Mayo County Council

Derrinumera Sludge Hub Centre & Leachate Treatment Facility

ENVIRONMENTAL IMPACT STATEMENT
(PREPARED FOR REVIEW OF WASTE LICENCE W0021-01)

VOLUME II : MAIN TEXT

May, 2007

TOBIN CONSULTING ENGINEERS

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Volume II : Main Text

PROJECT:

Derrinumera Sludge Hub Centre & Leachate Treatment Facility – Environmental Impact Statement

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Document Amendment Record

Client:	Mayo County Council
Project:	Derrinumera Waste Licence (W0021-01) Review for Sludge Hub Centre & Leachate Treatment Facility
Title:	EIS - VOLUME II - MAIN TEXT

Project Number: 1908			**Document Ref:** 1908 Volume II Main Text Rev I		
I	Final Doc. Issued to Client	MH	DG	MFG	08-05-07
H	Final Draft	MH	MFG	MFG	20-04-07
G	Issued to MCC	MH	MFG	MFG	19-01-07
F	Issued to MCC	MH	MFG	MFG	18-12-06
E	Issued to MCC	MH	MFG	MFG	24-08-06
D	New Legislation Included	MH	MFG	MFG	12-07-06
C	Issued to MCC	MH	MFG	MFG	
B	Issued to MCC	MH	MFG	MFG	30-06-05
A	Draft Report	MH	MFG	MFG	07-03-05
0	Draft Report	DB	DG	SF	15-01-04
Revision	**Purpose / Description**	**Originated**	**Checked**	**Authorised**	**Date**
		TOBIN *CONSULTING ENGINEERS*			

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PREAMBLE

PREAMBLE

This Environmental Impact Statement (EIS) has been prepared by TOBIN and TES Consulting Engineers on behalf of Mayo County Council. It relates to a proposal to review the existing Environmental Protection Agency (EPA) Waste Licence (Ref. No. W0021-01) for Derrinumera Landfill. The review is required for the inclusion of a Sludge Hub-Centre (SHC) and a Leachate Treatment Facility (LTF) at the existing landfill site, with an extension of the existing licensed boundary to accommodate the proposed development. This EIS has been prepared according to the *'Guidelines on the information to be contained in Environmental Impact Statements',* (EPA, 2002), *'Advice Notes on Current Practice in the preparation of Environmental Impact Statements'*, (EPA, 2003) and relevant legislation. The Environmental Impact Statement and such further information relating to the application to An Bord Pleanála and the Environmental Protection Agency (EPA) will be available for public inspection and/or purchase at the offices of Mayo County Council, Áras an Chontae, The Mall, Castlebar, Co. Mayo during normal working hours (Monday to Friday excluding public holidays) and at the offices of the Environmental Protection Agency, Johnstown Castle Estate, Co. Wexford.

A secondary element of this development proposal involves the pumping of treated leachate from the proposed Leachate Treatment Facility on-site at Derrinumera to the outfall of the proposed Newport Waste Water Treatment Plant (WWTP) for co-discharge with treated effluent. The Newport Sewerage Scheme EIS has been published in parallel with this EIS, which also deals with the marine discharge of treated leachate and treated effluent. The Newport Sewerage Scheme EIS will be available for public inspection and/or purchase at the offices of Mayo County Council, Áras an Chontae, The Mall, Castlebar, Co. Mayo during normal working hours (Monday to Friday excluding public holidays).

This EIS contains information on the scale and nature of the proposed development, alternatives examined, a description of the existing environment, impact assessment of the proposed development and mitigation measures to reduce the impact on the receiving environment.

The overall EIS has been arranged in four volumes, as follows:

Volume I	**Non Technical Summary;**
Volume II	**Main Text;**
Volume III	**Drawings;**
Volume IV	**Appendices.**

This document (Volume II – Main Text) has been structured as follows:

- **Section 1** Introduction & Background;
- **Section 2** Alternatives;

- **Section 3** Description of the Existing Situation & Proposed Development;
- **Section 4** Description of Existing Environment / Likely Impacts / Mitigation Measures;
- **Section 5** Interaction of Environmental Effects & Summary of Mitigation Measures;
- **Section 6** Conclusion;
- **Section 7** References & Glossary of Terms.

Section One

INTRODUCTION & BACKGROUND

1 INTRODUCTION & BACKGROUND

TOBIN and TES Consulting Engineers were requested by Mayo County Council to undertake an Environmental Impact Statement (EIS) as part of the review of their existing Environmental Protection Agency (EPA) Waste Licence (Ref. No. W0021-01) for Derrinumera Landfill. The review is required for the inclusion of a Sludge Hub-Centre (SHC) and a Leachate Treatment Facility (LTF) at the existing landfill site, with an extension of the existing licensed boundary to accommodate the proposed development. This EIS has been prepared according to the '*Guidelines on the information to be contained in Environmental Impact Statements',* (EPA, 2002) and the '*Advice Notes on Current Practice in the preparation of Environmental Impact Statements'*, (EPA, 2003).

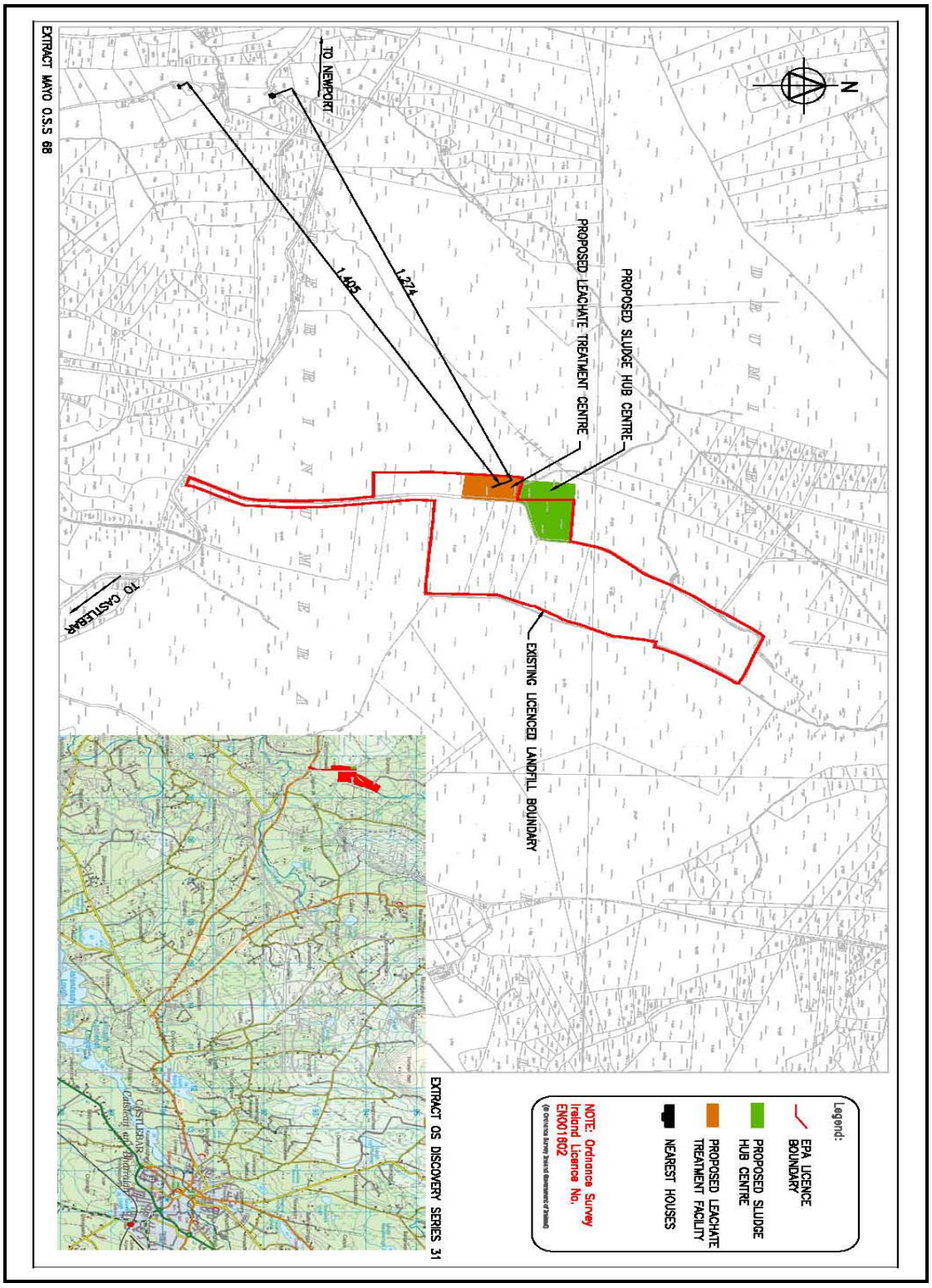
1.1 THE EXISTING DERRINUMERA LANDFILL SITE

The Derrinumera Landfill is operated by Mayo County Council and has been receiving waste since 1974. The site is located between two hills, 500m north of the main Castlebar to Newport road (R311) (refer to Figure 1.1). The site is surrounded by blanket bog and the nearest habited dwelling is more than a kilometre away. Large tracts of land within the blanket bog to the north, west and east of the site have been afforested. The Glaishwy River passes along the eastern boundary of the site, although at this point in its course the river is little more than a stream. The river flows into Beltra Lough 3.5 km north of the landfill.

Up until 1998, the Derrinumera Landfill was best described as an un-engineered, dilute and attenuated site. The surrounding peat offered a significant degree of attenuation to leachate migrating from the site. However, due to Section 40(4) of the Waste Management Act, 1996, which states that BATNEEC (Best Available Technology Not Entailing Excessive Cost)[1] should be used and emissions shall not contravene any standards, it was no longer feasible to operate the Derrinumera site as an un-engineered site. Thus, in 1998 Mayo County Council applied to the Environmental Protection Agency (EPA) for a licence to operate an engineered landfill site at Derrinumera. The plan was to develop two lined cells for the disposal of non-hazardous waste on top of the existing waste body. The EPA granted the licence in December 1999, and at the present time the principal activity at the landfill is the placement of waste into the engineered and lined Cell No. 2 and the temporary capping off of lined Cell No. 1.

[1] The definition of BATNEEC was changed by Part 2 Section 7(2) of the Protection of the Environment Act 2003, to BAT (Best Available Technique).

Figure 1.1 Site Location Map



The quantities of waste accepted at Derrinumera have declined in recent years. During 2000, 38,630 tonnes of non-hazardous waste was accepted at the landfill facility, however waste quantities have seen a considerable decline since then. The waste acceptance figures for 2000 to 2005 are as follows:

Year	Waste Acceptance[2] (tonnes per annum)
2000	38,630
2001	38,252
2002	35,931
2003	30,280
2004	29,280
2005	29,915

Other activities being carried out at the landfill include the collection of leachate at the northern end of the site and storage of the collected leachate in three leachate storage tanks. As a condition of the existing EPA Licence (W0021-01), the leachate is removed from the site by tanker to Castlebar Wastewater Treatment Plant (WWTP). A more detailed description of the disposal history and current position regarding leachate management at Derrinumera Landfill is outlined in Section 3.3.1.

A landfill gas management system was previously installed at the site, which incorporates a flare. A civic amenity site opened in July 2001 at the site, for the recycling and reclamation of materials. The buildings on-site include a site office/control building, a waste sorting shed and a maintenance shed. The Council have also recently bought land adjacent to the north-western site boundary (refer to proposed Sludge Hub Centre site, shown on Figure 1.1).

1.2 TERMS OF REFERENCE AND BASIS FOR LICENCE REVIEW

1.2.1 GENERAL

The broad grounds on which a review of the EPA Waste Licence (W0021-01) is being sought are:

1. It is proposed to include a County Mayo Sludge Hub Centre (SHC) at the existing landfill facility, which is required for the fulfilment of the Mayo Sludge Management Plan, adopted by the Elected Members in 2001, and the Review of Mayo Sludge Management Plan (2002), adopted by the Elected Members in 2003.

2. Mayo County Council currently export dewatered wastewater sludge cake outside of the county for landspreading. Should this practice be prohibited in the near future, prior to the commissioning of the sludge drying permanent plant at Derrinumera, a short term

[2] Sourced from Derrinumera Landfill On-site Records

fallback would be required with regard to sludge drying. Therefore, the Council wish to include within the review, the option to temporarily relocate to Derrinumera, an existing interim sludge drying/lime-dosing system, (currently located but non-operating at Ballina WWTP). This temporary plant would be retired upon commissioning of the Sludge Hub Centre permanent plant.

3. The Council wish to implement leachate treatment at Derrinumera, in preparation for compliance with an An Bord Pleanála instruction to cease leachate imports to Castlebar WWTP. Part three of the Schedule attached to An Bord Pleanála Certification of the expansion and upgrade of the Castlebar WWTP, issued on the 21st November 2001, stated:

   "No sewage sludge or landfill leachate from outside the expanded Castlebar Waste Water Treatment Plant shall be transported onto the site for processing at this location having regard to the limited assimilative capacity of the River system relative to the likely demands arising from within the Castlebar area."

   The preferred alternative is to treat leachate on site, and pump the treated leachate to a confluence point with the discharge pipe from the proposed Newport WWTP. It is proposed to deliver the treated leachate to the Newport WWTP outfall via a pumped rising main on the selected route shown on Drawing No. 1908-2200, Volume III. The confluence point will be downstream of the Newport sewage treatment process but within the site boundary of the proposed Newport waste water treatment plant. It should be noted that leachate will not be discharged into the Newport town collection system. It should also be noted that it is not proposed that leachate be treated in the proposed Newport Waste Water Treatment Plant as appropriate treatment facilities will be provided at Derrinumera Leachate Treatment Facility in accordance with Environmental Protection Agency requirements as conditioned in the Waste Licence for the landfill.

   The treated leachate delivery pipeline will be constructed in 200mm nominal diameter HPPE or HDPE, and will be laid in trench in the road margin over most of its route. The proposed pipeline length will be approximately 8 km. The pipe will be laid along the R311 for the majority of it's length, passing the townlands of Derrinumera, Cartron, Cuilmore, Clooneshil, Drumlong and Newport Town on it's proposed route.

1.2.2 THE SLUDGE HUB-CENTRE

The SHC will be constructed and operated under a Design Build Operate (DBO) contract for the collection, drying, temporary storage and sustainable re-use or disposal of treated municipal sludge, collected from wastewater and water treatment plants throughout County Mayo. The likelihood is, subject to receipt and assessment of tenders, that the preferred method of production of biosolids, detailed in the DBO tendering process, will be thermal

drying. However, sludge composting is also envisaged as a second facility and its impacts are accordingly reported in this EIS.

The Sludge Hub Centre will stand on its own fenced area at the Derrinumera Landfill site, with biosolids manufacture being separate from all other waste handling activities at the site. Sharing of weighbridge and wheelwash facilities, internal road access, and utilities such as water and sewage will take place.

The SHC will accept an estimated total of 27,844 tonnes per annum (tpa) of sludge on start-up, rising to 32,580 tpa by the year 2020. These sludge quantities take into account sludges arising from wastewater and water treatment plants in County Mayo at the expected tonnages when entering the SHC. The quantities are based on values abstracted from the Mayo Sludge Management Plan (2000) and the recent indications that sludge quantities may exceed these estimates, based on an assessment of needs study conducted by Mayo County Council. The dry solids (DS) content of the sludge entering the facility will range from small quantities of liquid wastewater sludge at 3% DS, with the bulk of the wastewater sludge being dewatered to an average of 17.5 % DS. [Biosolids produced from the wastewater sludge drying process will have a beneficial re-use as fertiliser to be transported off-site and landspread in accordance with the *'Review of Mayo Sludge Management Plan'* (2002).] A smaller volume of sludge arising from water treatment will enter the facility at an average of 18 % DS.

1.2.3 THE RELOCATION OF A TEMPORARY DRYING-LIME DOSING PLANT

If the need arises, it is proposed to temporarily relocate a proprietary engineered diesel fuelled sludge drying and lime stabilisation plant, rated at 2.5 tonnes per hour (t/hr), currently located at Ballina WWTP, to the existing machinery garage building of Derrinumera Landfill facility. The existing Machinery building is located within the licensed site boundary, which would ultimately be incorporated within the fenced boundary of the proposed SHC facility. An Bord Pleanála have prohibited importation of sludges to Castlebar WWTP in their certification for the expansion and upgrading of the WWTP.

However, as the matter stands, and having regard to the temporary nature of a diesel fuelled drier and the fact that its emission characteristics are not as would be expected with a fully engineered drier, this will be a non-favoured option. However Mayo County Council require permission to do so, temporarily, as a fallback solution to the present arrangement of sludge exportation out of the county.

If the temporary relocation were permitted, and if so required, Mayo County Council staff at Derrinumera would operate this interim plant until such time as the Sludge Hub Centre DBO Contractor was appointed. Directly on appointment, that Contractor would be required to operate the interim plant, until the permanent drying plant was commissioned, at which time the interim plant would be taken out of service. The expected operation period of the interim plant at Derrinumera would be 3 years maximum. The interim plant is diesel fuelled; fuel storage facilities and bunding for these would be provided within the curtilage of the

Maintenance Building. The interim plant includes carbon filters for scrubbing of the exhaust from the drying drum.

1.2.4 THE LEACHATE TREATMENT FACILITY

At present, tankering of leachate for treatment at Castlebar WWTP is costing Mayo County Council in excess of €0.5 million annually in direct costs. The operation has negative environmental impacts arising from the transportation of the leachate to Castlebar, and it ties up in excess of up to 1,800 population equivalent (p.e.) of valuable wastewater treatment capacity at Castlebar WWTP. (It should be noted however that the volume of leachate going on for treatment will reduce over time as waste dries with aging and as engineered landfill cells are capped off from rainfall ingress.) Furthermore, and more importantly, it will be prohibited to bring leachate to the expanded and upgraded WWTP.

Mayo County Council therefore wish to include leachate treatment in the scope of the waste licence review, and wish to include this treatment within the scope of the DBO Contract at the proposed SHC.

The leachate will be treated at the landfill, and the treated leachate will be pumped, via a pumped rising main on the selected route shown on Drawing No. 1908-2200, Volume III, to the proposed marine outfall discharge location for treated municipal wastewater at Newport. Broadly speaking the Council would propose BAT approaches to leachate treatment, and would be guided by the EPA as to the required treated leachate standards, having regard to the known consistent performance of current technology in treating leachates.

As part of the Derrinumera Waste Licence (W0021-01) Review, a report, entitled; *'The Marine Discharge of Treated Leachate'*, was prepared by TOBIN Consulting Engineers. The report examines any issues arising from the Derrinumera Leachate Treatment Facility proposal, in order to establish the environmental sustainability of the development. A copy of this report is provided in Appendix 3, Volume IV of this EIS.

1.3 LEGISLATIVE FRAMEWORK

1.3.1 EU SLUDGE MANAGEMENT LEGISLATION

The most important EU Directives affecting the management of sewage sludge are summarised in the following sections:

1.3.1.1 The Sewage Sludge Directive (Council Directive 86/278/EEC).

This directive (with amendments: Council Directive 91/692/EEC; Council Regulation 1882/2003/EC; and Council Regulation 807/2003/EC), seeks to encourage the use of sewage sludge in agriculture and to regulate the use of sludge in such a way as to prevent harmful

effects on soil, vegetation, animals and man. To this end, it prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into soil. Treated sludge however can be applied to land subject to certain conditions. Treated sludge is defined as having undergone '*biological, chemical or heat treatment, long-term storage or any other appropriate processes so as significantly to reduce its fermentability and the health hazards resulting from its use*'. To provide protection against potential health risks from residual pathogens, sludge must not be applied to soil in which fruit and vegetable crops are grown, or less than ten months before fruit and vegetable crops are to be harvested. Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge. The Directive also requires that sludge should be used in such a way that account is taken of the nutrient requirements of plants and that the quality of the soil and of surface water and groundwater is not impaired.

The main Irish legislation, which give effect to the provisions of the Sludge Directive (Council Directive 86/278/EEC) are as follows:

- European Communities (Use of Sewage Sludge in Agriculture) Regulations 1991 (S.I. 183/1991);
- Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (S.I. 148/1998);
- Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations, 2001 (S.I. 267/2001).

The Regulations specify rules for the sampling and analysis of sludges and soils. They set out requirements for the keeping of detailed records of the quantities of sludge produced, the quantities used in agriculture, the composition and properties of the sludge, the type of treatment to be used and the sites where the sludge is used. Limit values for concentrations of heavy metals in sewage sludge, intended for agricultural use and in sludge-treated soil, are also given.

1.3.1.2 The Urban Waste Water Treatment Directive (Council Directive 91/271/EEC)

This directive sets out requirements for the provision of collection systems and wastewater treatment. It also set out the following deadlines for secondary treatment of wastewaters coming from agglomerations:

- At the latest by 31 December 2000 for agglomerations of more than 15,000 p.e. (population equivalent)[3];

[3] Population equivalent (p.e.) is the unit of measure used to describe the size of a wastewater discharge. Population equivalent is the biodegradable load (matter) in wastewater having a 5-day biochemical oxygen demand (BOD) of 60g of oxygen per day. Population equivalent doesn't necessarily reflect the actual population of a community. BOD is a widely used measure of 'pollution potential'- BOD is a measure of oxygen use, or demand, by bacteria breaking down the biodegradable load in sewage treatment plants or environmental waters. BOD is the basis for deriving the Population Equivalent of a catchment of the sewage works.

- At the latest by 31 December 2005 for agglomerations between 10,000 and 15,000 p.e;
- At the latest by 31 December 2005 for agglomerations of between 2000 and 10000 p.e. discharging to fresh water and estuaries.

The Urban Waste Water Treatment Regulations, 2001 (S.I. No. 254 of 2001) gives effect to the Directive. The regulations also set out a requirement that discharges *".. to coastal waters from agglomerations with a population equivalent of less than 10,000"* shall be subject to *"appropriate treatment"* by December 31st 2005. "appropriate treatment" is defined in the regulations as treatment by any process and/or disposal system, which after discharge allows the receiving waters to meet the relevant quality objectives and the relevant provisions of Council Directive 91/271/EEC and of other Community Directives. This provision is applicable to the Newport Wastewater Treatment Plant, therefore appropriate treatment has been proposed there.

The Directive (91/271/EEC) also banned the marine disposal of wastewater sludge from the 31 December 1998 and encourages the re-use of wastewater sludge, where appropriate, recommending that disposal of wastewater sludge be minimised where possible. There are more stringent provisions for agglomerations discharging into sensitive areas such as fresh waters and estuaries. The progressive implementation of the Urban Waste Water Directive in all Member States is resulting in an increase in the quantities of sewage sludge requiring treatment and disposal. This increase is mainly due to the practical implementation of the Directive, but is also due to the increase in the number of households connected to sewers and the improvement in the level of treatment (up to tertiary treatment with removal of nutrients in some Member States).

1.3.1.3 EU Working Document on Sludge

An EU Working Document on Sludge, currently in its third draft, deals with all aspects of sludge management. The main headings covered in the draft document include:

- *Definitions*: definitions for sewage sludge, septic tank sludge and industrial sludges;
- *Use of Sludge on Land*: detailing the appropriate uses of sludge on land;
- *Limit Values*: detailing provisions on concentration limit values for heavy metals and organic compounds in both sludges and soils;
- *Obligation for Treatment*: measures to reduce the likelihood of the dispersion of pathogens into the environment and to build up consumers' confidence;
- *Conditions for use of Land*: detailing appropriate conditions for the application of sludge to land, the type of crops that can be grown on such land and harvest time for such crops;
- *Producer Responsibilities and Certification*: detailing provisions on sludge producer responsibility and certification;

- *Information Requirements*: details the information that the producer of the sludge should supply to the receiver;
- *Codes of Practice*: proposes to set up codes of good practice for the use of sludge in the varying outlets;
- *Prevention of Pollution*: proposes the setting up of a global strategy to ensure the long-term availability for the beneficial use of sludge.

The draft working document also lists appropriate sludge treatment processes, limit values for concentrations of heavy metals in soil, limit values for concentrations of heavy metals, organic compounds and dioxins in sludge for use on land, sampling frequencies, and analysis and sampling methods.

1.3.2 EU WATER QUALITY LEGISLATION

Some of the most important EU legislation involving water quality and discharges of effluent to receiving waters are summarised in the following sections:

1.3.2.1 The Urban Waste Water Treatment Directive (Council Directive 91/271/EEC)

The Urban Waste Water Treatment Regulations, 2001 (S.I. No. 254 of 2001) give effect to this Directive, as stated in Section 1.3.1.2 above. These regulations specify limits on wastewater treatment discharge of BOD_5, COD and Total Suspended Solids. The regulations also set discharge limits for Total Phosphorus and Total Nitrogen for discharges to sensitive waters, as listed in the Third Schedule of the regulations. The Urban Waste Water Treatment Regulations also set out deadlines for secondary treatment of wastewaters depending on the size of agglomerations, as detailed in Section 1.3.1.2.

1.3.2.2 EU Council Directive (76/464/EEC) on Water Pollution by Discharge of Dangerous Substances

EU Directive 76/464/EEC, dealing with water pollution by discharges of certain dangerous substances, was implemented by statute in Ireland, into the Local Government (Water Pollution) Act 1977. Various regulations gave effect to this Act, including:

- Water Quality (Dangerous Substances) Regulations, 2001 (S.I. 12/2001).

In the marine environment, the above regulations cover the obligations under the Directive by setting limits on the concentration of various pesticides, solvents, metals, and other substances. These limits themselves result from extensive testing of the toxicity of these compounds to marine life, not just at the adult stage, but at the juvenile or larval stage as well.

1.3.2.3 The Bathing Water Directive (Council Directive 2006/7/EC)

This Directive repeals Directive 76/160/EEC, which was one to the first pieces of European environmental legislation to be set. The Bathing Water Directive (76/160/EEC) set minimum mandatory standards for the quality of Bathing Water throughout the European Union. The aim of the Directive was to protect public health and the environment from faecal pollution at locations where people bathe. The Directive required Member States to identify popular bathing areas and monitor the bathing waters for indicators of microbiological pollution throughout the bathing season. The Directive allowed two years for each member state to set up the necessary legislation and ten years for compliance.

The main Irish legislation, which give effect to Directive 76/160/EEC are as follows:

- Quality of Bathing Waters Regulations, 1992 (S.I. 155/1992), as amended by Statutory Instruments: S.I. 145 of 1994; S.I. 230 of 1996; and S.I. 177 of 1998.
- Quality of Bathing Waters (Amendment) Regulations, 2001 (S.I. 22/2001).

These regulations designate bathing areas and outline water quality parameters to be measured, as well as specified testing frequencies and methods for analysis.

In December 2005 an agreement was reached between the Member States, the European Commission and European Parliament on a new Bathing Water Directive. This new Bathing Water Directive (2006/7/EC) was adopted on February 15th, 2006 and revokes Council Directive 76/160/EEC.

Directive 2006/7/EC is aimed at tightening water quality standards and ensuring relevant information on bathing waters is available to the general public. This new Directive sets out provisions for the monitoring and classification of bathing water quality, the establishment of management systems for bathing water quality, and the provision of information on bathing waters to the public.

1.3.2.4 EU Shellfish Directive (Council Directive 79/923/EEC)

This Directive, (with amendments: Directive 91/692/EEC and Council Regulation 1882/2003/EC), seeks to protect or improve shellfish waters in order to support shellfish life (bivalve and gastropod molluscs) and growth, thus to contribute to the high quality of shellfish products directly edible by man. The Directive sets physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with or endeavour to meet. The Directive is designed to protect the aquatic habitat of bivalve and gastropod molluscan species of shellfish. This includes oysters, mussels, cockles, scallops and clams. The Directive does not cover shellfish crustaceans like crabs, crayfish and lobsters.

The main Irish legislation, which gives effect to the Directive is as follows:

- Quality of Shellfish Waters Regulations, 2006 (S.I. 268/2006)

The Quality of Shellfish Waters Regulations, (S.I. 268/2006) revoke previous shellfish regulations (S.I. 200/1994 and S.I. 459/2001). The revoked regulations previously specified indirect standards for discharge to shellfish inhabited waters. The new Shellfish regulations (S.I. 268/2006) now prescribe actual quality standards for shellfish waters, designate the waters to which they apply, and require the preparation and implementation of action programmes in respect to all such waters '*to take reasonably practicable steps to reduce pollution in those waters with a view to meeting the standards specified in Schedule 4'*. The 2006 Shellfish regulations are not intended to overrule the operation of the Water Quality (Dangerous Substances) Regulations 2001 (S.I. 12/2001).

1.3.2.5 EU Water Framework Directive (Council Directive 2000/60/EC)

This Directive came into force on the 22nd of December 2000, and is generally known as the 'Water Framework Directive' or 'WFD'. The objective of the Directive is to rationalise and update existing water legislation by setting common EU wide objectives for water. The WFD has a broad scope relating to water quality in rivers, lakes, canals, groundwater, transitional (estuarine) waters and coastal waters out a distance of at least one nautical mile.

The fundamental objective of the WFD aims at achieving and/or maintaining "high status" in relation to all waters by 2015. Under this Directive Member States are obliged to ensure that a co-ordinated approach is adopted for the achievement of the WFD objectives and for the implementation of programmes of measures for this purpose. The main activities for the implementation of the WFD will take place in the context of River Basin Management (RBD) Projects led by Local Authorities.

In accordance with the requirements put forward by the European Communities (Water Policy) Regulations, S.I. 722 of 2003 (which transposes the Water Framework Directive (2000/60/EC) into Irish law), work to date includes an initial characterisation and analysis of Ireland's river basin districts, which was conducted and submitted to the European Commission in the form of a National Summary Report in March 2005 by the Environmental Protection Agency. An *'Article 5 Characterisation : Summary Report'* was produced as part of the Western River Basin District Management System, which encompasses the subject area of the proposed development.

1.3.3 EU HABITATS DIRECTIVE

1.3.3.1 Council Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora

In 1992 the European Community adopted Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. This directive is the main community instrument, which aims to safeguard biodiversity. Under the Directive, Member States have a responsibility to preserve habitats and species of Community interest and to identify and designate, as Special Areas of Conservation (SAC), sites which are important for the protection of the species and habitats covered by the Directive. The Special Areas of Conservation, and the Special Protection Areas (SPA) designated under the Birds Directive (79/409/EEC), make up the European network of protected sites, known as Natura 2000.

Proposed SACs are selected at national level in accordance with the scientific criteria set out in Annex III of the Habitats Directive. Ireland had, (at the end of 2001), formally proposed 363 candidate SACs for inclusion in the EU Natura 2000 network. The total area involved in these proposals is close to 1 million hectares.

1.3.4 NATIONAL WASTE MANAGEMENT POLICY

The Department of the Environment, Heritage and Local Government published the national waste management policy statement in September 1998, entitled '*Waste Management - Changing Our Ways'*, which includes a number of provisions relating to engineered landfills and composting facilities, which are seen as a necessary element of an integrated waste management system for the country.

The '*rationalisation of municipal landfills leading to an integrated network of some 20 state-of-the-art facilities*' nationwide is also recommended within the scope of '*Waste Management - Changing Our Ways*'. The closure of the existing landfills in County Mayo and in adjoining counties reflects the fact that this recommendation is currently being addressed. The continued development of state-of-the art facilities accepting waste from County Mayo at Derrinumera and Rathroeen is in accordance with this recommendation.

The Department of the Environment, Heritage and Local Government also published the national waste policy statement in March 2002, entitled '*Preventing and Recycling Waste - Delivering Change'* that evolved from and is grounded in the 1998 policy statement '*Waste Management - 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;
- Outlines a range of measures that will be undertaken in the interests of minimising waste generation and ensuring a suitable expansion in re-use and recycling performance; and
- Identifies issues and possible actions that require further systematic consideration.

The 2002 waste policy statement concentrates on 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.

The 2002 waste policy statement also recommends the establishment of a National Waste Management Board to co-ordinate, monitor, review and advise on all aspects of waste management policy at all levels of the waste hierarchy.

In April 2004 the Department published an additional waste policy statement entitled *'Waste Management – Taking Stock and Moving Forward'*. *'Waste Management - Changing Our Ways' (1998), 'Preventing and Recycling Waste: Delivering Change' (2002) and 'Waste Management – Taking Stock and Moving Forward' (2004)* combine to provide a policy framework for the modernisation of Irish waste management infrastructure and services.

The policy approach remains grounded in the concept of integrated waste management, based on the internationally recognised waste hierarchy, designed to, by 2013, achieve the ambitious targets set out in *'Waste Management - Changing Our Ways'*. Waste management planning continues to be delivered through local authorities in their regional groupings.

A National Waste Prevention Programme was launched following the publication of the 2004 document. Key initial areas focused on improved data collection and an examination of the factors contributing to waste generation in targeted sectors and specific waste streams.

The *'Waste Management – Taking Stock and Moving Forward'* document recognised that landfill will have a continued role as a waste management tool but it will progressively change to a residual role, in accordance with its place at the bottom of the waste hierarchy. In order to ensure a sharper focus on the implementation of waste management plans, local authorities are now required to -

- Set out in their plans the key actions that are to be delivered in each of the plan's five years; and
- Prepare, within 3 months of the end of each year, an annual report on implementation.

1.3.5 CONNAUGHT WASTE MANAGEMENT PLAN

The '*Connaught Region Waste Management Plan'*, as adopted in September 2001, covers the jurisdictions of Galway, Mayo, Sligo, Leitrim and Roscommon County Councils, together with Galway Corporation. The Plan has regard to all non-hazardous wastes generated within the functional areas of each of the above local authorities. As part of the Plan, a number of waste management policies were adopted, covering all non-hazardous and hazardous wastes including non-hazardous sludges. Section 9.3.7 of the Plan outlines the Sludge Management Policy, the main policy being that each local authority should embark on the preparation of individual sludge management plans on a countywide basis. The Waste Management Plan will have regard to the provisions of the individual plans. A new Waste Management Plan is now in place entitled *'Connaught Waste Management Plan (2006-2011)'*.

1.3.6 MAYO SLUDGE MANAGEMENT PLAN

The Sludge Management Plan (SMP) for County Mayo was originally prepared in November 2000 in accordance with the recommendations of the document "*Sludge Management Plans: A Guide to their Preparation and Implementation"* (Fehily Timoney and Co. 1999). The aim of the SMP was to identify sludge management facilities to facilitate treatment and reuse of non-hazardous sludges and to give recommendations to further the sustainable management of all non-hazardous sludges arising in County Mayo. The main recommendations of the SMP at the time included:

- Hub-centres for treatment of municipal wastewater sludge to be established at Castlebar, Ballina, Achill Island, Belmullet and Louisburgh;
- Thermal drying to be installed at the hub-centres at Castlebar and Ballina, if both hub-centres are developed;
- A number of satellites will be set up for the transportation of municipal wastewater sludge to the Castlebar Hub-Centre, namely at Ballinrobe, Claremorris and Swinford. Dewatered sludge from Westport and Kiltimagh Wastewater Treatment Plants (WWTPs) will be brought to the Castlebar Sludge Hub, along with liquid sludge arising at Mulranney, Newport, Ballyhaunis, Balla and Ballyvary;
- If the hub-centre were developed at Ballina it would accept dewatered sludges from Killala and liquid sludges from Crossmolina and Foxford. Alternatively, if a single hub-centre was developed at Castlebar, Ballina would serve as a satellite;
- It was proposed that the hub-centre in Castlebar would be set up in the wastewater treatment plant.

Mayo County Council had prepared an EIS for certification by the Minister for the expansion and upgrading of the Castlebar Wastewater Treatment Plant, and for the development of the sludge treatment hub-centre at Castlebar. Following changes in legislation and in lieu of the Minister, An Bord Pleanála certified the EIS, however Condition 3 of the certification had

implications for the development of the hub-centre at the Castlebar WWTP. Condition 3 stated:

"No sewage sludge or landfill leachate from outside the expanded Castlebar Wastewater Treatment Plant shall be transported onto the site for processing at this location having regard to the limited assimilative capacity of the river system relative to the likely demands arising from within the Castlebar area."

This meant that a sludge hub-centre servicing the needs of the southern half of County Mayo could not be developed at the Castlebar WWTP. Also, leachate produced at Derrinumera Landfill could no longer be transported to the Castlebar WWTP for co-treatment with municipal wastewater once the expansion to the WWTP had been commissioned.

Following An Bord Pleanála's decision, Mayo County Council commissioned Fehily Timoney and Co. to review the recommendations and conclusions of the Mayo Sludge Management Plan. The Elected Members subsequently adopted the Review of Mayo Sludge Management Plan in 2003. In the Review of Mayo Sludge Management Plan (2002), attempts were made to identify an alternative site for a hub-centre in the vicinity of the Castlebar WWTP, but no suitable sites were available. Other WWTPs throughout the county were also examined but they were on the periphery of the county and were unsuitable in terms of transport cost and proximity of residential development. As part of an attempt to minimise sludge transportation costs, an alternative hub-centre location closer to the centre of gravity for sludge production was sought. Derrinumera Landfill was identified under the Review of the Mayo Sludge Management Plan as being the most suitable site.

Arising from the Review of the Mayo Sludge Management Plan by Fehily Timoney & Co., the main recommendations were:

- A single sludge hub-centre for the treatment of all municipal sludges in the county should be established at Derrinumera Landfill site;
- Thermal drying will be the preferred sludge treatment technology employed or an equivalent alternative, which brings flexibility to the overall strategy;
- Westport, Ballinrobe, Claremorris, Swinford, Foxford, Ballina, Achill Island, Achill Sound and Newport will serve as satellites for transportation of municipal wastewater sludge to Derrinumera Hub-Centre;
- The preferred procurement option is a Design, Build and Operate contract;
- All process waters produced during the sludge treatment process will be co-managed with landfill leachate arising on-site.

1.3.7 THE REQUIREMENT FOR AN ENVIRONMENTAL IMPACT STATEMENT

The Sludge Hub Centre (SHC) and Leachate Treatment Facility (LTF) will be the subject of a DBO arrangement. As the proposed development will be carried out in partnership with a

local authority that is a planning authority (i.e. Mayo County Council), the SHC and LTF are therefore classified as exempted development not requiring planning permission. "Exempted development" is defined in the Planning and Development Act 2000 by reference to Section 4(1), which lists a number of categories of exempted development, including:

'(f) development carried out on behalf of, or jointly or in partnership with, a local authority that is a planning authority, pursuant to a contract entered into by the local authority concerned, whether in its capacity as a planning authority or in any other capacity;'

As the SHC and LTF is classified as exempted development under Section 4(1)(f) then:

1. The procedure for approval of an EIS for the proposed development will be as outlined under Section 175 of the 2000 Act if an EIS is required; or
2. The procedure for approval will be as outlined in Section 179 of the 2000 Act in the case whereby no EIS is required.

Certain procedures contained in Sections 175 and 179 of Part X of the 2000 Act will be relevant to the SHC and LTF proposal. These procedures will need to be complied with before the construction can proceed. An outline of these provisions is set out in detail below.

This Environmental Impact Statement, as part of the EIA process, has been prepared pursuant to the provisions of Section 13 of the Waste Management (Licensing) Regulations (S.I. No. 395 of 2004), Part X of the Planning and Development Act, 2000 and the Planning and Development Regulations, 2001 (S.I. No. 600 of 2001) to 2006 (S.I. No. 685 of 2006), which give effect to the EIA Directives. Section 13 of the Waste Management (Licensing) Regulations 2004 requires that applications for waste licences or licence reviews are to be accompanied by an EIS:

' Where development is proposed to be carried out, being development which comprises or is for the purposes of a waste recovery or waste disposal activity, and is of a class for the time being specified under article 93 of the Planning and Development Regulations……..'

Article 93 of the Planning and Development Regulations 2001 provides that the prescribed classes of development are set out in Schedule 5 of the Regulations. The combined effects of Sections 175 and 176 of the 2000 Act (both being elements of Part X of the 2000 Act) and of Article 93 and the Fifth Schedule of the 2001 Regulations, is to subject those developments listed in the Fifth Schedule to the EIA regime, now set out in Part X of the 2000 Act.

Schedule 5 of the 2001 Regulations includes the following potentially relevant categories:

1. *Part 2, 11(b) - installations for the disposal of waste with an annual intake greater than 25,000 tonnes not included in Part 1 of this Schedule;*

2. *Part 2 11(d) - sludge-deposition sites where the expected annual deposition is 5,000 tonnes of sludge (wet);*
3. *Part 2 13(a) – Any change or extension of development which would: -*

    - *result in the development being of a class listed in Part 1 or paragraphs 1 to 12 of Part 2 of the Schedule, and*
    - *result in an increase in size greater than –*
        - *25 percent, or*
        - *an amount equal to 50 per cent of the appropriate threshold,*

    whichever is the greater.

(In this paragraph, an increase in size is calculated in terms of the unit of measure of the appropriate threshold.)

Once the SHC and LTF have been commissioned, it is envisaged that during the life of the DBO contract an estimated amount of sludge in the range of 27,844 to 32,580 tonnes per annum could enter the facility. The current quantity of waste that is licensed to be accepted for disposal to landfill at the landfill site is 40,000 tpa. The acceptance of this estimated amount of sludge at the facility, due to the development of the SHC at Derrinumera, will lead to an increase in total waste acceptance, which is greater than that referred to in category 3.

Given the nature of the proposed development, it is considered that an EIS is required and that the Section 175 procedure be followed.

Where Section 175 applies, the local authority must: -

(a) Prepare (or have prepared) an environmental impact statement (EIS) in respect of the proposed development (Section 175(1)); and
(b) Apply to An Bord Pleanála (the "Board") for approval for the development in question (Section 175(3)); and
(c) Not proceed with the development in question until the Board has approved it (with or without modification) (Section 175(2)).

Thus, due to the above, this EIS has been prepared for the Licence Review of Derrinumera Landfill Site to include a Sludge Hub Centre and Leachate Treatment Facility, with disposal of the treated leachate via a pumped discharge to the outfall of the Newport Wastewater Treatment Plant. The EIS assessment and approval process will be a split competency function between An Bord Pleanála and the EPA with regards to licensable activities.

1.4 SCOPING & PUBLIC CONSULATION

The purpose of this section is to provide an overview of the consultation process followed to date in respect of the proposed facility. In accordance with Section 1.4 of the '*Guidelines on the Information to be Contained in Environmental Impact Statements' (2002)*, the

consultation process consisted of consultation with competent bodies, statutory bodies, interested parties and the public. The primary objective of involving competent bodies, statutory bodies, and interested parties at an early stage in the Environmental Impact Assessment process is to aid scoping of the EIA.

Consultations, with regard to the scope of the environmental impact assessment, were carried out in the form of written consultations and/or consultation meetings with the following government and non-government bodies:-

- Environmental Protection Agency;
- Department of Environment, Heritage & Local Government;
- An Bord Pleanála;
- North Western Fisheries Board;
- National Parks & Wildlife Service;
- Bord Iascaigh Mhara;
- Marine Institute;
- Clew Bay Marine Forum Ltd;
- Castlebar Town Council;
- Clew Bay CLAMS Group;
- Mr. Kieran Thompson, Newport House;
- Irish Shellfish Farmers Association;
- Newport & District Development Co.
- Clew Bay Oyster Cooperative Society Ltd;

A copy of the letters sent to the consulted bodies is included in Appendix 1, Volume IV, and replies and correspondence from government and non-government bodies are given in Appendix 2, Volume IV.

This EIS has also been sent to An Bord Pleanála for its approval. As part of the application to An Bord Pleanála copies of the EIS have also been sent to the following statutory bodies:

- An Chomhairle Ealaíon;
- Bord Fáilte Éireann;
- An Taisce- The National Trust for Ireland;
- Department of the Environment, Heritage and Local Government;
- Department of Communications, Marine and Natural Resources;
- The Heritage Council;
- West Regional Authority;
- North Western Regional Fisheries Board;
- The Irish Aviation Authority;
- Aer Rianta;
- The National Roads Authority;

- The Environmental Protection Agency;
- Health Service Executive - Western Area.

1.5 PROCEDURES AND STRUCTURE OF THE EIS

This EIS contains information on the scale and nature of the proposed development, a description of the existing environment, impact assessment of the proposed development and mitigation measures to reduce the impact on the receiving environment.

This Environmental Impact Statement has been prepared in accordance with the requirements of:

- The European Communities (Environmental Impact Assessment) Regulations 1989 (S.I. No. 349 of 1989);
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 1994 (S.I. No. 84 of 1994);
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 1996 (S.I. No. 101 of 1996);
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 1998 (S.I. No. 351 of 1998);
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 1999 (S.I. No. 93 of 1999).
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 2000 (S.I. No. 450 of 2000).
- The European Communities (Environmental Impact Assessment) (Amendment) Regulations 2001 (S.I. No. 538 of 2001).

The Second Schedule to the Environmental Impact Assessment Regulations (1989) sets out the information that should be provided in an Environmental Impact Statement.

The structure and content of the Environmental Impact Statement has been based on the above legislation and on the following documents, as published by the Environmental Protection Agency:

- *'Guidelines on the information to be contained in Environmental Impact Statements'* (2002);
- *'Advice Notes on Current Practice in the preparation of Environmental Impact Statements'* (2003).

This Environmental Impact Statement provides for:

- A description of the site and the existing environment;

- A description of the alternatives examined;
- A description of the proposed development;
- The impacts, if any, resulting from the proposed development;
- The measures to mitigate any adverse impacts;
- A non-technical summary.

The overall EIS is arranged in four volumes, as follows:

- Volume I: Non Technical Summary;
- Volume II: Main Text;
- Volume III: Drawings;
- Volume IV: Appendices.

Volume II of the EIS contains the main text body and is divided into five sections, which are detailed below:

- Section 1: Introduction & Background;
- Section 2: Alternatives;
- Section 3: Description of Existing Situation & Proposed Development;
- Section 4: Description of the Existing Environment/ Likely Impacts and Mitigation Measures;
- Section 5: Interaction of Environmental Effects, & Summary of Mitigation Measures;
- Section 6: Conclusion;
- Section 7: References & Glossary of Terms.

