base and 3m up the sidewall.

- Granular Stabilising Layer (200mm)

  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.

  It is proposed to incorporate a leak detection system into the stabilising layer. Though it is not common practice in Europe to include a leak detection system with a DAC lining system, it is proposed to incorporate this system within the liner 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. The leak detection system will comprise of a 250mm HDPE detection standpipe which is connected to a constructed sump at the base of the landfill cell. The leak detection system can be monitored on a regular basis by using a dip meter or pumped for sampling purposes. In the unlikely event that a leak should occur, the leachate level within the cell can be controlled by pumping through the sidewall riser.

- Asphaltic Binder Layer (60mm)

  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. This layer typically has void space of 18%.

- Dense Asphaltic Concrete Layer (80mm)

  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. The typical void space in this layer is less than 3%.

The minimum requirements for the liner set out in EC Landfill 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:* $K <= 1.0 \times 10^{-9}$ *m/s; thickness >= 5 m,*

- *An equivalent artificially established geological barrier not less than 0.5 meters thick."*

The Landfill Directive also states that 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 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 and typical. This will be demonstrated by laboratory testing. The maximum side slope height will be 10m with a maximum gradient of 1 in 2.

- A minimum 500mm thick drainage stone layer with a hydraulic conductivity > 1.0×10^{-3} m/s incorporating a herringbone system of leachate collection pipework
- A Geotextile functioning as a filtration layer, on which the waste is placed.

4.5.1.3 Cells for non-hazardous waste

Two cells for non-hazardous waste will be developed and restored over four phases. Refer to **Table 4.1** above for capacities the proposed waste cells and **Figures 4.3 - 4.7** which show the locations of the non hazardous cells.

4.5.1.4 Lining system for cells for non hazardous waste

A composite clay and geo-membrane liner will be installed on the base and side walls of the proposed cells for non hazardous waste. The liner will meet the minimum requirements set out in EC Landfill 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: $K <= 1.0 \times 10^{-9}$ m/s; thickness >= 1 m"*

It is proposed that the lining system for cells for non hazardous waste will be constructed as follows, from the bottom up:

- A compacted mineral layer with a minimum thickness of 1.0m with a hydraulic conductivity less than or equal to 1.0×10^{-9} m/s.
- 2mm thick welded Geomembrane HDPE Liner.
- A non woven geotextile.
- A minimum 500mm thick drainage stone layer with a Hydraulic conductivity > 1.0×10^{-3} m/s incorporating a herringbone system of leachate collection pipework [2].
- A Geotextile functioning as a filtration layer, on which the waste is placed.

[2] Beneath this barrier layer, an additional Bentonite Enhanced Soil (BES) mineral liner will be placed, as a mitigation measure recommended in the Hydrogeological Quantified Risk Assessment. This layer will be 1m thick, with a permeability less than or equal to 6.6×10^{-10} m/s.

4.5.1.5 Cells for inert waste

Three cells for inert waste will be developed and restored over four phases. Refer to **Table 4.1** above for capacities of the proposed waste cells and **Figures 4.3 - 4.7** which show the locations of the inert cells.

4.5.1.6 Lining system for inert waste

A clay liner will be installed on the base and side walls of the proposed cells for inert waste, in compliance with the current licence requirements. The existing cells for inert waste have been constructed using on site clay deposits. All cells have been fully independently verified and they exceed the requirements of the licence and landfill directive.

The liner will meet minimum requirements set out in EC Directive 99/31/EC Annex 1 and current waste licence as follows:

- Directive 99/31/EC Annex 1: *landfill for inert waste: K <=1.0 × 10^{-7} m/s; thickness >=1m.*
- Waste licence: *"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:*
- *A mineral layer of a minimum thickness of 1m with a hydraulic conductivity less than or equal to 1.0 x 10-7 m/s, or similar with equivalent protection to the foregoing.*

4.5.2 New site entrance and access road at the southern boundary

The proposed MEHL development includes for the construction of a new site entrance from the LP01080 road at the southern boundary of the site. The new entrance will cater for all site related traffic. The existing entrance on the LP01090 road will be used only as an emergency entrance and exit. Refer to **Figure 4.1.** The existing haul road through the central portion of the MEHL 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 tightly controlled.

4.5.3 New administration building and site management infrastructure

A new administration building, with access control, twin weighbridges and car parking will be located on the eastern side of the proposed MEHL facility, approximately 200m from the southern site boundary. Refer to **Figure 4.1.** The administration building will comprise a reception area, two offices, one meeting room, a canteen, a file store, and shower and toilet facilities. The building will be approximately 16.7m x 9.25m in area and approximately 6m high, and will be a single storey building with flat roof. Ten car parking spaces will be provided adjacent to the administration building. An additional five car parking spaces will be provided at the solidification building.

Wheel washing facilities are proposed on the exit from the facility. 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 wheel wash will be drained as required to remove silt. The second wheel wash will be a spray type wash. Wash water will be recycled and eventually be disposed to the leachate holding tanks.

4.5.4 Solidification of Flue Gas Treatment Residues

4.5.4.1 Introduction

Flue gas treatment residues tend to be very soluble and if they are consigned to landfill without prior treatment there is a risk of leaching of the soluble salts and heavy metals. Leachability is controlled by a range of factors including the concentration and chemical form of the pollutant, pH, and pore water dynamics, time and ratios for solid-liquid contact. Some form of pre treatment of the flue gas treatment residues is necessary to ensure compliance with the waste acceptance criteria limits.

The flue gas treatment residues will be solidified to encapsulate the heavy metals and salts. In the stabilisation process, cement, leachate from the landfill (as a substitute for fresh water) and a small quantity of additives such as acid will be added to residues. The process involves a reaction between water and cement to form a chemical and physical encapsulation of the leachable elements. The acid is added to the mixture to control the pH.

4.5.4.2 Solidification Plant

The solidification plant will be used to receive and treat hazardous flue gas treatment residues prior to their deposition at the hazardous landfill cells. The solidification process will be undertaken within a fully enclosed building.

The design of the solidification plant has been developed with reference to similar plants in operation in Europe. The solidification plant will consist of the following:

- An enclosed Process Building with Process Area, Laboratory, Process Control Room and Welfare facilities (showers, canteen, toilets 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 flue gas treatment 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 curing solidified ash (floor area 1,285 m^2).

The proposed MEHL solidification plant will have a capacity of approximately 50,000 tpa. The solidification plant will be modular and it will be possible to increase or decrease the capacity, subject to demand and regulatory requirements. The proposed size is based on maximum deliveries of residues.

The solidification plant will be located on the eastern side of the non hazardous waste cell. Refer to **Figure 4.2.** The solidification plant will be screened by constructing the plant at a lower level than the administration building. A curing storage building for solidified material will be constructed adjacent to the solidification plant and will include a bunded compound to store diesel for machinery and plant.

The solidification building will incorporate noise attenuating cladding. In procuring the plant, 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 high speed roller shutter doors and mechanical ventilation and filters preventing dust emissions.

The curing and storage building will also contain a drainage system to collect any potential run off from the solidified material as it cures. All run off will be collected and directed back to the hazardous leachate holding tank for reuse in the solidification process.

4.5.4.3 Operation of the Solidification Plant

Upon arrival at the MEHL facility, the fully enclosed road tanker transporting flue gas treatment residues to site will be weighed at the weighbridge and will then proceed 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. The material will be pumped from the tanker to a steel silo. The pumping system will be fully enclosed. The empty tanker will then depart from the site via the weighbridge and wheel wash. The tanker will at no time enter into the cells of the facility.

From the silo the material will be pumped to the mixing unit where cement, leachate or water, and acid will be added at a controlled rate, in a batch process, using an electronic process control system. A flow diagram of the solidification process is provided in **Figure 4.8**.

4.5.4.4 Mixing Ratios

The ratios of residue to cement, water (leachate) and additives will be defined following a pilot study before operation commences. Subject to the waste licence, ash from other sources could also be used in the solidification process.

The waste acceptance criteria (WAC), specified by the EPA (following Council Decision 2003/33/EC) in the waste licence for the proposed facility, will have a significant bearing on the ratio of cement, water/leachate and additives used in the process. In a number of EU states including Belgium and the Netherlands, a derogation of up to 3 times the limit values for a number of the waste acceptance criteria parameters has been granted to facilitate landfilling of solidified flue gas treatment residue in hazardous cells. A derogation of three times the waste acceptance criteria limits for hazardous waste will be sought by MEHL for all applicable parameters. 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 **Chapter 14** *Soils, Geology and Hydrogeology* for further details).

4.5.4.5 Storage, Curing and Deposition

Following solidification, the wet material will be deposited into circa $1m^3$ Intermediate Bulk Containers (IBC) bags and conveyed to the curing storage building located beside the solidification plant either via an underground mechanical conveying system, or by the use of plant at surface level. At and from this point in the solidification process, the lightweight flue gas treatment residue is effectively 'locked into' the mixed material, and there is no risk of ash particles becoming airborne.

The solidified material will be stored there 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.

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.

Solidified IBC bags/blocks will be transported from the storage building when the storage building capacity is full, to a temporary storage area within the active hazardous landfill cell. 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.

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. However, it is envisaged that the material could comply with WAC sooner and therefore in agreement with the relevant regulators the solidified material could be tested and deposited in its final destination in the hazardous landfill cell earlier than 28 days. 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.

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.

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.

4.6 Site Utilities

4.6.1 Groundwater Management

The liner formation level will be constructed at 102.5 m OD Malin or higher. The available historical data and recent site investigation data indicates that the lining system will be above the existing groundwater level. The proposed MEHL development will not impact the existing groundwater levels and dewatering will not be required for construction.

Refer to **Chapter 14** *Soils, Geology and Hydrogeology* for further details on groundwater management.

4.6.2 Surface Water Management

The proposed surface water management system will control site rainwater runoff and prevent any potential pollutants entering the stream, located on the northern boundary of the site and surface water drain along the southern boundary. The surface water management system detailed below has been designed in accordance with Sustainable Drainage Systems (SuDs) principles and the requirements of the Greater Dublin Strategic Drainage Study Regional Drainage Policies. At present, there are no surface water drainage features within the footprint of the proposed landfill. The existing surface water drains are located along the boundaries of the site and discharge to the local stream, flowing from west to east on the northern boundary. Currently, some surface water ponds in the base of the quarry void form from time to time. This is pumped out as required into two settlement ponds, located along the northern edge of the site, before discharging into the northern stream. The surface water collected from the operating quarry is directed to sumps and removed by pumping. 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 Messrs 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.

As most of the excavations required to complete the construction of the new landfill cells will be undertaken within the existing quarried void, run off during construction will naturally be contained within the void and will be managed in the same way it is currently managed, i.e. it will be pumped out to the settlement ponds as necessary. The discharge rate of surface water from the landfill footprint during construction will be regulated by controlling the 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.

Percolation tests previously undertaken on the site and information obtained from the site investigations indicate that the site sub soils are predominantly free draining. It is intended to percolate surface water from suitable areas directly to ground. It is proposed to construct a number of segregated surface water management systems to control surface water, where percolation to ground is not appropriate. The locations of these systems are shown on the planning application drawings. The systems proposed are as follows:

- The surface water from the new entrance and main access road will be collected in french drains located in the road margins and discharged to ground. Any surplus surface water will discharge into the open drain south of the administration building.
- 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 pipe network to a new detention basin, which will discharge to the open drain south of the administration building. A class I bypass petrol separator, hydrobrake and gate valve will be installed on the detention basin outlet. Sampling will be undertaken from the hydrobrake chamber to monitor water quality. Surface water from roofs at the administration building will be collected separately and diverted to a rainwater storage tank. This water will be reused in toilets in the administration building.
- Once the proposed MEHL facility is operational, surface water from any unfilled sub-cells, haul roads and the undeveloped landfill footprint will be collected and pumped to the underground pipe network. The surface water will discharge into a constructed wetland along the northern boundary, prior to discharging into the northern stream. Completed cells will be capped and surface water run-off diverted to reduce infiltration. Following the full restoration of the site, surface water will continue to drain to this wetland. A hydrobrake and a gate valve will be installed on the outlet. The outlet will be sampled to monitor water quality and the gate valve closed in the event of an incident.
- Surface water from the hard-standing area around the solidification plant will be collected and pumped to the holding tank which will collect leachate from the cells for hazardous waste. The leachate will be used in the solidification process. In the event that there is an excess at the leachate in the holding tank, the leachate will be disposed off site to an appropriately licensed facility.

4.6.2.1 Proposed Wetland System

This wetland treatment system consists of a sedimentation basin (forebay) prior to conveyance through the extended detention wetland. This is designed for water quality control and flow attenuation to protect the receiving water system from increased runoff, erosion and otherwise potential flooding.

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

Once the landfill is capped, the wetland system will receive relatively clean storm water runoff from the grassed landfill capping. The key function of the system throughout this phase is to provide wildlife habitat and to enhance the local amenity value. It also assists in 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).

The wetland encourages 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, 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.

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.

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.

4.6.3 Fire water Retention

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 firewater managed with the leachate.

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.

4.6.4 Sanitary Effluent Management

Sanitary effluent water will be generated from the canteen, toilet and wash facilities on site. All effluent will be collected in a sealed underground pipe network and discharged to a packaged treatment plant with treated effluent percolated to ground. The system will be sized to allow for additional loading. The proposed system will effectively treat effluent from a staff of 20.

The suitability of the site for an onsite domestic effluent treatment plant was assessed by EPA approved assessors. The assessment concluded that the site is suitable for discharge to ground if a gravity polishing filter is constructed on site.

4.6.5 Leachate Management

Three leachate types will be generated on site from the inert, non-hazardous and hazardous waste cells. The primary aim of the leachate management 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 necessitate the construction of sub cells within the main cell. It is proposed to divide each of the hazardous waste cells H1, H2, H3 and the non hazardous waste cells NH1 and NH2 in half to reduce leachate generation. 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.

Hazardous waste sub cells will each contain one sump provided at the sidewall of the cell. 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 adjacent to 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.

The non-hazardous waste 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 modular concrete leachate holding tank designated for non-hazardous waste leachate.

The hazardous waste leachate is required for the solidification process, as described in Section 4.5.4. The leachate will be utilised in place of water, as commonly practiced in Europe. The requirement to balance the leachate volume required for solidification with the annual rainfall and leachate storage may require excess leachate to be tankered off site to an EPA licensed waste water treatment plant. However, in Europe it is commonly the case that little or no leachate is generated through the solidified flue gas treatment residues and therefore leachate is expected to be minimal in the hazardous cells.

It is intended to reduce the leachate generation by using rainwater deflectors on the sidewall. These are temporary stainless steel channels fitted at falls. The deflectors will catch rainfall on the sidewall and divert it away from the waste into an inactive cell or temporary sump. The clean water will then be discharged through the proposed wetlands to the northern boundary stream.

The management of the non hazardous leachate will be the same as for the management of hazardous leachate as detailed above.

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.

4.7 Waste Acceptance and Handling

Waste to be accepted at the facility will have to comply with the waste types and acceptance criteria specified by the EPA in the waste licence. The general public carrying waste in cars, vans or small trucks will not be permitted to access the facility. Suitable waste will only be accepted from holders of Waste Collection Permits (exemptions may apply in line with the Regulations).

Delivery of waste loads will be agreed in advance with the consigner. Prior to delivery of any wastes to site, it will be necessary to demonstrate that all consignments will comply with the waste acceptance criteria. This will be determined using appropriate waste characterisation testing as described below and the waste will only be approved for acceptance if it complies with the relevant criteria.

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.*"

Prior to delivery of any wastes to site, consignments will be required to undergo waste acceptance criteria testing as per the Environmental Protection Agency rules and conditions for testing attached to the licence prior to confirmation of approval for acceptance.

Upon arrival of waste at the site, the weighbridge operator will direct the vehicle to the appropriate cell, or the solidification plant, depending on the determination and classification of the waste.

A segregated quarantine area will be provided within the active hazardous cell to accommodate waste that will require further testing, if necessary. After testing, it will be disposed of in the cells for hazardous or non hazardous waste, as appropriate, or returned to source if necessary, in consultation and agreement with the EPA. A separate quarantine area for inert waste will be provided in a designated part of the cell for inert waste. The existing inert waste quarantine bays are no longer required and will be decommissioned.

4.7.1 Hazardous Waste Handling Procedure

Procedures for acceptance and management of waste will be prepared and agreed with the EPA as part of the application for a waste licence. A description of the procedure for placing solidified material in the cells for hazardous waste is provided in Section 4.5.4 above. Contaminated soils deposited in the cells for hazardous waste will be covered with clay to minimise fugitive emissions, where necessary.

4.7.2 Non Hazardous Waste Handling Procedure

4.7.2.1 Bottom Ash Handling Procedures

Bottom ash will be transported in covered trucks and deposited directly into the waste cell. A detailed waste placement procedure for bottom ash will be developed and agreed with the EPA during the licensing process for the facility. It may be possible in the future to reuse bottom ash as an aggregate or to undertake additional metal recovery, when legislative changes or improvements in technology occur. A separate area of the facility will be designated to facilitate future recovery of bottom ash. This provision is referred to as ‘Design to mine’.

4.7.2.2 Contaminated Soil and Other General Waste Streams Handling Procedures

Soils will be deposited directly into the appropriate waste cell. Where necessary, contaminated soils will be covered with a layer of clay directly after deposition to minimise fugitive emissions.

4.7.3 Inert Waste Handling Procedure

Inert wastes generally will not require specialist handling, other than precautions to prevent nuisance dust emissions. Inert waste handling procedures will comply with the established and agreed practices and procedures, employed by MEHL under the current waste licence.

4.8 Operating Hours

As per the current licence (W0129-02), waste will be accepted at the facility between the hours of 8.00am and 6.00pm, Monday to Friday inclusive and 7.00am to 4.00pm on Saturdays.

The facility will operate between the hours of 7.00am to 7.00pm, Monday to Friday and 7.00am to 5.00pm on Saturdays. The early start and later finishing will allow for preparation, cleaning, etc. of the facility. The site will not operate on Sundays or Bank Holidays.

4.9 Health and Safety Aspects

4.9.1 Design and Construction Health and Safety

The proposed MEHL facility has been designed in accordance with the Safety Health and Welfare at Work Act, 2005 and the Safety, Health and Welfare at Work (Construction) Regulations, 2001 - 2006. The following principles are incorporated into the design of the proposed facility:

- The plant will be designed by skilled personnel according to internationally recognised standards, design codes, legislation, good practice and experience.
- The design will be reviewed to check for safety hazards in steady and non-steady state conditions and for ease of operability. Backup systems for equipment used in critical situations, including pumps, control systems, power supply and instruments, will be provided.
- Fire detection and fire fighting systems will be provided.
- The design will comply with Irish Building Regulations Technical Guidance Document Part B Fire Safety and with MEHL's insurance company's requirements.

MEHL will apply strict rules on safety such as a working permit system, training of operators and staff, and provision and use of personal protection equipment where appropriate. Wherever possible, MEHL will strive to minimise human interaction in safety critical operations in order to eliminate the potential for 'human factors' to initiate or exacerbate an accident at the site.

MEHL attaches the greatest importance to the health and safety of all persons employed on its sites and indirectly affected by them. All construction projects are carried out, so far as is reasonably practicable, in such a way that the risks to the health and safety of all persons engaged in, or affected by, its construction and maintenance are eliminated or reduced to an acceptable level under current health and safety legislation, namely the Safety, Health and Welfare at Work Act 2005 and good practice.

MEHL also employs a full time, fully qualified Health and Safety Officer who is responsible for ensuring that relevant legislation is adhered to and that best practice in health and safety is employed and enforced.

4.9.2 General Operational Safety

The operation of the MEHL integrated waste management facility will pose a low risk to the site staff and residents in the surrounding area.

In compliance with the Safety, Health and Welfare at Work Act, 2005, MEHL will revise its safety statement, which will cover the operation of the facility. By providing opportunities, facilities and financial resources, MEHL will ensure that all members of staff are in possession of the knowledge, skills and experience necessary to perform their jobs to a satisfactory standard. MEHL will carry out Health and Safety Risk Assessments in order to identify the health and safety hazards associated with its activities and to determine where controls are required. Both the Register of Environmental Aspects and the Health and Safety Risk Assessments will be updated to incorporate the activities at the proposed facility.

Prior to start up of the MEHL facility, a comprehensive set of operating procedures covering all aspects of the different activities will be drawn up. The purpose of these procedures is to ensure that MEHL:

- Maintains control over the environmental, quality and safety aspects of its activities.
- Meets the aims laid down in the Environmental, Quality and Health and Safety Policies.

- Remains compliant with all relevant operating licences, permits and legislative requirements.

The fire safety aspects of the development will comply with the Irish Building Regulations, with particular reference to Technical Guidance Document Part B Fire Safety, so that a Fire Safety Certificate will be obtained for each building prior to the commencement of construction; and to follow as far as practicable the recommendations in the British Standard BS5588 Code of Practice for Fire Safety in Buildings.

The solidification plant and buildings will be designed and provided with adequate fire protection and detection systems consistent with the requirements of the Building Regulations and in consultation with MEHL's insurers. The fire protection system will be based on tried and tested systems. The systems for detection and fire fighting will include smoke/heat detectors, fire alarm system, on site storage of water for fire fighting purposes and manual call points.

4.9.3 Transport of Hazardous Waste to the site

4.9.3.1 Introduction

The transport of hazardous waste is strictly controlled in Ireland, so as to ensure, as far as possible, that there are no negative environmental or health and safety effects. The following sections briefly outline the regulatory framework and the legal requirements applying to the labelling and transport of hazardous waste to the MEHL facility.

4.9.3.2 Tracking of Waste Shipments

Hazardous waste movements in Ireland are controlled under SI No. 47 of 1998 - Waste Management (Movement of Hazardous Waste) Regulations, 1998. In order to move waste, a consignment note (known as a C1 form) system, is required. The C1 form enables Local Authorities to track the waste. The C1 form (obtained from the Local Authority where the waste originates), is uniquely numbered. Completed C1 forms are returned to the Local Authority.

The consignment note system is a comprehensive of way of tracking the movement of waste shipments from the producer to the consignee, i.e. the disposal/recovery facility.

4.9.3.3 Safe Transport of Hazardous Waste

The transport regulations cover areas such as classification, description, packaging, labelling of waste, and training of handlers and drivers. The regulations apply equally to dangerous goods and wastes classified as hazardous for transport.

There are a number of sets of regulations which apply, depending on the mode of transport. Most hazardous waste is transported by road in Ireland, while sea transport is used for the export of wastes for recovery or disposal. In the case of road transport, the Carriage of Dangerous Goods by Road regulations and European Communities (Carriage of Dangerous Goods by Road) (ADR

Miscellaneous Provisions) regulations, Statutory Instruments 288 and 289 of 2007, respectively, apply.

Prior to transport from the consignor's premises, the waste shipment must be assessed and classified to establish the hazard class to which the waste must be assigned. Within a class, the ADR codes have particular 'Packing Groups', which assign a level of hazard to the material. Following the classification of the material, it has to be labelled and packaged in the correct UN approved containers. The material is labelled with the UN number, proper shipping name and the correct 'hazard diamond', which shows the correct hazard symbol associated with the material, e.g. flammable in the case of petrol.

All road tankers and trucks must be labelled clearly to show what they are carrying. For package waste, a load plan is also carried on the truck, so that in the event of an accident the emergency services will be aware of the location of all items being transported.

Finally, the drivers of vehicles transporting hazardous waste receive specialist training in the handling and transporting of hazardous substances.

4.9.3.4 Transportation Routes

Operating procedures will direct all vehicles entering the MEHL facility to turn right into the facility from LP01080 via the new entrance at the southern boundary of the site. Signage will be placed along the access route indicating to drivers that it is only permitted to turn left onto LP01080 when exiting the facility.

4.10 Environmental Management System

MEHL operates an environmental management system which is independently certified to be in compliance with ISO 14001:2004 Environmental Management Systems. This system will operate in the proposed integrated waste management facility.

In compliance with ISO 14001, the system ensures that the MEHL facility is managed in a comprehensive, planned, systematic and documented manner.

The environmental management system has the following main elements:

- Environmental Policy – MEHL's environmental policy sets out its commitment to the environment.
- Environmental Aspects – the register of environmental aspects identifies the activities undertaken by MEHL, which have the potential to have a significant effect on the environment.
- Legal and Other Requirements - the register of identifies the relevant legislation, regulations, licensing conditions, planning conditions and constraints which apply to MEHL's activities.
- Objectives and Targets - the register of set environmental goals for MEHL, aimed at continual environmental improvement, and defines the actions to achieve the goals.

- Roles, Responsibility and Authority – the management structure of MEHL, with particular emphasis on the staff, who have responsibility for the environmental aspects.
- Competence, Training and Awareness – MEHL policies and procedures to ensure that employees are aware of and trained to undertake their environmental responsibilities.
- Communication – procedures to communicate environmental management issues internally and externally.
- EMS Documentation – the structure of the EMS and related documentation.
- Document Control – procedures to ensure control of documents.
- Operational Control – the procedures to identify, plan and manage the organization's operations in line with the environmental policy and to ensure that the objectives and targets are achieved.
- Emergency Preparedness and Response - procedures to prevent and respond to potential emergencies, including roles and responsibilities, actions to be undertaken.
- Monitoring and Measuring – operations and activities are monitored to assess the implementation and effectiveness of the EMS.
- Evaluation of Compliance – audit procedures to determine compliance with legal and other requirements.
- Nonconformity and Corrective and Preventive Action – a system to identify non compliances and their causes, and correct the non compliances and prevent their recurrence.
- Records –the actions undertaken as part of the environmental management system are recorded.
- EMS Audit - periodically verify that the EMS is effective and achieving objectives and targets.
- Management Review – periodic review of the environmental management system by MEHL management.

4.11 Regulatory Control

4.11.1 Waste Licence

Waste disposal in Ireland is controlled primarily through the Waste Management Act of 1996-2003, as amended. Under the act, the EPA has the responsibility for the licensing of all significant waste recovery and disposal activities. In order to operate the waste management facility, MEHL requires a new waste licence.

The licensee must adhere to a wide range of conditions to ensure the satisfactory management of the facility during its operation. The waste licence also addresses any restoration and aftercare provisions that may be required, once the facility ceases operations. The table of contents of the waste licence is given below. The licence may be viewed on the EPA's web site, www.epa.ie.

Glossary of Terms

Decision & Reasons for Decision

Part I Schedule of Activities Licensed

Part II Schedule of Activities Refused

Part III conditions

Condition 1 – Scope

Condition 2 – Management of the Activity

Condition 3 – Infrastructure and Operation

Condition 4 – Interpretation

Condition 5 – Emissions

Condition 6 – Control and Monitoring

Condition 7 – Resource Use and Monitoring

Condition 8 – Materials Handling

Condition 9 – Accident Prevention and Emergency Response

Condition 10 – Restoration and Aftercare Management

Condition 11 – Notifications, Records and Reports

Condition 12 – Financial Charges and Provisions

Schedule A – Limitations

Schedule B – Emission Limits

Schedule C – Control & Monitoring

Schedule D – Recording and Reporting to the Agency

Schedule E – Annual Environmental Report

A new waste licence, based on the current proposal, will be sought.

4.12 Best Available Techniques

The Integrated Pollution Prevention and Control (IPPC) Directive 96/61/EC covers certain waste activities. In Ireland, the requirements of the Directive, with respect to these activities, were implemented in the Waste Management Act 1996 to 2010.

The Directive introduced the concept of best available techniques, which are to be used in pollution prevention and control.

The term "*best available techniques*" is defined in Article 2(11) of IPPC Directive as:

"the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular

techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole."

Article 2(11) of the same Directive goes on to clarify further this definition as follows:

"techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;

"available" techniques are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

"best" means most effective in achieving a high general level of protection of the environment as a whole.

BAT does not relate just to technology and equipment. Management systems are also covered.

The EU has prepared a series of reference documents, for different industrial activities, which define BAT for that activity. The BREF notes are published on the web site: http://eippcb.jrc.es/pages/FActivities.htm

To obtain a waste licence it will be necessary to demonstrate that the management systems, controls and abatement technology, to be implemented in the MEHL facility, meet the requirements of BAT.

The EPA document *"BAT Guidance Notes for the Waste Sector; Landfill Activities"*, April 2003 and the EPA landfill manual "*Landfill Site Design*", 2000 define BAT for landfills. The BAT Guidance Notes state 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 assist 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.

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".

In the design options appraisal for the proposed MEHL facility, both a single composite and a double composite HDPE liner were considered. However, the DAC liner has a much lower permeability and provides much better containment than either of these options and was therefore preferred over the options referred to in the EPA Landfill Site Design Manual.

4.13 Provisions for Site Restoration

Restoration and capping of the cells will be undertaken on a phased basis, as each cell is completely filled. The sub soils for restoration will be available from site stock piles. Other materials for the capping will be imported as required.

Cell NH2 will be capped following completion of phase 4. The administration building and car park will be removed and the area, in which they were located, will be regraded to the required levels, covered in topsoil and landscaped. At that stage the site will be fully restored.

The details of the aftercare management plan must be approved by the EPA, as part of the Closure, Restoration and Aftercare Management Plan, which is a requirement of Condition 10 the current licence. It is anticipated that there will be a similar requirement in the new waste licence.

4.14 References

Environmental Protection Agency (2003) *BAT Guidance Notes for the Waste Sector; Landfill Activities*, EPA, April 2003

"EU COUNCIL DIRECTIVE 96/61/EC concerning integrated pollution prevention and control Landfill Site Design

Waste Management Act 2006 - 2010

5 Construction Activities

5.1 Introduction

This Chapter describes the proposed construction methodology for the MEHL integrated waste management facility and outlines measures to be taken to ensure that the impacts of construction activities are minimised.

The design of the MEHL integrated waste management facility has been developed sufficiently to allow the potential environmental impacts of the proposed construction, operation and restoration phases to be evaluated.

Please refer to **Chapter 4** *Proposed Site and Project Description* for a description of cell capping and site restoration.

5.2 Duration and Phasing

The construction sequence and methodology will be developed in detail by MEHL's engineers and the construction contractors. The facility has been designed with sufficient capacity for an operational life of 25 years for acceptance of hazardous waste. Detailed design will be completed post-planning and licensing. It is anticipated that construction activities will be similar to those summarised below, which are typical for a project of this type.

Details of specified engineering works will be submitted to the EPA for approval, prior to commencement of construction, in accordance with the relevant waste licence conditions.

It is expected that construction work at the site will commence in 2011. A phased construction sequence will be utilised, with additional lined cells added as required. Construction works will occur at the start of each of the four phases as described in the sections below and shown in **Figures 4.3** to **4.7.** The existing active inert waste cells will remain fully operational throughout the construction period.

An indicative phasing programme for site development has been developed and is included in **Appendix A5.1**. A detailed description of the works is provided below and summarised in **Table 5.1**.

Table 5.1 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

5.2.1 Phase 1 Construction & Operation (2011 -2016)

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.

The construction and operational works which will be undertaken in Phase 1 are outlined below (refer to **Appendix A5.1**). 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 Cell H1 at the end of Phase 1/beginning of Phase 2.

Non-Hazardous

- Construction of engineered bunds between Non Hazardous and Inert cells.

Inert

- Construct Inert 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[3].

[3] 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.

5.2.2 Phase 2 Construction & Operation (2014 -2024)

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.

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.

The construction and operational works which will be undertaken in the second phase are outlined below (refer to **Appendix A5.1**). 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 Waste Cell H2.
- Excavate natural ground from the eastern slope to form Hazardous Waste 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 Waste Cell H2.
- Cap and restore Hazardous Waste Cell H1 at the end of Phase 1/beginning of Phase 2.
- Operate Hazardous Waste Cell H2.
- Relocate waste quarantine area to cell Hazardous Waste Cell H2.
- Cap and restore Hazardous Waste Cell H2 (end of Phase 2/beginning of Phase 3).

Non Hazardous

- Construct Non Hazardous Waste Cell NH1.
- Construct and commission Non Hazardous Waste Cell NH1 leachate collection infrastructure.
- Construct and commission leachate holding tank for Non Hazardous Waste Cell NH1.
- Operate Non Hazardous Waste Cell NH1.

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 Waste Cell C5 and Inert Waste IN3.

Solidification Plant

- Operate Solidification Plant and Storage Building.

Other

- Recovery operations1

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.

5.2.3 Phase 3 Construction & Operation (2022 -2034)

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.

The construction and operational works which will be undertaken in Phase 3 are outlined below (refer to **Appendix A5.1**). 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 Waste Cell H3 leachate collection Infrastructure.
- Cap and restore Hazardous Waste Cell H2 (end of Phase 2/beginning of Phase 3).
- Operate Hazardous Waste Cell H3.
- Cap and restore Hazardous Waste Cell H3 (end of Phase 3/beginning of Phase 4).

Non Hazardous

- Operation of Non Hazardous Waste NH1.
- Cap and restore Non Hazardous Waste 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.

5.2.4 Phase 4 Construction & Operation (2034 -2036)

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.

The construction works which will be undertaken in Phase 4 are outlined below (refer to **Appendix A5.1***)*. 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 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.

5.2.5 Final Restoration

The final restoration will comprise the demolition and recycling of the administration building, electrical substation, car parking 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 presented in **Figure 12.12.**

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 **Figures 12.8 - 12.12.** This landscape design was prepared by Messrs Brady Shipman Martin Landscape Architects.

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.

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.

5.2.6 Construction of Lining System for the Hazardous Waste Cells

Hazardous waste cells will be constructed as follows:

- Excavate and fill base to required formation level.
- Excavate and fill side walls to required formation level.
- Place and compact layers of engineered clay over the liner footprint.
- Inspect, test and certify the engineered clay liner.
- Place and compact layers of granular stabilization layer.
- Install leak detection pipework and sumps.
- Lay and compact asphaltic binder layer.
- Lay dense asphaltic concrete layer.
- Lay mastic sealer layer.
- Coring and testing of liner density, compaction and permeability on an adjoining test pad.
- Place 500mm thick drainage layer.
- Construct leachate collection pipework & sumps.
- Construction of waste quarantine area.

Figure 5.1 shows the construction of a DAC liner**.**

5.2.7 Construction of the Non - Hazardous Waste Cells

Non hazardous waste cells will be constructed as follows:

- Excavate and fill base to required formation level.
- Excavate and fill side walls to required formation level.
- Construct reinforced earthwork wall on southern boundary.
- Install polystyrene block wall on southern boundary slope.
- Place and compact layers of Engineered Clay over the liner footprint.
- Inspect, test and certify the Engineered Clay liner.
- Lay HDPE lining panels.
- Double seam fusion weld panel joints.
- Visually inspect and test seams using air and spark testing.
- Lay geo-textile protection fleece over HDPE liner.
- Place 500mm thick drainage layer over geotextile fleece.
- Construct leachate collection pipework & sumps.

Figure 5.2 shows the construction of a non-hazardous liner**.**

The engineered clays for the non hazardous liner will be taken from site stockpiles and off site sources. The liner will be compacted to form the base and side walls. The wall will be constructed in lifts of no higher than 2m.

The HDPE liner will be installed by experienced welders and require a placement plan, test seams, air testing and spark testing to ensure that integrity of the liner is adequate. A geo-textile fleece will be placed with a min 500mm lap over the HDPE liner to protect the liner from damage when placing the leachate drainage layer. Finally, a leachate drainage layer comprising non calcareous rounded stone will be carefully placed over the geotextile to a depth of 500mm. The leachate collection pipe work and sumps will be embedded within the drainage stone.

5.2.8 Construction of the Inert Waste Cells

Inert waste cells will be constructed as follows:

- Excavate and fill base to required formation level.
- Place and compact layers of Engineered Clay over base.
- Place and compact Engineered Clay perimeter bund wall (in 2m lifts).
- Inspect, test and certify the Engineered Clay liner.

Engineered clays will be taken from site stockpiles and off site sources. The clays will be worked insitu to achieve the required permeability with wetting as needed to meet the required moisture content, and the addition of additives, such as bentonite, if appropriate.

Figure 5.3 shows the construction of an inert liner**.**

5.2.9 In situ Material Testing

Compliance testing will be carried out by the contractor upon completion of the compaction of each panel of the DAC liner 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.

As requested by the EPA, compliance testing will not be carried out on the final liner itself but on test pads to be constructed at the same time as the liner.

The final details of these tests including the number, spacing and type of tests undertaken will be agreed with the EPA in advance of commencement of construction. On completion of the tests, a report presenting the results of the field trials and field and laboratory testing undertaken during the field trials will be submitted to the EPA.

Some existing slopes required to form the landfill cell bunds will require excavation and regrading to meet the construction requirements and EPA CQA requirements for the lining systems proposed.

5.2.10 Structures Construction

The main structures will be constructed in Phase 1 and will include the administration building, solidification plant and solidification storage building, see **Figure 4.4.**

Domestic type construction methods will be used to construct the administration building. The building will consist of concrete blockwork, stonework, precast concrete flooring, plastering, uPVC windows and doors. The building will be constructed to achieve a building energy rating of B2 or higher.

The solidification plant will comprise walls of blockwork, composite cladding and precast concrete. The roof will comprise composite cladding panels on roof purlins. The floors will be insitu or precast concrete. Internal walls forming the office, canteen, laboratory and stair enclosure will be constructed in blockwork. The storage building superstructure will consist of a steel frame with lightweight cladding. The initial 2m of the external walls will be precast concrete or blockwork.

It is anticipated that some off site prefabrication of elements of the structure will be used in the construction of the site buildings. Bulky structural elements will be transported to site and erected using a mobile crane. A prefabricated structure will minimise waste arising on site and reduce the construction programme.

Mechanical equipment required for the solidification plant will be prefabricated off site. Mixers, silos and tanks will be installed as the structure is erected.

The substation will be constructed at the start of the project in compliance with ESB standards and details.

The completion of the buildings will include the installation of the final roofing, cladding, windows and doors. Internal finishes will include painting, floor finishes, suspended ceilings, skirting, architrave, internal doors, lighting and ventilation in both the administration building, solidification plant and storage building.

5.2.11 External Completion

The last stage of the permanent works will be the completion of any external works including:

- Laying final access road & car park paving.
- Completion of landscaping.
- Completion of external services, i.e. lighting.
- Completion of external drainage including leachate holding and sanitary effluent plant.
- Commissioning all mechanical and electrical installations.
- General snagging and tidy up of permanent works.

Signage and road markings will be erected at this stage. Landscaping will be completed around the administration building, car parks and access road.

5.3 Materials Source and Transportation

Selection and specification of construction materials will be informed by local availability of these materials. Within the necessary constraints of performance, durability and cost, construction materials will be sourced from local suppliers and manufacturers where feasible.

The DAC lining system will be constructed by specialist contractors who will specify and confirm the design parameters of the selected materials before they can be used in the DAC lining system.

Before commencement of the works on site, the contractor will 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.

5.4 Employment and Accommodation

Employment: During construction of the facility, typically the workforce on site will average 25 with the peak workforce expected to be 50.

Accommodation: A temporary site compound and access road will be located in the car parking area of the permanent works.

The site compound will include a temporary car park allowing for 50 car spaces for site construction management and visitors.

It is anticipated that the workforce will be predominantly from the surrounding area. However, a specialist workforce from overseas may be employed to install the DAC liner. Accommodation of these workers will be provided in existing hotels, guest houses, bed and breakfast and rented accommodation.

Working Hours: Normal construction working hours, 07.00 – 19.00 Monday to Friday, and 07.00 – 17.00 on Saturday, will be observed. It may be necessary to work overtime including at weekends and at night at certain stages. Working outside normal hours may be necessitated through considerations of safety, weather, schedule or sub-contractor availability. The construction programme will be planned in such a way that noisy construction activities will be avoided outside normal hours, if possible, and the amount of work outside normal hours will be strictly controlled.

Access: Construction of the new site access will be completed during enabling works. This will facilitate access to the site from the LP01080 road. A new haul road will be constructed through the central portion of the site to provide access to the proposed landfill cells.

5.5 Mitigation Measures

5.5.1 Dust Minimisation

As construction activities are likely to generate some dust emissions, particularly during the site clearance and bulk excavation phase, a dust minimisation plan will be prepared and implemented by the contractor during the construction phase of the project.

The following measures will be implemented as part of the dust minimisation plan:

- Limiting vehicle speeds on the construction site.
- During very dry periods, spraying surfaces with water will control dust emissions from heavily trafficked locations.
- All vehicles exiting the site will make use of wheel wash facilities prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary. Wheel-washing facilities will be located away from sensitive receptors.
- Topsoil and other dusty material being moved onsite will be transported in covered trucks, where the likelihood of emitting dust is high, and during dry weather conditions the area of removal will be sprayed with water from a mobile tanker on a regular basis to control dust emissions.
- Exhausts emissions from vehicles operating within the site, including trucks, excavators, diesel generators or other plant equipment, will be minimised through regular servicing.

In addition dust mitigation measures and dust monitoring prescribed in the waste licence for the facility will continue to be implemented.

5.5.2 Soil, Surface Waters and Groundwater

Soil, surface water or groundwater from the site could become contaminated with silt or debris during the construction phase.

The employment of good construction management practices will serve to minimise the risk of pollution of soil, surface waters or groundwater. The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, Control of Water Pollution from Construction Sites, guidance for consultants and contractors (Masters-Williams et al 2001). The guide is written for project promoters, design engineers and site and construction managers. It addresses the main causes of pollution of soil, surface waters and groundwater from construction sites and describes the protection measures required to prevent pollution of groundwater and surface waters and the emergency response procedures to be put in place so that any pollution, which occurs, can be remedied. The guide addresses developments on green field and potentially contaminated brown field sites.

The construction management of the site will take account of the recommendations of this document.

Site activities considered in the guidance note include the following:

- Excavation
- Earthmoving
- Concreting operations
- Spreading of topsoil
- Road surfacing
- Site drainage, and the control and discharge of surface water run-off from the site.
- Oil and fuel delivery and storage.
- Plant maintenance.

The protection measures include:

- Training of site managers, foremen and workforce, including all subcontractors, in the pollution risks and the preventative measures.
- Written procedures to address activities where there is a particular risk of pollution.
- Emergency response plan.
- Persons with responsibility for emergency response identified at the start of the project.
- Spill control equipment readily available.
- Control of site drainage and surface water runoff to remove silt and other potential contaminants.
- Maintaining the site clean and tidy, with proper collection and storage of waste.

- Storage of oils and fuel in bunds.
- Drip trays for stationary plant.
- Regular maintenance and removal from site of leaking plant or equipment.
- Dedicated refuelling locations for mobile plant.

Implementation of the CIRIA guide's recommendations will ensure that the risk of pollution of soils, groundwater and surface waters, resulting from the construction activities, is minimised. A detailed hydrogeological assessment of the construction phase is set out in **Chapter 14** *Soils, Geology and Hydrogeology*.

5.6 Site Tidiness

The following are some of the measures that will be taken to ensure that the site and surroundings are maintained to a high standard of cleanliness:

- Daily site inspections will be undertaken to monitor site tidiness.
- A regular programme of site tidying will be established to ensure a safe and orderly site.
- Scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind.
- Food waste will be strictly controlled on all parts of the site.
- Mud spillages on roads and footpaths outside the site will be cleaned regularly and will not be allowed to accumulate.
- Wheel-wash facilities will be provided for vehicles exiting the site.
- In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the normal manner.

5.7 Construction Safety

The requirements of the Safety, Health and Welfare at Work Act 2005, the associated Safety, Health and Welfare at Work (General Application) Regulations 2007, the Health, Safety and Welfare at Work (Construction) Regulations, 2006 and other relevant Irish and EU safety legislation will be complied with at all times.

As required by the Construction Regulations, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases. This plan will be reviewed as the development progresses. The contents of the Health and Safety Plan will follow the recommendations of the Regulations.

The Regulations require the developer of a project to appoint a “Project Supervisor Design Process” and “Project Supervisor Construction Stage”. MEHL has appointed a Project Supervisor Design Process in accordance with the current legislation.

The Project Supervisor Design Process will assemble the Safety File as the project progresses. The Safety File will be incorporated into the overall technical record system at the end of the project.

5.8 Waste Management

A construction and demolition waste management plan will be developed and maintained by the main contractor prior to construction works commencing on site. The Plan will meet the requirements of the DoEHLG *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects*.

It will include the following as a minimum:

- Name and contact details of the main contractor including the nominated project manager.
- Description of the Project.
- Specific waste management objectives for the project.
- Roles including training and responsibilities for C&D Waste.
- Wastes arising including proposals for minimisation/reuse/recovery/recycling.
- Estimated cost of waste management.
- Demolition Plan.
- Material handling procedures.
- Waste auditing protocols.
- Record keeping procedures.
- Proposals for education of workforce and plan dissemination programme.

The following will also be considered as part of the Waste Management Plan:

- The identification of the amounts of materials intended to be stored temporarily on site and the location of such storage.
- Procedures for controlling sub contracts i.e. for checking waste procedures of subcontractors and ensuring sub-contractors fulfil design teams and contractors obligations in respect of waste management.
- Designation of separate storage areas for different types of waste materials in order to maximise their re-use and recycling potential.
- Procedure for record keeping for waste retained on site.
- Procedure for record keeping for hazardous waste, for example, C1 forms and transfrontier shipment documents.
- Details of authorised waste hauliers with appropriate and up-to-date Waste Collection Permits. Details of permitted or licensed recovery and/or disposal facilities where waste materials will be sent, including copies of permits and licenses.