1.6 STUDY TEAM AND CONTRIBUTORS TO THE EIS

A team of consultants, co-ordinated by Tobin and TES Consulting Engineers, has prepared this EIS. The relevant inputs of the various members of the Study Team are as follows:

Tobin Consulting Engineers, Castlebar, County Mayo	Project Direction, Traffic and Roads, Water.
TES Consulting Engineers, Dublin	Project Management, Production, Evaluation and Reporting, Facility Design, Noise, Climate, Air Quality, Ecological Assessment, Geology and Hydrogeology, Surface Water, Planning, Tourism, Archaeology, Socio-Economics, Landscape.

Odour Monitoring Ireland, Trim, County Meath	Odour Modelling
Moloney & Associates, Carrigaline, County Cork	Predictive Noise Modelling
Biosphere Environmental Services, Greystones, County Wicklow	Terrestrial Ecological Assessment of LTF Pipeline Route
Dr. Evelyn A. Moorkens, Rathfarnham, Dublin 14	*'Margaritifera Margaritifera'* Survey of LTF Pipeline Route

Hydrodynamic modelling and treated effluent dispersal information was also provided to the Team by Mott MacDonald Pettit Ltd., (Consulting Engineers to Mayo County Council on the Newport Sewerage Scheme).

1.7 DIFFICULTIES ENCOUNTERED

The most significant difficulty encountered during the study was the attainment of clear discharge standards appropriate to the discharge of treated leachate to the coastal environment, in particular for substances which are considered as priority substances in Ireland. The European Communities (Quality of Shellfish Waters) Regulations, S.I. No. 268 of 2006 specifies limits for eleven categories of parameters however it could be considered that the limit values specified in the Regulations may not cater for every possible substance present in the treated leachate.

Whilst the project team engaged in consultation with the Environmental Protection Agency and Bord Iascaigh Mhara during the environmental impact assessment process regarding additional environmental quality standards for treated leachate in the context of the proposed receiving waters, there was no information available with regard to what these environmental quality standards would be set at. In the absence of this information, the only approach available to the project team in selecting appropriate discharge standards for treated leachate was on the basis of a literature review of existing environmental quality standards as enshrined in national legislation. In many cases recommended environmental quality criteria in international publications were less than existing background levels in the Irish environment or there was an insufficient dataset for assessment of background levels on a national basis. When assessing the appropriateness of these discharge standards, it should be noted that ultimately the Environmental Protection Agency will be required to establish the discharge standards for the treated leachate being discharged from Derrinumera landfill as part of the Waste Licence Review process which is currently on-going.

The publication of the new Shellfish Regulations (which now prescribe actual quality standards for shellfish waters and designate the waters to which they apply), was seen as a

very positive advance in establishing leachate discharge standards for the project, thus a proposed set of standards was compiled by the Project Team, based on the 2006 Shellfish Regulations, the 2001 Dangerous Substances Regulations and other legislation. The set of proposed leachate discharge standards remain subject to review by the Environmental Protection Agency.

In general, however, no other difficulties were encountered in collecting data for the compilation of this EIS. TOBIN Consulting Engineers wish to thank Mayo County Council staff for their courtesy and assistance provided throughout the preparation of this Environmental Impact Statement.

Section Two

ALTERNATIVES

2 ALTERNATIVES

2.1 DO NOTHING APPROACH

In 1991, the Directive 91/271/EEC, concerning urban wastewater treatment, banned the marine disposal of wastewater sludge from the 31st of December 1998. It encouraged the beneficial re-use of wastewater sludge where appropriate and recommended that disposal of wastewater sludge be minimised where possible. With the Mayo Sludge Management Plan (2000), it was hoped that, with the proposed extension of the Castlebar WWTP, a sludge hub-centre for the treatment of municipal non-hazardous sludges could be established at the expanded plant, together with the development of hub centres at Ballina, Achill Island, Belmullet and Louisburgh.

As a condition of the existing Derrinumera Landfill Site EPA licence (W0021-01), leachate is removed from the site by tanker to the Castlebar Wastewater Treatment Plant. However, as outlined in the introduction to this EIS (refer to Section 1.2.1), An Bord Pleanála, in their certification for the expansion and upgrading of the Castlebar WWTP, have effectively prohibited the existing arrangement of treating landfill leachate at the wastewater treatment plant (WWTP) in Castlebar. The An Bord Pleanála condition implies that, once the upgrading and expansion of Castlebar WWTP occurs, alternative arrangements must immediately fall into place for the treatment of Derrinumera Landfill leachate.

The An Bord Pleanála decision also prohibits the importation and treatment of sewage sludge arising from outside of the expanded Castlebar WWTP, once the upgrading of the Plant occurs. Therefore alternative arrangements must also be made for treatment of this sludge in lieu of the original plans to treat this sludge at the formerly envisaged Castlebar WWTP Sludge Hub Centre. The upcoming contract for the upgrade of Castlebar WWTP therefore imposes a tight limit on the allowable timescale for the development of the SHC and LTF at Derrinumera Landfill Site.

A "do nothing approach" would mean that the sludge produced at Castlebar WWTP and others throughout the county would have to be either treated on-site at each WWTP, land spread on agricultural land banks outside the county or disposed of at licensed landfill sites. None of these options are desirable for environmental and economic reasons. Also, municipal sludge disposal at waste landfill sites is either prohibited by waste licence or is about to be prohibited. The National Policy on sludge management is to establish regional Sludge Management Plans and develop centralised treatment of sludge and to encourage reuse where possible. The "do nothing approach" would mean that it would not be possible to implement the Sludge Management Plan for County Mayo. An alternative treatment and disposal strategy must be found for leachate; the current arrangement, as outlined above, has a predetermined remaining life.

2.2 ALTERNATIVE SITES

As outlined previously, the An Bord Pleanála decision on Castlebar WWTP effectively meant that a Sludge Hub-Centre (SHC) could not be established there and leachate could not be brought to the plant from the Derrinumera Landfill. Following An Bord Pleanála's decision, Mayo County Council commissioned Fehily Timoney and Co. to review the recommendations and conclusions of the Mayo Sludge Management Plan. In the Review of Mayo Sludge Management Plan (2002), attempts were made to identify an alternative site for a hub-centre in the vicinity of the Castlebar WWTP, but no suitable sites were available.

Other WWTPs throughout the county were examined for their suitability as a site for the SHC. The criteria for site selection, given in the document, '*Sludge Management Plans: A Guide to Their Preparation and Implementation'* (Fehily Timoney & Co. 1999), were used to try to find an appropriate site. The WWTPs at Westport, Swinford and Ballinrobe were initially examined. However, they were effectively ruled out because of their location at the periphery of the county. The location of a SHC at any of these locations (Westport to the west, or Swinford to the east, or Ballinrobe to the south) would significantly increase the annual cost and the impact of sludge transportation within the county. This is because the centre of gravity for sludge production in County Mayo is close to Castlebar. Also, the development of a SHC at the Westport WWTP would not be compatible with the certified EIS for that plant.

As outlined in Section 1.3.6, the original Mayo Sludge Management Plan of November 2000, recommended the setting up of five SHCs for County Mayo: at Castlebar WWTP and Ballina WWTP (largest facilities) and at Achill Island, Belmullet and Louisburgh (to serve more remote locations). Since the adoption of the Plan, the "*Ballina and Environs Development Plan"* (June 2003) has zoned Belleek as a recreational and leisure area. Ballina WWTP is located in Belleek. In an area of recreational leisure zoning, the development of the SHC at the Ballina WWTP may encounter planning difficulties. Also, the road access to the plant is inadequate to support the number of vehicles associated with the operation of a SHC. For these reasons Ballina WWTP could not be considered as a suitable location for a sludge hub centre.

2.3 ALTERNATIVE SLUDGE AND LEACHATE TREATMENT PROCESSES

2.3.1 ALTERNATIVE SLUDGE TREATMENT OPTIONS

As this is a Design Build and Operate (DBO) project, the exact nature of sludge treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. This section provides a brief outline of sludge treatment processes that typically have been used successfully in similar sized plants treating similar type sludges.

A more detailed description of sludge treatment processes is provided in Section 3.2.

For the sludge treatment process the EIS proposes both a sludge-drying unit and a tunnel composting system. The most likely treatment outcome is that 80% of the sludge intake will be treated by the permanent sludge drier and 20% of the intake will go to the composting facility. The principal elements involved in the SHC at Derrinumera will include:

- Sludge Reception and Handling;
- Sludge Thickening and Dewatering;
- Permanent Sludge Drier;
- Tunnel Composting System;
- Interim Sludge Treatment (may be required prior to commissioning of Permanent Sludge Drier); and
- Finished Product Transportation.

2.3.1.1 Sludge Reception and Handling

The existing weighbridge system at the landfill site will be shared with the DBO Contractor, which will be used for weighing of any chemical or nutrient deliveries to the site and for weighing sludge imports to and biosolids exports from site as required for the proper management of the sludge register.

This Sludge Reception Facility will receive dewatered sludge cake from the various satellite WWTP's and WTP's and a minor volume of liquid sludge from smaller treatment plants around the county. The liquid sludge will be sent for prior dewatering whilst the sludge cake will be fed onto an Apron Belt Feeder or similar, with an integral cake pump which will deliver cake onwards to the drier. It will be covered with a canopy and a loading bay cover with an air management system.

Sludge going on for composting will be mixed into a homogenous state, transported from the sludge hoppers to the reception/preparation area of the compost building via covered screw conveyor or by front-end loader. The sludge will be stored in a sludge bunker, typically 100m^3 in size. The reception/preparation area will have a bunker for storing the bulking agent (typically wood-chips). There will be an area for mixing the sludge and woodchips, and an inspection and quarantine area for out-of-spec sludge.

2.3.1.2 Sludge Thickening and Dewatering

It is expected that a small amount of sludge will be imported as liquid sludge to the Sludge Hub Centre (SHC), from smaller treatment plants, the remainder will arrive at the SHC as sludge cake. The dewatering system will be designed using new or existing equipment or a combination of both, which will produce a dewatered sludge with a minimum dry solids content of 17.5% or within a suitable range above this point consistent with the landfill licence.

The proposed dewatering system will be provided complete with a fully enclosed dewatered sludge handling system.

2.3.1.3 Permanent Sludge Drier

There are many variants of thermal driers, but all require energy input to release the molecular entrained water. Drying is achieved either by convection drying when hot gas / air is blown through the sludge or by conduction drying whereby the sludge is brought into contact with a heated surface.

There are various types of thermal driers operating in Europe, including:

- Horizontal drum driers (e.g. rotary driers, paddle driers and thin film driers);
- Vertical tray drier pelletisers;
- Conveyor belt driers;
- Fluidised bed driers.

A description of the various types of thermal driers is provided in Section 3.2. Atmospheric emissions from such a drying system would be required to comply with TA Luft 2002 requirements.

To the extent that this is a Design Build Operate Contract, the appointed Contractor will have relative freedom in designing the drying process units that he feels are most appropriate for the project in terms of economic design from both the constructional and operational perspective. Notwithstanding this fact, there are both broad constraints and unit specific constraints that must apply to all designs.

The sludge drier will be capable of providing a minimum 90% DS final product (bio-solid) in a 2-5mm hard round pellet form. The sludge drier will be handling sludge cake of a variable consistency, over an operating period, which is inclusive of all necessary annual scheduled maintenance downtime. Drier designs that bring the drying medium into contact with the sludge will also be subject to the conditions for proper handling and treatment of odour emissions.

The potential to use landfill gas as an auxiliary fuel shall be investigated, and used if found feasible and cost effective, subject to regulatory requirements. Microturbine options that generate power and heat from natural gas shall also be considered in the context of the overall heat balance and energy requirement of the Hub Centre.

2.3.1.4 Tunnel Composting System

It is Mayo County Councils intention that, in the interests of flexibility and value for money in selected sludge disposal routes, that sludge composting would be a technical option available to the Contractor, in parallel with sludge drying and subject to resolution of constraints.

An in-vessel composting system, such as tunnel composting, hangar composting or container composting, is best suited amongst biological treatment options for the treatment of municipal sludge. Of the in-vessel composting technologies, the tunnel composting system is the most efficient, reliable and flexible. A typical tunnel composting facility will comprise a fully enclosed dedicated warehouse-type building, with all treatment processes, including acceptance of waste, composting, refinement and storage of final products carried out within the building.

A biofilter would be installed, through which all collected process air would be emitted.
The compost building typically would consist of a main sludge reception and preparation area, composting tunnels and a composting refinement and storage area. The composting system will comprise of the following elements:

- Tunnel Composting Area
- Compost Refinement/Storage Area
- Process Control System (temperature sensors and moisture control)
- Air Management (including air scrubber/biofilter/fans)
- Water Management

2.3.1.5 Interim Sludge Treatment

It is proposed to utilise an existing diesel fuelled sludge drying and lime stabilisation plant as a possible fallback facility to provide an interim solution should the need arise prior to commissioning of the SHC permanent plant. In such an event, it is proposed to temporarily relocate the unit, (currently located at Ballina WWTP), to the existing machinery maintenance building.

At present, dewatered sludge is being removed to licensed and permitted sites, located outside of the county. In the event that this existing arrangement becomes unavailable, Mayo County Council staff would be required to operate this interim plant until such time as the Sludge Hub Centre DBO Contractor was appointed. Directly on appointment, that Contractor would be required to operate the interim plant, until his permanent drying plant was commissioned, at which time he would retire the interim plant. The maximum expected operation period of the Interim Plant at Derrinumera would be 3 years.

The interim plant will be approximately 4 to 5 years old and would consist of initial lime dosing by augering of slaked lime into dewatered sludge cake. The lime/sludge mixture would then be passed through a diesel-fuelled drum drier. The approximate residence time in the drier would be ten minutes. The water may be recycled in a closed loop cooling system, in which case a water tank would be installed to provide top-up cooling water at Derrinumera Landfill, and the cooling water would be re-circulated through a dump heat radiator or evaporation tower, which would also be located at the landfill site. As the interim plant is diesel-fuelled, a bunded fuel storage area would be provided.

Final dried sludge/lime product can be reused as a cover material and as a soil supplement to encourage vegetation on earthen embankments at the Derrinumera Landfill.

2.3.1.6 Finished Product Storage and Handling

The dried product will be stored in dried product storage silos or equivalent ground bins in compliance with the European Communities (Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres) Regulations, 1999 (S.I. No. 83 of 1999).

A bagging unit shall be provided adjacent to the dried product storage area, linked to the storage bins or silos by means of conveyors. The dried product storage capacity shall be at least equivalent to one week's production at average throughput rates (approximately 69 m^3 at 90% DS). Dried product will be transported off site either in bulk, or in bagged form. In the case of truck transport, this shall be from an on-site designed truck filling station, including an operator platform within a weatherproof canopy.

Adequate dust control measures will also be incorporated to provide a safe working area and to prevent excess dust emissions to atmosphere during the filling operation.

2.3.2 ALTERNATIVE LEACHATE TREATMENT OPTIONS

As this is a Design Build and Operate (DBO) project, the exact nature of the leachate treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. This section provides a brief outline of leachate treatment processes that typically have been used successfully in similar circumstances.

A more detailed description of leachate treatment processes is provided in Section 3.4.

The LTF will cater for the treatment of raw leachate collected from the landfill waste body, all potentially contaminated stormwater from hard surfaces on site, which has been designated as ‘grey water’ by the EPA, and any additional loadings otherwise generated from any other operations on site such as excess process water from sludge drying and supernatant arising from dewatering of smaller volumes of liquid sludge. Secondary and tertiary treatment processes would be suitable for the attainment of a treated effluent that will comply

with required discharge standards (Refer to Section 3.4.3.7 and Appendix No. 3 – Volume IV). Adequate flow balancing measures will also be an integral part of the leachate treatment process.

2.3.2.1 Secondary and Tertiary Treatment of Leachate

The following process options will be considered for effective treatment of the leachate and these may be offered in the tender process.

- Air Stripping/Aeration in Lagoons or SBR Processes;
- Reed Beds;
- Rotating Biological Contactors;
- Membrane Filtration;
- Chemical Precipitation;
- Electrolytic Oxidation;
- Reverse Osmosis;
- Other Proven Systems.

However, no leachate treatment process will be acceptable from the procurement process that is not based on proven technology. To ensure that the optimal process control is maintained, monitoring equipment and sampling facilities shall be provided. The influent flow from the leachate lagoon and effluent from the leachate treatment works shall be monitored and automatically sampled as specified. Sampling facilities (for "grab" samples) shall be provided after every process step in the liquid stream and in the sludge stream.

2.4 ALTERNATIVE TREATED LEACHATE DISCHARGE POINTS

Following on from the An Bord Pleanála condition, which implies that once the upgrading and expansion of Castlebar WWTP occurs, the current arrangement of co-treating the leachate with Castlebar wastewater for subsequent discharge of final effluent to the Castlebar River system, an alternative means must be sourced for the treatment and disposal of the leachate generated in Derrinumera Landfill.

Following best environmental practice it has been considered that the treatment of leachate should be conducted at the source and as such it is proposed to treat the leachate at Derrinumera Landfill. Once the leachate is treated (in accordance with the discharge standards as will be specified by the Environmental Protection Agency) it will need to be discharged to the receiving environment.

There are three theoretical alternatives, 1) discharge to groundwater, 2) discharge to the Glaishwy River and 3) discharge to the nearest coastal waters (i.e. Newport). Option 1 is not considered appropriate due to the volumes being generated (maximum volume of leachate

production expected to peak at 700 m^3 per day, maximum discharge from LTF to be restricted to 500 m^3 per day). Option 2 is not considered appropriate due to the very low flow conditions in the Glaishwy River. Option 3 is the best alternative solution and has been demonstrated in both this Environmental Impact Statement and in the Newport Sewerage Scheme EIS to be an environmentally sustainable option.

2.5 CONCLUSIONS

The condition, accompanying the An Bord Pleanála certification for the upgrade and expansion of the Castlebar WWTP, as discussed in Section 2.1, has made it necessary to cease leachate importation of Derrinumera leachate at this Plant in the near future. In this situation a "do nothing approach" cannot be considered since an alternative treatment option must be provided for this leachate.

This condition has also rendered the establishment of a Sludge Hub Centre at Castlebar WWTP unfeasible, given the prohibition of sewage sludge imports. A "do nothing approach" would mean that untreated, dewatered sludge throughout the county would eventually have to be landspread outside the county or disposed of at licensed landfills, both practices which are undesirable from environmental and economic grounds.

Following best environmental practice it has been considered that the treatment of leachate should be conducted at the source, and as such, it is proposed to treat the leachate at Derrinumera Landfill. Once the leachate is treated (in accordance with the discharge standards as will be specified by the Environmental Protection Agency), it requires to be discharged to the receiving environment. Of the three theoretical options outlined in Section 2.4 above, Option 3 (discharge to the nearest coastal waters, i.e. Newport) has been considered the best alternative solution.

Various locations were considered for alternative arrangements relating to the provision of a Sludge Hub Centre. In terms of selecting a Sludge Hub Centre site, using the criterion of minimising sludge transportation by locating the proposed SHC close to the centre of gravity for sludge production, the Derrinumera Landfill was identified as the most suitable site. The site is located approximately 14km from Castlebar WWTP, thus minimising the sludge transportation costs in the county as a whole. Other positive attributes of the Derrinumera site that were identified include:

- The existing facility has an established landuse of waste recovery and disposal and is subject to operation under a Waste Licence issued by the EPA (Ref. No. W0021-01);
- The site is remote, with the nearest inhabited dwelling and sensitive receptor being greater than a kilometre away;
- Geographically the site is centrally located within the county, adjacent to the centre of gravity of sludge production;
- The site is serviced by a good road network;

- There is a sufficient footprint available at the site to accommodate the SHC as well as the LTF;
- All process water produced by the operations of the SHC can be co-managed with the landfill leachate produced on-site;
- There is a requirement at the landfill site for both daily cover and final capping material. The Biosolids produced from the wastewater sludge treatment process can be utilised as either daily cover or incorporated with soil and subsoil and used as final capping material at the site.
- Alternatively, the Biosolids can be bagged or transported in bulk for reuse offsite under the terms of the Sludge Management Plan for County Mayo, or the equivalent Plan for adjacent counties.

Following environmental and practical assessment of the options, the existing Derrinumera Landfill Site has emerged as the chosen site for the location of the SHC and LTF.

Section 2.3 also provides a brief outline of the alternative treatment process options considered for both elements of this project.

Section Three

DESCRIPTION OF THE EXISTING SITUATION AND PROPOSED DEVELOPMENT

3 DESCRIPTION OF THE EXISTING SITUATION & PROPOSED DEVELOPMENT

3.1 SLUDGE TREATMENT: EXISTING SITUATION

3.1.1 LOCAL AUTHORITY SLUDGE ARISINGS IN COUNTY MAYO: GENERAL

The total volume of non-hazardous sludges generated in County Mayo in 2000 was 191,823 tonnes dry solids (tDS) [4]. Almost 90% of sludge generation was due to agricultural wastes, with local authority sludges arising from wastewater treatment accounting for 0.7% or 1,285 tDS per year (tDS/yr) [5]. Discarding agricultural sludges, wastewater treatment sludges accounted for 6.4% of all sludges. Table 3.1.1 shows the volumes of non-hazardous sludge generated in County Mayo as identified by Mayo Sludge Management Plan 2000 and the Review of the Mayo Sludge Management Plan 2002.

Table 3.1.1 Volumes of Non-Hazardous Sludge Arising in County Mayo in 2000 (tDS/yr) [6]

Sludge Generation Sector	Tonnes Dry Solids per Year
Wastewater treatment sludge	1,285
Water treatment sludge	294
Industrial sludge	
- Slaughtering	2,904
- Food Processing	241
- Fish Rearing	1
- Electricity Generation	15,472
Sub-total	*18,618*
Agricultural Slurry	
- Cattle	141,280
- Sheep	14,243
- Pigs	3,624
- Poultry	3,551
- SMC	8,930
Sub-total	*171,628*
Total	**191,823**

More recent estimates of water treatment sludges suggest that current production is closer to 1228 tpa, and wastewater treatment sludges in the present year are now approximately 2 times greater than the original Year 2000 estimate, previously set out in the Mayo Sludge Management Plan.

[4] Source 'Review of Mayo Sludge Management Plan' by Fehily Timoney & Co., November 2002

[5] Source 'Review of Mayo Sludge Management Plan' by Fehily Timoney & Co., November 2002

[6] Source 'Review of Mayo Sludge Management Plan' by Fehily Timoney & Co., November 2002

3.1.2 MUNICIPAL WASTEWATER TREATMENT SLUDGE ARISINGS

Mayo County Council has made an inventory of the details of all large municipal wastewater plants in the county. Actual volumes of sludge arisings at the principal wastewater treatment plants (WWTPs) of Castlebar and Ballina were measured. The rate of sludge production at Castlebar was found to be 49 grams dry solids per person per day (gDS/h/d). Unlike Castlebar, Ballina WWTP includes primary treatment of wastewater and consequently the rate of sludge production was higher at 55 gDS/h/d.

The trend towards increased urbanisation in County Mayo, especially in the three principal urban areas of Castlebar, Ballina and Westport, coupled with the Directive 91/271/EEC, concerning urban wastewater treatment, will call for larger WWTPs achieving higher effluent standards. In response to these pressures, Mayo County Council has developed a programme of investment for the upgrading of wastewater treatment facilities in the county. The programme is due to be completed in the next few years, with the exception of further expansion of the Castlebar and Ballina WWTPs. This will mean that the volumes of sludge arising from municipal wastewater treatment will increase significantly in the next twenty years. Table 3.1.2 outlines current and estimated future sludge volume arisings for municipal wastewater treatment sludge for the largest WWTP's in County Mayo, abstracted from the Review of Mayo Sludge Management Plan 2002.

Table 3.1.2 Current and Future Sludge Volumes arising from Municipal Wastewater Treatment in Principal Towns in County Mayo from 2000 to 2020 (tDS/yr)[7]

Year	Total (Mayo County)	Wastewater Treatment Plants		
		Castlebar	Ballina	Westport
2000	1,285	360	264	0
2005	2,092	540	456	219
2020	2,784	720	639	246

The table above illustrates that municipal wastewater treatment in County Mayo is expected to double by the year 2020. This large increase is due principally to:

- The doubling in size of both the Castlebar and Ballina WWTPs;
- The commissioning and operation of a new WWTP at Westport;
- The upgrading of WWTPs and septic tanks serving smaller communities in the county;
- The provision of new biofilters and package plants at towns throughout the county; and
- The addition of phosphorus removal facilities at existing WWTPs.

[7] Source 'Review of Mayo Sludge Management Plan', Fehily Timoney & Co., November 2002

3.1.3 MUNICIPAL WATER TREATMENT SLUDGE ARISINGS

Mayo County Council has kept an annual inventory of the details of all water treatment plants (WTPs) for a number of years. This inventory has also included the WTPs at which sludge has been generated. Most water treatment sludge in the county arises from the Lough Mask Regional and the Ballina Regional schemes. Table 3.1.3 gives the volumes of WTP sludges arising in County Mayo. These rates of sludge production are based on certain assumptions and were derived from sludge production calculations based on typical compositions of waters. In County Mayo, Castlebar, Ballinrobe, Ballindine, Claremorris, Ballyhaunis, Balla and Knock are supplied with water from Lough Mask. Ballina and Killala are served by water from Lough Conn. Carrowmore Lake supplies Bangor Erris and Belmullet, while Westport is supplied by a water abstraction from Moher Lake, with a supplementary supply from Lough Mask. These sludges are currently disposed of to landfill. In accordance with the *'Management of Water Treatment Sludges'* Circular, dated February 2005, the SHC will be required to dry such sludges in order to minimise the end volume of sludge and to improve stability and handleability for placing on the landfill. The water treatment sludges (including sludges resulting from the leachate treatment process) will be dried and handled separately from wastewater sludges and will then be landfilled.

Table 3.1.3 Volumes of Sludge Arising from Municipal Water Treatment in County Mayo for 2006 (tDS/yr)

Water Treatment Plants	Daily Use (m^3)	Sludge (tDS/yr)
Achill Regional	2,175	39
Ballina Regional	11,274	202
Erris Regional	5,900	106
Kiltimagh	900	16
Lough Mask Regional	40,600	729
Mulranny	406	7
Newport	262	5
Swinford	950	17
Westport	3,750	106
Total (includes 4% increase allowed for inclusion of smaller plants)		**1228**

3.1.4 EXISTING SLUDGE MANAGEMENT INFRASTRUCTURE IN COUNTY MAYO

The existing sludge management infrastructure in County Mayo consists of dewatering equipment and equipment for sludge pasteurisation. Mayo County Council has invested significantly in dewatering equipment. Wastewater treatment plants (WWTPs) at Achill Island, Ballina, Ballinrobe, Ballyhaunis, Bangor Erris, Castlebar and Swinford have gravity thickeners and filter belt presses in operation, whilst Westport and Claremorris WWTPs are equipped with sludge dewatering centrifuges. The newer presses are capable of achieving

17% to 24% dry solids (DS), while the older presses produce a sludge cake of approximately 12%. A new press has recently been installed at Castlebar, which is capable of producing sludge of at least 17% dry solids. Polyelectrolyte is used to increase the effectiveness of all dewatering equipment.

As part of the programme of investment in WWTP upgrades, Mayo County Council has installed double belt filter presses at Crossmolina and Knock, and are planning to install these units at Killala and Kiltimagh. In addition, it is intended that dewatering equipment will be installed at the proposed Belmullet WWTP, and at Foxford, Newport and Charlestown.

A number of WWTPs in the county have sludge drying beds, namely Achill Island, Ballindine, Charlestown, Cong, Kilkelly, Kiltimagh, Mulranney and Shrule. These drying beds were installed in WWTPs throughout Ireland in the 1960's and 1970's; however, due to the Irish climate, they have rarely operated efficiently, and the current use of these facilities is diminishing.

3.2 SLUDGE TREATMENT: PROPOSED DEVELOPMENT

3.2.1 INTRODUCTION

This section describes a number of sludge related elements that are proposed for the Derrinumera Landfill. These are:

- The interim solution of relocating an interim sludge drier/ lime-dosing system (currently located at Ballina WWTP), to Derrinumera Landfill (if required);
- Construction and operation of a Sludge Hub-Centre (SHC) at the Derrinumera Landfill.

As this is a Design Build and Operate (DBO) project, the exact nature of sludge treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. As a result, the following process descriptions are generic in nature. For the sludge treatment process the EIS describes both a sludge-drying unit and a tunnel composting system, the latter is the form of composting system that is best suited for the biological treatment of sludge. Volume III of the EIS consists of a set of drawings relating to the design of the SHC and LTF.

The proposed facilities will be constructed at a base level of approximately 80m O.D. The maximum height of the structures will be 13.5m (approx.), which means that the top of the structures will be at approximately 93.5m O.D. The landfill Cells will be finished to a height of 96m O.D., therefore, the proposed facilities will not be visible from the southeast on the R311; the principal long distance view into the site.

3.2.2 PROCESS DESIGN FIGURES FOR THE SHC AND ANCILLARY WORKS

The design of the SHC and ancillary works shall be in accordance with Best Available Techniques (BAT) and shall be such as to facilitate the operation, monitoring, sampling and maintenance of all processes and equipment. The process and equipment chosen shall have been used successfully in similar sized plants treating similar type sludges.

The SHC and ancillary works shall be designed and constructed in accordance with best national and international practices, and shall be operated to the requirements set out in the Contract Documents.

The design life of the permanent works shall be not less than the following:

Building and Civil Engineering Works	50 years
Main Plant Items	15 years
SCADA / Telemetry / PLC Equipment and Similar Items	10 years
Wearing Parts which normally require periodic replacement	5 years

The overall design life of the Sludge Treatment Works will be based on the 2020 design loadings and flows. The buildings and other civil engineering main structures will have a design life of 50 years, while mechanical plant items will have a design life of 15 years. The SHC, LTF and ancillary works shall be provided and operated in accordance with the design figures given in Table 3.2.1. (Leachate treatment is dealt with in Sections 3.3 and 3.4). In accordance with the *'Management of Water Treatment Sludges'* Circular, dated February 2005, the SHC will be required to dry waterworks sludges on a batchwise basis (separately from municipal wastewater treatment plant sludges) in order to minimise the end volume of sludge and to improve stability and handleability for placing on the landfill at Derrinumera.

Table 3.2.1 Sludge Hub Centre Design Figures

	Parameter	Sewage Sludge	Waterworks Sludge
1.	Annual load of Dry Solids at 2020	3,365 tDS	1,412 tDS*
2.	Annual Load of Sludge	24,731t	7,844t
3.	Weekly Load of Sludge	453 m^3/week	144 m^3/week
4.	Daily Intake on 6 day week	75 m^3/d	24 m^3/d
5.	Leachate Flow to Treatment	500m^3/day	
6.	Estimated Peak Flow	10 l/sec.	
7.	Dewatered sludge mean dry solids content	17.5%	18%
8	Liquid sludge mean dry solids content	3%	
8.	Thermally-Dried-Sludge Dry Solids Content	90%	

** Refer to Table 3.1.3 – Water Treatment Sludge arising for 2006 – 15 % increase added to allow for 2020 loading*

Any hydraulic or organic loadings, generated as a result of the sludge treatment, sludge dewatering, drier cooling processes, leachate treatment, or otherwise generated from any other operations on site, shall be additional loadings to the above listed. The proposed Sludge Hub Centre and Leachate Treatment Facility shall be suitably designed so that any additional loadings, such as those outlined above, shall be included within the overall limits specified for discharge of treated leachate at the proposed Newport WWTP treated effluent outfall.

3.2.3 GENERAL DESIGN PHILOSOPHY FOR THE SHC AND ANCILLARY WORKS

The design for the SHC and ancillary works shall be based on the following overall design philosophy:

(i) The overall design of the sludge treatment works is to be based on the 2020 design loadings and flows, i.e. 3,365 tDS wastewater sludges (with the bulk of the wastewater sludge being dewatered to an average of 17.5% DS and a smaller quantity of liquid wastewater sludge arriving at the SHC at 3% DS), and an additional 1,412 tDS waterworks sludges at 18% DS, though modular evolution in some elements towards that capacity in accordance with the projections of the Mayo Sludge Plan will be acceptable.

(ii) In order to facilitate maintenance, the sludge drier and ancillary works shall be capable of operating, without loss of standards, during the planned maintenance

downtime to be expected in normal operation, and the design must have contingent proposals to handle loads during annual or other major overhaul periods.

Where design proposals are based on the use of individual units, the interconnecting pipework shall be configured such that, for example in a three stream process, any combination of primary elements can feed any combination of secondary elements, and any combination of secondary elements can feed any combination of tertiary elements, and so on.

(iii) Sludge acceptance arrangements and biosolids storage elements shall take all foreseeable buffer conditions into account, and make reasonable provision for breakdown and resumption of process plant.

(iv) Sludge thickening arrangements shall be appropriately screened to maintain a standard of final product. In the event that mechanical thickening devices are used, such as belt or drum thickeners, then appropriate standby shall be provided.

(v) A sufficient number of standby pumps, fans, air blowers, etc, shall be provided in order to ensure continuation of the sludge treatment in the case of equipment failures or breakdown. The standby equipment shall be to the same specification as the duty units, with automatic changeover, or be available in stock on-site if permanent installation of the standby facility is impractical.

The minimum number of standby units required is as follows

Number of Duty Units	Standby Requirement
1	100%
2	50%
3	33%
4	25%

Where conveyor systems are dedicated to only one screen, silo, bagging unit, drier, etc, then the keeping of spares on-site is required for all wearing or possible defective parts. In all other cases, where conveyors are dedicated to more than one unit, an installed standby conveyor is required together with spares in stock as described above for single unit application.

Non-essential utilities (shut down not critical for up to two days) do not require installed standby units. Replacements for all wearing or possible defective parts shall be held in stock on site.

(vi) The Contractor shall be required to conduct a Hazard and Operability Study of each segment of the works and of the total works, and shall be required to include either in

the Capital Works or by way of operational procedures any measures arising from the recommendations of such studies.

(vii) The Contractor shall also be required to put forward proposals for the biological treatment of the sludge using a tunnel composting system. The composting system design must be flexible and take into account the constraints of the proposed site (area, etc.).

3.2.4 SLUDGE THICKENING AND DEWATERING

A system will be required for thickening and dewatering of some non-dewatered sludges from WWTPs and, in addition, the dewatering of surplus sludges generated from the leachate treatment process itself.

The dewatering system will be designed using new or existing equipment or a combination of both, which will produce a dewatered sludge with a minimum dry solids content of 17.5% or within a suitable range above this point consistent with the landfill licence.

The proposed dewatering system will be provided complete with a fully enclosed dewatered sludge handling system. This system must be designed with the following functions in mind, namely:

a) To handle sludge from the on-site Leachate Treatment Facility;
b) To handle some watery sludges (non-dewatered) from WWTPs and WTPs; and
c) To handle dewatered sludge at lower solids contents from WWTPs and WTPs throughout County Mayo.

3.2.5 SLUDGE DRYING

3.2.5.1 Sludge Load Projections

Sludge will be imported predominantly as sludge cake from the various satellite WWTPs and WTPs in County Mayo, in accordance with the Mayo Sludge Management Plan. The Plan breaks down the estimated sludge production over time, providing details at 2005, 2010 and 2020.

It is expected that a small amount of sludge will be imported as liquid sludge to the Sludge Hub Centre (SHC), from smaller treatment plants in throughout the county, the remainder will arrive at the SHC as sludge cake. Table 3.2.2 below shows how these arisings are calculated. Broadly speaking, it is expected that by the year 2020, a weekly load of wastewater sludge cake of 331m^3 will arrive in skips at the SHC, at an average solids content of 17.5% DS. A volume of 122m^3 of liquid sludge per week will also arrive in 10m^3 suction tankers.

These loads correspond to approximately 37 No. skip loads weekly, and 12 No. tanker loads weekly of liquid sludge. It will be a matter for the DBO Contractor to collect these sludges on as efficient a rota as they can devise within the serviceability limits of the available storage at the various treatment plants, consequently up to 12/13 No. skip loads of dewatered cake and perhaps 4/5 No. tanker loads every two days would be expected; these numbers take account of inefficiencies, which prevent every skip arriving full of sludge.

The sludge acceptance, buffering area, vehicle circulation area and parking provision shall be designed to accommodate these loads within the area delineated and assigned to the SHC on the site.

It is estimated that up to 1,412 tDS per year of waterworks sludges will be dried at the SHC. In accordance with the *'Management of Water Treatment Sludges'* Circular, dated February 2005, the SHC will be required to dry waterworks sludges on a batchwise basis (separately from municipal wastewater treatment plant sludges) in order to minimise the end volume of sludge and to improve stability and handleability for placing on the landfill. Generally, it is expected that by the year 2020, a weekly volume of 144m^3 of water treatment sludge will arrive in skips at the SHC, at an average solids content of 18% DS. This would correspond to approximately 16 No. skip loads weekly or 5/6 No. skip loads of dewatered cake every two days.

Table 3.2.2 Sludge arisings in County Mayo

SOURCE OF SLUDGE	SLUDGE VOLUMES						DEWATERING METHOD	DHC direct	Ballina	Belmullet	Swinford	Westport	Ballinrobe	Claremorris	Newport	Foxford	Crossmolina	Achill Island
	2000		2005		2020													
	p.e.	tDS/a	p.e.	tDS/a	p.e.	tDS/a												
LIQUID SLUDGE:																		
Attymass	56	0.8	64	0.9	200	3.6	Tankered to Ballina		3.6									
Aughgower	32	0.5	37	0.6	300	5.4	Tankered to DHC	5.4										
Balla	400	7.3	506	9.2	1200	22.3	Tankered to DHC	22.3										
Ballindine	330	6	417	7.6	1000	18.6	Tankered to Claremorris							18.6				
Ballycastle	300	5.4	575	10.5	600	10.9	Tankered to Ballina		10.9									
Ballycroy	56	0.8	64	0.9	200	3.6	Tankered to DHC	3.6										
Ballyvary	400	7.3	506	9.2	557	10.1	Tankered to Swinford				10.1							
Belcarra	16	0.2	633	11.5	800	14.8	Tankered to Ballinrobe						14.8					
Bohola	32	0.5	460	8.4	483	8.8	Tankered to Swinford				8.8							
Bonniconlon	350	6.4	403	7.4	423	7.7	Tankered to Ballina		7.7									
Carracastle	24	0.4	28	0.5	250	4.5	Tankered to Swinford				4.5							
Cong	1500	27.4	2530	46.2	2783	51.6	Tankered to Ballinrobe						51.6					
Doogort	400	7.3	483	8.9	507	9.2	Tankered to Achill Island											9.2
Drummin	16	0.2	18	0.2	150	2.7	Tankered to DHC	2.7										
Glenamoy	16	0.2	18	0.2	200	3.6	Tankered to DHC	3.6										
Gweesala	56	0.8	64	0.9	500	9.1	Tankered to DHC	9.1										
Hollymount	200	3.6	242	4.4	254	4.6	Tankered to Ballinrobe						4.6					
Inver	32	0.5	37	0.6	200	3.6	Tankered to Ballina		3.6									
Irishtown	350	6.4	423	7.7	444	8.1	Tankered to Claremorris							8.1				
Kilkelly	800	14.6	1012	18.5	1113	20.7	Tankered to Swinford				20.7							
Killasser	56	0.8	64	0.9	250	4.5	Tankered to Swinford				4.5							
Kilmaine	32	0.5	403	7.4	600	10.9	Tankered to Ballinrobe						10.9					
Kilmovee	40	0.6	46	0.7	300	5.4	Tankered to Swinford				5.4							

SOURCE OF SLUDGE	SLUDGE VOLUMES						DEWATERING METHOD	DHC direct	Ballina	Belmullet	Swinford	Westport	Ballinrobe	Claremorris	Newport	Foxford	Crossmolina	Achill Island
	2000		2005		2020													
	p.e.	tDS/a	p.e.	tDS/a	p.e.	tDS/a												
Lahardaun	~	~	403	7.4	600	10.9	Tankered to Crossmolina										10.9	
Louisburgh	700	12.8	1150	21.0	1265	23.5	Tankered to DHC	23.5										
Meelick	40	0.6	46	0.7	200	3.6	Tankered to Swinford				3.6							
Midfield	40	0.6	46	0.7	200	3.6	Tankered to Swinford				3.6							
Moygownagh	48	0.7	55	0.8	250	4.5	Tankered to Ballina		4.5									
Mulranny	800	14.6	1380	25.2	1518	28.2	Tankered to Newport								28.2			
Pollathomas	36	0.5	41	0.6	200	3.6	Tankered to Belmullet			3.6								
Shrule	500	9.1	748	13.7	920	17.1	Tankered to Ballinrobe						17.1					
Tourmakeady	200	3.6	242	4.4	254	4.6	Tankered to Ballinrobe						4.6					
Turlough	400	7.3	483	8.9	800	14.8	Tankered to Foxford									14.8		
Old Head	500	9.1	604	11.0	634	11.5	Tankered to DHC	11.5										
Roundfort	~	~	~	~	250	4.5	Tankered to Ballinrobe						4.5					
Mayo Abbey	~	~	~	~	200	3.6	Tankered to Claremorris							3.6				
Knockmore	~	~	~	~	300	5.4	Tankered to Foxford									5.4		
Ballyglass	~	~	~	~	200	3.6	Tankered to DHC	3.6										
Achleam	~	~	~	~	300	5.4	Tankered to Belmullet			5.4								
Breaffy	~	~	~	~	4000	74.2	Tankered to DHC	74.2										
Bunacurry	~	~	~	~	200	3.6	Tankered to Achill Island											3.6
Clare Island	~	~	~	~	200	3.6	Tankered to DHC	3.6										
Manulla	~	~	~	~	400	7.3	Tankered to DHC	7.3										
Dooega	~	~	~	~	200	3.6	Tankered to Achill Island											3.6
Straide	~	~	~	~	300	5.4	Tankered to Foxford									5.4		
Killeen	~	~	~	~	150	2.7	Tankered to Westport					2.7						
Kilawalla	~	~	~	~	300	5.4	Tankered to Westport					5.4						
Parke	~	~	~	~	300	5.4	Tankered to Foxford									5.4		

SOURCE OF SLUDGE	SLUDGE VOLUMES						DEWATERING METHOD	DHC direct	Ballina	Belmullet	Swinford	Westport	Ballinrobe	Claremorris	Newport	Foxford	Crossmolina	Achill Island
	2000		2005		2020													
	p.e.	tDS/a	p.e.	tDS/a	p.e.	tDS/a												
Murrisk	~	~	~	~	500	9.1	Tankered to Westport					9.1						
Rooskey	~	~	~	~	200	3.6	Tankered to Ballina		3.6									
Islandeady	~	~	~	~	200	3.6	Tankered to DHC	3.6										
Carnacon	~	~	~	~	300	5.4	Tankered to DHC	5.4										
Lecanvey	~	~	~	~	300	5.4	Tankered to Westport					5.4						
Ballintubber	~	~	~	~	250	4.5	Tankered to DHC	4.5										
Aghamore	~	~	~	~	200	3.6	Tankered to Swinford				3.6							
Binghamstown	~	~	~	~	200	3.6	Tankered to Belmullet			3.6								
Partry	~	~	~	~	300	5.4	Tankered to DHC	5.4										
Valley	~	~	~	~	200	3.6	Tankered to Achill Island											3.6
Urlaur	~	~	~	~	200	3.6	Tankered to Swinford				3.6							
Barnacarroll	~	~	~	~	200	3.6	Tankered to Claremorris							3.6				
Carrowteige	~	~	~	~	200	3.6	Tankered to Belmullet			3.6								
Tooreen	~	~	~	~	200	3.6	Tankered to Claremorris							3.6				
Taugheen	~	~	~	~	200	3.6	Tankered to Claremorris							3.6				
Glencorrib	~	~	~	~	200	3.6	Tankered to Ballinrobe						3.6					
Bofeenaun	~	~	~	~	200	3.6	Tankered to DHC	3.6										
Newtown/Clogher	~	~	~	~	150	2.7	Tankered to DHC	2.7										
Carraholly	~	~	~	~	200	3.6	Tankered to Westport					3.6						
Bekan	~	~	~	~	200	3.6	Tankered to Claremorris							3.6				
Rossport	~	~	~	~	200	3.6	Tankered to Belmullet			3.6								
Facefield	~	~	~	~	150	2.7	Tankered to Claremorris							2.7				
Robeen	~	~	~	~	200	3.6	Tankered to DHC	3.6										
Saula	~	~	~	~	200	3.6	Tankered to Achill Island											3.6
Cashel	~	~	~	~	200	3.6	Tankered to Achill Island											3.6

SOURCE OF SLUDGE	SLUDGE VOLUMES						DEWATERING METHOD	DHC direct	Ballina	Belmullet	Swinford	Westport	Ballinrobe	Claremorris	Newport	Foxford	Crossmolina	Achill Island
	2000		2005		2020													
	p.e.	tDS/a	p.e.	tDS/a	p.e.	tDS/a												
SLUDGE DEWATERED AT SOURCE:																		
Achill Sound	140	2	978	17.8	1200	22.3	Belt Dewatered Cake to DHC											
Achill Island	2500	45.6	2613	47.7	3025	55.2	Belt Dewatered Cake to DHC											
Ballina	13000	264	28750	524.7	35000	638.8	Centrifuged Cake to DHC											
Ballinrobe	5000	91.3	6325	115.5	6958	129.1	Belt Dewatered Cake to DHC											
Ballyhaunis	2500	45.6	2875	52.4	6000	111.3	Belt Dewatered Cake to DHC											
Bangor Erris	500	9.1	633	11.5	1000	18.6	Belt Dewatered Cake to DHC											
Belmullet	~	~	2300	42.0	3000	55.7	Dewatered Cake to DHC											
Castlebar	20000	360	34500	621.0	45000	834.8	Centrifuged Cake to DHC											
Charlestown	900	16.4	1139	20.8	3000	55.7	Tankered to Swinford											
Claremorris	4000	73	5060	92.3	8000	148.4	Centrifuged Cake to DHC											
Crossmolina	2000	36.5	2530	46.2	2657	49.3	Dewatered Cake to DHC											
Foxford	1500	27.4	2300	42.0	3000	55.7	Dewatered Cake to DHC											
Killala	~	~	2300	42.0	2530	46.9	Belt Dewatered Cake to DHC											
Kiltimagh	1800	32.9	2530	46.2	2783	51.6	Belt Dewatered Cake to DHC											
Knock	1500	27.4	1725	31.5	1811	33.6	Belt Dewatered Cake to DHC											
Newport	800	11.7	1150	16.8	2000	37.1	Belt Dewatered Cake to DHC											
Swinford	5000	91.3	6325	115.5	6958	129.1	Belt Dewatered Cake to DHC											
Westport			13800	251.9	15525	288.0	Centrifuged Cake to DHC											
TOTALS:	*69914*	**1292**	*132061*	**2395**	*169602*	**3365**		**199.2**	33.9	19.9	68.3	26.2	111.8	47.4	28.2	31.0	10.9	27.3

3.2.5.2 Interim Sludge Treatment

As mentioned previously in Section 1.2.3, Mayo County Council wish to obtain permission to utilise an existing diesel fuelled sludge drying and lime stabilisation plant (currently located at Ballina WWTP), as a possible fallback facility to provide an interim solution should the need arise prior to commissioning of the SHC permanent plant. The Mayo Sludge Management Plan discourages landspreading of sludge in County Mayo. Mayo County Council currently export dewatered wastewater sludge outside of the county for landspreading. Should this practice be prohibited in the near future, prior to the commissioning of the sludge drying permanent plant at Derrinumera, a short term fallback would be required with regard to sludge drying. In such an event, it is proposed to temporarily relocate the unit, which is rated at 2.5 t/hr, to the existing machinery garage building. This is located within the existing licensed site boundary and would ultimately be incorporated within the fenced boundary of the proposed SHC facility.

An Bord Pleanála have prohibited importation of sludges to Castlebar WWTP, once the WWTP upgrade contract is commissioned. At present, dewatered sludges are being removed to licensed and permitted sites, located outside of the county. In the event that this existing arrangement becomes unavailable, Mayo County Council staff would be required to operate this interim plant until such time as the Sludge Hub Centre DBO Contractor was appointed. Directly on appointment, that Contractor would be required to operate the interim plant, until his permanent drying plant was commissioned, at which time he would retire the interim plant. The maximum expected operation period of the Interim Plant at Derrinumera would be 3 years. However, as the matter stands, and having regard to the temporary nature of the diesel fuelled drier and the fact that its emission characteristics are not as would be expected with a fully engineered drier, this would be a non-favoured option.

The interim plant would be approximately 4 to 5 years old and would consist of initial lime dosing by auguring of slaked lime into dewatered sludge cake at 11-12% DS. The lime/sludge mixture would then passed through a diesel-fuelled drum drier, with temperatures varying from 180°C to 400°C. The residence time in the drier would be approximately ten minutes. Previously, treated effluent was used as a process cooling water, with two condensers using typically 6,500 gallons per hour. This volume was then cooled and discharged to the final effluent outfall. The water may be recycled in a closed loop cooling system, in which case a water tank would be installed to provide top-up cooling water at Derrinumera Landfill and the cooling water would be re-circulated through a dump heat radiator or evaporation tower, which would also be located at the landfill site. As the interim plant is diesel-fuelled, a bunded fuel storage area would be provided.

The final dried sludge/lime product typically reaches a dry solids content of up to 65% DS, with a lime content of 10% expressed by wet cake weight. It can be reused as a cover material and as a soil supplement to encourage vegetation on earthen embankments at the Derrinumera Landfill. It would be intended to carry out this practice for the interim period.

The plant would be run 6 days a week from 8:00am to 6:30pm from Monday to Friday and from 8:00am to 2:00pm on Saturdays at the landfill site for the interim period, if required.

The odour removal system, currently fitted to the plant consists of two types of Carbon media, one layered above the other, with a cavity between. The first Carbon media is *Filtracarb SA62* and is used for odour removal. The second Carbon media is *Filtracarb EX64* and serves as final polishing.

At the present, Mayo County Council owns the thermal drying unit. Depending on future circumstances with regard to exportation and landspreading of municipal sludges outside of County Mayo, on signing of the contract, the DBO Contractor may be required to relocate this equipment from Ballina to Derrinumera or to take over equipment already relocated there and to assume responsibility to accept and dry sludge, and to continue to operate this equipment until such time as the equipment is decommissioned and replaced by new thermal drying equipment.

3.2.5.3 Short Term Sludge Exportation from Castlebar

Previously, dewatered sludges from Ballinrobe, Claremorris and Ballyhaunis (WWTP's) were imported to Castlebar WWTP, for drying in the sludge drying / lime dosing plant there. The decision of An Bord Pleanála relating to the WWTP precludes importation of sludges to Castlebar upon commissioning of the new WWTP, therefore the option for importation of sludge to Castlebar WWTP must cease once the capital works on the WWTP upgrading contract have been implemented in full. If there is a necessity to move an interim drying plant to Derrinumera, the Council, or the Sludge Hub Centre Contractor will be required to operate it there.

However, at present, dewatered sludge being produced at Castlebar WWTP along with dewatered sludges from Ballina, Ballinrobe, Claremorris, Ballyhaunis and various other WWTPs throughout the county are currently being transported outside the County for agricultural usage.

3.2.5.4 Design of Process Units for the Permanent Sludge Drier

There are many variants of thermal driers, but all require energy input to release the molecular entrained water. Drying is achieved either by convection drying when hot gas / air is blown through the sludge or by conduction drying whereby the sludge is brought into contact with a heated surface. In the case of convection drying, the gas / air flowing through the drier can be heated directly or indirectly. With direct heating the hot waste gas from the combustion chamber is fed into the drier, while with indirect heating, air is heated via a heat exchanger. With conduction drying, heat is usually provided by either steam or from a hot oil system. The drier will have various combinations of heated jackets and hollow paddles / disks through which the heating medium flows.

There are various types of thermal driers operating in Europe, including:

- Horizontal drum driers (e.g. rotary driers, paddle driers and thin film driers);
- Vertical tray drier pelletisers;
- Conveyor belt driers;
- Fluidised bed driers.

Rotary driers consist of a horizontal drum, which rotates around its axis. The sludge to be dried is moved through the drum by internal fittings (paddles / blades) or taken up by the drying gas flowing axially through the drum. In the case of convection driers, gas input temperatures can be as high as 450ºC. As Rotary driers should not be used for sewage sludge in the adhesive phase (40-60% dry solids), mechanically dewatered sludge is mixed with dried product (normally under / over sized) to achieve fluidity before it is fed into the drying drum. In a paddle drier, a heated paddle or series of discs rotate in a mass of sludge, held in a heated stationary chamber with dried material cascading from the end of the drier.

With a thin film drier, sludge is spread onto the outer heated wall of the drier by a rotor. The drier can be used to dry sludge to over 90% dry solids, but its main advantage is that it can handle the difficult sticky phase between 40 – 60% dry solids without back mixing. A single stage thin film unit is often used in conjunction with a paddle drier to take the sludge from 60% to over 90% dry solids.

In a vertical tray drier, recirculated granules coated with sludge are rolled over heated trays by a slow ploughing movement and transported by gravity from one tray to the next, until they reach the outlet at the bottom of the drier.

With the different types of sludge drier design, many models share a feature of inlet mixing of dewatered sludge with a fraction of the dried product, or perhaps a dust extract return flow to increase the dry solids content of the cake to be dried.

With rotary drums, sludge is dried at temperatures varying between 420 and 660ºC within the rotary drum, but sometimes with an inlet temperature at the primary burner itself of over 800ºC, where with a contact time of the order of 2 seconds, odourous compounds can be fed to be oxidised for odour control. The drum heating design can involve two heating circuits, a primary circuit capable of using multiple fuel sources, and indeed waste heat from a CHP (combined heat and power) or other motor, and a secondary circuit fed from the primary by heat exchanger. Evaporation of water from the sludge takes much of the heat energy from the hot air, but the temperature of the sludge solids themselves does not rise above 80-85% for odour control and control of overheating of the biosolids.

Belt driers hold the sludge in an extruded form on the belt or slotted plate as drying proceeds. The slotted plate is drawn slowly through the different temperature zones of the drier, which

operates at lower temperatures than rotary drum, in the region of 130-140ºC. Air loaded with moisture is withdrawn from the drum, condensed, with heat exchange to the inlet sludge, and the condensate is treated in the waste system. Dried air is recirculated, but typically a fraction is withdrawn to hold the overall installation under negative pressure for odour control. This air is passed through an odour scrubber before release to atmosphere.

Atmospheric emissions from such a drying system would be required to comply with TA Luft 2002 requirements. The Contractor must comply with the appropriate health and safety legislation including the European Council Directive 94/9/EC –ATEX Directive.

To the extent that this is a Design Build Operate Contract, the appointed Contractor will have relative freedom in designing the drying process units that he feels are most appropriate for the project in terms of economic design from both a constructional and operational perspective. Notwithstanding this fact, there are both broad constraints and unit specific constraints that must apply to all designs. These are expanded upon in the following sections.

3.2.5.4.1 Sludge Reception facility

This facility will receive dewatered sludge cake from the various satellite WWTPs and WTPs, and will consist of an Apron Belt Feeder or similar, with an integral cake pump which will deliver cake onwards to the drier. It will be covered with a canopy and a loading bay cover with an air extract rate not less than five air changes per hour. The rate of forward feed of the cake feed pump will be variable, but matched to the capacity of the drier as follows:

Apron Hopper Holding Capacity of Dewatered Cake	$85m^3$ (one day)
Forward Feed Rate	$5.32m^3$/hr based on 16 hour day
Foul Air Extraction Rate	At least five times the enclosed volume per hour

3.2.5.4.2 Sludge Drier Unit

The sludge drier will be capable of providing a minimum 90% DS final product in a 2-5mm hard round pellet form. The sludge drier will be handling sludge cake of a variable consistency, over an operating period which is inclusive of all necessary annual downtime, and which is properly served by skilled labour during its operating time at the Hub Centre. Drier designs that bring the drying medium into contact with the sludge will also be subject to the conditions for proper handling and treatment of odour emissions. The potential to use landfill gas as an auxiliary fuel shall be investigated, and used if found feasible and cost effective, subject to regulatory requirements. Microturbine options that generate power and heat from natural gas shall also be considered in the context of the overall heat balance and energy requirements of the Hub Centre. Designs that mix dried product with incoming sludge

cake shall ensure that there is adequate mixing over the range of dewatered cake characteristics to be expected.

3.2.5.4.3 Dried Product Storage and Handling

Dried product will be cooled and stored in a safe manner in dried product storage silos or equivalent ground bins. Particular care will be taken to avoid dusty conditions leading to flashover or other fire risk. The dried product will be stored in compliance with the European Communities (Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres) Regulations, 1999 (S.I. No. 83 of 1999).

The dried product storage capacity shall be at least equivalent to one week's production at average throughput rates (approximately 69 m^3 at 90% DS). In a multiple silo system, a design that permits dried product to be discharged to a truck or to a conveyor feeding a bagging unit shall be provided, with feeding to one unit, while drawing from the other silo being possible.

3.2.5.4.4 Dried Product Transportation

Dried product will be transported off site either in bulk, or in bagged form. In the case of truck transport, this shall be from an on-site designed truck filling station, including an operator platform within a weatherproof canopy. The station shall incorporate all necessary feed conveyors, and loading bellows for use with open bodied trucks. Adequate dust control measures will also be incorporated to provide a safe working area and to prevent excess dust emissions to atmosphere during the filling operation. Filling bellows shall be adjustable by electrically powered winch, with a weatherproof control pendant, and shall incorporate automatic shut-off when the container is detected as full. The entire area shall be designed with safe, efficient loading in mind, and with a loading capacity not less than 40 tonnes per hour.

3.2.5.4.5 Bagging Plant

A bagging unit shall be provided adjacent to the dried product storage area, linked to the storage bins or silos by means of conveyors. The bagging unit shall be capable of filling seven bags per hour at a unit capacity of $1m^3$ of dried product. The bagging unit will include:

(a) An operator access platform;
(b) Powered and unpowered roller conveyors for handling filled bags to a storage position;
(c) Load cells for unit filling control;
(d) A filling nozzle, bag inflator and sealing system;
(e) A four-loop suspension bag handling mechanism.

3.2.5.4.6 Dust Control

Dust generated from conveyors, during silo filling, truck filling or bag filling operations will be controlled. Dust will be extracted from the vicinity of the truck loading bellows and the bag filling nozzle, as well as conveyor covers at points of product drop, and will be ducted to a dust filter. There will be isolation dampers fitted at all dust sources, an adequate number of extraction fans to properly exhaust the dust to cartridge filters, that shall be adequate for the dust load and these will be self cleaning. The dust extract system will be linked to the dried product handling, storage and transportation system, so that it starts to function as soon as the dried product is actively handled.

3.2.5.4.7 Cooling and Condenser water

Potable water that remains uncontaminated by the cooling mechanism may be, with the approval of the Agency, discharged to the surface water system after appropriate cooling to 20 deg C has taken place, but all contaminated condensates and spent cooling water shall be treated as part of the foul effluent flow. Because of this, the feasibility of using treated leachate, as a cooling medium, or other forms of heat dumping that may have benefits in the effluent treatment process, will be investigated.

3.2.5.4.8 Fuel Storage

The Derrinumera site does not have a natural gas supply; consequently gas storage will be provided in a certified pressurised gas storage vessel(s), with adequate storage capacity to maintain the sludge drier in efficient operation between refills. The gas storage vessels will be located as agreed by the Fire Officer and the Agency.

3.2.5.4.9 Odours

Depending on the model of the drier and burner chosen, oxidation of odorous emissions by the drier itself may include at least two seconds residence time in the burner at a temperature of not less than 850°C. Odour scrubbing by alternative biological filter or carbon filter or other means will be properly sized for the actual odour load on the filters, and particular care will be exercised in design for detection of and ease of replacement of spent media.

3.2.5.5 Instrumentation Control and Automation

The DBO Contractor will share the existing weighbridge system at the site with the landfill operator. In addition to weighing the waste going to landfill, the weighbridge will be used for weighing of any chemical or nutrient deliveries to the site and for weighing sludge imports to and biosolids exports from site as required for the proper management of the sludge register.

At each flow metering point, the contractor shall provide a suitably valved bypass to allow calibrated flow meters to be installed which can be used to verify the accuracy of the main online meter from time to time. The contractor will be required to include for the provision of suitable calibration meters and for their re-calibration at regular intervals during the lifetime of the plant.

3.2.5.6 Monitoring and Sampling

To ensure that the optimal process control is maintained, monitoring equipment and sampling facilities shall be provided. Sampling facilities (for "grab" samples) shall be provided after every process step in the liquid stream and in the sludge stream.

3.2.6 TUNNEL COMPOSTING SYSTEM

3.2.6.1 Introduction

It is Mayo County Council's intention that, in the interests of flexibility and value for money in selected sludge disposal routes, that sludge composting would be a technical option available to the Contractor for a proportion of the sludges accepted, in parallel with sludge drying and subject to resolution of constraints. Accordingly, the environmental impacts of sludge composting are also examined.

An in-vessel composting system, such as tunnel composting, hangar composting or container composting, is best suited amongst biological treatment options for the treatment of municipal sludge. Of the in-vessel composting technologies, the tunnel composting system is the most efficient, reliable and flexible. A typical tunnel composting facility will comprise a fully enclosed dedicated warehouse-type building, with all treatment processes, including acceptance of waste, composting, refinement and storage of final products carried out within the building.

The compost building would usually have a height varying from approximately 6 to 10 metres. A biofilter would be installed, through which all collected process air would be emitted. The process air for the waste reception/mixing area and the composting tunnels would be extracted from the rest of the building. Therefore, the complete building would be kept under slight negative pressure and would be equipped with doors that open and close automatically. (Refer to Volume III of EIS).

Based on current and projected sludge arisings in County Mayo, the volume of wastewater sludge (raw sludge) arriving at the proposed facility will be 24,731 tonnes per annum or 476 tonnes per week. The bulk of the wastewater sludge being dewatered to an average of 17.5% DS and a smaller quantity of liquid wastewater sludge will arrive at the SHC at 3% DS. However, it may not be feasible to compost the full sludge volume. A realistic volume for treatment would be 20% of the intake (96 tonnes per week). The rest of the sludge would be

dried using the new sludge drier. It is assumed that about 60% of the dry solids present in the raw sludge are of organic origin and the Carbon/ Nitrogen (C/N) ratio may be under 10:1.

3.2.6.2 Site layout and infrastructure

It is envisaged that the composting facility will be constructed to the north west of the landfill footprint, adjacent to Cell No.1, as shown on Drawing No. 1908-2202, Volume III. The main objectives for locating the composting facility on this location are as follows:

- To integrate the composting facility with the existing landfill site infrastructure and ancillary facilities including site accommodation building, weighbridges, wheelwash, wastewater collection etc;
- To minimise the visual impact of the composting building and the biofilters on the surrounding area. The composting facility is to be constructed in a location removed from residential properties and public roads. Keeping the various buildings close together also helps to reduce the visual impact. The eventual profile of the capped and finished landfill will also provide screening to the east of the composting facility;
- To minimise the potential impact of odour emissions from the biofilters of the composting facility. As the composting facility will be removed from residential properties, there will be no impact due to residual emissions from the biofilter or composting building. The layout is however intended to minimise odour impact on landfill staff and on those using the Civic Amenity Site;
- Vehicle access to the composting facility will be similar to that for the landfill.

3.2.6.3 Facility Description

The compost building typically would consist of a main sludge reception and preparation area, composting tunnels and a composting refinement and storage area. The following is generic description of each element. (Refer to Volume III – EIS Drawings).

3.2.6.4 Sludge Reception/Preparation Area

The main sludge reception and mixing area for the composting facility would be the same as the sludge drier reception area, as described in Section 3.2.5.4.1. Once the sludge has been mixed into a homogenous state it is transported from the sludge hoppers to the reception/preparation area of the compost building via covered screw conveyor or by front-end loader. Typically, the raw sludge should have a C/N ratio of between 30:1 and 35:1. The sludge would be stored in a sludge bunker, typically 100m^3 in size. The reception/preparation area would have a bunker for storing the bulking agent. Typically, this bulking agent would be wood-chips. There would be an area for mixing the sludge and woodchips, and an inspection and quarantine area for out-of-spec sludge.

The sludge and wood chips can be mixed with either a mechanical mixer or using a front-end loader. The sludge is mixed with wood chips in order to achieve a suitable dry solids content (40%) and porosity (50%) for handling and composting. The wood chips will be recovered from the dried sludge, as they will not be broken down by the short composting period.

Typically, a portion of the previously composted sludge, at 70% DS, is also added to the mixing tank. The dried sludge helps fresh sludge reach the desired dry solids content of approximately 40% DS for loading into the tunnels. An extra beneficial result of mixing the previously composted sludge and the already used wood chips with the raw sludge is that the raw sludge is inoculated with biological active matter. This helps accelerate the composting process.

With the exception of mixing with bulking material and dried sludge, no further pre-treatment of the sludge is required.

3.2.6.5 Tunnel Composting Area

As shown on Drawing No. 1908-2202, Volume III, the composting process would take place in the tunnel composting area. Based on a maximum input of 4,967 tonnes of sludge per annum, 4 No. enclosed composting tunnels would normally be required. This number can vary depending on what the contractor proposes by way of a mixed solution of sludge drying and/or composting. The facility will have the space flexibility to provide for the gradual increase in the quantities of sludge at the facility to this overall 24,731tpa sewage sludge capacity. In the event of a restricted flow stream to composting; this would be achieved by using only a part of the aeration floor area, pro rata on the actual quantity to be treated (percentage of design capacity), but with one spare tunnel.

As illustrated on Drawing No. 1908-2209, Volume III, the main features of the composting tunnels will be:

- A number of composting tunnels, usually constructed with reinforced concrete;
- The dimensions of each tunnel are typically 30m in length, 6m in width and 6m in height;
- The front end of each tunnel comprises an air-tight retractable steel door;
- A concrete aeration floor, through which air is blown, is installed underneath each tunnel, with aeration channels embedded in the concrete floor. These channels would also collect any leachate and process water;
- An air blower/ventilator would be installed at the back of each of the composting tunnels, to supply air to the individual aeration floors of each of the tunnels. The ventilators feed the aeration floors via channels connected through the concrete retention wall;
- An air collection duct would be installed over the middle of the compost in the tunnels to collect the process air. The collected air would be fed to an air treatment system, i.e. air scrubber and biofilter.

As well as the net number of tunnels required, an extra tunnel is usually provided to allow for the unloading of compost from a finished tunnel and the loading of a new tunnel during one working day. Nominally, front-end-loaders would be used for internal transport of the mass flows (dosing raw sludge, dried sludge and wood chips into the mixer; loading the mixed sludge into the tunnels; unloading of the tunnels; dosing dried sludge for final sieving). Typically, two front-end-loaders would be utilised.

After a period of 2 to 4 weeks in a tunnel, the tunnel would be emptied using the front-end loader. The matured compost would be moved using the front-end loader to the compost refinement area, where the woodchips would be sieved out of the matured, dried compost. The woodchips would not initially be broken down by the short composting period and thus can be reused again. The sieved compost would then be placed in the storage area within the building.

Each of the compost tunnels would be fitted with an individual process control system for both air and water. Therefore, composting conditions can be separately controlled in each of the tunnels. One compost tunnel is usually filled every day using a front-end industrial loader. The floors of the tunnels normally consist of aeration channels embedded in the reinforced concrete, which provide for forced aeration (blown air) in the tunnels. An air collection duct would be provided in the roof of each of the tunnels, which would connect into the air treatment system.

3.2.6.6 Compost Refinement/Storage Area

The compost refinement step is required to remove the woodchips from the matured compost. The woodchips will not initially break down during the composting period; therefore, they can be removed from the compost by sieving and reused as bulking material. The mechanical equipment used for compost refinement would comprise of a mobile drum sieve system, with adjustable sieving plates in the trommel. The compost can be conveyed to the refinement area by either an industrial front-end loader or by conveyor-belt.

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

The underflow of the trommel screen, the sieved compost, would be moved using the front-end loader to the compost storage area. The compost can be either utilised on-site for landscaping and restoration purposes, or bagged for re-sale. The overflow of the trommel would be conveyed from the trommel to oversize fraction storage bay and subsequently returned to the composting cycle.

3.2.6.7 Process Description

The fresh mixed sludge is usually filled to a height of approximately 3.5m within the tunnels. At the end of the composting process in the tunnels there is usually an approximate 40% mass reduction of the input sludge.

The mixed sludge is placed in piles over the whole length and width of the aeration floor. Due to the intensive aeration through the floor, it is not required to place the material in separate windrows, thereby maximising the capacity per square metre of aeration floor.

During the four-week composting period, the mass and volume of the sludge is gradually reduced, due to biological degradation and evaporation of moisture. Up to 90% of the moisture in the sludge can be evaporated during the composting period. The height of the composting mass is kept constant over the total composting period, so that the floor area, which is occupied by a charge of sludge, decreases as the composting period advances. The dimensions of the composting section are usually calculated on the basis of the expected mass loss over time, in relation to the required sludge throughput.

3.2.6.8 Process Control

The primary process control is usually executed by temperature sensors placed at different locations and depths in the sludge mixture in the tunnels. The signal of the temperature sensors is transmitted to a central process computer, which would be installed in the adjoining facility accommodation.

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

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

As outlined previously, ventilators or air blowers will be installed behind the compost tunnels i.e. one per tunnel. They ensure the maximum control of air input to the individual tunnels. Each of the ventilators would have an adjustable aeration rate up to a maximum of 2,500m³/hr. Therefore, the rate of aeration in each of the tunnels can be adjusted according to optimum process requirements, which is controlled by the central process computer.

3.2.6.9 Air Management

The composting process extracts air from the composting building, generating slight negative pressure and preventing emissions through open doors. This air is fed via ventilators or air blowers through the aeration floors of the composting tunnels.

An air collection duct is normally installed below the roof of each of the tunnels, which collects air for transport to the air treatment system comprising of an air scrubber and biofilter.

A separate air collection duct is normally installed in the sludge reception/mixing area and the compost refinement/storage area, as odour emissions can be high during handling of dewatered sludge.

An air scrubber is usually installed at the rear of the compost building, adjacent to the biofilters. The scrubber treats the process air from the compost tunnels and from the pre-treatment and refinement areas. In biological drying/composting of sewage sludge, the process air usually has relatively high ammonia content. The air scrubber effectively absorbs most of the ammonia. This is particularly important where biofilters are applied for the post-treatment of air. High levels of ammonia are toxic for the biological process in biofilters. The water scrubber typically consists of a tank in which water will be sprinkled through fine nozzles, creating a vapour mist.

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

From the scrubber, the excess air is fed through a biofilter. The biofilter comprises of large concrete box, in which a layer of media, typically coarse shredded wood chips. A manifold and air ducts are fitted on the bottom to ensure an even distribution of air through the biofilter. In dry and relatively warm periods, water can be sprinkled on to the biofilter to maintain the proper moisture content. The biofilter is nominally covered with a hood, which collects the air from the top of the biofilter and emits it through an air vent. This system ensures that there is a single point of emission from the biofilter, and prevents the biofilter from becoming water logged.

The flow of process air to be treated is not constant and depends mainly on the actual flow of raw sludge to be treated and the fresh air conditions that fluctuate throughout the year. Taking this into account, a maximum of 8,000 to 10,000 m^3/h of process air must be treated. The

specific airflow of the biofilters will be between 8 and 10m^3/m^2/hr. Therefore, the required biofilter area will be 200 to 250m^2.

Every 2-4 years, part of the biofilter material (wood chips) is usually replaced with fresh material, in order to maintain the odour removal efficiency of the filter. A maintenance access is usually provided on the side of the biofilter, through which a small bobcat can enter to empty/fill the biofilter. Spoilt wood chips can be removed by the bobcat through the maintenance access, and can be used in the composting process in the facility. A temporary blower and associated ductwork would nominally then blow fresh wood chips into the biofilter.

3.2.6.10 Water Management

As mentioned previously, up to 90% of the moisture in the sludge is normally evaporated during the composting process. Leachate generation will be minimal. A part of the moisture is condensed by the air scrubber preceding the biofilter. The remainder passes through the biofilter as vapour and is emitted to the atmosphere. The condensed water from the air scrubber is collected in an underground water tank, which is normally underneath the air scrubber. This collected water can then be used for several purposes:

- As process water in the water scrubber, to condition process air prior to bio-filtration;
- To moisten the biofilters, if required; and
- For cleansing of hardstand areas within the composting building.

Any leachate generated during the composting process and from the washing down of hardstand areas is usually collected at a central point. In this case, the collected leachate can be treated by either sending it to the proposed on-site Leachate Treatment Facility, or passing it through a mechanical filter and reusing it as process water, or any other method that the contractor chooses, which is approved by the Agency.

3.3 LEACHATE TREATMENT: EXISTING SITUATION

3.3.1 CURRENT POSITION REGARDING LEACHATE MANAGEMENT AT DERRINUMERA

Derrinumera Landfill has been receiving waste since 1974, and up until 1998 was best described as an un-engineered, dilute and attenuating landfill site. Due to the unlined nature of the waste, leachate could not be captured for treatment; however, the surrounding peat did offer a significant degree of attenuation to leachate migrating from the site.

Following licensing of Derrinumera Landfill (Licence No. W0021-01, granted December 1999) by the Environmental Protection Agency as per the requirements of the Waste Management Act, 1996 and associated regulations, a bentonite cut-off wall was constructed

at Derrinumera in Summer 2001, with the main objective being to retain any leachate flowing from the permeable deposits in the enclosed area surrounding the waste body, from escaping into the surrounding lands.

With the installation of the cut-off wall, leachate captured within the enclosed area was then diverted to a balancing lagoon, and pumped from there to three on-site storage tanks. As a condition of the Waste Licence issued by the EPA for Derrinumera, leachate is transported by tanker from Derrinumera to Castlebar WWTP for treatment.

After arriving at the treatment plant, leachate is currently discharged to the head of the works for co-treatment with Castlebar Town's incoming wastewater. The leachate and municipal wastewater is treated together prior to discharge to the Castlebar River system. The Castlebar River flows into Lough Cullin and the Lough Conn System and from there eventually reaches the River Moy, south of Foxford. The River Moy ultimately discharges to the coastal waters of Killala Bay. It should be noted that the Moy Estuary/Killala Bay is a Candidate Special Area of Conservation (site reference 000458).

The Moy is a designated salmonid water in its entirety, therefore the preservation of high standards of water quality on the Castlebar River are essential to its salmonid spawning grounds. The Castlebar River is designated 'sensitive' under the Urban Waste Water Treatment Regulations[8], partly due to the particularly low flows in dry weather and seasonally variable assimilative capacity to incoming treated effluent.

Treated effluent from Castlebar WWTP was, up until early June 2005, discharged to the Castlebar River at Knockthomas. On expansion of the plant, to provide a greater hydraulic capacity, a condition was applied by An Bord Pleanála to pipe the treated effluent to a new outfall location further downstream at the confluence of the Castlebar and Manulla Rivers. The new pipeline and outfall consequently has been constructed and was commissioned in early June, 2005.

The EPA monitor effluent levels, river quality at various locations upstream and downstream of the Castlebar WWTP new and retired discharge locations, and regularly check the trophic status of Lough Conn and Lough Cullin. The overall biological rating of the stretch of river below the retired outfall has shown general improvements in water quality, as the Q ratings have improved since biological sampling by the EPA began in 1971. Since the outfall changeover occurred in June 2005, no EPA biological sampling results have become available. The receiving water; Lough Cullin, along with Lough Conn, has been classified as having a mesotrophic[9] status. Since leachate importation at Castlebar WWTP commenced, no additional notable environmental effects have been observed or recorded in the receiving waters as a result.

[8] Urban Waste Water Treatment Regulations, 2001 (S.I. NO. 254 of 2001)

[9] Source; EPA, (2005) "Water Quality in Ireland 2001 – 2003"

In December 2006, following unusually high rainfall levels, authorisation was received from the Environmental Protection Agency to temporarily transport untreated leachate from Derrinumera Landfill to Westport Wastewater Treatment Plant for treatment and subsequent discharge to Clew Bay.

In November 2001, Mayo County Council's application for the upgrade and expansion of the Castlebar WWTP was certified by An Bord Pleanála. An Bord Pleanála, in certifying the application, has made it a condition of such expansion that the importation of leachate there is discontinued when the new Castlebar WWTP is in place;

> *"No sewage sludge or landfill leachate from outside the expanded Castlebar Waste Water Treatment Plant shall be transported onto the site for processing at this location having regard to the limited assimilative capacity of the River system relative to the likely demands arising from within the Castlebar area."*

In this regard Mayo County Council must source an alternative means for the treatment and disposal of the leachate generated in Derrinumera Landfill. Following best environmental practice it has been considered that the treatment of leachate should be conducted at the source and as such it is proposed to treat the leachate at Derrinumera Landfill. Once the leachate is treated (in accordance with the discharge standards as will be specified by the Environmental Protection Agency) it will need to be discharged to the receiving environment. There are three theoretical options, 1) discharge to groundwater, 2) discharge to the Glaishwy River and 3) discharge to the nearest coastal waters (i.e. Newport). Option 1 is not considered appropriate due to the volumes being generated (maximum volume of leachate production expected to peak at 700 m^3 per day, maximum discharge from LTF to be restricted to 500 m^3 per day). Option 2 is not considered as appropriate due to the very low flow conditions in the Glaishwy River. Option 3 is the best alternative solution and has been demonstrated in both this Environmental Impact Statement and in the Newport Sewerage Scheme Environmental Impact Statement to be an environmentally sustainable option.

3.3.2 CURRENT LEACHATE VOLUMES AT DERRINUMERA

At present the leachate held within the cut-off wall is collected in a lagoon. From the lagoon, the leachate is then pumped to, and stored in, 3 large identical pre-cast concrete collection tanks on site. Each tank has a volume of 297m^3 (i.e. 10.4m diameter with a working depth of the order of 4m). In addition, the leachate collected from the lined cells is pumped directly to the holding tanks.

The waste body at Derrinumera has been surrounded by a 1.3km long, 600mm wide bentonite cut-off wall, keyed 0.5m into bedrock since 2001. The purpose of the wall is to stop leachate migration from the waste body in the unlined historical deposit and it also diverts upland surface water around the unlined waste. Low permeability flows in the bedrock are not, of course, prevented by the cut-off wall. This leachate flows to a balancing lined lagoon at

present, with a floor area of 860m^2 and a volume in the region of 3,600m^3. This lagoon balances peaks in leachate production, which broadly mirrors rainfall, and provides a measure of settlement. Leachate is pumped from the lagoon to the three holding tanks from which the tankers are filled through a gantry loading system. The leachate is then taken off site to Castlebar WWTP for treatment.

The volumes to be handled and the strength of the constituents in the leachate, vary from winter to summer. Looking at the experience of 2001, 125m^3/day approximately was transported in May and June and 130m^3/day was tankered in September. Over the year an average daily leachate flow of 258m^3/d was recorded, ranging from a minimum of 125m^3/d to a maximum of 358m^3/d. In 2002, which had been exceptionally wet, volumes as high as 650m^3/d were removed in February and in November. In 2004 an average daily leachate flow of 269.7m^3/d was recorded, and in 2005 the daily leachate flow averaged at 266.4m^3/d. In the future, these volumes will change as cells are filled and capped off, with the maximum volume of leachate production, expected over the design life of the landfill, peaking at 700m^3/d. Once the LTF has been commissioned, the maximum allowable discharge of treated leachate from the plant will be restricted to 500 m^3 per day and the existing on-site lagoon will be utilised as a balancing facility when the daily leachate production exceed this volume. This figure has been used for design purposes.

3.4 LEACHATE TREATMENT: PROPOSED DEVELOPMENT

3.4.1 INTRODUCTION

This section describes a number of leachate related elements that are proposed for the Derrinumera Landfill, which will include the construction and operation of a Leachate Treatment Facility (LTF) at Derrinumera Landfill.

As this is a Design Build and Operate (DBO) project, the exact nature of leachate treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. As a result, the following process descriptions are generic in nature. For the leachate treatment process the EIS describes a sequencing batch reactor (SBR), since activated sludge processes work well with this type of leachate, but it shall include further polishing such as precipitation or membrane technology in order to achieve the required standards.

3.4.2 PROCESS DESIGN FOR THE LTF AND ANCILLARY WORKS

The design of the LTF and ancillary works, including any such elements of the existing leachate handling works as are retained, shall be in accordance with Best Available Techniques (BAT) and shall be such as to facilitate the operation, monitoring, sampling and maintenance of all processes and equipment. The process and equipment chosen shall have been used successfully in similar sized plants treating similar type leachates.

The LTF and ancillary works shall be designed and constructed in accordance with best national and international practices, and shall be operated to the requirements set out in the contract documents.

The design life of the permanent works including the refurbished elements of the existing plant shall be not less than the following:

Building and Civil Engineering Works	50 years
Main Plant Items	15 years
SCADA / Telemetry / PLC Equipment and Similar Items	10 years
Wearing Parts which normally require periodic replacement	5 years

The buildings and other civil engineering main structures will have a design life of 50 years, while mechanical plant items will have a design life of 15 years. The LTF and ancillary works again shall be provided and operated in accordance with the design figures given in Table 3.2.1., Section 3.2.2 above.

The final effluent discharge standards were determined by reference to Irish Legislation, European Directives, best management guidelines and also water quality modelling. The requirements for treated leachate from the leachate treatment plant will fall in line with the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 2001 (S.I. No. 254/2001), which specify the following requirements:

- BOD_5 25 mg/l;
- SS 35 mg/l;
- COD 125 mg/l.

Because of the salmonid status attached to the Newport River and Lough Furnace, both situated on the verge of Newport Bay, a concentration of 5 mg/l of Ammonia as N was derived based on compliance with the Quality of Salmonid Water Regulations, 1988(S.I. No. 293 of 1988), in order to ensure the protection of migratory fish species.

- Amm N 5 mg/l.

In addition, a standard for Faecal Coliforms of 2,000 Nr./100 ml is also proposed for the discharge due to the designation of the coastal waters off Newport as a Class A Shellfish Production Area.

In addition to the above standards, it has been anticipated that additional requirements are appropriate to be specified for the treated leachate to ensure the protection of the sensitive receiving environment of Newport Bay, associated water bodies, protected species and

habitats, (Refer also to Appendix 3, Volume IV). Details on additional requirements are given in Section 3.4.3.7 – *Treated Leachate Discharge Standards* and in Appendix 3, Volume IV. These requirements may be amended as the Environmental Protection Agency directs.

3.4.3 GENERAL DESIGN PHILOSOPHY FOR THE LTF AND ANCILLARY WORKS

The design for the LTF and ancillary works shall be based on the following overall design philosophy:

(i) In order to facilitate maintenance, the leachate treatment plant and ancillary works shall be capable of operating without loss of standards during the planned maintenance downtime to be expected in normal operation, and the design must have contingent proposals to handle loads during annual or other major overhaul periods.

Where design proposals are based on the use of individual settlement tanks and aeration basins or individual units in general, the interconnecting pipework shall be configured such that, for example in a three stream process, any combination of primary elements can feed any combination of secondary elements, and any combination of secondary elements can feed any combination of tertiary elements, and so on;

(ii) Leachate inlet and outlet arrangements, shall take all foreseeable buffer conditions into account, and make reasonable provision for breakdown and resumption of process plant;

(v) A sufficient number of standby pumps, fans, air blowers, etc, shall be provided in order to ensure continuation of the leachate treatment in the case of equipment failures or breakdown. The standby equipment shall be to the same specification as the duty units, with automatic changeover, or be available in stock on-site if permanent installation of the standby facility is impractical.

The minimum number of standby units required is as follows:

Number of Duty Units	Standby Requirement
1	100%
2	50%
3	33%
4	25%

Non-essential utilities (shut down not critical for up to two days) do not require installed standby units. Replacements for all wearing or possible defective parts shall be held in stock on site.

(vi) The Contractor shall be required to conduct a Hazard and Operability Study of each segment of the works and of the total works (including such elements of the existing leachate handling system as are retained), and shall be required to include either in the capital works or by way of operational procedures any measures arising from the recommendations of such studies.

3.4.3.1 Stormwater Flows

All contaminated stormwater from the waste acceptance area, and runoff from the circulation roads and hard surfaces, which is not to be discharged to the surface water system around the landfill, and has been designated as 'grey water' by the EPA, shall be included in the leachate collection system. The DBO Contractor will be expected to manage the balancing capacity of the lagoon and holding tanks, so as to permit any necessary priority to be given to such stormwater flows as the pumping stations that handle it may require.

3.4.3.2 Leachate Treatment Units

The Contractor will be required to design and construct a Leachate Treatment Facility at the Sludge Hub Centre site in Derrinumera. On the basis of water balancing of the landfill, the leachate volume to be treated has been calculated at 500m³ as a daily maximum. The contractor will be required to provide an appropriate volume of storage on-site, which will also allow any leachate discharges to tankers in the event of process failure or planned maintenance downtime of the Leachate Treatment Facility. The design of the LTF shall incorporate a suitable scouring system so that the LTF can be fully and automatically cleaned, and residues at the bottom of the various tanks removed.

3.4.3.3 Secondary and Tertiary Treatment

The contractor will be required to design, build and operate a suitable and complete secondary and tertiary treatment system in accordance with the parameters previously outlined.

The following process options will be considered for effective treatment of the leachate.

- Air stripping/aeration in lagoons or SBR processes;
- Reed beds;
- Rotating biological contactors;
- Membrane filtration;
- Chemical precipitation;
- Electrolytic oxidation;
- Reverse osmosis;

- Other proven systems.

The tendering contractor will offer the system that he considers to be the most economically advantageous, and which consistently achieves the required treated leachate standards.

The selected process system will meet with the following general requirements:

(i) Aeration Systems:
Aeration systems will be required to be fine bubble diffused aeration systems. Surface aeration systems will not be acceptable.

(ii) Air Blowers:
Variable speed air blowers will be required. These will be designed to cater for peak BOD loadings of up to 500 mg/l and will be designed with space for the addition of one further blower unit.

(iii) Aeration Control:
In order to obtain optimum process conditions, the aeration capacity will be controlled by measurement equipment of the constituents' oxygen and/or ammonium and/or nitrate in the separate aeration tanks. In addition, timers and/or the influent flow measurement may be used as input signals for the aeration control strategy.

(iv) SBR Systems:
Where an SBR type system is proposed, it shall where possible be based on tanks with similar dimensions to the tanks already provided. A flow-balancing tank will be a requirement in conjunction with any SBR system proposed by intending Contractors. The flow balancing tank will be required to accommodate pump operation variation with peaks of up to 1.25 times average flow, and to provide mixing for sludge supernatants with the leachate.

(v) Process Modification:
Process modifications will be considered which:

a) Are designed to achieve required treated leachate standards and stated noise and odour emissions standards;
b) Incorporate measures to reduce the impact of the development on the environment.

However, no leachate treatment process will be acceptable from the procurement process that is not based on proven technology. A process based on proven technology is defined as a process which:

- Has been demonstrated to have at least three (3) years satisfactory use at reference sites with stable process conditions;

- Has been employed successfully on at least three leachate treatment plants of similarly sized loadings and modules as proposed, treating a similar effluent to that of Derrinumera and achieving the effluent standards required;

A high standard of operator safety and comfort will be required by the incorporation of good access, equipment lifting devices, separate storage facilities for chemicals, ventilation and lighting to all operating areas, machinery guards, proper electrical insulation facilities, noise suppression and insulation, stairs, handrails, covers, etc.

3.4.3.4 Sludge Thickening and Dewatering

As stated in Section 3.2.4, there will be a system for thickening and dewatering of surplus sludges generated from the leachate treatment process itself.

The dewatering system will be designed using new or existing equipment or a combination of both, which will produce a dewatered sludge with a minimum dry solids content of 17.5% or within a suitable range above this point consistent with the landfill licence. The proposed dewatering system will be provided complete with a fully enclosed dewatered sludge handling system. In accordance with the *'Management of Water Treatment Sludges'* Circular, dated February 2005, surplus sludge arising from the leachate treatment process will be dried batchwise in order to minimise the end volume of sludge and to improve stability and handleability for placing on the landfill.

3.4.3.5 Instrumentation Control and Automation

There will be a system of instrumentation, control and automation on the leachate treatment plant that is consistent with the efficient operation of the process. The instrumentation will also provide data that will enable both the operator and the County Council to verify the basis for operational charges.

The DBO Contractor will share the existing weighbridge system at the site with the landfill operator. In addition to weighing the waste going to landfill, the weighbridge will be used for weighing of any chemical or nutrient deliveries to the site.

At each flow metering point, the contractor shall provide a suitably valved bypass to allow calibrated flow meters to be installed, which can be used to verify the accuracy of the main online meter from time to time. The contractor will be required to include for the provision of suitable calibration meters and for their re-calibration at regular intervals during the lifetime of the plant.

3.4.3.6 Monitoring and Sampling

To ensure that the optimal process control is maintained, monitoring equipment and sampling facilities shall be provided. The influent flow from the leachate lagoon and effluent from the leachate treatment works shall be monitored and automatically sampled as specified. Sampling facilities (for "grab" samples) shall be provided after every process step in the liquid stream and in the sludge stream.

Monitoring facilities shall be provided for the following operating parameters:

Inlet works	Flows and levels including separate measurement of return flows
SBR or Aeration Tanks (if included)	DO, COD Ammoniacal N MLSS Power Consumption Pressure at Air Blowers
Primary and Final Settlement Tanks (if included)	Sludge Blanket Level (High / Low)
Sludge Thickener (if included)	Sludge Levels (High / Low)
All Pump Discharge Points	Flows

3.4.3.7 Treated Leachate Discharge Standards

The final effluent discharge standards were determined by reference to Irish Legislation, European Directives, best management guidelines and also water quality modelling. The Second Schedule Parts 1 and 2 of the Environmental Protection Agency Act 1992 (Urban Wastewater Treatment) Regulations, (S.I. No. 419) 1994, (Amended by S.I. No. 254, 2001), set out the discharge limits and percentage reductions for urban wastewater and it is proposed to take these limits as working standards for the treated leachate produced at the site.

While Part 1 of these regulations are directly applicable to the proposed discharge, Part 2 of the regulations set standards for total phosphorus and nitrogen discharge levels to sensitive waters. The waters off the Newport coast are not classified as sensitive in the Urban Waste Water Treatment Regulations (2001). As such, no legislative requirement exists for the provision of advanced treatment for nitrogen and phosphorous removal. The lack of any observed problem with green or brown algae blooms in the coastal waters off Newport indicates that there is no eutrophic tendency in the waters. Given these considerations the provision of advanced secondary treatment for nitrogen and phosphorous removal is not considered necessary for the proposed wastewater treatment plant.

The minimum number of samples to be taken is related to the size of the treatment plant and shall be collected at regular intervals during the year. The number of samples taken would be twelve annually, for the purposes of determining compliance with the discharge standards,

but more frequent sampling is expected of a competent Contractor as part of good operation and maintenance practice on the Leachate Treatment Facility.

The maximum number of samples that may fail the requirements, expressed in concentrations or percentage reductions in the Second Schedule, Part I of S.I. 254 (2001), is specified in the Table to the Fifth Schedule of S.I. 254 (2001). This corresponds to a 95-percentile pass regime.

The treated wastewater shall be assumed to conform to the relevant parameters if, for each relevant parameter considered individually, samples of the water show that it complies with the relevant parametric value in the following way:

(a) For the parameters specified in the Second Schedule Part I of S.I. 254 (2001), a maximum number of samples that are allowed to fail the requirements, expressed in concentrations and/or percentage reductions in that Table and that sub-paragraph, is specified in the Table below to the Fifth Schedule;
(b) For the parameters of the Second Schedule Part I expressed in concentrations, the failing samples taken under normal operating conditions must not deviate from the parametric values by more than 100%.