The main contractor will be required to minimise waste and to segregate waste at source. The possible measures used to achieve these aims will include:

- Ordering of appropriate quantities of materials, with a just-in-time philosophy.
- Immediate and careful storage of materials delivered to the site.
- Storing under cover and raised above ground materials, which are vulnerable to damage by rain.

- Careful handling of materials, using appropriate equipment, to avoid undue damage.
- Designating separate storage areas for different types of waste in order to maximise the re-use and recycling potential of the waste.

Material that is likely to be surplus to requirements will include construction waste such as soil and stones, concrete, asphalt, metals, wood and packaging.

Construction and demolition waste will be recovered or disposed of on site where it meets the acceptance criteria set out in the EPA Waste Licence. Where construction and demolition waste may not be disposed or recovered on site, it may be delivered to the Murphy Concrete Manufacturing Limited site at Gormanstown in Co. Meath, provided it meets the acceptance criteria set out in licence No. W0151-01.

Project wastes which will not be accepted at either of these sites will be consigned to an appropriate waste collection permit holder for delivery to an authorised waste facility. Construction and demolition waste will be transported by authorised waste collectors in accordance with the Waste Management (Collection Permit) Regulations, 2007 and the Waste Management (Collection Permit) (Amendment) Regulations, 2008. Construction and demolition waste will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2010.

5.9 Services Requirements

5.9.1 Electricity

Electricity for the construction site compound will be connected with the agreement of the ESB. The requirement for mobile diesel generators will be limited to pumps, welders and site lighting.

There will be a requirement to construct a substation and switch room adjacent to the administration building to provide electricity to the site infrastructure. The substation will be constructed at the start of the project in compliance with ESB requirements.

5.10 Other Construction Impacts

Other impacts relating to the construction phase of the project are dealt with in specific chapters. For example the potential impacts on flora and fauna are addressed in **Chapter 13**, *Flora and Fauna*. Noise and vibration sources during construction, and the proposed mitigation measures, are addressed in **Chapter 11** of this EIS, *Noise and Vibration*. Traffic issues associated with the construction phase of the development are addressed in **Chapter 8** of this EIS, *Roads and Traffic*. The potential impact on the archaeological, architectural and cultural heritage is addressed in **Chapter 16.**

5.11 Mitigation Measures

It is MEHL's policy to limit and minimise the environmental impact of the construction activities by specifying high standards of housekeeping, ensuring appropriate attention to environmental issues in construction contracts, and by continuously monitoring performance during construction. All construction activities will also be carried out in accordance with the conditions of the EPA waste licence.

5.12 Residual Impacts

Every reasonable effort will be made to ensure that negative environmental effects will be minimised during the construction phase of the project. Construction management and the proposed mitigation measures outlined above will ensure there is minimal impact.

It is anticipated that with the proper construction management, there will be no long term significant residual impacts arising from the construction of this development.

6 Planning and Policy Context

6.1 Introduction

This chapter outlines the planning and policy context of the proposed MEHL integrated waste management facility. The proposed development is examined in the context of the policies and objectives of the documents outlined below. A number of relevant discussion papers and reports are examined.

6.2 International Commitments and Guidance

6.2.1 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992)

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. The Convention has 172 Parties and aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes. The Basel Convention came into force in 1992.

The Basel Convention regulates the transboundary movements of hazardous and other wastes applying the "Prior Informed Consent" procedure (shipments made without consent are illegal). The Convention obliges its Parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner. To this end, Parties are expected to minimise the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation and to prevent or minimise the generation of wastes at source. Strong controls have to be applied from the moment of generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal.

Conformance of the Project to Policy Objectives

For the solid, non-biodegradable, hazardous waste which is generated in Ireland, the MEHL facility would offer a local disposal option, which would comply with one of the objectives of the Basel convention which states that signatories to the agreement *'ensure that hazardous and other wastes are disposed of in an environmentally sound manner'* within the country's own jurisdiction.

The proposal would also comply with the Basel Convention's objective of minimising the movement of wastes across international borders.

6.2.2 Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The Kyoto Protocol sets binding targets for 37 industrialised countries and the European Community for reducing greenhouse gas (GHG) emissions. These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.

To meet their targets, most ratifying nations would have to combine several strategies:

- Place restrictions on their biggest polluters.
- Manage transportation to slow or reduce vehicle emissions.
- Make better use of renewable energy sources and displace the use of fossil fuels.

Conformance of the Project to Policy Objectives

The MEHL facility will allow certain hazardous waste, currently exported, to be disposed of in Ireland. The reduction in shipping volumes of waste overseas will reduce greenhouse gas emissions and therefore help towards meeting Ireland's targets under the Kyoto Protocol. As only non-biodegradable wastes will be accepted at the MEHL facility, no greenhouse gases will be produced by the waste.

By providing an Irish solution to hazardous waste management, at a strategic location within the country, the site will mitigate against transportation-related emissions associated with transporting this waste stream long distances. Refer also to **Chapter 10,** *Climate.*

6.3 EU Directives and Policy Guidance

6.3.1 The EU Sixth Environmental Action Programme (EAP)– 'Environment 2010: Our Future, Our Choice'

The EU sixth action programme is the successor to the EU fifth action programme (1992 – 1999), 'Towards Sustainability'.

The 6th Environmental Action Programme – which has a lifespan of 10 years (2002-2012) – has been the policy framework for EU environment policy since 2002. It sets out the major priorities and objectives for environment policy in the European Union.

The Programme forms the basis for the environmental dimension of the EU Sustainable Development Strategy. It makes an essential contribution to the overarching objective of sustainable development, focussing primarily on actions and measures aimed at increased competitiveness and economic growth and enhancing job creation. The EU Sustainable Development Strategy states that:

"measures proposed and adopted in favour of the environment should be coherent with the objectives of the social and economic dimensions of sustainable development and vice versa".

The Environmental Action Programme document acknowledges that new waste treatment facilities meet extremely high operating standards that reduce harmful emissions and risks significantly. However, with much waste still going to older and less well managed facilities, waste management and waste transport are still problematic in many areas of the European Union.

The European Union's approach to waste management policy is based on the waste management hierarchy. The Environmental Action Programme document states that while this approach has been successful in improving standards in waste management, it has not halted the increase in waste volumes. The Programme states that the focus needs to be more on waste prevention but acknowledges that this is one of the most challenging aspects of the waste issue and will require the de-coupling of waste generation from economic growth.

The European Union's approach to waste management is based on three principles:

- Waste prevention: This is a key factor in any waste management strategy. If we can reduce the amount of waste generated in the first place and reduce its hazardousness by reducing the presence of dangerous substances in products, then disposing of it will automatically become simpler.
- Recycling and reuse: If waste cannot be prevented, as many of the materials as possible should be recovered, preferably by recycling. The European Commission has designated several specific 'waste streams' for priority attention, the aim being to reduce their overall environmental impact. This includes packaging waste, end-of-life vehicles, batteries and electrical and electronic waste.
- Improving final disposal and monitoring: Where possible, waste that cannot be recycled or reused should be safely incinerated, with landfill only used as a last resort. The EU has recently approved a directive setting strict guidelines for landfill management. It bans certain types of waste, such as used tyres, and sets targets for reducing quantities of biodegradable waste.

Conformance of the Project to Policy Objectives

Modern waste management in accordance with the waste hierarchy is moving towards diversion of waste from traditional landfill. Six of the ten waste management regions, representing 29 of the 34 county and city councils in Ireland, propose to develop waste to energy infrastructure. Energy recovery from waste ranks higher than disposal on the waste hierarchy. Of those authorities not proposing to develop waste to energy capacity, some are proposing to use neighbouring capacity. Residual waste landfill capacity is an integral part of the waste hierarchy and facilitates the development of modern and future waste management infrastructure.

The proposed MEHL facility will be a highly controlled, engineered landfill solution for those wastes which are not feasible to be recycled or reused and for residues from incineration.

6.3.2 Thematic Strategy on the Prevention and Recycling of Waste/Proposal for a Directive of the European Parliament and of the Council on Waste (2005)

The 6th Environmental Action Programme recommends that a thematic strategy on the recycling of waste and initiatives in the field of waste prevention should be developed to reduce the environmental impacts of resource use in line with the EU's Sustainable Development Strategy.

In December 2005, the EU Commission published a communication entitled "Taking Sustainable Use of Resources Forward: A Thematic Strategy on the Prevention and Recycling of Waste". Page 6 of this Strategy emphasises the potential that waste policy (prevention and promotion of the recycling and recovery of waste) has to contribute to reducing the negative environmental impacts of resource use and increasing resource use efficiency. This has been implemented by the revised Waste Framework Directive, as discussed later in this Chapter.

Pages 6 – 8 of the Strategy recommend a combination of measures promoting waste prevention, recycling and reuse including the following:

- A renewed emphasis on the full implementation of existing legislation;
- Simplification and modernisation of existing legislation;
- Introduction of life-cycle thinking into waste policy;
- Promotion of more ambitious waste prevention policies;
- Better knowledge and information which will underpin the continued development of waste prevention policy;
- Development of common reference standards for recycling; and
- Further elaboration of the EU's recycling policy.

Conformance of the Project to Policy Objectives

In line with the ethos of the Thematic Strategy on the Prevention and Recycling of Waste, the MEHL proposal details waste recovery for viable waste streams, and highly controlled, engineered landfill solutions for those wastes which are not feasible to be recycled or reused.

6.3.3 Self-Sufficiency Principle

The concept of the European Union becoming self-sufficient in waste disposal was introduced in a revision to the Waste Framework Directive in 1991. This principle of European self-sufficiency is continued in the latest revision of the Waste Framework Directive, 2008/98/EC. Article 16 of the 2008 Directive states that a network of facilities should "*be designed to enable the Community as a whole to become self-sufficient in waste disposal as well as in the recovery of [municipal waste], and to enable Member States to move towards that aim individually, taking into account geographical circumstances or the need for specialised installations for certain types of waste.*"

This highlights the aim for all Member States to become self-sufficient for waste disposal but recognises the fact that it can be difficult to develop viable facilities that use the best available techniques in certain geographic locations. One of the key objectives of the National Hazardous Waste Management Plan 2008-2012 is to strive for increased self-sufficiency in the management of hazardous waste and to reduce hazardous waste export.

Conformance of the Project to Policy Objectives

The MEHL proposal will be the first integrated waste management facility which provides for the disposal of certain hazardous wastes and avoids the requirement for shipment of such waste streams overseas, thus complying with the principles of self-sufficiency.

6.3.4 Proximity Principle

Page 28 of the EPA's Technical and Economic Aspects of developing a National Difficult Waste Facility (NaDWaF) document states that *"the 1989 European Commission Waste Strategy introduced the principle that waste disposal take place as close to the point of production as possible (the proximity principle). The intended objective is to contribute to the development of an integrated network of waste installations using the best practicable environmental option (BPEO). For a specific objective, the procedure establishes the option that provides the most benefits or the least damage to the environment, as a whole and at an acceptable cost, in the long term as well as in the short term. This process is used in Northern Ireland. While the approach has not been formally adopted in Ireland it has been used for example in the Pilot Strategic Environmental Assessment of the Replacement Midlands Waste Management Plan 2005-2010"*.

One of the guiding principles of the United Nations Basel Convention (refer to Section 6.2.2 above) is that, in order to minimize the threat to human health and the environment that hazardous wastes should be dealt with as close to where they are produced as possible.

The Waste Framework Directive, 2008/98/EC, Article 16 also states that a network of facilities should "*enable waste to be disposed of or [municipal waste] to be recovered in one of the nearest appropriate installations, by means of the most appropriate methods and technologies, in order to ensure a high level of protection for the environment and public health.*"

Page 28 of the EPA's Technical and Economic Aspects of developing a National Difficult Waste Facility (NaDWaF) document states that *"the proximity principle does not specify or require every waste disposal facility to be local. Regional, national and even European level facilities can be appropriate for certain wastes which require special treatment. The point of disposal of waste as close to its production is not always appropriate in the case of the need for a national facility to deal with hazardous waste, therefore examination on a county by county basis for the national need applying the proximity principle cannot be appropriate. Instead proximity will mean within Ireland or the island of Ireland.*

Therefore, the approach adopted in the National Hazardous Waste Management Plan for the development of a National Difficult Waste Facility (NaDWaF) is entirely consistent with the principles of self-sufficiency and proximity through establishing a need and identifying the technical and economic feasibility of developing facilities on the island of Ireland".

Conformance of the Project to Policy Objectives

The MEHL proposal will be the first integrated waste management facility which provides for the disposal of certain hazardous wastes and avoids the requirement for shipment of such waste streams overseas, thus complying with the proximity principle.

6.3.5 EU Directive 2008/98/EC on Waste and repealing certain Directives

The new Waste Framework Directive 2008/98/EC was published on 24 November 2008 and will have effect from 12 December 2010 (some minor amendments apply from 12 December 2008). It is one of the most important pieces of EU environmental legislation in recent years. The new Directive revises the existing Waste Framework Directive, the Hazardous Waste Directive and the Waste Oils Directive. Ireland already has in place the necessary laws to comply with these three Directives. However, the revised Waste Framework Directive does introduce several new provisions which will require policy decisions to be made before deciding on the necessary transposing legislation. The Directive 2008/98/EC sets the basic concepts and definitions related to waste management and lays down waste management principles such as the "polluter pays principle" and the "waste hierarchy".

The Directive lays down a five-step hierarchy of waste management options which must be applied by Member States when developing their national waste policies:

- Waste prevention (preferred option);
- Re-use;
- Recycling;
- Recovery (including energy recovery); and
- Safe disposal, as a last resort.

Member States must design and implement waste prevention programmes and the European Commission is set to report periodically on progress concerning waste prevention. The Directive also sets new recycling targets: By 2020, Member States must recycle 50% of their household and similar waste and 70% of their construction and demolition waste.

The Directive simplifies and modernises current EU waste legislation by:

- Introducing an environmental objective;
- Clarifying the notions of recovery, disposal, end of waste status and by-product;
- Defining the conditions for mixing hazardous waste;
- Specifying a procedure for the establishment of technical minimum standards for certain waste management operations.

Conformance of the Project to Policy Objectives

The MEHL proposal provides a safe disposal option for certain hazardous wastes, such as providing for the disposal of hazardous residual wastes from waste-to-energy facilities and other non-biodegradable hazardous, non-hazardous and inert wastes, in specially-engineered cells and in line with best practice internationally. In this way, the proposal meets with the waste hierarchy objectives outlined in the Waste Framework Directive.

6.3.6 EU Directive 1999/31/EC – Landfill of Waste

The EU Landfill Directive is concerned with reducing the impact on the environment and on human health from the landfilling of wastes. The Directive addresses the landfilling of hazardous, non-hazardous and inert wastes. It states that the prevention, recovery and recycling of waste, and the recovery of materials and energy, are to be encouraged so that natural resources and land are not wasted. Member States should have regard to the polluter pays principle and should also apply the principles of proximity and self-sufficiency to the management of wastes.

The Directive sets out criteria for the classification of landfills and the types of waste to be accepted at the different classes of landfill. The Directive addresses the licensing, control and monitoring, closure and after care of landfills. In Article 6, the Directive states that only waste, which has been subjected to treatment, where possible, to reduce the quantity or the hazards to human health or the environment, is to be landfilled.

The Landfill Directive outlines various technical requirements in relation to hazardous waste acceptance, landfill liner requirements, etc.

Conformance of the Project to Policy Objectives

The proposal offers the first hazardous waste landfill solution for the island of Ireland, which is in line with the principles of self-sufficiency, 'polluter pays' and 'proximity principle' promoted in the Landfill Directive. The facility will be engineered to meet all requirements of the Landfill Directive, and other relevant guidance and best practice.

6.4 Irish National Policies, Objectives and Guidance on Waste Management and Energy

6.4.1 National Development Plan 2007-2013

The National Development Plan (NDP) sets out a programme of integrated investments that will underpin the Country's ability to grow in a manner that is economically, socially and environmentally sustainable. It follows on from the previous National Development Plan 2000-2006, however it has a greater focus on the necessary infrastructure which will be important in attracting investment and ensuring progress.

The National Development Plan seeks to reach new economic and social goals, with emphasis placed on the protection of the environment. Increased prosperity and growth clearly presents challenges. Economic growth — through increased consumption levels, energy demands and waste flows — can add significantly to the pressures on the environment.

The Plan acknowledges that enhancing the availability of a range of high quality waste management solutions is important for national competitiveness and balanced regional development, particularly for business in terms of cost and choice of investment location.

One of the key outputs under the National Development Plan's priorities will be to significantly improve the capacity and environmental sustainability of waste infrastructure, for example under the Waste Management Sub-Programme:

- €753 million may be spent to address problems associated with landfills.
- Support, through private investment, the development of thermal treatment plants to reduce landfill usage and promote greater use of recycling and recovery.

The NDP recognises that, whilst improvements have been made in recycling rates, this translates into only a small reduction in the amount of municipal landfilling. In effect, the link between economic growth and waste generation has been weakened but it has yet to be severed fully.

In line with national policy, the National Development Plan states that on the integrated approach to waste management, thermal treatment with energy recovery will be the preferred option for dealing with residual waste, after achieving ambitious targets in respect of waste prevention, recycling and recovery.

With reference to cross-border initiatives, the Plan states that the Government will be pursuing co-operation with Northern authorities in the development of the Plan's environmental services programme in the areas of water supply, waste water, waste management and climate change.

Eligible activities include the development of cross-border economic, social and environmental activities such as "improved access to transport, information and communication networks and services, and cross-border water, waste and energy systems and facilities".

Conformance of the Project to Policy Objectives

The proposed MEHL integrated waste management facility supports modern waste management techniques and the provision of complete waste infrastructure for Ireland. The MEHL facility will underpin industrial development by ensuring that the necessary hazardous waste management infrastructure is in place and will reduce Ireland's dependency on exporting hazardous wastes for landfill. The National Development Plan seeks cross-border co-operation on waste facilities, which is line with proposals for the MEHL facility.

6.4.2 National Climate Change Strategy 2007-2012

The National Climate Change Strategy details the proposed measures to be taken by Ireland to limit the emission of global warming gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxides (NO_x) and certain fluorinated gases from all sectors of the economy to meet its 2008-2012 commitment. It also demonstrates how these measures position the nation for the post-2012 period, identifying the areas in which further measures are being researched and developed to enable the eventual 2020 commitment to be met.

The Strategy notes that emissions from the waste sector consist mainly of methane from landfills. Emissions reductions in the sector are to be achieved primarily through the diversion of biodegradable waste from landfill. The preferred options listed for the residual treatment of biodegradable waste are thermal treatment with energy recovery or mechanical-biological treatment.

Conformance of the Project to Policy Objectives

The proposed MEHL facility will provide a residual waste disposal solution for waste-to-energy developments, which in turn will reduce the amount of biodegradable waste being landfilled, thereby reducing greenhouse gas emissions. The MEHL proposal is for the landfilling of non-biodegradable wastes only, which have been pre-treated in a preferred technology. There are no anticipated greenhouse gas emissions associated with the proposed operation. It should also be noted that greenhouse gas emissions from the transportation of this hazardous waste abroad, as is currently the case, will be eliminated. Refer to **Chapter 10** *Climate* also.

6.4.3 Making Ireland's Development Sustainable, 2002

Making Ireland's Development Sustainable highlights the importance of ensuring development is carried out in sustainable manner. One of the main challenges that need to be focused on is the management of waste.

The strategy states that Ireland needs to achieve better resource efficiency through breaking the link between the rate of economic growth, the use of resources and the generation of waste.

The report notes that alternative systems to landfill for the collection and treatment of wastes including integrated waste management infrastructure, are necessary. In relation to industrial waste, cleaner production process and other eco-efficient measures will add in the minimisation of industrial waste. The strategic objectives for waste are to promote waste reduction, reuse, recycle, and higher environmental standards in waste disposal.

Conformance of the Project to Policy Objectives

The proposed MEHL facility is an essential part of an effective, integrated waste management strategy to accommodate economic growth by the nation. It offers self-sufficiency for the management of certain hazardous materials.

6.4.4 Waste Management – Changing our Ways, 1998, Delivering Change, 2002 and Taking Stock and Moving Forward 2004

Following the EU Directives and the coming into force of the Waste Management Act in 1996, the Irish Government published *Waste Management: Changing our Ways* in 1998. The document introduced the waste management hierarchy for the first time and is the cornerstone of Irish waste management policy. This hierarchy regards waste prevention as the most favourable option followed by minimisation, reuse, recycling and energy recovery in that order. Waste disposal is the least favoured option at the bottom of the hierarchy.

The policy recommends the need for major change in the planning, financing and operational approach to waste management by local authorities. It advocates a comprehensive integrated waste management system based upon compliance with

Irish and EU legislation incorporating best practice and resource efficiency in economic sectors.

The *Changing Our Ways* policy statement promotes the regionalisation of waste management planning because such an approach can deliver the benefits of the economies of scale, which are necessary to construct and operate new waste infrastructure. The scope for increased participation by the private sector in all areas of waste management is acknowledged in relation to the establishment and operation of waste recovery and disposal facilities. Ensuring waste producers pay the full cost of waste management (collection, treatment and disposal) will serve to focus public attention on the implications of waste production. The 'polluter pays' principle also provides an economic incentive to reduce waste generation and is an integral part of the policy instrument.

With regard to thermal treatment the policy document states that waste to energy incineration can play a significant part in the management of residual waste of many EU countries and, generally, materials recycling and waste-to-energy incineration are fully compatible with an integrated approach to waste management. While the disposal to landfill of residues is still required waste-to-energy is effective in diverting a significant percentage of waste away from landfill, and with the proper control, it has a considerably lower potential environmental impact than landfill.

The Department of the Environment and Local Government published the national waste policy statement in March 2002, entitled '*Preventing and Recycling Waste - Delivering Change'* which evolved from and is grounded in the 1998 policy statement '*Changing Our Ways*.' The 2002 waste policy statement '*Preventing and Recycling Waste - Delivering Change'* addresses the factors and practical considerations that are relevant to the achievement of Government policy objectives and for the prevention of and recovery of waste.

The 2002 Waste Policy Statement highlights the necessary disciplines that must be imposed within waste management systems to secure real progress on waste prevention, re-use, and recovery. It outlines a range of measures to be undertaken in the interests of minimising waste generation and ensuring a suitable expansion in re-use and recycling performance and the policy statement identifies issues and possible actions which require further systematic consideration.

The 2002 waste policy statement concentrates upon the three highest steps on the waste hierarchy recognising, as do the local and regional waste management plans, that emphasis must be given to the widest practicable realisation of waste prevention, minimisation, re-use, materials recycling and biological treatment before energy recovery through thermal treatment and final disposal in landfill.

Waste Management – Taking Stock and Moving Forward acknowledges the comprehensive policy framework for modernising the approach to waste management put in place in 1998 in the form of the policy statement *"Waste Management: Changing Our Ways"*.

The policy was based on an "integrated waste management" approach based on the waste hierarchy, which places emphasis on waste prevention followed by minimisation, re-use, recycle, energy recovery and finally the environmentally sustainable disposal of residual waste. It sets out a series of specific targets relating to municipal waste, which are to be achieved by 2013, including:

- Diversion of 50% of household waste from landfill
- Minimum 65% reduction in biodegradable waste consigned to landfill
- Recycling of 35% of municipal waste
- Recycling of 85% of C&D waste (construction & demolition).

This policy document acknowledges the underdeveloped state of waste infrastructure in Ireland. It determines that significant investment in new facilities is necessary in order to address the shortfall in adequate infrastructure.

With the focus on prevention, re use and recycle, the document states that there will still be waste remaining that must be managed in the most environmentally appropriate way. According to European Waste Management Policy, the way forward was presented as being the conversion of waste to energy as an environmentally preferable waste management option to landfill. It was recognised however that a limited amount of landfill disposal will always be required. Waste-to-energy is identified as an effective means of diverting a significant percentage of waste away from landfill, and with the proper control, as having a considerably lower environmental impact than landfill.

The document highlights that thermal treatment with energy recovery has a role to play as one element of an integrated approach to waste management.

In relation to hazardous waste landfill, the document states that *"funding may be provided towards the provision of a hazardous waste landfill, the need for which was specifically identified in the National Hazardous Waste Management Plan prepared by the EPA"*.

Conformance of the Project to Policy Objectives

The proposed MEHL waste management facility complies with the objectives of the Changing Our Ways policy statement. It will form part of an integrated waste management infrastructure that is emerging in the Dublin Region and will embrace the 'polluter pays' principle. The facility will entail a substantial private sector capital investment, in line with the policy of increasing private sector involvement in the provision of waste management facilities and the proposed waste-to-energy facility will generate electricity from a renewable source.

The proposal offers a hazardous waste disposal facility to the Island and, through the provision of a residual waste disposal option, facilitates the development of thermal treatment capacity in Ireland. Only appropriate and pre-treated waste will be acceptable, in line with national policy and targets.

6.4.5 National Biodegradable Waste Strategy 2006

The National Biodegradable Waste Management Strategy is designed to secure the diversion of municipal biodegradable waste from landfill. It states that despite reaching high levels of recycling and biological treatment, significant quantities of residual waste will continue to be generated. The Strategy found that waste growth was stronger than predicted in policies and Waste Management Plans and, therefore, the capacity required to meet targets must be revised upwards.

Therefore, the scale of the challenge to meet the Landfill Directive targets is great and requires urgent and concerted efforts.

The Strategy considered the different treatment technologies available and set targets for the contribution of each option, with recycling and biological treatment the preferred treatment methods. By 2013 the Strategy aims to have 54.4% of biodegradable municipal waste recycled or biologically treated with a further 18.5% treated in residual treatment methods. This residual capacity is equivalent to approximately 592,000 tonnes MSW[4]. The amount of residual treatment is to increase to 22% of total biodegradable municipal waste arising by 2016.

The Strategy puts forward a number of integrated options that will require implementation to minimise the environmental impacts of landfilling biodegradable municipal waste and to achieve the targets under the Landfill Directive. One of the fundamental principles of the Strategy is to strive to maximise the recovery of materials firstly, and energy secondly as a sustainable means of treating waste, rather than diverting from landfill to other forms of disposal.

It recognises that all countries with high landfill diversion rates use thermal treatment for a considerable proportion of traditional, 'mixed waste' collection of biodegradable municipal waste, whereby thermal treatment is mainly incineration with energy recovery.

The Strategy states that *"thermal treatment with energy recovery in accordance with the internationally-accepted waste management hierarchy is a key element of Irish waste management policy"*. It is seen as a robust technology for dealing with mixed residual waste and is supported by the National Climate Change Strategy. Furthermore, it is noted that energy recovered in the form of heat or electricity can reduce dependence on imported fossil fuels, as well as decreasing the generation of methane gas in landfills.

Conformance of the Project to Policy Objectives

With reference to the Biodegradable Waste Strategy, the MEHL proposal is for the landfilling of non-biodegradable waste only. The proposal facilitates the development of thermal treatment capacity in Ireland, through the provision of a residual hazardous waste disposal option. Thermal treatment will make a significant contribution to progress on biodegradable waste diversion targets.

6.4.6 National Hazardous Waste Management Plan 2008-2012

The National Hazardous Waste Management Plan was prepared and published by the EPA in accordance with Section 26 of the Waste Management Acts 1996 to 2008. The Plan is a statutory document prepared under Irish law. It also satisfies Article 6 of Directive 91/689/EEC on hazardous waste which states that member states shall draw up plans for the management of hazardous waste.

The Plan recommends a policy of moving towards national self sufficiency by seeking to minimise the export of hazardous waste. In order to achieve this, Page IX of the Plan notes that *"if Ireland were to become fully self-sufficient, hazardous waste landfill and incineration are measures which would be required"*.

[4] Whereby MSW is composed of 74% biodegradable material in line with the EPA National Waste Report 2006

Page 71 of the Plan continues; *"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".*

In terms of the provision of infrastructure and self-sufficiency, the following recommendations made in the Plan apply to this objective (Page 86 of the Plan),

"20. Commission a study in 2009 to clarify the technical and economic aspects of providing hazardous waste landfill capacity. (Body responsible for this action: EPA).

21. Keep under review the provision of hazardous waste landfill capacity and taking into account any recommendations that may be made by the EPA study (See recommendation 20 above), consider the use of appropriate, economic or other instruments to ensure such capacities are provided, whether by the private or public sector by 2012. (Body responsible: Department of the Environment, Heritage and Local Government).

22. Commission a study in 2009 on the treatment of waste solvents with particular regard to the potential for solvent recycling. (Body responsible: EPA)".

In pursuance of recommendation 20 above, the EPA issued a request for tenders in June 2009 to carry out a study in relation to the provision of a National Difficult Waste Facility.

Conformance of the Project to Policy Objectives

At present, there is no merchant landfill for hazardous waste in Ireland. The MEHL site at Hollywood has the capacity to provide such a facility which is set out as a national requirement in the National Hazardous Waste Management Plan and this is the subject of this application.

6.4.7 Draft Statement for Waste Policy – For Consultation

The draft policy statement for consultation outlines the key principles and actions which it is envisaged will inform Irish waste policy for the coming decade and beyond. Its core objective is to put sustainability at the core of Ireland's resource and waste management policy. As outlined on Page 3, the draft policy statement aspires to a paradigm shift in the approach to waste management in Ireland towards resource management with significant potential to add value and create jobs in the economy.

The emphasis in the draft policy statement is on developing policies, legislation, incentives, levies and penalties, which would lead to the management of waste moving up the waste hierarchy. Waste production would be minimised and the waste, which arises, would be treated as a resource. The purpose of the policy statement, when finalised following public consultation, will be to provide the framework within which Ireland will meet, and where possible exceed, EU targets for environmental performance in waste management.

While the draft policy statement concentrates on waste as a resource, there is implicit recognition that residual waste is unavoidable. For example, targets for residual waste per capita are set out on page 18. In the draft policy statement, MBT (mechanical biological treatment) is identified as a means of treating residual waste on page 25.

One of the proposed policy measures on Page 19 of the draft policy statement relates to incinerator bottom ash and states that '*the classification of incinerator bottom ash as hazardous will be examined in conjunction with the EPA which is charge with the licensing of such facilities. In particular, the application of ecotoxicity testing to the material will be examined.*'

Conformance of the Project to Policy Objectives

The MEHL proposal will support new technologies, including MBT and waste to energy by providing a facility for the disposal of the residues. The proposed MEHL facility will be in the unique position of offering landfill disposal capability under all classes of landfill: inert, non-hazardous and hazardous. All incoming wastes will be subject to WAC (Waste Acceptance Criteria) control and 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.

6.5 Regional Policy and Guidelines

6.5.1 Regional Planning Guidelines for Greater Dublin Area 2010-2022

The new Regional Planning Guidelines were made by the Dublin and Mid-East Regional Authorities on the 15th June 2010. The Regional Planning Guidelines aim to give regional effect to the National Spatial Strategy and to guide the development plans for each county. The Regional Planning Guidelines inform the Development Plans in each Council area and have effect for six years.

Page 138 of the new Guidelines states that *"Waste management infrastructure provision is an important part of the physical infrastructure investment needed in the Greater Dublin Area for population and economic growth. Since the 2004 RPGs a number of developments and projects have been delivered improving the management of the regions municipal solid wastes including investments in recovery centres, civic amenity sites and the granting of waste-to-energy facilities."*

Page 139 of the new Guidelines notes that *"Local Authorities should seek to anticipate burgeoning waste streams, identify opportunities to integrate facilities where appropriate and identify current or future opportunities for reuse of waste."*

Strategic Policy PIP5 states that:

"To ensure, from environmental, business and public health needs, that waste management remains a priority for local authorities and waste management regions in continuing to invest in promoting and facilitating reuse and recycling by residential and commercial sources and that high standard options for

treatment and final disposal of waste are available within the Greater Dublin Area".

Conformance of the Project to Policy Objectives

The MEHL proposal is consistent with the policies on waste management contained in the Regional Planning Guidelines. The proposal will contribute substantially to the achievement of an objective in the Regional Planning Guidelines for the Greater Dublin Region, i.e. the provision of waste management infrastructure. The MEHL proposal is for a high standard integrated waste management facility which will provide a Best Available Techniques (BAT) option for the disposal of non-biodegradable hazardous waste, non hazardous waste and inert waste in accordance with landfilling best practise and the Landfill Directive.

6.5.2 Waste Management Plan for the Dublin Region 2005-2010

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.

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.*

Conformance of the Project to Policy Objectives

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.

6.6 Local Policy and Guidelines

6.6.1 Fingal County Development Plan 2005 – 2011

The 2005-2011 Fingal County Development Plan was adopted in 2005. With regard to waste management, the Plan is closely integrated with the Dublin Waste Management Plan re-iterating the long term objectives and targets of the region, and then setting out specific objectives for the area, including policies for waste prevention, recycling, enforcement, and facilitation of effective waste management through better building design, etc.

The County Plan sets out "Principles for Development" in this area.

- New development should be located well below the skyline.
- The use of existing housing stock should be maximised and existing housing should be refurbished in preference to replacement by a new house.
- Ridgelines should be protected from development.
- Listed views and prospects should be protected.
- Field and roadside hedgerows should be retained. Proposals necessitating the removal of extensive field and roadside hedgerows will not be permitted.
- A number of areas have been identified as particularly sensitive to the development of forestry; they include Landscape Groups 2, 3 and 4.

The MEHL site is within an area designated as LG3 (Landscape Group 3) and High Lying Agricultural. Refer to **Figure 6.1.** The Development Plan describes these landscape groups as follows:

LG2, LG3 AND LG4 - NORTH FINGAL UPLANDS

Description

"These areas comprise the 'North Fingal Uplands' The highest point in the county is located in LG 3 at Knockbrack 176 metres OD this is slightly higher than the Ben of Howth at 171 metres OD. The 3 grouped areas are closely related and together form a visual ridge to the north of the County. There are a number of important visual ridges on these uplands which are visible over a wide area of Fingal and Meath. There are spectacular views from the roads in LG3 extending from the Wicklow Mountains in the south to the Mourne Mountains in the north and out to Lambay Island to the east. Almost the whole county can be seen from the higher roads. The character of the uplands is very attractive in its own right with a mixture of pasture and arable farming combined with strong hedgerows on a rolling topography. There is little obtrusive or inappropriate development in the area and there is a pronounced absence of any substantial deciduous or coniferous woodland.

Sensitivity

Given the height of the ridge lines relative to the surrounding countryside it is likely to be difficult to locate any built development in these areas without it becoming unduly obtrusive.

Views of the upper elevations of the uplands are available from long distances and over a wide area of the surrounding lower lying countryside. Panoramic views are available from the uplands to the surrounding areas. These views should be protected.

Rural uses such as houses, forestry, masts, extractive operations, landfills, and large agricultural units have the potential to give rise to substantial impacts".

Section 5.4 of the County Plan deals with the Fingal Rural Economy including "EXTRACTION AND AGGREGATES." It states as follows;

"High quality aggregate reserves exist within the County. Such aggregates are scarce natural resources which require careful management. The Council will seek to ensure that development which would sterilise these aggregate reserves or prevent their efficient or effective recovery is not facilitated. The extraction and aggregate industry is land intensive and can have significant impacts. It is important both to minimise the impact of these types of development both during and after use and to encourage the recycling of building materials.

Objective REO18

To consider proposals for extraction only where the Council is satisfied that environmental quality and amenity will be fully protected and appropriate provision for the restoration of the landscape is being made.

The suitability of any aggregate enterprise shall be assessed on the basis of the sensitivity of the local environment to the predicted impacts, the scale of the development proposed and the capacity of the road network in the area to accommodate associated traffic. The Council will not permit extractions which would result in a reduction of the visual amenity of areas of high scenic or recreational amenity or damage to areas of scientific importance or of geological, botanical, zoological and other natural significance. All workings shall be subject to landscaping requirements, and worked out quarries, pits and spoil heaps shall be rehabilitated to suitable land uses.

The use of landfilling with waste other than topsoil, subsoil and builders rubble is not considered to be an acceptable method of rehabilitation of pits. Bonds or levies will be required by the Council as a condition of any planning permission granted to ensure satisfactory reinstatement on completion of extraction".

Conformance of the Project to Policy Objectives

This MEHL proposal is for the infilling of a worked out quarry; restoration contours will be in keeping with pre-quarrying condition and adjoining land levels. The proposed development is therefore well below the skyline, away from the ridge and it does not interfere with views and prospects which need protecting. There is removal of some hedgerow to create a new entrance, but this is kept to a minimum, consistent with road safety. The hedgerow removed will be replaced set back behind the current location.

The impacts of the current MEHL facility were assessed in previous applications and Environmental Impact Statements and are assessed further in this document. Further information is provided in **Chapter 12** *Landscape and Visual.*

Section 5.4 of the County Plan is concerned primarily with extraction. Whilst it is no longer relevant given the MEHL quarry has been worked out, it does identify the Council's focus in assessing such development. The key factors of interest are: the scale of development, the capacity of the road network to accommodate associated traffic, no reduction in visual amenity or damage to areas of scientific interest, suitable landscaping and the satisfactory reinstatement on completion of extraction.

The requirement to primarily landfill with topsoil, subsoil and builders rubble is understandable as a general requirement throughout the County. It does leave open the possibility for other waste streams in suitable sites subject to the planning and licensing regime.

The Plan also identifies views and prospects to be protected in the vicinity. The proposed MEHL facility, being contained within a worked out quarry, will not interfere with those views and prospects. It is only in the latter stage when the contours are being reinstated and restored that development on this site will be visible. Refer to **Chapter 12** *Landscape and Visual* for further information.

6.6.2 The Draft Fingal County Development Plan 2011 - 2017

Fingal County Council has prepared a Draft Fingal Development Plan 2011 - 2017 which was placed on public display from 1st April, 2010 to 14th June, 2010. Over 1,000 submissions have been received during this public consultation period. The manager had prepared a report on these submissions and at the time of preparing this document, this report is being considered by the Elected Representatives.

The Plan introduces a new objective in relation to the MEHL site with the provision of Local Objective 92 which states as follows:

Facilitate the relocation of offices, weighbridge, primary vehicular entrance and internal access road serving existing quarry, to be sensitively designed and located on site. Maintain existing entrance on Baldaragh Road as an emergency entrance only. The Draft Plan continues with most of the policies in the current Plan relating to Naul Uplands. It continues to define the area surrounding the development site as an area with a High Lying Character type of landscape but describes it somewhat differently from the current Plan, as follows.

"HIGH LYING CHARACTER TYPE
This is an area of upland, rising to a high point of 176 metres at Hillfort Mound, to the south east of the Naul. These hills afford panoramic views of the Mourne Mountains to the north, the coastline to the east and the Wicklow Mountains to the south. There are a number of important visual ridges on these uplands, which are visible over a wide area of Fingal and Meath. Almost the whole County can be seen from the more elevated roads. The character of the uplands is very

attractive with a mixture of pasture and arable farming combined with strong hedgerows in a rolling landscape.

The High Lying Character Type is categorised as having a high value. The elevated area is very scenic, with panoramic views and strong hedgerows. It also has an important ecological value particularly as the 'Bog of the Ring' proposed Natural Heritage Areas is situated here. There is little obtrusive or inappropriate development in the area and there is a pronounced absence of any substantial coniferous woodland. The area's importance is highlighted by the High Amenity zoning covering substantial parts of the area".

The Draft Plan has identified views and prospects to be protected on both the regional road to the south of the MEHL site and on the county road to the west of the quarry.

The Draft Plan does propose to introduce two new elements which directly affect this site. The first relates to Geology and is set out in Section 5.3 as follows:

"5.3 GEOLOGY -COUNTY GEOLOGICAL SITES

In 2007 the Geological Survey of Ireland assessed the geological heritage of Fingal and produced a report entitled The Geological Heritage of Fingal which is available on the Council's website. In this report GSI identified sites of geological importance in the County, and recommended their protection as County Geological Sites. Some of these sites may be designated, in due course, as Natural Heritage Areas (NHAs) because of their geological interest from a national perspective. The Council will seek to maintain and where possible enhance the geological heritage values of these sites. The Council will consult the Geological Survey of Ireland, when considering undertaking, approving or authorising developments which are likely to affect County Geological Sites.

Objective GH01
Protect and enhance the geological heritage values of the County Geological Sites listed in Table GHo1 and indicated on Green Infrastructure maps".

The Draft Plan has identified the Quarry on the MEHL site as a County Geological Site. In response to this proposed designation, MEHL consulted with the Geological Survey of Ireland. Following the consultation, an agreement was made to make access available to interested parties to view geological features within the MEHL site. This will include providing a viewing platform within the site. Refer to **Chapter 1** *Introduction* for the correspondence from the GSI.

The second change is the provision of Local Objective 92 which states as follows, *Facilitate the relocation of offices, weighbridge, primary vehicular entrance and internal access road serving existing quarry, to be sensitively designed and located on site. Maintain existing entrance on Baldaragh Road as an emergency entrance only.*

This provision makes it an objective of the Council to facilitate the MEHL proposal to move the offices, weighbridge and administration of this development within the site and to service these relocated facilities off a new entrance roadway.

6.7 Zoning Objectives for the Site

The MEHL site is located in the Naul Hills area which has a zoning designation of "HA-High Amenity" in the Fingal County Development Plan 2005 - 2011. Refer to **Figure 6.2.** Table No. 5.5 of the Written Statement identifies this zoning objective as follows:

"Objective HA: To protect and improve high amenity areas.
Vision: The zoning objective seeks to protect these highly sensitive and scenic locations from any inappropriate development. Only agricultural uses and low impact amenity uses will be considered, when it can be shown that the special qualities of these areas will not be eroded by any proposed development. In recognition of the amenity potential of these areas, opportunities to increase public access will be sought".

The Plan states that High Amenity landscapes include the coastal zone, river valley areas (Liffey, Delvin, Ward and Tolka) and the Naul Hills area. It describes the Naul Hills area as follows:

"This is an area of upland, rising to a high point of 176 metres at Hillfort Mound, to the south east of the Naul Village. These hills while not significant on a national scale are of regional importance and afford panoramic views of the Mourne Mountains to the north, the coastline to the east and the Wicklow Mountains in the South. This landscape character area includes Landscape Groups 2, 3 and 4.
There are a number of important visual ridges on these uplands, which are visible over a wide area of Fingal and Meath. Almost the whole county can be seen from the more elevated roads. The character of the uplands is very attractive in its own right with a mixture of pasture and arable farming combined with strong hedgerows in a rolling landscape".

The Draft Fingal Development Plan 2011 - 2017 proposes to continue zoning the area as High Amenity but amends the wording as follows.

"ZONING OBJECTIVE "HA" HIGH AMENITY

Objective: Protect and enhance high amenity areas.

Vision: The zoning objective seeks to protect these highly sensitive and scenic locations from inappropriate development and reinforce their character, distinctiveness and sense of place. In recognition of the amenity potential of these areas, opportunities to increase public access will be explored".
The Draft Plan expands on the High Amenity zoning as follows:

"A High Amenity Zoning (HA) has been applied to areas of the County of high landscape value. These are areas which consist of landscapes of special character in which inappropriate development would contribute to a significant diminution of landscape value in the County. These landscape areas meet one or more of the following criteria:

- *Contain scenic landscape of high quality*
- *Afford expansive or interesting views of surrounding areas*
- *Are components in important views and prospects*
- *Are unique or special within the County*
- *Are important elements in defining the coastal character of the County*
- *Act as a backdrop to important coastal views*
- *Contain important groups of trees or woodland*
- *Are elevated or ridge sites on which development would be obtrusive*

Provide public access to interesting attractive landscapes or to semi-natural areas
Objective HA01
Protect High Amenity areas from inappropriate development and reinforce their character, distinctiveness and sense of place.

Objective HA02
Ensure that development reflects and reinforces the distinctiveness and sense of place of High Amenity Areas, including the retention of important features or characteristics, taking into account the various elements which contribute to its distinctiveness such as geology and landform, habitats, scenic quality, settlement pattern, historic heritage, local vernacular heritage, land-use and tranquillity".

Conformance of the Project to the Zoning Objective

The MEHL site has been in use as a quarry since the 1940s with infilling of the quarry with inert waste commencing in 2003 [planning permission for infilling was granted in 1988 initially but this permission was not exercised at that time]. The proposed landfilling activity will be carried out within the quarry void and will not be visible from the surrounding area. Refer to **Chapter 12** *Landscape and Visual* for further details.

6.8 References

Department of the Environment, Heritage and Local Government (2007) *Ireland National Climate Change Strategy 2007-2012* Department of the Environment, Heritage and Local Government, Dublin

Department of the Environment, Heritage and Local Government (2002) *Making Irelands Development Sustainable Review, Assessment and Future Action* Department of the Environment, Heritage and Local Government, Dublin

Department of the Environment, Heritage and Local Government (1998) *Waste Management – Changing our Ways* Department of the Environment, Heritage and Local Government, Dublin

Department of the Environment, Heritage and Local Government (2002) *Preventing and Recycling Waste - Delivering Change* Department of the Environment, Heritage and Local Government, Dublin

Department of the Environment, Heritage and Local Government (2004) *Waste Management - Taking Stock and Moving Forward* Department of the Environment, Heritage and Local Government, Dublin

Department of the Environment, Heritage and Local Government (April 2006) *National Strategy on Biodegradable Waste* Department of the Environment, Heritage and Local Government, Dublin

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Department of the Environment, Heritage and Local Government (2010) *Draft Statement of Waste Policy – For Consultation* Department of the Environment, Heritage and Local Government, Dublin

Dublin Regional Waste Steering Group (2005) *Waste Management Plan for the Dublin Region 2005 - 2010*

Environmental Protection Agency (2006) *National Waste Report 2006* EPA, Wexford

Environmental Protection Agency (2008) National Hazardous Waste Management Plan 2008 - 2012 EPA, Wexford

Environmental Protection Agency (2010) *Technical and Economic Aspects of developing a National Difficult Waste Facility (NaDWaF).* EPA, Wexford

Environmental Protection Agency (2005) *Pilot Strategic Environmental Assessment of the Replacement Midlands Waste Management Plan 2005-2010.* EPA, Wexford

EU COUNCIL DIRECTIVE 1999/31/EC *Landfill of Waste*

EU COUNCIL DIRECTIVE 2008/98/EC *Waste Framework Directive*

EU COMMUNICATION (December 2005) COM(2005)666 *Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste in the European Union*

Fingal County Council (2005) *Fingal County Development Plan 2005 – 2011*

Fingal County Council (2010) Draft *Fingal County Development Plan 2011 – 2017*

Foras (May 2008) Waste Management Benchmarking Analysis and Policy Priorities

Government of Ireland (2002) *National Development Plan 2007-2013* (2007) The Stationary Office, Dublin

Official Journal of the European Communities (L242/1) (2002) The EU Sixth Environmental Action Programme (EAP)– 'Environment 2010: Our Future, Our Choice'

Secretariat of the Basel Convention (1992) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

The Regional Planning Guidelines Office (2010) Regional Planning Guidelines for the Greater Dublin Area 2010 – 2022.

United Nations (1998) Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)

7 Human Beings

7.1 Introduction

This chapter addresses impacts of the proposed MEHL integrated waste management facility on human beings.

The proposed development has the potential to impact human beings in several ways. The potential impacts on human beings from traffic, visual effects, built and natural heritage, material assets, air, noise and vibration and leachate emissions are dealt with in the specific chapters in the EIS dedicated to those topics. In this chapter, issues such as health and safety, social consideration, land-use, zoning and economic activity are examined.

7.2 Assessment Methodology

7.2.1 Baseline Description

7.2.1.1 Introduction

This assessment was conducted by reviewing the current socio-economic status in the areas close to the proposed development. The site is located within the Hollywood Electoral Division. Baseline information with respect to the demographic and employment characteristics of the resident population within the catchment area was sourced from the 1996, 2002 and 2006 Censuses (where available). The data included information on population, structure, age profile, number of persons at work and unemployment profile. Information was also sourced from the following documents/websites:

- The Fingal County Development Plan 2005 - 2011
- Draft Fingal County Development Plan 2011 – 2017
- Central Statistics Office (CSO)
- The Department of Education and Sciences website www.education.ie

During the preparation of this EIS, consultations were held with a number of parties in order to ensure that environmental issues, including socio-economic, recreational and amenity issues relating to the project were addressed. The parties consulted are listed in **Chapter 1** *Introduction* of this EIS.

7.2.1.2 Principal Potential Receptors

An assessment of the principal potential receptors within the environs of the facility including homes, schools and commercial and industrial premises was conducted and is detailed below.

Homes

The closest residence to the site is a detached house in its own grounds, which is approximately 300m from the centre of the MEHL site. The next closest property is circa 340m from the centre of the MEHL site. Naul village is 3km from the MEHL site. Refer to **Figures 1.1 and 1.2.**

Schools and Colleges

Naul National School is 2.7km from the MEHL site boundary (North West) and Hedgestown National School is 2.9km to the east of the site. Details are provided in **Table 7.1** below on schools within 5km of the MEHL site.

Table 7.1 Education Facilities in the Area

Name	Road	Locality
Naul National School	Naul Hill	Naul
Ballyboghil National School	Naul Road	Ballyboghil
Balrothery National School	Coach Road	Balrothery
Hedgestown National School	Jordanstown	Lusk
Trinity Remand Centre	Oberstown	Lusk
Scoil Naomh Ciaran	Rooty Cross	Old Town
Oberstown Boys Centre	Oberstown	Lusk
Oberstown Girls Centre	Oberstown	Lusk

Health, Social and Community Facilities

Table 7.2 below lists the social and community facilities within 5km of the MEHL site. One nursing home is located within 5km of the MEHL site at Oldtown.

Table 7.2 Social and Community Facilities

Name	Road	Locality
Balrothery Community Centre	Glebe South	Balrothery
Naul Community Hall	Naul Village	Naul
Seamus Ennis Centre	Naul Village	Naul
34th Dublin Ballyboghill Scout	Gerradstown	Ballyboghill
Balbriggan Floral Artists	Rochestown	Naul
Ballyboghill Hedgerow Society	Richardstown	Ballyboghill
St. Patricks Hall, Ballyboghill Mother and Toddler		Ballyboghill
Ballyboghill Senior Citizens	Westmanstown	Ballyboghill
Naul and District Gardening Club	Three Gates, Weston	Naul

Table 7.3 below lists the sports facilities within 5km of the MEHL site.

Table 7.3 Sports Facilities

Name	Road	Locality
Hollywood Lake Golf Club	Hollywood Little	Ballyboghill
Shooting Grounds	Hollywood Great	
North County Cricket Club	Inch Road	Balbriggan
Balrothery Pitch and Putt Club	Darcystown	Balbriggan
Knockbrack Cricket Club	Belgee	Rings Common, Balbriggan
Ballyboghill Golf Club	Naul Road	Ballyboghill
Courtlough Shooting Grounds	Courtlough	Balbriggan
Ring Common's Sports Centre	Bog of the Ring	Ring Commons
Sports Ground (Naul)		Naul
Sports Ground (Naul)		Naul
Sports Ground (Oberstown)		Oberstown
Sports Ground (Ballystrane)		
Sports Ground (Oberstown)		Oberstown
Ballyboghill G.F.C	Newtown Lane	Oldtown
Running Track	Westown	Naul

7.2.1.3 Heritage and Amenity

Heritage

Archaeological, architectural and cultural heritage are discussed in **Chapter 16,** *Archaeological, Architectural and Cultural Heritage.* Nature Conservation Areas are discussed in **Chapter 13,** *Flora and Fauna.*

The MEHL site is listed as an Area of Geological Interest in the Draft Fingal County Development Plan 2005-2011. This aspect is discussed in detail in **Chapter 14** *Soils, Geology and Hydrogeology.*

A list of Scenic Routes is set out in **Chapter 12** of this EIS, *Landscape and Visual.*

Local Amenity

The MEHL site is located in the Naul Hills area which has a zoning designation of "HA-High Amenity" in the Fingal County Development Plan 2005 - 2011. Further information on this is provided in **Chapter 6** *Planning and Policy Context.*

Hollywood Lakes Golf club is located to the south of the MEHL site and there is a shooting range to the west of the site.

7.2.1.4 Economic Activity

Agriculture

The predominant land use in the immediate vicinity of the MEHL site is agricultural. There are a number of farms with tillage and grazing being the main agricultural practices.

Horticulture

There are a few farms in the area that supply organic produce to small farmers markets.

Commercial and Industrial Premises

There are a number of small industries on the roads surrounding the site which provide employment, including Wood Group JTC Ltd to the south east of the site, Dixon Transport to the north west of the site and Leacabawn Enterprises Ltd to the East of the site. Refer to **Figure 3.2**. MEHL understands that as of 26th October 2010, Dixon Transport is no longer at this location and the impact on the traffic numbers and noise monitoring is significant and positive by virtue of this change. There is a waste permitted facility located to the north-west of the MEHL facility, which has been in operation since January 2005. There is a second waste permitted facility to the south-west of the facility, operational since 2009. Fingal County Council proposed landfill site (not yet commenced construction) is located 1.4 km to the south east of the MEHL site.

7.2.2 Recent Trends in Population

The smallest geographical units distinguished by the Central Statistics Office (CSO) are Electoral Divisions. The MEHL site is located in Hollywood, North Co. Dublin within the Hollywood Electoral Division.

Table 7.4 outlines the population change between 1996 and 2006 and the growth rate of these population figures. The population in the Fingal area has increased by over 43% over the ten year period and the population in the Hollywood Electoral Division has increased by over 14% over the ten year period.

Table 7.4 Population of State, County Dublin, Dublin City, Fingal Area and Hollywood Electoral Division 1996-2006

District	1996	2002	2006	Change from 1996-2006 (%)
State	**3,525,719**	**3,917,203**	**4,239,848**	**+20.3**
Dublin(County and City)	1,058,264	1,122,821	1,187,176	+12.2
Fingal	167,683	196,413	239,992	+43.1
Hollywood (Electoral Division No 22)	874	952	998	+14.2

(**Data source:** CSO website)

Table 7.5 outlines the population change and growth rate of the main towns near the MEHL site between 1996 and 2006. The populations of the towns in the area have increased substantially in the ten year period.

Table 7.5 Population of Main Towns near Hollywood 1996, 2002, 2006

District	1996	2002	2006	Change from 1996-2006 (%)
Dublin City	481,854	495,781	506,211	+5.0
Lusk	2,287	2,456	5,236	+128.9
Balbriggan	5,743	6,631	6,731	+17.2
Swords	22,314	27,175	33,998	+52.4
Drogheda	24,460	28,333	28,973	+18.5
Garristown	228	289	257	+12.7
Skerries	7,339	9,149	9,535	+29.9
Total	**544,225**	**569,814**	**590,941**	**+8.6**

(**Data source:** CSO website)

7.2.2.1 Age Profile

Table 7.7 below outlines the age profile of the population in terms of dependent age cohorts (0-14 and 65+) and working age cohorts (15-64) over a ten year period between 1996 and 2006.

Table 7.7 Population of each catchment categorised into independent, dependent and childbearing cohorts 2002-2006

District	0-14 & 65+ yrs Dependent (%)	15-64 yrs Independent (%)	15-44 yrs Childbearing (%)
State 1996	35.0	65.0	45.0
State 2002	32.2	67.8	46.5
State 2006	31.4	68.6	46.6
Dublin 1996	31.9	68.1	49
Dublin 2002	29.3	70.7	50.4
Dublin2006	28.6	71.4	50.7
Fingal 1996	33	67	49
Fingal 2002	28.6	71.3	51.1
Fingal 2006	28	71.9	52.6

District	0-14 & 65+ yrs Dependent (%)	15-64 yrs Independent (%)	15-44 yrs Childbearing (%)
Hollywood ED 2002	33	67	44.7
Hollywood ED 2006	30.5	69.5	43.2

(**Data source:** CSO website)

In summary, it is evident that the Hollywood Electoral Division has a growing population with a below average proportion of people within the dependent and childbearing age groups but with an above average proportion within the working age groups.

7.2.3 Recent Trends in Employment

The National Quarterly Household Survey Statistics showing employment and unemployment figures for the State and Dublin between 2007 and 2010 are shown in **Table 7.8**. The statistics for Q1 2010 show that there were 1,857,600 persons employed which is an annual decrease of 108,000 from Q1 2009. There were 275,000 persons unemployed in Q1 2010, an increase of 52,200 from Q1 2009. There has been a further increase of 2,700 persons unemployed between Q1 2010 and Q2 2010 for the State. Coincidentally, employment figures for the State for Q2 2010 have increased by 1,500 from Q1 2010 figures whilst employment in Dublin has decreased by 4,700 persons in the same period.

Table 7.8 Employment and Unemployment Figures for the State and Dublin for Persons 15 Years and Over (000's)

Area	In Employment					Unemployed				
	Q1 2007	Q1 2008	Q1 2009	Q1 2010	Q2 2010	Q1 2007	Q1 2008	Q1 2009	Q1 2010	Q2 2010
State	2,088.5	2,124.1	1,965.6	1,857.6	1,859.1	98.1	109.4	222.8	275.0	293.6
Dublin	614.8	620.6	571.8	540.3	535.6	28.6	30.9	55.6	66.9	69.6

(**Data source:** CSO website)

7.3 Health and Safety Assessment

7.3.1 Introduction

Employment Health Advisors (EHA) Ltd undertook a health impact assessment of the potential effect on the human health of the proposed MEHL facility. The full health impact assessment is presented in **Appendix A7.1.**

7.3.2 Assessment Methodology

There are two possible approaches that can be used to assess the possible health effects of a project such as this.

Method 1

Assess the environmental baseline in terms of existing conditions, for example by measuring existing levels of contaminants in the air.

Then examine how these existing conditions will change due to emissions or influences associated with the construction and operational stages of the project.

Finally estimate the resulting effects on human health, paying particular attention to vulnerable receptors such as hospitals, schools, nursing homes and elderly persons. As we typically depend on Standards, for example, Air Quality Standards, for this assessment this is often called the standards or source based approach.

Method 2

Assess the human health baseline identifying in particular vulnerable groups and estimating possible effects of probable emissions.

The initial attractiveness of Method 2 is that it puts human health as the central study issue. One of the main drawbacks is due to the fact that baseline data on human health for a defined geographical study area is very difficult to obtain and that which can be obtained may not be reliable or scientifically sound.

Baseline environmental analysis is by comparison a fairly exact science and has the benefit of providing a simpler but more reliable assessment for a project such as this. Therefore Method 1 is the baseline evaluation approach chosen to assess the possible health effects for this project.

For the assessment of potential effects on human health of the proposed facility both in the construction phase and in operation it is first necessary to identify the parameters that need to be studied. To do this a baseline evaluation has been conducted.

The steps taken in the baseline evaluation detailed in this report included:

- Identification of the study area and characterisation of the baseline environment with the identification of sensitive populations and receptors.
- Review of the public consultations undertaken and the issues identified.
- Literature search to identify issues identified with similar projects elsewhere.
- Analysis of predicted residual changes, after mitigation in the environment attributable to the construction and operational phases of this project.
- Proposal of additional mitigation measures where applicable.

Population and Sensitivity

When the potential effects on human health of any emissions are assessed, amongst the most important factors to be considered are, the number of people who may be exposed, the duration of that exposure and the vulnerability or sensitivity of those individuals to those emissions.

Residential areas, public and private health facilities, workplaces, commercial areas and educational facilities are particularly important because significant numbers of persons usually spend significant time at these locations.

Places of worship and recreational areas are also important because of the significant numbers of persons that may be there but the fact that people usually spend less time in these places than for example in their homes or workplaces, may be relevant for some emissions.

Agricultural areas usually have limited numbers of people present and for a limited time but farm residences themselves are considered like any other homes.

The sensitivity of an area in this context refers to the vulnerability of the population. Vulnerable persons include the sick, the very young or old. Receptors that are considered to be very highly sensitive include health care facilities, both public and private, as these are more likely to include the elderly, ill or infirm. Sensitive receptors also include schools due to the presence of children. When health impacts are assessed particular attention must be given to these sensitive groups.

Study Area

The potential effects of any emissions are related to the level or dose of those emissions. The highest level will be closest to the proposed scheme and will, nearly always decrease with increasing distance. In choosing the study area, evidence from the literature regarding the area of potential effects around a facility and on information contained elsewhere in this EIS such as in the Air Quality Chapter was considered. Based on these factors the likely effects are generally confined within 3000 metres of the proposed scheme. This is therefore taken as the study area.

Consultation

Extensive consultation has already taken place with members of the public and other interested parties. Consultation with the public included open and localised sessions with smaller residents groups. This process identified many areas of concern to them.

These areas of concern included but were not limited to:

- Leachate treatment and disposal
- Liner integrity and leak detection
- Potential for wind-blown dust
- Potential contamination of groundwater
- Potential impacts on farming
- Transport of hazardous materials by road

7.3.3 Literature Review

Background

The term “landfill” is extremely broad and complex with the potential for a wide variety of exposures and exposure scenarios involving a multiplicity of agents with different toxicological properties.

The site factors affecting the likelihood that a landfill leads to potentially harmful population exposure include: engineering and containment, hydrogeology and topography, the type and quantity of waste contained, the mixing of contents, the presence and depth of leachate and the management practices.

The main concerns on health consequences derive from emissions of chemical mixtures or infectious agents, where these are present.

Epidemiological studies on the health effects of waste landfills exist, but many share the important weakness of the lack of direct exposure measurement. For this reason the exposure pathways are either modelled (for example using geographical information systems) or, more frequently, assessed through surrogate measures, such as the distance of the residence from the landfill sites. The studies may not be directly comparable with each other and cannot be related to the proposed MEHL facility unless the wastes, disposal methods, management practices, etc are similar.

It is against this background that EHA Ltd reviewed the medical literature specifically in relation to the proposal to apply for permission to develop an existing EPA-licensed landfill (a previous quarry) accepting inert construction and demolition waste to the acceptance of incinerator ash (hazardous/non-hazardous), hazardous and non-hazardous soils and inert soils generated on the island of Ireland, all of which are non-biodegradable wastes.

Review

In Ireland a report was commissioned by the Health Research Board at the request of the Department the Environment and Local Government. This was published in 2003 and was entitled *Health and Environmental, Effects of Landfilling and Incineration of Waste– A Literature Review*. This will be referred from here as the HRB Report.

In the UK, The University of Birmingham/ Enviros study 2004 published *Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes* also looked at this area. This report was commissioned by the Department of the Environment Food and Rural Affairs (DEFRA). This will be referred to as the DEFRA report. As the name suggests it concentrated on municipal waste but nevertheless does contain a good review of the literature at that time covering all aspects of landfill. The UK report in particular was well resourced and comprehensive. As stated it is largely a literature review and most had already been reported in the HRB report. It did however conclude though that the “health effects of handling municipal solid waste by methods including, but not exclusively landfilling had at most a minor effect on human health”. It did not make any statement on the landfilling of hazardous material.

EHA Ltd has relied heavily on these publications and the following studies which predate their publication are reviewed in either or both of these documents and taken directly verbatim from either or both of these documents. It was not felt necessary to further analyse these studies. Since then however there have been a number of useful reviews including the World Health Organisation (WHO) publication**:** *Population health and waste management***:** *scientific data and policy options***.** *Report of a WHO workshop***.** *Rome, Italy,* in March 2007.

Specifically with regard to Hazardous Waste landfills a useful review entitled: *An examination of cancer epidemiology studies among populations living close to toxic waste sites* was published by Russi et Al in 2008, this will be referred to as the Russi review.

Finally there has been a very recently published review entitled *Systematic review of epidemiological studies on health effects associated with management of municipal solid waste*, by *Porta et AL* was released in December 2009 by the journal *Environmental Health* 2009, 8:60. While again it is clear from the title that it concentrated on municipal solid waste it nevertheless has some useful additions. This will be referred to as the Porta review.

Waste Type

The term "hazardous landfill" includes all landfills receiving any hazardous materials such as chemicals, asbestos etc. The MEHL facility is proposed to take hazardous incinerator ash and hazardous soils, as well as non-hazardous incinerator ash and non-hazardous and inert soils. Many of the other landfills studied would have an intake of a wide diversity of materials. These studies are of limited value in assessing the health impact of a specific hazardous landfill site such as the proposed site. Where appropriate, EHA Ltd will state whether the studies relate to hazardous, non hazardous landfills or both.

The other major disadvantage in interpreting the literature is that they are, by their nature, historical. Many of the studies date back some years but also many of the health conditions have a long latent period, that is the time between exposure and the development of symptoms, which for some effects such as cancer may be many years. They reflects practices which bear little relationship to modern controls such as the limitations on materials entering the facility and perhaps as importantly the engineering controls in a modern engineered landfill. In particular we understand that for the proposed facility the flue gas treatment residues will be carefully sealed prior to landfilling, minimising the possibility of any emissions to which humans may be exposed.

Some other important documents reviewed included:

WHO Report

This was quite a wide review published in 2007 about a wide range of Waste Management options. This gave an interesting summary of its conclusions in relation to Landfill in particular. It said.

"*With regards to waste landfills, a wide variety of exposures, exposure pathways and exposure scenarios are involved, entailing a large complexity and difficulty in estimating the health risks possibly involved. Only few epidemiological studies have evaluated sites with respect to the types of chemicals they contain and release; most studies on the health effects of waste landfills in fact lack direct exposure measurement, and rely on residential distance from the site or sometimes on exposure modelling. Many health endpoints have been considered in epidemiological studies, including cancer incidence and mortality and reproductive outcomes such as birth defects and low birth weight. Despite the methodological limitations, the scientific literature on the health effects of landfills provides some indication of the association between residing near a landfill site and adverse health effects. The evidence, somewhat stronger for reproductive outcomes than for cancer, is not sufficient to establish the causality of the association. However, in consideration of the large proportion of population potentially exposed to landfills in many European countries and of the low power of the studies to find a real risk, the potential health implications cannot be dismissed.*"

The report commented on another review in Italian by Linzalone and Bianchi (2005).

It concluded that there were no consistent results in studies on cancer incidence, mortality and congenital malformations were reported. Increases in low birth weight and different types of symptoms were consistently found. They stated that the availability of environmental data and individual measurements of exposure was very poor in most of the studies.

The WHO report also noted that concurrently with the workshop three multi-site studies were published, two of them dealing with United States hazardous sites. In the first one (Kuehn et al., 2007) a series of significant risks for congenital malformations, decreasing with distance from the sites, have been found; in the second one (Mueller et al., 2007) foetal deaths for women residing near the sites were not associated with the distance but an association was observed among women residing less than one mile from pesticide–containing sites. The third study (Jarup et al., 2007) analyzed the risk of giving birth to a child with Down syndrome, associated with residence near 6 289 landfill sites (processing special, non-special and unknown waste type) in England and Wales. Postcodes within the two kilometres zone were classified as exposed and people living beyond two kilometres comprised the reference population. No excess risks of Down syndrome related to landfill sites were found and adjustment for socioeconomic status did not influence the estimates. Interestingly no differences in risk between hazardous waste sites and other landfill sites were found.

The Russi Review 2008

This review carried out Medline searches of the peer-reviewed English language medical literature covering the period from January 1980 to June 2006 using the keywords "toxic sites" and "cancer", and identified articles from published reviews. They studied cancer incidence in communities surrounding hazardous waste landfills. As the authors recognized, some of the location investigated included both toxic wastes and municipal solid wastes. Most studies did not appear to be responses to a recognized cancer mortality cluster. Studies were highly variable with respect to handling of competing risk factors and multiple comparisons.

The Porta Review 2009

This is noteworthy as it is just published. As stated it did concentrate on MSW sites but did include others studies as well.

It reported:

In most cases the overall evidence was inadequate to establish a relationship between a specific waste process and health effects; the evidence from occupational studies was not sufficient to make an overall assessment. For community studies, at least for some processes, there was limited evidence of a causal relationship and a few studies were selected for a quantitative evaluation. In particular, for populations living within two kilometres of landfills there was limited evidence of congenital anomalies and low birth weight with excess risk of 2 percent and 6 percent, respectively. The excess risk tended to be higher when sites dealing with toxic wastes were considered. For populations living within three kilometres of old incinerators, there was limited evidence of an increased risk of cancer, with an estimated excess risk of 3.5 percent. The confidence in the evaluation and in the estimated excess risk tended to be higher for specific cancer forms such as non-Hodgkin's lymphoma and soft tissue sarcoma than for other cancers.

Specific Health Effects

Congenital Malformations/Reproductive Problems

The Health Research Board (HRB) report stated that a number of studies have shown an apparent increase in the incidence of low birth weight, birth defects. Problems were reported around some hazardous waste landfills falling significantly below current operating standards, such as Love Canal in the U.S. Again EHA Ltd would stress that these would have been "dumps" in every sense and more or less anything could find its way in and thereafter out. These could not, in any way, be compared with modern-day engineering, environmental and operational controls at regulated landfills.

The report also said studies such as Geschwind et al. (1992), Budnick et al. (1984), Croenet al. (1997), Roberts et al. (2000) and more recently Goldberg (2005) reported similar findings but also shared common limitations. It is however fair to say that low birth weight is one of the most consistent finding. However it is also one of the factors most vulnerable to confounders. For example two factors very closely linked to low birth weight are lower social class and maternal smoking. It has been repeatedly found that deprivation scores are consistently higher around landfills.

Chromosomal congenital anomalies, as opposed to total anomalies, were studied in a further report from the EUROHAZCON group (Vrijheid et al. 2002). The investigators reported a higher risk of chromosomal anomalies in those who lived within 3 km of hazardous waste sites when compared to those in the study population who lived between 3 and 7 km from one of the study sites.

A Scottish study (Morris 2003) showed no statistically significant excess risks of congenital anomalies or low birth weight in populations living near special waste landfill sites in Scotland.

A Welsh study (Palmer 2005) reported an apparent increase in the rate of congenital abnormalities in the vicinity of 24 Welsh landfills after opening from 1983 to 1997. Many of these were "Special waste", that is hazardous, sites. They concluded that a causal relationship could not be established. It is of note that when the study looked at enhanced data from 1998 to 2000 it did not show a significant increase. In addition the landfills studied were also examined in the earlier but much larger Elliot study. The latter is considered by many, the most complete and the findings of the Elliot study are dealt with separately.

Of particular note is a January 2004 study published in the Irish Medical Journal by Boyle et al. The occurrence of congenital anomalies in proximity to municipal landfill sites in the Eastern Region (counties Dublin, Kildare, Wicklow) was examined by small area (district electoral division), distance and clustering tendencies in relation to 83 landfills, five of which were major sites. For the more populous areas of the region 50% of the population lived within 2-3 km of a landfill and within 4-5 km for more rural areas. They concluded that congenital anomalies were not found to occur more commonly in proximity to municipal landfills.

Cancers

The HRB report pointed out that Pukkala and Ponka (2001) studied the risk of cancer in people living in houses built on top of an old municipal dump in Finland. They identified a small increase in cancers on the basis of cancer incidence rates in Helsinki. The numbers studied were quite small. The incidence of cancer was also studied around Love Canal, Janerich et al. (1981) and rates were no higher than those calculated for the entire state outside of New York City. Another study by Polednak and Janerich (1989) found no association between death from lung cancer and residence in the selected census tracts around hazardous waste landfills.

Goldberg et al. (1995.) evaluated whether cancer incidence among persons who lived near the Miron Quarry (operating as a landfill) was higher than expected. Some cancers appeared increased but these increases in risk were weak and for most conditions were not statistically significant. Again the evidence was not strong or consistent enough for conclusions to be drawn.

The Russi review (2008) concluded:

To date, epidemiological studies of populations living in the vicinity of a toxic waste site have not produced evidence of a quality that most epidemiologists would consider adequate to establish a causal link between toxic waste exposures and cancer risk.

It went on to state that even if these might be an effect the magnitude is too small to be measured.

Again to summarise, the evidence linking landfill to cancer is weak, perhaps even surprisingly so because the areas studied were again hazardous sites with known problems. Certainly it is reasonable to extrapolate that the human risk of cancer from living adjacent to a well operated landfill are absolutely minimal.

Elliot Studies

The largest study carried out on the health effects of landfill sites was that by Elliot *et. al*. for the Dept of Health in the UK published in August 2001. This appeared to show small excess risk, in the region of 1 % for overall congenital abnormalities to those living within 2Km radius of a landfill site. It also showed a higher rate for those living near a "special" (hazardous) waste site although this is less relevant to this hearing.

To put this into context the background rate of congenital abnormalities is about 2% of all births. A 1% increase even if true would give a rate of 2.02%. In an area of low population one might have to wait several hundred years or even more for an effect.

Interestingly the study showed that approximately 80% of the British population live within 2Km of a landfill site though not all are operational. Though the study is generally well designed there are a number of limitations in this study however some of which it shares with some of the other studies quoted. By the nature of this type of study it studies "the good, the bad and the ugly", that is, covering landfill sites in all states of use, age and type of landfill, hazardous or non hazardous. It will therefore include the well designed and operated but also those which are not. It would be possible for one or two "bad eggs" in terms of poorly managed landfill sites to skew a study particularly given the very small level of reported excess.

There are also anomalies in the data, for example when they studied landfill sites recently opened there was an excess risk of congenital abnormalities predating the opening of the landfill site suggesting demographic or other environmental factors were primarily responsible.

While the study did attempt to allow for confounders such as deprivation etc in effect it is impossible to allow for all possible confounders and they did not even attempt to control for some potentially relevant factors such as smoking and occupation. *Therefore while noteworthy the findings cannot be relied upon and need to be considered in the light of the other available literature.*

Elliot et al. recently updated the previous study (2009) in order to evaluate whether geographical density of landfill sites was related to congenital anomalies. The analysis was restricted to 8804 sites operational at some time between 1982 and 1997. There were 607 sites handling special (hazardous) waste and 8197 handling non-special or unknown waste type. The exposure assessment took into account the overlap of the two km buffers around each site, to define an index of exposure with four levels of increasing landfill density. Several anomalies (hypospadias and epispadias, cardiovascular defects, neural tube defects and abdominal wall defects) were evaluated. The analysis was carried out separately for special and non-special waste sites and was adjusted for deprivation, presence or absence of a local congenital anomalies register and maternal age. The study found a weak association between intensity of hazardous sites and some congenital anomalies (all, cardiovascular, hypospadia and epispadias).

7.3.3.1 Summary of Literature on Health Effect of Landfilling

One of the main difficulties about reviews of epidemiological evidence is that they are by their nature historical. While they may accurately reflect the situation as it was, nowadays with far greater engineering controls and much higher level of supervision of what enters landfills and management of potential emissions it is certain that potential health effects are less than in the past. In others words we can look at a worst case scenario but modern landfill are far better than what was there in the past.

Unfortunately there does not appear to be any literature specifically on the landfilling of incinerator ash. EHA Ltd use studies of hazardous or special landfills but these are a relatively poor substitute for specific data. However, EHA Ltd found that the impact on human health was minimal even where landfill sites were used for disposing of wastes presenting significantly greater hazards than those from the solidified incinerator fly ash proposed for this facility.

At present there is little or no evidence to demonstrate a link between cancer and exposure to any landfill facility.

A number of studies have reported putative links between hazardous landfill sites and congenital abnormalities but again these studies are somewhat inconsistent. The association between adverse birth outcomes such as low birth weight and birth defects is somewhat stronger but may reflect socioeconomic factors rather than any exposure. However, even now we can conclude if any effect is shown it will be at a very low level indeed and in all likelihood not measurable. In practical terms, this means that we are confident that there will be no effect.

Reports of increased risk of respiratory, skin and gastrointestinal illnesses are based mainly on self-reported symptoms. Although this evidence must not be dismissed, consideration should be given to the strong possibility of bias and the influence of fears and worry related to the waste.

7.3.4 Site Specific Assessment

7.3.4.1 Geology and Hydrogeology

From information contained in **Chapter 14** *Soils, Geology and Hydrogeology*, 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.

The residual impacts on groundwater are considered to be imperceptible with the proposed mitigation measures in place.

Given this assessment EHA Ltd is confident that there will be no deleterious effect on Human Health or on food production or agriculture as a result of water contamination.

7.3.4.2 Air

From information contained in **Chapter 9** *Air Quality*, the residual impact on air quality as a result of the proposed scheme will not be significant following the implementation of all mitigation measures. This applies for both construction phase and the operational phase.

Mitigation measures will be in put place including:

- Waste cells, particularly hazardous and non-hazardous cells, will be covered daily as necessary in order to minimise fugitive dust emissions.
- All dust generating material will be transported in covered trucks.
- Water sprays will be used to ensure that boiler/bottom ash will not dry out during dry or windy conditions to minimise the potential for dust dispersion.

This will ensure that fugitive emissions are kept to a minimum and certainly below levels that might cause Air Quality Standards to be exceeded.

It is important in this regard that Dust monitoring will continue as per the existing waste licence or any new waste licence issued by the Environmental Protection Agency. Therefore EHA Ltd can be confident that not alone is there no impact on air predicted, none can occur without immediate action.

EHA Ltd is therefore confident that no detrimental effect on human health or on food production or agriculture can result from emissions to air from this project.

7.3.5 Hazard Identification

7.3.5.1 Legislation

Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances as amended by 2003-105-EC is known as the Seveso Directive or COMAH Directive. This Directive has been transposed into Irish law by the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006).

The objectives of the Directive are to minimise the risk of major accidents by applying loss prevention techniques to projects from the design stage onwards, and by providing appropriate mitigation measures to minimise the consequences of those major accidents that may occur.

7.3.5.2 Applicability of Seveso Directive

Incinerator fly ash and residues from gas cleaning are classified as “N” “dangerous to the aquatic environment” with combined risk phrases R51/53 – “Toxic to aquatic organisms; may cause long term adverse effects in the aquatic environment” because of the concentrations of heavy metals in these wastes. The quantities of these materials present at the MEHL facility will exceed the lower tier threshold of 200 tonnes, but not the upper tier threshold of 500 tonnes. Refer to **Table 7.9** below.

Incinerator ash i.e. bottom ash, fly ash and residues from gas cleaning is not classified as toxic (T) or very toxic (T+) to human health. It is classified as harmful (Xn) with combined risk phrase R20/21/22.

Table 7.9 Seveso Directive Lower and Upper threshold quantities for R51/53 Substances

Column 1	Column 2	Column 3
Dangerous Substances	**Qualifying quantity (tonnes) of the dangerous substances as delivered in Article 3 (4),for the application of**	
	Articles 6 and 7	**Article 9**
(i) R50: "Very toxic to aquatic organisms" (including R50/53)	100	200
(ii) R51/53: "Toxic to aquatic organisms; may cause long term adverse effects in the aquatic environment"	200	500

7.3.5.3 Risk Assessment

The flue gas treatment residues are classified as hazardous to the aquatic environment. The solidified material (after processing) is not classified as hazardous.

This material will be present at the MEHL facility as follows:

(a) Storage silos (approximately 200 tonnes) to provide storage for 48 hours usage in the solidification plant.

(b) Road tanker (approximately 50 tonnes) based on two fully loaded 40 m^3 tankers

(c) In process (0.5 tonne)

The storage silos, road tanker and curing area will be located within a contained area, so that any loss of containment will be prevented from entering watercourses, etc. The storm water from the contained area will discharge to a hazardous waste leachate holding tank and used in the solidification process as described above.

Mixtures of flue gas treatment residues and other materials are not classified as hazardous to the aquatic environment, whether uncured, partially cured or totally cured.

Flue gas treatment residues and other incinerator ashes are not toxic to humans.

Aqueous hydrochloric acid will be stored in a bunded tank. Hydrochloric acid is a corrosive material.

Small quantities of diesel oil will be stored in bunded tanks for refuelling site vehicles.

The physical form of the cured solidified waste and the containment measures adopted for other materials will ensure that the risk of a major accident is negligible.

7.3.5.4 Potential Major Accidents

Potential major accidents at the proposed development have been identified as the following:

- Loss of containment of incinerator ash from road tanker at the facility.
- Loss of containment of incinerator ash storage silo.

Measures for Preventing Major Accidents

Incinerator ash will be transported to the facility in fully enclosed and contained road tankers. Each road tanker will have a capacity of approximately 25 tonnes. Up to two such road tankers could be present at the facility at any one time.

The road tankers will be purpose-designed for the transport of incinerator ash and will be sealed to prevent loss of containment.

At the facility, tankers will be weighed in, directed to solidification plant; driven inside the solidification building and automatic doors will close behind the vehicle. Incinerator ash will be pneumatically transferred from the road tanker to the storage silos, which will have a capacity of 200 tonnes. Transfer hoses will be specified for transfer of incinerator ash and designed to withstand at least 1.5 times the operating pressure. Hoses will be regularly pressure tested and inspected, and will be replaced at regular intervals.

The storage silos will be designed to international standards and will be provided with a vent filter to prevent the escape of dust although the dust does not present a toxic hazard to humans.

Procedures will be established and training provided for staff in the discharge of road tankers and the operation of all associated equipment.

Measures for Mitigating the Consequences of Major Accidents

The road tanker parking area, the ash storage silos and the solidification plant will be located within a kerbed area, providing containment in an emergency scenario. The area will be sloped to a collection sump, which will be provided with a valve.

7.3.5.5 Conclusion

The proposed MEHL facility does not pose any risk to human health. The potential for damage to aquatic systems is minimised by providing robust primary containment of the hazardous materials being handled and secondary containment for any spills.

The risk to the aquatic environment is considered to be negligible.

7.4 Evaluation of Impacts and Mitigation Measures

7.4.1 Introduction

Impacts on humans as a result of the proposed development have been considered in detail in other chapters of this EIS, as follows:

Chapter 5 *Construction Activities*

Chapter 8 *Roads and Traffic*

Chapter 9 *Air Quality and Climate*

Chapter 11 *Noise and Vibration*

Chapters 12 *Landscape and Visual*

Chapter 17 *Material Assets*

In this chapter, the impacts of the proposed development on human beings are evaluated in the following sections.

7.4.2 'Do Nothing' Impacts

The 'Do nothing' scenario is the continued operation of the existing inert landfill facility with ultimate full restoration of the site to original levels as per existing planning and EPA waste licence conditions.

7.4.3 Economic Activity

7.4.3.1 Land Use

The site is owned and operated by MEHL as an EPA licensed inert landfill since 2003. It was formerly a quarry from which limestone and shale were extracted. No economic activity will be displaced by constructing the proposed integrated waste management facility on the site.

7.4.3.2 Land Use Impact and Seveso ll Directive

The facility will be an establishment to which Articles 6 and 7 of the Control of Major Accident Hazards Involving Dangerous Substances Directive 96/82/EC (Seveso II Directive) will apply. This means that the facility will be a lower tier establishment under the Directive. It is expected that there will be no off-site impacts or restriction on land use due to the facility's status under the Directive.

7.4.3.3 Agriculture

As described above in Section 7.3.4.2, no detrimental effect on human health or on food production or agriculture can result from potential emissions from the proposed development.

7.4.3.4 Tourism

The visual impact of the development on tourist routes and amenities is assessed in **Chapter 12** *Landscape and Visual Assessment* of this EIS.

7.4.3.5 Property Values

Property values are addressed in **Chapter 17** *Material Assets.*

7.4.3.6 Construction Phase Economic Impact

The construction of the proposed MEHL facility will cost circa €20 million. There will be a maximum number of 50 jobs created during construction. There will also be a substantial number of indirect jobs, created in the off-site construction services providers and material suppliers. These jobs will be a beneficial economic impact of the proposed development. In addition, it is envisaged that local shops, pubs and service providers in the area will experience increased trade during the construction phase.

The development will lead to a general increase in economic activity in the area.

7.4.3.7 Operational Phase Economic Benefit

The proposed MEHL facility will provide critical waste management infrastructure and make an economic contribution country-wide by managing the relevant waste types on the island of Ireland as opposed to exporting them overseas for management. When the proposed development becomes operational, it is anticipated that an additional 15 people will be employed at the facility. These jobs are seen as being a significant beneficial effect of the scheme. It is estimated that the employment provided will contribute substantially to the local economy. The MEHL facility will also generate annual expenditure on maintenance, security, insurance and various other services, which will be from local suppliers where possible. The employees at the facility may frequent retail and recreational establishments in Naul village, thus adding to the general economic activity in the village.

7.4.4 Mitigation Measures

The Health and Safety features incorporated into the design of the proposed facility are outlined in **Chapter 4** *Proposed Site and Project Description.* The Health and Safety policy, procedures and work practices of the proposed development will be in conformance to all relevant health and safety legislation both during the construction and operational stages of the facility. The proposed development will be designed and constructed to best industry standards, with an emphasis being placed on the health and safety of employees, local residents and the community at large. The main characteristics of the proposed development are outlined in **Chapter 4** *Proposed Site and Project Description* and in the drawings submitted with the planning application.

To minimise potential environmental nuisances associated with the proposed development, comprehensive mitigation measures will be implemented, during both the construction and operational phases of the development. These mitigation measures will reduce any potential negative impacts of the proposed development on the residential amenity of the local area. Refer to **Chapters 4, 8, 9, 11, 12** and **13** of this EIS for further details of mitigation measures.

7.5 Residual Impacts

The proposed mitigation measures will minimise nuisance and inconvenience to the local residents during construction and operation of the facility and will ensure any nuisance and inconvenience will be negligible.

The jobs created during construction and operation, and the contribution which MEHL and its employees will make to the local economy, will have a significant positive economic impact on the North Dublin area.

7.6 References

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8 Roads and Traffic

8.1 Introduction

8.1.1 Background

This chapter of the EIS presents the results of a transport assessment of the proposed MEHL integrated waste management facility during construction and operation. The existing transport features and surrounding road network is described and the likely significant impacts on the road network with both the construction and operational phases are assessed. It is not proposed to increase the annual capacity for the landfill from that which is currently allowed under the terms of planning permission and EPA licence. Therefore it is envisaged that the traffic to site will not change in the future.

The current planning application also includes a proposal to relocate the existing site entrance from local road LP01090 to LP01080. Assessments take into account the proposed Fingal County Council Landfill Project which is in close proximity to the existing MEHL facility and proposes road access changes to the site from the M1 motorway.

This chapter presents an assessment of the potential impact of the proposed changes to the MEHL site on the existing traffic and transportation environment. The existing environment is described, the likely impacts are assessed and mitigation is proposed where required.

8.1.2 Scope and section structure

This chapter assesses the potential transport impacts of the proposed amendment to the existing development on the surrounding road network, taking into account the proposed internal infrastructural works and the phasing timeline of the development. Due to the nature of the activity at the site most of the trips will be made by heavy goods vehicles (HGVs) with few passenger car trips of site staff.

The remaining part of the chapter is subdivided as follows:

- Assessment Methodology
- Receiving Environment
- Proposed Development
- Development Trips
- Traffic Impact
- Mitigation Measures
- Residual Impacts
- References

8.1.3 Consultation

The National Roads Authority (NRA) was consulted in the context of the consultation process as recommended by An Bord Pleanála (ABP) during the pre-application stage for the application as Strategic Infrastructure Development. No relevant issues have arisen from this consultation.

The project team has liaised with the Transportation Department of Fingal County Council regarding the design of a new entrance and access road to the facility, as well as the scope of the assessments to be carried out.

8.2 Assessment Methodology

8.2.1 Key Assumptions

Existing trips to the proposed MEHL development site are mainly Heavy Goods Vehicles (HGVs). Car trips to the site are not significant in the context of the trips generated by this facility; however they have been taken into consideration. Therefore, for this assessment, less emphasis has been given to sustainable modes of transport to the site such as bus, walking and cycling. More emphasis is given to HGV access to the site and their route to/from the site.

The assessment methodology was based on the following primary assumptions;

- No proposed increase in the capacity, which is 500,000 tonnes per annum. Therefore there will be no increase in traffic levels on the local road network due to the proposed scheme.
- However, as the proposed development proposes the acceptance of different waste streams, trip distribution pattern on strategic road network, particularly on M1 and R132, will change.
- This study considered two scenarios as the part of the overall assessment. The first scenario is the use of the 'existing road network' where development traffic will continue using LP01080 and R132 Flyover to access/egress site. The second scenario is that the new 'County Road' link to M1 Courtlough Interchange, proposed as the part of the Fingal Landfill Project, would be operational.
- Design year flows on the surrounding road network for assessment purpose is based upon the forecasted traffic flows obtained from Fingal Landfill Project EIS 2007. No additional traffic surveys were conducted for the current assessment.
- Existing peak hour traffic levels on the surrounding network are estimated from the forecasted 2009 'Do Nothing' scenario traffic flows from Fingal Landfill EIS project. According to this report, AM and PM peak hour periods were identified as 08:00-09:00 for AM peak hour and 17:00-18:00 for PM peak hour for the surrounding road network.

8.2.2 Assessment Scenarios

The following sections summarise the scenarios appraised for existing (2010) and design years. In addition to the current year of assessment 2010, three assessment years scenarios, 2011 (main construction stage), 2014 (interim year) and 2024 (design year), are considered for the impact assessment purpose.

As mentioned above, the current assessment considers the impact of the proposed development on the surrounding road network and junctions for both the scenarios 'with' and 'without' Fingal Landfill Project. This is in response to the request received from Fingal County Council Transportation Department and ABP during project consultation meetings.

The following section summarises each scenario assessed in the assessment:

- **2010 - The Existing Situation**

For this scenario flows have been extracted from the Fingal Landfill EIS "2009 AM & PM Peak Do Nothing Traffic Flows" diagram and the following has been applied:

- Factored to year 2010 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL traffic as per 2010 site traffic data.
- Removal of M1 Business Park (West) traffic.

- **2011 – Main Construction Stage**

- Factored to year 2011 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL earthworks construction traffic.
- The addition of MEHL traffic as per 2010 site traffic data.
- Removal of M1 Business Park (West) traffic.

'Without' Fingal Landfill Project

- **"Do Nothing" 2014** *(without MEHL proposed scheme)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2009 AM & PM Peak Do Nothing Traffic Flows" diagram and the following has been applied:

- Factored to year 2014 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per 2010 traffic distribution pattern *(Assumption- No increase in development trip generation)*

- **"Do Something" 2014** *(with MEHL proposed scheme) ("Do Nothing" 2014 scenario with revised MEHL traffic distribution + cell construction traffic + new entrance)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2009 AM & PM Peak Do Nothing Traffic Flows" diagram and the following has been applied:

- Factored to year 2014 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.

- The addition of MEHL peak hour traffic, assignment as per revised traffic distribution pattern *(Assumption- No increase in development trip generation)*
- An allowance for cell construction traffic.