Table 3.4.2 Second Schedule, Part 1 of S.I. 254 of 2001

Parameter	Standard	Minimum Percentage Reduction	Reference Method of Measurement
Part 1			
BOD_5	25 mg/l	70-90	Homogenized, unfiltered, undecanted sample. Determination of dissolved oxygen before and after five-day incubation at 20ºC $\pm$ 1ºC, in complete darkness. Addition of a nitrification inhibitor
Suspended Solids	35 mg/l	90	-Filtering of a representative sample through a 0,45 um filter membrane. Drying at 105°C and weighing. -Centrifuging of a representative sample (for at least five mins with mean acceleration of 2,800 to 3,200g), drying at 105ºC and weighing
COD	125mg/l	75	Homogenized, unfiltered, undecanted sample Potassium dichromate

Table 3.4.3 Fifth Schedule of S.I. 254 of 2001

Series of Samples taken in any Year	Maximum Permitted Number of Samples which Fail to Conform
4 – 7	1
8 – 16	2
17 – 28	3
29 – 40	4
41 – 53	5
54 – 67	6
68 – 81	7
82 – 95	8
96 – 110	9
111-125	10

Because of the salmonid status attached to the Newport River and Lough Furnace, both situated on the verge of Newport Bay, a concentration of 5 mg/l of Ammonia as N was derived based on compliance with the Quality of Salmonid Water Regulations, 1988(S.I. No. 293 of 1988), in order to ensure the protection of migratory fish species.

- Amm N 5 mg/l.

In addition, a standard for Faecal Coliforms of 2,000 Nr./100 ml is also proposed for the discharge due to the designation of the coastal waters off Newport as a Class A Shellfish Production Area. (A standard for Faecal Coliforms of 2,000 Nr./100 ml, as proposed for the discharge of Newport WWTP treated effluent, has also been proposed for the discharge of treated leachate).

In addition to the above standards, it has been anticipated that additional requirements are appropriate to be specified for the treated leachate to ensure the protection of the sensitive receiving environment of Newport Bay, associated water bodies, protected species and habitats, (Refer also to Appendix 3, Volume IV). There are no specific guidelines recommending the quality of landfill leachate prior to or after treatment. The establishment of discharge standards as required for the treated leachate in accordance with the Waste Licence Review is a function of the Environmental Protection Agency under the Protection of the Environment Act, 2003, Waste Management Act, 1996, Environmental Protection Agency Act, 1992 and associated regulations. This Waste Licence is currently being reviewed by the Environmental Protection Agency.

In obtaining a complete reference list of standards appropriate to substances which could potentially be contained within the treated leachate and which present a potential risk, a

number of publications and guidances were referenced in addition to consultations with the Environmental Protection Agency and Bord Iascaigh Mhara, including;

- Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 2001 (S.I. No. 254 of 2001);
- Quality of Salmonid Water Regulations, 1988 (S.I. No. 293 of 1988);
- United States Food and Drug Administration, *National Shellfish Sanitation Program Standards* (USFDA, 1995),
- Water Framework Directive 2000/60/EEC;
- European Communities Directive concerning the quality of bathing waters (76/160/EEC and 2006/7/EC) and related statutory instruments;
- European Communities Directive concerning the health conditions for the production and placing on the market of live bivalve molluscs (91/492/EEC);
- Dangerous Substances Regulations, 2001 (S.I. No. 12 of 2001);
- Environmental Protection Agency *Towards Setting Guidelines Values for the Protection of Groundwater in Ireland, Interim Report* (EPA, 2003); and,
- European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006).

The European Communities (Quality of Shellfish Waters) Regulations, S.I. No. 268 of 2006 specifies limits for eleven categories of parameters however it could be considered that the limit values specified in the regulations may not cater for every possible substance present in the treated leachate. Whilst the project team engaged in consultation with the Environmental Protection Agency and Bord Iascaigh Mhara during the environmental impact assessment process regarding additional environmental quality standards for treated leachate in the context of the proposed receiving waters, there was no information available with regard to what these environmental quality standards would be set at. In the absence of this information, the only approach available to the project team in selecting appropriate discharge standards for treated leachate was on the basis of a literature review of existing environmental quality standards as enshrined in national legislation. In many cases recommended environmental quality criteria in international publications were less than existing background levels in the Irish environment or there was an insufficient dataset for assessment of background levels on a national basis. When assessing the appropriateness of these discharge standards, it should be noted that ultimately the Environmental Protection Agency will be required to establish the discharge standards for the treated leachate being discharged from Derrinumera landfill as part of the Waste Licence Review process which is currently on-going.

From the preliminary hydrodynamic modelling the minimum dilution factors available under the worst-case scenario (or minimum) dispersion conditions at the preferred outfall location is 18.6 (Refer to Section 5.1 Hydrodynamic Modelling of the Proposed Outfall, Appendix 3, Volume IV of this statement). Based on the validatory modelling exercise with the worst case wind conditions affecting Inner Newport Bay and Lough Furnace, the minimum dilution factors

available at this outfall A is 913. To this extent, in assessing appropriate discharge values for specific 'risk' determinands, it was considered that the most conservative approach would be to apply a factor of 18.6 to the target environmental quality standard. It is stressed that this was the minimum dilution factors available for a limited time (i.e. 30 minutes during the tidal cycle) after which available dilutions significantly increase. To this extent the calculated discharge limits for the treated leachate are included below in *Table 3.4.1 Proposed Discharge Standards for Treated Leachate*. This table presents the discharge concentration to be attained in the treated leachate (subject to Environmental Protection Agency licensing), the predicted concentration at the edge of the initial mixing zone and the appropriate relevant Irish statutory limit.

When referencing the table below, please note the following;

1,000 microgrammes = 1 milligramme
1,000 milligrammes = 1 gramme
1,000 grammes = 1 kilogramme.

Additional Screening Values for Receiving Environment

Given the extremely low levels of contaminants predicted to be discharged in the treated leachate, there is no short-term negative impact predicted in the environment. Pre- and post-discharge monitoring will be implemented such that all specified standards are met in order to safeguard the quality of water in the bay. In addition to the monitoring requirements for treated leachate as specified by the Environmental Protection Agency in the Waste Licence for Derrinumera Landfill, biannual monitoring of the receiving waters, sediment, fish and shellfish tissue at sites adjacent to the proposed discharge and moving away from the discharge will be implemented to safeguard the ecological integrity and in particular the favourable conservation status of the receiving environment in the short, medium and long-term. The development and implementation of this monitoring programme will be conducted in consultation with the relevant state and semi-state bodies (i.e. Environmental Protection Agency, Mayo County Council, Department of Environment, Heritage and Local Government and the Department of Communications, Marine and Natural Resources [including the Marine Institute]) with input from local stakeholders. When considering the above, consultation will be engaged in with the EPA as the establishment of discharge standards for the treated leachate is a function of the Environmental Protection Agency under the Protection of the Environment Act, 2003, Waste Management Acts, 1996-2003, Environmental Protection Agency Act, 1992 and associated regulations through the Waste Licensing Review process. This process is currently on-going.

When assessing the results of the biannual monitoring programme referred to above, the following 'early warning limits' as specified hereunder in *Table 2.4.2 Proposed Screening Criteria for Receiving Environment* will be referenced, in addition to any limits specified through the Waste Licensing process for Derrinumera landfill by the Environmental Protection Agency. It should be noted that the development of appropriate standards for the

receiving environment are subject to change (influencing factors include new legislation and the outcome of new scientific research) and as such the relevant standards will be reassessed on an annual basis. It should also be noted that in the event of elevated results being detected in the receiving environment, that the source of such elevated results may not necessarily arise from the discharge of treated leachate – the purpose of the biannual monitoring programme will be to confirm the capability of the receiving environment to continue to accept discharges of treated leachate.

It should be noted that the results of this Biannual Monitoring Programme will be forwarded to the Environmental Protection Agency for consideration as part of their Waste Licence enforcement activity at Derrinumera Landfill. Should the results of the Monitoring Programme indicate that alternative limits or controls are required at the Leachate Treatment Facility or the landfill in general, Mayo County Council will implement same in agreement with the Environmental Protection Agency.

Table 3.4.4 Proposed Discharge Standards for Treated Leachate

Determinand	Concentration in Discharge of Treated Leachate	Concentration in Receiving Waters Post Initial Mixing Zone (20 M x 20 M grid) Min. Dilutions 18.6*	Irish Regulatory Standard	Reference	Name of Standard
GENERAL					
PH	7-9 pH units	-	7-9 pH units	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
BOD	25 mg/l	-	25 mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
COD	125 mg/l	-	125 mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
Ammonia (as N)	5 mg/l	-	-	-	-
Suspended Solids	35 mg/l	-	35mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
Faecal Coliforms	2,000 per 100 ml	-	-	-	-
Phenol	0.5 ug/l	-	-	-	-
Colour	Deviation of <10 from background	Deviation of <10 from background	Deviation of <10 from background	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Salinity	<40 PSU	2.15 PSU	<40 PSU and less than 10% increase in background	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Dissolved Oxygen	Average Equal or Greater than 70% Min. 60%	-	Average Equal or Greater than 70% Min. 60%	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Total Petroleum Hydrocarbons	No visible film No harmful effects on shellfish	-	No visible film No harmful effects on shellfish	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Polychlorinated Biphenyls (sum ICES 7 CBs: PCBs 28, 52, 101, 118, 138, 153 and 180)	0.30 micrograms per litre	0.016 micrograms per litre	0.30 micrograms per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
DISSOLVED METALS					
Arsenic	40 (max.) micrograms per litre 20 (avg.) micrograms per litre	2.15 micrograms per litre	40 micrograms per litre 20 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Cadmium	5 micrograms per litre	0.27 micrograms per litre	5 micrograms per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006

* This is indicative of conditions at low water spring tide. Dilutions at all other phases of the tide are greater than this.

Table 3.4.4 Proposed Discharge Standards for Treated Leachate (continued)

Determinand	Concentration in Discharge of Treated Leachate	Concentration in Receiving Waters Post Initial Mixing Zone (20 M x 20 M grid) Min. Dilutions 18.6*	Irish Regulatory Standard	Reference	Name of Standard
DISSOLVED METALS (continued)					
Chromium	30 (max.) micrograms per litre 15 (avg.) micrograms per litre	1.61 micrograms per litre	30 micrograms per litre 15 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Copper	10 (max.) micrograms per litre 5 (avg.) micrograms per litre	0.54 micrograms per litre	10 micrograms per litre 5 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Lead	20 (max.) micrograms per litre 5 (avg.) micrograms per litre	1.08 micrograms per litre	20 micrograms per litre 5 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Mercury	0.40 micrograms per litre	0.02 micrograms per litre	0.40 micrograms per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Nickel	50 (max.) micrograms per litre 25 (avg.) micrograms per litre	2.69 micrograms per litre	50 micrograms per litre 25 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Silver	10 micrograms per litre	0.54 micrograms per litre	10 micrograms per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Zinc	200 (max.) micrograms per litre 40 (avg.) micrograms per litre	10.75 micrograms per litre	200 micrograms per litre 40 micrograms per litre	S.I. No. 268 of 2006 S.I. No. 12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
STANDARD IONS					
Cyanide	10 micrograms per litre	0.54 micrograms per litre	10 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Fluoride	1500 micrograms per litre	80.65 micrograms per litre	1500 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
VOLATILE ORGANIC COMPOUNDS					
Dichloromethane	10 micrograms per litre	0.54 micrograms per litre	10 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Toluene (Methylbenzene)	10 micrograms per litre	0.54 micrograms per litre	10 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Xylene (Dimethylbenzene)	10 micrograms per litre	0.54 micrograms per litre	10 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
TRIAZINE HERBICIDES					
Atrazine	1 microgramme per litre	0.054 micrograms per litre	1 micrograms per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001

Simazine	1 microgramme per litre	0.054 micrognammes per litre	1 micrognammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
ORGANOTIN COMPOUNDS					
Tributyltin	0.001 micrognammes per litre	0.00005 micrognammes per litre	0.001 micrognammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001

* This is indicative of conditions at low water spring tide. Dilutions at all other phases of the tide are greater than this.

In the table above, where two standards are specified, e.g. the dissolved metal Arsenic, the requirement is that the limit value specified in European Communities (Quality of Shellfish Waters) Regulations, 2006 should be considered the maximum value and the limit value specified in the Water Quality (Dangerous Substances) Regulation, 2001 should be considered as the average value.

Compliance with discharge standards will be as per the detail of interpretation specified in the revised Waste Licence granted to Derrinumera Landfill by the Environmental Protection Agency.

Table 3.4.5 Proposed Screening Criteria for Receiving Environment

Determinand	Screening Criteria for Receiving Waters	Source	Screening Criteria for Shellfish Tissue (mg/kg)	Source
pH	7 – 9 pH units	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Temperature	Differential from background levels less than 2 degrees celsius	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Colouration (after filtration)	Differential from background levels of less than 10 milligrammes per litre	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Suspended Solids	Differential from background levels of less than 30%	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Salinity	Mandatory Less than 40 practical salinity units and differential from background levels less than 10% Guide 12-38 practical salinity units	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Dissolved Oxygen	80% (average value)	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Total Petroleum Hydrocarbons	No visible film or deposit on shellfish or waters nor harmful effects on shellfish	S.I. No. 268 of 2006	Not Applicable	Not Applicable
Faecal Coliforms	100 faecal coliforms per 100 millilitres	S.I. No. 268 of 2006	Equal to or less than 300 in the shellfish flesh and intervalvular fluid	S.I. No. 268 of 2006
Organohalogenated Substances	0.30 microgrammes per litre Polychlorinated Bi-phenyls	S.I. No. 268 of 2006	Mandatory 300 microgrammes per kilogramme wet weight @ 1 percent lipid Guide 100 microgrammes per kilogramme wet weight @ 1 percent lipid	S.I. No. 268 of 2006
Tributyltin	0.001 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Atrazine	1 microgramme per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Simazine	1 microgramme per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Standard Ions				
Cyanide	10 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Fluoride	1500 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Volatile Organic Compounds				
Dichloromethane	10 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Toluene	10 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Xylene	10 microgrammes per litre	S.I. No. 12 of 2001	Not Applicable	Not Applicable
Dissolved Metals				
Arsenic	40 microgrammes per litre	S.I. No. 268 of 2006	30 mg per kg dry weight	S.I. No. 268 of 2006
Cadmium	5 microgrammes per litre	S.I. No. 268 of 2006	5 mg per kg dry weight	S.I. No. 268 of 2006

Chromium	30 microgrammes per litre	S.I. No. 268 of 2006	6 mg per kg dry weight	S.I. No. 268 of 2006
Copper	10 microgrammes per litre	S.I. No. 268 of 2006	400 mg per kg dry weight	S.I. No. 268 of 2006
Mercury	0.4 microgrammes per litre	S.I. No. 268 of 2006	1 mg per kg dry weight	S.I. No. 268 of 2006
Nickel	50 microgrammes per litre	S.I. No. 268 of 2006	5 mg per kg dry weight	S.I. No. 268 of 2006
Lead	20 microgrammes per litre	S.I. No. 268 of 2006	7.5 mg per kg dry weight	S.I. No. 268 of 2006
Zinc	200 microgrammes per litre	S.I. No. 268 of 2006	4,000 mg per kg dry weight	S.I. No. 268 of 2006
Silver	10 microgrammes per litre	S.I. No. 268 of 2006	15 mg per kg dry weight	S.I. No. 268 of 2006
Organoleptic Parameters				
Taste	No impairment of taste in shellfish flesh			

3.4.3.8 Treated Leachate Discharge Pipeline

It is proposed to deliver the treated leachate to the outfall of the proposed Newport WWTP via a pumped rising main on the selected route shown on Drawing No. 1908-2200, Volume III. The treated leachate pipeline will terminate at the head manhole on the outfall of the Newport WWTP treated effluent discharge. The confluence point will be downstream of the Newport sewage treatment process but within the site boundary of the proposed Newport waste water treatment plant. It should be noted that leachate will not be discharged into the Newport town collection system. It should also be noted that it is not proposed that leachate be treated in the proposed Newport Waste Water Treatment Plant as appropriate treatment facilities will be provided at Derrinumera Leachate Treatment Facility in accordance with Environmental Protection Agency requirements enforced through the Waste Licence for the landfill.

The pipeline will be constructed in 200mm Nominal Diameter HPPE or HDPE, and will be laid in trench in the road margin over most of its route. The pipeline will have minimum cover of 0.9m from finished ground level to the crown of the pipe, but cover may exceed this where the pipeline is graded in a varying ground profile. The proposed pipeline length will be approximately 8 km. The pipe will be laid along the R311 for the majority of it's length, passing the townlands of Derrinumera, Cartron, Cuilmore, Clooneshil, Drumlong and Newport Town on it's proposed route. Refer to Section 4.2.4.3 for pipeline construction methodology.

As a result of the above arrangement to pump treated leachate a distance of some 8km to Newport, the provision of a Treated Leachate Pumping Station at Derrinumera will be necessary. The DBO Contractor appointed for the Sludge Hub Centre, will design and construct this station, including the provision and maintenance of standby pumping plant and telemetry to monitor the pumps. Once the station has been commissioned, it will be operated by the DBO Contractor, who will be required to assume full responsibility for its operation.

The Contractor will be obliged to maintain this pumping station so that it remains in proper working order on a 24hr/7 day week basis. In order to provide for breakdown situations and subsequent resumption of process plant, key spares necessary for the operation of the leachate treatment plant and pumping station must be held on site by the Contractor.

3.5 FACILITY ACCOMMODATION AND LABORATORY FACILITIES

A facility manager's office would be provided in the proposed facility control building. The central composting process computer is normally located in the composting building, along with a control room housing PLC-equipment. Canteen, toilet/shower/changing facilities would be provided within the proposed control building, as well as a storage area for sampling equipment and spare parts of small equipment (e.g. for ventilators, temperature sensors).

Certified laboratories would normally carry out extensive analyses of leachate, waste and compost samples, off-site. The proposed control building will also be equipped with a small laboratory where basic parameters (e.g. dry solids, volatile solids, pH) can be measured, as part of the process control measures. A stove and a small oven for drying samples will form the main equipment, along with pH and temperature metres, a conductivity metre, etc.

3.5.1 INTERACTION WITH EXISTING LANDFILL

As the proposed Sludge Hub Centre (SHC) and Leachate Treatment Facility (LTF) will be sited at the existing Derrinumera Landfill Facility, a number of elements of the existing site infrastructure will be shared. Some elements will be extended/modified to accommodate the proposed developments, namely:

- *Site security*: The security fencing will be extended to include the external boundary of the proposed SHC and LTF. The security fencing will be extended chain-link fencing;
- *Site roads*: The sites roads will be extended to convey traffic from the site entrance/weighbridge to the proposed SHC and LTF. The road construction specification will be the same as the one used for existing roads in the landfill facility;
- *Fire control*: The existing fire control infrastructure will be extended to service the proposed development. This will involve the installation of additional fire hydrants adjacent to the SHC and the LTF;
- *Foul and surface water drainage syst*ems: Both systems will be extended to cover the proposed development;
- *Lighting & CCTV*: The existing site lighting and CCTV system will be extended to cover the proposed development.

Other elements of the site infrastructure that will be shared with the proposed development include:

- The weighbridge;
- The wheelwash; and
- Plant storage and garage.

Proposed Water Supply
As there is a restricted water supply at present at Derrinumera Landfill (max. 10 m^3/hr), there will be a requirement to source an alternative supply to cater for necessary process waters for sludge drying and composting, along with the requirement to meet domestic needs of the staff facilities.

Since the Islandeady Group Water Scheme (GWS) is the closest water source being sufficient to meet the future requirements of the SHC and LTF facility, it is proposed to connect to this scheme via a watermain extension. A new section of watermain will be laid in the grass margin of the R311 as far as the landfill facility. In the interests of safety during pipeline

construction, all appropriate traffic control and safety measures will be put in place and maintained on a continuous basis. Consultations will be undertaken with the National Parks and Wildlife Service in advance of construction of the watermain.

3.5.2 ADMINISTRATION BUILDING

The administration building will be a two-storey construction, offering a good view of the works and the entrance and providing facilities for the overall control of the SHC and LTF. It is envisaged that 2 No. full time technical staff will operate from the administration building.

The building will be constructed to integrate into the overall architectural concept of the site and will occupy an approximate floor area of 200m^2, with space for car parking facilities. Potable water storage of 1m³ volume will be provided. The areas to be provided are as follows:

a) Control room and adjoining office (50m²)
   The control room will be orientated and have sufficient double-glazing so that it provides a good view of the treatment works. It will provide space for the main control consol, the SCADA system and the plant mimic. The main control panel room will provide space for the equipment control panels. This room will be separated from the control room by a soundproof partition. The area provided will be sufficient for additional control equipment likely to be required to cater for future plant enlargement or for changes in technology;
b) Reception (10m²);
c) Plant manager's office (10m²);
d) Meeting room (10m²);
e) Toilets for male and female persons (10m²);
f) Storeroom (10m²);
g) Medical room (6m²);
h) Staff canteen/kitchen (20m²);
i) Disabled persons toilet (12m²);
j) Staff changing facilities (40m²);
k) Laboratory and adjoining storeroom (20m²).

3.5.3 MAINTENANCE BUILDING

A maintenance building of approximately 100m² floor area will be provided, including the following separate areas:

- Maintenance equipment storage area to house such items as lawnmowers, dumper, pressure washers, etc;
- Spare parts storage area;
- Workshop;
- Consumables storage; and

- Adjustable steel shelving, 3m high x 10m long.

3.5.4 CHEMICAL STORAGE

Chemical storage will be provided and will be bunded as appropriate.

3.5.5 FLAMMABLE LIQUID STORAGE

A purpose built area shall be provided for the storage of flammable liquid, to the satisfaction of the Fire Officer and the Agency.

3.6 THE OPERATION PHASE

3.6.1 HOURS OF OPERATION AND TRAFFIC

It is proposed that the Sludge Hub-Centre (SHC) and Leachate Treatment Facility (LTF), with the approval of the Agency, will accept sludges 6 days a week from 8:00am to 6:30pm from Monday to Friday and from 8:00am to 2:00pm on Saturdays, however the facility may be staffed for longer periods. The leachate treatment and composting processes would operate on a continuous basis (24 hours per day; 7 days per week), and would be computer controlled in the absence of an operator on-site.

The drying and composting facility would only operate outside these hours when required to cater for the later arrival of sludge tankers or sludge skip vehicles due to breakdown or other exceptional circumstances.

Sludge that is accepted at or near closure of operating hours would be unloaded in the acceptance area and stored overnight and handled during the next working day.

3.6.2 STAFFING LEVELS

At its full capacity of 32,580tpa, it is expected that the sludge drying and the sludge composting facilities would employ approximately six full-time personnel but this is a matter for the DBO Contractor, subject to agreement with the Agency. The personnel would have the following main tasks:

- Process monitoring (temperature, water and air management) and sampling of incoming waste and compost products, executing basic laboratory analyses;
- Machinist for front-end loaders (mixing of fresh sludge, filling composting tunnels, compost refinement);
- Maintenance of mechanical/electrical equipment (shared with overall facility);
- Cleansing activities (shared with overall facility).

The personnel would be expected to include a manager, an administrative person, a sampling technician and one skilled operative and drivers. A number of drivers would also be employed for transporting biosolids, but this is a matter for the DBO contractor and might be a subcontract arrangement.

Personnel for weighbridge administration will be shared with other waste activities on-site, while other administration tasks and general management would be provided under the DBO contract.

3.6.3 HEALTH AND SAFETY

The Contractor must comply with the appropriate health and safety legislation including:

- European Council Directive 94/9/EC –ATEX Directive;
- The Safety, Health and Welfare at Work Act, No. 7 of 1989; and The Safety, Health and Welfare at Work Act, No. 10 of 2005;
- Safety, Health and Welfare at Work (Construction) Regulations, (S.I. No. 504 of 2006);
- Safety, Health and Welfare at Work (General Application) Regulations, (S.I. No. 44 of 1993); Amendment Regulations, (S.I. No. 188 of 2001); and Amendment No. 2 Regulations, (S.I. No. 53 of 2003);
- Safety, Health and Welfare at Work (Biological Agents) Regulations, (S.I. No. 146 of 1994); and Amendment Regulations, (S.I. No. 248 of 1998); and
- Safety, Health and Welfare at Work (Control of Noise at Work) Regulations, (S.I. No. 371 of 2006);
- Safety, Health and Welfare at Work (Work at Height) Regulations, (S.I. No. 318 of 2006);
- Safety, Health and Welfare at Work (Control of Vibration at Work) Regulations, (S.I. No. 370 of 2006);
- European Communities (Waste Water Treatment) (Prevention of Odours and Noise), Regulations, (S.I. No. 787 of 2005).

Perimeter security fencing will be extended to encompass the Sludge Hub-Centre (SHC) and the Leachate Treatment Facility (LTF). The internal entrance gate to the SHC and LTF will be locked outside normal operating hours.

3.6.4 PERFORMANCE MANAGEMENT SYSTEM (PMS)

Mayo County Council will implement a Performance Management System to manage the performance of the selected contractor for the construction and operation of the proposed development. To ensure optimal performance at the Plant, the Contractor shall be required to provide integrated and compatible systems for effective operation of the SHC and LTF. Under the PMS, the Contractor shall be required to routinely submit reports relating to the

performance of the entire works that he is in control of, i.e. the PMS will also set out requirements relating to testing, sampling and reporting of performance management information. From time to time the Contractor will be required to co-operate with an independent Auditor to oversee the compliance of the Contractors Reporting System with the PMS. In general, elements of the PMS will involve a liaison monitoring committee; independent compliance auditing and public relations management. Under the PMS the Contractor shall be obliged to provide details of facility specific procedures and templates for reporting.

3.7 THE CONSTRUCTION PHASE

3.7.1 GENERAL

It is proposed to construct the Sludge Hub-Centre (SHC) and Leachate Treatment Facility (LTF) following the successful application to the EPA for a review of the Waste Licence and to An Bord Pleanála for planning aspects.

The construction works associated with this development will involve normal construction activities such as excavation, filling, lifting, pumping, pipe laying, concrete works, mechanical installation etc. Blasting is not envisaged for this development.

A Construction Management Plan will be drawn up prior to the commencement of construction activities, in order to minimize the impacts to the environment during construction. The Construction Management Plan will detail the allowable working day, construction traffic, parking arrangements and incorporating environmental protection measures. Provisions to reduce the environmental impact of the construction activities will include the following:

- Requiring the contractor to ensure that no pollution or obstruction of ground water and watercourses is caused by his operations;
- Requiring the contractor to comply at a minimum with the provisions of BS 5228 (Noise Control on Construction and Demolition Sites), Part I & Part 2, 1997;
- The following limits are recommended in respect of noise and vibration at the façade of existing dwellings;

Monday to Friday 0700 hours to 1900 hours	70 $L_{Aeq(1\ hr)}$ dB	80 L_{Amax} dB
Monday to Friday 1900 hours to 2200 hours	60 $L_{Aeq(1\ hr)}$ dB	65 L_{Amax} dB
Saturday 0800 hours to 1630 hours	60 $L_{Aeq(1\ hr)}$ dB	65 L_{Amax} dB
Sundays and Bank Holidays		

0800 hours to 1630 hours 60 $L_{Aeq(1\ hr)}$ dB 65 L_{Amax} dB

For Protection of Buildings
8 mm/s (vibration frequency, <10 Hz)
12.5 mm/s (vibration frequency, 10 to 50 Hz)
20 mm/s (vibration frequency, > 50 Hz)
Continuous piling: 2.5 mm/s (tolerable level).

It should be noted that these limits are sourced from the National Roads Authority Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2003. For typical construction works, compliance with the average noise level of 70 dB(A) would also imply compliance with the maximum limit of 80 dB(A). The exception would be noise of a significant nature such as piling or rock breaking where required.

- Where necessary, require the contractor to erect suitable noise barriers to minimise disturbance and avoid nuisance when operating machines at night (between 1900 hours and 0800 hours);
- Limiting vibration caused by construction plant to the maximum permitted values in BS6472, 1992 (Guide to evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz);
- Requiring the contractor to take reasonable precautions to ensure that all wastewater discharged shall not be harmful to or cause obstruction or deposit in drains and to prevent oil, grease or other objectionable matter being discharged into drains;
- Requiring the contractor, during the execution of works, to keep all plant and materials and all equipment connected with the construction of the works in good order and clean and tidy;
- Requiring the contractor to remove any waste materials from the site to a licensed waste facility;
- Requiring the contractor to ensure that the public roads in the vicinity of the site are maintained free from all mud, dirt and rubbish, which may arise from or by reason of the execution of the works. To facilitate this, the contractor will be required to provide a separate wheel washing facility to an approved standard within the construction site;
- Prohibiting the disposal of excess concrete on any part of the construction site;
- Requiring the contractor to provide a designated bin for washing down the chutes of concrete lorries on site;
- Requiring the contractor to keep the construction compounds free and clear of excess dirt, rubbish piles and scrap wood etc. at all times. Requiring the contractor to keep the designated parking area and other common areas clear and free of rubbish and debris;
- Requiring the contractor to be responsible for the disposal of all wood, food, food packaging and paper generated during the construction phase. The contractor will have to provide containers and vehicles for the collection of such materials and will have to either dispose of them at the Derrinumera Landfill Facility or send them to a licensed recovery facility. Dumping of these items within the construction site will be prohibited;

- Requiring scrap materials, rubbish, etc. to be hauled out of the work areas (daily) and disposed of by the contractor on a daily basis to a licensed waste disposal facility, in accordance with the terms of the licence;
- Requiring the contractor to obtain any necessary permits from the Local Authority or Environmental Protection Agency for the disposal of waste;
- At the completion of the work, require the contractor to leave the construction area in a neat, clean and orderly condition;
- Requiring the contractor to provide sanitary facilities that would be adequate for his construction personnel. Sanitary facilities will include proper wash down WC's with sewer connections, or if this is impractical, chemical closets;
- Requiring that all temporary buildings associated with construction of the development comply with the Safety, Health and Welfare Regulations. On completion of the works, the contractor will remove them entirely with all slab, drains and water mains and restore the surface of the land to its original condition or other such reasonable condition as may be agreed with the Client, taking account of any licence requirements.

In addition, any excavated material generated during the construction of the plant will be reused on site, where appropriate. Parking facilities for construction vehicles and private transportation will be located within the development site. Temporary site fencing will be erected and maintained to secure the site during the construction phase.

Section Four

DESCRIPTION OF EXISTING ENVIRONMENT/ LIKELY IMPACTS / MITIGATION MEASURES

4 DESCRIPTION OF EXISTING ENVIRONMENT/ LIKELY IMPACTS / MITIGATION MEASURES

4.1 HUMAN BEINGS

4.1.1 INTRODUCTION

This section provides an assessment of the potential impacts, of the proposed Sludge Hub Centre (SHC) and proposed Leachate Treatment Facility (LTF), on the human environment. This section deals with the positive and negative impacts of the proposals on human beings in relation to:

- Population;
- Employment;
- Agriculture and Landuse;
- Amenity;
- Tourism; and
- Health & Safety.

The proposed development consists of the setting up of a SHC and LTF at the existing landfill site in Derrinumera. Permission is also sought to allow for the option to move an existing sludge drier/lime stabilisation unit, (currently located at Ballina WWTP), to Derrinumera Landfill to provide an interim sludge treatment solution, if so required. This solution is proposed until the SHC is commissioned. It is proposed to have a sludge-drying unit, supplemented by a composting unit, as the permanent sludge treatment process in the proposed SHC.

It is proposed to use a Sequencing Batch Reactor (SBR), or equivalent BAT, to treat the leachate on-site. The treated leachate will then be pumped to the outfall of the proposed Newport WWTP. It is proposed to deliver the treated leachate to the Newport WWTP outfall via a pumped rising main on the selected route as shown on Drawing No. 1908-2200, Volume III.

The pipeline will be constructed in 200mm Nominal Diameter HPPE or HDPE, and will be laid in trench in the road margin over most of its route. The proposed pipeline length will be approximately 8 km. The pipe will be laid along the R311 for the majority of it's length, passing the townlands of Derrinumera, Cartron, Cuilmore, Clooneshil, Drumlong and Newport Town on it's proposed route. (Refer to Section 4.2.4.3 for pipeline construction methodology).

This section examines the proposed development and comments on the impacts and mitigation measures on human beings in the vicinity of the Derrinumera site.

4.1.2 EXISTING ENVIRONMENT

4.1.2.1 Landuse

Derrinumera Landfill is located between two hills 500 metres north of the R311, on the main Castlebar to Newport road. The landfill is approximately 6.5 km east of Newport, 3km south of Lough Beltra and beside the Glaishwy River. The proposed SHC and LTF will be located at the existing landfill site, in the northwestern corner beside Cell 1. The area surrounding the site comprises of peat land, which is privately owned, and large tracts of this land have been afforested with conifers. Some of the bog land remains as an open common grazed by sheep.

The land use in this area is principally small-scale agriculture, mainly pasture. Much of the land in the area is fallow, with some old fields, or marginal agricultural land.

The proposed development at Derrinumera Landfill is located in a rural area with a relatively low density and dispersed population. Residential development in the immediate vicinity of the proposed site is confined to a number of "one-off" dwelling houses. There are no households within 1km of the site.

The rural nature of the site and the distance from an urban area suggests that the population close to the proposed development is unlikely to increase significantly in the near future.

4.1.2.2 Population

An overview of population and demographic information for County Mayo indicates the following trends:

Table 4.1.1 Population Change in the Region and Locality of the Proposed Development

	1986	1991	1996	2002	2006
State	3,540,643	3,525,719	3,621,035	3,917,203	4,234,925
Connaught	431,109	423,031	433,231	464,296	503,083
Mayo	115,184	110,713	111,524	117,446	123,648
Castlebar Rural District	13,612	13,469	13,920	12,952	13,901
Castlebar Urban	6,349	6,073	6,585	6,585	6,184
Newport (East & West)	1,538	1,521	1,591	1,636	1,827
Kilmaclasser DED	522	490	490	539	533

Source- CSO 2006.

All of the existing settlements in the vicinity are a considerable distance from the subject site the nearest being at Newport 6.5 km to the west and Westport 9 km to the southwest.

Information obtained from the 1996, 2002 and 2006 Census from the Central Statistics Office (CSO) shows the population of the State, Connaught and County Mayo have all increased between the years of 1986 and 2006.

The town of Castlebar is the administrative capital of Mayo. The population of Castlebar Urban District has increased from 1991, has remained stable from the 1996-2002 period, but 2006 figures have revealed a recent decline. However, the population of Castlebar rural area has increased since 2002. This highlights the growth and stability of population in the Castlebar rural areas; however in the Castlebar urban areas, population is undergoing decline.

The population in the town of Newport has increased since 1986, but has remained steady since 2002. The proposed development site is located in the DED of Kilmaclasser and this area has seen an increase in population since 1986 following declines in population in 1991 and 1996.

4.1.2.3 Socio-Economic Profile of the Locality

Commercial forestry represents the primary economic activity in the immediate surroundings of the site. The principal soil type underlying the region of Derrinumera Landfill is a low-level blanket peat. The range of uses of blanket peat in agriculture is very limited due to its poor drainage, adverse physical condition and it's occurrence in areas of poor climate.[10] Most farms in the area are small family holdings. The landfill site and its associated works have also generated employment in the area with 13 staff employed at the present time (August 2006).

Derrinumera is located approximately 6.5km east of Newport. Newport is located on the Northeast corner of Clew Bay and the Brown Oak River flows through its centre. As well as its scenic and coastal location, fishing plays an important part in the tourism of the area. There are no large-scale industries or businesses located in Newport. Small-scale employers include the Fisheries, South West Mayo Development Company, Maigheo Teic, and other small service enterprises. Much of the major employment in the area is provided by factories such as Baxter in Castlebar and Allergan Pharmaceuticals in Westport[11].

[10] Teagasc, 1998, Enhancing and Visualising Data on Soils, Land Use and the Environment.

[11] South West Mayo Development Company, 2004

Westport is a busy tourist town, situated at the southeast corner of Clew Bay. Fishing is very popular in the area, with shore fishing and boat fishing available locally. There are also sea and fresh water fishing as well as deep-sea fishing facilities in the area. There are numerous walking and cycling tracks in Westport. Tourism plays an important part in terms of employment in the region. Other employment in Westport includes companies such as Allergan, AMO, Isotron, Carraig Donn, Portwest and Field Boxmore Berrys.

At present, there are approximately 50 manufacturing industries in Castlebar. Castlebar is a larger town than Westport and its population has grown and stabilised over the last number of years. The town is well serviced with roads including the N5 to the East and North and the N60 to the South. According to 2002 Census data, the majority of those employed in Castlebar were employed in Health and Social work 17%, Manufacturing Industries 15%, Wholesale and Retail Trade 15%, Public Administration and Defence 8%, Education 8% and Construction 8%.

A number of companies, operating in sectors from manufacturing, to international services/software are located in Castlebar. These include Baxter Healthcare, Fort Wayne, American Power Conversion and Johnson Manufacturing Company. There are also a number of Enterprise Ireland supported companies located in the town (Table 4.1.2). These provide a significant level of employment. Education is also an important employer in the town with a campus of Galway-Mayo Institute of Technology located in the town.

Table 4.1.2. Enterprise Ireland Supported Companies in Castlebar

Company	Product/Service	Scale*
Ballyheane Timber Products	Furniture	Small
Cashin Printing Services	Printing	Small
Castlebar Enterprise Centre	Enterprise Space	Medium
Connaught Telegraph Limited	Newspaper and Printing	Medium
Corcoran Engineering	Engineering	Small
Duffy Engineering	Engineering (Fabrication)	Small
Flanco Engineering Ltd	Precision Engineering	Small
Gavin Bros. Ltd	Bread and Confectionary	Small
Jackson Engineering	Engineering	Small
Kelleher Oliver Trophies	Trophies	Small
Lawless Glass	Double Glazed Units	Small
Murphy stainless Steel	Stainless Steel	Medium
Rathure Ltd.	Knitwear	Small
Richard Oliver Ltd.	Artists Brushes	Small
Roadstone Ltd.	Concrete Products	Medium

Source: Enterprise Ireland, 2004. * Small (Up to 25 Employees), Medium (25-50 Employees), Large (50+ Employees)

4.1.2.4 Agriculture and Land-Use

As mentioned above, the land surrounding the landfill site is of limited use for farming enterprises and therefore local holdings of sheep and cattle are generally small. There are large areas of associated peat/moor land much of which is under commercial forestry.

4.1.2.5 Amenities and Tourism

It is an objective of Mayo County Council in the County Development Plan 2003 - 2009[12] to protect those areas of outstanding landscape, the natural and built environment and cultural heritage that form the county's tourism resource. Tourism in Mayo is a major employer. This is primarily focused on walking and angling in the area. It is mainly centred on Ballintubber Abbey, The Ceide Fields, Croagh Patrick, Foxford Woollen Mills, Pontoon, Westport House and the Museum of Country Life. None of these amenities are located within 9 km of the proposed development site.

There are no amenity facilities within the immediate study area. The land surrounding the site is quite unremarkable in nature, comprising mainly land under forestry and blanket peat land.

There are two walking routes, which are located in proximity to the town of Newport:

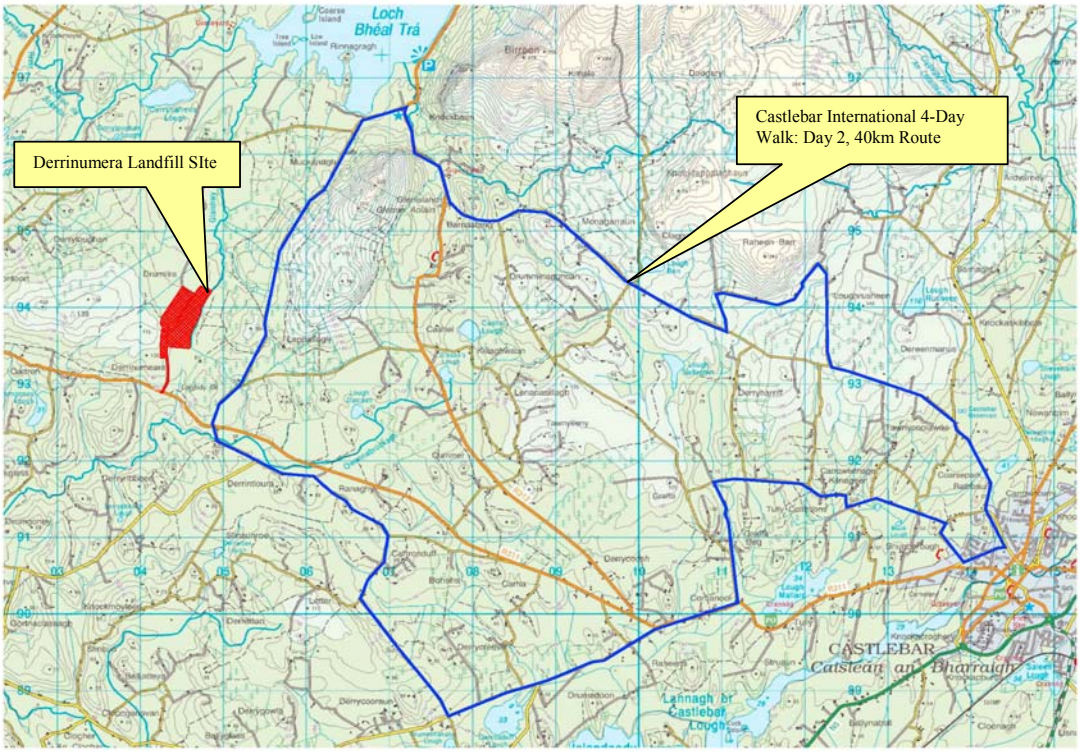
- The Bangor walking trail starts from Newport and ends in Bangor. This walking route, which covers 48km, passes Nephin Beg Mountain. The closest the trail gets to the landfill is at Newport, approximately 6.5km to the east;
- The Western Way walking trail starts in County Galway on the shores of Lough Corrib and winds its way north to the Ox Bow Mountains. It runs between Newport and Westport, to the west of the landfill and it stretches over 170km. The closest the trail gets to the landfill is 3km to the southwest.

There is an International four-day walking tour, which takes place each summer, which comprises a series of road walking routes and rambles, of 20km - 40km, near the town of Castlebar. Table 4.1.3 lists the number of participants in the walking tour from 1999 to 2005. The nearest route to the proposed development is on day two of the walking tour, which passes approximately 1km east of the site, where it crosses the R311 and heads north through the village of Glenisland. Figure 4.1.1 shows the nearest route passing the development site.

[12] Mayo County Council – 'County Development Plan 2003 – 2009'

Table 4.1.3 Number of Participants for Castlebar International Four Day Walks, 1999 to 2005

Year	No. of Participants
1999	1,371
2000	1,223
2001	-
2002	924
2003	702
2004	804
2005	806



Source map: OS Discovery Series Map 31

Figure 4.1.1 Castlebar International Four-Day Walking Tour – Day 2, 40km Route

Beltra Lough is located 3.5 km to the North of the site and is an important lake for angling. The lake is 3.8 km wide and provides fishing for spring salmon and Grilse from June and Sea trout from July. Angling is permitted at this Lough however it is no longer permitted to catch and kill trout here.

The Newport River flows into Clew Bay and Lough Beltra is its source. The rights to fish here are owned in their entirety by Newport House, which also owns the fishing rights to West Lough Beltra. The Newport River is noted for its salmon and sea trout fishing. This river is located north of the proposed development. The Newport River

is designated a candidate Special Area of Conservation (cSAC) [code 002144].

As outlined in the 2003 – 2009 Mayo County Development Plan, the tourism industry is a powerful driver of the economy and social development of County Mayo. This is especially true in rural areas, which could benefit from economic diversification. However, due to the fact that the landfill has been in place since 1974, the locating of the SHC and the LTF at the landfill site will not unduly impact on the tourism of the area.

4.1.2.6 Road and Traffic in the Existing Environment

Access to the site is off the Castlebar to Newport Road. Traffic flow at the landfill site is controlled by a number of measures and access to the proposed development shall be off the access road to the lower site. This is dealt with in more detail in Section 4.10.2 of this EIS.

4.1.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.1.3.1 Effect on Population

The proposed SHC and LTF are necessary for sludge and leachate treatment for County Mayo. The development will reduce the loading on the existing WWTP in Castlebar, due to the fact that leachate generated at Derrinumera will be no longer be brought to Castlebar. This will allow the Castlebar WWTP to accept additional wastewaters. This in turn will attract more industries to the region, which will have a positive impact on the economy of County Mayo. The efficiencies of other WWTPs in County Mayo will also improve, as all local authority sludges generated will be treated at the proposed SHC. This will improve the wastewater infrastructure throughout Mayo, thus enhancing the region as an attractive area for development.

4.1.3.2 Effect of Traffic on Population

Effect of Construction Traffic on Population:
The delivery of building materials to and from the site will lead to an increase in traffic volumes during the construction of the proposed SHC and LTF. The effects however will be short term and will be of a scale similar to any medium construction project. It is not envisaged that the construction phase will have a negative impact on the R311 due to its current good condition and there will only be a slight increase in traffic volume during construction.

Effect of Pipelaying on Traffic

The construction of a pumped rising main for transfer of treated leachate from Derrinumera Leachate Treatment Facility to Newport will have a short-term impact on traffic patterns in the affected area. Traffic management is a key issue for sewer construction in narrow rural roads and therefore will be a key issue for this element of the development. Traffic management plans will be compiled in accordance with the requirements of the *'Traffic Signs Manual (Chapter 8 – Temporary Traffic Measures and Signs for Roadworks)'*, Department of Environment, 2006 (or any subsequent amendments thereof) to ensure the continuous smooth flow of traffic along the pipeline route. It is envisaged that the pipeline construction will have a very slight short-term negative impact on traffic patterns during the construction period.

Effects of Operation Traffic on Population:

In the future, once the proposed SHC and LTF are up and running, traffic volumes will vary. There will be increases due to importation of sludges, employee traffic and traffic associated with exports of biosolids and fuel for the sludge drier. However, there will be reduced traffic due to the discontinuation of tanker transport of leachate to Castlebar WWTP, once the proposed system for pumping treated effluent from the LTF to Newport WWTP outfall is commissioned. This decrease in traffic will in all likelihood cancel out any increase in HGV traffic volume. It can therefore be concluded that the net effect of the SHC development will not significantly alter the present traffic situation at Derrinumera. This will be discussed in more detail in Section 4.10 of this EIS.