- **"Do Nothing" 2024** *(without MEHL proposed scheme)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2024 AM & PM Peak Do Nothing Traffic Flows" diagram and the following has been applied:

- Factored to year 2024 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per 2010 traffic distribution pattern *(Assumption- No increase in development trip generation)*

- **"Do Something" 2024** *(with MEHL proposed scheme) ("Do Nothing" 2024 scenario with revised MEHL traffic distribution + cell construction traffic + new entrance)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2024 AM & PM Peak Do Nothing Traffic Flows" diagram and the following has been applied:

- Factored to year 2024 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per revised traffic distribution pattern (*Assumption- No increase in development trip generation*)
- An allowance for cell construction traffic.

'With' Fingal Landfill Project

- **"Do Nothing" 2014** *(without MEHL proposed scheme)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2009 AM & PM Peak Do Something Traffic Flows" diagram and the following has been applied:

- Factored to year 2014 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per 2010 traffic distribution pattern *(Assumption- No increase in development trip generation)*

- **"Do Something" 2014** *(with MEHL proposed scheme) ("Do Nothing" 2014 scenario with revised MEHL traffic distribution + cell construction traffic + new entrance)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2009 AM & PM Peak Do Something Traffic Flows" diagram and the following has been applied:

- Factored to year 2014 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.

- The addition of MEHL peak hour traffic, assignment as per revised traffic distribution pattern *(Assumption- No increase in development trip generation)*
- An allowance for cell construction traffic.

- **"Do Nothing" 2024** *(without MEHL proposed scheme)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2024 AM & PM Peak Do Something Traffic Flows" diagram and the following has been applied:

- Factored to year 2024 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per 2010 traffic distribution pattern (*Assumption- No increase in development trip generation*)

- **"Do Something" 2024** *(with MEHL proposed scheme) ("Do Nothing" 2014 scenario with revised MEHL traffic distribution + cell construction traffic + new entrance)*

For this scenario flows have been extracted from the Fingal Landfill EIS "2024 AM & PM Peak Do Something Traffic Flows" diagram and the following has been applied:

- Factored to year 2024 using NRA growth factors.
- The removal of MEHL traffic as per 2004 EIS.
- The addition of MEHL peak hour traffic, assignment as per revised traffic distribution pattern *(Assumption- No increase in development trip generation)*
- An allowance for cell construction traffic.

8.3 Receiving Environment

8.3.1 Site Location and Context

The MEHL site is located in a rural area of North County Dublin approximately 4.5km south of Naul in the townland of Hollywood Great between the M1 and the R108 Naul Road. Historically, the site was used for the extraction of limestone and shale. This activity ceased at the end of 2007. The site now operates as a licensed landfill. The licensed landfill has been in operation since 2003 alongside the quarry activity until the quarrying ceased towards the end of 2007.

Figure 1.1 shows the location of the site in the context of the wider local and national road networks.

The site currently has one access point from Local Road LP01090. At present it is advised by MEHL and observed that most of the vehicles access the site from the east via the M1.

8.3.2 Existing Site Trips

The current operation consists of the restoration of the historic quarry by means of filling the quarry void with inert waste. At present, the void is being filled at a maximum rate of 500,000 tonnes per year under the conditions of the 2007 planning permission. The limits and conditions associated with the landfill activities are set out in the EPA Licence No. W0129-02.

The current EPA Licence states that waste may only be accepted at the facility between the hours of 8.00am and 6.00pm Monday to Friday inclusive and 7.00am to 4.00pm on Saturdays. The current planning permission states that the site shall operate only between the hours of 7.00am to 7.00pm Monday to Friday and 7.00am to 5.00pm on Saturdays.

The site does not operate on Sundays or Bank Holidays. The general public carrying waste in cars, vans or small trucks are not permitted to access the facility. Therefore the only vehicles carrying waste to the site are HGVs.

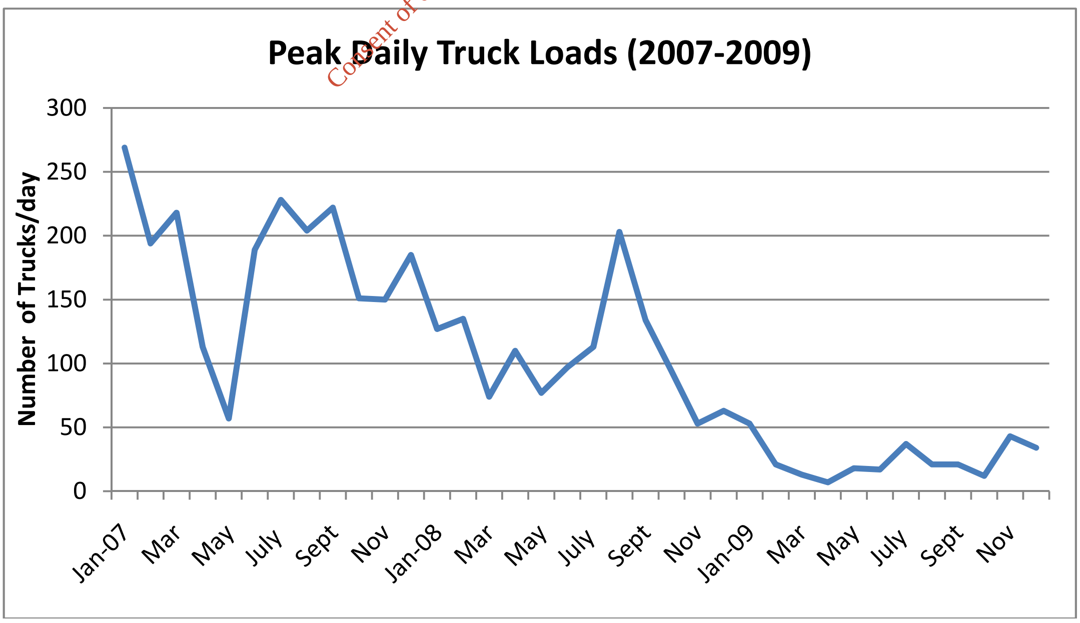
With the current economic slowdown, numbers of trips to site have dramatically reduced in the last 2 years. **Table 8.1** below shows the tonnage and truck loads accepted by the facility over the last 3 years.

Table 8.1 MEHL Annual Tonnage Accepted & Loads (2007 – 2009)

Year	Total Tonnage Accepted	Total No. of Loads per Annum	Average Tonnage per Load
2007	433,572	23,291	18.6
2008	225,996	11,472	19.7
2009	42,206	2,206	19.1

There has been a 90% decrease in annual tonnage and total no. of loads per annum accepted at the landfill between 2007 and 2009.

Graph 8.1 Variation of Peak Daily Truck Loads (2007 – 2009)



Graph 8.1 shows the variation to peak daily trips (one-way) from 2007 to 2009.

It is clear from the graph there has been a considerable decrease in the peak number of daily loads accepted to the facility from 2007 until the end of 2009. The most recent data shows less than 50 HGVs a day entering the facility, equating to approximately 6 HGVs entering during the morning peak (i.e. 12 two-way trips).

Graph 8.1 shows that trips to site are considerably reduced (approximately 90%) from 2007 to 2009 and the same trend continues in 2010. During January 2007, the maximum peak daily trucks visiting site was observed to be around 260 HGVs, equating to a maximum 520 in and out trips. This was observed during a period of significant economic activity and is very unlikely to be reached again in the foreseeable future.

The daily profile of waste being accepted at the site shows a negligible amount being accepted during the PM peak period. Therefore, no landfill site traffic is considered for the surrounding road network PM peak hour assessment.

8.3.3 Local Road Network and Junctions

The principal road network surrounding the proposed development site includes (See **Figure 8.1**):

Links

- **LP01090:** This is a north-south local road linking the LP01080 in the south to Rowans Road in the north. The access to the landfill is located on this road approximately 280m from its junction with the LP01080. The section of the road between this junction and the site access has a steep gradient rising toward the site access road.
- **LP01080:** This is an east-west local primary road, which links the R132 (in the east) with the R108 Naul Road (in the west) via a bridge over the M1 Motorway just to the west of the R132 / Hedgestown Roundabout. The LP01080 generally has a minimum cross-section of 6m along its length between the R132 and LP01090 junction. There are some residential properties and farm service roads with direct frontage onto the LP01080.
- **Tooman Road:** this is located east of the MEHL landfill and is approximately 1.5km long. There are approximately 15 residential properties accessed from this road. The road has a narrow carriageway and a number of bends with poor visibility.
- **R108 Naul Road:** This is a north south regional road linking St. Margaret's in the south to Balbriggan in the north.
- **R132:** Having provided the main Dublin to Belfast road connection, this is now a regional road linking the N1 in Santry to Dundalk. The road caters for local traffic between towns and villages in North Co Dublin, Meath and Louth.
- **M1:** This is a national motorway connecting Dublin to Belfast. It's a two-lane carriageway in both directions with a hard shoulder and is the busiest road in the vicinity of the site.

Junctions

- **LP01080 / LP01090:** This is a 3-arm priority junction, currently being used by the majority of trucks entering the existing MEHL landfill. It is estimated to have a visibility of 35m to the left at this junction. The required forward visibility to the left along LP01080 (an 80kph road) is 145m according to the DMRB. Therefore, forward visibility to the left from LP01090 is far below standard at this junction. There is a high proportion of HGVs using this junction, and thus safety should be maximised.
- **LP01080 / Tooman Road:** this is a 4-arm crossroad junction. Tooman Road has a steep gradient rising from this junction to the North. The majority of HGVs accessing and egressing the site pass through this junction along LP01080.
- **M1 Courtlough Interchange (East and West):** These are two 4-arm roundabouts with on and off slips to and from the M1. Each of these roads are single lane carriageways. The inscribed circle diameters of the eastern and western roundabouts are approximately 32m and 35m respectively. The existing and proposed M1 business parks are accessed via this interchange.
- **LP01080 / "Five Roads" Roundabout:** This is a 4-arm roundabout junction, located at the eastern end of the LP01080. The junctions arms include the R132 flyover, a link to the on and off ramps for R132 northbound and an access to a cul-de sac road. The majority of HGVs accessing and egressing the site pass through this junction along LP01080.
- **R132 / Hedgestown Roundabout:** This is a 4-arm roundabout junction, located south of the LP01080 / "Five Roads" junction. Two of the arms on the roundabout are the on and off ramps for the R132 southbound. Another arm is the R132 flyover which links to the LP01080 / "Five Roads" roundabout. The majority of HGVs currently accessing the landfill pass through this junction.

8.3.4 Existing Traffic Levels

Existing peak hour traffic levels on the surrounding network are estimated from the forecasted 2009 'Do Nothing' scenario traffic flows from Fingal Landfill EIS project. According to this report, AM and PM peak hour periods were identified as 08:00-09:00 for AM peak hour and 17:00-18:00 for PM peak hour for the surrounding road network.

The various assumptions for the existing 2010 scenario are included as described in Section 8.2.2 of this report. Using these assumptions, existing 2010 traffic flows to the network are calculated. **Table 8.2** and **Figure 8.2** shows the 2010 peak traffic flows on relevant links and junctions surrounding to the site.

Table 8.2 Existing 2010 Link Traffic Flows (Two-Way) (veh/hr)

Link	AM Peak	PM Peak
LP01090	55	75
LP01080 West of LP01090	113	145
LP01080 East of LP01090	135	156
Ballyboghill Road	18	33
LP01080 East of Tooman Road	124	144

Link	AM Peak	PM Peak
Tooman Road	33	41
M1 Flyover	734	1015
Rowan Rd (East of M1 Interchange)	1332	1410
R132	698	730
R132 Flyover	76	113
M1 North of Interchange	3502	3362
M1 South of interchange	3716	3962

Table 8.3 Existing 2010 Junction Traffic Flows (Two-Way) (veh/hr)

Junction	AM Peak	PM Peak
LP01090 / LP01080	151	188
LP01080 / Tooman Rd	155	187
M1 Interchange West Roundabout	752	1050
M1 Interchange East Roundabout	1383	1510
R132 / Hedgestown Roundabout	97	129
LP01080 / The "Five Roads" Roundabout	131	176

8.3.5 Current Site Access & Car Parking

The current access to the site is located off LP01090. This road has a steep gradient up to the access. There is limited sight visibility at the LP01080 / LP01090 junction. All trucks accessing the development must negotiate this junction. As part of the proposed development, the existing access will no longer be used by normal site traffic, but will be retained for emergency purposes only.

There are no marked parking spaces in the MEHL site. The area where staff and visitors currently park can cater up to approximately 8-10 vehicles. Vehicular trips to the site other than those of HGVs predominantly take place before the AM peak hour.

8.3.6 Existing Public Transport

There is no public transport in close proximity to the MEHL site. Dublin Bus service 33 and 33a run through the town of Lusk, approximately 8km from the site.

The 101 expressway bus service by Bus Éireann stops at various locations between Dublin and Drogheda, including stops at Balbriggan and Balrothery. This is a frequent service with buses running every 20mins during the peak periods and every 30mins during the off-peak periods. The nearest stop is on the R132 at the Hedgestown roundabout slip road.

8.3.7 Existing Walking and Cycling Facilities

There are currently no pedestrian or cycling facilities available along Tooman Rd., Rowan's Rd, LP01080 or LP01090.

8.4 Proposed Development

8.4.1 Proposed Facility

The proposed MEHL integrated waste management facility will be for non-biodegradable waste, including hazardous waste. The development also includes a proposal to relocate the existing site access from local road LP01090 to LP01080.

There is no proposal to increase the current landfill intake capacity of 500,000 tonnes per annum.

8.4.2 Proposed Site Entrance and Access

A new entrance and access road off LP01080 is proposed for the MEHL waste facility, replacing the existing access off LP01090. It is a 3-arm priority junction with the development entrance forming the minor arm and LP01080 forming the major arm. The proposed entrance is described in more detail in **Chapter 4** *Proposed Site and Project Description* and can be seen in **Figure 4.4.** The proposed entrance has been included as a special local planning objective in the Draft Fingal Development Plan 2011 – 2017.

The impact of the traffic distribution as a result of the relocated access is generally positive, as the existing HGVs associated with the landfill travel from the east along the LP01080 and pass the location of the proposed new access. The new entrance will mean that none of the HGVs will have to travel via the LP01090 / LP01080 junction, which has poor visibility, or along LP01090, which has a steep gradient, to the existing access to the site. It is proposed that the existing access will still be retained for emergency purposes only.

The proposed entrance is in accordance with the requirements of the NRA's Design Manual for Roads and Bridge (DMRB). To provide the necessary visibility, some hedgerows will be removed and replaced at the amended entrance.

The access road allows for queuing of 20 HGVs internally within the site from the access junction up to the weighbridge (approximately 200m). This will avoid HGVs queuing on the public road.

8.4.3 Car Parking

It is proposed to have fifteen car parking spaces associated with the new development. The development plan standard does not specify a standard for quarry/landfill. Due to the rural location of the development and lack of public transport in the area, nine spaces are deemed adequate.

8.5 Development Trips

8.5.1 Trip Generation Operational

The existing EPA waste licence and planning permission for the existing development allows for the acceptance of up to 500,000 tonnes of waste per annum. There has been a dramatic reduction in the amount of waste the facility has been accepting due to the current recession. Assuming the facility is open for 300 days per annum, and an average of 20 tonne per load (see Table 8.1), it is estimated that there would be 83 truck loads per day (166 two-way movements) if maximum intake was achieved annually.

Other daily movements will include staff, visitors and delivery and collection of cement, acid and leachate. Assuming a worst case scenario, this amounts to an additional 51 two-way trips per day.

Therefore, the number of trucks and other movements equates to a maximum average of 25 two-way movements per hour (over a 9 hour day) in and out of the facility. For a robust assessment, a peak hour factor of 2 has been assumed, therefore 58 two-way movements are assumed for appraisal purposes.

It is assumed that there will not be any increase in traffic levels due to the proposed development. Therefore for both the “Do Nothing” and “Do Something” scenario, 25 one-way trips to and from the site are used for trip generation.

8.5.2 Trip Generation - 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 associated with the existing inert waste facility, at a similar volume to that experienced at the site during operations in 2010, as the site footprint will be subject to significant reconfiguration and redevelopment.

At its peak, it is estimated that 3 tipper trucks would be filled every 12 minutes, equating to 240 trips (two-way) per day. 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.

Throughout the life of the proposed waste facility, there will be intermittent periods of construction activity associated with the proposed development as it is necessary for one waste cell to be constructed before the previous waste cell has reached its capacity. However, for a “worst case” scenario, it is assumed that there will be 20 trips (two-way) associated with construction activity in 2014 and 18 trips (two-way) associated with construction activity in 2024, both during the AM and PM peak hour periods of “Do Something” scenario.

8.5.3 Trip Distribution

The trip distribution for the different scenarios is outlined below, based on the assumptions presented for each of these scenarios in Section 8.2.2.

- For “Do Nothing” scenario

The existing directional split of site traffic at the LP01080 / LP01090 is 98% to and from the east and 2% to and from the west. The existing eastbound site traffic is then distributed 100% along the M1. The majority of HGVs originate from south of the facility and it is estimated that of the HGVs using the M1, that 98% of traffic travel south and 2% travel north.

In the future “Do Nothing” scenarios, the existing distributions have been retained as the waste being accepted at the landfill will remain the same.

- For “Do Something” scenario

Due consideration had been given to establishing likely changes in trip distribution pattern for HGVs travelling to and from M1. A proportion of the waste accepted by the proposed development will originate from north of the site. Therefore, in comparison to “Do Nothing” scenario, a higher proportion of the traffic would be travelling to and from north of the site. It is assumed that in the “Do Something” scenario, that 80% of HGVs that are currently using the M1 will originate from the south with the other 20% of HGVs originating from the north.

It is estimated that 100% of the construction vehicles will travel to and from the south along the M1.

The “Without Fingal Landfill” and “With Fingal Landfill” scenarios have also been taken into account. The “Without Fingal Landfill” scenario assumes all traffic using the M1 associated with the development will use the LP01080 / “Five Roads” roundabout junction. The “With Fingal Landfill” scenario assumes that the all traffic associated with M1 will use the new “County” Road proposed as per Fingal Landfill EIS project.

The traffic distribution and traffic flows for all scenarios are presented in **Figures 8.3 – 8.12.**

8.5.4 Traffic Assignment

The waste trips and construction trips have been applied to the road network and are presented in **Tables 8.4** to **8.6** and **Figures 8.3 – 8.12.**

8.6 Traffic Impact

This section looks at the traffic impact of the proposed MEHL development on the surrounding road network.

8.6.1 Link Assessments

The two-way traffic flows on the roads along the routes which the vehicles will travel to and from the site are shown in **Tables 8.4 - 8.6** for the “Do Nothing” and “Do Something” scenarios, both ‘With’ and ‘Without’ the Fingal Landfill Project in place. An interim year of 2014 and a design year of 2024 have been analysed. The earthworks construction stage year of 2011 has also been considered for ‘Without’ the Fingal Landfill Project only as it will not be in place by then.

Table 8.4 2011 Link Traffic Flow Increases

Link	Peak Period	Without Fingal Landfill		
		DN	DS	% Diff
LP01090	AM	94	56	-41%
LP01080 West of LP01090		117	116	-1%
LP01080 East of LP01090		176	138	-21%
Ballyboghill Rd		19	19	0%
LP01080 East of Tooman Rd		164	171	4%
Tooman Rd		34	34	0%
Rowans Rd (West of M1 Bus. Park West)		159	159	0%
Rowans Rd (East of M1 Bus. Park West)		426	426	0%
M1 Flyover		840	843	0%
Rowan Rd (East of M1 Interchange)		1409	1416	0%
R132		756	763	1%
R132 Flyover		97	100	3%
M1 North of Interchange		3915	3914	0%
M1 South of interchange		4265	4273	0%
LP01090	PM	77	77	0%
LP01080 West		150	150	0%
LP01080 East		161	161	0%
Ballyboghill Rd		34	34	0%
LP01080 East of Tooman Rd		148	192	30%
Tooman Rd		42	42	0%
Rowans Rd (West of M1 Bus. Park West)		288	288	0%
Rowans Rd (East of M1 Bus. Park West)		556	556	0%
M1 Flyover		1055	1077	2%
Rowan Rd (East of M1 Interchange)		1452	1496	3%
R132		752	796	6%
R132 Flyover		116	138	19%
M1 North of Interchange		4387	4387	0%
M1 South of interchange		4758	4802	1%

(DN = Do Nothing, DS = Do Something)

LP01080 and R132 flyover both experience increase in traffic flows of greater than 5% during the PM as there was previously negligible operational traffic during the PM peak hour period. However, these roads have low volumes of traffic on them and the additional traffic volumes are not anticipated to generate any significant delays on these roads.

Decreases on certain links are as a result of the location of the new site entrance off LP01080 and decrease of operational traffic during construction.

Table 8.5 2014 Link Traffic Flow Increases

Link	Peak Period	Without Fingal Landfill			With Fingal Landfill		
		DN	DS	% Diff	DN	DS	% Diff
LP01090	AM	94	44	-53%	94	31	-67%
LP01080 West of LP01090		118	118	0%	121	121	0%
LP01080 East of LP01090		177	129	-27%	174	113	-35%
Ballyboghill Rd		19	19	0%	19	19	0%
LP01080 East of Tooman Rd		165	185	12%	172	192	12%
Tooman Rd		34	34	0%	34	34	0%
Rowans Rd (West of M1 Bus. Park West)		160	160	0%	409	429	5%
Rowans Rd (East of M1 Bus. Park West)		431	431	0%	679	699	3%
M1 Flyover		848	858	1%	1024	1034	1%
Rowan Rd (East of M1 Interchange)		1422	1442	1%	1526	1526	0%
R132		763	783	3%	820	820	0%
R132 Flyover		98	108	10%	18	18	0%
M1 North of Interchange		3953	3962	0%	3958	3967	0%
M1 South of interchange		4306	4318	0%	4360	4372	0%
LP01090	PM	78	78	0%	78	78	0%
LP01080 West		151	151	0%	151	151	0%
LP01080 East		162	162	0%	162	162	0%
Ballyboghill Rd		34	34	0%	34	34	0%
LP01080 East of Tooman Rd		150	170	13%	151	171	13%
Tooman Rd		43	43	0%	43	43	0%
Rowans Rd (West of M1 Bus. Park West)		291	291	0%	474	494	4%
Rowans Rd (East of M1 Bus. Park West)		562	562	0%	745	765	3%
M1 Flyover		1065	1075	1%	1232	1242	1%
Rowan Rd (East of M1 Interchange)		1466	1486	1%	1617	1617	0%
R132		759	779	3%	859	859	0%
R132 Flyover		118	128	9%	36	36	0%
M1 North of Interchange		4429	4429	0%	4430	4430	0%
M1 South of interchange		4804	4824	0%	4835	4855	0%

(DN = Do Nothing, DS = Do Something)

LP01080 and R132 flyover both experience increase in traffic flows of greater than 5%. However, these roads have low volumes of traffic on them and the additional traffic volumes are not anticipated to generate any significant delays on these roads.

Decreases on certain links are as a result of the new road layout, including the new 'County Road' and the location of the new site entrance off LP01080.

Table 8.6   2024 Link Traffic Flow Increases

Link	Peak Period	Without Fingal Landfill			With Fingal Landfill		
		DN	DS	% Diff	DN	DS	% Diff
LP01090	AM	103	53	-49%	103	53	-49%
LP01080 West		116	116	0%	116	116	0%
LP01080 East		185	137	-26%	185	137	-26%
Ballyboghill Rd		23	23	0%	23	23	0%
LP01080 East of Tooman Rd		170	188	11%	177	195	10%
Tooman Rd		40	40	0%	40	40	0%
Rowans Rd (West of M1 Bus. Park West)		262	262	0%	512	530	4%
Rowans Rd (East of M1 Bus. Park West)		1357	1357	0%	1607	1625	1%
M1 Flyover		1650	1659	1%	1829	1838	0%
Rowan Rd (East of M1 Interchange)		2207	2225	1%	2298	2298	0%
R132		1243	1261	1%	1280	1280	0%
R132 Flyover		105	114	9%	21	21	0%
M1 North of Interchange		5243	5276	1%	5275	5284	0%
M1 South of interchange		5781	5814	1%	5863	5872	0%
LP01090	PM	60	60	0%	60	60	0%
LP01080 West		133	133	0%	133	133	0%
LP01080 East		161	161	0%	161	161	0%
Ballyboghill Rd		42	42	0%	41	41	0%
LP01080 East of Tooman Rd		149	167	12%	149	167	12%
Tooman Rd		48	48	0%	48	48	0%
Rowans Rd (West of M1 Bus. Park West)		415	415	0%	592	610	3%
Rowans Rd (East of M1 Bus. Park West)		1510	1510	0%	1687	1705	1%
M1 Flyover		2000	2009	0%	2151	2160	0%
Rowan Rd (East of M1 Interchange)		2269	2287	1%	2417	2417	0%
R132		1247	1265	1%	1339	1339	0%
R132 Flyover		123	132	7%	42	42	0%
M1 North of Interchange		5849	5849	0%	5873	5873	0%
M1 South of interchange		6439	6457	0%	6469	6487	0%

(DN = Do Nothing, DS = Do Something)

LP01080 and R132 flyover link both experience increase in traffic flows of greater than 5%. However, these roads have significantly low volumes of traffic on them and the additional traffic volumes are not anticipated to have any significant impact on these roads.

Decreases on certain links are as a result of the new road layout, including the new ‘County Road’ and the location of the new site entrance off LP01080.

8.6.2 Junction Assessments

The total traffic flows at each of the junctions described earlier in Section 8.3.3 have been listed in **Tables 8.7 - 8.9** for the “Do Nothing” and “Do Something” scenarios, both with and without the Fingal Landfill Project in place. An interim year of 2014 and a design year of 2024 have been analysed. The earthworks construction stage year of 2011 has also been considered for ‘Without’ the Fingal Landfill Project only as it will not be in place by then.

A detailed modelling analysis of a junction is generally required when a development causes a 5% or greater increase in the total traffic.

Table 8.7 2011 Junction Traffic Flow Increases

Junction	Peak Period	Without Fingal Landfill		
		DN	DS	% Diff
LP01090 / LP01080	AM	193	155	-20%
LP01080 / Tooman Rd		196	203	3%
M1 Business Park West Roundabout		449	449	0%
M1 Interchange West Roundabout		956	960	0%
M1 Interchange East Roundabout		1529	1535	0%
M1 Business Park East Roundabout		1906	1912	0%
R132 / Hedgestown Roundabout		119	122	3%
LP01080 / “Five Roads” Roundabout		172	179	4%
LP01090 / LP01080	PM	194	194	0%
LP01080 / Tooman Rd		193	237	23%
M1 Business Park West Roundabout		579	579	0%
M1 Interchange West Roundabout		1164	1186	2%
M1 Interchange East Roundabout		1565	1609	3%
M1 Business Park East Roundabout		2018	2062	2%
R132 / Hedgestown Roundabout		133	155	17%
LP01080 / “Five Roads” Roundabout		181	225	24%

(DN = Do Nothing, DS = Do Something)

As can be seen in **Table 8.7**, there are increases of 17 - 24% at the LP01080 / Tooman Rd junction, LP01080 / “Five Roads” Roundabout and R132 / Hedgestown Roundabout in the PM peak hour only. Traffic decreases at these junctions during the AM peak hour due to the decreased operational traffic.

Traffic levels at each of these junctions are low, with the LP01080 / Tooman Rd junction having the highest level of traffic flow. An increase of 44 vehicles equates to a 23% increase in traffic flows during the PM peak hour. As the traffic levels are at a low level, it is not deemed necessary to provide further junction assessments for 2011 construction scenario.

The M1 interchange roundabouts experience only a 2%-3% increase in traffic due to the earthworks construction stage.

Table 8.8 2014 Junction Traffic Flow Increases

Junction	Peak Period	Without Fingal Landfill			With Fingal Landfill		
		DN	DS	% Diff	DN	DS	% Diff
LP01090 / LP01080	AM	195	146	-25%	195	132	-32%
LP01080 / Tooman Rd		198	218	10%	204	224	10%
M1 Business Park West Roundabout		453	453	0%	702	722	3%
M1 Interchange West Roundabout		965	975	1%	1192	1212	2%
M1 Interchange East Roundabout		1543	1563	1%	1697	1707	1%
M1 Business Park East Roundabout		1924	1944	1%	2017	2017	0%
R132 / Hedgestown Roundabout		120	130	8%	42	42	0%
LP01080 / "Five Roads" Roundabout		173	193	12%	19	19	0%
LP01090 / LP01080	PM	196	196	0%	196	196	0%
LP01080 / Tooman Rd		194	214	10%	196	216	10%
M1 Business Park West Roundabout		584	584	0%	768	788	3%
M1 Interchange West Roundabout		1175	1185	1%	1358	1378	1%
M1 Interchange East Roundabout		1580	1600	1%	1746	1756	1%
M1 Business Park East Roundabout		2037	2057	1%	2177	2177	0%
R132 / Hedgestown Roundabout		134	144	7%	53	53	0%
LP01080 / "Five Roads" Roundabout		183	203	11%	42	42	0%

(DN = Do Nothing, DS = Do Something)

As can be seen in **Table 8.8**, there are increases of 8%-11% at the LP01080 / Tooman Rd junction in the AM and PM peak hour and at the LP01080 / "Five Roads" Roundabout and R132 / Hedgestown Roundabout during the AM peak hour only.

Traffic levels at each of these junctions are low, with the LP01080 / Tooman Road junction having the highest level of traffic flow. An increase of 20 vehicles equates to a 10% increase in traffic flows during the AM peak hour (With Fingal, Do Something). As the traffic levels are at a low level, it is not deemed necessary to provide further junction assessments for 2014 scenarios.

The M1 interchange roundabouts experience only a 1%-2% increase in traffic due to the development.

Table 8.9 2024 Junction Traffic Flow Increases

Junction	Peak Period	Without Fingal Landfill			With Fingal Landfill		
		DN	DS	% Diff	DN	DS	% Diff
LP01090 / LP01080	AM	202	153	-24%	202	153	-24%
LP01080 / Tooman Rd		209	227	9%	216	234	8%
M1 Business Park West Roundabout		1446	1446	0%	1696	1714	1%
M1 Interchange West Roundabout		2072	2081	0%	2300	2318	1%
M1 Interchange East Roundabout		2564	2582	1%	2709	2718	0%
M1 Business Park East Roundabout		2853	2871	1%	2940	2940	0%
R132 / Hedgestown Roundabout		132	141	7%	51	51	0%
LP01080 / "Five Roads" Roundabout		178	196	10%	22	22	0%
LP01090 / LP01080	PM	177	177	0%	177	177	0%
LP01080 / Tooman Rd		200	218	9%	200	218	9%
M1 Business Park West Roundabout		1599	1599	0%	1776	1794	1%
M1 Interchange West Roundabout		2341	2350	0%	2507	2525	1%
M1 Interchange East Roundabout		2678	2696	1%	2832	2841	0%
M1 Business Park East Roundabout		3000	3018	1%	3135	3135	0%
R132 / Hedgestown Roundabout		146	155	6%	64	64	0%
LP01080 / "Five Roads" Roundabout		187	205	10%	49	49	0%

(DN = Do Nothing, DS = Do Something)

Similarly to **Table 8.8**, in **Table 8.9**, there are increases of 8%-10% at the LP01080 / Tooman Road junction in the AM and PM peak hour and at the LP01080 / "Five Roads" Roundabout and R132 / Hedgestown Roundabout during the AM peak hour only. Traffic levels associated with the MEHL development are not expected to increase between 2014 and 2024.

Traffic levels at each of these junctions are low, with the LP01080 / Tooman Road junction having the highest level of traffic flow. An increase of 18 vehicles equates to a 8% increase in traffic flows during the AM peak hour (With Fingal, Do Something). As the traffic levels are at a low level, it is not deemed necessary to provide further junction assessments for 2024 scenarios.

The M1 interchange roundabouts experience only a 1% increase in traffic due to the development.

8.7 Mitigation Measures

As there will be no change in the peak volume of traffic entering and exiting the facility, mitigation measures are not required as a result of the proposals. Any mitigation measures regarding the construction stage of the development are outlined in **Chapter 5** *Construction Activities*.

8.7.1 Residual Impacts

There will be no significant negative residual impacts associated with the development from a traffic and transportation viewpoint. There are beneficial residual impacts in terms of site access as the proposed new entrance off LP01080 is much safer, with greater visibility than the existing access off LP01090.

8.7.2 References

This report has been prepared taking into account the following documentation:

"Traffic and Transport Assessment Guidelines", National Roads Authority, September 2007,

"Guidance on Transport Assessment", UK Department for Transport, March 2007,

"Traffic Management Guidelines", 2003, Department of the Environment and Local Government, Dublin Transportation Office, Department of Transport,

"Design Manual for Roads and Bridges", National Roads Authority

Transportation Research Board, (2000). Highway Capacity Manual.

Fingal Development Plan

National Roads Authority, (2003). Future Traffic Forecast 2002 to 2040.

UK Highways Agency's, (2009). Design Manual for Roads and Bridges; DMRB Volume 11.

UK Highways Agency, (1999). Design Manual for Roads and Bridges. Traffic Capacity of Urban Roads. TA 79/99.

Environmental Protection Agency, (2002). Guidelines on the Information to be Contained in Environmental Impact Statements.

Environmental Protection Agency, (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

Fingal Landfill Project- 2007 Environment Impact Assessment, Technical Appendix G-April 2006.

9 Air Quality

9.1 Introduction

This chapter 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. The existing ambient air quality environment is described and the likely significant impacts on air quality associated with both the construction and operational phases are assessed.

9.2 Assessment Methodology

This section outlines the methodology used to assess both the construction and operational impacts of the proposed MEHL facility and outlines the air quality standards and significance criteria against which the impacts are assessed.

The structure and content of this assessment are in accordance with the EPA 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002) and the EPA 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003).

The assessment of the construction phase considers 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 considers the impact of operational traffic, fugitive emissions and odour.

9.2.1 Legislation and Guidance

In order to reduce the impact of poor air quality on human health and on the environment, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or Air Quality Standards (AQS) are prescribed for the protection of human health and ecosystems.

The Air Quality Standards Regulations 2002 (SI No. 271 of 2002) establish the limit values in Ireland for total oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), particulate matter less than 10µm in diameter (PM_{10}), benzene and carbon monoxide (CO). These regulations transpose the requirements of EU Directives 1999/30/EC and 2000/69/EC. The limit values relevant to this assessment are presented in **Table 9.1** below.

In June 2008 the European Union published the Directive 2008/50/EC (of the European Parliament and of the Council) of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe. This new air quality Directive repeals Directives 96/62/EC, 1999/30/EC, 2000/69/EC, 2002/3/EC and Decision 97/101/EC. As a Member State, Ireland is obliged to transpose this Directive into law before 11 June 2010. This Directive has not been transposed in Ireland to date.

The principal change resulting from the new Directive is the replacement of the Air Quality Standard (AQS) (SI No. 271 of 2002) for PM_{10} of 20 µg/m^3 with a new limit value of 40 µg/m^3. The Directive also specifies a Stage 1 annual mean limit value for particulate matter less than 2.5µm in diameter ($PM_{2.5}$) of 25 µg/m^3

to be achieved by 2015 and a Stage 2 annual mean limit value of 20 $\mu g/m^3$ to be achieved by 2020. This Stage 2 limit value is to be reviewed by the Commission in 2013, taking into account any developments on health, environmental effects and experience of the limit value within Member States. These new limit values are included in **Table 9.1** below.

There are no AQSs in Irish regulations for Volatile Organic Compounds (VOCs) with the exception of benzene. The AQS for benzene is also presented in **Table 9.1** below.

Table 9.1 AQS Regulations 2002 (No. 271 of 2002) and Other Relevant Guidance

Pollutant	Limit value for the protection of:	Averaging period	Limit value ($\mu g/m^3$)	Basis of application of limit value	Limit value attainment date
NO_2	human health	1-hour	200	≤18 exceedances p.a. (99.79 %ile)	1 January 2010
		Calendar year	40	Annual mean	1 January 2010
SO_2	human health	1-hour	350	≤24 exceedances p.a. (99.73 %ile)	17 June 2002
	human health	24-hour	125	≤3 exceedances p.a. (99.18 %ile)	17 June 2002
	vegetation	Calendar year and winter (1 October to 31 March)	20	Annual mean	17 June 2002
NO_x	vegetation	Calendar year	30	Annual mean	1 January 2010
PM_{10}	human health	24-hours	50	≤7 exceedances p.a. (98%ile)[1] ≤35 exceedances p.a. (90%ile)[2]	1 January 2010 (Stage 2)[1]
		Calendar year	20[1] /40[2]	Annual mean	1 January 2010 (Stage 2)[1]
$PM_{2.5}$	human health	Calendar year	25[2]	Concentration cap	1 January 2015
		Calendar year	20[2, 3]	Annual mean	1 January 2020
Benzene	human health	Calendar year	5	Annual mean	1 January 2010
CO	human health	8-hour running mean	10,000	Max. daily 8-hour mean	1 January 2005

[1] S.I. No. 271 of 2002

[2] 2008/50/EC

[3] Indicative value to be reviewed by the Commission in 2013

MEHL is required to undertake dust deposition monitoring biannually at four locations in accordance with their current EPA Waste Licence (No. W0129-02) with a licence limit value of 350mg/m^2/day averaged over a 30-day period.

9.2.2 Construction Phase Impact Assessment Methodology

The following potential sources are considered in this assessment:

- Construction and landfilling activities.
- Construction traffic.

9.2.2.1 Construction and Landfilling Activities

The National Roads Authority (NRA) guidance 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes' (2006) states that "*it is very difficult to accurately quantify dust emissions arising from construction activities*". It advises the use of a semi-quantitative approach to determine the likelihood of a significant impact, which it combines with an assessment of the proposed mitigation measures.

Dust emissions from construction sites can lead to elevated PM_{10} concentrations locally and can cause soiling of properties. The assessment criteria, taken from the NRA guidance, are outlined in **Table 9.2** below.

The distance criteria specified by the NRA in **Table 9.2** are applicable to this assessment as they consider the potential for significant effects based on the scale of construction activities.

Table 9.2 Assessment Criteria for the Impact of Dust Emissions from Construction Activities with Standard Mitigation in Place (NRA 2006)

Source		**Potential distance for Significant Effects (Distance from Source)**		
Scale	Description	Soiling	PM10 a	Vegetation Effects
Major	Large construction sites, with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites, with limited use of haul routes	25m	10m	10m

[a] Significance based on the PM_{10} Limit Values specified in S.I. No. 271 of 2002, which allows 35 daily exceedances/year of 50 µg/m³

Standard mitigation measures are assumed to include the following:

- Spraying of earthwork activities and site haul roads during dry conditions.
- Provision of wheelwashes at exit points.
- Control of vehicle speeds and speed restrictions.
- Sweeping of hard surface roads.

The impact is assessed in terms of the following significance criteria as outlined in the EPA 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003):

- Imperceptible Impact - An impact capable of measurement but without noticeable consequences.
- Slight Impact - An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate Impact - An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
- Significant Impact- An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- Profound Impact - An impact which obliterates sensitive characteristics.

The activities at the MEHL site will be undertaken in four phases (refer to **Chapter 5** *Construction Activities*). Phase 1 will comprise the civil engineering works and construction of first waste cells, whereas Phases 2 - 4 will comprise the construction of further cells and day to day filling and restoration of cells.

It is proposed to use Dense Asphaltic Concrete (DAC) for lining of the base and walls of hazardous waste cells. The air quality impacts associated with the construction of DAC liners are assessed in relation to the duration of construction and the proximity of the closest sensitive receptors.

9.2.2.2 Construction Traffic

The UK Highways Agency 'Design Manual for Roads and Bridges' (DMRB, 2007) states that if daily traffic flows change by less than 1,000 annual average daily traffic (AADT) or Heavy Duty Vehicle (HDV) flows change by less than 200 AADT then the impact on air quality can be considered neutral. During the construction phase, no routes are predicted to achieve an increase of this significance, refer to **Chapter 8** *Roads and Traffic*.

9.2.3 Operational Phase Impact Assessment Methodology

The following potential operational sources are considered in this assessment:

- Operational site traffic
- Odour
- Fugitive emissions

It is only proposed to accept non-biodegradable material at the MEHL facility, therefore impacts associated with the generation of methane and carbon from the decomposition of organic materials are not considered.

9.2.3.1 Operational Traffic

As stated above, the DMRB specifies that if daily traffic flows change by less than 1,000 annual average daily traffic (AADT) or Heavy Duty Vehicle (HDV) flows change by less than 200 AADT then the impact on air quality can be considered neutral. During the operational phase, no routes are predicted to achieve an increase of this significance. Moreover, decreases in HDVs are predicted on the LP01090 and LP01080 East of LPO1090 due to the relocation of the site entrance, refer to **Chapter 8** *Roads and Traffic*.

9.2.3.2 Odour

The assessment of potential odour impact is assessed in relation to the material to be received on site, the proposed waste handling procedure and the proximity of the closest sensitive receptors.

9.2.3.3 Fugitive Emissions

Contaminated soils have the potential to release fugitive volatile organic compounds (VOC) emissions. These emissions are assessed in relation to the proposed waste handling procedures and the proximity of the closest sensitive receptors. The impact of heavy metals and dust during normal site operations, i.e. handling and processing of waste is also considered.

9.3 Receiving Environment

9.3.1 EPA Background Concentrations

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.

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)

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 9.3**). All measured values are easily in compliance with relevant limit values.

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 9.3 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.

9.3.2 On Site Monitoring

MEHL undertakes dust deposition monitoring biannually at four locations in accordance with their current Environmental Protection Agency (EPA) Waste Licence (No. W0129-02).

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.

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.

9.4 Evaluation of Air Quality Impacts

9.4.1 Construction Phase

9.4.1.1 Construction Activities

The bulk of the construction activities will be undertaken during Phase 1 site activities (refer to **Chapter 5** *Construction Activities*) and will comprise the following:

1. Construct new site entrance with access road at the southern boundary.
2. Install and commission services, electricity, telecommunications & water.
3. Initial landscaping works.
4. Construct new administration building & site management infrastructure.
5. Construct and commission leachate management collection infrastructure.
6. Construct and commission leachate holding tank for hazardous cell H1.
7. Remove and decommission existing site infrastructure.
8. Construct and commission surface water management infrastructure.
9. Excavate natural ground from eastern slope for Solidification Plant.
10. Construct and commission Solidification Plant and Storage Building.
11. Construct engineered bund between Non Hazardous and Inert Waste cells.
12. Construct Hazardous Waste Cell H1.
13. Commence Operation of Hazardous Waste Cell H1.
14. Remove inert waste from the existing Inert Waste Cell to Inert Waste Cell IN1.
15. Construct & partially fill Inert Waste Cell IN1 up to 125m OD Malin.
16. Complete the capping & restoration of Inert Waste Cells C1, C2.
17. Cap and restore Hazardous Waste Cell H1 at the end of Phase 1/beginning of Phase 2.
18. Construct Hazardous Waste Cell H2 at the end of Phase 1/beginning of Phase 2.
19. Operate Inert Waste Cell C5.
20. Construct Inert Waste Cell IN3 at the end of Phase 1/beginning of Phase 2.
21. Construct and commission stormwater wetlands treatment area in the north of the site.

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.

Two private residential properties adjoin the southern boundary. Refer to 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.

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.

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.

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.

9.4.1.2 Construction Traffic

During the construction phase, no routes are predicted to achieve a significant increase in traffic volumes, refer to Section 9.2.3.1.

9.4.2 Operational Phase

9.4.2.1 Operational Traffic

During the operational phase, no routes are predicted to achieve a significant increase in traffic volumes, refer to Section 9.2.3.1.

9.4.2.2 Odour

The following material will be received at the landfill:

- Inert waste
- Non-biodegradable, solid non-hazardous wastes
- Suitable hazardous wastes

Odours from landfills are typically caused by the decomposition of waste.

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.

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.

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.

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.

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.

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.

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.

9.4.2.3 Fugitive Emissions

VOCs

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.

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.

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

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.

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

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.

For inert wastes, dust deposition monitoring for the existing facility (refer to Section 9.3.2) has demonstrated that monitored levels are generally well below the licensed limit. The movement of inert waste into the new inert waste cell IN1 is discussed in Section 9.4.1.1. No significant dust impact is anticipated as a result of the continued acceptance of inert waste on site.

As discussed in Section 9.4.2.2, 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.

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.

Hence no impact on the air quality environment is predicted to result from potential fugitive emissions.

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.

9.5 Mitigation Measures

9.5.1 Construction Phase

9.5.1.1 Construction Activities

The Contractor will be obliged to comply with the dust deposition limits set by the existing EPA Waste Licence.

The Contractor will compile a Dust Minimisation Plan. The mitigation measures detailed below will form part of the Dust Minimisation Plan.

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.

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.

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.

9.5.1.2 Construction Traffic

No mitigation measures are required as no negative impacts on air quality are predicted.

9.5.2 Operational Phase

9.5.2.1 Operational Traffic

No mitigation measures are required as no negative impacts on air quality are predicted.

9.5.2.2 Fugitive Emissions

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.

9.5.2.3 Odour Emissions

Routine walk-overs 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.

9.6 Residual Impacts

9.6.1 Construction Phase

Following the implementation of all mitigation measures outlined above, no significant soiling effects will be experienced at the nearest sensitive receptors.

9.6.2 Operational Phase

The residual impact on air quality as a result of the proposed scheme will not be significant following the implementation of all mitigation measures.

9.7 References

Building Research Establishment, 2003. Measurements of PM10 from a Construction Site: A Case Study, BRE Environment for National Society for Clean Air. BRE, Watford, UK.

Commission of the European Communities, 2008. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe.

Highways Agency (UK), 2007. Design Manual for Roads and Bridges – Volume 11. Highways Agency, UK.

Department for Environment, Food and Rural Affairs (UK), 2006. Local Air Quality Management - Technical Guidance. DEFRA, UK.

Environmental Protection Agency, 2002. Guidelines on Information to be Contained in Environmental Impact Statements.

Environmental Protection Agency, 2003. Advice Notes on Current Practice in the Preparation of Environmental Impact Statements.

Environmental Protection Agency, 2006. Environmental Management Guidelines. Environmental Management in the Extractive Industry (Non-Scheduled Minerals). EPA, Wexford, Ireland.

Environmental Protection Agency, 2010. Air Quality in Ireland 2009. EPA, Wexford, Ireland.

German Engineering Institute, German Standard VDI 2119 - Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method). German Engineering Institute, Germany.

National Roads Authority, 2006. Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Scheme. NRA, Dublin, Ireland.

TA Luft, 2002. Technical Instructions on Air Quality.

10 Climate

10.1 Introduction

The impacts of the proposed integrated waste management facility on climate were considered for both macro-climate and micro-climate. The climate of a large geographic area such as Ireland is defined as a macro-climate. The climate in the immediate area is known as the micro-climate.

The potential micro-climatic impacts were considered in relation to the existing micro-climatic conditions, the size of the proposed scheme and the nature of use of the surrounding environment.

The impact on macro-climate (and thus climate change) was considered in relation to Ireland's obligations under the Kyoto Protocol (Framework Convention On Climate Change, 1997; Framework Convention On Climate Change Ireland, 1999).

10.2 Assessment Methodology

The methodology used in the macro-climate assessment is as follows:

- Provide an overview of UN, EU and Irish policies in relation to climate change and reduction of greenhouse gases and note mechanisms in place to control greenhouse gases at the national level.
- Quantify the change in greenhouse gases emissions (as CO_2) due to the operation of the proposed scheme.

The methodology used in the micro-climate assessment is as follows:

- Describe the existing micro-climate conditions.
- Identify the issues which might affect micro-climate.
- Assess the significance in the context of the site.

10.3 Policies in relation to Climate Change

10.3.1 Kyoto Protocol Targets

Ireland is currently faced with meeting two targets with respect to greenhouse gas (GHG) emissions. The first of these is the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) which limits Ireland's total national emissions to an average of 62.8 M tonnes of CO_2 per annum (13% above the baseline estimate) in the period 2008 – 2012.

In January 2008, the EU Commission put forward a package of proposals that will deliver on the European Union's commitments to fight climate change and promote renewable energy up to 2020 and beyond. The package seeks to deliver a 20% reduction in total EU GHG emissions by 2020 (relative to 1990 levels). This was agreed by the EU Parliament and Council in December 2008.

10.4 Receiving Environment

In March 2009, the Environmental Protection Agency (EPA) revised its GHG projections based on the economic downturn (based on the Credit Crunch Scenario, contained in ESRI's Medium Term Review 2008 – 2015). The projected annual average emissions for 2008-2012 including specific measures due to be introduced by the government are 58M tonnes of CO_2. This projection is 4.5M tonnes less than the Kyoto limit. CO_2 emissions from road and rail transport in the EU are included in each Member State's national target.

According to the Met Éireann 30-year average climate data (1961 – 1990), the mean daily air temperature at the Dublin Airport meteorological station (the nearest meteorological station to the proposed development) is 5.0°C in January and 15.1°C in July. The mean daily temperature year-round average is 9.6°C.

The mean annual rainfall is 732.7 mm. On 128 days in the year the rainfall is more than 1 mm.

The mean annual wind speed is 5.1 m/s (Force 3 on the Beaufort Wind Scale - "Gentle Breeze").

The mean daily sunshine is 3.9 hours.

Meteorological monitoring is currently carried out on site as required by the current Waste Licence No. W0129-02.

10.5 Predicted Impacts

10.5.1 Macroclimate

In general the proposed development shall have a positive impact on CO_2 levels for the following reasons:

- The proposed facility will facilitate the development of waste-to-energy plants to treat municipal and other wastes. The use of waste to energy for the management of municipal waste will reduce the amount of biodegradable waste being landfilled. This, in turn, will reduce gaseous emissions of methane and carbon dioxide produced as a result of the decomposition of biodegradable material in the landfills.
- Waste to energy plants generate electricity which replaces the requirement for electricity generated by using fossil fuels.
- As the proposed facility will eliminate the requirement to ship certain hazardous wastes abroad for disposal, it is estimated that a saving of 3,100 tonnes of CO_2 will be made per year. This is based on an average of 106,000 tonnes per year of certain hazardous wastes being transported to Germany by sea (http://www.carbonfund.org/business/calculator). Although CO_2 savings cannot be accurately calculated, there is the potential for reductions in CO_2 emissions due to the combination of reduced truck miles required for waste transport when compared with that required for waste export and the proximity of the facility to major waste generators.
- The facility will accept non-biodegradable wastes only; it will therefore not generate landfill gas, a greenhouse gas.

As no significant increases in traffic volumes are predicted during the operational or construction phases (refer to **Chapter 8** *Roads and Traffic*), no impact on CO_2 from vehicle emissions is envisaged. No significant impacts on climate are envisaged during the construction phase of the development due to the limited scale of the construction phase.

10.5.2 Microclimate

Given that the site is already in use as a landfill for inert waste and that there will be no increase in annual tonnage of waste above the current licensed limit of 500,000 tonnes per annum, there will be no significant impact on microclimate.

10.6 Mitigation Measures

No climate mitigation measures are required for the proposed scheme as no negative impacts are predicted.

10.7 Residual Impacts

No significant residual impacts on climate are predicted as a result of the proposed scheme.

10.8 References

Department of the Environment, Heritage and Local Government (DoEHLG), 2007. National Climate Change Strategy 2007-2012. DoEHLG, Custom House, Dublin 1.

Met Éireann, 2010. www.meteireann.ie

UK Highways Agency, 2007. Design Manual for Roads and Bridges Screening Method, Version 1.03b. The Highways Agency, London, UK.

United Nations Framework Convention on Climate Change, 1997. Kyoto Protocol to the United Nations. UNFCC Bonn, Germany.

11 Noise and Vibration

11.1 Introduction

This chapter of the EIS presents an assessment of the potential impacts of noise and vibration from the proposed MEHL integrated waste management facility.

11.2 Assessment Methodology

11.2.1 Methodology Summary

The impact assessment has been conducted using the following methodology:

- In order to establish the current noise environment in the vicinity of the existing MEHL site, an attended baseline noise monitoring survey has been conducted. A review of annual noise monitoring results surveyed during 2008, 2009 and 2010 in accordance with the current EPA waste licence was also conducted.
- The key impacts of the proposed development have been assessed using the methodology set out in BS 5228 *Code of Practice for the Control of Noise and Vibration on Construction and Open Sites – Part 1: Noise & Part 2: Vibration* (2008) and ISO 9613*:* Acoustics: *Attenuation of Sound during propagation outdoors* (1996).
- Impacts relating to traffic noise were assessed with reference to the UK Department of Transport's *Calculation of Road Traffic Noise* (CRTN) (1988) document.
- Impacts relating to the operational services plant associated with the proposed MEHL facility were assessed in accordance with ISO 9613: 1996 Part 2 *General Method of Calculation* (1996).

11.2.2 Assessment Criteria

11.2.3 Noise Criteria

The existing MEHL facility is currently operated in accordance with EPA waste licence (W0129-02).

Schedule B4 of the waste licence sets out the emission limit values for noise applicable to the site at the nearest noise sensitive locations. These are as follows:

- Daytime dB(A) $L_{Aeq\ (30\ minutes)}$ 55 [note1]
- Night-time dB(A) $L_{Aeq\ (30\ minutes)}$ 45 [note1]

Note 1: *There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise-sensitive location.*

It is proposed therefore, that as part of the new licence for the proposed MEHL facility, the same noise limits, as set out above, will apply at the site.

The proposal to construct an integrated waste management facility for non biodegradable waste including hazardous waste at the existing site will involve periods where 'construction' activities are taking place at the site. Given the nature of this type of development however, the 'construction' and 'operational' phases will overlap as new cells are developed, filled, capped and restored. It is considered prudent therefore to treat all works associated with the development of the integrated waste management facility as part of the ongoing operation of the site.

In this instance, the operational noise limits set out in the current waste licence will apply to all activities associated with the 'construction' and 'operational' phases.

The emission limit values for the facility are based on emissions from activities within the bounds of the site. When considering activities outside the bounds of the site from traffic along surrounding roads, consideration is given to the relative change in noise level from additional traffic flows.

In order to assist with interpretation of vehicle related noise, **Table 11.1** offers guidance as to the likely impact associated with any particular change in traffic noise level.

Table 11.1 Likely Impact associated with change in Traffic Noise Level

Change in Ambient Noise Level (dB LAeq)	Subjective Reaction	Impact
< 3	Negligible	Imperceptible
3 – 5	Perceptible	Slight
6 – 10	Up to a doubling of loudness	Moderate
11 – 15	Over a doubling of loudness	Significant
> 15		Profound

11.2.4 Vibration Criteria

The current waste licence for the facility does not contain vibration limits as no vibration generating sources exist at the site. Whilst it is not proposed to introduce vibration sources into the operational phase of the proposed facility, there may be intermittent sources during the initial site works, where road works and excavation works are in operation.

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

It is acknowledged that humans are particularly sensitive to vibration stimuli and that any perception of vibration may lead to concern. In the case of road traffic, vibration is perceptible at around 0.5 mm/s and may become disturbing or annoying at higher magnitudes.

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385 1993: *Evaluation and Measurement of Vibration in Buildings: Guide to Damage Levels from Groundborne Vibration*, and;
- British Standard BS 5228-2 2009: *Code of Practice for Noise and Vibration Control on Construction and Open Sites: Vibration*.

BS 7385 states that there should typically be no cosmetic damage if transient vibration does not exceed 15 mm/s at low frequencies rising to 20 mm/s at 15 Hz and 50 mm/s at 40 Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings.

BS 5228 recommends that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15 mm/s for transient vibration at frequencies below 15 Hz and 20 mm/s at frequencies above than 15 Hz. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%. In addition, where continuous vibration is such that resonances are excited within structures the limits discussed above may need to be reduced by 50%.

The NRA document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* also contains information on the permissible construction vibration levels during the construction phase. These are set out in **Table 11.2**.

Table 11.2 Construction Vibration Limits

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

These limits are typically in line with those set by the EPA for licensed facilities such as quarries and mining operations which typically have vibration limits of 8-12mm/s daytime.

11.3 Receiving Environment

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.

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.

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.

11.3.1 Measurement Locations

Three measurement locations were selected; each is described in turn below and is shown in **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.

11.3.2 Instrumentation

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 **Appendix A11.1** for Certificate of Calibration.

11.3.3 Survey Periods

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.

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.

11.3.4 Procedure

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.

11.3.5 Weather

The weather during the daytime survey period was dry with temperatures of approximately 14°C and wind speeds were less than 2m/s.

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.

11.3.6 Measurement Parameters

The noise survey results are presented in terms of the following five parameters:

L_{Aeq} is 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} is the instantaneous maximum sound level measured during the sample period.

L_{Amin} is the instantaneous minimum sound level measured during the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

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 2×10^{-5} Pa.

11.3.7 Survey Results and Discussion

11.3.8 Location S01

The survey results for Location S01 are summarised in **Table 11.3** below.

Table 11.3 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

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}.

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}.

No source of vibration was observed.

11.3.9 Location S02

The survey results for Location S02 are summarised in **Table 11.4** below.

Table 11.4 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

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}.

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}.

No source of vibration was observed.

11.3.10 Location S03

The survey results for Location S03 are summarised in **Table 11.5** below.

Table 11.5 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}
Daytime	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

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}.

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}.

No source of vibration was observed.

11.3.11 Annual Waste Licence Monitoring

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.

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 **Figure 11.2** for annual monitoring locations.

Table 11.6 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 of the site	57	66	63	42	57	52
N8	Located along the local road at southeast corner of the site	62	69	63	48	59	45

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.

11.4 Noise and Vibration Characteristics of the Proposed Development

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.

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 **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.

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.

Each of these activities is discussed in the following sections.

11.5 Evaluation of the Noise and Vibration Impacts

11.5.1 Site Development and Cell Operation

11.5.1.1 Phase 1

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.

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.

Table 11.8 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. **Figure 11.3** illustrates the location of the assessment positions.

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 11.8 Phase 1 Site development and Cell Development Noise Calculations

Description	**Predicted Noise Level dB $L_{Aeq, 1 hr}$**			
(Plant Item and BS5228 Reference)	**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*
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	**Operation of Crusher and screener adjacent to**			

Description (Plant Item and BS5228 Reference)	Predicted Noise Level dB $L_{Aeq, 1 hr}$			
	NSL1	NSL2	NSL 3	NSL 4
Equipment (C9.14)*	**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.

The indicative calculated noise levels set out in **Table 11.8** 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.

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 11.8** and hence are expected to operate within the licence limits.

11.5.1.2 Phase 2

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.

Table 11.9 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 **Figure 11.3** have been assessed.

Table 11.9 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**

The indicative calculated noise levels set out in **Table 11.9** 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.

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 11.9** and hence are expected to operate within the licence limits.

11.5.1.3 Phase 3

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.

Table 11.10 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 **Figure 11.3** have been assessed.

Table 11.10 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
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**			
Asplalt 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

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	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**

The indicative calculated noise levels set out in **Table 11.10** 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.

11.5.1.4 Phase 4

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.

Table 11.11 presents noise calculations based on the assumptions noted above. The same noise sensitive locations as illustrated in **Figure 11.3** have been assessed.

Table 11.11 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

Description (Plant Item and BS5228 Reference)	**Predicted Noise Level dB $L_{Aeq, 1 hr}$**			
	NSL1	**NSL2**	**NSL 3**	**NSL 4**
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
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**

The indicative calculated noise levels set out in **Table 11.11** 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.

11.5.2 Traffic Accessing the Facility

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:

$$L_{Aeq,T} = L_{Ax} + 10\log_{10}(N) - 10\log_{10}(T) - 10\log_{10}(r_2/r_1) - Att_{bar}\ dB$$

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

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.

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.

11.5.2.1 Construction Phase Traffic

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.

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.

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 **Figure 11.3.**

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.

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 $L_{Aeq,\ hr}$.

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.

11.5.2.2 Operational Phase Traffic

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.

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 $L_{Aeq, 1 hr.}$

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 $L_{Aeq, 1hr}$.

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.

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.

11.5.3 Building Services Plant

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.

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.

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.

11.5.4 Additional Vehicular Traffic on Public Roads

Traffic volumes along the surrounding road network with and without the planned MEHL development for the year 2011 has been assessed and presented in **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 11.12** below indicate resultant traffic flows and changes in noise levels associated with the MEHL site.

Table 11.12 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

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 11.1** confirms that this increase is negligible and the resultant impact is imperceptible.

11.6 Mitigation Measures

11.6.1 Site Development and Cell Operation

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 & 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.

It is proposed that vibration from construction activities be limited to the values set out in **Table 11.2**.

11.6.2 Traffic Accessing the Facility

The noise impact assessment outlined in Section 11.5 has demonstrated that mitigation measures are not required.

11.6.3 Building Services Plant

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.

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.

11.6.4 Additional Vehicular Traffic Along Public Roads

The noise impact assessment outlined in Section 11.5 has demonstrated that mitigation measures are not required.

11.7 Residual Impacts

The assessments outlined in Section 11.6 above 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.

11.7.1 Site Development and Cell Operation

During the initial construction phase of the project, the impact to noise and vibration is predicted to be within the daytime noise limits values.

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.

11.7.2 Traffic Accessing the Facility

The predicted noise level due to traffic accessing the facility is within the proposed licence limits, therefore the impact is not significant.

11.7.3 Building Services Plant

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.

11.7.4 Additional Vehicular Traffic Along Public Roads

The predicted increase in noise level associated with additional vehicular traffic post-development is imperceptible along the surrounding routes assessed.

11.8 References

BS5228: Part 1: 2009. Code of Practice for Noise and Vibration Control on Construction and Open Sites: Noise.

BS5228: Part 2: 2009. Code of Practice for Noise and Vibration Control on Construction and Open Sites: Vibration.

BS7385: Part 2: 1993. Evaluation and Measurement of Vibration in Buildings: Guide to Damage Levels from Groundborne Vibration.

ISO 9613-2: 1996 Acoustics: Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation.

IS0 1996:2007. Acoustics – Description Measurement and Assessment of Environmental Noise

Murphy Environmental Hollywood Limited - EPA Waste Licence W0129-02

Murphy Environmental Hollywood Limited (W0129-02) – Annual Environmental Report (AER) 2009.

National Roads Authority, 2004. Guidelines for the Treatment of Noise and Vibration in National Road Schemes.

UK Department of Transport, 1988. Calculation of Road Traffic Noise.

12 Landscape and Visual

12.1 Introduction

This Chapter of the EIS provides an assessment of the landscape and visual impacts associated with the proposal to develop an integrated waste management facility for non biodegradable wastes including hazardous and non-hazardous waste-to-energy incineration residues, hazardous and non-hazardous soils and inert soils, and other compatible waste streams within the existing landfill facility at Hollywood Great, Nags Head, Naul, County Dublin. The existing MEHL facility operates under waste licence W0129-02 and planning permissions F04A/0363 and F07A/0262.

The assessment involved reviewing photographs, aerial photography, photomontages, plans and sections of the proposed MEHL facility, various publications and reports. A site visit was undertaken to the MEHL site and environs during the summer of 2010.

12.2 Assessment Methodology

The assessment of landscape and visual impacts includes:

Landscape impacts

- Direct impacts upon specific landscape elements and sensitive buildings within and adjacent to the site;
- Effects on the overall pattern of the landscape elements which give rise to the character of the site and its surroundings;
- Impacts upon any special interests in and around the site.

Visual impacts

- Direct impacts of the development upon views in the landscape;
- Overall impact on visual amenity and residential properties.

Visual impacts may be defined under 'Visual Intrusion' and 'Visual Obstruction', where: -

- Visual intrusion is impact on a view without blocking, and
- Visual obstruction is impact on a view involving blocking thereof.

Significance Criteria

Table 12.1 below sets out the significance criteria used for this assessment. These criteria are based on the EPA Guidelines on Information to be contained in Environmental Impact Statements, 2002 and Advice Notes on Current Practice in the preparation of Environmental Impact Statements (2003).

Table 12.1 Significance Criteria

Impact Level	Definition
Imperceptible	An impact capable of measurement but without noticeable consequences
Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate -	An impact that alters the character of the environment in a manner that is consistent with the existing and emerging trends
Significant	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspects of the environment
Profound	An impact which obliterates sensitive characteristics

The ratings may have negative, neutral or positive applications where:

- Positive impact: A change that improves the quality of the environment
- Neutral impact: A change that does not affect the quality of the environment
- Negative impact: A change that reduces the quality of the environment

Terms relating to the duration of impacts are as described in the EPA Guidelines as:

- Temporary Impact: Lasting one year or less
- Short-term Impact: Lasting one to seven years
- Medium-term Impact: Lasting seven to fifteen years
- Long-term Impact: Lasting fifteen to sixty years
- Permanent Impact: Lasting over sixty years

12.2.1 Photomontages

In order to more fully present the visual aspects of the proposed MEHL development, six photomontages have been prepared from a number of locations which are representative of views from surrounding areas. These are shown in **Figure 12.13** include two views taken from the County road to the south of the site (LP01080) near the proposed site entrance and views from local County roads to the north (LP01090), northeast and east. A more distant view from the R132 at Hedgestown is also included, some 2km east of the site.

12.2.2 Photographic Review

As part of the site visit a photographic review was undertaken of the site and surrounding area in order to more fully understand and demonstrate the visual context. The photo-view locations are shown in **Figure 12.2** and illustrated in **Figures 12.3-12.7.**

12.3 Receiving Environment

12.3.1 Site Context

The site is located in north County Dublin within the town lands of Hollywood Great and Tooman. It is situated within a rural, agricultural landscape containing local highpoints such as Hillfort in Knockbrack to the north. To the west is the summit of Hollywood Great of which the site forms the eastern flank.

The area is accessible with good transport links to Dublin. The M1 is located 3km to the east and provides direct access to the site via the Balbriggan South interchange. The R108 runs 1km to the west and links the local settlement of Naul, located some 2.5km to the north west of the site. The local roads around the site are characterised by groups of residential properties and agricultural lands. There are circa 60 residential properties within 1 km of the perimeter of the MEHL site. To the north and south it is mainly pasture. To the south east, east and west the land is predominately used for tillage.

12.3.2 Landscape Character

The area is part of the North Fingal Uplands which forms a high lying area to the north of the County around Naul. The topography of the area is quite pronounced and falls from west to east. Knockbrack is the highest point at 176 mA.O.D and forms part of a visual ridge to the north of the County. This visual ridgeline encloses the site to the west extending southwards to Hollywood Great at 151mA.O.D. Part of the eastern flank of this local hill at Hollywood Great has been removed by quarrying and is now part of the subject site. Some minor ridgelines run west to east from these higher lands along which are aligned local County roads. Walshestown Road (LP01080) on the southern boundary of the site parallels a ridge as does the County road to the north within the townlands of Walshestown and Rowans Little.

Typical land uses comprise a mix of arable and pasture. Hedgerows form strong field boundaries and are quite dense containing many mature trees. Mature tree and woodland groups tend to occur around old settlements and along rivers and ditches. A linear belt of mixed woodland runs along the ditch to the east of the site and there are wooded pockets within the townlands of Tooman and north of Walshestown.

The elevated nature of the Fingal Uplands allows panoramic and long range views from selected view-points, extending towards the Irish coast to the east and the Wicklow Mountains to the south. In other locations where the viewpoint is less elevated views tend to be more enclosed by topography and vegetation, such as the lands east of the site.

There are groups of residential properties along local County roads, mainly linear, ribbon style development, interspersed with farm properties, although the principal land use comprises tillage and dairy farming. Some of these residential properties are relatively recently constructed in the last number of years given the proximity to the M1 and Dublin City.

12.3.3 Site Description

The site is currently a landfill facility for inert waste having previously been a quarry until 2007. Remnants of quarry benches are evident on the south and south east part of the site as shown in photo-view 2 and 3 **Figure 12.3**, where there are also water bodies. The existing site entrance is located on the south western corner off the LP01090 road and comprises a metal gate bounded on both sides by a block wall. A parking area and offices are located beside the entrance.

A stockpile area is located outside the quarried area to the south east. On the southern boundary are two arable fields that run contiguous to the LP01080. These act as visual buffers to the two private residential properties (A, B & C, see **Figure 12.1**) that either adjoin the southern boundary or are located on the LP01080. The middle portion of the site is currently being filled with inert waste.

Topography

The site lies on the eastern flank of a local hill at Hollywood Great. The LP01080 road to the south of the site parallels the southern side of the ridge and the lands generally slope from north west to south east. The quarried area of the site has effectively removed part of the north eastern portion of the hill and part of the ridge, although generally the ridge remains intact and backgrounds the quarry to the south. The lowest part of the site is on the north eastern boundary. The northern boundary parallels a stream and local valley that separates Hollywood Great from Knockbrack. On the eastern boundary (beyond the quarried area) the site falls steeply in an easterly direction towards relatively low lying agricultural lands.

Vegetation

The site has a number of hedgerows which define the boundaries and some internal hedges to the south, which separate the quarried area from the two fields adjoining the LP01080.

To the north the boundary is quite open and comprises mainly gorse scrub with some Hawthorn and Elder.

A dense Hawthorn hedge runs along the western boundary adjoining the local County road and prevents open views into the site. The south boundary has a low Hawthorn hedge on a ditch, shown in photo-view 15, **Figure 12.7.** To the north of this hedge an internal hedgerow runs east west. It contains many semi-mature trees mainly Ash and some Elder with Hawthorn and generally forms a good screen although there are some gaps in the hedgerow in places, shown in photo-view 6, **Figure 12.4**.

Views

From the MEHL site there are open views north of Knockbrack extending from the summit eastwards along the ridgeline paralleled by a local County Road shown in photo-view 1 and 3, **Figure 12.3**.

To the east there are also open, panoramic views towards the coast and Lambay Island shown in photo-view 2, **Figure 12.3**. Within the immediate vicinity of the MEHL site, views of the adjoining lower lying agricultural lands are screened by the edge of the site. These views are only available from the eastern boundary of the site and shown in photo-view 5, **Figure 12.4**.

Views south from the quarried area are contained by the sides of the facility, by intervening vegetation and topography. There are however glimpsed views which extend towards the Wicklow Mountains from limited locations as shown in photo-view 6, **Figure 12.4**.

Views west are limited by the summit of the local hill at Hollywood Great.

12.3.4 Landscape Planning Context

The Fingal County Development Plan 2005-2011 was consulted in regard to landscape and visual aspects that may have relevance to the site and site context in terms of landscape designations and listed views and prospects.

12.3.4.1 Fingal County Development Plan 2005-2011

High Amenity Areas

These are areas which consist of landscapes of special value or sensitivity in which inappropriate development would contribute to a significant diminution of landscape amenity in the County, (Refer Appendix B, page 1 Landscape Character Assessment of the 2005-2011 County Development Plan).

The site is included within the Naul Hills area shown on Index Map 1A of the Plan and is zoned objective 'HA' – '*to protect and improve high amenity areas'*. The High Amenity Area includes the higher lands to the north and north west of the site taking in Cabin Hill and Hillfort, Knockbrack.

Preserved Views

There are a number of preserved views within the environs of the MEHL site. The local County road to the south (LP01080) between the R108 and M1 has listed views as does the R108 Naul Road to the west. There are listed views from the local County road to the immediate east of the site. Other preserved views occur to the north within the townlands of Knockbrack and Walshestown. These are illustrated in **Figure 12.20.**

Landscape Character Assessment

As described in the Development Plan Fingal County Council is divided into seven landscape character areas. The MEHL site occurs within the High Lying Agricultural Area referred to as Landscape Group 3 (LG3) in the Landscape and Natural Heritage Map A. This is illustrated in **Figure 6.1** and is described as "*an area of upland, rising to a high point of 176 metres at Hillfort Mound, to the south east of the Naul Village. These hills while not significant on a national scale are of regional significance and afford panoramic views of the Mourne Mountains to the north, the coastline to the east and the Wicklow Mountains in the south."* A number of principles relating to development within this zone are also described including the protection of ridgelines, listed views and prospects and the avoidance of removal of field and roadside hedges. (Refer Index Appendix B, page 2, Fingal County Development Plan 2005-2011).

The high lying lands around Naul including the MEHL site occur within Landscape Group 3 and are part of the North Fingal Uplands. Knockbrack is the highest point at 176metres and forms part of a visual ridge to the north of the County. There are panoramic views available from the uplands to surrounding areas and there are views towards the uplands from the surrounding lower lying countryside. The area is sensitive to development given the elevation of the ridges.

12.3.4.2 Draft Fingal County Development Plan 2011-2017

The existing land zonings contained in the current Fingal County Development Plan 2005-2011still pertain to the environs in the Draft Plan 2011-2017. The elevated lands around the Naul Hills are zoned as a '*High Amenity Area*'. In addition a large proportion of the area is designated as a sensitive landscape extending between the M1 west to just beyond the R122. It is still within the same landscape character area described as a '*High Lying Agriculture Landscape Character Area*'.

Protected Views

The protected views referred to in the Draft Plan are as per the current Fingal County Development Plan 2005-2011 with the exception that they are extended to include a section of the local County road (PL01090) to the immediate west of the MEHL site, between the junction of the PL01080 and the existing site entrance. They are also extended to include the local County road to the north within the vicinity of Knockbrack/ Walshestown. These are illustrated in **Figure 12.21.**

Green Infrastructure

High amenity areas and highly sensitive landscapes are included within the each of the five key themes which the green infrastructure strategy seeks to address. It is the Council's policy to "*protect areas of high landscape quality including Special Amenity Areas, High Amenity zoned lands, and Highly Sensitive Landscapes identified on the Development Plan Green Infrastructure M*ap" (Refer Chapter 3, page 86 of the Draft Development Plan).

12.4 Characteristics of the Development

The proposal is for an integrated waste management facility for non-biodegradable wastes including hazardous waste. A detailed description is given in **Chapter 4** *Proposed Site and Project Description.* The proposed MEHL facility will comprise the following:

- 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.

- Relocation of administration building and ancillary infrastructure.
- Provision of a new facility entrance.
- Construction of a solidification plant, associated storage tanks, silos, storage building and staff welfare facilities.
- Installation of leachate, surface water and other associated landfill management infrastructure.
- Construction of a temporary storage compound.

The new entrance will cater for all construction and customer traffic into both the landfill and solidification plant. It is proposed to retain the existing entrance as an emergency entrance/exit only.

The operational life of the facility will be for 25 years and during this period the works will be divided into four phases although some overlapping between each phase may occur. Most of the activity will initially commence in the west and north of the site during Phase 1 and then move into the centre portion of the site during Phase 2.

The site will be progressively restored and as each cell is filled it will be capped and seeded. Restoration will commence in the northern portion of the site and move southwards. The final restoration will comprise the construction of a cap for cell NH2 while the administration building and car park will be removed. The final site profile will reinstate the ridgeline removed by the quarrying activity.

12.5 Landscape and Visual Impact

12.5.1 Introduction

Landscape and visual effects arise from a variety of sources. Effects can be negative (adverse), positive (beneficial), direct, indirect secondary or cumulative and be either permanent or temporary. They can also arise at different scales (local, regional or national) and have different levels of significance (local, regional or national). This section sets out the likely impact on the landscape character and visual effects during the initial site construction works and on-going operation of the landfill that may arise from the proposed integrated waste management facility. Their overall significance on the landscape and visual character is also described.

12.5.2 Construction Impacts

These are likely to arise as a result of:

- Construction of hazardous and inert cells and site infrastructure.
- Construction of new site entrance.
- Proposed lighting at the site entrance, along the entrance road and around the solidification plant.
- Associated landscape works to site boundaries and area east of temporary storage compound.

- Removal of MEHL hedgerows along LP01080 to facilitate sightlines from proposed entrance.
- Movement of construction machinery.
- Excavation and removal of overburden.

The initial construction operations will give rise to temporary, slight and cumulative impacts on the landscape and visual character. As activity will take place within the existing MEHL site the proposed works will largely be screened by topography in views from the south and east. There will be a slight, negative impact from lighting which will be of short duration as the lighting will be not be operational after the site closes in the evening.

From the east views are limited by the relatively level topography and intervening vegetation as shown in photo-view 10, **Figure 12.6**. Thus the majority of the works and proposed landfill cells will be screened from view.

The works will be visible within long range and elevated views from the north. Six properties located over 500m from the site boundary will have open views. However properties to the north have established views of the existing quarry and inert landfill facility, so changes to the existing view will be slight.

From the northwest, five properties within 500m of the site boundary have open views south. These are located within the townlands of Beldaragh and Walshestown, shown in photo-view 1 and 3, **Figure 12.3**. The southern face of the existing MEHL site is visible in the mid-ground view and a portion of the old quarry floor. From this elevated view-point the phased development of the hazardous and non-hazardous cells will be visible, particularly within the southern part of the site. Works associated with the development of site infrastructure and the construction of the solidification plant will be glimpsed. However relative to the existing planning permission, changes to the view as a result of the proposed development are unlikely to be significant. Overall this will give rise to a slight/ moderate, negative visual impact. There will be a slight, neutral impact from lighting as these properties are not in close proximity to the site.

Overall a change of use from an existing inert landfill facility to one which includes hazardous waste will give rise to a slight, negative impact on the existing landscape and visual character. The character and context of existing views will not change significantly.

12.5.3 Description of Likely Significant Impacts

The most significant changes would be to elevated views south where the formation of the cells and gradual infilling with waste would be seen against the exposed southern slopes of the existing MEHL site. However, as the southern face of the old quarry and MEHL site represents the highest part of the site and the continuation of the ridge at Hollywood Great, any infilling and change in ground profile would not be seen against the skyline. As the lands will be progressively restored the impact would be slight, neutral and cumulative. This is illustrated in photomontage view 3, **Figure 12.15.2** and **12.15.3** and photomontage view 4, **Figure 12.16.2** and **12.16.3** where progressive restoration of the site represents an improvement in the view.

12.5.4 Impact on the Landscape Character

In determining the significance of the impact on the landscape, an assessment of the following factors needs to be considered:

- The sensitivity of the affected landscape and visual resources.
- The altering of existing patterns of the landscape and features.
- The scale and magnitude of change.

The landscape within the environs of the site is regarded as sensitive given that it occurs within a High Amenity Area, designated in the Fingal County Development Plan 2005-2011 and there a number of protected views within the vicinity. However, any assessment of the impact of the proposed development on this sensitive landscape must be set within the context of the existing old quarry and MEHL site, which is now a feature of the local area. The proposed landfill development will not significantly alter the character of the existing landscape.

Some features of the local landscape have already been altered in development of the existing site. The quarry has to some degree altered the topography of the area by removing a section of the local hill at Hollywood Great and principally affecting views from the north. However the ridgeline of the hill has remained to a large extent intact, thus reducing the potential impact on existing landscape patterns by avoiding an obvious cut in the hillside. There is a slight depression on the skyline when viewed from the north east where the higher part of the ridgeline has been removed, as illustrated in photo-view 9, **Figure 12.5** and photomontage view 3, **Figure 12.15.2**. However the ridgeline is perceived as generally continuous and only the quarry slopes on the southern boundary have changed the features of the landscape. The proposal to infill the site with waste will have a positive impact on existing landscape features and patterns already altered by the old quarry development on the MEHL site by restoring to the original profile of the ridgeline.

In assessing the impact on the landscape character it is considered therefore that the degree of change that will result from infilling the existing site will be slight and neutral. The changing landform as the site is gradually infilled and the final land profile at the end of the works, will replace views of the existing quarry benches. This will give rise to a small scale and positive change in the character of the local area. On completion of the works the impact will be positive as the ridgeline of the hill is restored. This is illustrated in photomontage view 3, **Figure 12.15.4** and photomontage view 4, **Figure 12.16.4**.

12.5.5 Visual Impacts (Refer to Figure 12.1 for Location of Properties)

The assessment of the visual impact describes:

- Changes in the character of the views resulting from the proposed development;
- Changes in the visual amenity of the visual receptors.

Change in Character of Views

The main change in the character of existing views will be from the north and north west where views are more open and elevated and the existing quarry is visible. The progressive infilling of the proposed landfill cells will provide some screening of the south and east facing quarry benches and rock slope shown in photomontage view 4, **Figure 12.16.3**.

From the west, south and east, there will be no significant change to existing views. Photomontage view 5, **Figure 12.17.2** and **12.17.3** illustrate that there are imperceptible changes to existing views from the local County road to the east.

Overall within the context of the existing planning permission for an inert facility the impact will be slight.

Change in Visual Amenity of the Visual Receptors

The following describes the visual impact of the proposed development on residential properties, views from roads and from other visual receptors.

Impact on Visual Amenity of Residential Properties

Within the groups of residential properties located on local County roads within the vicinity of the MEHL site eleven properties have open views of the site. The remaining properties which are in excess of fifty have either glimpsed views or are screened by intervening vegetation and/or topography. The location of these properties is indicated in **Figure 12.1** while the impact on views is described in the following section.

Properties to South on LP01080 (Group A which includes Properties A-E)

There will be a slight to moderate impact on the three properties to the south of the site (A-C), one of which adjoins the site boundary (see **Figure 12.1**) and are shown in photo-view 12, **Figure 12.6**. Views into the site are currently screened by a ridgeline which extends from the local hill at Hollywood Great and parallels the local County road just inside the site boundary, shown in photo-view 13 and 14, **Figure 12.7**. However there will be potential impact through construction traffic and disruption to existing traffic on the LP01080 at stages during the initial construction works and proposed new site entrance and removal of hedgerows along the road to facilitate sightlines. While these properties have limited existing views into the MEHL site, there will be a slight, negative impact during construction of the new site entrance and removal of hedgerow along the LP01080 to properties “A, B” and “C”, although direct views are mainly screened by the curvature of the road and vegetation.

As the new hedgerow planting matures, the impact will be imperceptible and neutral in the short term. The remaining properties on this road, east of property “C”, are located at a lower elevation than the site providing only glimpsed views of the quarry stockpiles at present, as illustrated in photo-view 11, **Figure 12.6**. While there will be glimpsed views during the construction stages of the proposed works on the eastern side, the impact will be slight and neutral in the short term as screen planting matures.

The proposed lighting at the site entrance and along the site access road will have a slight to imperceptible impact to properties “A, B” and “C”. The proposed low bollard lighting along the main entrance road will ensure minimal light pollution. The lighting impact from the 6m high light columns around the solidification plant will be slight as the plant is set below existing ground levels and the horizontal cut off cowled light fittings will avoid significant light spill. Overall as the LP01080 is currently unlit at night there will be a slight to imperceptible, neutral and medium term impact.

Properties to West (Group A)

Views from housing along the LP01080 just west of the junction with the PL01090 are screened by the ridgeline of the local hill at Hollywood Great which runs to the north of these houses. One property to the immediate west (Property "E", refer **Figure 12.1**) although located on elevated ground will have no views of the site as it is screened by the brow of the hill and by intervening hedgerows.

Properties to North on LP01090 (Group B)

These include properties on the local County road LP01090 and a group of houses on a local access road to the west of the County road, within the townland of Beldaragh. The most open views will occur from properties "H, J, K" and "L". Property "H" occurs on relatively low lying ground near the north west boundary of the MEHL site, shown in photo-view 3, **Figure 12.3** and photo-view 8, **Figure 12.5**. It has open views of the southern face of the existing quarry. Properties "J, K" and "L" shown in photo-view 1 and 3, **Figure 12.3** have more elevated views over the MEHL site.

Modifications to the topography and configuration of the site during development of the landfill cells will not significantly change the nature and character of these existing views and the impact will be moderate, negative and cumulative during the initial construction works. However the progressive infilling of the landfill during the operational stages will give rise to a slight, positive and medium term impact. This is shown in photomontage view 3, **Figure 12.15.2** and **12.15.3** where the impact on the view improves as the site is progressively restored from Phase 2 onwards.

Other properties further north along this road will have either glimpsed views given the intervening mature vegetation or have enclosed views. For those with glimpsed views the impact would be slight and negative during the construction and imperceptible during the operational stages.

There will be a slight, neutral and cumulative impact as a result of proposed lighting to those properties that overlook the MEHL site, given the distance from the site. The existing entrance to the MEHL site is currently lit at night at the request of local residents and this lighting is visible. The lighting around the solidification plant will have a slight to imperceptible, neutral impact as the 6m columns will be set below existing ground level and will avoid significant light spill with the addition of horizontal cut off cowled light fittings. The lighting bollards along the entrance road will also have an imperceptible impact.

Properties to North East (Group C)

Six properties in this group have open, elevated views towards the site and the existing site operations. Five of these properties are located on the southern side of the County road. A typical view is illustrated in photo-view 9, **Figure 12.5**. The southern edge of the old quarry workings is visible. Changes to the view during construction involving excavation and formation of the landfill cells are likely to give rise to a moderate, negative impact as the existing site is the main focus of the view and the initial construction activity will draw attention to the MEHL site.

However, the progressive infilling of the cells during the operational stages will give rise to minor changes in the view and the impact will be slight, positive and medium term. This is illustrated in photomontage view 4, **Figure 12.15.2** and **12.16.3**.

The remaining properties to the east of this road, near the junction of the County road to Balrickard and the County road south west, will have either glimpsed views or views enclosed by intervening vegetation. For those properties with glimpsed views there will be a slight, negative impact during construction and an imperceptible impact during the operational stages.

Given that many of the above activities would have taken place under the existing licence, the overall impact will as a consequence be neutral. There will be a slight, neutral impact associated with lighting as those properties with glimpsed or open views are over 1.5km from the lit part of the site. In addition the 6m high columns with horizontal cut off cowl light fittings are set below existing ground level around the solidification plant.

Properties to East (Group D)

Generally views of the site from properties along this road are screened by vegetation and topography, with houses at a much lower elevation than the site. Long views west are obscured by a minor ridgeline and sloping ground to the immediate east of the site. For properties near the junction of the LP01080, views west are screened by a ridgeline.

There are glimpsed views however available of the overburden and quarry stockpiles for some properties located just south of the farm access track to property “G”. A typical view west from this location is shown in photo-view 10, **Figure 12.6**. However, changes to the view during the construction and operational stages will be imperceptible. This is illustrated in photomontage view 5, **Figure 12.17.2** and **12.17.3**. The principle change will be replacement of views of the stockpiles with views of the proposed landscape screen planting around the facility control area, car park and temporary storage compound as it matures.

The closest residential property to the site within this group is (Property “G”), shown in photo-view 5, **Figure 12.4** and occurring on lower lying lands to the east, will have views of the landscape screen planting on the eastern site boundary but the proposed landfill cells will be screened by rising topography to the west. Photo-view 4, **Figure 12.4** illustrates the local ridgeline which screens the site works. There will be a slight, negative impact during the construction phase associated with the movement of machinery and the development of the landfill cells, site infrastructure and landscape planting on the eastern side of the site. During the operational stages the landscape woodland planting on the eastern side will mature and the impact will be slight and neutral in the short term.

There will be an imperceptible impact associated with lighting for these properties. The lighting on the eastern side will be screened by the site topography and light spillage will be avoided by use of horizontal cut off cowled light fittings. The lighting around the solidification plant, which will be removed during Phase 4, is unlikely to have an impact as the plant is located on a lower level than the office buildings and weighbridge area.

Impact on Views from Roads

There are glimpsed views of the site from the local County roads to the immediate west, north and east. Views from the south are screened by an intervening ridgeline.

The most open views occur from the north where the existing old quarry workings on the MEHL site are a dominant feature in the view. However changes resulting from the construction of the landfill cells and subsequent filling during the operational stages will not alter the existing character of these views. There will therefore be a slight, negative impact during the initial construction stage and a slight, positive impact during the operational stages as the site is progressively restored. This is illustrated in photomontage view 3, **Figure 12.15.2** and **12.15.3** and photomontage view 4, **Figure 12.16.4** and **12.16.5**.

From the east, the site is not visible and glimpsed long distant views of the existing stockpiles over existing hedgerows will change only slightly. Removal of these stockpiles and the maturation of the landscape woodland planting during the operational stages will be the main change in the view. This will result in a slight to imperceptible and neutral impact during the construction and operational stages as illustrated in photomontage view 5, **Figure 12.17.3**. In more distant views from the R132 at Hedgestown, east of the M1, glimpsed views of the existing site are illustrated in photomontage view 6, **Figure 12.18.2**. The site is seen as part of the hill at Hollywood Great but is a small part of the existing view and is not significant. Progressive restoration of the site will have a positive, medium term impact on the views as the hill is progressively restored and views of the quarry face will gradually disappear. This is shown in photomontage view 6, **Figure 12.18.3**.

From the south the main change will be a new entrance constructed on the LP01080. This will be designed to fit the existing rural character and the visual impact from the road will be slight, negative and temporary during construction and slight, neutral post construction as illustrated in photomontage view 1, **Figure 12.13.3** and photomontage view 2, **Figure 12.14.3**.

12.5.6 Summary of Landscape and Visual Impacts

The existing MEHL site is an established feature of the local landscape and is part of the existing view and character. It is not highly visible from the east, south or west due to the topography of the area and intervening vegetation. The most open views occur from elevated land to the north and north west where there are ten residential properties that overlook the site.

The principal change to existing views, as a result of the proposed development, will be increased activity, particularly during the initial construction stage where activity will draw attention to the site. This will give rise to slight/ moderate and negative impact to properties with open, elevated views. During the operational stages the progressive infilling and restoration of the site will not significantly change the character and nature of existing views and there will generally be a slight, positive impact in the medium term.

Within the context of the existing licence and planning permission the impact will be slight.

There will be a imperceptible-slight impact associated with lighting to those properties located on the LP01080.

While there are preserved views in close proximity to the site none directly overlook the proposed development and the impact will be imperceptible.

12.5.7 Impact on Landscape Planning Context

The impact of the proposed development on landscape planning policies relates to the impact on the various landscape designations within the area as described in Section 12.3.4.

High Amenity Area

These are areas which consist of landscapes of special value or sensitivity in which inappropriate development would contribute to a significant diminution of landscape amenity in the County.

The proposed development while it occurs within a landscape of special value and sensitivity would not result in a diminution of landscape amenity within the North Fingal Uplands. The existing MEHL is an established feature of the area and both during the construction and operational stages the proposed development would not represent a significant change to the landscape character or to existing views. When the landfill activities cease and the site is progressively restored to amenity use, there would be a positive impact on the landscape character as disturbed land and the hill profile is reinstated.

Preserved Views

In the Fingal County Development Plan 2005-2011, the closest designated views to the site occur from the County roads to the immediate south (LP01080) and east. From each of these roads the site and its activities are generally screened by the topography of the local area. The construction of a new entrance on the LP01080 will not affect the main focus of the view south east across the Irish coast and the impact will be imperceptible. There will be no significant changes to existing views from the County road to the east of the site, as the existing site is not particularly visible, also resulting in an imperceptible visual impact.