The effects of the proposed SHC and LTF are considered to be minimal as there are no households within 1km of the landfill site. In addition, the current landfill has already been in existence for over three decades. In light of this, the proposed SHC will not unduly impact on the population of the area. The majority of residents who live close to Derrinumera Landfill (i.e. over 1km away) will not have their social/travel arrangements disrupted and will encounter little or no change to their existing situation. The proposed site does not have any facilities such as churches, post offices, shops or national schools in the immediate vicinity. Those using the regional road adjacent to the site entrance will already encounter some limited traffic impacts due to the landfill currently in operation.

Possible Effects of Sludge Transportation Vehicles on Population:

The transportation of sludge has the potential to impact on the population as a result of spillages from vehicles bringing the dewatered sludge to the site. The majority of vehicles will contain sealed skips carrying sludge cake and the remainder will be bunded sludge tankers containing liquid sludge.

Only licensed contractors using vehicles that are sealed, roadworthy and meet the relevant standards for sludge transport vehicles will transport the collected sludge to the site. A description of these transport vehicles is provided in Section 4.10 of this EIS.

4.1.3.3 Effects on Employment

The project will create and will continue to support employment at local, and county levels both directly and indirectly.

Operation Activities:
There has been a history of constant employment at the landfill over a period of three decades. Extra employment at the landfill will occur when the proposed SHC and LTF are developed and will include a manager, an administrator, a sampling technician, a skilled operative and a number of drivers for transporting the sludge to the facility. These workers will spend locally and the spin-off from continuing employment at the landfill will also contribute to local employment. Throughout the construction period plant and equipment and associated operatives will be sourced locally wherever practicable. It is intended that during operation local people and services will be used for ongoing operation and maintenance where feasible.

Employment will also be created by the transportation of sludge to the site, in this way the positive impacts from the proposed development will be felt locally and also at a county level.

4.1.3.4 Effects on Agriculture and Land-use

Impact on the Immediate Site of the Proposed Development:
The proposed SHC and LTF are to be located on the site of the existing landfill. Since none of the site is used for agriculture, and since the construction will have no impact on any agricultural lands, the impact of the proposed development on the agriculture and land use in the immediate area is deemed negligible.

Impact on Agriculture and Farming in the Local Area:
The average farm size in Mayo, according to the CSO, is 21.9ha. This is below the Irish average farm size of 31.4ha and the Connaught average of 23.8ha. Agriculture in County Mayo is predominately reliant on specialist beef production 60%, mixed grazing livestock 16% and specialist sheep 15%. The agricultural land adjacent to the proposed development is generally poor with smallholdings of sheep and cattle.

The impacts of the proposed development have the potential to be significant in a worst-case scenario as a result of fugitive emissions, transport spillages etc. However best practise technology and techniques significantly reduce if not remove this potential.

Any spillages that may occur on site will be contained by the 'grey water' collection system. In addition to this, it is not envisaged that the implementation of the proposed development will have an adverse impact on groundwater resources. The potential of offsite spillages from vehicles transporting sludge cake and liquid sludge is negligible due to the standard and safety design of these transportation vehicles.

Impact on Agriculture and Farming Nationally:
According to the Mayo County Development Plan, employment in agriculture constitutes 22% of all employment in the county. Despite Mayo's high dependence on agriculture, employment in this sector declined by some 27% between 1986-1996. This decline is counterbalanced by a sustained rise in the numbers employed in the industrial and service sectors.

The SHC and LTF will be located at the existing landfill site and are unlikely to impact on agricultural activity. The SHC and LTF will be operated under best practice guidelines at all times so that adverse impacts shall not be felt in the surrounding areas.

There have been no significant impacts on farming activities or animal health as a result of the activities at the landfill to date. It is envisaged that the locating of a SHC and LTF here, will not increase any risk of negative impacts on farming activities or animal health.

4.1.3.5 Effects on Amenities and Tourism

Tourism generates considerable revenue for the west of Ireland. In 2002, it generated €596million with 2.35million visitors coming to the region (Ireland West Tourism). The proposed development of a SHC and LTF has the potential to impact negatively on the amenities and tourism of the area.

A brochure entitled "Mayo – Sustainable Tourism in the Coastal Zone" was published by An Taisce and Mayo County Council in 2000. Within this publication, a visitor survey was carried out during July, August and September of 1999 to determine the profile of current visitors to Mayo. During the survey, some five hundred and eighty three interviews were carried out across the following locations in Mayo: Achill; Mulranny; Erris; Westport and the Ceide Fields Visitor Centre.

Of the people surveyed, walking was the most popular leisure activity, followed closely by water-based activities, general sight seeing and relaxing. Fishing was also popular with those visitors staying in Westport and Erris.

Negative aspects of the holiday were quoted as being too much development (especially in Achill), a general lack of facilities (particularly no indoor leisure

facilities to cater for wet weather conditions) and a need for improved roads and signage.

A number of tourism centres have been identified in the county (see previous Section 4.1.2.5). The nearest walking routes- Bangor and the Western Way walking routes are not located in immediate proximity to the proposed site. There is no major tourist attraction located within 9 km of this proposed development. The nearest walking route, the "Western Way", is located 3km from the site. The walking route of the four-day walking festival runs close to the proposed development site during some of its stages. The current landfill however has been in operation for over three decades and has not impacted on the popularity of this walking festival.

Any potentially contaminated runoff, arising as a result of the development, will be contained via the proposed on-site 'grey water' collection system, which will eliminate the potential of such pollution reaching the nearby water channels. Potential silt runoff, resulting from pipelaying operations on the R311, will be prevented from entering nearby water channels with the provision of adequate siltation prevention measures, which will be agreed prior to the commencement of works. Therefore the amenities at Beltra Lough and Newport River will not be impacted upon.

Although tourism is an important sector in the economies of County Mayo, the landfill and its proposed development is located in an area of the county, which is not considered to be a significant tourist attraction. The visual impact of the proposed development will not cause any significant impact.

4.1.3.6 Effects on Property

Effect of Traffic and Construction Traffic on Property:

The main potential impacts on dwelling houses will occur during the construction phase of the development from increased traffic and its related noise. However, traffic increases will be negligible due to the constant history of landfill activity, construction and capping over the last few years at this site. Details of the impact of both construction and operation traffic are given in Section 4.10.3.

In relation to the possibility of devaluation of residential and other properties adjacent to the site it is concluded that, when the development is complete and operated in accordance with the proposed plans, that any adverse impact on the overall value of property in the area will be negligible. There are relatively few dwellings in proximity to the site, with the nearest dwelling located over a kilometre away. This means that the impacts of this type of development will be limited by its remote location and will impact on relatively few people. The visual impact of the proposed SHC and LTF at the existing landfill site is also limited due to its location behind Cell 1.

Given the central location of the proposed development of a SHC at Derrinumera, the delivery of sludge to this location will lead to a net decrease in sludge transportation related traffic experienced throughout the county.

Increased HGV movements will occur as a result of sludge importation to and biosolids exportation from the proposed facility. However, the discontinuation of tanker transport of leachate to Castlebar as a result of the proposed development, will in all likelihood cancel out any increases in HGV traffic at the site. Therefore, it is not envisaged that the proposed SHC and LTF will result in any increases in HGV traffic volumes.

The number of car movements at the site will increase by 12 movements per day due to the additional 6 No. staff, which will be required to run the SHC and LTF. Based on current car movements at the facility, this will lead to an approximate 6% increase in car movements. It is not considered that this minor increase in car movements will have a negative impact on the community as these workers will spend locally and the spin-off from continuing employment at the landfill will also contribute to local employment.

Effect of Odour on Property:
The detailed odour impact assessment carried out for this proposed SHC and LTF (refer to Section 4.7.3 of the EIS) shows that no significant odour impact will be perceived in the vicinity of the proposed development. In keeping with commonly used odour annoyance criteria internationally, the proposed development, which will be operated using best practice techniques, will be unlikely to generate complaints.

4.1.3.7 Effects on Health and Safety

Impacts regarding the health and safety of this proposed development, relate primarily to concerns about individuals either straying or trespassing into the subject area, alongside the health and safety of every worker or visitor to the site.

In the case of workers and visitors to the site, the day to day operation of this development, including any activities associated with site machinery and on-site vehicles, and additionally how visitors are to present and conduct themselves when engaging with the proposed SHC and LTF, will be undertaken in compliance with all health and safety legislation pertaining to such.

The proposed SHC and LTF will be designed, constructed and operated in accordance with Safety, Health and Welfare at Work (Construction) Regulations 2006 and Safety, Health and Welfare at Work (Biological Agents) Regulations, 1998, and also in accordance with relevant other legislation as set out previously in Section 3.6.3. The

Biological Agent Regulations set out the duties of an employer as regards the health of their employees. Employers must identify the biological agent to which workers are, or may be, exposed. They must assess the risk, making use of the classification referred to in Regulation 2 and the Fourth Schedule, and proceed in accordance with the remaining Regulations where appropriate.

Fencing shall be put in place around the proposed SHC and LTF so as to maximise safety and security at the site. Only people depositing sludge or involved in monitoring or otherwise authorised by Mayo County Council will be permitted to enter the SHC or LTF site. Access to the site outside of normal operational hours is not permitted unless specifically authorised and supervised by Mayo County Council.

Beneficial impacts of discontinued leachate tankering operations have already been referred to above.

4.1.4 MEASURES TO MITIGATE ADVERSE IMPACTS

The project is being developed in such a manner that the impact on human beings (i.e. dwelling houses, agricultural, tourism and traffic) is minimised.

4.1.4.1 Safety and Security

- It is the intention to operate the proposed development, including all machinery, in compliance with relevant health and safety laws and regulations.
- A Construction Management Plan will be drawn up prior to the commencement of construction activities, in order to minimize the impacts to the environment during construction. The Construction Management Plan will detail the allowable working day, construction traffic, parking arrangements and incorporating environmental protection measures. Fencing shall be placed around the perimeter of the development so as to ensure security at the site.
- There will be little or no long-term change to social or travel patterns for those local residents living close to the site, or along the local road network surrounding the site, as no public road, footpath or pathway will be permanently severed. The nearest residence is located over 1km away from the site. The existing access route in place at the landfill shall be utilised for this development also.
- Prior to 1983 there was a right of way through the site but the Council has since extinguished this.

4.1.4.2 Traffic Safety During Pipeline Construction

During the pipeline construction phase on the R311, the Contractor shall be responsible for the planning, implementation and maintenance of traffic safety and

management measures required in order to facilitate the work including the ultimate removal of temporary traffic control facilities (i.e. traffic cones, traffic cylinders, signage and lighting) when each phase of the works is complete. Prior to the commencement of the works the Contractor will be required to provide detailed traffic management plans, compiled in accordance with the requirements of the *'Traffic Signs Manual (Chapter 8 – Temporary Traffic Measures and Signs for Roadworks)'*, Department of Environment, 2006 (or any subsequent amendments thereof).

In the interests of avoiding interruptions in traffic flow the Contractor will be required to phase the works so that a maximum of 100m of pipework can only be constructed at any one time. Complete Road closures will not be permitted, and access will be maintained at all times for private entrances and business premises affected by or adjacent to the works.

In the interests of public safety, all appropriate traffic control and safety measures will be put in place and maintained on a continuous basis, i.e. traffic cones, traffic cylinders, temporary traffic signage and lighting. The Contractor will be required to appoint a Traffic Safety and Control Officer to liase with the Gardai and put into immediate effect any traffic measures considered necessary to ensure the safety of the public.

4.1.4.3 Day to Day Running of Development

- The main concerns regarding the construction of the proposed SHC and LTF is the increase in traffic volumes at the site and on the adjoining road network. In order to mitigate any impact that construction traffic may have on the entrance road, an appropriate sum will be provided in the construction contract to cover the possible repair or re-strengthening of the entrance road from the R311, and the permanent reinstatement of any affected sections of the R311 post pipeline construction.
- Ongoing monitoring of noise and odour at the site will take place and the use of noise abatement equipment as necessary will be undertaken at the development. It should also be noted that the appointed Contractor will also be required to comply with the *European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations, 2005, S.I. No. 787 of 2005.* These Regulations were introduced in December 2005 and set out requirements for waste water treatment plants to be designed, constructed, operated and maintained so as to avoid causing nuisance from odour emissions or noise. They also require operators of such plants (sanitary authorities or their agents) to;
    1) Maintain records of mandatory environmental standards, including those relating to odours and noise which relate to waste water treatment plants;
    2) Provide details of all necessary steps taken to comply with the Regulations to the Environmental Protection Agency each year;

3) Make a report annually to the Environmental Protection Agency detailing any incidents arising from odours or noise in respect of any waste water treatment plant and details of any environmental complaints in relation to the operation of such plants; and
4) Forward copes of all complaint records to the Environmental Protection Agency for any specific plant over any specified period on request from same.

The responsibility for ensuring compliance with the requirements of the Regulations lies with the Environmental Protection Agency.

- Current landfill activities do not adversely affect farming operations. In order to minimise the potential impacts on the environment, the proposed SHC and LTF will be operated in accordance with good management practices.
- Throughout the construction phase the contractor will maintain close contact with the Gardai to keep them informed of planned road use and road safety issues.

Outside the site, negative effects on properties closest to the site will be slight and short-term. The nearest residence is located over a 1km away. Therefore the potential impacts on local residences are minimal. The proposed SHC and LTF will pay a major positive role in servicing the needs of householders, tourism, industry and commerce in the county.

Accordingly with the mitigation measures outlined in relation to visual intrusion, noise, traffic, effects on tourism and agriculture, the potential negative effects of the proposed SHC and LTF on the local residents are expected to be negligible.

4.1.5 CONCLUSIONS/RECOMMENDATIONS

Derrinumera has been identified as the most suitable location for a SHC and LTF in the Mayo Sludge Management Plan due to a number of factors. These include:

- Its remote location in relation to neighbouring houses and sensitive receptors;
- It has a good road network serving the site; and
- The current land use as a waste handling facility.

The main advantage of this site is the established land use as a landfill site. This means that there is infrastructure in place that will suit this type of development. The surrounding road infrastructure is already suited to the transportation of large loads of waste material. Due to the use historically as a landfill, the locating of a SHC and LTF here will not unduly impact on the scenic nature or tourism of the area.

The SHC and LTF will comply with all regulations pertaining to the running of such a development.

The proposed SHC and LTF will not have an overall negative impact on the socio-economic profile of the area. This development is a necessary element of the overall waste management infrastructure needs of County Mayo and will ensure that the necessary infrastructure is in place to allow for continued growth of industries and employment in County Mayo.

4.2 ECOLOGY (FLORA & FAUNA)

4.2.1 INTRODUCTION

This section details the ecological assessment of lands at Derrinumera Landfill, County Mayo and the corridor surrounding the proposed treated leachate pipeline route. The aims of an ecological assessment were to:

- Identify habitat type present within the site and along the proposed treated leachate pipeline route;
- Identify the predominant plant and animal species within each habitat; and
- Identify any rare or threatened habitats present and assess if they will potentially be impacted upon by the proposed development. This also included the identification of any designated areas of conservation within 5km of the proposed site.

4.2.2 EXISTING ENVIRONMENT

4.2.2.1 Baseline Ecological Survey of Proposed Development Site

4.2.2.1.1 Methodology

This study consisted of both a desk study and a field study.

The desk study involved:

- Inspection of relevant maps and aerial photographs where available; and
- Review of existing and proposed designations in Department of the Environment Heritage and Local Government Heritage Service's datasets.

A vegetation classification was carried out by walking through and visually inspecting the site in September 2003. The site was then divided and described by habitat type according to "A Guide to Habitats in Ireland" (Fossit, 2000). This walkover survey does not provide for a comprehensive species list, however, it is sufficient to describe and evaluate the ecological value of the site. Habitat type and direct sightings were considered for likely presence of endangered or threatened species.

Aquatic invertebrate sampling was carried out on the 17th September 2003 by kick sampling according to standard EPA methodology and using nets with a 1mm mesh. The kick sample taken was in the most suitable gravel-stone substrate present downstream of the site, for a duration of 2 minutes, (refer to Figure 4.2.3). This location in the stream is adjacent to the existing water sampling point, as used by Mayo County Council for the existing Waste Licence monitoring programme. The sample was then preserved with alcohol and taken to Scientific Resources Ltd. in the Zoology Department of Trinity College, Dublin for identification and analysis.

The results were analysed and values assigned using the EPA scheme of Biotic Indices or Quality (Q) Values. The relationship of Q-Values to water quality is set out in Table 4.2.1 below. (Refer to Section 4.2.2.1.6 for result obtained).

The evaluation of a water quality rating is based on the relative abundance of groups of indicator organisms. Table 4.2.1 outlines the key features of the classification system.

Table 4.2.1. The Biological River Quality Classification System (McGarrigle *et al.*, 2002)

Q Value	Community Diversity	Water Quality
Q5	High	Good
Q4	Reduced	Fair
Q3	Much Reduced	Doubtful
Q2	Low	Poor
Q1	Very Low	Bad

4.2.2.1.2 Survey Constraints

Field visits were undertaken during late summer. It is possible, therefore, that some species may be under-recorded due to seasonal factors.

A comprehensive faunal survey was not a practical proposition for the following reasons:

- Most animals are small and shy of human presence, therefore, it would take a far more detailed study to confirm their presence than this study's time allows; and
- Many mammals often tend to be more active at night making their presence more difficult to detect.

For this reason, the faunal surveys were carried out by searching for signs such as dwellings, droppings, feeding areas and occasionally by direct sightings. Habitat type was considered for the likely presence of certain species. Bird species on site were identified by direct sightings and calls. Again habitat type was considered for likely presence of rare or endangered species.

4.2.2.1.3 Site and Area Description

The site is situated approximately eleven kilometres west of Castlebar, Co Mayo (refer to Figure 1.1). The site for the SHC & LTF currently comprises of a settlement lagoon and bare ground and buildings, however the land fenced in for the landfill was also surveyed and a habitat classification carried out. Additional habitats in the study area therefore include amenity grassland, wet grassland, recolonising bare ground, the landfill waste body, spoil, bare ground and lowland blanket bog.

4.2.2.1.4 Designated Areas of Nature Conservation

The following designated area of nature conservation, i.e. candidate Special Areas of Conservation (cSAC), is within 5km of the proposed site and is shown graphically in Figure 4.2.1.

Table 4.2.2 Designated Areas of Nature Conservation

Site Name	Site Code	Designation	Distance to Site (Km)	Orientation
Newport River	002144	cSAC	2km	Northwest

The Newport River is a relatively short river, flowing from Beltra Lough to the sea at Newport, County Mayo. The cSAC area has recently been revised to include Lough Beltra, as shown on Figure 4.2.1.

It is a low-level river, which flows through wet grassland and wet heath. In parts the wet grassland is improved to varying degrees through the application of fertilisers. A small section of the river runs through blanket bog. There are sections of the riverbank that are wooded with deciduous trees. Some coniferous afforestation occurs close to the river in two areas.

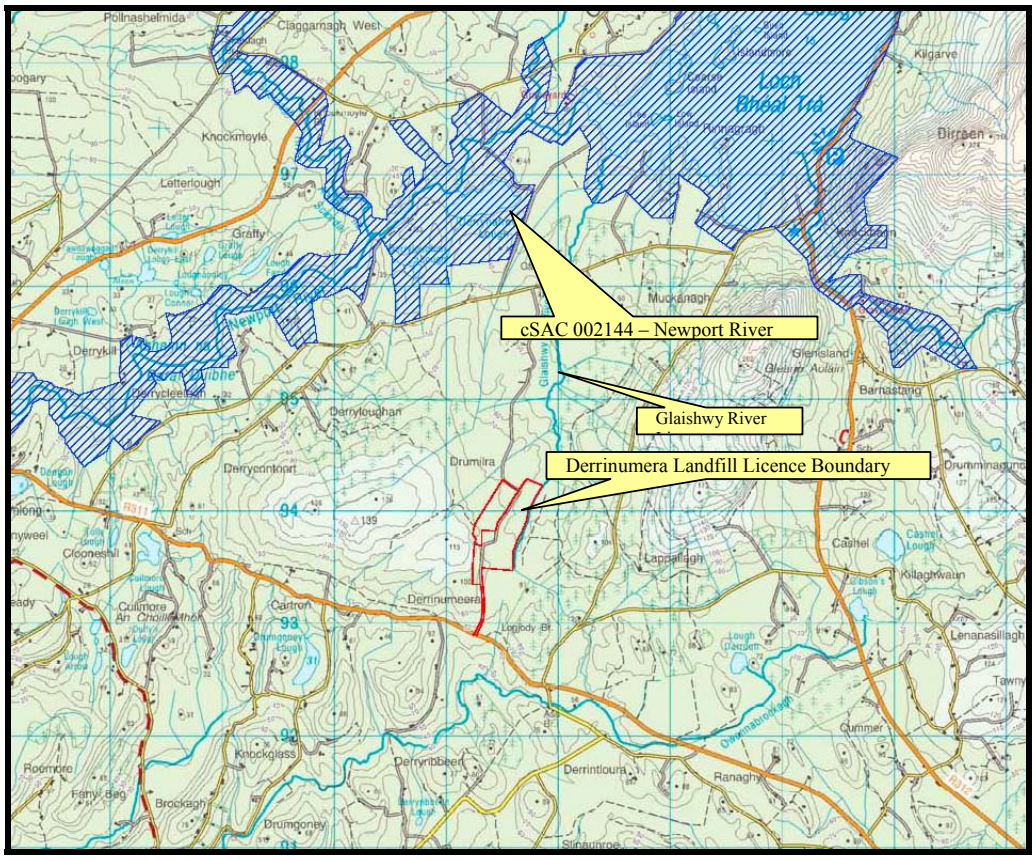
The Newport River, located north of the proposed development, flows from its source at Lough Beltra on into Clew Bay. Newport House owns the fishing rights to this river and to west Lough Beltra. This river is noted for its salmon and sea trout fishing. Freshwater pearl mussels, a protected species listed in both the 1976 Wildlife Act and the European Union Habitats Directive, are known to occur in the Newport River. Due to the significant presence of the pearl mussel here, the Newport River is designated a candidate Special Area of Conservation (cSAC) [code 002144]. The water quality of the river is good and the site supports populations of mussels along with several other protected species including Otter and Kingfisher. The rare Irish Heath is also known from the site.

Clew Bay is designated a candidate Special Area of Conservation [code 01482] under the Habitats Directive, as many of the habitats and species in Clew Bay are listed under Annex I of the Directive. In addition, Clew Bay is a designated shellfish water (under the *European Communities [Quality of Shellfish Waters] Regulations, 2006*) and forms part of the 'transitional and coastal waters' as designated by the Water Framework Directive. The site includes all of the estuarine habitat in Newport Bay, extending to the road bridge in the town. Clew Bay is also protected under an Oyster Fishery Order that was granted to the Clew Bay Oyster Co-operative in 1979.

Lough Furnace (adjacent to Newport and linked to Newport Bay by the Burrishoole Channel) contains an Annex I Priority Habitat under the Habitats Directive - one of the few permanently stratified lagoon lakes in Ireland and UK.

The Burrishoole catchment is a scientific area of conservation and local salmon stocks are protected under the EU Habitats Directive. The Burrishoole system is regarded as a world index site for Atlantic salmon and feeds into international assessments conducted by the International Council for Exploration of the Seas (ICES), the European Inland Fisheries Advisory Council (EIFAC) and the North Atlantic Salmon Conservation Organisation (NASCO). It should also be noted that eels are also a key species studied in the Lough Furnace/Burrishoole System. The natural and flat oyster beds in Clew Bay are of both national and international importance.

As stated above, the interest in the Newport River lies primarily in the presence of a significant population of the Freshwater Pearl-Mussel (Margaritifera margaritifera). A survey in 1995 estimated the population of the Pearl-Mussel within the site at approximately 5,000 individuals. As the water quality of the river is good, the mussels were found throughout the river system in both gravel and rocky bed areas. Given the proximity of the treated leachate pipeline route to the Newport River and its tributaries, a Molluscan (Margaritifera margaritifera) survey was undertaken during February 2005, in order to assess whether the streams which would intersect the route of the pipeline along the R311 support the pearl mussel. This survey was carried out under licence from the NPWS. Findings from the 'Margaritifera Margaritifera' Survey are summarised below, and a copy of the full report is included in Appendix No. 5, Volume IV.



Source map: OS Discovery Series Map 31

Figure 4.2.1 Map Showing the Location of the Nearest cSAC, Newport River.

4.2.2.1.4.1 *Findings of Margaritifera Survey*

The purpose of the survey was to establish the presence or absence of adult freshwater pearl mussel. Ten streams were surveyed along the proposed pipeline route (see

Figure 1, Appendix No. 5, Volume IV), of which no mussels were encountered. Due to visibility conditions and weather constraints, it was not possible to survey the Newport River, however living mussels could commonly be seen from the bank through a bathiscope, downstream of the bridge
and along the pipeline route.

Pearl mussels are particularly sensitive to silt runoff. A short episode of silt pollution can kill all pearl mussels in the age group of 0+ to 5+. A prolonged silt episode can kill adult as well as juvenile mussels. Given the extent of the pipeline proposed to run alongside the Newport River (up to 1.5km), and the fact that it coincides with the main concentration of the mussel population, all reasonable efforts will be made to keep the pipeline trench as great a distance as possible from the bankside of the Newport River. Where this is not possible, the contractor will be required to provide proposals for stringent siltation prevention along the pipeline route and to provide contingency planning in regards to the risk attached to pipelaying as regards siltation episodes.

A risk assessment has been carried out, in terms of operational risks associated with the treated leachate transfer pipeline, which has been provided in Section 4.2.4.3 of this EIS. Where the pipe crosses the river, it is intended to sleeve the pipe with a larger diameter pipe laid beneath the riverbed, with the sleeve terminating in a chamber on each side of the river. Consultations will be undertaken with the National Parks and Wildlife Service in advance of this construction. It is proposed that river crossing works will be strictly supervised by an ecologist.

4.2.2.1.5 Habitats

Figure 4.2.2 outlines the main habitat types identified within the development site and descriptions of each are given below.

Figure 4.2.2 Habitat Map

4.2.2.1.6 Flora

Amenity Grassland (improved) (GA2)[13]:
This habitat is found adjacent to the office building to the south of the site. It is species poor with a short sward. Grasses present include *Poa* spp and Yorkshire fog (*Holcus lanatus*). Other species present include: daisy (*Bellis perennis*), clovers (*Trifolium* spp) and ribworth plantain (*Plantago lanceolata*).

Wet Grassland (GS4):
This habitat is found to the north of the site graduating from bog and recolonising bare ground. Typical species here include creeping buttercup (*Ranuculus repens*), soft rush (*Juncus effuses*), rosebay willow herb (*Epilobium angustifolium*), red clover (*Trifolim pratense*), ribwort plantain (*Plantago lanceolata*) and nettles (*Urtica dioica*). Other species present include marsh pennyworth (*Hydrocotyle vulgaris*), Bullrush (*Typha latifolia*) and Willow (*Salix* spp). The main grass species present are *Agrostis* spp, *Festuca* spp and *Poa* spp. Occasional blanket bog species still survive in patches; such as heather (*Calluna vulgaris*) and common cotton grass (*Eriophorum angustifolium*).

Recolonising Bare ground (ED3):
A large portion of land surrounding the existing landfill is considered under this category. Many species present are typical of boggy areas while others are more grassland in nature. The predominant species are sorrel (*Rumex acetosa*), bramble (*Rubus fruticosus*), colt's foot (*Tussilago farfar*), white clover (*Trifolium repens*) and red clover (*Trifolium pratense*). Other species include daisy (*Bellis pernnis*), dandelion (*Taraxacum* spp), gorse (*Ulex europaeu*s), willow (*Salix atrocinerea*) and *Rhododendron ponticum.*

Refuse and Other Waste (ED5:)
This applies to the working face of the landfill.

Spoil and Bare Ground (ED2):
This habitat is scattered through the existing landfill and civic amenity area.

Lowland Blanket Bog (PB3:):
Degraded Atlantic blanket bog:
This habitat exists to the northern and southern edges of the site. It grades into wet grassland and recolonising bare ground. Species recorded include: purple moor grass (*Molinia caerulea*), soft rushes (*Juncus effuses*), sedges (black bog rush (*Schoenus nigricans*), deer sedge (*Trichophorum caespitosum*) and common bog cotton (*Eriophorum angustifolium*)), cross-leaved heath (*Erica tetralix*), bell heather (*Erica*

[13] Nomenclature as used in Fossit, 2000

cinerea), ling (*Calluna vulgaris*), *Spagnum* spp, *Cladonia portentosa*, *C. uncialis*, milkwort (*Polygala serpyllifolia*), tormentil (*Potentilla erecta*), round-leaved sundew (*Drosera rotundifolia*), Bilberry (*Vaccinium myrtillus*) and bog asphodel (*Narthecium ossifragum*).

Buildings and Artificial Surfaces (BL1):
The existing landfill is located to the centre of the site. Encompassed within the site are roadways, lagoons, hard standing areas and offices with associated outbuildings.

Watercourses

Drainage Ditch (FW4):
A drainage ditch runs along a portion of the site road to the settlement lagoon. It is generally species poor, ranging from isolated stands of pondweed (*Potamogeton polygonifolius*), bottle sedge (*Carex rostrata*) and soft rush (*Juncus effuses*).

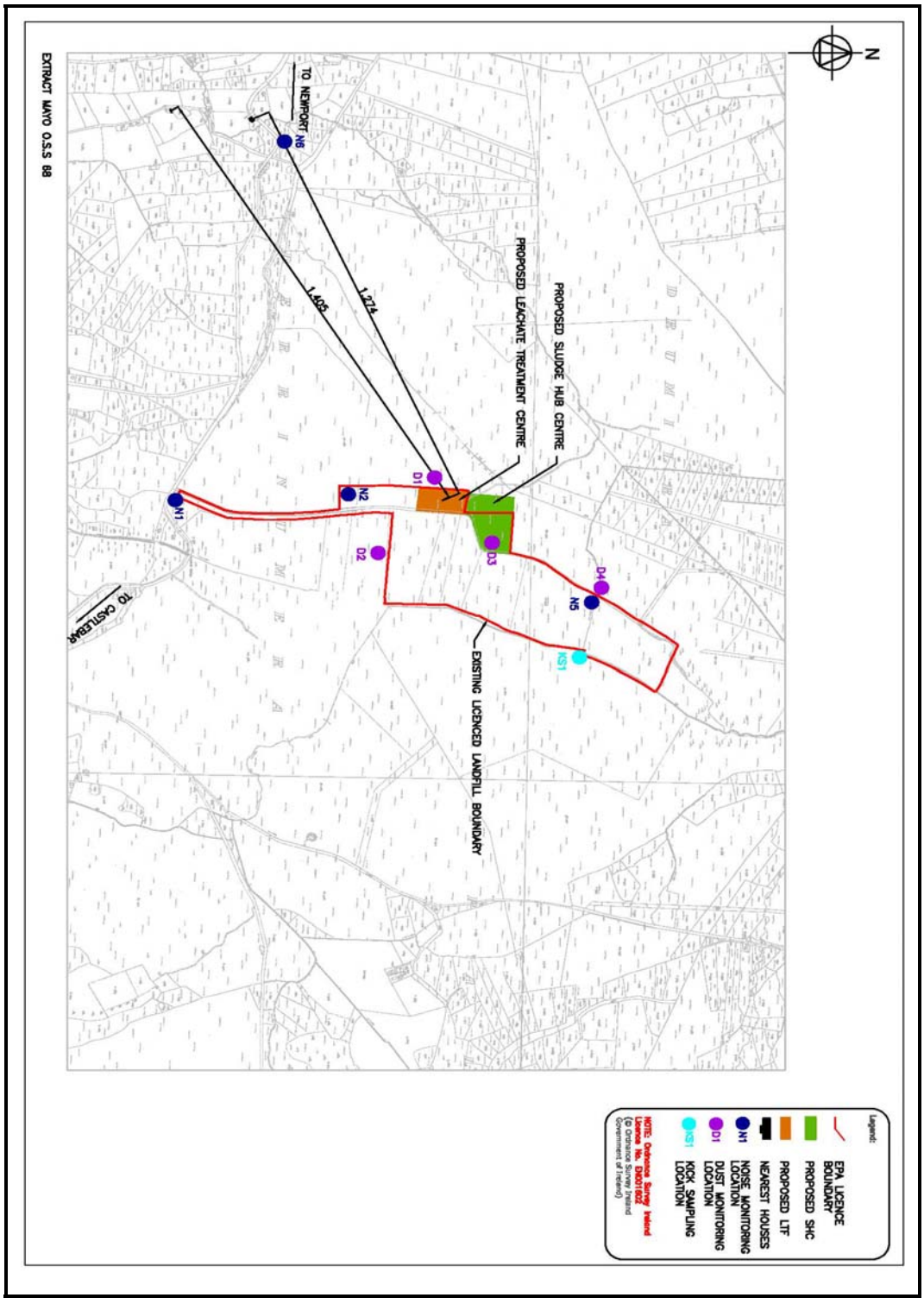
Depositing/Lowland Rivers (FW2):
The Glaishwy River flows north outside the easterly boundary of the landfill site, but at this point on its course the river is little more than a stream. The river is outside the study area. From there it flows into Beltra Lough from which the Newport River leaves to head to the sea entering at Newport.

A kick sample was taken to the north of the site in September 2003 in a suitable gravely substrate (KS1), the location of which is shown on Figure 4.2.3. This is the same location from where the landfill water monitoring samples are taken. Bank side vegetation included bramble. The table below lists the species identified. The official lab results are shown in Appendix 6, Volume IV.

Table 4.2.3 Species List from Kick Sample (KS1)

Phylum	Taxic Group	Q Group	Number
Mollusca	**Class Gastropoda**		
	Limnea sp.	D	18
	Class Bivalvia		
	Sphaerium sp.	D	1
Arthropoda	**Class Insecta**		
	Order Coleoptera Family Dytiscidae *Dytiscus* sp.	C	5
	Order Diptera Family Chironomidae	D	3
Number of Taxic Groups			4
Total Abundance			27
Overall Q-Rating			2-3
Shannon-Weiner Equitability Index (J')			0.68
Berger-Parker Dominance Index Value (1/d)			1.5

Figure 4.2.3 Monitoring Map



The sample contained only Group C and D fauna, and was dominated by limneid snails. This resulted in a Q-value of 2-3 being assigned, indicative of moderate levels of pollution. However, the sample contained large quantities of quite coarse organic matter, indicating that the sample was not taken from an area of reasonably high water velocity. Thus a Q-value of 3 may be more appropriate.

The EPA have a monitoring point at Glaishwy Bridge, approximately 2km north of Derrinumera Landfill Site (downstream) and the following table gives the recent biological quality ratings for the monitoring point, showing improvements in the overall quality of the stream. An EPA report on Biological Surveys of the Glaishwy River is given Appendix 7, Volume IV.

Table 4.2.4 Results of Biological Surveys of the Glaishwy River

Sampling Station		**Biological Quality Ratings (Q Values)**				
No.	Location	Jun 2000	May 2001	Dec 2001	Jun 2002	Dec 2002
0100	Glaishwy Bridge	3	3	3	3	3-4
		Jun 2003	Dec 2003	Jun 2004	Dec 2004	June 2005
		3-4	3-4	4	4	4

The EPA Report on biological surveys of the Glaishwy River indicates Q value ratings of 3-4 for December 2003 and 4 for Dec 2004 and June 2005, indicating slight pollution in 2003 with recent improvements to unpolluted levels of water quality in December 2004 and June 2005.

4.2.2.1.7 Fauna

Birds

During the survey, birds typical of this habitat were observed such as blackbird *(Turdus merula)*, meadow pipit (*Anthus pratensis*), wood pigeon *(Columba palumbus)*, magpie (*Pica pica*), blue tit (*Parus caeruleus*), starling *(Sturnus vulgaris),* chaffinch (*Fringilla coelebs*), hooded crow (*Corvus corone cornix)* and robin (*Erithacus rubecula*). These are all common and widespread species typical of the habitat types present.

Mammals

There were no signs of specific mammals noted during the field survey, though it is probable that a range of species utilize the site and surroundings; including hedgehog (*Erinaceus europaeus*), pygmy shrew (*Sorex minutus*), bank vole (*Clethrionomys glareolus*), rat (*Rattus noirvegicus*) and wood mouse (*Apodemus sylvaticus*). No evidence of badgers (Meles meles) or Foxes (*Vulpes vulpes*) was noted during the survey, although they may utilise the area for foraging. No evidence of bats was observed within the proposed site. No mature deciduous trees were found, nor any

ruined or old buildings suitable as summer roosts for bats. Therefore, it is unlikely that bats roost in the area.

Other Vertebrates

There are no other records of vertebrates from the site; however, other vertebrates likely to utilise the area are frogs (*Rana temporaria*) in marginal drainage channels. Frogs are common across cutover bog that has re-vegetated and in bogs where pools provide breeding and feeding areas.

Invertebrates

No invertebrates were recorded at the site but it is likely that marginal vegetated areas are home to common butterflies, such as small heath (*Coenonympha pamphilus*), dragonflies such as common hawker (*Aeshna juncea*) and common darter (*Sympetrum striolatum*) and damselflies, such as blue-tailed damselfly and large red damselfly (*Pyrrhosoma nymphula*). A range of small beetles, spiders and ants would also be found along the vegetated margins of the cutover bog and bog remnant fringes.

4.2.2.1.8 Evaluation

An attempt is made here to provide an evaluation of the habitats within the landfill site boundary. The evaluation follows the Regini (2000) guidelines for ecological evaluation. This evaluation considers the presence/absence of noteworthy species and a judgement of the viability of the habitat present. The levels of ecological value are listed in Table 4.2.5.

Table 4.2.5 Levels of Ecological Value

Ecological Value	
A	International value
B	National value
C	Regional Value
D	High local value
E	Moderate local value
F	Low local value
G	Negligible

The proposed development site is considered to have **low local value F**. This category includes '*undesignated sites, or features considered appreciably to enrich the local habitat resource within the context of a Parish or neighbourhood (e.g. a species-rich hedgerow)*' (Regini 2000). This assignment is justified for the following reasons:

- There are no records or sightings of rare plants or animals within the proposed development site;
- The proposed development site does not include any areas designated, or that will be potentially designated, for their ecological value;
- The greater part of the site comprises *buildings and artificial surfaces* and *recolonising bare ground*;
- The only habitat of ecological significance listed within the land fringing the proposed development site is lowland blanket bog, PB3. This is however disturbed/fragmentary and considered to be of low ecological value;
- The bog fringes are therefore viewed as having a local ecological value as they provide remnant areas for persistence of local species;
- The most significant ecological aspect is that the area is located within the catchment of the Glaishwy River and the Newport River cSAC (as shown in Figure No. 4.2.1).

4.2.2.2 Baseline Ecological Survey of Treated Leachate Pipeline Route

A terrestrial assessment was undertaken during March 2005. This assessment involved a survey of the surrounding habitat, flora and fauna of the proposed treated leachate pipeline route. A copy of the report is included in Appendix No. 4, Volume IV.

4.2.2.2.1 Methodology

A field survey of the pipe route was carried out in early March 2005. Practically the entire route was covered by foot. The width of the survey corridor varied, being up to 50 m to either side of the central line in the less developed sections.

During the survey, habitats, plant species and vegetation types present were recorded using an (enlarged) Ordnance Survey 1:10,560 scale map (Map No.s 1 to 3, Appendix 4, Volume IV). Habitat classification is according to the system recommended by The Heritage Council (Fossitt 2000). Notes were made on bird species present along the survey corridor. For mammals, the main emphasis was on search for signs of activity or dwellings, such as setts of badgers. Particular attention was given to the possible presence of habitats and/or species, which are legally protected under Irish or European legislation (especially the Flora Protection Order 1999; Wildlife Act 1976; Wildlife (Amendment) Act 2000; EU Habitats Directive; EU Birds Directive).

The standard literature was checked for references to the site and locality, as were the listings and maps of sites of conservation importance in County Mayo held by the National Parks and Wildlife section of the Department of the Environment, Heritage and Local Government.

4.2.2.2.2 Survey Constraints

The survey was carried out in early spring, a period when principal habitats are readily identified based on perennial species, early growing species and physical characters. As no terrestrial habitats of high conservation value were identified, further survey in summer is not considered necessary. Apart from bats, most mammals are active in winter and their signs could be easily found due to low vegetation cover. Both resident bird species and winter migrants were present at time of survey. While a survey for nesting birds was not conducted, this is not considered a significant limitation, as no species of conservation importance (other than kingfisher) would be expected to occur within the survey area due to the types of habitat present.

Overall, no significant difficulties were encountered in compiling information on the flora and fauna of the study area.

4.2.2.2.3 Study Area Description

The study area extends from the existing landfill site at Derrinumera to Newport Harbour, a distance of approximately 6.5 km from east to west. The pipeline will follow the existing road for practically the entire route, with part of it skirting the Newport River. The study corridor is mostly through low quality agricultural land, with developed land predominating towards Newport town. The topography of the area is low-lying hills, with a rise from west to east to over 100 m at Derrinumera.

The principal natural or semi-natural habitat of conservation importance in the study area is the Newport River. Elsewhere, the habitats have low or negligible conservation value though the various small lakes are of local interest. There are no known rare or scarce plants (as listed in the Flora Protection Order 1999[14] or in Curtis & McGough 1988[15]) in the area. The fauna found in the area is typical of the Irish countryside. There are no habitats to support concentrations of wintering waterfowl.

4.2.2.2.4 Designated Sites of Conservation in the Survey Area

Two candidate Special Areas of Conservation, designated under the EU Habitats Directive (Council Directive 92/43/EEC), are relevant to the study area:

[14] Flora (Protection) Order, 1999 (S.I. No. 94 of 1999)

[15] Curtis & McGough (1988), "The Irish Red Data Book. 1. Vascular Plants". Stationary Office, Dublin

- The Newport River cSAC (code 02144) is an important site for the pearl mussel *Margaritifera margaritifera* and the Atlantic salmon *Salmo salar*, species that are listed on Annex II of the EU Habitats Directive. Other important species such as otter *Lutra lutra* and kingfisher *Alcedo atthis* also occur. The site includes all of the river channel upriver of the old railway bridge in Newport but the extent of adjoining terrestrial habitat that is included within the site is currently under review (M. Dromey NPWS pers. comm.). For details for this site see NPWS site synopsis in Appendix 4, Volume IV.

- Clew Bay cSAC (code 01482) is of importance for a suite of habitats and species listed on Annex I and Annex II of the Directive respectively. The site includes the entire estuarine habitat in Newport Bay, extending to the road bridge in the town.

4.2.2.2.5 Flora

A description of habitats and flora along the route from east to west, including mapping and photographs are included in Appendix 4, Volume IV.

The entrance road to the landfill is surrounded to the west by an established conifer plantation and to the east by a recently planted plantation. Soils here are peat based, with heath and bog apparently the habitats present prior to planting. The entrance road to the landfill is lined by alder *Alnus glutinosa* trees and shrubbery.

The section of the R311 from the landfill to Cartron is relatively recent, with remnants of the original road surface still present. Species present in the grassy areas include common couch *Elymus repens*, cock's foot *Dactylis glomerata*, crested dog's tail *Cynosurus cristatus*, thistles *Cirsium* spp., nettle *Urtica dioica* and dandelion *Taraxacum* spp. Gorse *Ulex europaeus* scrub is a feature alongside the road and in some of the adjoining fields, as is bramble *Rubus fruticosus* dominated scrub. Rushes (both *Juncus effuses* and *J. inflexus*) occur in places indicating wet conditions. Occasionally, heath species such as bell heather *Erica cinerea,* heather *Calluna vulgaris*, purple moor-grass *Molinia caerulea* and tormentil *Potentilla erecta* survive along the road margins. At the wall/fence boundaries between the road verge and adjoining land, occasional hawthorn *Crataegus monogyna* and willow *Salix* spp. is found. The principal adjoining habitats in this area are wet heath and wet grassland, the latter improved to varying degrees. The wet heath has been heavily grazed.

From Cartron to Cuilmore a section of new road of c.1 km is under construction. The habitats here are disturbed and the pipeline would presumably be laid in the already disturbed ground.

The R311 runs close to Cuilmore Lough but is separated by a strip of ground that includes a building and some scrub. Moving west of Cuilmore, the land is more improved with improved grassland pasture being dominant. The road verges are narrower (1-2 m approximately) and comprise mostly grass. A low tree line of alder occurs on the northern side of the road just west of the small road which runs along the west side of Cuilmore Lough. Elsewhere along this section, fence lines are sometimes accompanied by low hawthorn. Doogan Lough is very close to the R311, being separated by a narrow field of improved grassland and some dense scrub.

The R311 follows the Newport River from Drumlong to the town. The eastern section of this length, as far as the bridge (bridge east of Newport Town), runs south of the river. The southern side of the road is skirted by a low grassy bank on which there is a low, well-maintained hawthorn hedge. Telegraph wires run above the hedge. Beyond the hedge there is steeply sloped ground that supports a strip of deciduous woodland, mostly birch *Betula pubescens*. A wet drain runs along the base of the slope. On the riverside, there is a grass verge of 1-2 m width. Between the verge and the riverbank, there is mostly woodland and scrub. This strip varies in width but is more than 10 m in places. Species present include ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus,* hawthorn and willow *Salix* spp.

After crossing the bridge, the road runs north of the river as far as the town. On the north side, opposite a disused mill type building, there is a low bank with a row of trees and shrubs. Behind this is a millrace channel. Shortly after this, there is ribbon housing development that runs almost continuously to the town. South of the road, a stand of low woodland and scrub occurs alongside the river just west of the old mill building. This includes ash and willow, with dense bramble cover over much of the area. The road then runs virtually alongside the river, separated only by a low stone wall.

The section of the pipeline, which will run through the town, is entirely within a built environment. The final section of pipeline leading to the proposed sewerage plant at Caulicaun would pass along a hedge-lined track that is partly overgrown. Hawthorn is the principal species. The treated leachate rising main will terminate at the proposed Newport WWTP outfall sump, which will be located within the site boundaries of the WWTP.

4.2.2.2.6 Fauna

Birds

The majority of the bird species, which occur within the survey area, are common and widespread species of the open countryside. A list of all the species recorded during the survey, along with their scientific names, is given in Appendix 4, Volume IV.

Meadow pipits were widespread in the grassland fields and open areas of heath alongside the R311. Skylark is also present in the area. Snipe are probably widespread, as several were flushed from one of the wet fields near Derrinumera. A further species of the wet grassland habitat is reed bunting.

Common birds of the scrub and woodland habitats include such species as blackbird, song thrush, wren and various tit and finch species. The wintering thrush, redwing, was recorded at several locations.

The Newport River provides good habitat for kingfisher *Atthis alcedo,* which is known to breed locally on the river (B. Madden, previous observations). Other wetland species, which use the river, include mallard, grey heron and cormorant. Grey wagtail is widespread on the river.

Mammals, Amphibians and Reptiles

The mammal species of most conservation interest, which occurs in the study area, is otter *Lutra lutra.* This species is known from the Newport River and is also widespread in Clew Bay (NPWS data, B. Madden previous observations).

A range of common species of the countryside was recorded in the area, including brown rat *Rattus norvegicus,* fox *Vulpes vulpes* and rabbit *Oryctolagus cuniculus*. Other ubiquitous species such as long-tailed field mouse *Apodemus sylvaticus* and pygmy shrew *Sorex minutus* would be expected, as well as less common though widespread species such as the Irish stoat *Mustela erminea* and badger *Meles meles.* It is noted, however, that no badger setts occur along the proposed pipe route. The Newport River corridor has good potential for bat species though elsewhere in the survey area the potential is low due to the scarcity of tall trees. Bats could roost in the stonework associated with the bridge.

The common frog *Rana temporaria* is present in the area (spawn noted on flooded ground close to R311). However, there are no ponds in the survey area, which could support newts *Triturus vulgaris.* The habitats along the route could support the common lizard *Lacerta vivipara*.

4.2.2.2.7 Evaluation of the Ecological Importance of the Survey Area

Ecological interest within the survey area centres on the Newport River, which, as well as aquatic/fishery interests, supports otter and kingfisher, species listed on Annex II of the Habitats Directive and Annex I of the Birds Directive respectively. The river is of International importance, as shown by the SAC designation. The woodland and scrub alongside the river is considered an integral part of the riparian habitat.

Elsewhere, the existing R311 passes through habitats that are partly or largely improved, namely improved agricultural grassland, wet grassland and remnant heath. None of these habitats are of significant conservation importance. The various small lakes that occur to the south of the R311 appear of reasonable quality and are rated of Moderate Local value.

The survey area does not appear to support any rare or protected plant species (as listed in Flora Protection Order 1999 or in Curtis & McGough 1988).

Apart from the riparian fauna already referred to, the various fauna species, which occur in the survey corridor, are common species of the countryside and none are threatened or are of particular conservation importance.

4.2.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.2.3.1 Impacts at the Development Site

The SHC and LTF will be constructed at Derrinumera Landfill in an area that has been cleared of vegetation and potential habitats. Therefore the potential impact on flora and fauna is negligible.

The proposed SHC and LTF will be in the catchment of the Newport River cSAC. However, during operation, there will be no release of pollutants (e.g. hydrocarbons, wheelwash, etc.), siltation or release of leachate to watercourses in the area. Indirect impacts on the cSAC are unlikely if the appropriate mitigation measures as proposed are put in place to control water quality during the construction and operational phases.

4.2.3.2 Pipeline Construction Impacts

The principal impact by the scheme will be habitat disturbance due to trench excavations. This will involve the temporary loss of some habitats but the actual permanent loss of habitat will be minimal.

Habitat disturbance

Along the largest length of the route, from Derrinumera to the Newport River, the pipeline would affect road verges that comprise hard-core, grass areas or disturbed ground. Apart from a relatively short length of hedgerow at Clooneshil, there are no hedgerows or tree lines of note. The land adjacent to the road, should it be required for working wayleaves, is predominantly wet or improved grassland and remnant heath. None of these habitats are of significant conservation value and disturbance by the development is rated as an impact of minor significance. The various lakes to the

south of the R311 would not be directly affected, as precautions will be taken during construction to prevent run-off (see mitigation measures).

Along the route section which runs alongside the Newport River east of the bridge crossing point, the line will be laid on the southern side of the road, therefore disturbance of the grass bank and hedgerow there would only be rated as of minor significance.

In the section west of the bridge crossing point, the route is likely to have less, if any, of a potential impact on the Newport River, as for much of the length there is ample hardcore areas associated with the existing developed areas. Disturbance to the trees/shrubs and associated mill race channel along the north side of the road, opposite the disused mill building, will be avoided as much as possible, as disturbance of these would be of minor to moderate significance.

There are no ecological interests and hence impacts of potential concern in the section of the route which passes through the town towards the proposed sewerage plant site.

Potential impacts on fauna

The various species of fauna (mammals, birds, amphibians) which occur along the pipe route would be largely unaffected by the scheme and all will continue to occur in the immediate vicinity. It is noted that no badger setts were located along the pipe route. Similarly, there are no colonies of nesting birds such as rooks or grey herons in any of the trees that could be affected.

As the pipeline is unlikely to have any direct impacts on the Newport River, it is considered that the otter and kingfisher populations would not be adversely affected. As pollution incidents during construction could affect the food supplies of these important species, suitable mitigation measures to counteract this occurrence will be enforced. Silt control measures will be implemented such as the construction of silt fences, which will be installed at the edge of the construction area to retain or filter runoff before discharge into adjacent watercourses. Sediment traps or basins will be installed to allow captured sediments to settle out. To improve trapping efficiency, these basins will be designed to incorporate features such as larger volumes, use of baffles, skimmers and other outlet devices and multicell construction. Sediment traps will be regularly inspected, maintained and cleaned as necessary.

The road bridge (east of Newport Town) that crosses the Newport River could support roosting bats. Should the scheme involve any direct interference with the stonework of this bridge, then roosting bats, if present, could be affected. If the road bridge over the Newport River were to be affected, then a survey would be required to establish whether the stonework provides a roost site for bats. This should be carried out in

advance of construction by a qualified bat surveyor. Should bats be found, then appropriate mitigation measures shall be carried out.

Overall, it is considered that no species of fauna would be lost from the immediate area or unduly disturbed due to the proposed development and therefore the biodiversity of the local area would not be adversely affected.

4.2.4 MEASURES TO MITIGATE ADVERSE IMPACTS

4.2.4.1 Mitigation Measures for Potential Impacts at the Development Site

As with the landfill, consideration was given to avoidance and reduction of impacts on the ecological environment at all stages. However, as with any development, some degree of impact is inevitable. Outlined below are mitigation measures that are recommended to avoid or reduce the predicted impacts of the proposed development, specifically the SHC and LTF, on the ecological environment.

Habitats:
The proposed development is a SHC and LTF in the grounds of an existing landfill thus mitigating against the need to construct the development in a green field site. There will be no removal of trees or other areas of semi-natural habitat during the construction.

Watercourses:
Mitigation measures for construction impacts will include the imposition of adequate protection measures to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with recognized standards. Surface run-off from roads and hardstanding within the facility will be fed through a grit trap and petrol/oil interceptors. The run off will then be diverted through settlement lagoons prior to outfall to the surface water drainage network.

All leachate from the proposed SHC will be contained and treated onsite at the proposed LTF, thus avoiding potential adverse impacts on watercourses. Site roads and depots are already managed to prevent silt-laden run-off from entering watercourses. This involves roads and other hardstand areas within the facility being constructed with gullies to drain all clean storm-water run-offs and allow settlement prior to discharge, via an oil interceptor and grit trap to a surface water lagoon. Surface water will be allowed to settle here prior to discharge to local watercourses.

Silt laden run-off will be collected in the existing settlement lagoons. They will also allow for the retention of surface water on site in the event of accidental spillages at the site.

In periods of warm weather, the spraying of insecticides may augment fly control. The use of insecticides will be kept to an absolute minimum, and where used will be applied according to manufacturers recommendations and best practice. Spraying will be conducted under contract.

4.2.4.2 Mitigation Measures for Potential Impacts of Treated Leachate Pipeline Construction

The route will be aligned to avoid causing disturbance to: the length of hedgerow (mostly alder trees) at Clooneshil; the woodland and scrub along the Newport River east of the road crossing. If it is found necessary to utilize any of the ground between the river and existing road, then consultations will be undertaken with the National Parks & Wildlife Service in advance of construction. If disturbance of this sensitive area is necessary, works will be strictly supervised by an ecologist; the line of trees/shrubs on the grass bank alongside the mill race channel opposite the disused mill building just west of the crossing point.

Any native species disturbed during pipeline construction shall be replaced with a similar species (probably mostly hawthorn and ash), whilst non-native species such as sycamore should be replaced with ash or oak. Banks and ditches that are disturbed shall also be re-instated.

Agreed mitigation measures will be taken to prevent run-off from construction areas reaching the three small lakes close to the R311 (Doogan Lough, Tully Lough, Cuilmore Lough).

During the construction phase, strict pollution control measures will be taken to prevent run-off or other pollutants from entering the Newport River and potentially affecting the food supplies of otter and kingfisher. Silt control measures will be implemented such as the construction of silt fences, which will be installed at the edge of the construction area to retain or filter runoff before discharge into adjacent watercourses. Sediment traps or basins will be installed to allow captured sediments to settle out. To improve trapping efficiency, these basins will be designed to incorporate features such as larger volumes, use of baffles, skimmers and other outlet devices and multicell construction. Sediment traps will be regularly inspected, maintained and cleaned as necessary.

If it is found during the construction phase, that the road bridge over the Newport River were to be affected, then a survey would be required to establish whether the stonework provides a roost site for bats. This would be carried out in advance of construction by a qualified bat surveyor. Should bats be found, then appropriate mitigation measures shall be carried out.

Unless previously agreed with the National Parks & Wildlife Service, cutting and removal of trees, scrub, hedgerows or vegetation on uncultivated land, which provide breeding habitat for bird species, should take place outside of the bird-nesting season, which is officially the period between March 1st and August 31st. This would comply with Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000[16].

4.2.4.3 Mitigation Measures for Potential Impacts from Treated Leachate Pipeline Operation

4.2.4.3.1 Pipeline Construction Methodology

The treated leachate pipeline from the Leachate Treatment Plant at Derrinumera to the head manhole on the outfall of the Newport WWTP treated effluent discharge, will operate as a pumped pipeline, with a treated leachate pumping station at the outlet side of the Leachate Treatment Plant, and will be included in the DBO Contract, both for construction and for operation.

The pipeline will be constructed in 200mm Nominal Diameter HPPE or HDPE, and will be laid in trench in the road margin over most of its route. It will be provided with on line Sluice Valves at approximately 1 km intervals, so that it can be isolated in sections of 1 km in length for leakage detection purposes. It will be equipped with Scour Valves at the lowest points of its longitudinal section, with the scour discharge taken into sealed offline chambers from which scoured washdown of the line would be removed by tanker.

The pipeline will have minimum cover of 0.9m from finished ground level to the crown of the pipe, but cover may exceed this where the pipeline is graded in a varying ground profile. The location of the pipe will be marked by a series of marker posts at intervals, and its location in the trench will be identified by a strip of marker tape, laid on the pipeline surround material, and beneath the general backfill. This marker tape will be responsive to electronic detection equipment used at the surface to locate the position of the pipeline.

Within the trench, the pipeline will be surrounded by granular bedding and surround material to the specification of the pipeline manufacturer, and supervision of the backfilling operation over the surround will ensure that no sharp stones are permitted in the selected backfill material, similar to normal practice in laying pressurised watermains.

[16] Refer to Section 46 of the Wildlife [Amendment] Act (2000) re. exemptions for certain construction works.

Lengths of pipeline will be welded on site into a string prior to lifting the string into the prepared trench. The welding operation will be carried out by specialist pipeline welders, each certified as competent to do this work, under controlled conditions of temperature, using a welding hot plate which melts the plastic material at both pipe faces to be welded. The pipes are then brought together under force at high temperature to secure fusion of the melted material, as evidenced by formation and dimension of the external bead. Each individual welded joint has a site record of the weld quality, and a selected number of samples of the days work are retained for destructive testing of the weld at an offsite accredited testing laboratory. The internal pipe weld bead is removed by a special tool after the weld has been made and passed. Mayo County Council has direct working experience of this technology, and there are a large number of contractors in the marketplace qualified to do this work.

Where the pipeline crosses a stream or river, it is intended to sleeve the pipe within a larger diameter pipe laid beneath the river bed, with the sleeve terminated in a chamber on each side of the river or stream, so that

(a) sampling of standing water in the chambers will indicate if any leakage is taking place in the pipeline, in circumstances where leakage might otherwise be difficult to locate, and
(b) so that any future deepening of the riverbed at that location, however unaware of the leachate pipeline, will strike the sleeve before impacting on the leachate pipeline itself.

With a river crossing, the normal method of pipe laying would involve timing the work for a period of low flow in the river, and then either

(a) digging out a temporary bypass flow on one bank, while working in the bed of the river protected by sandbags, or
(b) constructing a sandbagged working area on half the riverbed, followed by a similar construction on the opposite side, and laying the pipeline across in two half-sections, again without interrupting the river flow.

In each case the working excavation would be kept dry by pumping out water ingress, but the pumped water would be taken to a bankside lagoon, lined with Terram fine fabric, and settled for retention of fine material before the decanted flow returns to the river.

Before removing the sandbags and allowing the normal flow to resume over the backfilled riverbed excavation, the bed would be restored in a manner to be agreed with the Fisheries Board and the National Parks and Wildlife Service.

4.2.4.3.2 Risk Assessment

In terms of risks associated with the treatment of the leachate, and transfer of treated leachate to the outfall, these risks can be broadly categorised as follows:

(a) Power Failure or Mechanical Failure at the Leachate Treatment Plant or at Newport WWTP;
(b) Bursting or blockage of the treated leachate pumped pipeline;
(c) Accidental damage to the treated leachate pumped pipeline;
(d) Low-level leakage from the pipeline.

In terms of mechanical reliability, or in the event of a power failure, raw leachate collected from the unlined waste-body (below the lined cells) will continue to flow to the lagoon as it does at present. Similarly, leachate pumps, which would normally lift leachate from wells within the lined cells directly to the treatment plant, will automatically shut down, allowing leachate levels to temporarily accumulate within the cells, which is permitted to a depth of 1 metre on the base liner A suitable emergency valved bypass facility (to be installed) will intercept any leachate which has to be pumped to remain within this temporary storage constraint. Intercepted leachate will then flow gravitationally to the lagoon for storage. The lagoon will be kept drawn down as its' normal condition, so that this storage capacity will be available when needed.

The Lagoon pumps will not lift leachate for treatment on power failure, and neither will the treated leachate pumps deliver into the pipeline, while power supplies are out. A SCADA signal on power failure will in any case prevent the treated leachate pumps at Derrinumera starting up. Equally, in the event of power interruption at the municipal treated effluent pumps at Newport WWTP, a SCADA signal will prevent the treated leachate pumps at Derrinumera starting up. Therefore, for the duration of a power or mechanical failure at either treatment plant, treated leachate will not be pumped to Newport, and balancing facilities will be utilised in Derrinumera to accommodate this leachate.

It will be a requirement of the DBO Contract that appropriate levels of standby equipment are installed for all mechanical plant. Short-term interruption of the aeration process to an SBR plant will not harm the biomass in that plant.

The leachate treatment process will have a clarification phase as a minimum in an SBR process, and may have a filtration stage to follow that, if this is required to meet discharge standards. The risk of blockage of the treated leachate pipeline is therefore small. Nonetheless it will be equipped with Scour Valves at the lowest points of its longitudinal section, with the scour discharge taken into sealed offline chambers from which scoured washdown of the line would be removed by tanker.

The treatment of leachate being discharged into Clew Bay will be to an appropriate standard based on limits specified in Irish legislation. The design philosophy has

been to comply with the Urban Waste Water Treatment Regulations, 2001 and to otherwise treat the leachate such that the environmental quality standards specified in the Water Quality (Dangerous Substances) Regulations, 2001 and European Communities (Quality of Shellfish Waters) Regulations, 2006 are already attained in the pipeline prior to discharge to the receiving environment. The Environmental Protection Agency have a key role in establishing discharge standards for the treated leachate at Derrinumera landfill as part of the Waste Licence review which is currently being conducted.

The accidental release of a leachate, which has been treated to these very high standards, would have a minimum impact on the environment into which it leaks. Nonetheless it is very important to ensure that accidental releases of treated leachate does not occur, therefore numerous mitigation measures will be put in place along the entire route of the pipeline

In terms of pipeline bursting, this would be evident from the change in pressure conditions as experienced at the pumping station for any burst which occurred close to that station, if it were not evident by visual means near the burst site. In accordance with normal flow monitoring at both Derrinumera and Newport, two flow meters will be installed on the pipeline, one at the treated leachate pumping station at Derrinumera, and the other immediately prior to the combined outfall at Newport WWTP. In the case where there is a detected instantaneous difference in flow-rate, greater than 15%, showing up on the two flow meters, (thus indicating a possible significant loss of leachate along the pipeline route), an investigation to determine the cause of this deviation will be carried out immediately and an automatic shutdown facility will be immediately triggered. Similarly, if the sum of the daily bulk flows differs from meter to meter by more than 10% on any one day, this will again warrant an immediate investigation.

The treated leachate pipeline would be a continuously welded pipeline, pressure tested at the time of its construction, and before being commissioned to carry treated leachate. If low-level leakage were subsequently suspected, the pipeline can be divided into convenient lengths for testing purposes by closure of valves along it, in a sequential manner, until the section unable to sustain a test pressure is identified If it is found that a leakage of leachate is the probable cause for these anomalies in flow readings, step testing of the pipeline between valve chambers will be undertaken to identify the location of the leak. Again the lagoon at the headworks would provide sufficient balancing capacity to interrupt the discharge, repair the burst or leak, and if necessary mobilise tankers to transport the treated leachate on a temporary basis to the Westport Main Drainage system.

In order to prevent or mitigate the risk of accidental damage, the treated leachate pipeline would have an identifying marker tape placed on top of the granular surround to the pipeline in the trench. This would alert any machine driver as to the presence of

the pipeline, it would also prevent accidental misinterpretation of it as a watermain or other service.

In terms of low level leakage, which might not result in a noticeable pressure drop at the headworks treated leachate pumping station, this would be tracked in terms of comparison of the volumes of treated leachate discharged, with the metered discharge of treated leachate measured at the outfall sump at Newport, which should balance within metering accuracies. The treated leachate pipeline would be a continuously welded pipeline, pressure tested at the time of its construction, and before being commissioned to carry treated leachate. If low-level leakage were subsequently suspected, the pipeline can be divided into convenient lengths for testing purposes by closure of the Sluice Valves along it, in a sequential manner, until the section unable to sustain a test pressure is identified. Thereafter, likely sources of leakage, such as scour valves with defective glands or seals, would be examined, and afterwards the entire pipeline checked, if necessary by installing further SluiceValves to narrow down the possible sections of leakage.

As a matter of design, any stream or river crossing would be carried out in sleeved construction. This passes the treated leachate main within a sleeve of a larger pipeline beneath a river or stream bed, so that leakage to surface waters that might otherwise not be noticed is constrained to emerge at either end of the sleeve, above water level, where it can be tested and either confirmed watertight, or isolated and pumped by tanker in the event a leak is detected, pending repair.

Sampling of the treated wastewater from the Castlebar WWTP, when treating this leachate from Derrinumera, has shown that the secondary treatment process of a WWTP of the scale of Castlebar and Westport is capable of handling such leachate. Consequently the tankering of that leachate, as an interim solution, to Westport, where there is spare capacity to accept it, during any interruptions in normal treatment and pumping to the Newport WWTP Outfall, is sustainable.

4.2.5 CONCLUSIONS/RECOMMENDATIONS

Development Site

The development will be constructed in an area that has already been cleared, thus the potential impact on flora and fauna is negligible. The mitigation measures mentioned will reduce any impacts that may occur.

Pipeline Construction and Operation

The mitigation measures outlined above will be fully implemented, thereby ensuring compliance with the various National and EU legislation relating to habitats and species. Impacts on terrestrial ecology due to the proposed pipeline construction will be negligible to minor.

The contractor will be required to provide contingency planning against those items set out in the risk assessment (outlined in Section 4.2.4.3.2.), so as to ensure that potential adverse effects on surrounding watercourses are completely avoided.

4.3 SOIL & GEOLOGY.

4.3.1 INTRODUCTION

A report describing the existing soil conditions, geology and hydrogeology of the development site and surrounding area was prepared following a desk study, and site investigations at Derrinumera. Relevant documents that were accessed included:

- Geological maps;
- Publications by the National Soil Survey of Ireland, the Department of the Environment and Local Government, Teagasc, the Environmental Protection Agency and the Geological Survey of Ireland; and
- The original Waste Licence Application (No. W0021-01) submitted to the EPA by Mayo County Council in 1998.

The existing environment in the above regard is summarised in the following section. The 'Soil, Geology and Hydrogeology of the Development Site' report is included in Appendix 8, Volume IV.

4.3.2 EXISTING ENVIRONMENT

4.3.2.1 Overburden and Geology Encountered

The principal soil type underlying the region of Derrinumera Landfill is a low-level blanket peat. Peat is a partially decomposed mass of vegetation that has grown in a shallow lake or marsh, characterised by a high content of organic matter (over 30%) and by being at least 30 cm in depth.

In places this peat directly overlies bedrock, but where the bedrock is deeper, glacial deposits underlie this peat. In general, these glacial deposits consist of a sandy glacial till overlying fluvioglacial outwash sands. Both of these deposits consist of a range of clast sizes up to and including cobbles and boulders. Unconsolidated deposits that varied from sandy clay-to-clay rich sand were found during site investigations to the north, northeast, east, and southeast of the waste body.

The subject site is underlain by rocks belonging to the Croaghmoyle Formation (CM), which forms part of the Middle Devonian aged Beltra Group. Rocks belonging to the Beltra Group are generally referred to as the Middle Devonian Old Red Sandstone.

The Croaghmoyle Formation comprises rocks that are described as conglomerates composed mostly of quartzite pebble clasts that were derived from debris flows on an alluvial fan from high ground to the northwest.

4.3.2.2 Site Investigation Findings

Site investigations, comprising intrusive drilling, have been undertaken at the landfill site in 1997, 2000, 2001, and 2003.

A number of relatively shallow trial pits were excavated to the north of the landfill in 1997. Due to unstable ground conditions and formation collapse, all of the pits were terminated at shallow depths, thus bedrock was not encountered in any of the pits. The thickness of peat identified in all of these pits ranged from 0.3m to 3.35m. Glacial deposits encountered beneath the peat were described as sandy glacial till and/or fluvioglacial sand as discussed above.

The peat layer was found to be very thin or absent in the boreholes installed in 1997 to the south and west of the landfill. However, these boreholes were located on firm ground for reasons of drill rig access and stability. The depth of peat encountered in these boreholes varied throughout the site from 0m to 1.55m. Peat was encountered in all of the monitoring boreholes installed in 2003 to the north, northeast, east and southeast of the landfill. The thickness of this peat ranged from 2.5m to 4.8m in these boreholes with the exception of one borehole to the north of the wastebody where only a 0.3m thin horizon of peat was encountered.

15 No. gas monitoring wells were bored during 1997. Approximately 4.5m of sandy glacial till was encountered overlying bedrock in 3 No. gas wells located near the site office to the southwest of the landfill and approximately 2.8m of this till was identified overlying presumed bedrock in a gas well drilled to the west of the landfill. Approximately 1.5m of sandy glacial till was encountered overlying presumed bedrock in a gas well that was installed to the south of the landfill. Fluvioglacial sands were not identified in any of the boreholes installed to the south or west of the landfill. Sandy glacial till varying in thickness from 0.45m to 3.0m was described overlying bedrock in all of the groundwater monitoring wells installed in 1997 with the exception of one borehole located to the south where no overburden was encountered.

Unconsolidated deposits that varied from sandy clay-to-clay rich sand were described in the monitoring boreholes installed in 2003 near the cut-off wall to the north, northeast, east, and southeast of the waste body. The thickness of the unconsolidated deposits in these boreholes varied from 0.7m to 3.8m.

The bedrock encountered during drilling of boreholes in 1997 was described as red conglomerate bedrock. Bedrock encountered in the recent drilling of monitoring boreholes was described as a series of interbedded medium to coarse-grained red to purple/brown sandstones and fine to medium grained conglomerates. The conglomerates are composed of rounded to subrounded clasts of quartz, quartzite and sandstone with minor black/green volcanics in a sandstone matrix. There are also thin bands (<10cm thick) of red/brown mudstone.

In general, the depth to bedrock around the landfill is shallow and was in the order of <3.5m in the boreholes installed in 1997. However, the depth to bedrock varied from 4.5m to 7.4m in the monitoring boreholes installed in 2003. Bedrock outcrop occurs as ridges and rocky hills to the west and south of the landfill, respectively. The depth to bedrock under the landfill waste body was not determined, as drilling into bedrock under the fill area could have resulted in leachate being introduced to any underlying groundwater resources in the bedrock.

4.3.2.3 Conclusion to Site Investigation Findings

The most relevant boreholes to the proposed SHC and LTF to the west of the landfill site are MW1, MW5 and G9 (refer to Figure 3.2.1 in Appendix 8, Volume IV). MW1 was drilled in an area where bedrock occurs at ground level and hence no unconsolidated deposits were encountered. G9 was installed to a depth of 2.8m through sandy glacial till without encountering bedrock. The unconsolidated deposits encountered in MW5 comprised 0.6m of peat overlying 2.6m of sandy glacial till. Bedrock was encountered at 3.2m below ground level in this borehole. The bedrock encountered in both MW1 and MW5 was described as red conglomerate. This is considered to be a solid base for the foundations of the proposed development.

4.3.3 IMPACTS OF THE PROPOSED DEVELOPMENT

Implementation of the proposed SHC and LTF development will result in the removal of peat and unconsolidated subsoils to facilitate construction. The removal of these formations has a direct, permanent effect. However, this is not considered to be a significant negative impact.

The removal of bedrock will be necessary in parts of the subject site to create a level platform for the construction of the proposed sludge hub and leachate treatment centre. This is a direct, permanent effect but is not considered to be a significant negative impact.

4.3.4 MEASURES TO MITIGATE ADVERSE IMPACTS

Removal of peat, subsoil and bedrock is an inevitable consequence of the proposed development and no mitigation measure can be reasonably implemented. Any significant water ingress encountered by removal of subsoils and bedrock during the construction phase will be intercepted by drains and diverted to an existing drainage channel.

Where it is necessary to remove overburden or topsoil to facilitate construction, where possible and in the context of an agreed landscaping plan, any soils removed to allow for construction of development will be reused for the construction of landscaping features around the development site. These measures will ensure that any loss of existing topsoil or overburden resource is minimised.

All site works will be conducted in an environmentally responsible manner so as to minimise any adverse impacts on the soils that may occur as a result of works associated with the construction phase.

During construction phases, exposed soil is often dampened to avoid erosion and generation of dust. It is important that the 'dampening' water is not allowed to migrate to the groundwater or into the local river network.

4.3.5 CONCLUSIONS/RECOMMENDATIONS

The proposed development will not involve direct discharge to ground nor will it involve substantial excavation of soils and rock. There is no direct impact envisaged on the geology of the area.

4.4 WATER & HYDROGEOLOGY

4.4.1 INTRODUCTION

This water section, which was prepared following a desk study and site investigations at Derrinumera Landfill Site, addresses the surface water and groundwater environments in the region of the proposed development and existing landfill site. Relevant documents that were accessed comprised:

- Publications by the Department of the Environment, Heritage and Local Government (DoEHLG), the Environmental Protection Agency (EPA) and the Geological Survey of Ireland (GSI); and
- The original Waste Licence Application (No. W0021-01) submitted to the EPA by Mayo County Council in 1998.

It also addresses the anticipated impacts on the Marine Environment in Newport Bay and its environs consequent to a discharge of treated leachate. Documents, which are relevant in this context, are:

- *'The Marine Discharge of Treated Leachate'* – 2006, (Appendix 3, Volume IV);
- *'Leachate Characterisation Report'* – 2003, (Appendix 10, Volume IV).

Additionally, the impacts of discharging a treated leachate to the marine environment via the outfall from the Newport Wastewater Treatment Plant are assessed under:

- The Newport Sewerage Scheme EIS, published in parallel with this document, as part of the planning permission process;

The above reports, concerning treated leachate discharge, were compiled based on:

- Sampling results on the raw leachate (2003 and 2005) (sampling carried out by TES and TOBIN Consulting Engineers);
- Marine fieldwork and modelling undertaken in summer 2004;
- The expected efficiencies of treatment resulting from the various treatment processes likely to emerge from a DBO Contract procurement process for the SHC and the LTF.

In the Newport Sewerage Scheme EIS, the expected impacts based on the information to date are outlined, and the sustainability of the proposed marine discharge of treated leachate is tested on the model runs already performed, and for the outfall location selected.

4.4.2 EXISTING ENVIRONMENT

4.4.2.1 Surface Water Hydrology at Development Site

Surface water hydrology for the site was addressed in the original Waste Licence Application submitted by Mayo County Council to the EPA in 1998. This document was prepared prior to lining of Cell No. 1 and the construction of a cut-off wall around the perimeter of Derrinumera Landfill. One of the main objectives of this cut-off wall, which was installed during the period April to July 2001, is to retain any leachate flowing from the waste body. The main findings from the 1998 report are included in Appendix No. 11, together with results from more recent hydrological investigations undertaken post-lining of Cell No. 1 and cut-off wall installation.

4.4.2.2 Ground Water Hydrology at Development Site

Overburden and bedrock hydrogeology were also addressed in the original Waste Licence Application, submitted by Mayo County Council to the EPA in 1998. This document was prepared prior to lining of Cell No. 1 and the construction of a cut-off wall around the perimeter of Derrinumera Landfill. The main findings from the 1998 report are included in Appendix No. 11 together with results from recent hydrogeological investigations undertaken post-lining of Cell No. 1 and cut-off wall installation.

4.4.2.3 Marine Environment of Proposed Newport WWTP/ Derrinumera LTF Outfall Location

In light of the proposal to discharge treated leachate, in combination with final effluent from Newport Waste Water Treatment Plant, to the marine environment via a common outfall, the baseline dataset of the aquatic ecology and water quality for the receiving environment has been developed in the Newport Sewerage Scheme EIS, which has been published in parallel with this EIS. An extensive body of marine research work has been done in support of the Newport Sewerage Scheme, including the calibration and verification of a Hydrodynamic Model of the Inner Newport Bay area. The area covered by this research includes the Burrishoole/Lough Furnace system and the Newport Channel in general. Preconstruction baseline data (biotic and abiotic) have been collected from the area of the proposed discharge, the bay and associated aquatic system in general (marine, brackish and freshwater). Refer to Section 3.3 of the Newport Sewerage Scheme Environmental Impact Statement for baseline data on the existing marine environment of the proposed Newport WWTP/ Derrinumera LTF outfall and surrounding area.

4.4.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.4.3.1 Construction Phase - Runoff from Development Site

During the construction phase of the proposed development, it is likely that peat washings and a high content of suspended solids will be added to the drainage channels that drain the subject site. This is not considered to be a significant negative impact as the drainage channels flow to a settlement pond prior to discharge to the Glaishwy River, enabling settlement of any peat washings and suspended solids prior to discharge. Furthermore this impact is short-term and temporary, during the construction phase only.

4.4.3.2 Construction Phase – Pipe-laying of Treated Leachate Rising Main

The provision of a treated leachate rising main between Derrinumera LTF and Newport WWTP combined outfall will involve a pipe-crossing of the Newport River in a location upstream of Newport Town, along with the pipe-crossing of several streams on route. In addition, there are a number of small loughs, which, although will not be directly affected by excavation works, are in close proximity to the pipeline route. The primary impact associated with pipelaying is the potential occurrence of silt pollution events, however, stringent mitigation measures will be put in place for the prevention of such an event. Silt control measures will be implemented such as the construction of silt fences, which will be installed at the edge of the construction area to retain or filter runoff before discharge into adjacent watercourses. Sediment traps or basins will be installed to allow captured sediments to settle out. To improve trapping efficiency, these basins will be designed to incorporate features such as larger volumes, use of baffles, skimmers and other outlet devices and multicell construction. Sediment traps will be regularly inspected, maintained and cleaned as necessary.

4.4.3.3 Groundwater/Surface Water Resource Protection

The proposed development would have potential to cause groundwater and surface water contamination from vehicular fuel spillages and accidental sludge spillages on the sludge reception area, or from potential spillages from material storages on site. However, the proposed development is to be founded on a concrete hardstand and it is proposed that any surface water runoff on the concrete hardstand area which is deemed to be potentially contaminated will be diverted to the existing 'grey water' collection network to ensure that no contaminants discharge from the site.

The GSI[17] Groundwater Classification Schemes designate aquifers in the majority of the area surrounding the development site as L1/H (Locally Important Aquifer which is moderately productive only in local zones with high vulnerability) with some areas surrounding the site having a classification of L1/E (with small pockets of extreme vulnerability)

Notwithstanding the above classifications however, it is not envisaged that the implementation of the proposed development will have an adverse impact on groundwater resources, as liquids generated within the process are captured for treatment, unless they are of a standard permitting discharge to surface waters, and there are no local groundwater abstractions in the area or downgradient of the proposed development. Furthermore, as the area immediately downgradient of the proposed development is already developed by landfilling, it is not envisaged that

[17] DoEHLG, EPA, GSI (1999), "Groundwater Protection Schemes", Joint Publication.

implementation of the proposed development will have any increased impact on the quality of the underlying groundwater resources.

4.4.3.4 Stormwater Runoff

The development of the proposed SHC and LTF will result in additional stormwater runoff generation from the impermeable surfaces on the site. This will result in increased runoff to drainage. The exact impermeable area of the proposed development is unknown (this will be established under the DBO Contract), however, it is likely that much of the proposed area will be paved. This will reduce the amount of effective rainfall infiltrating the soil and bedrock aquifers. This is a direct, long-term effect but is not considered to be a significant negative impact given that there is an existing stormwater management system at the landfill site that can accommodate this additional runoff. Stormwater collected from roofs will be collected and used as process water in the operations of the proposed SHC.

4.4.3.5 Potential Impacts from Accidental Spillages/Breakages of Treated Leachate Pipeline

In terms of risks associated with the treatment of the leachate, and transfer of treated leachate to the outfall, these risks can be broadly categorised as follows:

(a) Power Failure or Mechanical Failure at the Leachate Treatment Plant or at Newport WWTP;
(b) Bursting or blockage of the treated leachate pumped pipeline;
(c) Accidental damage to the treated leachate pumped pipeline;
(d) Low-level leakage from the pipeline.

The impacts associated with bursting, blockage or accidental damage to the treated leachate pumped pipeline, would result in an accidental release of treated leachate to the surrounding lands and watercourses and at worst case entering Newport River, which is a water supply source for Newport Village and its environs. A risk assessment for the proposed transfer of treated leachate to the outfall at Newport is provided in Section 4.2.4.3.2. Adequate mitigation measures will be available for the prevention of a pollution event resulting from the above risks (a) to (d) as detailed in Section 4.2.4.3.

4.4.3.6 Potential Impacts on Receiving Waters from Marine Discharge of Treated Leachate

The discharge of a treated leachate to the marine environment in inner Newport Bay has the potential to impact negatively on the surrounding habitats and species. The

results of the impact could include the loss of species and their habitats, with the contamination of water, sediment and biota. Given the environmental significance of the receiving environment, the mitigation strategy that will be adopted to protect that environment and its inhabitants will be through the adoption of adequate discharge standards in the leachate treatment process.

A detailed version of the potential impacts on various species in relation to the baseline dataset of the aquatic ecology and water quality for the receiving environment has been developed in the Newport Sewerage Scheme EIS. (Refer to Section 3.3, Newport Sewerage Scheme Environmental Impact Statement).

4.4.4 MEASURES TO MITIGATE ADVERSE IMPACTS

4.4.4.1 Construction Phase

Any water ingress that may be encountered in the overburden and/or the upper weathered zone of the bedrock during the construction phase will be intercepted by a french drain and diverted to an existing artificial drainage channel or a natural watercourse. Drainage channels will be diverted via stilling ponds to reduce the silt content that would otherwise enter the downstream waters.

All site works will be conducted in an environmentally responsible manner so as to minimise any adverse impacts on the soils and water that may occur as a result of works associated with the construction phase.

4.4.4.2 Pipelaying Precautionary Measures

As a river crossing and a number of stream crossings will be required along the pipeline route, the Contractor will be required to provide proposals for stringent siltation prevention along the pipeline route and to provide contingency planning in regards to the risk attached to pipelaying as regards siltation episodes.

In regards to the Newport River crossing, the standard method of pipe laying would be employed involving timing the work for a period of low flow in the river, and then either

(c) digging out a temporary bypass flow on one bank, while working in the bed of the river protected by sandbags, or
(d) constructing a sandbagged working area on half the riverbed, followed by a similar construction on the opposite side, and laying the pipeline across in two half-sections, again without interrupting the river flow.

In each case the working excavation would be kept dry by pumping out water ingress, but the pumped water would be taken to a bankside lagoon, lined with Terram fine

fabric, and settled for retention of fine material before the decanted flow returns to the river.

Before removing the sandbags and allowing the normal flow to resume over the backfilled riverbed excavation, the bed would be restored in a manner to be agreed with the Fisheries Board and the National Parks and Wildlife Service.

4.4.4.3 Groundwater/Surface Water Resource Protection

As part of the proposal, it is intended to divert surface water runoff on the concrete hardstand area to the existing surface water collection network. However, in the proposed sludge reception area, the correct design and maintenance of wastewater collection and disposal systems will be used to ensure prevention of groundwater contamination. Oil interceptors will also be installed in appropriate locations (i.e. refuelling locations) such that surface water, which could become contaminated with hydrocarbons, is afforded appropriate treatment. Equipment will be regularly maintained and leaks repaired immediately. Accidental spillages will be contained and cleaned up immediately. Remediation measures will be carried out in the unlikely event of pollution of adjacent watercourses in accordance with recommendations from suitability qualified and experienced personnel.

4.4.4.4 Surface Water and Groundwater Monitoring

Permanent groundwater monitoring wells exist at the landfill site. Routine sampling and analysis will be carried out during both the construction phase and the operational phases to ensure that no adverse impact occurs that is associated with its development. A suite of parameters for analysis will be agreed upon with the regulatory body. Similarly, surface water samples will be collected for analysis on a routine basis during both construction and operational phases to ensure no adverse impact occurs on the surface water quality.

4.4.4.5 Storage of Raw Materials, Products and Wastes

With regard to on-site storage facilities and activities, any raw materials, fuels and chemicals, will be stored within structurally sound warehousing buildings and/or bunded areas if appropriate. On-site transfer areas must have adequate protective measures to guard against potential accidental spillages or leakages. All fuels and chemical storage tanks will be bunded, either locally or remotely, to a volume not less than the greater of the following:

(a) 110% of the capacity of the largest tank or drum within the bunded area; or

(b) 25% of the total volume of substance, which could be stored within the bunded area.

All drainage from bunded areas will be diverted for collection and safe disposal. Any spillages of raw materials onto paved areas resulting from on-site activities such as dried sludge bagging or composting shall be immediately removed for return to stockpile or safe disposal. Runoff from these areas will be designated as 'grey water' and will be included in the leachate collection system. All equipment and machinery will have regular checking for leakages and quality of performance.

4.4.4.6 Increased Stormwater Runoff

Increase in runoff is an inevitable consequence of the proposed development. Measures will be taken to ensure adequate drainage for stormwater runoff is in place when the proposed development is implemented.

4.4.4.7 Treated Leachate Pipeline

In terms of the risk of pipeline leakages or plant failure, mitigation measures to counteract these risks are detailed in Section 4.2.4.3 in regards flow monitoring and control. Where the pipeline crosses a stream or river, it is intended to sleeve the pipe within a larger diameter pipe laid beneath the river bed, with the sleeve terminated in a chamber on each side of the river or stream, so that

(a) sampling of standing water in the chambers will indicate if any leakage is taking place in the pipeline, in circumstances where leakage might otherwise be difficult to locate, and
(b) so that any future deepening of the riverbed at that location, however unaware of the leachate pipeline, will strike the sleeve before impacting on the leachate pipeline itself.

Provision of adequate mitigation measures in combination with ongoing monitoring will ensure pollution impacts from potential leakages from the pipeline are eliminated.

4.4.4.8 Marine Discharge of Treated Leachate

The environmental significance of local ecological characteristics will be considered at all times. The purpose of designating and managing SACs is to maintain at, or to restore to, 'favourable conservation status' the habitats and species listed in Annexes I and II of the directive.

Given the environmental significance of the receiving environment the mitigation strategy will be through the adoption of adequate discharge standards in the leachate

treatment process. The treatment of leachate being discharged into Clew Bay will be to an appropriate standard based on limits specified in Irish legislation. The design philosophy has been to comply with the Urban Waste Water Treatment Regulations, 2001 and to otherwise treat the leachate such that the environmental quality standards specified in the Water Quality (Dangerous Substances) Regulations, 2001 and European Communities (Quality of Shellfish Waters) Regulations, 2006 are already attained in the pipeline prior to discharge to the receiving environment. The Environmental Protection Agency have a key role in establishing discharge standards for the treated leachate at Derrinumera landfill as part of the Waste Licence review which is currently being conducted. Discharge concentrations in the treated leachate and wastewater will be monitored to ensure that the specified discharge standards are complied with in accordance with the requirements of the revised Waste Licence.

In addition to the monitoring requirements for the treated leachate as specified by the Environmental Protection Agency in the Waste Licence for Derrinumera landfill, biannual monitoring of the receiving waters, sediment, fish and shellfish at sites adjacent to the proposed discharge and moving away from the discharge will be implemented to safeguard the ecological integrity and in particular the favourable conservation status of the receiving environment in the short, medium and long-term. The development and implementation of this monitoring programme will be conducted in consultation with the relevant state and semi-state bodies (i.e. Environmental Protection Agency, Department of the Environment, Heritage and Local Government, Department of Communications, Marine and Natural Resources [including the Marine Institute]) with input from local stakeholders.

The purpose of this biannual monitoring programme will be to confirm the capability of the receiving environment to continue to accept discharges of treated leachate and treated wastewater. It should be noted that the results of this Monitoring Programme will be forwarded to the Environmental Protection Agency for consideration as consideration as part of their Waste Licence enforcement activity at Derrinumera Landfill.

Ultimately the Environmental Protection Agency will be required to establish the discharge standards for the leachate being discharged from Derrinumera landfill and outline monitoring frequencies as part of the Waste Licence Review process, which is currently on going.

During a meeting with National Parks and Wildlife Service in December 2004 it was requested that separate monitoring locations be included within the scope of the proposed development for the treated leachate, the treated wastewater from Newport wastewater treatment plant, and for the combined flows prior to the final discharge above the high water mark. These will be provided.

The reader should also make reference to the '*The Marine Discharge of Treated Leachate'* Report, which also deals with the environmental sustainability of the marine discharge of treated leachate provided in Appendix No. 3, Volume IV.

4.4.5 CONCLUSIONS/RECOMMENDATIONS

Siltation prevention measures have been outlined above for the construction phase of the development in terms of facility and pipeline construction. The potential for contamination of ground or surface waters around the SHC and LTF will be eliminated by means of an extension of the existing 'grey water' management system on site. Potential pollution of watercourses resulting from accidental leakages from the transfer of treated leachate to the proposed outfall will be mitigated against by several means, including sleeved pipe installation under stream/river crossings and continuous monitoring. The most significant potential impact in terms of water pollution relates to the discharge of treated leachate to Newport Bay. Mitigation measures to offset this potential impact includes the treatment of leachate to acceptable and safe standards prior to discharge in combination with a strict monitoring programme. Compliance with the mitigation measures above will ensure that no negative impact will be felt on the receiving environment as a result of the proposed development.

4.5 AIR: NOISE & VIBRATION

4.5.1 INTRODUCTION

The scope of the environmental noise and vibration aspects of this EIS were determined by reference to guidelines published by the Environmental Protection Agency (EPA) in 2003 – *'Advice Notes on Current Practice in the preparation of Environmental Impact Statements'* and by consultation with TES Consulting Engineers.

The noise environmental aspects of the EIS involve a number of components:

- Description of the existing noise environment;
- Identification of the principal sources of noise emissions in the locality;
- Identification of sensitive receptors;
- Description of the likely source and nature of noise emissions from the proposed development;
- Evaluation of the noise emissions and description of impacts arising from same;
- Identification and description of measures to mitigate impacts, where necessary.

All of the above components have been addressed in this report.

4.5.1.1 Glossary

Ambient noise:
The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.

Background Noise Level:
The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T. ($L_{A90, T}$).

Criterion Noise Level:
The long-term mean value of the noise level that must not be exceeded. This is generally stipulated in the IPC licence and it may be applied to a noise source, a boundary of the activity or to noise sensitive locations in the vicinity of the facility.

dB (decibel):
The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μPa).

dBA or dB(A):
An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'–weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

Facade Level:
Noise levels at locations 1m from the facade of a building are described by the term Facade Levels and are subject to higher noise levels than those in open areas (free-field conditions) due to reflection effects.

Impulsive Noise:
A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. In determining whether a tonal adjustment applies, reference can be made to ISO 1996-2 (1987) - Section 4.1.

$L_{Aeq,T}$:
The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T.

Noise:
Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could cause actual physiological

harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.

Noise Sensitive Location:
Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity, which for its proper enjoyment requires the absence of noise at nuisance levels.

Rating level ($L_{Ar,T}$) :
The specific noise level, plus any adjustment for the characteristic features of the noise.

Root Mean Square (RMS):
The RMS value of a set of numbers is the square root of the average of their squares.

Time-weighting:
One of the averaging times (Fast, Slow or Impulse) used for the measurement of RMS sound pressure level in sound level meters.

Tonal Noise:
Noise, which contains a clearly audible tone, i.e. a distinguishable, discrete or continuous note (whine, hiss screech or hum etc.). In determining whether a tonal adjustment applies, reference must be made to ISO 1996-2 (1987) - Section 4.1.