The additional preserved view designated in the Draft Fingal County Development Plan 2011-2015 which occurs along the County road (LP01090), west of the site between the existing site entrance and junction with the County road (LP01080) south of the site, will not be significantly impacted. The road rises steeply from the junction and views from this road are elevated as the road crosses the ridge at Hollywood Great. However, the site is not significant in the view with the exception of glimpsed views through the site entrance. Changes to the internal layout of the site during construction and during the operational stages will have an imperceptible impact on views from this section of road.

Overall the local topography within the site provides good screening and the impact on preserved views will not be significant.

12.6 Mitigation Measures

12.6.1 Introduction

In order to minimise or reduce the potential visual impacts of the proposed development, the following mitigation measures are proposed during the initial construction phase of the development.

Landscape Screen Planting

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 **Figure 12.8.** 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.

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 **Figure 12.8** 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

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 **Figure 12.8** 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.

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.

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

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

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

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, **Figure 12.15.3** and photomontage view 4, **Figure 12.16.3**. The site will be progressively restored in four phases from north to south as shown in **Figures 12.9-12.11**.

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.

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.

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. The solidification plant will be decommissioned and a non-hazardous cell NH2 constructed.

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.

Proposals showing the restored site are shown in **Figure 12.12**. 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, **Figure 12.15.4** and photomontage view 4, **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.

Lighting

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 will not give rise to a significant impact.

12.6.2 Worst Case Scenario

The worst case scenario assumes the hypothetical situation where mitigation measures are not put in place or fail entirely. In this instance this would relate primarily to the progressive restoration of the site.

12.6.3 Monitoring Measures

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.

12.7 Residual Impacts

Following final restoration of the site the residual landscape and visual impacts will be positive.

12.8 References

Fingal County Council Fingal County Development Plan 2005-2011, Fingal County Council

Fingal County Council Draft Fingal County Development Plan 2011-2017, Fingal County Council

Environmental Protection Agency (2002) Guidelines on the Information to be contained in Environmental Impact Statements and Advice Notes on Current Practice in the preparation of Environmental Impact Statements (2003). EPA, Wexford.

The Landscape Institute/ Institute of Environmental Management and Assessment (2002)

Guidelines for Landscape and Visual Impact Assessment (2nd Edition) Spon Press

13 Flora and Fauna

13.1 Introduction

Natura Environmental Consultants were appointed by Arup to carry out an ecological impact assessment of the MEHL proposed development site, at Hollywood, Naul, in north County Dublin. The site is located in an existing licensed landfill within a former quarry site. The work has included a desk study, consultations, field survey and reporting, as outlined below. It also included an Appropriate Assessment (Screening) under the European Communities (Natural Habitats) Regulations, 1997, which is attached in **Appendix A13.1.**

This chapter 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. This report follows the Environmental Protection Agency's Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002) and Advice Notes on Current Practice in the Preparation of Environmental Impact Assessments (EPA, 2003). Appropriate Assessment of Plans and Projects in Ireland, Guidance for Planning Authorities. (DoEHLG 2010) and European Commission Guidance (2001).

13.1.1 Relevant Legislation

Flora and fauna in Ireland are protected at a national level by the Wildlife Act, 1976 and Wildlife (Amendment) Act, 2000 and the Flora (Protection) Order, 1999 (SI 94/1999). They are also protected at a European level by the EU Habitats Directive (92/43/EEC) and the EU Birds Directive (79/409/EEC).

Under these Directives and Acts, sites of nature conservation importance are designated in order to legally protect faunal and floral species and important/vulnerable habitats. The categories of designation are as follows;

- Candidate Special Areas of Conservation (cSAC) are designated under the European Communities (Natural Habitats) Regulations 1997 to comply with the EU Habitats Directive (92/43/EEC).
- Special Protection Areas (SPAs) and designated under the EU Birds Directive (79/409/EEC). cSACs and SPAs are considered to be of international importance.
- Proposed Natural Heritage Areas (pNHA) are designated under the Wildlife (Amendment) Act, 2000. They have limited legal protection under the County Development Plan.

13.2 Methodology

13.2.1 Desk Study and Consultations

A desk study was carried out to collate the available information on the local ecological environment. The Development Applications Unit and database (http://www.npws.ie) of the National Parks and Wildlife Service (NPWS) of the

Department of the Environment, Heritage and Local Government were consulted in relation to designated areas and records of rare plants and protected species in the vicinity of the proposed MEHL development site. Inland Fisheries Ireland (IFI) was consulted with regard to the fisheries value of watercourses within the study area.

13.2.2 Habitat Survey

A habitat survey was carried out in May 2010 to identify, describe, map and evaluate habitats and to verify the information gathered at the desk study stage. Habitats were classified using *A Guide to Habitats in Ireland* (Fossitt, 2000). Mammals, birds, amphibians and reptiles were assessed in the course of the main habitat survey using a combination of direct sightings and observations of signs, tracks and droppings.

13.2.3 Bird Survey

A survey of peregrine falcon on the proposed MEHL development site was undertaken by R and D Avian Ecology over the summer of 2010. The results of this survey, as well as an assessment of impacts of the proposed development on the peregrine birds that use this site are assessed. Recommendations for mitigation measures to minimise the impacts are proposed in the report by R and D Avian Ecology. Refer to **Appendix A13.2** for the full peregrine falcon report.

13.2.4 Assessment Methodology

The ecological evaluation of the site and prediction of impact significance is based upon the National Roads Authority (NRA) (2009) Guidelines for the Assessment of Ecological Impacts of National Road Schemes. It is in line with the Guidelines for the Information to be contained in Environmental Impact Statements (EPA, 2002). The ecological evaluation criteria are listed in **Appendix A13.3.**

13.3 Site Description

13.3.1 General Study Area

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.

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.

13.3.2 Designated Areas for Nature Conservation

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 13.1** and some of which are shown on **Figure 13.1.**

Table 13.1 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
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

13.3.3 Protected Species of Flora and Fauna

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.

13.4 Description of Habitats

The habitats are described below and are shown in **Figure 13.2.**

13.4.1 Spoil and Bare Ground

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 **Chapter 14** *Soils, Geology and Hydrogeology*.

13.4.2 Exposed Calcareous Rocks (ER2)

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 **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.

13.4.3 Recolonising Bare Ground (ED3)

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 13.2**.

Table 13.2 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
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

13.4.4 Eroding Upland Streams (FW1)

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 **Chapter 14** *Soils, Geology and Hydrogeology* and **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.

13.4.5 Mixed Broadleaved Woodland (WD1)/Scrub (WS1)

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.

13.4.6 Artificial Lakes and Ponds (FL8)

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.

13.5 Mammals

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.

13.6 Insects, Reptiles and Amphibians

Butterflys 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.

13.7 Birds

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 13.3.**

Table 13.3 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

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.

13.7.1 Peregrine Falcon

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 **Appendix A13.2.** 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.

13.8 Site Evaluation

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.

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 **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.

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.

13.9 Potential Impacts of the Proposed Development

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 **Chapters 14** and **15** respectively.

13.9.1 Potential Impacts of the Proposed Development on Designated Sites

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 **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 **Figure 13.1.**

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 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 **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.

13.9.2 Habitats

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.

13.9.3 Fauna

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.

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.

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.

13.9.4 Aquatic Environment and Fisheries

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 **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.

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.

13.10 Mitigation Measures

13.10.1 Mitigation by Avoidance

13.10.1.1 Designated Areas for Nature Conservation

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.

13.10.1.2 Protected Species of Flora and Fauna

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.

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 **Appendix A13.2** for full details.

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.

13.10.1.3 Habitats

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.

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.

13.10.2 Mitigation During Construction

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 **Chapters 14** *Soils, Geology and Hydrogeology* and **Chapter 15** *Surface Water* of the EIS.

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.

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).

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.

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.

Details of the surface water drainage system design and mitigation measures to ensure no significant adverse impacts on the adjoining watercourses are described in **Chapter 15** *Surface Water*.

Potential impacts to Groundwater are dealt with in **Chapter 14** *Soils, Geology and Hydrogeology*. Design and mitigation measures are described in 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 **Chapter 14** *Soils, Geology and Hydrogeology* for full details.

13.10.3 Mitigation During Operation

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.

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.

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 **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.

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 **Appendix A13.2.**

13.11 Residual Impacts

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.

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.

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.

There will be no residual significant adverse impacts on the local surface watercourses or on the groundwater resource, provided the mitigation measures described in **Chapters 14** *Soils, Geology and Hydrogeology* and **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.

13.12 References

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14 Soils, Geology And Hydrogeology

14.1 Introduction

This chapter describes the natural characteristics of the site of the proposed MEHL development and its immediate surroundings, in terms of soils, geology and hydrogeology. In addition, this chapter discusses the suitability of the site in terms of its receiving geology and hydrogeology for the siting of an integrated waste management facility.

An assessment is made 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.

14.1.1 Project team

This chapter of the EIS has been prepared by the Arup EIS Project team and with peer review and input by Eugene Daly from Eugene Daly Associates (EDA).

14.2 Assessment Methodology

The assessment methodology included a review of relevant legislation, data collection, site investigations and numerical modelling.

14.2.1 Legislation and guidance

The chapter has been prepared generally in accordance with the following guidelines:

- Environmental Protection Agency (EPA, 2002). 'Guidelines on the Information to be Contained in Environmental Impact Statements'.
- Environmental Protection Agency (EPA, 2003). 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements'.
- Environmental Protection Agency (EPA, 2006). EPA Landfill Manuals. Manual on site selection, draft for consultation.
- Geological Survey of Ireland (GSI). Groundwater Protection Responses for Landfills
- Institute of Geologists of Ireland (September 2002). 'Geology in Environmental Impact Statements – a Guide'.
- National Roads Authority (NRA, 2008). 'Environmental Impact Assessment of National Road Schemes – A Practical Guide'.
- National Roads Authority (NRA, 2009). 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes'.

Relevant legislation for the impact assessment is outlined in the following paragraphs.

14.2.1.1 Groundwater Directives (80/68/EEC) and (2006/118/EC)

The existing Groundwater Directive (80/68/EEC) aims to protect groundwater from pollution by controlling discharges and disposal of certain dangerous substances to groundwater. The Directive was transposed into Irish Law by the Protection of Groundwater Regulations, 1999 (SI No. 41 of 1999).

The existing Groundwater Directive (80/68/EEC) is to be repealed by the Water Framework Directive 2006/60/EC (WFD) in 2013. New or amended regulations are expected before then to enact the Water Framework Directive and Directive 2006/118/EC on the protection of groundwater. Directive (2006/118/EC) is commonly referred to as the "Groundwater Daughter Directive".

In Ireland the original Groundwater Directive (80/68/EEC) was primarily transposed into National legislation through:

- The Local Government (Water Pollution) Act, 1977 to 1990.
- The Local Government (Water Pollution) Regulations, 1978 (SI No 108 of 1978).
- The Protection of Groundwater Regulations, 1999 (SI No 41 of 1999). This is due to be repealed and replaced by the Waste Water Discharge (Authorisation) Regulations, 2007 (SI 684 of 2007) in 2013.
- The Local Government (Water Pollution) (Amendment) Regulations, 1999 (SI No 42 of 1999).

14.2.1.2 Water Framework Directive 2000/60/EC and SI 722 of 2003 European Communities (Water Policy) Regulations 2003 – 2005

The EU Water Framework Directive 2000/60/EC came into force on 22 December 2000 and its primary objective is for all waters to achieve 'good' ecological status by 2015. The Water Framework Directive 2000/60/EC also promotes the sustainable use of water resources, defines a management and reporting system based on River Basin Districts (RBDs) and sets environmental objectives which take account of the full range of pressures on the aquatic environment (including pollution, abstraction, flow regulation, habitat impact etc). A Register of Protected Areas will be defined under the Water Framework Directive 2000/60/EC and the criteria for sites to be included on this list are:

- Waters used for the abstraction of drinking water.
- Areas designated to protect economically significant aquatic species.
- Recreational waters.
- Nutrient sensitive areas.
- Areas designated for the protection of habitats or species.

The Working Group on Groundwater[5] have prepared a number of guidance documents covering different aspects of the water environment, including groundwater abstractions, risk assessments, etc.

The River Basin Management Plan and the associated Programme of Measures for the Eastern Region was published in late 2009. This is a draft desk based study and was developed to help manage the implementation of the Water Framework Directive in the Eastern Region. It describes actions that are proposed to protect water over the coming years. **Figure 14.1** shows the boundary of the Eastern River Basin District.

14.2.1.3 European Communities Environmental Objectives (Groundwater) Regulations 2009 (S.I. No. 9 of 2010)

The old Groundwater Directive (80/68/EEC) will be repealed by 2013 under the WFD but remains in force for preventing or limiting pollution from List I and List II substances until then. It is to be replaced by the requirements of the Water Framework Directive (2000/60/EC) and new Groundwater Directive (2006/118/EC). The purpose of the European Communities Environmental Objectives (Groundwater) Regulations is to transpose the requirements of the two latter directives into National legislation and provide for transitional arrangements from the old Groundwater Directive (80/68/EEC).

These Regulations aim to:

- Establish a new strengthened regime for the protection of groundwater in line with the requirements of the Water Framework Directive (2000/60/EC) and by the Groundwater Directive (2006/118/EC).
- This is to be achieved by establishing clear Environmental Objectives, Groundwater Quality Standards and Threshold Values for the classification of groundwater and the protection against pollution and deterioration.
- The Regulations also introduce the legal basis for a more flexible, proportionate and risk based approach to implementing the legal obligation to prevent or limit inputs of pollutants into groundwater which already exists under the old Groundwater Directive (80/69/EEC).

14.2.2 Assumptions and Technical Limitations

No significant assumptions were made during the assessment. The description of existing conditions was based on desk study information and ground investigation data, as outlined below.

The Geological Survey of Ireland (GSI) provides geological and aquifer maps which have been referenced in this study. However, the GSI specifically state that these maps and particularly the location of geological and aquifer boundaries should be confirmed with site specific information as has been undertaken in this study.

[5] Within the framework of the Water Framework Directive a technical Working Group on Groundwater was established. The aim of the group is to exchange information and experiences on groundwater issues as they related to the WFD (e.g. characterisation, risk assessment, monitoring, chemical status and trends, programmes of measures, etc.).

Site conceptual models were established at each stage of the project and these were tested and refined where necessary as more information became available.

14.2.3 Sources of Information

The existing conditions within the area of the proposed MEHL development have been interpreted from historic studies on the site as well as desk study and ground investigation data. The main sources of information for the study were desk studies of material from the general area and site specific investigations including:

- Site visits
- Desk study comprising published information and site specific historic data and reports
- Geophysical surveys
- Ground Investigation
- Monitoring data
- Well survey
- Quantitative Risk Assessment (QRA) modelling

14.2.3.1 Site visits

Site visits and walkovers were undertaken by Arup and EDA staff from December 2009 to July 2010. Site supervision of drilling and all hydraulic tests, and ongoing groundwater monitoring were also undertaken by Arup and EDA staff over this period.

14.2.3.2 Desk Study

A desk study carried out for the development availed of the following sources:

Publically Available

- An Foras Taluntais. Ireland, General Soils Map, Second Edition, Published by the National Soil Survey
- Fingal County Council (2006). Groundwater monitoring of the Bog of the Ring. Final hydrogeological Assessment Report.
- Geological Survey of Ireland (2005). Bog of the Ring: Source Protection Zones. (Prepared in association with Final County Council).
- Geological Survey of Ireland (1999). 1:100,000 scale Bedrock Series geology Map Sheet 13
- Geological Survey of Ireland (19th Century). 1:10,560 scale Bedrock Series geology Map Sheet Dublin 14/2
- Geological Survey of Ireland (1901). 1:63,360 scale Bedrock Series geology Map Sheet 102 (1901)
- Geological Survey of Ireland National Draft Bedrock Aquifer map
- Geological Survey of Ireland Groundwater Database
- Geological Survey of Ireland Quaternary Geology map of Dublin

- McConnell, B., Philcox, M. And Geraghty, M. (2001). Geology of Meath: A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 13, Meath. Geological Survey of Ireland.

Project Specific

These project specific references are listed in the order that the appendices are presented.

- Jones, G.Ll. (2009). Conodate Report on the geology of the landfill site Hollywood, Naul, Co. Fingal. (**Appendix A14.1**)
- Jones, G.Ll (2010). Conodate Micropalaeontology report on sample MEHL – 18, 15.2-15.8 m, The Naul, Co. Fingal. (**Appendix A14.1**)
- APEX (2010). Report on the Geophysical Survey at the MEHL Integrated Waste Facility Site in Naul, Co. Dublin (**Appendix A14.2**)
- Site investigation report: IGSL (2010) Ground Investigation Factual report on MEHL Integrated Waste Management Facility. (**Appendix A14.3**)
- Borehole logs and well records for monitoring wells drilled as part of the current EPA waste licence (**Appendix A14.4**)
- On site hydraulic test records including pump tests, infiltration testing, etc. (**Appendix A14.5** and **Appendix A14.6**)
- Patel Tonra (2010). Historic groundwater level and quality monitoring data (**Appendix A14.7** and **Appendix A14.8**)
- Minerex (2010) Well survey report. (**Appendix A14.9**)
- White Young Green (2010). Engineering Report for Planning.

14.2.3.3 Geophysics

Surface geophysics was undertaken on the site by Apex Geoservices Ltd in two phases as outlined in section 14.3.3.1. The full geophysical report is included in **Appendix A14.2** and this provides information of the techniques used and how the results were calibrated against the site investigation results.

14.2.3.4 Ground Investigations

Numerous boreholes were drilled on the site between 1998-2008 as part of the work for the existing EPA waste licence for the MEHL facility (EPA waste license number W0129-02). These are situated on the site perimeter as shown on **Figure 14.2** and have been used to provide preliminary information on the geology of the site. The geological logs for all boreholes drilled area included in **Appendix A14.3**.

As part of this assessment additional boreholes were drilled in the centre of the site in the proposed locations for the proposed hazardous and non-hazardous waste cells. This information was used to establish the geology in this area and further delineate the geological profile of the site as detailed in section 14.3.3.2.

The new boreholes were also completed as groundwater monitoring installations to allow the groundwater regime beneath the site to be interpreted further. The location of these boreholes are shown on **Figure 14.2**. These new boreholes will be decommissioned and grouted prior to construction to prevent them from becoming a pathway for contaminants.

A complete list of all boreholes drilled on the site are presented in **Table 14.1** below.

Table 14.1 Drilling details for all boreholes on site.

Borehole ID	Date Drilled	Type of Borehole	Drilling supervised by
BH4A	18/11/2008	Monitoring Well	Patel Tonra
BH5	03/09/1998	Monitoring Well	KT Cullen & Co.
BH6	03/09/1998	Monitoring Well	KT Cullen & Co.
BH7	07/09/1998	NA	KT Cullen & Co.
BH8	17/08/2001	Monitoring Well	KT Cullen & Co.
BH9	03/08/2001	N/A	KT Cullen & Co.
BH10	04/08/2001	Monitoring Well	Golder Associates
BH10a	05/03/2007	Monitoring Well	Golder Associates
B11a	02/05/2007	Monitoring Well	Golder Associates
BH12	01/05/2007	Monitoring Well	Golder Associates
BH13	15/04/2007	Monitoring Well	Golder Associates
BH14	02/03/2007	Monitoring Well	Golder Associates
BH15	06/04/2010	Core: backfilled	Arup
BH15a	22/04/2010	Monitoring Well	Arup
BH16	12/04/2010	Core: finished as monitoring well	Arup
BH17	05/05/2010	Pumping well	Arup
BH18	20/04/2010	Core: finished as monitoring well	Arup
BH19	21/04/2010	Monitoring Well	Arup
BH20	22/04/2010	Monitoring Well	Arup

Detailed information of the site investigation works undertaken to date including raw data and interpretation are contained in **Appendices 14.2 – 14.12**.

In summary, these works consisted of:

- 3 No. Cable Percussion (Shell and Auger) Boreholes
- 3 No. Geobore S cored boreholes
- 3 No. Monitoring wells
- 1 No. Pump well
- 22 No. Trial pits
- 3 No. Soakaway pits
- 6 No. Side Slope surveys

- Laboratory testing for soil properties
- Groundwater quality analysis
- In situ testing consisting of pump tests, falling and rising head tests, soakaway testing and SPT's in shell and auger boreholes
- Well development of new and existing wells

14.2.3.5 Monitoring data

Groundwater level and quality monitoring has been undertaken on the site since 2003 as part of the existing landfill licence. All data collected during this period was made available for use in this assessment.

As outlined in section 14.2.3.4 additional monitoring points were constructed as part of the investigations for this assessment. Data collected from these is presented in **Appendix A14.7** and **Appendix A14.8**.

14.2.3.6 Well survey

A well survey was undertaken in the area surrounding the MEHL site to determine the locations of any groundwater abstractions in the area. The full details of this are contained in **Appendix 14.9**.

14.2.3.7 Quantitative Risk Assessment modelling

A detailed quantitative risk assessment (QRA) modelling exercise was undertaken as part of this assessment using the program LandSim v2.5. This model was used to quantify the potential risk to groundwater and groundwater based receptors from the proposed development

The main model undertaken used the landfill design criteria as provided by the landfill designer (WYG, 2010) and all site specific geological and hydrogeological data collected during this assessment.

Supplementary models were created following consultations with the Environmental Protection Agency (EPA). The first supplementary model simulated the impact of the proposed development on groundwater if no engineered mitigation measures (liners etc) were put in place. The second supplementary model simulated the impact to groundwater if the liner of the largest hazardous cells failed.

The outputs from these modelling exercises are discussed in full in a Quantitative Risk Assessment report in **Appendix A14.10**. This includes details of the model construction, any limitations, the operating principals, the results and interpretation. The results have been summarised in sections 14.7.1.2 and 14.8.2.2 of this report.

14.2.4 Consultations

Consultations were held with the following organisations:

- **Geological Survey of Ireland (GSI):**
    - The GSI were contacted regarding the designation of the MEHL site as a Geological Heritage Area (GHA) and an on-site meeting was held with the GSI.
    - The Groundwater team of the GSI were also contacted about the proposed MEHL development. Correspondence detailing the consultation with the GSI is contained within **Appendix A1.2**.
- **Environmental Protection Agency (EPA):**
    - Consultations have been held with the EPA.
- **Fingal County Council (FCC):**
    - Consultations have been held with FCC.
- **An Bord Pleanála**

14.2.5 Assessment Criteria

This chapter has been prepared with reference to the document produced by the Institute of Geologists of Ireland, entitled 'Geology in Environmental Impact Statements – a Guide' (September 2002). This document outlines the likely impacts and potential mitigation measures for geological and hydrogeological issues.

An impact assessment will be undertaken in line with the guidelines which are summarised below and explained in full in **Appendix A14.11**.

Following the assessment of impacts, mitigation measures are proposed in this assessment to avoid, reduce and, if possible remedy, any negative impacts on the geological and hydrogeological environment. These are described in Section 14.5 below.

Any residual impacts, which are the final impacts which result after mitigation measures have been fully established, are described in Section 14.6 below.

14.2.5.1 NRA guidelines

No significance rating criteria are supplied in the IGI Guidelines. For this reason the significance criteria from the NRA guidance document 'Environmental Impact Assessment of National Road Schemes – Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (NRA, 2009) was used to provide the significance ratings for this impact assessment.

These guidelines provide a range of criteria for assessing the importance of a feature and for quantifying the magnitude of geological and hydrogeological impacts. These are presented in **Tables A14.11.1 - A14.11.4** of **Appendix A14.11**. The significance of the potential impact takes account of both the importance of the feature and magnitude of the potential impact. The significance rating is determined from the matrix presented in **Table A14.11.5** of **Appendix A14.11**.

14.2.5.2 GSI guidelines

Cognisance was also paid to the GSI guidance document 'Groundwater Protection Responses for Landfills'. This document was prepared for the placement of non-hazardous wastes however the GSI has stated that its principles could also be applied to hazardous and inert waste sites.

Within the guidance document the GSI have prepared a response matrix for landfills which is presented in **Table A14.11.6** of **Appendix A14.11**. The matrix is based on the vulnerability of groundwater, whether the site is within a Source Protection Area for a groundwater abstraction and the aquifer classification of the site.

14.3 Existing Soils and Geology

14.3.1 Landscape and Topography of the Site and Surrounding Area

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.

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 and which will be discussed in section 14.3.2.1. Knockbrack Hill to the north east of the site represents the highest elevation in the surrounding area at 176 mOD.

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 **Figure 14.3**.

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.

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 **Figure 14.3**.

14.3.2 Regional Soils and Geology information

14.3.2.1 Bedrock Geology

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.

Several lithologies are reported from the area around Hollywood (**Geological Survey of Ireland – Geology of Meath, 2001**) as shown on **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.

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

Table 14.2 shows approximate ages for each formation.

Table 14.2 – 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

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.

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.

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.

The Balrickard Formation is a feldspathic micaceous sandstone with shale and argillaceous fossiliferous micrite of Pendleian age.

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."

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.

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.

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.

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.

14.3.2.2 Quaternary Geology

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

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.

14.3.2.3 Soils

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.

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.

14.3.3 Site Specific Geological information

A detailed site investigation was undertaken as part of the investigative works at MEHL site. The locations of all investigations are shown on **Figure 14.5** and the full factual report is presented in **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 A14.4**. The cores obtained demonstrated that these rocks are weathered and broken too.

14.3.3.1 Results of the Geophysics

A field mapping exercise was undertaken by G. Ll Jones on the MEHL site and a report is presented in **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.

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.

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 **Figure 14.6)**.

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 **Appendix A14.2**.

14.3.3.2 Bedrock Geology

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 **Figure 14.6**). The revised bedrock geological map presented in **Figure 14.6** is founded on significantly more detailed geological information than was available during the production of the GSI 1999 publication.

The principal difference between **Figure 14.6** and the GSI Sheet 13 geological map for the area (**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.

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.

Overall the geology of the site youngs to the north, starting with the Loughshinny formation passing upwards and eventually into the Walshestown formation.

A schematic cross section for the site is presented in **Figure 14.7**.

A summary table of the information from the boreholes used to amend the geology map is presented in the following table, **Table 14.3**.

Table 14.3 – Borehole Summary

Borehole ID	Date Drilled	Strata Encountered	Formation/Description	Depth
BH4A		Overburden	Clays	0.0 - 4.3
	18/11/2008	Bedrock	Loughshinny	4.3 - 12.2
BH5		Overburden	Clays	0.0 - 6.0
	03/09/1998	Bedrock	Walshestown	6.0 - 35.0
BH6		Overburden	Clays	0.0 - 4.0
	03/09/1998	Bedrock	Walshestown	4.0 - 19.5
BH7		Overburden	Clays	0.0 - 2.0
	07/09/1998	Bedrock	Walshestown	2.0 - 26.0
BH8		Overburden	Clays	0.0 - 3.0
	17/08/2001	Bedrock	Walshestown	3.0 - 27.0
BH9		Overburden	Clays	0.0 - 12.0
	03/08/2001	Bedrock	Walshestown	12.0 - 50.0
BH10		Overburden	Clays	0.0 - 4.0
	04/08/2001	Bedrock	**Loughshinny**	4.0 - 84.0
BH10a		Overburden	Clays	0.0 - 10.0
		Bedrock	Balrickard/Donore (?)*	10.0 - 21.0
	05/03/2007	Bedrock	**Loughshinny**	21.0 - 68.0
B11a		Overburden	Clays	0.0 - 2.0
	02/05/2007	Bedrock	Walshestown	2.0 - 30.0
BH12		Overburden	Clays	0.0 - 5.5
		Bedrock	Walshestown/Balrickard/Donore (?)*	5.5 - 46.0
	01/05/2007	Bedrock	**Loughshinny**	46.0 - 65.0
BH13		Overburden	Clays	0.0 - 5.5
		Bedrock	Walshestown/Balrickard/Donore (?)*	5.5 - 46.0
	15/04/2007	Bedrock	**Loughshinny**	46.0 - 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.

Table 14.3 – Borehole Summary Continued

Borehole ID	Date Drilled	Strata Encountered	Formation/Description	Depth
BH14		Overburden	Clays	0.0 - 6.0
		Bedrock	Balrickard/Donore (?)*	6.0 - 30.0
	02/03/2007	Bedrock	**Loughshinny**	30.0 - 38.0
BH15		Overburden	Clays	0.0 - 3.2
		Bedrock	Balrickard (?)*	3.2 -10.0
		Bedrock	Possible Donore (?)*	10.0 - 26.1
	06/04/2010	Bedrock	**Loughshinny**	26.1 - 31.9
BH16		Overburden	Clays	0.0 - 0.8
	12/04/2010	Bedrock	Walshestown	0.8 - 60.0
BH17		Bedrock	Balrickard/Donore (?)*	0.0 -37.0
	05/05/2010	Bedrock	**Loughshinny**	37.0 - 54.0
BH18		Overburden	Clays	0.0 - 0.6
		Bedrock	Balrickard (?)*	0.6 - 5.1
		Bedrock	Donore (?)*	5.1 - 15.2
	20/04/2010	Bedrock	**Loughshinny**	15.2 - 21.2
BH19		Overburden	Clays	0.0 -5.0
		Bedrock	Balrickard (?)*	5.0 - 14.0
	21/04/2010	Bedrock	Donore (?)*	14.0 - 18.0
BH20		Overburden	Clays	0.0 - 7.0
		Bedrock	Walshestown	7.0 - 34.0
		Bedrock	Balrickard/Donore (?)*	34.0 - 43.0
	22/04/2010	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.

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.

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.

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.

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.

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".

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.

14.3.3.3 Soils

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.

14.3.3.4 Quaternary Geology

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.

14.3.3.5 Geological Heritage Areas

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.

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.

14.3.4 Summary of the Geology of the MEHL Site

1. An extensive investigation was undertaken at the MEHL site to assess the local geology.
2. 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.
3. Where they occur within this former quarry, the Quaternary deposits consist of Glacial Tills.
4. 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 60 m 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.
5. 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.

14.4 Description of Groundwater Baseline

14.4.1 Hydrology

A full description of the hydrology of the site and the surrounding area is included in **Chapter 15** *Surface Water*. Surface water features in the vicinity of the MEHL site are shown on **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.

14.4.1.1 Rainfall

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.

The 30-year average rainfall measured at Dublin airport is 750 mm. Monthly and annual total rainfall for 2003-2010 are presented in **Appendix A14.7** and annual totals are summarised below in **Table 14.4**.

Table 14.4 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

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.

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 **Appendix 14.7** and summarised in **Table 14.4**. The data shows that the rate of potential evapotranspiration has not changed much since 2003.

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 14.4.

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[6].

This indicates that despite high levels of actual rainfall being measured, the amount of rainfall which may eventually enter groundwater is comparatively low.

14.4.2 Regional Hydrogeology

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 **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.

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).

Table 14.5 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 section 14.3.3.2 and the work undertaken as part of this assessment has led to the boundaries of the lithologies on site being refined as indicated in **Figure 14.6**. From this the aquifer classification has been refined and is presented in **Figure 14.8.**

Table 14.5 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

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.

14.4.2.1 The Aquifer

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.

[6] Water Framework Directive (2005). Working group on groundwater guidance document No. 5. Guidance on the assessment of the impact on groundwater abstractions.

The aquifer is part of the Lusk – Bog of the Ring Groundwater Body (GWB) as shown on **Figure 14.1**.

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.

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.

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 section 14.3.4 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.

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).

Based on the criteria summarised in section 14.2.5.1 the aquifer would be given a Medium Importance.

14.4.2.2 The Aquitard

The aquitard is composed of the formations which were deposited during the Namurian period and is part of the Hynestown GWB (**Figure 14.1**). As stated above the upper part of the Donore Formation is similar to the overlying Naumiran strata and therefore is considered to be part of the aquitard. A geological description of these units is provided in section 14.3.2.1.

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.

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.

Based on the criteria summarised in section 14.2.5.1 the aquitard would be given a Low Importance.

14.4.2.3 Groundwater Flow Direction

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.

14.4.3 Hydrochemistry

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.

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.

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.

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.

Elevated manganese and iron concentrations were thought to originate from the shaly beds in the limestone.

14.4.3.1 Groundwater Vulnerability

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.

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 14.6** below. The Extreme vulnerability class is further sub-divided into Extreme (X) – rock near Surface or Karst and Extreme (E) - subsoils <3m thick.

Table 14.6 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

The GSI groundwater vulnerability maps show different vulnerability ratings in the site and the surrounding area and these are displayed in **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.

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.

14.4.4 Groundwater Resources

14.4.4.1 GSI Well Records

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.

14.4.4.2 Well Survey

A well survey was undertaken to establish if any wells were present in the area which were not identified on the GSI database.

The full details of the well survey are presented in **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.

The well survey identified only 3 properties in the area which have wells abstracting from groundwater and their locations are shown on **Figure 14.10**. As outlined in section 14.4.2.3 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.

In line with the significance criteria presented in **Table A14.11.4**, these wells would have a Low importance as they are supplying less than 50 homes.

14.4.4.3 Bog of the Ring

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 **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 **Figure 14.10**.

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.

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).

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 section 14.4.2.1. It is generally thought that sands and gravels in the vicinity of the Bog of the Ring wellfield provide significant additional storage.

Based on the criteria summarised in section 14.2.5.1 the Bog of the Ring abstraction would have a resource valuation of a High Importance as it is supplying more than 1000 homes.

14.4.5 Features Dependent on the Groundwater Regime

14.4.5.1 Groundwater Dependent Terrestrial Ecosystems (GDTEs)

A full review of ecological features and designated ecological heritage areas in the study area are discussed in detail in **Chapter 13** *Flora and Fauna*.

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[7], SPA[8] and SAC[9] (site codes 000208 and 004015) and the Bog of the Ring pNHA (site code 001024). These features are shown on **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

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.

14.4.5.2 Surface Water Features

There is a stream to the north of the MEHL site (**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.

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.

14.4.6 Site Hydrogeology

14.4.6.1 Introduction

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 section 14.3.3. 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.

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[7] pNHA: Proposed National Heritage Area
[8] SPA: Special Protection Area
[9] SAC: Special Area of Conservation

Many of the monitoring wells and new boreholes drilled on site, as described in section 14.2.3.4, were positioned in locations to investigate this. This is described in full in **Appendix A14.4**.

The final network of groundwater monitoring boreholes was developed on site as shown in **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

Detailed interpretation and data for these are presented in **Appendices A14.3-A14.12**.

Table 14.7 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	Possibly finishing in the Donore Fm which may be part of the aquifer here

The designation as to whether these monitoring wells are in the aquifer or aquitard will be presented in **Table 14.11** once the hydraulic characteristics have been investigated.

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.

14.4.6.2 Aquifer Characteristics

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.

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

Infiltration tests were undertaken in trial pits across the base of the excavation to assess the vertical permeability of the deposits.

Full details of the methodology for these tests, the calculations and the interpretation of the results are also included in **Appendix A14.5**. The results of the infiltration tests are summarised below in **Table 14.8**.

Table 14.8 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.

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.

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.

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

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 **Appendix A14.5**. **Table 14.9** summarises the results obtained from those tests.

Table 14.9 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

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.

The results of the tests undertaken in boreholes tapping the Namurian strata indicate a lower permeability than the Loughshinny Formation.

The caveats associated with the equations and method of testing as outlined in **Appendix A14.5** should be borne in mind when considering these results.

Packer Tests

Packer tests were developed for use to estimate the amount of grout which would have to be used to block a fracture.

Packer tests were undertaken in the open Geo-bore 'S' holes in BH15, BH16 and BH18 on the MEHL site.

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.

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.

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 x 10^{-6} m/s.

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 x 10^{-6} m/s for this fractured area in the Walshestown Formation.

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.

The packer test yielded a permeability value of 2.2 x 10^{-6} m/s at this location.

The results of all packer tests are summarised in **Table 14.10**.

Table 14.10 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

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 **Appendix A14.6.**

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.

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.

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.

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.

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.

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.

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 **Appendix A14.6** and are summarised below.

Based on the shapes of the curves in the graphs, the groundwater in the aquifer is confined by the overlying low permeability deposits.

The groundwater in BH19, BH16 and BH5 appear to be tapping a linear weathered area, fault or fracture zone.

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.

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.

14.4.6.3 Groundwater Levels

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 **Appendix A14.7**.

Table 14.1 summarises the maximum, minimum and average groundwater levels recorded on site for all installations.

Table 14.11 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
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

Graphs of groundwater levels with corresponding rainfall data are plotted in **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 as outlined in section 14.4.1.1. The hydrographs indicate that recharge/infiltration is slow and relatively low responding to seasonal rainfall rather than individual rainfall events.

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.

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.

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.

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.

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.

14.4.6.4 Hydraulic Conditions

The water table map presented in **Figure 14.13** shows groundwater in the aquifer flowing to the south east. This is in line with the regional pattern discussed in section 14.4.2. The hydraulic gradient in the aquifer is approximately 0.02 – 0.04 indicating that the water table has a moderate gradient.

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 section 14.4.6.2 the groundwater velocity would be approximately 1.48×10^{-5} m/s.

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.

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.

14.4.6.5 Hydrochemistry

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 **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 **Appendix A14.8** and summarised below.

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.

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 in section 14.4.2.3

Elevated spot concentrations of iron and nitrite were found in BH20 and BH18 respectively.

Sulphate concentrations exceeded the Drinking Water Standard in BH10A in the most recent round. In previous monitoring rounds, the values were within guidelines values.

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.

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 to indicate that no contamination is present. 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.

Ionic balances were used to assess the quality of the data provided by the laboratory.

Vulnerability

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.

The aquitard strata on-site act as a low permeability layer and confine/isolate groundwaters within the aquifer from the surface

Following the GSI vulnerability criteria outlined in **Table 14.6** this would indicate that the majority of the site has a Moderate vulnerability rather than Extreme.

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.

14.4.6.6 Site Conceptual Model

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.

Based on the criteria established in section 14.2.5, 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.

14.5 Description of Proposed Development

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.

The proposed site layout is shown on **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 **Chapter 4,** *Proposed Site and Project Description* section 4.5.

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.

The risk to groundwater from each waste type will be dependent on where the waste will be placed. Based on the assessment undertaken in section 14.4.2 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.

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.*'

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

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: $R2^2$

In line with the responses outlined in **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.

The impact assessment for the proposed development and the proposed mitigation measures are outlined fully in sections 14.6 and 14.8.

14.6 Evaluation of Potential Impacts

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 which is discussed in section 14.6.1 and the potential impacts to hydrogeology which is discussed in section 14.6. A discussion as to whether these impacts are likely is also presented and if significant impacts are likely then mitigation measures are proposed in section 14.8. Any residual impacts which remain after the mitigation measures have been developed are discussed in section 14.9.

14.6.1 Potential Impacts To Soils And Geology

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.

The aspects of the proposed MEHL development which have the potential to impact on the soils and geology of the site are:

1. 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.

2. 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.

14.7 Potential Impacts To Groundwater

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.

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

These impacts have the potential to occur both at the construction and operational phases of the site works.

14.7.1.1 Hydrogeological Regime

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.

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 in section 14.8.2.1.

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.

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.

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.

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.

This indicates that placing low permeability engineered waste cells over the site will have no impact on the recharge to the aquifer.

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.

14.7.1.2 Contamination Of The Aquifer And Groundwater Based Receptors

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.

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.

The placement of waste is also a potential impact and this has been outlined further for each waste type.

Quantitative Risk Assessment

As outlined in section 14.2.3.7 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.

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.

Full details of the assessment including justifications for input parameters, detailed results and interpretation are included in the QRA report presented in **Appendix A14.10**. 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

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.

14.7.1.3 Groundwater Resources

The impact of the proposed development at the MEHL site on groundwater resources at the MEHL site can be considered both in terms of the sterilisation of the groundwater resource beneath the site and the potential for contamination of the groundwater resource. The potential for contamination is covered in detail in section 14.7.1.2 and this section will deal solely on the potential impact to the sterilisation of resources.

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.

The significance of the impact to the aquifers in an unmitigated scenario in line with the criteria outlined in **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'.

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.

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.

Mitigation measures proposed for these potential impacts are outlined in section 14.8.2.3.

14.7.1.4 Groundwater Flooding

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.
- As outlined in section 14.4.6 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 as outlined in section 14.4.6

For this reason groundwater flooding will not cause an impact on the MEHL site and will not be considered further in this assessment.

14.8 Mitigation Measures

14.8.1 Mitigation Measures For Soils And Geology

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 **Chapter 4,** *Proposed Site and Project Description* for details of the phasing of these works. Following consultation with the GSI, MEHL has agreed to;

i) provide a viewing platform from which the quarry faces can be viewed in a safe environment

ii) To provide an information panel

iii) To maintain certain exposures for as long as is practical and

iv) To allow for professional and/or student access where the necessary insurances are in place.

These proposals were accepted by the Irish Geological Heritage Programme and relevant correspondence are included in **Appendix A1.2**.

- 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.

14.8.2 Mitigation Measures For Groundwater

The mitigation measures which have been developed are outlined below.

14.8.2.1 Hydrogeological Regime

As outlined in section 14.7.1.1 the only potential impact from the proposed development to the hydrogeological regime arise from the waste acting as a barrier to flow.

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.

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.

14.8.2.2 Groundwater Contamination

Mitigation measures have been prescribed for the potential impacts which may cause groundwater contamination as outlined in section 14.7.1.2.

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 **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 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 Ashphaltic 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 **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 **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

As outlined in section 14.2.3.7 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 in section 14.7.1.2. This section presents the impact when all liners are in place and functioning correctly and also when one hazardous cell is leaking.

Full details of the assessment including justifications for input parameters, detailed results and interpretation are included in the QRA report presented in **Appendix A14.10**. The scenario was modelled over a 20,000 year time span to assess any future mobilisation of contaminants.

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 pollutants' (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.

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.

14.8.2.3 Groundwater Resources

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.

14.9 Residual Impacts

A summary of the impacts to each receptor and the residual impact once mitigation measures have been put in place is outlined in **Table 14.12**. All residual impacts have a Significance rating of 'Imperceptible'.

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.

The residual impacts on groundwater are considered to be Imperceptible with the proposed mitigation measures in place.

Table 14.12 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 **Appendix A1.2** 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
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

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15 Surface Water

15.1 Introduction

This chapter 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.

The principal potential impacts to surface water are associated with discharges to the receiving surface watercourses from the proposed integrated waste management facility. The potential for pollution to these surface water features from sediment loading and associated anthropogenic polluting substances entering both surface and sub-surface watercourses can arise during both the construction and operational phases of the proposed MEHL facility. However, risk to surface water systems during the operational phase will be minimal as the drainage system will incorporate sustainable drainage practices and pollution control mechanisms. Mitigation measures will be implemented during the construction phases to minimise potential impacts on surface water systems. Therefore, there will be no significant negative effects to nearby surface watercourses or the downstream catchment during construction and operation of the MEHL facility. Mitigation measures are described in detail in Section 15.5.

The hydrological impact assessment addresses the potential impacts that arise from the proposed MEHL facility and is tailored to include the following:

- Surface watercourses and features in proximity to the proposed MEHL facility and potential impact on them arising from both construction and operational phases of the proposed development.
- Sites of aquatic ecological importance in proximity to the proposed development.
- Flood risk consideration.

These potential impacts are described in detail in Section 15.4. This hydrological impact assessment is supplemented with the following appendices:

- **A15.1** Water Quality Assessment and Legislative Standards
- **A15.2** OPW Flood Report for Ballyboghill Catchment Ballough Stream
- **A15.3** Suggested Salmonid Water Sampling Plan

15.2 Methodology

15.2.1 Study Area

For a hydrological impact assessment all surface water catchments which could potentially be impacted by the proposed MEHL facility are assessed.

15.2.2 Environmental Protection Agency Guidance

The Environmental Protection Agency (EPA) of Ireland outlines the process of preparation and the content required for an EIS in two guidance documents:

- EPA Guidelines on the Information to be contained in Environmental Impact Statements, March 2002.
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) September 2003.

The 2009 NRA Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes was also utilised as part of the assessment methodology. Please refer to Section 15.2.5 for further details.

The hydrological impact assessment process utilises the principles and guidance of both of these documents to assess the potential impacts of the proposed landfill on the existing hydrological environment and provides a suite of mitigation measures to negate or minimise these potential impacts.

15.2.3 Literary Resource Review

Information has been compiled from the following major sources:

- Fingal County Development Plan 2004-2010;
- Eastern River Basin District (ERBD) Catchment Characterisation Report (2005).
- ERBD River Basin Management Plan and Programme of Measures and its associated Strategic Environmental Assessment (2009/2010);
- The existing EPA waste licence (W0129-02) for the facility and associated surface water monitoring data.

Background information on the local and regional surface water network and its vulnerabilities and status was obtained from an array of documents and online references. References included the Environmental Protection Agency's (EPA) online Water Quality database and electronic mapping suites and a range of supplementary documents available from the Eastern River Basin District Authority website (ERBDA).

For the full range of literary resources utilised for this hydrological impact assessment please refer to Section 15.7 References.

15.2.4 Legislation and Guidance

15.2.4.1 Water Framework Directive 2000/60/EC and SI 722 of 2003 European Communities (Water Policy) Regulations 2003 – 2005

The EU Water Framework Directive (WFD) 2000/60/EC came into force on 22nd December 2000, and enacted into Irish legislation through SI 722 of 2003 European Communities (Water Policy) Regulations 2003. This legislation and regulation is a significant piece of legislation for water policy, as it provides a co-ordinated approach across Europe for all water policies, establishing a management structure for future water policy.