4.5.2 EXISTING ENVIRONMENT

The landfill operation is located in an extremely remote location. The nearest dwelling to the landfill is located on the R311 to the southwest, approximately 1,274 metres from the extreme southwest corner of the landfill site.

4.5.2.1 Noise Monitoring Programme

In fulfilment of certain obligations arising from the facility's Waste Licence (Ref. No. W0021-01), an annual monitoring programme is carried out to determine the noise impact of the landfill operations.

Derrinumera Landfill Waste Licence No. W0021-01 sets out noise emission limits, to be measured at noise sensitive locations. The licence states that "*there shall be no clearly audible tonal or impulsive component in the noise emissions from the activity at the facility boundary*" and that no specified emission arising from the facility shall exceed the emission limit values, which are tabulated below:

Day dB(A) L_{Aeq} (30 minutes)	Night dB(A) L_{Aeq} (30 minutes)
55	**45**

Mayo County Council personnel undertook the 2004 monitoring programme and the details of the survey results are summarised below.

A total of four sampling positions were selected for noise monitoring (refer to Figure 4.2.3), as set out in Waste Licence W0021-01.

Position N1: Located at the junction of the R311 and access road to the landfill site.

Position N2: Located at the extreme southwest corner of the landfill site, this position is representative of the southern and western boundaries.

Position N5: Located at the extreme northwestern corner of the landfill, this position is representative of the western and northern boundaries of the site.

Position N6: Located along the R311 approximately 1,150 metres to the southwest of the southern boundary of the existing landfill site. This position is representative of the nearest dwelling house.

The monitoring was conducted over discrete sampling periods of thirty-minute duration. A combination of day-time (08:00 - 22:00) and night-time (22:00 - 08:00) measurements was taken. The noise monitoring survey was conducted on the 8th and 9th December 2004. Weather conditions consisted of a light southwesterly breeze, dry and sunny but cold, with temperatures varying from 9.12 – 9.45ºC during daytime monitoring and 7.42 – 9.04ºC during night-time monitoring.

The environmental noise levels were determined using A-weighted network and fast-response. A Bruel and Kjaer Type 2260 Observer Noise Analyser was used. At each noise measurement point, the Sound Level Meter (SLM) was mounted on a tripod so that the microphone was maintained at 1.5 metres above ground level and at least 3.5 metres from any potential noise reflecting surfaces (other than the ground).

The following "A-Weighted" data were determined for each discrete sampling period:

L_{A10} The noise level equalled for 10% of the measurement period;

L_{A90} The noise level equalled or exceeded for 90% of the measurement period (This is taken to be representative of the 'background noise' level.);

L_{Aeq} The equivalent continuous A-weighted noise level for the measurement period. This is defined as the sound of a steady sound having the same energy as a fluctuating sound over a specified measuring period.

4.5.2.2 Monitoring Results

The results of the noise monitoring carried out at the designated locations during day and night time periods are summarised in Table 4.5.1.

Table 4.5.1 Noise Monitoring Results

Location	Date	Time	Duration	L_{Aeq}	L_{10}	L_{90}	Comment
DAYTIME							
N1	08-Dec-04	13:55:55	30mins	68	70	39	Main source of noise road traffic
N2	08-Dec-04	14:37:38	30mins	55	55	41	Main noise source landfill activity, truck movement
N5	08-Dec-04	15:15:18	30mins	50	52	47	Main noise source landfill activities
N6	08-Dec-04	15:51:45	30mins	57	62	42	Road traffic main source of noise
NIGHT TIME							
N1	08-Dec-04	21:47:03	30mins	66	54	< 31	No landfill operations audible. Road traffic main source of noise
N2	08-Dec-04	22:25:09	30mins	44	47	37	No landfill operations audible
N5	08-Dec-04	23:05:39	30mins	37	40	< 31	No landfill operations audible
N6	08-Dec-04	23:47:38	30mins	52	54	< 31	No landfill operations audible Main source of noise was road traffic

In relation to N1 and N6, both of which are situated on the main Newport Road, the elevated levels recorded are most probably attributable to the passage of cars on the R311. At N1 during the daytime approximately 80 vehicles passed as off-site traffic with a total of 12 vehicles as site related traffic. The L_{Aeq} during the daytime was 68 dB(A) with an L_{90} of 39 dB(A). During the night-time the L_{Aeq} was 66 dB(A) with an L_{90} of < 31dB(A).

Other off-site noises during the daytime sampling at N1, which would have influenced the results, were overhead aircraft. The reversing beacon of the landfill's compactor was barely audible at N1. No site operations were audible at N1 at night-time due to the complete shut down of the site with no plant or machinery in operation.

An L_{Aeq} of 57 dB(A) was recorded at N6 during the daytime and is most probably attributed to the fact that it is located adjacent to the Castlebar to Newport Road and is as a result of traffic and not the landfill activities. A total of 63 vehicles passed N6 during the sampling period during the day and would have contributed significantly to the noise levels recorded. The L_{90} for N6 was 42 dB(A). The reversing beacon of the compactor was barely audible at N6.

During night-time sampling at N6 approximately 40 vehicles passed during the sampling time and would have contributed to the slightly elevated noise levels. The night-time sampling period at N6 took place at 11.47pm. The L_{90} at night-time for N6 was <31 dB(A).

At the northern site boundary (N5) an L_{Aeq} of 50 dB(A) was recorded. The Godwin pump located at the leachate collection zone is only operational intermittently and was not in operation at this particular sampling period. The L_{90} for N5 was 47 dB(A). The main source of noise was the operation of machinery involved in the construction of the new Cell No. 2.

An L_{Aeq} recorded at N5 at night-time was 37 dB(A). No site operations were audible at N5 at night-time due to the complete shut down of the site with no plant or machinery in operation.

The L_{Aeq} recorded at N2, which is on the boundary of the landfill and closest to the landfill activities was 55 dB(A). The main sources of noise at this location were the reversing beacons of a skid steer plant, which was unloading skips during the sampling period. Also the wheelwash is in close proximity to the monitoring location at N2 and was intermittently in operation throughout the sampling period. The L_{Aeq} recorded at N2 at night-time was 44 dB(A). Traffic noise from the R311 was audible at N2 during the night-time.

Frequency analysis at the noise monitoring locations as prescribed in Licence W0021-01 show that there are no tonal emissions audible at any of the monitoring locations.

At the noise sensitive locations N1 and N6 the main source of noise was from the regular traffic on the main Castlebar to Newport road and not as a result of landfill activities. At each of these locations the reversing beacon of the compactor was barely audible and would not have contributed significantly. There have been no noise complaints received from local residents during 2004.

Noise levels at N2 were 1dB(A) over the licence noise emission limits both during the night-time.

Noise levels at N5 were within the licence limits.

4.5.3 IMPACTS OF THE PROPOSED DEVELOPMENT

The proposed development consists primarily of three elements as follows:

- The construction and operation of a Sludge Hub-Centre;
- The possible temporary relocation of an interim sludge drying and lime stabilisation plant;
- The construction and operation of a Leachate Treatment Facility.

Each of these elements is addressed separately below.

4.5.3.1 The Sludge Hub-Centre (SHC)

It is proposed that the SHC would be constructed and operated under a Design Build Operate (DBO) Contract for the collection, drying, temporary storage and sustainable re-use or disposal of treated municipal sludge, collected from wastewater and water treatment plants throughout County Mayo. The likelihood is that the preferred method of production of bio-solids will be thermal drying.

The SHC would stand on its own fenced site, with bio-solids manufacture separate from all other waste handling activities at the landfill. The SHC will handle an estimated 27,844 tonnes per annum (tpa) of dewatered sludge cake on start-up, rising to 32,580 tpa by the year 2020. The dry solids (DS) content of the wastewater sludge entering the facility will range from small amounts of liquid sludge at 3%, with the bulk of it being dewatered to an average of 17.5 % DS. Dewatered sludges arising from municipal water treatment will arrive at an average of 18 % DS.

Given the DBO nature of the proposal, details of the exact sludge treatment system are not currently known. However, the proposed SHC will be designed and operated to ensure full compliance with all environmental noise obligations that currently pertain to the licensed facility. In addition, good engineering practice will be incorporated into the SHC design to minimise its environmental impact.

While the environmental noise impact of the 'as yet to be designed' SHC cannot currently be predicted; the purpose built SHC can be readily designed and operated to a more stringent acoustical standard than either of the existing sludge drying and lime stabilisation plants proposed for a fallback interim solution. Using the latter facilities as 'worst case scenario', in terms of acoustical performance, the environmental noise impacts of the proposed SHC can be broadly estimated.

4.5.3.2 Relocation of Existing Sludge Drying and Lime Stabilisation Plant

It is proposed to temporarily relocate, if the need arises, a proprietary engineered diesel fuelled sludge drying and lime stabilisation plant, rated at 2.5 tonnes per hour (t/hr), (currently located at Ballina WWTP), to the existing machinery garage building which is located on the Derrinumera Landfill site. The existing machinery garage building would ultimately be incorporated within the fenced boundary of the proposed SHC facility.

If permitted, the temporary sludge drying and lime stabilisation plant (interim plant) would be operated by Mayo County Council staff until such time as the DBO Contractor was appointed. Directly on appointment, the Contractor would be required to operate the interim plant, until the permanent drying plant was commissioned.

The expected operational lifespan of the Interim Plant at Derrinumera will be 3 years. The interim plant will be diesel fuelled and it is rated at 2.5 tonnes per hour (t/hr). In order to characterise the typical emissions from the interim plant, a series of noise measurements was undertaken at a similar type plant at the existing Castlebar sludge drying and lime stabilisation plant.

A site visit to the Castlebar sludge drying and lime stabilisation plant was undertaken on the 16th of August 2003 and a characterisation of the dominant on-site noise sources was undertaken. This involved the determination of reference sound pressure levels for each of the significant noise sources. The measurements were taken when the machinery was operating normally.

Environmental noise levels were determined by using a Type 1 Bruel & Kjaer Modular Real-time Sound Level Analyser – B&K 2260F, with Half Inch, Free Field Microphone - B&K, Type 4189. The instrumentation was calibrated directly before and after the noise measurements.

The environmental noise levels were determined using the A-Weighted network and fast-response, and all environmental noise levels in this report are expressed in A-Weighted decibels (dBA), unless otherwise stated. The recorded measurements are presented in Table 4.5.2 below:

Table 4.5.2 Reference Noise Emissions from Fixed On-Site Sources

Plant/Equipment	Reference Position	L_{eq}
Wall-mounted extractor fan	5 metres from main fan	72
Oil Burner	2 metres from burner unit	85
Drier - Cylindrical Chamber	3 metres from unit	68

The data presented in Table 4.5.2 was based on short-term samples (typically 2-3 minutes duration), when the appropriate plant was operating normally.

All of the above listed typical sources and the entire interim plant will be sited within the existing machinery garage building, which is located on the Derrinumera Landfill Site. This is located a considerable distance from any noise sensitive receptor. The approximate distances from the interim plant to the nearest noise sensitive locations (NSLs) are presented in Table 4.5.3. These NSLs along with the position of the Leachate Treatment Facility and the SHC (including the interim plant) are shown in Figure 4.2.3.

Table 4.5.3 Distances to Nearest Receptors

Receptors	Distance from proposed Interim Plant (metres)
NSL1 (south-southwest of SHC)	1440
NSL2 (southwest of SHC)	1280

For the purpose of calculating the impact of the proposed dominant noise sources (which will be essentially identical to those identified in Table 4.5.2) a number of basic assumptions were made. It was initially assumed that free field conditions would apply to all of the individual sources and no consideration was, therefore, given to the effects of acoustical screening and/or acoustic reflection.

The Inverse Square Law was, therefore, used to calculate the expected reduction in noise levels as one moves away from a given noise source.

The Inverse Square Law states that as one doubles the distance from a source, a reduction of 6 dB is achieved as follows:

$L_{p2} = L_{p1} - 20 \text{ Log } (^{R2}/_{R1})$ where:

L_{p2} is the calculated sound pressure level (SPL) at a distance of R2 metres from the source.

L_{p1} is the measured reference SPL at a distance of R1 metres from the source.

Using the Inverse Square Law (and an adaptation of the 'activity L_{Aeq} method' provided in BS 5228) the impact of the individual sources on the nearest houses was calculated. The results of these calculations are shown in Table 4.5.4.

Table 4.5.4 Impact of Noise Emissions from Dominant Sources at the Nearest House

Plant/Equipment	Nearest House – NSL2 (metres)	Calculated Sound Pressure Level - SPL -(dBA)
Wall-mounted extractor fan	1280	24
Oil Burner	1280	29
Drier - Cylindrical Chamber	1280	15

Using the data in Table 4.5.4 and assuming all dominant sources operate simultaneously at the minimum distance of 1280m (without any acoustical screening whatsoever), the combined SPL at the nearest house would be 30 dBA. This prediction is based on the minimum attenuation available by distance alone (termed beam-spreading or wave-front spreading). However, this situation exaggerates the potential impact and although the exact configuration and layout of the Interim Plant is not currently known, the plant will be enclosed within the existing Machinery garage building. In addition, the calculated SPLs do not allow for the fact that all of the dominant noise sources will be well screened by the intervening ground, which will be predominantly soft. In reality, if we were to include the additional attenuation afforded by the building enclosure, ground absorption and atmospheric absorption, it would be likely that the combined SPL at the nearest house would be less than 10 dBA. Thus there will be negligible impact to the noise environment at the nearest residential properties.

While the discussion above relates exclusively to fixed sources of noise at the Interim Plant, some noise will arise from the transportation of raw materials and finished product on site. This noise can be generally considered as transportation noise and it will arise both on-site and off site. Transportation equipment (tractors, trucks and tankers etc.) operating on-site at the Interim Plant are likely to have a maximum sound power level (L_{WA}) of approximately 113 dBA (L_{WA} is the A-Weighted sound power level in dB). The operation of such plant would result in an activity L_{Aeq} of 85 dBA (BSI, 1997) at a distance of 10 metres. (The activity L_{Aeq} is the value of the equivalent continuous A-Weighted sound pressure level determined at a distance of 10 m from and over the period of a given activity).

Using an adaptation of the 'activity L_{Aeq} method' provided in BS 5228, the attenuation due to distance alone, would reduce the noise from the transportation equipment to 42 dBA at the nearest house (1280 m away). Allowing for screening, ground absorption and atmospheric absorption, it would be likely that the overall SPL (attributable to on-site transportation noise) at the nearest house would be less than 27 dBA. This level of noise would cause negligible impact to the noise environment at the nearest residential properties.

4.5.3.3 The Leachate Treatment Facility

Mayo County Council wish to include a Leachate Treatment Facility in the scope of the waste licence review, and wish to include this treatment within the scope of the DBO Contract at the proposed SHC. This proposal includes the on-site treatment of leachate at Derrinumera Landfill. It is proposed to then pump the treated leachate, via a rising main generally following the route of the R311, to the proposed marine outfall discharge for treated municipal wastewater at Newport. BAT approaches to leachate treatment will be adopted and as such regard will be had to the general guidance as set out in the EPA's Wastewater Treatment Manual (EPA, 1997)[18].

While the exact layout and facility design is not currently known, the principal noise source associated with the facility will be the diffused-air aeration system. This type of system is in widespread use at modern municipal and industrial wastewater treatment plants throughout the country.

The noise emissions from a diffused air system can be minimised by housing the air blowers within a concrete structure, which will ensure that negligible noise impact is caused at the nearest noise sensitive location.

While in the absence of detailed design, exact predictions are not possible, the combination of distance attenuation along with the additional attenuation afforded by the enclosures/screening, ground absorption and atmospheric absorption, would be likely to ensure that the noise attributable to the Leachate Treatment Facility at the nearest house would be less than 10 dBA. Thus, while the facility may operate over a twenty-four hour basis, it will cause no perceptible impact at any NSL.

4.5.3.4 Off-Site Transportation Noise

At the present time, road traffic using the landfill facility travel over the weighbridge, and traffic using the Civic Amenity Site proceed directly to that area without crossing the weighbridge. Bulk skip loads from the Civic Amenity area are also sent across the weighbridge for internal record keeping related to the various waste streams, so that in general it is necessary to interpret the weighbridge data, and civic amenity traffic, in order to arrive at proper equivalent vehicle counts along the access road to the facility.

Taking the counts for the 12-month period to the end of May 2005, a total of 64,224 vehicles have used the civic amenity site in that period, and 8,731 vehicles have used the weighbridge in the same period. The Landfill Manager would estimate that

[18] Environmental Protection Agency (1997), "Wastewater Treatment Manuals – Primary, Secondary and Tertiary Treatment"

approximately 90% of the weighbridge traffic would be HGV's. The breakdown of these HGV's is as follows:

(a) Proceeding to the Landfill with waste; or
(b) Associated with Leachate Haulage.

The remainder of the weighbridge traffic would be divided approximately evenly between load measurements of recyclables and cars with trailers sent for weight measurement.

Accordingly, it has been estimated that the traffic counts entering the Landfill access road at present are as follows (average based on 6-day week):

HGVs:	25 vehicles per day;
Cars and light commercial:	209 vehicles per day.

There are aspects of the proposed development that will give rise to increased traffic flow and other aspects that will reduce traffic movement to and from the landfill site. In the future, landfill traffic counts will vary as a net result of certain factors, e.g.:

(a) Increased traffic due to importation of all sludges as cake and liquid sludge to the proposed SHC;
(b) Increased traffic due to importation of fuel for the sludge drier;
(c) Reduced traffic in discontinuing the tanker transport of leachate to Castlebar, once the pumped system to Newport WWTP outfall is commissioned;
(d) Increased traffic of employees and service vehicles associated with the SHC; and
(e) Increased traffic associated with exports of biosolids from the SHC.

With regard to the total traffic counts, it has been predicted that up to 12/13 No. skiploads of wastewater sludge cake, 5/6 No. skips of water treatment sludge and 4/5 No. tanker load of liquid wastewater sludge will arrive at the landfill every two days. Once the SHC has been commissioned an additional 12 No. car movements will be generated per day, as a result of six full time employees being based at the SHC. Thus, the mean daily HGV movements will be increased by 48%, which will be offset by a reduction in leachate transportation HGV once the treated leachate pipeline has been commissioned as shown in Section 4.10.2.2. Car and mean daily light commercial vehicle movements will potentially increase by 6%.

A 100% increase in traffic flow would give rise to a 3 dB increase in the associated traffic noise and such an increase would be just perceptible. Even when disregarding the decrease in leachate transportation, a potential increase of 48% and 6% in HGV and cars/light commercial vehicles respectively would give rise to an imperceptible noise impact.

4.5.3.5 Vibration

In carrying out this assessment, it is assumed that there will be no blasting carried out. Taking account of the nature of the likely excavation works for the plant, buildings and associated pipework, such as excavation and rock-breaking, and the distance to the nearest properties (nearest property over 1.2 km away from development site), it is expected that the resulting vibration levels will not affect properties and will be well within the vibration limits for protection against structural damage (as set out in Table 4.5.5 below), and in terms of nuisance, will be imperceptible.

4.5.4 MEASURES TO MITIGATE ADVERSE IMPACTS

Although it is not likely that any significant noise impacts will arise as a result of the proposed developments at the landfill, the detailed planning and design of the proposed SHC and LTF will have regard to noise control. This will help to minimise environmental noise levels and it will additionally help to minimise the occupational exposure of plant operators.

Standard construction techniques will be used during the site development and construction phases of the development. While the extensive distances to the nearest noise sensitive locations will ensure that negligible impact is caused to the nearest noise sensitive locations, all plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988) and amendment regulations S.I. 297/1990 and S.I. 359/1996. In addition, the general noise control measures outlined in BS 5228 'Noise Control on Construction and Open Sites". must be taken into account. An appropriate noise limit for a typical construction project is 70 dB(A) during daytime hours as proposed in the recent National Roads Authority guidelines for road construction projects, during normal daytime working hours, as shown in *Table 4.5.5 below (Guidelines for Treatment of Noise and Vibration in National Roads Schemes, published draft, NRA, 2003).*

Table 4.5.5 Maximum Permissible Construction Noise Levels at the Façade of Dwellings (NRA published draft guidelines 2003)

Days & Times	**$L_{Aeq\ (1hr)}$ dB**	**L_{Amax} dB**
Monday to Friday 07.00 to 19.00	70	80
Monday to Friday 19.00 to 22.00	60	65
Saturday 08.00 to 16.30	65	75
Sundays and Bank Holidays 08.00 to 16.30	60	65
Vibration Limits: For protection of buildings 8 mm/s (vibration frequency <10Hz) 12.5mm/s (vibration frequency 10 to 50Hz) 20 mm/s (vibration frequency >50 Hz) **Continuous piling: 2.5mm/s (tolerable level)**		

$L_{Aeq(1hr)}$ is the one hour average noise level.
L_{Amax} is the measured maximum noise level.

Noisy construction works will be limited to 08.00 to 18.00 weekdays with Saturday working from 08.00 to 13.00 hours (relatively quiet construction activities could be carried out outside these hours, subject to strict controls, to meet the recommended National Roads Authority limit detailed in *Table 4.5.5* above.

Ongoing maintenance of construction plant and machinery will be undertaken to ensure that excessive noise emissions do not arise. Quiet plant will be always selected where appropriate and any unavoidable noisy plant will be attenuated and/or enclosed as far as is practicable.

Ensure rock-breaking and other noisy activities are adequately screened from the adjacent sensitive locations.

Use modern, silenced and well-maintained equipment conforming to EU directives, namely Outdoor Noise Directive 2000/14/EC. Ensure that workers are given appropriate training with respect to minimising noise and disturbance in the context of the BS 5228 assessment for the works.

In terms of current noise limits applicable to the workplace, during the operational phase of the SHC and LTF, the Contractor will be required to comply with the Safety, Health and Welfare at Work (Control of Noise at Work) Regulations, (S.I. No. 371 of 2006) and the European Communities (Waste Water Treatment) (Prevention of

Odours and Noise), Regulations, (S.I. No. 787 of 2005) and any other relevant legislation pertaining to the operation of the facility.

With regard to transportation noise, road vehicles will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations, 1988 (S.I. No. 320 of 1988) and amendment regulations S.I. 297/1990 and S.I. 359/1996. Traffic noise from the Leachate Treatment Facility and SHC will not give rise to any nuisance or significant impact, however, simple mitigation measures (such as good maintenance; switching off idling machines and avoiding unnecessary revving of engines) will help to minimise any potential impacts.

4.5.5 CONCLUSIONS/RECOMMENDATIONS

The nature and scale of the proposed development is such that noise emissions will arise during daytime from a number of fixed and mobile sources of noise. In addition, there will be noise emissions arising during night-time from certain items of equipment, including the LTF.

The final design and the operation of the proposed SHC and LTF will proceed with regard to the need to mitigate noise emissions. However, the overall development is unlikely to cause any significant noise impact at any noise sensitive location. Provision of the mitigation measures outlined above will ensure the proposed development will proceed with negligible noise impact to the surrounding community.

4.6 AIR: DUST

4.6.1 INTRODUCTION

Landfill sites can present a problem in relation to potential dust emissions. Also, the construction of the proposed SHC and LTF has the potential to create a problem in relation to dust emissions. For these reasons, a baseline dust profile needs to be conducted to establish the existing dust levels on site. As there is an existing dust monitoring programme at Derrinumera, the dust levels recorded from the monitoring (2002 to 2005) are referenced.

4.6.2 EXISTING ENVIRONMENT

To determine total dust deposition Bergerhoff gauges were used, as specified in the German Engineering Institute VDI 2119 document “Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)”. Four gauges (D1, D2, D3, D4) were set up so that the glass jars were between 1.5m and 2m from the ground at four different locations as shown in Figure 4.2.3, Section 4.2.

The prevailing wind across Derrinumera Landfill is from the southwest, so the dust monitors were placed taking this into account. Dust monitor D1 was located on high ground to the southwest of the site, D2 was located on the southern boundary of the landfill. Both were therefore located upwind of the site. Dust monitor D3 was located on the west boundary and D4 was located at the far northwest of the site. Both of these monitors were downwind of the site.

The jars were left open for a period of approximately 30 days and then collected. The samples were then submitted to Bord na Móna Environmental Ltd. for analysis and the results are presented in Table 4.6.1 to Table 4.6.4 below.

Table 4.6.1 Total Dust Deposition Levels 2002 (Monitoring Period 27/05/02 to 26/06/02)

D1 mg/m².d	D2 mg/m².d	D3 mg/m².d	D4 mg/m².d
53.8	1020	53.8	96.7

Table 4.6.2 Total Dust Deposition Levels 2003 (Monitoring Period 28/05/03 to 27/06/03)

D1 mg/m².d	D2 mg/m².d	D3 mg/m².d	D4 mg/m².d
32.26	80.64	53.76	817

Table 4.6.3 Total Dust Deposition Levels 2004 (Monitoring Period 14/06/04 to 14/07/04)

D1 mg/m².d	D2 mg/m².d	D3 mg/m².d	D4 mg/m².d
48	1526	183	65

Table 4.6.4 Total Dust Deposition Levels 2005 (Monitoring Period 01/07/05 to 29/07/05)

D1 mg/m².d	D2 mg/m².d	D3 mg/m².d	D4 mg/m².d
37	55	105	55

The Technical Instructions on Air Quality Control – TA Luft Guideline[19] set a limit for Total Dust Fallout at a mean value of 350 mg/m²/day with a 95percentile of

[19] TA Luft (2002). " Technical Instructions on Air Quality Control" – Guideline Document

650mg/m²/day. The limit set under Derrinumera Waste Licence W0021-01 is 350mg/m^2/day.

2002 and 2003 Results

In relation to the upwind dust monitoring locations, D2 had been high over the two years discussed. It was noted that this was due to contamination by birds. Overall, the total dust levels at D1 to D3 were low. This can be attributed to the fact that the majority of the site upgrading and the completion of Cell 1 had been achieved at that stage.

It can be seen that in 2003, the total dust level at D4 was unusually high. The high dust levels could be attributed to the movement of material stripped from lands adjacent to the facility, but this would have been minimal.

2004 Results

The total dust levels in gauges D1, D3 and D4 for 2004 were below the 350 mg/m²/day Waste Licence limit. The total dust level in gauge D2 was highly elevated. In relation to the upwind dust monitoring location D2, there was clear evidence of contamination by birds and also algal growth and therefore this would account for the higher level of dust in D2 in comparison to D1.

Overall the total dust levels at the dust monitoring locations D1, D3 and D4 were low. Excavation of construction material for the construction of Cell 2 was carried out during Summer 2004. To mitigate against this, the frequency of road washings was increased as a result of this development work.

2005 Results

The total dust levels in gauges were below the 350mg/m^2/day limit. Overall the total dust levels at the dust monitoring locations D1,D2, and D4 were low. The slightly elevated levels in D3 probably occurred as a result of works which took place in the borrow area adjacent to this monitoring location. Final construction works on Cell 2 (now complete) were ongoing during the sampling. The frequency of road washings has been increased as a result of this development work.

4.6.3 IMPACTS OF THE PROPOSED DEVELOPMENT

Wind blown dust emissions may arise during the construction phase of the proposed developments, although given the significant distance of at least 1km to the nearest dwelling, it is envisaged that there will not be a negative impact on these residents.

The deposition of dust and mud on the local roads is both unsightly and dangerous. Dust may be a particular problem during periods of dry windy weather.

Potential sources of dust include the following:

- Vehicles carrying dust on their wheels;
- Unvegetated stockpiles of construction materials; and
- The grading and processing of construction materials.

There may be a potential for the generation of dust from the handling of the dried biosolids product. However, the dried biosolids silo filing system will be under slight negative pressure and will be fitted with dust scrubbers. Therefore any dust generated will be contained and treated.

4.6.4 MEASURES TO MITIGATE ADVERSE IMPACTS

It is envisaged that there will be no nuisance associated with dust at the Sludge Hub Centre and the Leachate Treatment Facility for the following reasons:

- There will be no open storage of sludge;
- All tipping and mixing of sludge will be onto designated tipping areas within the enclosed reception area. Thus any dust generated will be contained. The fresh sludge will be wet in nature, not giving rise to dust emissions when treated;
- The dried biosolids from the sludge drier will be stored within the facility building;
- The bagging plant for the dried biosolids will also be contained within the facility building;
- The dry solids content of any compost will be kept below 65-70% by process control measures, since higher dry solids contents may give rise to excess dust formation;
- Any dried biosolids or compost transported both within the confines of the Derrinumera site and off-site will take place in covered trucks only;
- All site areas will be inspected and cleaned regularly;
- A dust capture component will be added to the permanent sludge-drying unit to prevent dust emissions from the unit;
- Vehicles exiting the facility will be required to pass through the existing wheelwash.

During the construction phases (as part of a Dust Management Plan), at the proposed development, the following additional mitigation measures will be put in place:

- A wheelwash at the entrance to the facility will ensure that dust emissions are not caused from the tyres of vehicles during construction;

- In periods of dry weather, spraying of the access routes and other exposed areas will be undertaken to help reduce dust emissions;
- All embankments and soil stockpiles will be vegetated immediately following placement to anchor the soil and reduce the surface area open to the environment.

A complaints register will also be maintained on-site and should any complaints relating to dust emissions be submitted, then these shall be immediately dealt with.

4.6.5 CONCLUSIONS/RECOMMENDATIONS

There will be no anticipated impact from dust emissions during the construction or operational phase of the proposed development, as the proposed mitigations will be adhered to.

4.7 AIR: ODOUR

4.7.1 INTRODUCTION

The operation of the current landfill and development of the proposed SHC & LTF in Derrinumera, County Mayo is faced with the issue of preventing odours causing impact to the public at large. The proposed operations will cover approximately 21.6ha. The current landfill consists of two engineered and lined Cells on top of an old unlined landfill body. Lined Cell No. 1 is currently temporarily capped, while Lined Cell No. 2 is the current waste deposition zone.

An odour impact assessment was carried out using latest odour measurement techniques. During the odour assessment, the key odour impact sources within the landfill operation and other proposed processes were identified in order to determine possible odour minimisation strategies. Contours of odour concentrations for the 98^{th} and 99.5^{th} percentile were predicted around the landfill, LTF and sludge drying/composting operation in order to examine the extent of any odour impact and the effectiveness of considered odour minimisation protocols.

Three options were covered within this odour impact assessment for the development of the SHC, namely:

1. Interim solution using an existing sludge drier;
2. A new sludge drier and operations to be fully enclosed within a building;
3. A composting system consisting of conventional tunnel system (16,840 metric tonnes yr^{-1}) with all raw materials and finished composting product handling carried out indoors.

Utilising historical and measured odour emission data and atmospheric dispersion modelling techniques, the predicted overall odour impact of the following scenarios were determined:

Scenario 1: Existing landfill operation assuming maximum input capacity;
Scenario 2: Existing landfill operations (maximum capacity) and proposed leachate treatment on-site utilising SBR diffuse fine bubble aeration;
Scenario 3: Existing landfill, leachate treatment and operation of interim sludge drier;
Scenario 4: Existing landfill, leachate treatment and operation of new sludge drying system (generic at this stage of development);
Scenario 5: Existing landfill, leachate treatment and proposed tunnel composting system.

The following sections provide a summary of the findings of the Odour Impact Assessment Report carried out. A full copy of the report has been provided in Appendix 13, Volume IV.

4.7.1.1 Background

4.7.1.1.1 Description of the Atmospheric Dispersion Modelling Process Used

Any material discharged into the atmosphere is carried along by the wind and diluted by wind turbulence. This process has the effect of producing a plume of air that is roughly cone shaped with the apex towards the source and can be mathematically described by the Gaussian equation. Atmospheric dispersion modelling has been applied to the assessment and control of odours for many years, originally using Gaussian form ISCST 3 and more recently utilising advanced boundary-layer physics models such as ADMS and AERMOD (Keddie et al. 1992). Once the odour emission rate from the source is known, ($Ou_E\ s^{-1}$), the impact on the vicinity can be estimated. These models can effectively be used in three different ways: firstly, to assess the dispersion of odours and to correlate with complaints; secondly, in a "reverse" mode, to estimate the maximum odour emissions which can be permitted from a site in order to prevent odour complaints occurring; and thirdly, to determine which process is contributing greatest to the odour impact and estimate the amount of required abatement to reduce this impact within acceptable levels (McIntyre et al. 2000).

The model used in this report was BREEZE Industrial Source Complex version 3 (ISC ST 3 Ver.4.012). This model is recommended in Environmental Protection Agency (EPA) guidelines on Air Quality Modelling for applications to refinery-like sources and other industrial sources. It is used with meteorological input data from the nearest representative source. The most important parameters needed in the meteorological data are wind speed, wind direction, ceiling heights, cloud cover, and Pasquill-Gifford stability class for each hour.

4.7.1.2 Establishment of Odour Impact Criterion for Landfill/Leachate Treatment/Sludge Drying and Composting Odours for use in the Model

Odours from landfill, leachate treatment, sludge drying and composting operations arise mainly from the volatilisation of odourous gases produced from uncontrolled anaerobic digestion of organic matter and the volatilisation of odourous compounds due to surface airflow patterns. Some of the compounds emitted are characterised by their high odour intensity.

4.7.1.2.1 Odour Annoyance Criteria.

Commonly used odour annoyance criteria in Ireland, UK and the Netherlands are illustrated in Table 4.7.1. Through extensive intensity relationship studies, an odour impact criterion of 3.0 Ou_E m^{-3} was established for the assessment of the proposed extension of Boghborough Landfill, London.

Table 4.7.1 Odour Annoyance Criteria for Dispersion Modelling

Concentration Limit Ou_E m^{-3}	Percentile value %	Application
Dutch (MPTER and Complex 1 Model)		
≤3.5	98	Wastewater treatment works existing site, rural area or industrial estate.
≤3.0	98	Compost facility existing site
English (ADMS model)		
≤5	98	Waste water treatment works Greenfield site,
Ireland (ISC ST Complex 1 section)		
≤3.0	98	Target limit for new pig production facility/limit value for tanning and mushroom compost industry
≤6.0	98	Target limit for existing pig production facility
England (Complex 1 model)		
≤3.18	98	Acceptable guideline for elimination of significant odour impact in vicinity of landfill

(McIntyre et al. 2000; EPA, (2001); Longhurst et al (1998))

An odour threshold concentration of 1 Ou_E m^{-3} is the level at which an odour is detectable by 50% of the screened panellists. As odours from landfills are considered more hedonically unpleasant than odour from intensive agricultural facilities, it would be prudent to limit the possibilities of odour impact and apply an odour impact criterion of ≤ 3 Ou_E m^{-3}.

In accordance with the odour annoyance criterion above in Table 4.7.1 and in keeping with Irish EPA and Boghborough Landfill recommendations, all residential dwellings will be located outside the ≤ 3 Ou_E m^{-3} contour for the 98th percentile in one year as determined by atmospheric dispersion modelling software. Longhurst et al., (1998) reported that for the Boghborough Landfill, an odour concentration of ≤ 3.18 Ou_E m^{-3} could be described as faint but not offensive within 95% confidence intervals.

Three years worth of hourly sequential meteorology data was used for the operation of ISC ST 3. This allowed for the determination of the worst-case year scenario for the overall impact of odour emissions from the proposed landfill and composting operations on the surrounding population.

Five data sets for odour emission rates were calculated to determine the potential odour impact of the landfill, sludge drying and composting operation. These scenarios are illustrated in Table 4.7.2 below:

Table 4.7.2 Summary of the Individual Area and Points Sources that are included in each of the Scenarios used in the Predictive Atmospheric Dispersion Modelling to Determine the Odour Impact in the Surrounding Vicinity of the Derrinumera Site

Process	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Over ground Leachate storage tanks 1, 2 and 3	X				
Leachate lagoon Cell 1	X	X	X	X	X
Active Face and operational area	X	X	X	X	X
Tipping head	X	X	X	X	X
Daily cover	X	X	X	X	X
Temporary cap	X	X	X	X	X
Flare gas vent	X	X	X	X	X
Leachate Treatment Facility tanks 1, 2 and 3		X	X	X	X
Temporary sludge drying facility			X		
New proposed sludge drying facility				X	
Composting Biofilter					X

4.7.2 EXISTING ENVIRONMENT

4.7.2.1 General

The current landfill consists of two engineered and lined Cells on top of an old unlined landfill body. Lined Cell No. 1 is currently temporarily capped, while Lined Cell No. 2 is the current waste deposition zone.

The different distances and directions that the proposed landfill, leachate treatment and sludge drying/composting operation is located from the neighbouring dwellings are represented in Figure 4.7.1 and Table 4.7.3. As can be observed, the closest resident is approximately 1200 metres to the southwest of the proposed site. As the predominant wind direction in this country is southwesterly, and a significant distance exists, odour complaints are generally not received from this area.

Table 4.7.3 Location and Distance of Nearest Residents in Relation to Derrinumera Landfill Flare

Resident Number	Approx. distance (Kilometre)	Direction relative to north (Degrees)
Nearest resident 1	1.4	239
Nearest resident 2	1.2	246

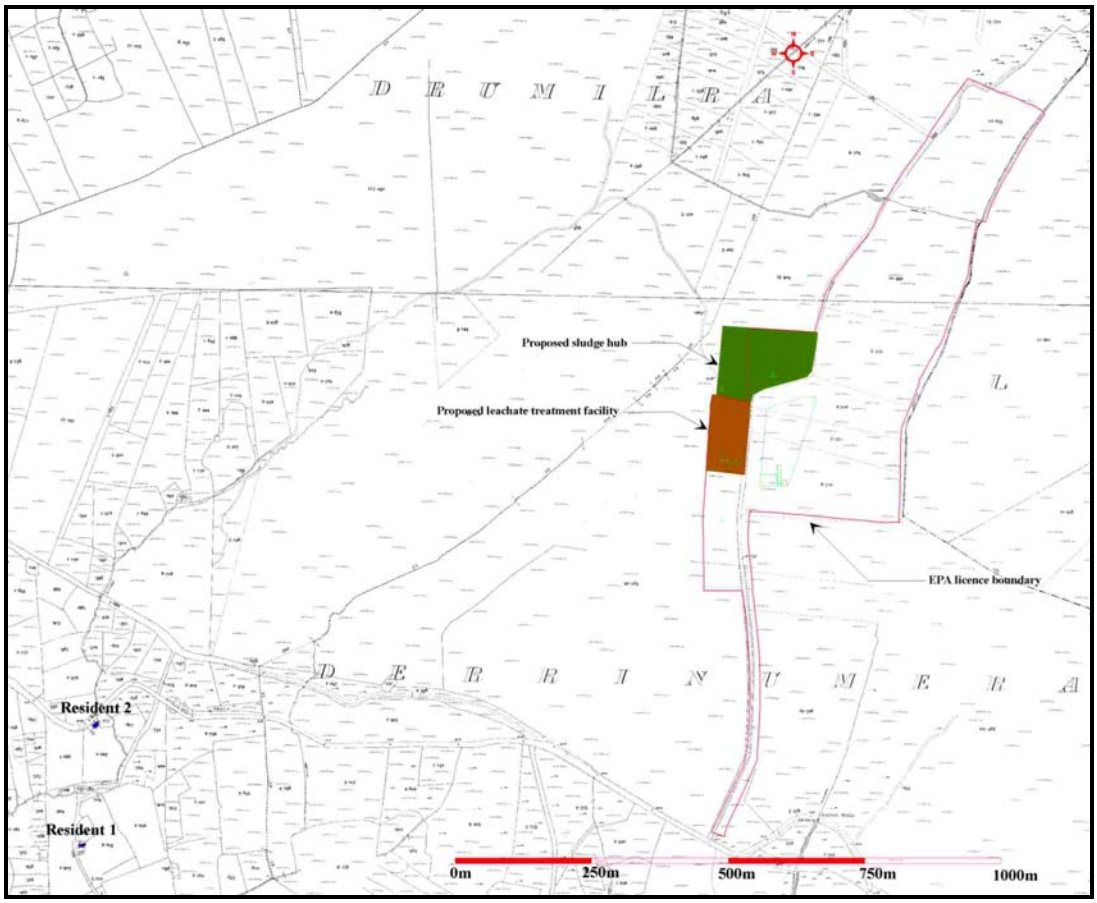


Figure 4.7.1: Aerial Diagram of Derrinumera Landfill and Relative Location of Residents
(denotes nearest residences)

The existing Waste Licence (Ref. No. W0021-01) requires that a complaints register be maintained at the landfill. The following complaints in relation to nuisance by odour were previously received:

Year	No. of Complaints Received	Source of Complaints
2000	2	Individuals
2001	1	Councillor (Glenhest Community)
2002	0	n.a.
2003	0	n.a.
2004	1	E.P.A. (while sampling on-site)
2005	7	Individuals
2006	1	Individual
2007	1	Individual

As illustrated on the register of complaints above, a significant number of odour complaints were received during 2005, which arose from residents of the Glenisland area. Given the geographical location of Glenisland, with a southerly or easterly component in the wind direction, or in cold weather air inversion conditions such as might apply during frosty weather, there is a possibility that landfill odours from the fresh waste may have migrated downgradient into the Glenisland valley, which may have led to the significant number of complaints during that year.

Cell No. 1, which is already full of waste, has been temporarily capped. Vertical gas wells have been installed in this cell recently and gas extraction is taking place at this time. The temporary capping however is not completely gas tight and minor emissions through this cap could account for some of the noxious odour from the cell. Permanent capping of Cell 1 will take place in spring/summer 2007, which will comprise of the sealing off of the cell with an impermeable liner. The possibility of noxious odour emanating from this cell will thereby be eliminated once permanent capping has been completed.

Cell No. 2 is receiving waste at present in the southern half of the cell. Housekeeping of the waste face is carried out in accordance with best practice techniques, with cover material being applied each evening, and with the working face being kept to a minimum area. This practice has served to keep odour emissions at bay. The permanent capping of Cell 1, combined with the continued proper waste housekeeping techniques will be expected to remedy current landfill related odour problems in the future.

4.7.2.2 Odours Arising from Landfill Operations

The formation of odorous compounds at a landfill is usually limited to the active face, operational area, landfill gas extraction wells, discontinuous flare operation, leachate lagoon and insufficient temporary capping of cells.

As waste is taken into the landfill facility and filled into cells, anaerobic conditions will predominate, with the incomplete breakdown of polysaccharides, proteins and carbohydrates from organic matter. This incomplete methanogenesis process will allow for the release of volatile fatty acids, sulphur containing compounds, volatile organic compounds and nitrogen containing organics, which have low odour detection thresholds. Any gases generated tend to rise through the deposited waste. This rate is affected by coverage methodology, operational procedures and management practices. The amount of gases emitted will vary from landfill to landfill and will be different for a single landfill at different times (e.g. physical soil type, changing landfill content, organic content of waste).

Once emitted into the air, landfill gases are carried on surface level winds. While this dilutes the gases with fresh air, it can also move them into communities. Naturally, wind speed and direction determine whether local residents will notice landfill odours so that the degree of the odour perception will vary greatly from day to day. At locations near the landfill, the

worst time of the day may be early morning or late in the evening during a stable atmosphere and low wind speeds. This is when winds tend to be most gentle, providing the least dilution of the odours.

4.7.2.3 Odour Dispersion Modelling of the Existing Scenario

Scenario 1 mimics the predicted overall odour emission rate from existing landfill operation. The following table illustrates the specific odour emission rate/fluxes used to determine an overall odour emission rate from the landfill operations.

Table 4.7.4 Predicted Overall Odour Emission Rate from Landfill Operation during Maximum Emission Event (Scenario 1)

Process	Area sources odour emission flux ($Ou\ s^{-1}\ m^{-2}$)	Exposed area (m^2)	Point source odour emission rate ($Ou\ s^{-1}\ m^{-2}$)	Overall odour emission rates ($Ou\ s^{-1}$)
Leachate Lagoon Cell 1	9.61	144		1384
Over-ground storage tanks 1 to 3	9.61	245		2354
Active Face	9.25	237		2192
Tipping head	92.5	100		9250
Daily cover	1.69	630		1065
Temporary cap	0.67	14594		9778
Flare gas vent			602	602
Total emission from Scenario 1				**26,625**

Figure 4.7.2 shows the results of the dispersion modelling for the existing scenario (scenario 1), providing a chart of the extent of the odour plume. The plotted odour concentrations of ≤ 3.0 $Ou_E\ m^{-3}$ for the 98th percentile during maximum odour emission event from landfill is illustrated in Figure 4.7.2.

As can be observed, the model predicted that no significant odour impact would be perceived in the vicinity of the operated landfill operation with all residents perceiving an odour concentration of less than 1.0 $Ou_E\ m^{-3}$ for 175 hours in a worst-case meteorological year. It was predicted that identified residents would perceive an odour concentration of between 0.1 $Ou_E\ m^{-3}$ and 0.3 $Ou_E\ m^{-3}$ for 175 hours in a worst-case meteorological year. The odour impact is approximately 10 to 30 times lower than the proposed limit criterion presented in Table 4.7.1. In accordance with odour annoyance criterion in Table 4.7.1, and in keeping with current recommended odour annoyance criterion in this country, the model has predicted that landfill operations would receive no complaints from the nearest residents, provided that best practice techniques are used during the operation of the landfill.