A few key objectives of the Directive are to:

- Protect all waters, including rivers, lakes, groundwater, transitional and coastal waters.
- Achieve "good status" in all waters by 2015, and maintaining "high status" where the status already exists.
- Have water management based on River Basin Districts (RBD).

The proposed MEHL facility is located within the Eastern River Basin District. Consequently, the proposed MEHL facility must be cognisant of the principles and objectives of the Eastern River Basin Management Plan (RBMP) (ERBDA, 2008a) and its associated strategic environmental assessment (ERBDA, 2008b).

The strategies and objectives of the Water Framework Directive in Ireland have been influenced by a range of national legislation and regulation including:

- SI 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988
- Local Government (Water Pollution) Acts 1977 – 1990
- SI 258 of 1998 Water Quality Standards for Phosphorus Regulations 1998

In turn the implementation of the Water Framework Directive and its associated policies has necessitated the introduction of new regulations in Ireland including:

- SI 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009.

These regulations are discussed further in the following sections.

15.2.4.2 SI 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009

These regulations have been devised as a more complete and stringent set of surface water quality regulations which covers the requirements of the Water Framework Directive and the Dangerous Substances Directive. These regulations came into effect on 30 July 2009 and have been adopted by the Government. These new regulations supersede previous water quality regulations (both EU and national), however the proposed MEHL facility must still be cognisant of previous regulations as they form the basis for a wide range of impact assessment and monitoring methodologies.

15.2.4.3 European Communities Priority Substances Directive 2008

The European Communities Priority Substances Directive was devised to assign a chemical status assessment for water bodies. Directive 2008/105/EC provides environmental quality standards in the field of water policy.

15.2.4.4 SI 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988

The Salmonid Regulations set water quality standards for salmonid waters, with identification of salmonid waters, water quality standards, and frequencies of sampling and methods of analysis and inspection.

15.2.4.5 Local Government (Water Pollution) Acts 1977 – 1990

The discharge of this act is the main legislation for the prevention and control of water pollution, including the general prohibition of polluting matter to waters. This water quality standards outlined in this act are now largely redundant as the standards laid out in the 2009 Regulations (SI 272 of 2009) are more refined, however, current impact assessment and monitoring methodologies must still be cognisant of this legislation.

15.2.4.6 SI 258 of 1998 Water Quality Standards for Phosphorus Regulations 1998

As part of the Water Pollution Acts, these regulations require water quality be maintained or improved, with reference to the biological quality river rating system as assigned by the Environmental Protection Agency between 1995 to 1997. This statutory instrument has also largely been superseded by the 2009 Regulations, however current impact assessment and monitoring methodologies must still be cognisant of this legislation.

15.2.5 Supplementary Guidance and Information

In 2009 the National Roads Authority (NRA) published their finalised *Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*. This document outlines a range of best practice guidelines for the assessment of hydrological impacts that are the most up to date hydrological impact assessment guidance available nationally. The NRA Guidelines reflect the principles and guidance already established by the EPA in their two guideline documents. However, the new NRA Guidelines are focused specifically on the hydrological environment and assessing the potential impacts on surface water catchments. Consequently, the NRA Guidelines provide a greater level of guidance on the methods and compilation of a hydrological impact assessment. The methodology for the proposed MEHL facility hydrological impact assessment incorporates key aspects of the assessment methodology prescribed in these guidelines which recommends that a hydrological impact assessment should include the following:

- Provide a detailed hydrological impact assessment methodology.
- Provide a Regional Overview and Characterisation of the hydrological environment.
- Assessment of likely significant positive and/or negative impacts on the existing hydrological environment.
- Provide appropriate construction and operational mitigation measures and provide an assessment of residual impacts.

Supplementary hydrological principles and guidance from a range of sources was also utilised for the hydrological impact assessment including:

- Rural and Urban Hydrology (Mansell, 2003)
- The Greater Dublin Strategic Drainage Study (Dublin City Council et al., 2005)

15.2.6 Consultation

Consultation for the environmental impact assessment relating to surface water and drainage was undertaken with Fingal County Council and comments were received regarding surface water and groundwater interactions which are subsequently assessed within this EIS.

Consultation was also undertaken in conjunction with the ecological team regarding aquatic ecology with the following organisations;

- Inland Fisheries Board Eastern River Basin District Division.
- National Parks and Wildlife Service (NPWS).

Suggestions from the consultees gathered during the consultation process have been integrated into the hydrological impact assessment process. These suggestions detailed in **Appendix A1.2** have contributed to the refinement of the proposed MEHL facility design process where considered appropriate and have strengthened the mitigation measures proposed for construction and operation.

15.2.7 Site Visit

A site visit was conducted by Arup as part of the hydrological impact assessment process in June 2010. All surface water features in proximity to the proposed MEHL facility were the subject of this site visit to ascertain specific areas which may be at risk from impact.

15.2.8 Existing Water Quality Assessment

The assessment of water quality for the proposed MEHL facility comprises a desk-top study examining water quality data supplied by the EPA and from MEHL's own water quality monitoring suites and compared to relevant water quality standards and guidance.

Under the Water Framework Directive (WFD) 2000/60/EC, and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations 2003, the water quality of River Basin Districts is assessed biologically, physically and chemically. Assessment using surveys is predominately conducted by the EPA and local authorities, and complemented by other government bodies including the Central Fisheries Board and the Marine Institute. **Appendix A15.1, Table 1** summarises the quality classes used to establish and monitor the condition of rivers and streams in Ireland. **Appendix A15.1, Table 2** describes in detail the classification system combined with the Biological Quality Q-Ratings, basic physico-chemical water quality, the status of the ecosystem and the human value associated with surface water systems.

15.2.9 Existing Hydrological Environment Categorisation

Characterisation of surface water systems is based on the identification of features of the baseline hydrological environment that are relevant and can be assigned a functional value. The functional value of each of these features is determined by three factors, the importance of the feature, the sensitivity of the feature and the existing adverse pressures affecting the feature. The assignment of functional values is also cognisant of technical standards, regulations and relevant legislation.

15.2.9.1 Importance

Surface water systems act as resources for both aquatic and terrestrial ecosystems and are an essential factor to sustain human life. Surface water floodplains can also act as a reserve or store for floodwaters during times of significant flooding and this can prevent floodwaters from impacting downstream. **Table 15.1** indicates how the importance of surface water resources is evaluated using specific criteria that have been defined for the purpose of hydrological baseline assessment.

Table 15.1 Hydrological Baseline Categorisation

Criteria	Functional Value
Surface Watercourses with Q-values of Q5 and/or Q4-5 or Q4, which are classified by the EPA as 'Class A - Unpolluted'. Surface Watercourses with flood plains that have significant storage capacity for potential floodwaters.	Very High
Surface Watercourses with Q-values of Q3-4, which are classified by the EPA as 'Class B -Slightly Polluted'. Surface Watercourses with flood plains that have significant storage capacity for potential floodwaters.	High
Surface Watercourses with Q-values of Q3 or Q2-3, which are classified by the EPA as 'Class C - Moderately Polluted'. Surface Watercourses with flood plains that have significant storage capacity for potential floodwaters.	Medium
Surface Watercourses with Q-values of Q2 or Q1-2 or Q1, which are classified by the EPA as 'Class D - Seriously Polluted'. Surface Watercourses with flood plains that have no storage capacity for potential floodwaters.	Low
Surface Watercourses that have been culverted. Surface Water Features solely used for visual amenity.	Very Low

15.2.9.2 Sensitivity

Surface water features are highly sensitive to culverting, which can alter flow conditions and affect light penetration to the watercourse. Surface water features are also at risk from discharges of surface water run-off which may contain polluting substances that can have a significant adverse impact on the biological and physico-chemical status of a watercourse such as a salmonid river or stream. Surface water features are also highly sensitive to morphological change through deepening, realignment or diversion of their natural channel which can also alter the hydrodynamic regime of the surface water feature. These factors were taken into account when defining the criteria to be used to assign a functional value to the baseline hydrological environment.

15.2.9.3 Existing Adverse Hydrological Pressures

Existing pollution has an adverse impact on the functional value of surface water features. Consequently the definition of the functional value for each individual watercourse has been cognisant of the pressures from pollution both upstream of the study area and within the study area. The existing hydrological pressures are reflected in the EPA Q-Value, which describes the biological status of the watercourse, please refer to **Appendix A15.1**. The higher the pollution level in a watercourse, the lower the Q-value. The Q-value reflects impacts from surface water run-off (including run-off from agricultural land which may contain nutrients and run-off from roads and buildings which may contain solids, hydrocarbons and heavy metals). The existing pressures are also apparent in the physico-chemical status of the surface water feature with both organic and inorganic pollutants altering the physico-chemical status.

15.2.9.4 Functional Value

The functional value of the existing hydrological environment is evaluated through the assessment of surface water criteria and the importance and sensitivity of the surface water features. The surface water criteria have previously been described in **Table 15.1**.

15.2.10 Impact Assessment

The source and type of all potential impacts is described in **Section 15.4**. Mitigation measures specified for the proposed MEHL facility are outlined in **Section 15.5**. The extent to which mitigation is needed increases as the significance of the impact increases. The residual impact is then evaluated in **Section 15.6** in terms of magnitude and significance. The criteria and durations used to assess the different impacts associated with the proposed MEHL facility are shown in **Table 15.2** and **Table 15.3**. The criteria have been defined in accordance with the 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA, 2002) and the recent NRA document "Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes" (NRA, 2009).

Table 15.2 Criteria for Assessment of Hydrological Impact Magnitude

Criteria	Impact Magnitude
Long-term to permanent change to a designated conservation site or designated salmonid river. Medium-term to permanent contamination of surface water over entire surface water catchment. Medium-term to permanent potential changes in drainage patterns over entire catchment.	Profound
Medium term change to a designated conservation site or a designated salmonid river. Temporary to short-term contamination of surface water over entire surface water catchment. Temporary to short-term potential changes in drainage patterns over entire catchment.	Significant
Temporary to short-term change to a designated conservation site or a designated salmonid river. Medium to long-term contamination of local surface water. Medium to long-term potential changes in local drainage patterns.	Noticeable
Short-term contamination of local surface water. Short term potential changes in local drainage patterns.	Slight
Temporary contamination of local surface water. Temporary potential changes in local drainage patterns.	Imperceptible

Table 15.3 Definition of Duration Criteria

Impact Description	Definition
Permanent Impact	Impact lasting over sixty years
Long-Term Impact	Impact lasting fifteen to sixty years
Medium-Term Impact	Impact lasting seven to fifteen years
Short-Term Impact	Impact lasting one to seven years
Temporary	Impact lasting for one year or less

15.2.11 Resource Availability

The information that was obtained was sufficient to perform the hydrological impact assessment.

15.3 Baseline Hydrological Environment

15.3.1 Introduction

A stream flows along the northern boundary of the MEHL facility (Refer to **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 (Refer to **Chapter 13** *Flora and Fauna* for further details on ecology). 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.

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. Please refer to **Chapter 13** *Flora and Fauna* for greater information on the estuary and its ecological status.

15.3.2 Catchment Character

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 **Figure 15.1**. Further details on hydrometric areas and catchments can be found on the EPA website.

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).

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).

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.

Other pressures on the hydrological environment consist of population growth (residential and tourists), industrial production and the transportation network.

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

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.

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.

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 **Chapter 14** *Soils, Geology and Hydrogeology.*

15.3.3 Flood Risk

The proposed MEHL facility is located in the north western section of the Ballough Stream catchment in the vicinity of its source. As discussed in Section 15.3.2 above, 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.

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. The report is located in **Appendix A15.2**. 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.

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.

15.3.4 Surface Water Flow

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.

15.3.5 Water Quality

15.3.5.1 Biological Quality

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 15.4** provides the quality status of the Ballyboghill Stream while **Table 15.5** provides the quality status of the Ballough Stream (EPA, 2007). Refer also to **Figure 15.2** which shows the vulnerability of these streams.

Table 15.4 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

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 15.5 Ballough Stream Q-Ratings

Station No.	Station Location	Year				
		1991	1996	1998	2001	2005
1600	Corduff Br	3	3	3	3-4	3

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).

15.3.5.2 Physico-chemical Quality

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 **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 15.6** indicates data at SW1 upstream of the site and **Table 15.7** indicates data at SW2 downstream of the site. **Table 15.8** indicates data at SW1 for the second quarter of 2010 while **Table 15.9** indicates data at SW2 for the second quarter of 2010.

Table 15.6 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
Ammoniacal Nitrogen	mg/l NH4-N	0.51	<0.20	2.500
Total Suspended Solids	mg/l	53.19	<10.00	284.000

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
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 15.7 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
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

Parameter	Unit	Average (7 yr)	Minimum Recorded	Maximum Recorded
Sulphate	mg/l	170.31	110.000	254.000
Total Alkalinity	mg/l	193.31	130.000	270.000

15.3.5.3 Surface Water Quality June 2010

Table 15.8 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
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 15.9 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
Orthophosphate	mg/l	0.14	0.65
Sulphate	mg/l	170.31	8.09
Total Alkalinity	mg/l	193.31	NDP

15.3.6 Morphology

A river's morphology consists of a combination of physical characteristics including catchment drainage patterns, channel shape and size, channel features and sedimentary characteristics.

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.

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.

15.3.7 Aquatic Ecology

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 **Chapter 13** *Flora and Fauna* for greater detail on aquatic ecology.

15.3.8 Functional Value

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.

15.4 Predicted Impacts

15.4.1 Potential Construction Impacts

Chapter 5 Construction Activities describes the construction phase of the proposed development. **Section 15.5** outlines the mitigation measures 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 (potential effects to aquatic ecosystems and protected species arising from construction impacts are considered in detail in **Chapter 14** *Flora and Fauna*). 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, betonite, 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.

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.

15.4.2 Potential Operational Impacts

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.

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.

These potential sources are discussed in greater detail below.

15.4.2.1 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.

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 **Chapter 7** *Human Beings* for further details.

If an accidental spillage of hazardous waste entered the surface water system, this has the potential to have a deleterious affect 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.

15.4.2.2 Road Runoff

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.

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.

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.

15.4.2.3 Winter Maintenance

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.

15.4.2.4 Leachate

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 **Chapter 4** *Proposed Site and Project Description* will ensure that such a leak will not occur.

Flood Risk

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 **Chapter 4** *Proposed Site and Project Description* and also outlined in summary in **Section 15.5.2**.

Further detail on the flood risk assessment is located at **Section 15.4.4**.

15.4.3 Impact Assessment

15.4.3.1 "Do-Nothing"

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.

15.4.3.2 Construction Impact Assessment

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 measures outlined in **Section 15.5.1** 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.

15.4.3.3 Operation Impact Assessment

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 outlined in **Section 15.5.2** will be implemented.

Consequently, there are no anticipated negative hydrological impacts to the surface water network as a result of the operation of the proposed MEHL facility.

15.4.4 Flood Risk Assessment

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*".

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.

The aim of the guidelines is to ensure that flood risk is neither created nor increased by inappropriate development.

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.

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.

Fundamental to the guidelines is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability.

In preparing this EIS, an assessment has been undertaken of any potential flood risk arising from the proposed development as outlined below.

15.4.4.1 Staged Approach to Flood Risk Assessment

Section 2.21 of the guidelines recommends that a staged approach be adopted when considering flood risk.

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.

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.

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).

Flood Zone C covers all areas of the plan which are not in zones A or B.

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.

It is therefore considered that the proposed development site lies within Flood Zone C.

15.4.4.2 Vulnerability Classification

Table 3.1 of the guidelines outlines the classification of vulnerability of different types of development.

The proposed development would be classified as being 'Less Vulnerable Development' under the guidelines as it would be considered a commercial enterprise.

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.

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.

15.4.4.3 Assessment of all potential sources of Flooding

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.

Other sources of flooding would include:

- Groundwater flooding;

- Surface water drainage flooding;
- Pluvial flooding (direct rainfall) from localised storm water runoff from adjacent ground.

As outlined earlier, as part of the assessment, Arup have reviewed any records of historic flooding available on the OPW National Flood Hazard Mapping website, www.floodmaps.ie. A copy of a summary report from the website is attached at **Appendix A15.2**. There is no evidence of historic flooding in the immediate vicinity of the site. Refer to **Chapter 14** *Soils, Geology and Hydrogeology* and **Appendix A14.7** for information regarding groundwater levels on site.

As outlined in **Chapter 4** *Proposed Site and Project Description* of this report and in summary in **Section 15.5.2**, 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.

15.5 Mitigation Measures

15.5.1 Construction Phase

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.

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.

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

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 (as outlined in Section 15.3.4) 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.

For further detail on mitigation measures required to protect ecology please refer to **Chapter 13** *Flora and Fauna.*

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.

15.5.2 Operation Phase

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 **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.

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.

15.5.3 Monitoring

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.

15.6 Residual Impact

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.

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

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16 Archaeological, Architectural and Cultural Heritage

16.1 Introduction

MEHL proposes to construct an integrated waste management facility for the acceptance of non-biodegradable waste including hazardous and non-hazardous incinerator ash, hazardous and non-hazardous soils and inert soils, and other compatible waste streams.

The site of the proposed integrated waste management facility was formerly a quarry from which limestone and shale were extracted and is currently in use as a landfill for inert waste with a number of inert landfill cells on site being filled in accordance with an Environmental Protection Agency (EPA) waste licence (W129-02).

MOORE GROUP was commissioned by Arup to determine the cultural heritage resource of the area and to determine how this would be impacted by the proposed development, propose mitigation measures and provide an indication of the likely residual impacts upon the cultural heritage of the region.

Moore Group is a multi-disciplinary environmental, planning and heritage resource management consultancy. Their work includes Environmental Impact Assessments (EIS), surveys of terrestrial, freshwater and marine environments (in conjunction with Moore Marine), conservation management planning, ecological landscape design, built heritage and archaeological consultancy and fieldwork including archaeological excavation and other specialist services.

For the purposes of this report the definition of "*cultural heritage*" is taken broadly from the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972, which considers the following to be "*cultural heritage*":

- Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science.
- Groups of Buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science.
- Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

16.2 Study Methodology

16.2.1 Conventions and Legislation

Ireland has ratified several European and international conventions in relation to the protection of its cultural heritage. Outlined herein are summaries of relevant conventions and legislation.

Planning and Development (Strategic Infrastructure) Act 2006-2009

The Planning and Development (Strategic Infrastructure) Act 2006 ensures the protection of the archaeological heritage resource by requiring that all applications under this Act are accompanied by an EIS including information on material assets, including the architectural and archaeological heritage, and the cultural heritage.

The National Monuments Act 1930 to 2004

Irish legislation for the protection of archaeological heritage is based on the National Monuments Acts 1930 and amendments of 1954, 1987, 1994 and 2004. These acts are the principal statutes governing the care of monuments in the Irish Republic. They provide for the protection of national monuments through the use of preservation orders. The Minister for the Environment, Heritage and Local Government has a specific role in relation to the protection of the archaeological heritage through powers provided by these acts and the National Cultural Institutions Act 1997. The overall state archaeological service is provided by the Department of Environment, Heritage & Local Government (DoEHLG) and delivered through the Planning and Heritage Section of the DoEHLG and the National Museum of Ireland (Irish Antiquities Division) on behalf of the Minister.

Monuments are protected under the National Monuments Acts in a number of ways:

- *National Monuments in the ownership or guardianship of the Minister or a local authority*. A National Monument is a monument under preservation by the State, as a result of its being considered to be of national importance. The legal basis for this status is the National Monuments Acts 1930 to 2004. The original national monuments Act was enacted in 1930 updating an original inventory of monuments comprised of those to which the Ancient Monuments Protection Act, 1882 applied. The most recent amendment in 2004 includes provisions for the partial or complete destruction of National Monuments by the Government. Only a small section of our monuments are in state ownership. The remainder are protected by the state under the National Monuments Acts but the care and preservation of these features depends largely on the interests and respect of individuals.
- *National Monuments, which are subject to a preservation order*; where it appears to the Minister that a monument, considered to be a national monument, is in danger or is actually being destroyed or falling into decay the Minister may, by preservation order or temporary preservation order,

undertake the preservation of the monument. A temporary preservation order will remain in force for six months and then expire.

- *Historic monuments or archaeological areas recorded in the Register Of Historic Monuments*; contains a list of all historic monuments known to the Minister. Owners or occupiers must not, other than with consent, alter, deface, demolish or in any manner interfere with a historic monument entered in the register (National Monuments (Amendment) Act, 1987)
- *Monuments recorded in the Record of Monuments and Places (RMP).* All known sites and monuments are identified and listed for protection in the Record of Monuments and Places, a statutory inventory of sites protected under the National Monuments (Amendment) Act, 1994. Monuments entered into it are referred to as Recorded Monuments. Owners or occupiers of Recorded Monuments are required to give two months notice to the Minister and obtain consent before carrying out any works in relation to the monument. This is to allow the National Monuments Service time to consider the proposed works and how best to proceed to further the protection of the monument. For national monuments in the ownership or guardianship of the Minister or a local authority or which are subject to a preservation order, the prior written consent of the Minister is required for any works at or in proximity to the monument. The RMP consists of a set of 6" maps of the different counties with an accompanying index which shows all the sites, monuments and zones of archaeological potential, recorded to date and protected in the county. The inventory concentrates on pre 1700 AD sites.

The European Landscape Convention 2000

In 2002 Ireland ratified the European Landscape Convention - also known as the Florence Convention, which promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. It is the first international treaty to be exclusively concerned with all dimensions of European landscape. The Convention came into force on 1 March 2004 and is part of the Council of Europe's work on natural and cultural heritage, spatial planning and the environment. It applies to the entire territory of the ratified parties and relates to natural, urban and suburban areas, whether on land, water or sea. It therefore concerns not just remarkable landscapes but also ordinary everyday landscapes. The European Landscape Convention introduces the concept of "*landscape quality objectives*" into the protection, management and planning of geographical areas.

The Planning and Development Act 2000

Under arrangements which came into operation on 1 January 2000 (The Planning and Development Act, 2000), the system of listing buildings was replaced with strengthened procedures for the preservation of protected structures and structures in architectural conservation areas (ACA).

A protected structure is a structure that a local authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social or technical point of view. Details of protected structures are entered by the authority in its Record of Protected Structures (RPS), which is part of the development plan. Each owner and occupier of a protected structure is legally obliged to ensure that the structure is preserved.

The legislation obligates planning authorities to preserve the character of places and townscapes which are of special architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest or that contribute to the appreciation of protected structures, by designating them ACA in their development plan. The Act also provides comprehensive protection for landscapes including views, prospects and the amenities of places and features of natural beauty or interest under a local authority's development plan. A development plan is required to include objectives for the preservation of the character of the landscape including the preservation of views and prospects. A planning authority may also designate, for the purposes of preservation, landscape conservation areas.

The Architectural Heritage and Historic Properties Act, 1999

The Architectural Heritage (National Inventory) and Historic Properties (Miscellaneous Provisions) Act, was promulgated in 1999 as a direct response to the Granada Convention (see below). The Act provides for the establishment of a national inventory of architectural heritage and for related matters and to provide for the obligations of local sanitary authorities in respect of registered historic monuments. Although this Act provides no direct protection for architectural sites, it is used by local authorities to inform the compilation of their Record of Protected Structures which, under the Planning and Development Act 2000, does afford legal protection.

European Convention on the Protection of the Archaeological Heritage (Valletta Convention), 1997

In 1997 the Republic of Ireland ratified the Council of Europe European Convention on the Protection of the Archaeological Heritage (the 'Valletta Convention'). Obligations under the Convention include: provision for statutory protection measures, including the maintenance of an inventory of the archaeological heritage and the designation of protected monuments and areas; the authorisation and supervision of excavations and other archaeological activities; providing for the conservation and maintenance of the archaeological heritage (preferably in situ) and providing appropriate storage places for remains removed from their original locations; providing for consultation between archaeologists and planners in relation to the drawing up of Development Plans and development schemes so as to ensure that full consideration is given to archaeological requirement, making or updating surveys, inventories and maps of archaeological sites and taking practical measures to ensure the drafting, following archaeological operations, of a publishable scientific record before the publication of comprehensive studies and preventing the illicit circulation of elements of the archaeological heritage, including co-operation with other states party to the convention.

European Convention on the Protection of the Architectural Heritage (Granada Convention), 1997

Also in 1997 the Republic of Ireland ratified the Council of Europe Convention on the Protection of the Architectural Heritage of Europe (the 'Granada Convention'). Obligations under this convention include maintenance of inventories of architectural heritage, provision of statutory measures to protect the architectural heritage, the adoption of integrated conservation policies, which include the protection of the architectural heritage as an essential town and country planning objective, developing public awareness of the value of conserving architectural heritage, etc.

UNESCO World Heritage Convention, 1972

In an international context Ireland is a ratified member of The World Heritage Convention, adopted by UNESCO in 1972. The Convention provides for the identification, conservation and preservation of cultural and natural sites of outstanding universal value for inclusion in a world heritage list. The World Heritage status is a non-statutory designation and no additional statutory controls result from this designation. However the impact of proposed development upon a World Heritage Site will be a key material consideration in determining planning applications.

16.2.2 Methodology

The assessment of impacts upon the archaeological, architectural and cultural heritage was based on a desktop study of published and unpublished documentary and cartographic sources, followed by a field survey and consultation with statutory stakeholders. In light of the legislative protection afforded to the cultural heritage resource (see above) this chapter assesses the archaeological, architectural, cultural and historical importance of the subject area and examines both the potential direct and indirect effects of the proposed development on the receiving environment.

16.2.3 Desk Based Study

World Heritage Sites and Candidate World Heritage Sites were reviewed to see if any are located within the vicinity of the proposed development.

All known cultural heritage sites were mapped in GIS along with aerial photography and Ordnance Survey Ireland (OSI) First Edition Mapping (Circa 1830). Sites mapped included the following:

- National Monuments, a now out of date data set previously available from www.heritagedata.ie
- Record of Monuments & Places (RMP) from www.archaeology.ie
- Records of Protected Structures (RPS) from Fingal County Council
- National Inventory of Architectural Heritage (NIAH) for County Fingal from www.buildingsofireland.ie
- Demesnes Landscapes and Historic Gardens indicated on the OSI First Edition Mapping

All townlands located within 2km of the proposed development site were listed and crossed referenced with:

- National Monuments, a list for County Dublin available from www.archaeology.ie
- Preservation Orders, a list available from the DoEHLG
- Lists contained in the Appendices 6 and 7 to the Report of the Commissioners or Church Temporalities of Ireland (1879) which contain lists of Churches, School Houses and Graveyards that were vested in the Representative Church Body and the Burial Boards under The Irish Church Act, 1869.

The Fingal County Development Plans were reviewed and several other documentary and literary sources were reviewed to obtain a comprehensive understanding of the cultural heritage of the region.

Based upon all the information reviewed, all sites were mapped in GIS and significant sites / regions / landscapes were highlighted for further analysis during the field survey.

In order to assess the potential impact of the proposal the following sources were also consulted or reviewed:

- Fingal Development Plan 2005-2011 and Draft Fingal Development Plan 2011-2017
- Excavations Bulletin
- Topographical files of the National Museum of Ireland
- Cartographic Sources
- Toponym analysis
- Aerial photographs
- Published archaeological inventories
- Documentary Sources: a number of literary references were consulted.

16.2.4 Field Survey

Following a detailed desk study of the study area a field survey was undertaken to further assess the potential impacts that the proposed development would have on the receiving cultural heritage environment. All mapping in GIS was loaded onto a laptop fitted with a GPS for review during the field survey and any previously unrecorded architectural or archaeological features were noted.

The assessment recognised that this type of development can have indirect impacts upon the setting and character of cultural heritage sites. During the field survey the following criteria were used to assess whether sites could be the subject of indirect impacts:

- A site’s distance from the proposed development.
- Landscape setting and context including condition, visibility, elevation, scale, screening, association with proximate cultural heritage sites.
- Cultural heritage value including each site’s legislative protection and rarity.

- Amenity value
- Viewer incidence
- Public accessibility
- Professional judgment

16.2.5 Consultation

A consultation letter was sent to the following statutory and non-statutory bodies on the 31 May 2010:

- Development Applications Unit of the DoEHLG
- Fingal County Council
- Meath County Council
- An Taisce
- The Heritage Council

Responses are attached in **Appendix A1.2**.

16.3 Receiving Environment

16.3.1 Archaeological, Architectural and Historical Background

Mesolithic Period

The Mesolithic (middle stone age) people were the first inhabitants of Ireland, arriving about 9000 years ago. They were a mobile society relying on wild resources for food, which was hunted and gathered using stone tools as well as boats, nets and traps. Settlement was in temporary and semi permanent groups of huts constructed of wood slung with hide, which may have operated as seasonal or hunting camps.

In many cases, the edges of coastal estuarine areas were the preferred location of Mesolithic (c. 6000 BC – 4000 BC) settlement. This is well attested to in the county of Dublin by the excavations carried out at Sutton in the 1940s and 1970s. Here, a shell midden was uncovered, which had been formed when Howth was an Island. The excavations produced artefacts of flint, chert and stone. Radiocarbon dating suggest a sixth millennium provenance with a later hearth in the midden being dated to 4340 – 3810 BC.

There is no evidence for Mesolithic activity in the area surrounding the MEHL site.

Neolithic Period

Farming was first adopted in the Middle East but spread gradually across Europe in succeeding centuries, arriving in Ireland about 4000 BC. Tending of crops and animals required a more sedentary lifestyle and larger permanent settlements were built. The megalithic (from the Greek mega – large and lith – stone) monuments of the Neolithic people built as communal tombs or for ceremonial purposes, are relatively common in the landscape. New methods were adopted for shaping stone tools and the first long distance trade networks were established.

Although there is no direct evidence of Neolithic activity in the immediate area, there is significant archaeological evidence for Neolithic activity in surrounding areas. The most immediate evidence comes from the discovery of a porcellanite stone axe fragment in the Naul as well as quartz and flint flakes in Walshestown (K.T. Cullen & Co., 1999). Further evidence in the county comes from the excavations at Lambay Island. Lambay Island is an important site, with excavations indicating significant axe manufacturing capabilities and further Neolithic activity. Further afield is the Fourknocks passage tomb cemetery and further passage tombs at Gormanston.

Bronze Age

As stone tools were replaced by the use of copper, later combined with tin to make bronze, the structure of society also changed over centuries. While some communal megalithic monuments, particularly wedge tombs continued to be used, the Bronze Age is characterised by a movement towards single burial and the production of prestige items and weapons, suggesting that society was increasingly stratified and warlike. In late Bronze Age Ireland the use of the metal reached a high point with the production of high quality decorated weapons, ornament and instruments, often discovered from hoards or ritual deposits.

Similar to the Neolithic period, the Bronze Age is well represented in North County Dublin. Although there are no Bronze Age monuments in the immediate area surrounding the subject site, continued activity in the area is attested to by the discovery of several funerary urns noted by Lewis (Lewis, 1837) and referred to by Waddell, found when levelling a hill in Hollywood (Waddell, 1990) and a copper cake at Damestown (K.T. Cullen & Co., 1999).

Iron Age

The Iron Age is known as a 'dark age' in Irish prehistory. Iron objects are found rarely, but there is no evidence for the warrior culture of the rest of Europe, although the distinctive La Tené style of art with animal motifs and spirals was adopted. Life in Iron Age in Ireland seems to have been much as it was in the early historic period – mixed farmers living in or around small defended settlements known as ringforts or stone cashels.

There is a hillfort and barrow cemetery at Knockbrack and Kitchenstown respectively, the hillfort at Knockbrack being one of the largest of Irish hilltop enclosures. There are significant Iron Age coastal settlements to the south at Drumanagh and the island of Lambay has a number of burials which are said to date to the Iron Age.

Early Historic and Medieval Periods

Continuing settlement and activity through the Early Christian/Early Historic periods is attested to by the numerous enclosure sites in the general area.

The principal town in the vicinity of the MEHL site is the Naul, located approximately 3.5km to the northwest. The name derives from the Irish An Áill, meaning 'the Cliff'. Formerly, Naul was an important village on the main road to Drogheda, and therefore was frequented by the stage coaches. Here, there was also a "White castle", of which nothing now remains. Built in the 13th Century, it was the home of Richard Caddell. The Caddell family were still in the area in the 19th century, as a monument that is locally known as "Caddell's Folly" was erected during the period by another Richard Caddell. The present Parish of Naul absorbs as many as five distinct Parishes of the medieval system, viz., Naul, Hollywood, Grallagh, Ballyboghill, and Wespalstown. The 'Black Castle', constructed by Richard Cruise in the late 12th century was located on a large cliff, which gave rise to the name of the town. After participating in the 1641 Rebellion, the Cruises were dispossessed of their castle and lands. The castle was eventually destroyed by Cromwells forces in 1649. Nearby Balrothery was originally established in 1343 by Richard Costentyn.

The following information regarding Hollywood derives from Lewis' Topographical Dictionary of Ireland:

> HOLLYWOOD, a parish, in the barony of BALROTHERY, county of DUBLIN, and province of LEINSTER, 4 miles (S. W.) from Balbriggan, on the road from Dublin by Naul to Drogheda; containing 1022 inhabitants. This parish, with respect to its agriculture, is in an unimproved state, though good limestone for burning exists near the ruins of its ancient church; there is also a quarry of black slate near Malahow. The principal seats are Malahow House, the residence of the Rev. T. Baker; and Malahow, of T. Cosgrave, Esq., from both of which are extensive views, and also from the R. C. parochial house at Damastown, embracing an extensive tract of country towards Dublin, backed by the Dublin and Wicklow mountains. The living is a vicarage, in the diocese of Dublin, episcopally united to the vicarages of Naul and Grallagh, and in the patronage of the Marquess of Drogheda; the rectory is impropriate in W.D. Pollard, Esq., and Capt. G. Pepper. The tithes amount to £229. 1. 9., of which £151. 14. 4. is payable to the impropriators, and the remainder to the vicar; and the vicarial tithes of the whole union amount to £92. 8. 11. The glebe-house was built by a gift of £369 and a loan of the same amount from the fate Board of First Fruits, in 1829; the glebe comprises 6 acres. In the R. C. divisions the parish forms part of the union or district of Naul or Damastown; the chapel at Damastown is a neat edifice, and near it is the parochial house for the R. C. clergyman, erected in 1833, at an expense of £500; there is a private school, in which are about 20 children. On levelling a hill near the ruins of the old church, in 1833, several urns containing ashes were found, about six feet below the surface. Near the spot is an extensive moat, or rath. There is a holy well, dedicated to St. Kennett.

16.3.2 World Heritage Sites and Candidate World Heritage Sites

The Island of Ireland contains three Unesco World Heritage Sites: The Giants Causeway, Bru na Boinne and Skellig Michael. None of these are located in proximity to the proposed development site. The nearest, Bru na Boinne is located approximately 20km to the north west of the proposed development site and is screened by topography.

In April 2010 the Minister for Environment Heritage & Local Government sought World Heritage status for a number of sites throughout Ireland, including:

- The historic city of Dublin
- The Céide Fields and North West Mayo Boglands
- Western Stone Forts
- The Aran Islands, Galway
- Cahercommaun, Clare
- Caherconree, Clare
- Benagh, Kerry
- Staigue, Kerry
- Early Medieval Monastic Sites
- Clonmacnoise
- Durrow
- Glendalough
- Inis Cealtra
- Kells
- Monasterboice
- The Royal Sites of Ireland:
- Cashel
- Dún Ailinne
- Hill of Uisneach
- Rathcroghan Complex
- Tara Complex

None of these sites are located in the vicinity of the proposed development.

National Monuments

As previously noted under Conventions and Legislation (16.2), National Monuments include sites in the care or guardianship of the state (Minister for Environment, Heritage and Local Government) or a local authority and sites protected by Preservation Orders.

Sites in the Ownership or Guardianship of the State

The now outdated dataset from www.heritagedata.ie does not indicate any national monuments in the vicinity of the proposed development site. The closest, a Church Tower (National Monument Number 590, RMP Number DU005-009) is located approximately 4.7 km away in the town of Balrothery. As this data is inaccurate all townlands within 2km of the proposed development site were cross referenced with the lists of National Monuments available on the www.archaeology.ie website. No further sites were found.

Sites in the Ownership or Guardianship of a Local Authority

Located in the lee of the hill less that 100m to the south west of the site boundary is a small, well maintained, church and graveyard (RMP DU004:023), which is in the ownership of Fingal County Council, as attested by the sign on the entrance gate "Fingal County Council, Enquiries, Ph No 401979." The site appears to relate to entry in Appendix 7 of the Report of the Commissioners or Church Temporalities of Ireland (1879) for a burial ground in Hollywood, County Dublin (**Table 16.1**).

Table 16.1 Details of entry in the Report of the Commission of Church Temporalities

Balrothery Union			
Name of Burial Ground		Diocese	Benefice or Parish
10	Hollywood	Dublin	Naul

16.3.3 Sites Protected by Preservation Orders

All townlands within 2km of the proposed development site were cross referenced with the list of sites under Preservation Orders available from the DoEHLG and no sites with this protective status were found.

16.3.4 Record of Monuments and Places

There are a number of sites on the Record of Monuments and Places (RMP) located within the study area. **Table 16.2** lists all RMP sites located within 2km of the proposed development site boundary. Additional descriptions and further information for sites near the subject site are provided in **Appendix A16.1**.

There is a notable density of archaeological sites on hilltops to the north of the MEHL site. Refer to **Figure 16.1**.

Table 16.2 RMP sites located within 2km of the Proposed Development Site

SMRS	Townland	Classification	NGR-E	NGR-N	Distance
DU004-021----	Hollywood Great	Barrow - Mound Barrow	315363	257904	80
DU004-023001-	Hollywood Great	Church	315358	257655	100
DU004-023002-	Hollywood Great	Graveyard	315359	257631	120
DU004-015----	Walshestown	Ring-Ditch	316155	258552	270
DU007-003----	Parnelstown	Earthwork	316121	256879	720
DU004-024----	Walshestown	Ring-Ditch	316835	258088	720

SMRS	Townland	Classification	NGR-E	NGR-N	Distance
DU004-022----	Hollywood Great	Ritual Site - Holy Well	314625	257629	800
DU004-025----	Walshestown	Enclosure	316917	258061	810
DU004-012007-	Knockbrack	Barrow - Unclassified	315393	259387	1060
DU004-012006-	Knockbrack	Hilltop Enclosure	315455	259460	1100
DU004-016----	Balrickard	Ringfort - Unclassified possible	317044	259287	1370
DU004-012004-	Knockbrack	Barrow - Unclassified	315496	259747	1370
DU004-012005-	Knockbrack	Barrow - Ring-Barrow	315472	259758	1380
DU004-012001-	Kitchenstown	Barrow - Unclassified possible	315493	259820	1440
DU004-012003-	Kitchenstown	Barrow - Bowl-Barrow	315486	259841	1460
DU004-012002-	Kitchenstown	Barrow - Unclassified	315476	259846	1470
DU004-026----	Rowans Little	Enclosure	317673	258372	1540
DU007-041----	Johnstown (Balrothery East By.)	Redundant Record	317407	256695	1710

16.3.5 Architectural Heritage

Record of Protected Structures

Immediately noticeable is that Fingal County Council has included all of the RMP sites in the vicinity of the proposed development site within their Record of Protected Structures (RPS). From the mapping it is evident that there is a variance in the position of the sites in the RPS and those in the RMP. For some sites this variance is in excess of 100m, the reason for it is unknown. Refer to **Figure 16.1** and **Table 16.3.**

The closest site of particular architectural significance is the Church and Graveyard (RPS 161) located less than 100m to the south west of the proposed development site. As noted previously, this site is also an RMP, and as it is in the ownership of Fingal County Council it is also protected as a National Monument. The entrance lane to the site is gated and opens onto a third class road that bounds the southern extent of the proposed development site, approximately 75m from the site boundary. This gateway is part of the curtilage and is therefore protected as part of the site (**Figures 16.1 to 16.3**).

Table 16.1 RPS sites located within 2km of the Proposed Development Site

RPS No.	Classification	Description	Townland	NIAH Ref No	RMP Ref No	NGR-E	NGR-N	Dist.
162	Possible Barrow	Low circular flat-topped mound (.75m high)	Hollywood Great		DU004-021	315384	257918	50
161	Church (in ruins)	Church in ruins with walled graveyard which is still in use	Hollywood Great		DU004-02301 +-02302	315354	257656	100
3	Ring-ditch site	Earthwork	Walshestown		DU004-015	316218	258441	190
165	Ring-ditch site	Earthwork	Walshestown		DU004-024	316779	258013	690
166	Enclosure Site	Earthwork	Walshestown		DU004-025	316836	257980	760
170	Mound site	Earthwork	Parnelstown		DU007-003	316176	256859	760
160	St. Kenny's Well	Holy Well	Hollywood Great		DU004-022	314654	257651	770
113	Mounds	Group of mounds	Knockbrack		DU004-01204 to 01207	315557	259377	990
168	Potential Site	Earthwork	Nevitt			317184	257576	1160
112	Mounds	Group of three burial mounds	Kitchenstown		DU004-01201 to 01203	315611	259560	1160
171	Cosy Cottage	Three-bay single storey thatched dwelling with slated one-bay extension	Johnstown			316814	256680	1270
169	Potential Site	Earthwork	Nevitt			317254	257196	1340
164	Ringfort possible site	Earthwork	Balrickard		DU004-016	317036	259271	1350
167	Enclosure site	Earthwork	Rowans Little		DU004-026	317672	258319	1540
159	Saint Canice's Church (RC)	Five-bay Roman Catholic Church with bellcote	Damastown	11315002		313655	257574	1770

National Inventory of Architectural Heritage

The National Inventory of Architectural Heritage for Fingal only lists one site within 2km of the proposed development site. This site, Saint Canice's Church (RC), is already listed in the RPS (RPS Number 159, see **Table 16.3**) and is located approximately 1.7km away.

Demesne Landscapes and Historic Gardens

A review of the First Edition OSI maps indicates that the nearest Demesne Landscape or Historic Garden is Walshestown House, located approximately 650m to the east north east of the proposed development site. Refer to **Figure 16.2**. Covering an area of approximately 19ha early mapping indicates that the house consisted of a number of buildings surrounded a central courtyard and aerial photography indicates that most of these buildings still survive. Located across rolling farmland from the MEHL site in the Townland of Walshestown the site is at a significantly lower elevation (~50m) and currently appears to be a number of private residences. A new house has recently been constructed at the entrance gate and two new houses closer to the site of the old house. No features appear in the RPS or NIAH in relation to the site and from publically accessible roads the historical potential of the site is not apparent.

Next closest is Damastown House located approximately 1.4km to the west of the proposed development site. A small site of approximately 2ha the First Edition OSI map indicates two structures on the site with another three at the entrance on the road to the south. At a significantly lower elevation than the MEHL site, the proposed development site is not apparent from this location.

Other Architectural Heritage

Adjacent to the entrance to the Church and Graveyard to the south west of the site is the entrance to a house. Located only a few metres to the west of the graveyard entrance is a square dressed stone gate pier with panelled faces capped with a square pyramid coping stone (**Figure 16.1 to 16.3**).

No other sites of architectural significance were noted during the field survey.

16.3.6 Cartographic Analysis

The following section considers the First and Second Edition Ordnance Survey sheets for the study area.

The first edition map depicts the church and graveyard to the south west of the subject site as well as a number of quarry areas throughout the study area. There are no further features of archaeological significance within the immediate study area. A number of isolated farm dwellings and outhouses are depicted in the general area. By the time of the second edition map there has been an intensification of quarrying activity in the subject site as well as further buildings constructed to the south of the subject site.

16.3.7 Aerial Photography

A search of aerial photographs on both Archaeology.ie and Ordnance Survey Ireland Smartmaps revealed no recognisable unrecorded archaeological features in the proposed subject area. Aerial photographs were cross referenced with the first edition OS maps and there is little variation in field sizes, patterns and settlement.

16.3.8 Toponym Analysis

Townland names are useful in terms of understanding the geology, archaeology, land use, ownership and folklore of an area. The names can provide information on families, topographical features, and historical incidents. In terms of the built environment many names reference churches, fords, castles, raths, graveyards, roads and passes etc. Townlands are the smallest administrative land divisions used in Ireland and are in fact the only surviving administrative structure with a continuous history of development going back to medieval times if not earlier. Irish townlands generally relate not to settlements, but land units and as such they acquired legal title at an early date. The basic divisions of the countryside, they were carefully recorded in the maps and books that accompanied the great land transfers of the seventeenth century. The names feature on the Ordnance Survey maps, the first edition of which was completed for the whole country circa1842. In the compilation of the Ordnance Survey scholars such as Eugene O'Curry and John O'Donovan were commissioned to provide the Survey with the anglicised forms of the Irish place-names, and it is these anglicised forms that have been in general use ever since. In compiling the following data a number of resources were consulted including the Placenames Database of Ireland www.logainm.ie and Irish Names of Places by P.W. Joyce (Joyce, 1913).

Within the study area the townland names reflect the natural landscape and history of the region. Topographic features are referenced in 'Naul' meaning cliff, while family names are reflected in the name 'Walshestown'. Hollywood would appear to have an English origin.

16.3.9 Previous archaeological fieldwork

A review of 'excavations.ie' indicated that a significant number of archaeological investigations have been carried out in the environs. A list of two previous fieldwork events is provided in **Appendix A16.2**.

16.3.10 Topographical Files

The topographical files of the National Museum of Ireland (NMI) identify all recorded finds held in the NMI archive that have been donated to the state in accordance with national monuments legislation. The files sometimes include reports on excavations undertaken by NMI archaeologists in the early 20th century. Valuable information that can be gleaned might include the exact location, ground type, depth below ground level and condition when found, of each find. However, the amount and the usefulness of the information available on each find can vary considerably. The topographical files are listed by county and townland and/or street name. A list of finds is provided in **Appendix A16.3**.

16.3.11 Field Survey

A field inspection was carried out on the 4th June 2010. At the time of the site visit conditions were bright and dry with good visibility. In addition to inspecting the subject site the area immediately surrounding was visited. The church and graveyard, Walshestown House and other relevant nearby sites were either investigated or reviewed during windscreen survey. Field-walking in the area of the MEHL site revealed nothing of additional archaeological significance. There were no features of note within the field where the new access is proposed. It was noted in an earlier assessment carried out by K.T. Cullen and Co. (Cullen, K.T. & Co., 1999) that there is a possibility that original pre-quarry topography may have survived at the north-eastern portion of the site.

Plate 16.1 Church and graveyard at Hollywood Great viewed from the north.

Plate 16.2 View of southern half of quarry from west.

16.4 Impacts

16.4.1 Potential Direct Impacts

Where a cultural heritage feature or site is physically located within an area where works take place and the work entails the removal of part, or all of the site or feature, a direct impact will occur. There is also potential for direct impacts on as yet undiscovered sites and features. Potential impacts from this type of development include:

- Obliteration of sites, features or deposits during site stripping or deposition
- Impacts upon sites, features or deposits to gain site access
- Impacts upon sites, features or deposits during widening of roads or upgrading of bridges to accept traffic

- Obliteration of sites, features or deposits during acquisition of capping material.

16.4.2 Predicted Direct Impacts

Given that the proposed development site is a former quarry that is currently in the process of accepting waste under EPA licence W129.02 and this proposal relates to its further reuse as a facility to accept waste, there is limited potential for impact upon the cultural heritage sites, features or deposits during the operation of the facility. The impacts are addressed under the following headings below:

- Deposition of waste material within the quarry
- New site access
- Access from local road
- Acquisition of capping material

Restoration of the subject site will result in a positive impact on the cultural heritage resource.

16.4.3 Deposition of waste material within the quarry

Any potential features of cultural heritage value previously located within the footprint of the quarry excavation itself have previously been obliterated. Therefore there is no potential for impact from this activity.

16.4.4 Site Access

As part of this application it is proposed to construct a new entrance to the site, from the road to the south, crossing a previously undisturbed green field area. No previously unrecorded cultural heritage sites were noted in the vicinity of the proposed site access. However, given the elevated position with expansive views to the south and the density of archaeological sites located on hilltops to the north there is a potential to impact upon previously unrecorded archaeological deposits during the construction of this roadway. Refer to **Figures 16.1 to 16.3**.

16.4.5 Access from Local Roads

The site has already been in operation for an extended period both as a quarry and a facility for accepting waste. The infrastructure required for the use proposed in this application is in place and changes to the proposed infrastructure are not proposed to support this application. However the assessment has noted an important site in close proximity to the proposed development, the Church & Graveyard to the south west. As previously noted this site is protected under Irish legislation as a National Monument as well as being an RMP and being listed in the Fingal County Council RPS. This protection extends to the gated entrance to the site and as such there is the potential that construction traffic could impact upon the site given its' proximity to the road. However, given that the proposed new entrance is to be located further from the graveyard than that which is currently in use this will serve to reduce the potential for impact upon this site.

16.4.6 Indirect Impacts

Where an architectural or cultural heritage site or its setting is located in close proximity to works an indirect impact may occur. There is also potential for indirect impacts on as yet undiscovered archaeology. Although indirect effects may occur during construction and operation of the proposed development, the greatest potential for long term indirect effects would occur during the operational phase.

Indirect impacts could take the form of impacts on the settings of architectural or cultural heritage features – impacts on setting are primarily visual and look at the effect of the development upon the setting of a site within the wider landscape.

16.5 Mitigation Measures

In accordance with the relevant legislation and Department of the Environment, Heritage and Local Government policy, the main mitigation measures would involve preservation in-situ, by avoiding any direct impacts on known sites.

It is recommended that works in undisturbed ground with regard to the new access road be monitored by a suitably qualified archaeologist, ideally under licence to the Department of the Environment, Heritage and Local Government.

It is further recommended that proposed groundworks in the north-eastern portion of the site where there is a possibility of pre-quarry, undisturbed strata being present, be monitored by a suitably qualified archaeologist, ideally under licence to the Department of the Environment, Heritage and Local Government.

In the event that archaeological deposits are discovered all work in the vicinity of the discovered deposits must cease and contact be made with the National Monuments Section of the Department of the Environment, Heritage and Local Government on how best to proceed. If a licence is not already in place then one will have to be obtained with provision made for full recording and excavation of any archaeological features or deposits which may be exposed.

There will be no direct impacts upon the known architectural or cultural heritage resource.

There will be no indirect impact on nearby architectural or cultural heritage sites.

16.6 Residual Impacts

There will be no residual impacts on the setting of any known architectural or cultural heritage sites in the vicinity of the subject site. It is the author's opinion that the impact will be positive upon the known architectural or cultural heritage sites in the vicinity of the subject site as there will be a reduction in the visual impact on cultural heritage sites in the vicinity. Additionally, given that the new entrance will be located further from the graveyard than that which is currently in use this will serve to reduce the potential for impact upon this site.

16.7 References

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17 Material Assets

17.1 Introduction

Material assets are defined in the EPA Advice Notes on Practice (in the preparation of Environmental Impact Statements), 2003 as '*resources that are valued and that are intrinsic to specific places, they may be either human or natural origin and the value may arise for either economic or cultural reasons'*. The assessment of cultural heritage will be addressed in combination with archaeological and architectural heritage in **Chapter 16**. This chapter will evaluate the economic assets only. Economic assets addressed will include the following areas:

- Land Use and Ownership
- Local Settlement
- Property Values
- Infrastructure and Utilities
- Natural Resources
- Waste Management
- Contribution to National Economy
- Opportunities for Future Development

17.2 Study Methodology

A desk study was carried out of existing material assets associated with the site. Projections of resource use were made for both the construction and operational phases of the development, and the impact on resource availability will be assessed. Mitigation measures are proposed where appropriate.

Where relevant, impacts on particular material assets such as the road network, and construction waste disposal facilities are considered in detail elsewhere in this EIS. Refer to **Chapters 5** *Construction Activities* and **Chapter 8** *Roads and Traffic* for further assessment of the impact of the proposed development on these assets. Cultural heritage is dealt with in **Chapter 16** *Archaeological, Architectural and Cultural Heritage*. Refer to **Chapter 4** *Site and Project Description* of this EIS for a detailed description of the site and surrounding areas.

17.3 Land Use and Ownership

17.3.1 Baseline

The proposed MEHL integrated waste Management facility will be located within the current MEHL inert landfill facility. The total 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. The area of land which adjoins the site and is under the control of MEHL is 14.6 hectares.

The site is located 8km south west of Balbriggan, 17km south of Drogheda and 22km north of Dublin City.

The lands in the immediate vicinity of the proposed facility are rural with a primarily agricultural land use. There is a low population density in the surrounding area of the proposed development. The local area is rural and is used for agriculture and horticulture.

There was a waste permitted facility located to the north-west of the MEHL facility, which was in operation since June 2004. The permit was extended in June 2007. There is a second waste permitted facility to the south-west of the facility, operational since May 2008. Both facilities are permitted to accept inert soil and stone for recovery.

There are a number of small industries on the roads surrounding the site which provide employment, including the Wood Group JTC Ltd to the south west of the MEHL site.

1.7 km to the east of the MEHL site is the site of the proposed Fingal County Council landfill. The landfill is approved and licensed to accept municipal waste and has been granted planning approval by An Bord Pleanála (Ref: PL 06F.EL2051 & CH2269) and a waste licence by the EPA (Register Number W0231). Refer to **Figure 3.2.**

17.3.2 Proposed Development

The proposed development is detailed in **Chapter 4** *Proposed Site and Project Description*.

The proposed development will take place on land within the ownership of MEHL which currently operates a landfill at this location. There will be no intensification of use as a result of this proposal. It will not result in the loss of family homes.

The proposed development will exceed the lower tier threshold under the Seveso Directive, due to the storage of materials considered toxic to the aquatic environment. Refer to **Chapter 7** *Human Beings*. This status, as a lower tier Seveso site, will not have any consequences for land use in the surrounding area.

17.3.3 Predicted Impacts

In 2003, the UK Department of Environment, Food and Rural Affairs published "*A Study to Estimate the Disamenity Costs of Landfill in Great Britain*". The study which was undertaken by Cambridge Econometrics[10] suggests that "lifecycle effects" are present in relation to house prices near landfills with a higher impact on house prices at the beginning of landfill operations which is mitigated in later working.

"Distance effects" were also noted with an average change in house prices of -7.06% within 0.25 mile of landfills in Great Britain. There was no impact on house prices over 2 miles from landfills.

The study notes that the type of waste going into the landfill also affects disamenity. Co-disposal, that is the mixing of hazardous with other waste in a given landfill has an increased disamenity affect over non- hazardous landfills.

[10] Data used includes a GIS database of residential mortgage transactions, socio economic neighbourhood characteristics from 1991 census data and landfill site data from the Environment Agency and the Scottish Environmental Protection Agency.

A landfill for inert solid non biodegradable waste has operated at the MEHL site for a number of years, and previously the facility was a quarry. As the proposed MEHL facility will accept non biodegradable waste only, the typical potential nuisances impacts associated with municipal waste landfills such as landfill gas, odours and vermin will not arise. On the other hand, the facility will accept solid non biodegradable hazardous waste. Because of these factors, it is difficult to predict with any certainty the effect, if any, of the proposed development on nearby property values.

17.3.4 Mitigation

Proposed design, licensing and operation of the MEHL integrated waste management facility will ensure the development does not have a significant impact on the community.

MEHL proposes to pay contributions into a community gain fund allied to the tonnage and waste classification of materials taken into the site which are either non-hazardous or hazardous in nature. The amount of that contribution will be consistent with other similar community gain models in existence.

17.3.5 Residual Impacts

There will be no intensification of use of the facility as a result of this proposal. It will not result in the loss of family homes.

It is difficult to predict with any certainty the effect, if any, of the proposed development on nearby property values.

17.4 Utilities Supply and Usage

17.4.1 Baseline

17.4.1.1 Road Infrastructure, Access and Traffic

The MEHL site currently has one access point from Local Road LP01090. At present it is advised by MEHL and observed that most of the vehicles access the site from the east via the M1 and R132.

The current access to the site is located off LP01090. This road has a steep gradient up to the access. There is limited sight visibility at the LP01080 / LP01090 junction. All trucks accessing the development must negotiate this junction. As part of the proposed development, the existing access will no longer be used by normal site traffic, but will be retained for emergency purposes only.

A new entrance and access road off LP01080 is proposed for the MEHL waste facility, replacing the existing access off LP01090. There will be no change in the peak volume of traffic entering and exiting the proposed facility. Refer to **Chapter 4** *Proposed Site and Project Description* and **Chapter 8** *Roads and Traffic* for further details.

17.4.1.2 Water and Wastewater

There is an existing potable water supply on site. A recent well survey was undertaken for residential properties within a 1km radius down-gradient of the site and 0.5km radius up gradient of the site. The survey identified only three properties in the area which have wells abstracting from groundwater. Two of these abstraction wells are up-gradient of the site and only one is down-gradient. This down-gradient well is used for watering gardens and is not for a potable water supply. All three locations where wells were noted are also supplied by mains water.

Water is used on the existing MEHL site for dust and mud control purposes in water sprinklers, wheelwash, bowser and roadsweeper. Water for these purposes is obtained from mains supply and surface water from the base of the quarry. Water is also captured from the roof of the maintenance shed and fed directly into a water storage tank which serves the wheel wash installed at the present site exit. Water used in the wheelwash is recycled to reduce water requirements.

Water usage at MEHL during 2009 was 797m^3. Reports of water usage are retained on site in accordance with the conditions of waste licence W0129-02 and are reported to the EPA in the Annual Environmental Report.

Foul water is serviced by a septic tank, which is emptied regularly and sent by tanker to a receiving sewage treatment works. In 2009 the septic tank was emptied once by a permitted waste collector and contents of approximately 3.6m^3 were delivered to Navan Wastewater Treatment Plant. Records of septic tank cleaning are maintained on site and reported to the EPA in the Annual Environmental Report.

17.4.1.3 Electricity

Electricity usage on site is for lighting (interior and exterior), heating and electronic equipment. Electricity services are provided to the site by ESB. A 38kV electricity supply is currently available on site. Electricity is sourced from a green energy provider. Refer to **Figure 17.1** for details of the proposed site services.

Records of electricity usage are maintained on site in accordance with the conditions of waste licence W0129-02. Based on electricity bills, the energy consumption at MEHL for 2009 was 127,540 kWh. Electricity usage is reported to the EPA in the Annual Environmental Report.

17.4.1.4 Fuel

Diesel fuel is used for on-site vehicles and some road vehicles. During 2009, a total of 3,240 litres of road diesel and 57,100 litres of green diesel were used by plant associated with activities at MEHL. Records of fuel usage are maintained on site in accordance with waste licence W0129-02 and are reported to the EPA in the Annual Environmental Report.

17.4.1.5 Telecommunications

The facility has telephone lines in/out as well as fax, internet and email access, which is served by a separate line. Broadband was installed in 2006. Mobile telephone services are also available within the site and the surrounding area.

17.4.2 Proposed Development

During both construction and operational phases of the project, water will be required for consumption by the construction and operations personnel. The existing mains water supply will be extended for this purpose. For general construction works, for the construction of the concrete elements of the buildings, and other construction uses, on site pond water will be used where feasible and the existing mains water supply will be used where it is not feasible to use site pond water.

Portable office and canteen facilities will be installed on concrete bases and an electrical supply connected. The contractor's fuel tanks will comprise double bunded tanks located in a secure position within the existing facility infrastructure.

Foul effluent will be collected in a temporary sealed underground precast concrete tank. The effluent will be regularly emptied by tanker and removed for treatment to a licensed waste water treatment facility.

A spray type wheel wash will be installed at the site exit. All construction traffic leaving the site will travel through the wheel wash. Water bowsers and road sweepers will be provided for dust suppression and the reduction of road deposits if required. Any overhead and underground service within the site, monitoring infrastructure such as groundwater monitoring installations and existing open drains will be identified and protected from construction activities.

The requirement for mobile diesel generators will be limited to pumps. A diversion of overhead lines and the construction of a substation will be undertaken to provide a mains supply of electricity to the site.

It is expected that circa 330,000 litres of diesel will be used on site per annum for plant and equipment.

17.4.3 Impacts

Extensions will be made to the existing mains water supply.

The construction of the new entrance and access road will require the diversion of overhead electrical lines, one a medium voltage line and the second a low voltage line. The electrical supply required for the facility control area and the requirements to divert power lines will be undertaken in consultation with ESB networks and in accordance with their specifications.

17.4.4 Mitigation

Use of utilities, resources and assets will be in accordance with good practice in energy and resource conservation, and efficiency. Energy efficient power systems will be employed and water conservation measures will be implemented. It is intended to undertake rainwater harvesting for use in the process, for example, to spray internal road networks over the non hazardous waste to reduce dust generation and reuse as grey water within the administration building.

17.4.5 Residual Impact

The residual impact on utilities supply and usage, including the Fingal County Council Water Supply will not be significant.

17.5 Natural Resources

17.5.1 Baseline

The integrated waste management facility is proposed on the site of a current landfill which was formerly a shale and limestone quarry. Quarrying of shale and limestone at the MEHL site ceased in 2007.

17.5.2 Proposed Development

A detailed description of the proposed development is presented in **Chapter 4** *Proposed Site and Project Description*.

As much as possible of this material will be reused on site for lining and capping, where the material meets the engineering specification for reuse for these purposes. It is estimated that 196,000m^3 of on-site material will be suitable for reuse on the site. It is estimated that 333,280m^3 of granular material for use in base and capping layers will be imported over the duration of the development (including restoration). Approximately 480,000m^3 excess subsoils and shales, the properties of which will not meet the engineering specification for use in base layers, lining or capping will be exported off the site for reuse and/or recovery.

A combination of imported materials and site deposits will be used to complete the capping layer, cover it with topsoil and landscape it.

There will be no effects on the potential for groundwater development in the area in the future as the detailed hydrogeological assessment predicts that there will be no contamination of the groundwater from the proposed MEHL facility. Refer to **Chapter 14** *Soils, Geology and Hydrogeology* for further details.

Possible future developments at the MEHL facility which would have a potential positive impact on natural resources are as follows:

- **Bottom Ash Recovery**: Opportunities for recovery of bottom ash for use in construction are being investigated by MEHL Ltd and will be considered in line with regulatory and market climate, however this is not part of the current application.
- **"Design to Mine"** (i.e. design which facilitates the future mining of landfills for resources). This has been included as a design objective in the facility design. It is expected however that the mining of landfills due to scarcity of resources is an activity that will not take place for a number of years following closure of the landfill, if at all, and so mining of this landfill is not part of the current application.

17.5.3 Impact

The impact of natural resource use on site will be slight.

17.5.4 Mitigation

Where possible on-site materials will be used for site engineering works.

Existing stockpiles of low permeability clays and subsoils on site will be used in the lining and capping systems. On-site deposits of boulder clay, with naturally low permeability, will be tested and may be used to form the clay liner and build the engineered inert landfill cells if it has the appropriate properties.

17.5.5 Residual Impact

The residual impact on natural resources is positive as the land will be fully restored to the pre-quarry levels.

17.6 Waste Management

17.6.1 Baseline

General commercial waste including waste from the site canteen and waste paper is removed from site by waste collection permit holders. In 2009, 4.46 tonnes of mixed municipal waste was removed from the MEHL site for recycling or disposal and 0.3 tonnes of mixed packaging for recycling. All commercial wastes will be segregated to ensure maximum recycling opportunities.

17.6.2 Proposed Development

Management of and disposal of waste during the construction phase is described in **Chapter 5** *Construction Activities*.

Waste generated during operation which meets the waste licence acceptance criteria will be deposited in the appropriate cells within the facility.

Other operational commercial waste from offices and the canteen will be collected from site by a waste collection permit holder and delivered to an authorised waste facility.

During the operational phase, approximately 3,815,000m^3 void space will be provided at the MEHL facility for the acceptance of non-biodegradable solid waste as follows:

- 755,500 m^3 for inert waste;
- 1,324,000 m^3 for non- hazardous waste; and
- 1,735,500 m^3 for hazardous waste.

17.6.3 Impact

The overall impact on waste management of the proposed development is likely to be significantly positive and long term as the result of the provision of significant void space on site for management of hazardous, non- hazardous waste and inert solid non-biodegradable waste.

The Fingal County Council Landfill Project, which will be located in close proximity to the proposed development, will provide landfill capacity for 300, 000 tonnes per annum of non hazardous municipal waste. As the MEHL facility will only accept solid non-biodegradable waste, there will be limited overlap in the types of waste which will be accepted in each facility.

Small quantities of commercial waste which will be generated during the course of the proposed development are expected to have a slight negative impact. Waste will be recycled and recovered insofar as possible.

17.6.4 Mitigation

Wastes will be avoided, minimised or recycled where economically feasible.

Waste generated on site will be source separated to facilitate recycling into dry mixed recyclable, biodegradable and residual waste fractions to contribute to achieving recycling targets set out in the Waste Management Plan for the Dublin Region 2005-2010.

Quarantine areas will be provided within the hazardous cell which will be segregated for hazardous and non hazardous wastes. 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 as appropriate to its compliance testing or arrangements made with the waste producer to deliver the waste to an alternative licensed or permitted waste facility.

17.6.5 Residual Impact

When the MEHL integrated waste management facility is in operation, it will have a significant positive economic residual impact by providing substantial capacity for landfill of certain hazardous wastes and avoiding the need to export this hazardous waste to Europe for disposal. It will also facilitate the development in Ireland of modern waste infrastructure. There will be a limited cumulative residual impact with the Fingal County Council Landfill Project in the provision of landfill capacity for solid non-biodegradable non hazardous waste.

17.7 Contribution to National Economy

A beneficial impact will be the creation of employment opportunities and resulting beneficial spin-off for local industries. Employment opportunities are discussed further in **Chapter 7**, *Human Beings*.

Construction of the MEHL integrated waste management facility will avoid the need to export some hazardous wastes from Ireland. The associated expenditure will stay within Ireland. The proposed development will result in a positive economic contribution to the national economy.

17.8 References

A study to estimate the disamenity costs of landfill in Great Britain-Final report. Cambridge Econometrics in association with EFTEC and WRc for DEFRA. DEFRA (2003).

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18 Cumulative Impacts, Other Impacts and Interactions

18.1 Introduction

This chapter addresses the cumulative impacts, indirect impacts and main interactions between different aspects of the environment likely to be significantly affected by the MEHL integrated waste management facility. This chapter also addresses environmental effects which have not been specifically addressed in the individual chapters of the EIS.

Only topics that could be logically linked to the development have been examined in detail. Accordingly, when a topic is not mentioned, the authors have concluded that no potential for impact exists.

18.2 General

The requirement to address cumulative impacts, indirect impacts and interactions of effects comes from the Regulations and EIA directive 85/337/EEC as amended by 97/11EC and 2003/35/EC. Schedule 6 of the Planning and Development Regulations 2001, which mirrors Article 3 of the EIA directives, specifies the information to be contained in an EIS, including the information listed below (emphasis is the author's):

"A description of the aspects of the environment likely to be significantly affected by the proposed development, including in particular:

- Human beings, fauna and flora
- Soil, water, air, climatic factors and the landscape
- Material assets, including the architectural and archaeological heritage, and the cultural heritage and
- The inter-relationship between the above factors."

"A description is also required of the likely significant effects (including *direct, indirect, secondary, cumulative,* short, medium and long-term, permanent and temporary, positive and negative) of the proposed development on the environment resulting from:

- The existence of the proposed development
- The use of natural resources."

18.3 Methodology

Reference was made to the EPA Documents, Guidelines on the information to be contained in Environmental Impact Statements, EPA 2002, and Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), EPA 2003 (EPA guidelines) in the preparation of this chapter of the EIS.

The EU has also prepared guidelines, Guidelines for the *Assessment of Indirect and Cumulative Impacts as well as Impact Interactions*, published by the Office for Official Publications of the European Communities in May 1999 (EU guidelines).

At the screening stage in the preparation of the EIS for the MEHL integrated waste management facility, the potential for significant cumulative and indirect impacts and interactions was examined and any such potential impacts were identified. Where the potential for significant cumulative and indirect impacts and interactions was identified, such impacts and interaction of impacts were included in the scope and addressed in the baseline and impact assessment studies for each of the relevant environmental media and aspects of the project. The cumulative and indirect impacts and interaction of impacts are presented in the chapters of the EIS which address the most relevant environmental media.

The matrix and expert opinion approaches, as outlined in the EU Guidelines, were used in the identification of the potential for significant cumulative and indirect impacts and interactions. Refer to **Table 18.1** for the matrix of potential interactions. Modelling and carrying capacity analyses were used to evaluate impacts.

The views of the statutory bodies and others, obtained during the EIS scoping and consultation process, were addressed. Reference was also made to the EPA Guidelines and, in particular, to the guidance given for the preparation of an EIS, in the EPA's Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), for the following project types:

Project Type 31 – Installations for the disposal of waste.

Project Type 32 - Waste disposal installations for the incineration, chemical treatment or landfill of hazardous and non-hazardous waste.

18.4 Definitions

There are no generally agreed and accepted definitions of indirect impacts, cumulative impacts or inter-relationship of impacts.

The EPA Guidelines define cumulative impact thus: *The addition of many smaller impacts to create one larger more significant impact.*

The EPA Guidelines do not define indirect impacts. The EPA Guidelines use the term synergistic impacts. Synergistic impact is defined as: *Where the resultant impact is of greater significance than the sum of its constituents.*

The EU guidelines use slightly different definitions as follows:

Indirect Impacts: Impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex pathway (sometimes referred to as second or third level impacts or secondary impacts).

Cumulative Impacts: Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.

Impact Interactions: The reactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area.

The term 'impact interactions' is equivalent to the term 'inter-relationship of effects'. The EU guidelines accept that their definitions overlap to a certain extent.

The EU guidelines also refer to 'Cross-Media Impacts', in which the impact in one environmental medium may also have an indirect impact on another medium.

18.5 Effects in Other Environmental Media

18.5.1 Matrix of Effects

Table 18.1 presents the effects matrix. The effects matrix examines the potential for the topic or issue in the left hand column to have an effect on the environmental media listed in the top row of the matrix.

If there is the potential for an effect during the construction phase, this is indicated by a 'C'. An 'O' indicates the potential for an effect during the operational phase and 'OC' indicates the potential for an effect during both phases. If there is considered to be no potential for an effect, this is indicated by '-'.

The purpose of the effects matrix is to identify potential effects in different media. Actual effects and their significance are dealt with in the most relevant chapter.

Table 18.1 Potential Interaction of Effects Matrix (C = Construction, O = Operational)

	Noise and Vibration	Air Quality	Climate	Landscape And Visual	Archaeological Architectural & Cultural Heritage	Human Beings	Material Assets	Flora and Fauna	Soils & Geology	Surface Water & Ground-water	Road Network & Traffic
Noise and Vibration	-	-	-	-	CO	CO	CO	CO	-	-	-
Air Emissions	-	-	CO	-	-	CO	-	CO	-	-	-
Emissions to water	-	-	-	-	-	CO	CO	CO	-		-
Landscape and Visual	-	-	-	-	-	CO	-	CO	-	-	-
Archaeological Architectural & Cultural Heritage	-	-	-	-	-	-	-		-		-
Human Beings	-	-	-	-	-	-	-	-	-	-	CO
Material Assets	-	-	-	-	-	CO	-	-	-	-	-
Flora & Fauna	-	-	-	-	-	CO	-	-	-	-	-
Soils & Geology	CO	CO	-	CO		-	CO	-	-	CO	-
Traffic	CO	CO	CO	CO	-	CO	-	-		-	-

18.5.2 Potential Effects in Different Media

The impact of noise and vibration during construction and operation and the impact on human beings of noise and vibration during construction and operation are addressed in **Chapter 11**, *Noise & Vibration.* Mitigation measures are proposed to ensure there will not be a significant impact.

In **Chapter 9**, *Air Quality*, the potential effects of air emissions from the facility, including emissions from traffic, on human beings, flora and fauna and the climate during the construction and operation phases are addressed. The assessment concluded there would not be a significant impact.

In **Chapter 12,** *Landscape and Visual*, the effects of landscape impacts on human beings are addressed. Landscape mitigation measures can also interact with flora and fauna, and this is addressed in **Chapter 13**, *Flora and Fauna.* As the cells in each phase are capped and following final restoration of the site the residual landscape and visual impacts will be positive.

The main effect of the development on human beings will be increased employment and economic activity, which is not expected to lead to a significant impact on other media. This is addressed in **Chapter 7,** *Human Beings***.**

The interaction of impacts between material assets and the other environmental media are addressed in the individual chapters.

The potential construction impacts on noise, air, ecology and surface water, resulting from the nature of the soils and bedrock on the site, are addressed in **Chapter 7**, *Construction Activities*. Any potential impacts on archaeology are addressed in **Chapter 14**, *Archaeology, Architecture and Cultural Heritage*.

The hydrology and hydrogeology of the site interacts with the terrestrial ecology and, in particular, the flora. These issues are addressed in **Chapter 14**, *Soils, Geology and Hydrogeology* and **Chapter 15** *Surface Water.* There is not expected to be a significant impact on other media.

Chapter 8, *Air Quality,* **Chapter 9**, *Noise and Vibration,* and **Chapter 7**, *Human Beings,* address the effects which traffic from the construction and operational phases will have on air quality, the noise environment and human beings, respectively. Traffic from the facility is not expected to have a significant impact on the climate.

18.6 Indirect Effects

A diversion of some overhead lines at the MEHL site and the construction of a substation will be undertaken to provide a mains supply of electricity to the site. A new entrance for the proposed facility will be constructed onto the existing L01080 road. The impact of this work will be negligible.

Other indirect effects are described in the chapters of the EIS which address the different environmental media. The status of the facility as a lower tier site under the Seveso II Directive is not expected to restrict off site land uses. Refer to **Chapters 17**, *Material Assets*, and **7**, *Human Beings*. The potential effects of emissions to air from the site on the human food chain and farming are addressed in **Chapter 7**, *Human Beings*. No significant indirect effects are anticipated.

18.7 Cumulative Impacts

The cumulative impacts of the proposed MEHL development have been addressed in the relevant chapters of the EIS.

To determine traffic impacts in **Chapter 8** *Roads and Traffic*, the additional traffic generated by the proposed development, at the existing MEHL facility, is combined with the baseline traffic generated by the existing users of the road network in the area. The traffic assessment also took into account the proposed Fingal County Council Landfill Project which is in close proximity to the proposed development and proposed road access changes to the site from the M1 motorway. Thus the cumulative traffic impacts are assessed and determined to be insignificant.

For the noise impact assessment in **Chapter 11,** *Noise and Vibration*, the noise emissions from the proposed integrated waste management facility, during construction and operation are combined with background noise levels to determine the impacts. The resultant cumulative noise impact will not be significant at the closest noise sensitive locations to the facility.

The cumulative landscape and visual impact of the proposed facility in combination with the surrounding landscape are addressed in **Chapter 12,** *Landscape and Visual Assessment*. Following final restoration of the site the residual cumulative landscape and visual impacts will be positive.

There will be a limited cumulative residual impact with the Fingal County Council Landfill Project in the provision of landfill capacity for solid non-biodegradable non-hazardous waste. This is addressed in Chapter 17, *Material Assets*.

Potential cumulative impacts of the proposed MEHL development with the Fingal County Council Landfill Project were considered in relation to flora and fauna, archaeology, air quality, noise, surface water and groundwater, however, no related cumulative impacts are anticipated.

The overall cumulative impact of the development will be the provision of essential waste management infrastructure, which will facilitate economic development, improved economic competitiveness and the development of modern waste management infrastructure in Ireland, a reduction in the quantity of hazardous waste to be exported from Ireland assisting in compliance with EU waste policies including the proximity principle and self sufficiency in waste management, additional capacity for the landfill of solid non biodegradable waste and increased economic activity in the north Dublin region during the construction and operation of the facility.

18.8 Other Impact Headings

18.8.1 Amenity

The impact of the proposed development on the amenity of the local area has been addressed in a number of sections of this EIS.

In **Chapter 7**, *Human Beings,* other impacts that the proposed development will have on amenity are assessed. **Chapter 12** *Landscape and Visual* addresses the impacts of the proposed development on the various landscape designations within the area. When the site is fully restored there will be a long term positive impact on amenity.

18.9 References

Environmental Protection Agency (2002) Guidelines on the information to be contained in Environmental Impact Statements EPA, Wexford

Environmental Protection Agency (2003) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) EPA, Wexford

Office for Official Publications of the European Communities (1999) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions

Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, Official Journal of the European Economic Communities, 1985

Directive 97/11EC amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, Official Journal of the European Communities, 1997

Planning and Development Regulations, 2001, Statutory Instrument No 600 of 2001, Government Publications Office, Dublin, 2001

19 Summary of Impacts and Mitigation Measures

19.1 Introduction

It is the intention of MEHL to reduce the adverse effects of the proposed development on the environment to a practical minimum. Where unavoidable environmental effects identified during the environmental impact assessment process, appropriate measures have been proposed to mitigate these effects as much as reasonably practicable.

This chapter summarises the likely residual environmental effects associated with the proposed development. For the definition of impact significance criteria, refer to the **Glossary**. The predicted impacts and recommended mitigation measures are comprehensively detailed in the relevant chapters of the EIS, and are summarised in **Table 19.1** and **Table 19.2** overleaf.

19.2 Summary of Mitigation Measures

Table 19.1 Construction Phase Mitigation

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Site Preparation & Enabling Works		
• Removal of topsoil • Bulk excavation and general site re-grading • Diversion of existing overhead power lines and telecom cables • Setting up of site fencing, site office, site facilities, secure storage compound, temporary car parking • Importation of equipment	• As required by the Construction Regulations, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases. • Any overhead and underground services within the site, mature hedgerows, monitoring infrastructure and existing open drains will be identified and protected. Consultation will be undertaken with ESB networks regarding diversion of existing power lines and works will be carried out in accordance with their specifications. • Within the necessary constraints of performance, durability and cost, construction materials will be sourced from local suppliers and manufacturers where feasible. • A construction environmental management plan will be prepared and implemented with the objective of keeping disruption and nuisance to a minimum. The plan will have regard to the guidance contained in the handbook published by the Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site, CIRIA 2005.	**Negligible** No significant impact predicted
Site Tidiness		
• Untidy site	The following are some of the measures that will be taken to ensure that the site and surroundings are maintained to a high standard of cleanliness. • Daily site inspections will be undertaken to monitor site tidiness. • A regular programme of site tidying will be established to ensure a safe and orderly site. • Scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind.	**Negligible** No significant impact predicted

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• Food waste will be strictly controlled on all parts of the site. • Mud spillages on roads and footpaths outside the site will be cleaned regularly and will not be allowed to accumulate. • Wheel-wash facilities will be provided for vehicles exiting the site. In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the appropriate manner.	
Generation of Waste		
• Construction waste, sewage and domestic type waste • Excavated Material	A construction and demolition waste management plan will be developed and maintained. The key principles underlying the plan will be to minimise waste generation and to segregate waste at source. The measures to achieve these aims include: • Ordering of appropriate quantities of materials, with a just-in-time philosophy. • Immediate and careful storage of materials delivered to the site. • Storing under cover and raised above ground, materials which are vulnerable to damage by rain. • Careful handling of materials, using appropriate equipment, to avoid undue damage. • Designating separate storage areas for different types of waste in order to maximise the re-use and recycling potential of the waste. • Temporary site sanitary accommodation will be connected to a holding tank which will be pumped out as required and disposed of in an appropriate manner to a licensed disposal facility.	**Slight** Waste not suitable for reuse or recovery will use up landfill space
Human Beings		
• Capital Investment of approximately €20 million.	• No controls or mitigation measures required. • In addition to the direct employment during the construction phase, there will be	**Moderate Beneficial** Employment.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
• 50 (peak) jobs on site and additional indirect jobs off-site.	substantial direct and indirect off-site employment and economic activity associated with the supply of construction materials and services during the construction phase.	
Traffic		
• Construction traffic during Phase 1 works.	• During Phase 1 construction, peak traffic is expected, however operational traffic will be minimal due to considerable site reconfiguration during this period. No roads and traffic mitigation measures are required for the proposed scheme as no impact is predicted.	**Negligible** No significant impact predicted.
Air Quality		
• Emissions from construction plant and vehicles. • Dust from movements on site in dry windy weather.	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 dust minimisation plan will be prepared and implemented by the contractor during the construction phase of the project. The following measures will be implemented as part of the dust minimisation plan to reduce dust emissions particularly during the site clearance and bulk excavation phase. • 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.	**Negligible** No significant impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors.	
Climate		
Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions	• During Phase 1 construction, peak traffic is expected, however operational traffic will be minimal due to considerable site reconfiguration during this period. As there will be no significant impact on climate, no mitigation measures are proposed.	**Negligible** No significant impact predicted.
Noise and Vibration		
Principal sources of noise • Earthworks plant and equipment. • Construction plant and equipment. • Construction traffic.	• 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.	**Slight** Temporary slight increase in noise levels during the construction phase.
Landscape and Visual		
• Removal of overburden • Movement of construction machinery • Removal of hedgerows	• Woodland planting is to be established to the east of the proposed solidification plant and car park area. This planting will be implemented during the initial construction phase and 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.	**Slight** Short term moderate effects during construction phase

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• Scrub planting will be established around the proposed wetlands in the north east corner of the site to enhance the ecological benefits. • Retention of perimeter hedgerows and thickening where necessary, 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 and Hawthorn and Blackthorn scrub planting on the cutting. New hedgerow planting will be carried out along the LP01080. • Retention of existing trees. • Incorporation of an existing wetland area near the southern boundary of the site.	
Flora and Fauna		
• Potential impact on aquatic environment and fisheries from run off	• There will be no development works or any disturbance of original 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). • Section 173 of the Fisheries (Consolidation) Act 1959 will be adhered to in relation to 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.	**Slight** Slight impact predicted.
• Disturbance of Peregrine Falcons	• Installation of alternate nest ledges and/or artificial boxes for peregrine falcons at two to three locations. • Restriction of access above the nest cliffs using fencing and/or appropriate barriers. • Phasing of construction activity and collection of monitoring data on peregrine occupancy and breeding success. • Restriction on the installation of safety netting totally and/or spatially and temporally.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• Enacting temporal restrictions to construction from 1st March to 31st July unless the breeding status of the peregrines is confirmed, to have failed or not be initiated or peregrines are not present during the breeding season. • Implementing a buffer zone for protection of nesting peregrines from disturbance of 30 – 50m if essential works are required during the breeding season. Increase buffer if birds are found to be disturbed at this distance i.e. flushing or alarm-calling or decrease buffer if no reaction is noted and works are required. • Advise staff and contractors of location of significant species and habitats prior to commencements of works through provision of maps and an induction talk on wildlife law and disturbance to birds.	
Soils, Geology and Hydrogeology		
• Regrading of roads and inert landfill cells. • Geological Heritage Area	• Any earthworks required on site should be monitored and carried out in a controlled manner, ensuring traceability of soils at all times. • Construct a viewing platform and allow limited access as per agreement with GSI.	**Negligible** No significant impact predicted
Surface Water		
• Rainwater runoff which could contain silt • Control of foul sewage • Uncontrolled release of concrete or concrete related runoff	• The Environmental Management Plan as per the waste licence will be updated. • 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	**Negligible** No significant impact predicted

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	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. • 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.	
Archaeological, Architectural and Cultural Heritage		
• Impact of ground disturbance on any potential archaeological material that may survive below the ground surface.	• It is recommended that ground works in undisturbed ground at the new access road be monitored by a suitably qualified archaeologist, ideally under licence to the Department of the Environment, Heritage and Local Government. In the event that archaeological deposits are discovered all work in the vicinity of the discovered deposits must cease and contact be made with the National Monuments Section of the Department of the Environment, Heritage and Local Government on how best to proceed.	**Negligible** There will be no significant impact on archaeological remains.
• Geological Heritage Area	• Construct a viewing platform and allow limited access as per agreement with GSI.	

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Material Assets		
Construction phase will require: • Extension to existing water supply. • Additional Fuel.	• A potable water supply for use within the contractor's accommodation will be provided from the existing public water supply. • The contractor's fuel tanks will comprise double bunded tanks located in a secure position within the compound.	**Negligible** There will be no significant impact.

Table 19.2 Operation Phase Mitigation

Source / Scale of Effect	**Control and Mitigation**	**Residual Impacts, Significance Level, Environmental Consequence**
• **Facility Operation**	• Facility will be subject to an EPA waste licence which licences and controls all site activities. The facility will operate in accordance with the licence conditions. • The facility holds the ISO14001 standard for Environmental Management Systems (EMS). • The facility is fully compliant with all its current planning permissions.	
Generation of Waste		
• Sewage and domestic type waste • Surplus leachate • Excavated material	• Wastes will be avoided, minimised or recycled where economically feasible. • Waste generated on site will be source separated to facilitate recycling into dry mixed recyclable, biodegradable and residual waste fractions to contribute to achieving recycling targets set out in the Waste Management Plan for the Dublin Region 2005-2010. • Quarantine areas will be provided within the hazardous cell which will be segregated for hazardous and non hazardous wastes. After characterisation and provided the waste has not become contaminated in any way it will be disposed of in the hazardous or non hazardous cells as appropriate to its characterisation, returned to source or delivered to an alternative licensed or permitted waste facility • Any surplus leachate not required for the solidification process will be tankered off site to a suitable disposal facility.	**Negligible** No significant impact predicted.
Human Beings		
• 15 additional jobs on site and additional jobs off-site.	• No mitigation measures required.	**Moderate Beneficial** Improvement in local employment.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Roads and Traffic		
• Operational traffic	• No proposed increase in the capacity, which is 500,000 tonnes per annum. Therefore there will be no increase in traffic levels on the local road network due to the proposed scheme. Therefore, no traffic mitigation measures are required for the proposed scheme as no impact is predicted.	**Negligible** No significant negative residual impacts
Air Quality		
• Dust and Emissions	• Dust monitoring will continue as per the existing waste licence or any revised waste licence issued by the Environmental Protection Agency. • 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, as required, during dry or windy conditions. Bottom ash will be quenched in the facilities in which it arises and will be delivered to site damp. • The implementation of the dust mitigation measures will place particular emphasis on areas in proximity to sensitive receptors. • Routine walk-overs as part of the current and ongoing daily inspection undertaken by the facility management 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.	**Negligible** No significant impact predicted
Climate		
• Operation vehicles, generators etc., may give rise to CO_2 and N_2O emissions	• No proposed increase in the capacity, which is 500,000 tonnes per annum. Therefore there will be no increase in traffic levels on the local road network due to the proposed scheme. As there will be no significant impact on climate, no mitigation measures are proposed.	**Negligible** No significant impact predicted.

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
Noise and Vibration		
• Operation Plant and Equipment	• Limiting the hours during which site activities are 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. • Placing of noisy plant machinery as far away from sensitive properties as permitted by site constraints.	**Negligible** No significant impact predicted.
Landscape and Visual		
	• New hedgerow planting will be carried out along the LP01080 and new access road where required. • 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. • Low level bollard lighting will be used along the entrance road to avoid light spillage on adjoining properties on the LP01080. • Progressive restoration of the site.	**Moderate Beneficial** The residual landscape and visual impacts will be positive after final restoration
Flora and Fauna		
• Increase local Biodiversity	• 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.	**Moderate Beneficial** Enhance local biodiversity

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• A proposed wetland system in the north east of the site will, over time, provide wetland habitat and add to the local habitat and species diversity. • An existing wetland area at the southern end of the site, which includes an open water body fringed with vegetation will be retained and will help to increase local biodiversity.	
• Potential contamination of aquatic environment	• On-site attenuation ponds will allow for the settlement of fine/particulate materials. • Ongoing monitoring to ensure no contaminating discharges to groundwater or surface water. Contingency plan in case of emergency.	**Negligible** No significant impact predicted
• Disturbance of peregrine falcon	• If monitoring results determine it necessary, the creation of an additional nest site away from the location of the MEHL site 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.	**Negligible** No significant impact predicted
Soils, Geology and Hydrogeology		
• Geological Heritage Area • Use of site deposits • Potential for waste to act as a barrier to groundwater flow • Potential groundwater contamination.	• Construct a viewing platform and allow limited access as per agreement with GSI. • On-site deposits of boulder clay, with naturally low permeability, has been tested and will be used to form the clay liner and build the engineered inert landfill cells. • Employing engineered liners in line with EU legislation and best practice. • Employ a leak detection system within the DAC lining system. The formation level for the construction of the liners will be set above the piezometric head of the water table.	**Negligible** No significant impact predicted

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• No hazardous waste will be placed on the Loughshinny formation. Only inert or non hazardous waste will be placed in this area. • An engineered material will be placed beneath the non-hazardous liner to enhance the protection for the aquifer. • In order to minimise leachate generation from the flue gas treatment residues, the waste will be solidified prior to being placed in the cells. • To further minimise leachate generation, a temporary cover system will be designed and used to reduce the amount of time the waste is exposed to the elements. • Separate leachate collection systems will be installed in the different classes of waste cells. Leachate collected from the hazardous cells will be re-used in the solidification plant further reducing the possibility of surface and groundwater contamination. • Waste types will be segregated to ensure that hazardous or non-hazardous material does not enter the inert cells. • As part of the waste licence conditions, an Environmental Monitoring Plan will be developed for the site to monitor groundwater.	
Surface Water		
• Runoff which could contain silt and/or contaminants.	• The surface water from the new entrance and main access road will be collected in french drains located in the road margins and discharged to ground. Any surplus surface water will discharge into the open drain south of the administration building. • 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.	**Negligible** No significant impact predicted

Source / Scale of Effect	Control and Mitigation	Residual Impacts, Significance Level, Environmental Consequence
	• Water quality monitoring shall be implemented as per the monitoring requirements of the EPA waste licence to ensure that the operation of the MEHL facility does not have an adverse effect on water quality.	
Material Assets		
• Community Gain	• MEHL proposes to pay contributions into a community gain fund allied to the tonnage and waste classification of materials taken into the site which are either non-hazardous or hazardous in nature. The amount of that contribution will be consistent with other similar community gain models in existence.	**Moderate/Significant Beneficial**
• Property Values	• The facility will accept only non biodegradable waste. Consequently the typical potential nuisances impacts associated with municipal waste landfills will not arise. • No controls or mitigation measures required.	**Negligible** No significant impact predicted
• Future increased consumption of potable water, power, fuel, etc.	• Use of utilities, resources and assets will be in accordance with good practice in energy and resource conservation, and efficiency. Energy efficient power systems will be employed and water conservation measures will be implemented. It is intended to collect rainwater for use in the process, to reduce the consumption of potable water. • On-site deposits of boulder clay, with naturally low permeability, will be tested and may be used to form the clay liner and build the engineered inert landfill cells if it has the appropriate properties.	**Slight** Increased consumption of energy and water resources