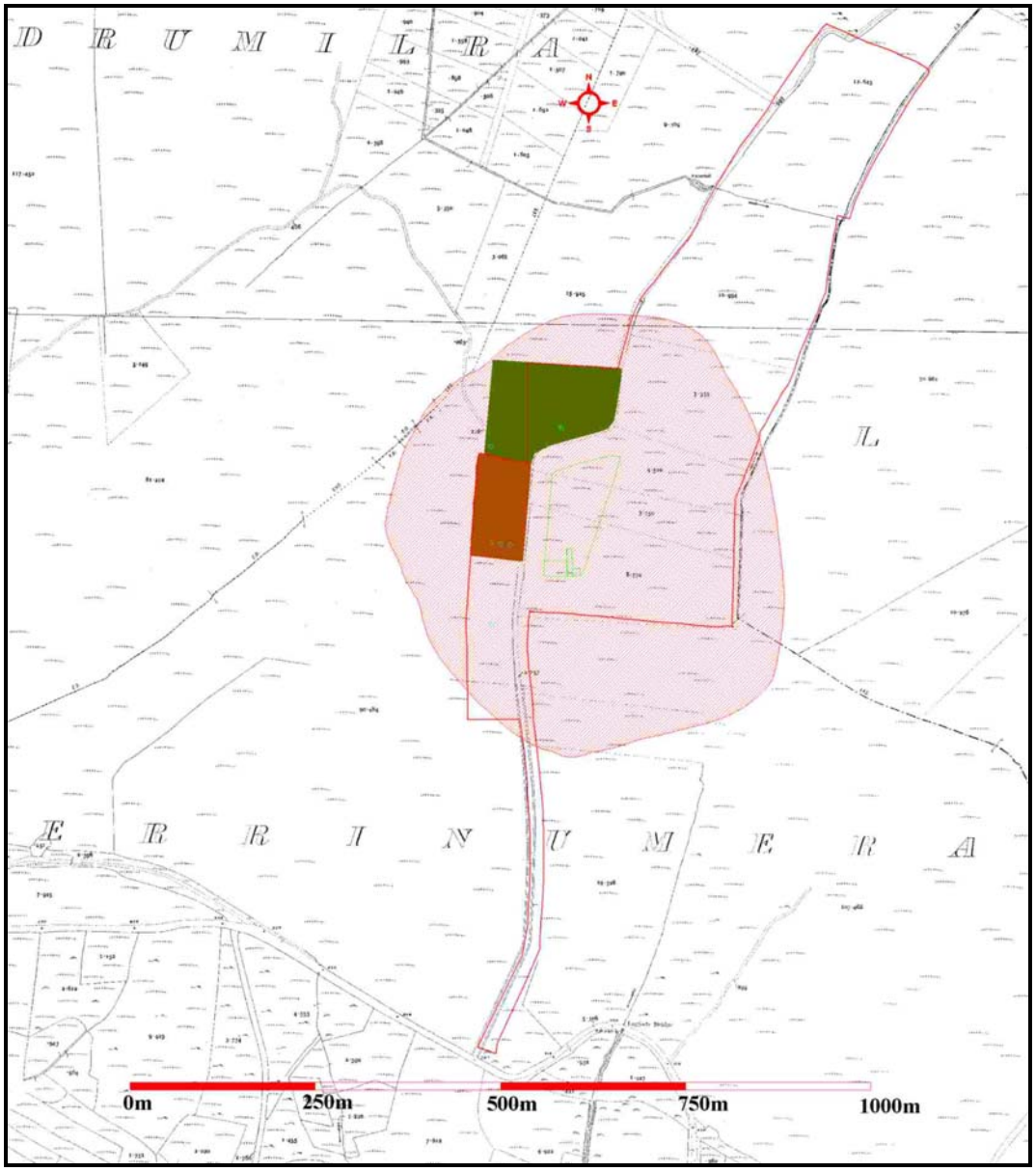


Figure 4.7.2 Predicted Odour Emission Contribution of Landfill Process to Odour Plume Dispersal for Scenario 1 at the 98th Percentile for Odour Concentrations ≤ 3.0 Ou_E m^{-3} (——).

4.7.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.7.3.1 Proposed Development and Odour Generation and Release

Derrinumera Leachate Treatment Plant Design.

Mayo County Council seek to include a Leachate Treatment Facility in the scope of the current licence review. While the exact layout and facility design is not currently known, the principal odour source associated with the facility will be the diffused-air aeration system. This type of system is in widespread use at modern municipal and industrial wastewater treatment plants throughout the country.

Derrinumera Sludge Drier Plant Design.

Interim (Temporary) Sludge Drier

The sludge drier formerly in use at the Castlebar WWTP was assessed using latest odour measurement techniques to determine typical odour emission rates, as this is a similar type plant to the existing Ballina drier, which is proposed for use as an interim solution to sludge drying at Derrinumera. The Castlebar plant installation is detailed in Appendix 13, Volume IV.

Previously, there were difficulties with odours from the existing installation, but receptors in this instance were as close as 50 metres from the facility. Temporary relocation of a similar type interim sludge drying unit to Derrinumera, more than 1km from the nearest residence, and to be decommissioned as soon as the fully engineered drier is in place, would be the latitude sought by Mayo County Council in this respect.

Proposed new Sludge Drying System

It is proposed that the SHC would be constructed and operated under a Design Build Operate (DBO) Contract for the reception, drying, temporary storage and sustainable re-use or disposal of treated municipal sludge collected from wastewater treatment plants throughout County Mayo. The likelihood is that the preferred method of production of bio-solids will be thermal drying using a fully engineered thermal drier, not to be confused with the temporary drying unit. The odour abatement capabilities of different types of sludge driers are detailed in Sections 3.2.5.4 and 3.2.5.4.9 of this statement.

Tunnel Composting Plant Design.

The composting system to be installed is a conventional tunnel system with all raw material and finished composting product handling carried out indoors. A number of composting tunnels will be operated within the composting building. There will be preliminary mixing of sludge with woodchips before sludge is placed into each tunnel.

Odour Formation and Release from Composting Operation

Odour Monitoring Ireland have identified the following relevant odour sources from the proposed Composting Facility:

- Acceptance and Pre-treatment of fresh sludge;
- Pre-composting;
- Composting tunnels;
- After treatment;
- Storage of finished compost.

4.7.3.2 Odour Dispersion Modelling of the Proposed Development

Scenarios 2, 3, 4 and 5 represent the predicted overall odour emission rate from the existing landfill operation together with varied elements of the proposed development as set out in Table 4.7.2. Five scenarios were chosen to estimate the worst-case potential odour impact from the current/proposed Derrinumera Site. The results of the model are provided in Sections 5.2, 5.3 and 5.4 of Appendix 13, Volume IV. Table 4.7.5 summarises the predicted overall odour emission rates during a maximum emission event for each scenario.

Table 4.7.5 Predicted Overall Odour Emission Rates during Maximum Emission Event for Scenarios 1 to 5.

Scenario	Description	Total Emission ($Ou\ s^{-1}$)
1	Existing landfill operations only	26,625
2	Landfill operations & leachate treatment	27,358
3	Landfill operations, leachate treatment & interim sludge drier	40,106
4	Landfill operations, leachate treatment & permanent sludge drier	34,746
5	Landfill operations, leachate treatment & composting system	30,373

The highest total odour emission was seen to occur during the modelling of Scenario 3 (40,106 Ou s^{-1}). Figure 4.7.3 illustrates the plume from the plotted odour concentrations of ≤ 3.0 $Ou_E\ m^{-3}$ for the 98th percentile during maximum odour emission event for Scenario 3. Plots of odour plumes resulting from modelling of the remaining scenarios are provided in the main Odour Impact Report in Appendix 13, Volume IV.

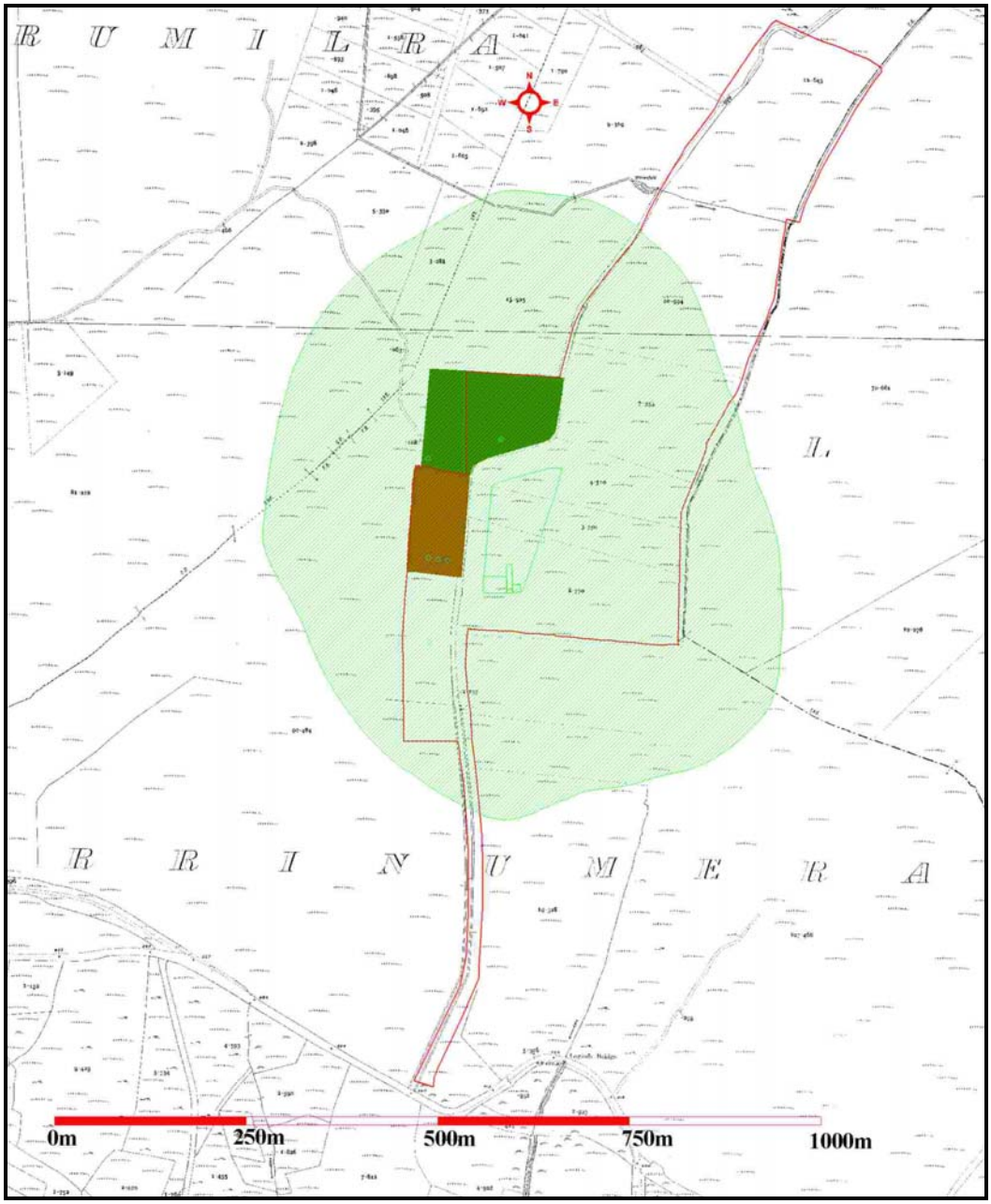


Figure 4.7.3 Predicted Odour Emission Contribution of Landfill, Leachate Treatment and Interim Sludge Drying Process to Odour Plume Dispersal for Scenario 3 at the 98th Percentile for Odour Concentrations ≤ 3.0 Ou_E m^{-3} (——).

In summary, a worst-case odour-modelling scenario was chosen to estimate worst-case odour impact from the proposed site. Results from the modelling confirm that, provided best practice techniques are employed at the proposed facility, no significant odour impact will be perceived in the vicinity of the operated Derrinumera site for Scenarios 1, 2, 3, 4 and 5; with all residents perceiving an odour concentration of less than 1.0 Ou_E m^{-3} for 175 hours in a worst-case meteorological year. It is predicted that identified residents will perceive an odour concentration of between 0.1 Ou_E m^{-3} and 0.7 Ou_E m^{-3} for 175 hours in a worst-case meteorological year. The odour impact is approximately 4.3 to 30 times lower than the proposed limit criterion presented in Table 4.7.1. In accordance with odour annoyance criterion in Table 4.7.1, and in keeping with current recommended odour annoyance criterion in this country, the Derrinumera proposed site operations, which will be operated using best practice techniques, will not cause an odour nuisance.

All residents in the vicinity of the Derrinumera site will perceive less than 3.0 Ou_E m^{-3} for all Scenarios for 44 hours in a worst-case year.

4.7.4 MEASURES TO MITIGATE ADVERSE IMPACTS

The following mitigation measures are proposed for the control and abatement of any odours resulting from the existing and proposed development in accordance with the recommendations of the Odour Impact Assessment Report. A more detailed description of odour minimisation/abatement strategies proposed is provided in Appendix 13, Volume IV.

The operators of Derrinumera Site, County Mayo must carry out the following:

- Establish odour management protocols for the Derrinumera Site including, strict meteorological data recording and sludge/waste inspection.
- Implement weekly odour inspections on odourous areas within the site boundary in order to maintain efficient odour management protocols.
- Provide sufficient temporary coverage to prevent volatilisation and stripping of odourous gases from exposed waste.
- Temporary cover active face with impermeable covers at weekends.
- Limit the tipping of highly odourous waste during meteorological conditions that may carry concentrated odour plumes towards close-by residences. All highly odourous waste will be covered immediately.
- Ensure fine bubble diffuse aeration system is employed for leachate treatment on-site in order to eliminate significant anaerobic events.
- Ensure all sludge-handling practices are carried out in-doors.
- Do not hold sludge on-site for elongated periods of time before treatment.
- Temporary cover all treated sludge with clay when landfilled in order to prevent odour events within the landfill.
- To maintain good housekeeping practices, closed-door management strategy and to implement an odour management plan for the operators of the proposed composting

plant. The composting operations will be maintained under negative ventilation to eliminate the release of puff odour emissions from the facility.

- It should also be noted that the appointed Contractor will be required to comply with the *European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations, 2005, S.I. No. 787 of 2005.* These Regulations set out specific reporting requirements to the Environmental Protection Agency in addition to setting out requirements for waste water treatment plants to be designed, constructed, operated and maintained so as to avoid causing nuisance from odour emissions.

4.7.5 CONCLUSIONS/RECOMMENDATIONS

A worst-case odour-modelling scenario was chosen to estimate worst-case odour impact from the proposed site. Results of the modelling scenario indicated that no significant odour impact would be perceived in the vicinity of the operated Derrinumera Site for scenarios 1 to 5. In keeping with current recommended odour annoyance criterion in this country, the Derrinumera site operations, which will be operated using best practice techniques, will not cause odour nuisance.

4.8 CLIMATE

4.8.1 INTRODUCTION

In this section a general overview of the climate in the Mayo Region and more specific meteorological data for the proposed site are outlined.

4.8.2 EXISTING ENVIRONMENT

4.8.2.1 Regional Climate

Over the summer months, the influence of anti-cyclonic weather conditions on the western and northwestern region results in dry continental air interspersed by the passage of Atlantic frontal systems. During much of the winter period, the climate is characterised by the passage of Atlantic low-pressure weather systems and associated frontal rain belts from the west. Occasionally, the establishment of a high-pressure area or anticyclone over Ireland results in calm conditions and during the winter months these are characterised by clear skies and the formation of low-level temperature inversions with light wind conditions at night-time. If anticyclonic conditions become established for a few days or more during the summer months, high temperatures during the day might be recorded, especially at inland locations. Long spells of dry weather are relatively rare but should continental air masses or anticyclones persist over Ireland, a period of drought conditions may occur which could last up to 2 or 3 weeks.

Weather Observing Stations:

Synoptic stations are those that observe and record all the surface meteorological data. These observations include rainfall, temperature, wind speed and direction, relative humidity, solar radiation, clouds, atmospheric pressure, sunshine hours, evaporation and visibility. They report a mixture of snapshot hourly observations of the weather known as synoptic observations, and daily summaries of the weather known as climate observations.

There are 15 synoptic stations scattered throughout the country:

- Malin Head;
- Clones;
- Belmullet;
- Knock Airport;
- Claremorris;
- Mullingar;
- Dublin Airport;
- Birr;
- Shannon Airport;
- Kilkenny;
- Valentia Observatory;
- Cork Airport;
- Casement Aerodrome, Baldonnel;
- Rosslare; and
- Clyone.

The nearest synoptic station to the Derrinumera Landfill Site is Knock Airport. However, this station is relatively new and the information available is limited. Therefore, the synoptic data from Claremorris is referred to in the following sections.

Rainfall Stations:

There are a number of rainfall-measuring stations throughout the Country. These stations measure the daily rainfall in millimetres (mm). A number of these will also measure additional parameters such as soil moisture, temperature, humidity, etc. Some forty-seven of these stations are located in County Mayo. The nearest off-site rainfall measuring station to the Landfill Site is located at Newport (Furnace).

Climate Measuring Stations:

The long term weather patterns at the Derrinumera Landfill Site reflect regional conditions affecting the west Connaught area, i.e. dominated by low fronts from the west and southwest in winter months and more settled conditions during summer months.

Data for localised conditions, or microclimate, are derived from meteorological measurements at Claremorris, located approximately 40km southeast of the site (as the crow

flies). Table 4.8.1 provides details of the geographical location of Claremorris Synoptic Station.

Table 4.8.1 Claremorris Synoptic Station

Synoptic Station	Claremorris
Grid Reference	V1342 2750
Latitude	534240
Longitude	85929
Height	71.0 m O.D.

A rainfall measuring station is located at Furnace, Newport, from which monthly annual average rainfall data is available for the period from 1961 – 1990. This station is located approximately 9 km from Derrinumera Landfill.

For a number of years, climatic parameters such as the maximum, minimum and actual temperature and wet and dry bulb readings have been monitored daily at the landfill by Mayo County Council and forwarded to Met Eireann.

A 10 m mast complete with an anemometer and north pointing directional indicator was established at the site. Various sensors for recording temperature, wind speed, humidity, barometric pressure and dew points were also put in place, as well as a rainfall gauge and evaporation pan.

Day to day weather patterns at the site is logged onto a database on site.

Monthly and annual mean and extreme temperature values from Claremorris for the period 1961 – 1990 are given in Table 4.8.2 below.

Table 4.8.2 Monthly and Annual Mean and Extreme Temperatures for Observatory, 1961- 90 (^{o}C)

Temperature	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean daily max.	7.2	7.6	9.6	12.0	14.5	17.0	18.4	18.2	16.1	13.2	9.5	7.9	12.6
Mean daily min.	1.4	1.3	2.3	3.3	5.5	8.2	10.2	9.8	8.1	6.3	3.0	2.3	5.1
Mean	4.3	4.5	5.9	7.6	10.0	12.6	14.3	14.0	12.1	9.8	6.2	5.1	8.9
Absolute max.	13.1	13.3	20.1	22.3	25.1	29.8	30.5	27.2	23.3	19.9	15.4	14.3	30.5
Absolute min.	-11.7	-17.1	-8.0	-5.5	-3.1	-0.4	0.6	1.1	-1.2	-4.0	-5.3	-8.3	-17.1

Rainfall:

Monthly annual average rainfall data is available for the period 1961 – 1990 from the nearest synoptic station, Claremorris, and also from the nearest rainfall measuring station, Newport (Furnace). It is given as follows:

Table 4.8.3 Monthly and Annual Average Rainfall Claremorris and Newport (Furnace), 1961- 90 (mm)

Station	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Claremorris	121	83	96	62	78	72	63	97	104	126	119	124	1143
Newport (Furnace)	168	109	139	87	87	88	89	122	145	170	169	172	1547

Monthly total rainfall data is available from the on-site measuring station at Derrinumera Landfill from 2002 to 2005. It is given as follows:

Table 4.8.4 Monthly and Annual Rainfall Derrinumera Landfill Site, 2002, 2003 2004, 2005 (mm)

Year	J	F	M	A	M	J	J	A	S	O	N	D	Annual
2002	124.4	195.6	101.6	69.8	96.4	88.6	68.2	67.8	23.6	187.6	176.6	118.2	1318.4
2003	135.7	89	90.2	66.2	198.8	68.5	101.9	36.4	78	86.4	194.8	117.6	1263.5
2004	140.8	31.4	115.6	3.84	10.33	102.4	91.6	107.4	169.6	165.2	118.4	186.4	1263.5
2005	118	90.4	78	113	128.2	85	49.2	95.6	134.8	129	173.8	149.2	1344.2

With regard to the synoptic station located at Claremorris, the average annual rainfall for the period 1961 – 1990 was 1,143 mm. This figure is higher than the national average. However, this is to be expected from such a location near the west coast.

The maximum elevation at the Derrinumera Landfill Site is approximately 96 m O.D., with the Climate Measuring Station positioned at 101m O.D. Newport Furnace, situated on the Atlantic coast is at an elevation of c.15 m O.D. and the annual average rainfall, at 1,547mm.

Evapotranspiration:

Evapotranspiration is the return of water vapour to the atmosphere by evaporation by land and by the transpiration by plants, generally measured from a short grass-covered surface (such as a permanent pasture), which is adequately supplied with water.

The mean monthly potential evapotranspiration figures for Claremorris synoptic station are detailed in Table 4.8.5 below as follows:

Table 4.8.5 Mean Monthly Potential Evapotranspiration at Claremorris, 1961 - 1990 (mm)

Month	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Evapo-transpiration (mm)	1.6	13.4	28.0	49.2	68.9	75.4	68.4	54.3	33.2	14.4	2.0	1.4	407.5

Wind:
Wind speed and direction at Derrinumera are strongly influenced by local topography. The prevailing wind direction at the site is southwesterly and the annual wind speed for 2005 was 4.01 knots.

30 year average monthly data from Claremorris Synoptic Station is available from 1961 – 1990. This data is summarised in Table 4.8.6 below.

Table 4.8.6 Monthly and Annual Average Wind Speed at Claremorris, 1961 - 1990 (knots)

Month	J	F	M	A	M	J	J	A	S	O	N	D	Annual Average
Mean Monthly Speed	10.0	10.0	10.2	8.7	8.3	7.9	7.5	7.3	8.0	9.0	8.7	9.7	8.8
Max. gust	96	85	74	57	62	54	66	54	91	70	70	79	96
Max. mean 10 minute speed	59	48	45	36	41	36	39	33	60	46	40	51	60
Mean no. of days with gales	1.2	0.9	1.0	0.1	0.1	0.1	0.0	0.0	0.2	0.4	0.5	0.7	5.2

The wind rose for the Claremorris station is given in Appendix 14, Volume IV.

4.8.2.2 Local Climate

As mentioned previously, a 10 m mast complete with an anemometer and north pointing directional indicator was established at the Derrinumera Landfill Site. Day to day weather patterns at the site are logged onto a database on site, and are shared with Met Eireann. The total rainfall recorded at the site from January 2005 to December 2005 was 1,344.2mm, which is about average for the area. The temperatures recorded at the site ranged between –2.61 and 25.19°C. The humidity ranged between 26.02% and 97.07%, with atmospheric pressure ranging between 961.95 millibars and 1030.01 millibars.

4.8.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.8.3.1 Surface Water Runoff

The development of the Sludge Hub Centre and Leachate Treatment Facility will result in additional stormwater runoff generation from the impermeable surfaces on site. This is not

considered to be a significant impact as additional stormwater will be collected and used as process water or will be diverted to the existing stormwater management system on site which is capable of handling such an amount of additional runoff.

4.8.3.2 Climate Change

The effects of climate change as they may impact on rainfall patterns are not considered relevant with regard to existing and future landfill operations at Derrinumera. Although leachate generation at the landfill is, to a considerable degree, influenced by rainfall patterns at present, capping of filled cells means the generation of leachate will be independent of future climate change when considering the relatively short lifespan of the last remaining waste cell (Cell 2). It can be reasonably assumed that permanent capping of all currently licensed landfill cells will be complete within the next 5 years. This permanent capping will involve covering the entire waste-body with an impermeable layer followed by up to 1 metre depth of natural soil, which will, in effect, return the landfill body to an almost 'green-field' state. Precipitation falling on these sealed off cells will either flow away towards natural surface water drainage routes of the area or be absorbed back to the atmosphere. Therefore, as the noticeable effects of climate change on precipitation begin to occur, landfill cells will already have been sealed off from the atmosphere, and leachate generation will no longer be dependant upon rainfall patterns.

4.8.3.3 Local Climate

No potential impacts are expected on the local climate of the area.

4.8.3.4 Global Climate

Under the Kyoto Protocol, the European Union aims to reduce the emissions of greenhouse gases by 8% below 1990 levels by the period 2008-2012. As a result, Ireland has agreed to limit the increase in its net greenhouse emissions to 13% above 1990 levels by the period 2008 to 2012. Carbon dioxide resulting from the bioconversion of biowaste is not considered a net contributor to greenhouse gas emissions, since the carbon is stored in the biomass for a limited number of years (short carbon cycle), whereas in the case of fossil fuels the carbon is stored for millions of years (long carbon cycle). Therefore, there will be no net contribution to greenhouse gas emissions. The potential to use landfill gas as an auxiliary fuel shall be investigated, and used if found feasible and cost effective, subject to regulatory requirements. If implemented, this will eliminate the requirement for natural gas and/or diesel, which would otherwise be necessary to fuel the sludge drier, which will have further environmental benefits.

4.8.4 MEASURES TO MITIGATE ADVERSE IMPACTS

Since it is envisaged that the proposed facility will have no impacts on the local or global climate, no specific mitigation measures have been identified.

4.8.5 CONCLUSIONS/RECOMMENDATIONS

The proposed development will have no impact on the local or global climate.

4.9 LANDSCAPE

4.9.1 INTRODUCTION

This section looks at the present landscape on and surrounding the site, the potential impacts the construction of the SHC and LTF would have on the landscape and the mitigation measures that would be put in place to limit these impacts. In undertaking this assessment, the *'Landscape Appraisal of County Mayo – County Development Plan, 2003-2009',* (Mayo County Council) was referenced to establish the local landscape character.

4.9.2 EXISTING ENVIRONMENT

Derrinumera Landfill is located approximately 6.5 km east of Newport town, just off the Castlebar to Newport Road (R311). The general character of the terrain is small gently sloping hillocks, containing low areas of poorly drained land. The existing landfill is located at a maximum elevation of approximately 96 m O.D (Malin Head), between a small hill immediately to the west and a small valley running in a north-south direction, towards the R311. The land rises again to the east to a high point located in the townland of Lappallagh. The slope regime in the area is in the medium range of 5% to 10%, with localised flat areas at the bottom of valleys and localised areas of steep slopes due to erosion.

The primary land-use in the area is agriculture- mainly small-scale farming, which for the most part is pastureland. There are large areas of blanket bog, with some cut-away bog. Much of the land in the area is fallow land, with some marginal agricultural land.

The principal ground cover in the area is blanket bog, with its associated plant species - mainly heathers and wild grasses. There are some commercial conifer plantations in the area along with pockets of deciduous wood planted along the R311 and adjacent to farm buildings in the locality. The principal species are Hazel, Ash, Sycamore, Silver Birch and Alder.

In visual terms, the siting of the existing landfill facility, on a ridgeline parallel to the Castlebar to Newport Road, makes it relatively obtrusive. Currently at the site, Cell 1 has been filled to a level of 96m O.D. and the average level of the road in the vicinity of the landfill is 70m O.D. However, the distance from Cell 1 to the R311, approximately half a mile, reduces the visual significance of the site. The main views into the site are from the south and southeast; i.e. from the R311 directly opposite the site at Logjody Bridge and from the stretch of road between Ass Bridge and Logjody Bridge, respectively. The absence of inhabited dwellings in the area means that there are no views from houses directly into the

landfill site. The surrounding empty landscape acts as an effective buffer against views into the landfill.

The general landscape quality is relatively poor in the area, compared to the high amenity landscape in the hinterland of Newport town. Short-distance views into the site from the access road are poor; the disturbed nature of the landfill being visually dominant and obtrusive. The prominent position of the south end of the landfill on a ridge means that the profile is seen against a backdrop of sky, rendering any change in profile more visually obtrusive.

Landscape Appraisal

According to the *'Landscape Appraisal of County Mayo'*, commissioned by Mayo County Council as part of the '*County Mayo Development Plan 2003-2009'*, the planning context in which the proposed development lies has been characterised as follows:

The site falls into the *Landscape Character Area I: Central Mayo Mountain Moorland.* This upland area includes the valley of Glen Nephin on the northern side, however the subject site is located to the south of Area I, which has been characterised as becoming increasingly rugged and undulating on the more gradual southward decent towards Castlebar and Clew Bay. The predominant land cover of Area I is moorland/bog type grasses with patches of woodland scrub and production forestry. Peat bogs cover large areas of this region, with significant pockets of transitional woodland scrub. The main land uses in Area I include conifer, broad-leafed and mixed forest plantations with scattered small-scale agriculture.

The scenic evaluation of the Mayo Landscape Appraisal indicates that the subject site is located in the vicinity of some "Vulnerable" areas and features. "Vulnerable" areas, as listed in the Landscape Appraisal include coastlines, river-banks and lake shorelines. The proposed development will be sited adjacent to two "Vulnerable Areas", i.e.: Lough Beltra and Newport River to the north of the site and; Owennabrockagh River to the south of the site. "Vulnerable Features" as detailed in the Landscape appraisal entail prominent skylines. The subject site is located between two prominent skylines to the east and west, which have been designated as "Vulnerable Features".

The policies regarding vulnerable areas require the protection of those principal features that give character and distinctiveness to the local landscape. Development must not impinge in any significant way on landscape character, integrity or uniformity. As detailed below, the proposed facilities will be constructed to a maximum height of 93.5m O.D.and will be sited between the existing landfill cells (finished height 96m O.D.) to the east and the highlands to the southwest and west (rising to 139m O.D.). Existing site infrastructure located to the south of the proposed development will also help to mask the facilities. The only potential for long distance views into the proposed facility are from the north, on the county road at Glaishwy Bridge. However, this is over 2km from the site and any visual impacts are negated by the vastness of the surrounding environment. It can therefore be concluded that the existing

topography and features of the area can effectively mask and comfortably accommodate the proposed development and assimilate it into the landscape.

4.9.3 IMPACTS OF THE PROPOSED DEVELOPMENT

It is planned to site the proposed facilities on the western side of the existing landfill site, beside Cells 1 and 2, and behind the existing civic amenity site and site accommodation building. The principal visual impact of the landfill site and the proposed facilities is on the Newport to Castlebar road (R311) to the south. As this road constitutes a popular tourist route, connecting Castlebar to Newport and Achill, there is a potential for significant negative, if localised, visual impact on the landscape.

However, because the existing landfill cells and site infrastructure from views from the R311 to the south will effectively mask the proposed facility, it is anticipated that the visual impact will be negligible. The proposed facilities will be constructed at a base level of approximately 80m O.D. The maximum height of the structures will be 13.5m (approx.), which means that the top of the structures will be at approximately 93.5m O.D. The landfill Cells will be finished to a height of 96m O.D., therefore, the proposed facilities will not be viewed from the southeast at R311; the principal long distance view into the site.

There are no views from the southwest (the direction of the nearest dwelling), due to the highlands to the southwest and west. These highlands rise to 139m O.D. to the west and to 115m O.D. adjacent to the western boundary of the south. The only potential for long distance views into the proposed facility are from the north, on the county road at Glaishwy Bridge. However, this is over 2km from the site and any visual impacts are negated by the vastness of the surrounding environment.

With regard to vulnerable areas that require protection, given the location of the proposed development as detailed above, the facilities will not impinge in any significant way on landscape character, integrity or uniformity.

4.9.4 MEASURES TO MITIGATE ADVERSE IMPACTS

As the proposed facility will be effectively masked by the landfill cells and the existing site infrastructure from views from the R311 to the south and southeast and the surrounding highlands to the west and southwest, it is envisaged that the proposed facility will have no impacts on the local landscape amenity. Therefore, no specific mitigation measures have been identified related to the development of the SHC and the LTF.

4.9.5 CONCLUSIONS/RECOMMENDATIONS

The proposed development will have no impact on the local landscape amenity due to its location behind the existing facilities and the greater elevations of the surrounding topography.

4.10 MATERIAL ASSETS – ROAD INFRASTRUCTURE & TRAFFIC

4.10.1 INTRODUCTION

The following section is an assessment of the impact of the proposed SHC and LTF on material assets, in this case relating to the impact on the road infrastructure in the vicinity of the Derrinumera Landfill.

4.10.2 EXISTING ENVIRONMENT

4.10.2.1 Existing Traffic to Derrinumera Landfill Site

At the present time, traffic using the Derrinumera Landfill travels over the weighbridge, and traffic using the civic amenity site proceeds directly to that area without crossing the weighbridge. Bulk skip loads from the civic amenity site are also sent across the weighbridge. This is for internal record keeping, related to the various waste streams. Thus, in general, it is necessary to interpret the weighbridge data and civic amenity traffic, in order to arrive at proper equivalent vehicle counts along the access road to the facility.

Taking the counts for the 12-month period to the end of May 2005, a total of 64,224 vehicles have used the civic amenity site in that period, and 8,731 vehicles have used the weighbridge in the same period. The landfill manager would estimate that approximately 90% of the weighbridge traffic would be HGV’s. The breakdown of these HGV's is as follows:

- Proceeding to the Landfill with waste;
- Associated with Leachate Haulage;
- The remainder being divided approximately evenly between load measurements of recyclables and cars with trailers sent for weight measurement.

Accordingly, it is estimated that the traffic counts entering the landfill access road at present as:

Vehicle Type	**Vehicles per day (based on 6-day week)**
HGVs :	25
Cars and light commercial	209

4.10.2.2 Leachate Transport Traffic

The above counts of HGVs include the transport vehicles for movement of leachate to Castlebar WWTP. At present, leachate is moved by articulated tanker. The volumes of leachate moved reflect the seasons on the landfill and the overall water balance on the site. Tanker unit volume has varied over the past few years, and Tables 4.10.1 to 4.10.5 set out the statistics, including mean daily traffic counts arising because of leachate transportation.

It is clear from these counts that leachate transport accounts for a significant fraction of the HGV traffic at the Landfill at present.

Table 4.10.1 Leachate Transportation from Derrinumera Landfill 2001

	Tanker Loads	Unit Size (m^3)	Volume (m^3)	Tractor Loads	Unit Size (m^3)	Volume (m^3)	Mean Traffic movements per day
January	368	22,27 & 28	8,498	68	9	612	28
February	238	22,27 & 28	5,588	75	9	675	22
March	192	22,27 & 28	4,797	29	9	261	14
April	236	22,27 & 28	5,342	25	9	225	17
May	127	22	2,794				8
June	124	22	2,728				8
July	251	22	5,522				16
August	335	22	7,370				22
September	129	22	2,838				9
October	354	22	7,788				23
November	384	22	8,448				26
December	452	22	9,944				29
Sub-Totals	***3,190***		***71,657***	***197***		***1,773***	
	Total Volume		**73,430m^3**	**Total Vehicles**		**3,387**	

Table 4.10.2 Leachate Transportation from Derrinumera Landfill 2002

	Tanker Loads	Unit Size (m^3)	Volume (m^3)	Tractor Loads	Unit Size (m^3)	Volume (m^3)	Mean Traffic movements per day
January	400	22.	8,800				26
February	881	22	19,382				63
March	661	22	14,542				43
April	174	22	3,828	2	9	18	12
May	477	22	10,494				31
June	342	22	7,524				23
July	204	22	4,488				13
August	198	22	4,356				13
September	195	22	4,290				13
October	337	22	7,414				22
November	909	22	19,998				61
December	422	22	9,284				27
Sub-Total	***5,200***		***114,400***	***2***		***18***	
	Total Volume		**114,418m^3**	**Total Vehicles**		**5,202**	

Table 4.10.3 Leachate Transportation from Derrinumera Landfill 2003

	Tanker Loads	Unit Size (m^3)	Volume (m^3)	Tractor Loads	Unit Size (m^3)	Volume (m^3)	Mean Traffic movements per day
January	359	22	7,898				23
February	338	22	7,436				24
March	301	22	6,622				19
April	171	22	3,762				11
May	370	22	8,140				24
June	290	22	6,380				19
July	178	22	3,916				11
August	147	22	3,234				9
September	166	22	3,652				11
October	161	22	3,542				10
November	452	22	9,944				30
December							
Sub-Total	***2,933***		***64,526***				
	Total Volume		**64,526m^3**	**Total Vehicles**		**2,933**	

Table 4.10.4 Leachate Transportation from Derrinumera Landfill 2004

	Tanker Loads	Unit Size (m^3) (approx.)	Volume (m^3)	Tractor Loads	Unit Size (m^3)	Volume (m^3)	Mean Traffic movements per day
January	651	21	13,623				21
February	458	21	9,585				16
March	291	21	6,090				9
April	426	21	8,915				14
May	151	21	3,160				5
June	93	21	1,946				3
July	209	21	4,374				7
August	146	21	3,055				5
September	390	21	8,162				13
October	800	21	16,742				26
November	512	21	10,715				17
December	438	21	9,167				14
Sub-Total	***4,565***		***95,534***				
	Total Volume		**95,534m^3**	**Total Vehicles**		**4,565**	

Table 4.10.5 Leachate Transportation from Derrinumera Landfill 2005

	Tanker Loads	Unit Size (m^3) (approx.)	Volume (m^3)	Tractor Loads	Unit Size (m^3)	Volume (m^3)	Mean Traffic movements per day
January	1,274	23	29,035				41
February	351	23	8,000				13
March	218	23	4,969				7
April	285	23	6,496				10
May	147	23	3,351				5
June	294	23	6,701				10
July	157	23	3,579				5
August	95	23	2,166				3
September	148	23	3,374				5
October	316	23	7,202				10
November	596	23	13,583				20
December	385	23	8,774				12
Sub-Total	***4,266***		***97,230***				
	Total Volume		**97,230m^3**	**Total Vehicles**		**4,266**	

4.10.3 IMPACTS OF THE PROPOSED DEVELOPMENT

In the future, traffic volumes will vary as a net result of opposite trends and components, i.e.:

a. Increased traffic due to importation of all sludges as cake and liquid sludge to the SHC;
b. Increased traffic due to importation of fuel for the sludge drier;
c. Reduced traffic in discontinuing the tanker transport of leachate to Castlebar, once the proposed pumped system to Newport WWTP outfall is commissioned;
d. Increased traffic of employees and service vehicles associated with the SHC; and
e. Increased traffic associated with exports of biosolids from the SHC.

The following table provides a summary of the estimated annual existing and proposed traffic movements to the Derrinumera Landfill Facility.

Table 4.10.6 –Estimation of Existing and Proposed Traffic Movements to and from Derrinumera Landfill Facility.

	Traffic In	**Traffic Out**	**Total**
Existing Traffic *			
Leachate Transportation	4,266	4,266	
Other HGVs	3,592	3,592	
Civic Amenity Traffic	65,097	65,097	
Sub-total	***72,955***	***72,955***	
Total traffic movements per annum (existing)			**145,910**
Future Traffic			
Leachate Transportation	0	0	
Other HGVs	3,592	3,592	
Civic Amenity Traffic	65,097	65,097	
Import Sludge Cake	2748	2748	
Import Liquid Sludge	639	639	
Import Drier Fuel	1	1	
Export Biosolids	397	397	
Additional Staff Vehicles	6	6	
Sub-total	***72,480***	***72,480***	
Total traffic movements per annum (future)			**144,960**

* (based on latest counts from Derrinumera On-site Records (2005)

It is envisaged that during the construction of the Sludge Hub Centre (SHC) and Leachate Treatment Facility(LTF), the volume of traffic is expected to increase slightly, however, the local road network is in good condition and will easily cater for the slight increase in traffic volumes.

Increased HGV movements will occur as a result of sludge importation to, and biosolids exportation from, the proposed facility. However, the discontinuation of tanker transport of leachate to Castlebar as a result of the proposed development, will in all likelihood cancel out any increases in HGV traffic at the site and may actually lead to a net decrease in the annual HGV movements to and from the site. Therefore, it is not envisaged that the proposed SHC and LTF will result in any negative impacts on traffic volumes.

Employee Related Traffic:

The number of car movements at the site will increase by 12 movements per day due to the additional six staff, which will be required to run the SHC and LTF. Based on current car movements at the facility, this will lead to an approximate 6% increase in car movements. It is not considered that this minor increase in car movements will have a negative impact on the community.

Construction Traffic:
The construction phase of the development will result in increased volumes of traffic on the surrounding roads, resulting mainly from the delivery of building materials to and from the site. The effects of this will be short term and will be of a scale similar to any medium construction project. The construction phase may have a negative impact on the surface of the entrance road, connecting the landfill to the Castlebar to Newport Road (R311). It is not envisaged that the construction phase will have a negative impact on the R311 due to its current good condition.

Effect of Pipe laying on Traffic
The construction of a pumped rising main for transfer of treated leachate from Derrinumera Leachate Treatment Facility to Newport will have a short-term impact on traffic patterns in the affected area. Traffic management is a key issue for sewer construction in narrow rural roads and therefore will be a key issue for this element of the development. Traffic management plans will be compiled in accordance with the requirements of the *'Traffic Signs Manual (Chapter 8 – Temporary Traffic Measures and Signs for Roadworks)'*, Department of Environment, 2006 (or any subsequent amendments thereof) to ensure the continuous smooth flow of traffic along the pipeline route. It is envisaged that the pipeline construction will have a very minor short-term negative impact on traffic patterns during the construction period.

4.10.4 MEASURES TO MITIGATE ADVERSE IMPACTS

It is envisaged that during the construction of the SHC and LTF, the volume of traffic is expected to increase slightly, as outlined above. However, the local road network is in good condition and will easily cater for the slight increase in traffic volumes.

During the pipeline construction phase on the R311, the Contractor shall be responsible for the planning, implementation, maintenance and ultimate removal of traffic safety and management measures required in order to facilitate the work.

In order to mitigate any impact that construction traffic may have on the entrance road to the landfill site and the road affected by the pipeline route, an appropriate sum will be provided in the construction contract to cover the possible repair or re-strengthening of the affected road sections.

Increased HGV movements will occur as a result of sludge importation to and biosolids exportation from the proposed facility. However, the discontinuation of tanker transport of leachate to Castlebar as a result of the proposed development, will in all likelihood cancel out any increases in HGV traffic at the site. Therefore, it is not envisaged that the proposed SHC and LTF will result in any increases in HGV traffic volumes.

The number of car movements at the site will increase by 12 movements per day due to the additional 6 No. staff, which will be required to run the SHC and LTF. Based on current car movements at the facility, this will lead to an approximate 6% increase in car movements. It is not considered that this minor increase in car movements will have a negative impact on the community as these workers will spend locally and the spin-off from continuing employment at the landfill will also contribute to local employment.

4.10.5 CONCLUSIONS/RECOMMENDATIONS

The proposed development will have no negative impact on the local road infrastructure.

4.11 MATERIAL ASSETS – ARCHAEOLOGICAL AND CULTURAL HERITAGE

4.11.1 INTRODUCTION

This section of the EIS details the cultural heritage and archaeological amenity of the Derrinumera area, as well as the area covering the route of the proposed treated leachate rising main. Any impacts, which the proposed development may have on the material assets of the development areas will also be examined in this section. Reference will be made to the archaeological study carried out by Mr. Michael Gibbons BA, MIAPA, for the original Waste Licence Application in September 1998, and also the Preliminary Archaeological Assessment of the proposed pipeline route carried out by Linda Beirne, MA Archaeologist.

4.11.1.1 Proposed Development Site

The existing archaeological and historical study is based on a comprehensive desk study of an area within 3.5km of the Derrinumera Landfill site. The Recorded Monuments listed by the Heritage Service (Department of Arts, Heritage, Gaeltacht and the Islands) within 3.5km of the landfill site were investigated. The Recorded Monuments investigated are based on information held by the Sites and Monuments Record Office of the Department of Arts, Heritage, Gaeltacht and the Islands in Dublin. The Topographical Files and the Finds Register of the National Museum of Ireland, and relevant aerial photographs were also consulted. A ground walkover was also carried out, covering an area within 500m of the landfill site boundary, to see if any unrecorded archaeological sites and monuments or finds were in existence.

Subsequent to the original archaeological desk study, an on-site archaeological study was completed more recently at the Derrinumera Landfill, concentrating on an area adjacent to the northwest boundary of the site, outside the existing licence boundary. This area was utilised as a borrow pit for the construction of Cell No.2. The cleared site will also become part of the proposed SHC. During the clearing of the site a number of unrecorded *fulacht fiadhs* were discovered.

Fulacht fiadhs are ancient cooking places, which usually survive as small horseshoe shaped mounds of charcoal-enriched soil packed with fragments of heat-shattered stones. They are usually situated close to a water source, like a stream, or in wet marshy areas. They date from the Bronze Age to the Medieval Period.

The archaeological excavation involved logging the *fulacht fiadhs.* The *fulacht fiadhs* were subsequently removed under licence from the National Museum of Ireland. No other archaeological finds were recorded. A report on the archaeological dig is included in Appendix 15, Volume IV.

4.11.1.2 Proposed Treated Leachate Pipeline Route

Linda Beirne, MA Archaeologist, Mayo County Council undertook a preliminary archaeological assessment. An examination of the relevant Recorded monument and Place Maps and Manual for County Mayo was carried out, so as to assess the impact on known archaeological constraints. A copy of the Preliminary Archaeological Assessment is provided in Appendix 16, Volume IV.

4.11.2 EXISTING ENVIRONMENT

4.11.2.1 Proposed Development Site

The results of the National Museum of Ireland Finds' Register showed one site: IA 1953:39. The file states that some bog butter was found in a wooden container in the town land of Lappallagh, approximately 1.5km east of the landfill site in 1953. No precise location is given and the finding of bog butter is quite common in Ireland. The find would be of local importance.

The results of the archaeological survey within 500m of the landfill site boundary revealed four previously unrecorded archaeological sites during the fieldwork (Sites A, B, C and D - Figure 4.11.1). One of the sites, Site D, is located within the area owned by Mayo County Council. The other sites are located outside the landfill boundary but within 500m of the site.

Site A - Possible Standing Stone:
Site A, a possible standing stone is located c. 240m outside the north-eastern boundary of the land owned by Mayo County Council. It is a conglomerate stone triangular in shape and

measures 1.1m in height and 1m thick. It is located in a cut-away bog and may not be of archaeological importance. If it were, it would be of local archaeological importance.

Site B - Possible Standing Stone:

Site B, two possible standing stones, is located 210m outside the northeastern boundary of the land owned by Mayo County Council. One of the stones is upright, while the other is a possible rock outcrop. The upright stone is 1.1m high, 0.7m wide and 0.38m thick. The other stone lies on its side adjacent to the upright stone and is 0.38m above ground level. Its visible length is 1.25m and it is 0.75m thick. The site may not be of archaeological importance. If it were it would be of local archaeological importance.

Site C - Possible Standing Stone:

Site C, a possible standing stone, is located 30m outside the northeastern boundary of the land owned by Mayo County Council. The stone is 1.9m long, 0.85m high and 0.65m thick. It may be a rock outcrop and of no archaeological importance. If it were it would be of local archaeological importance.

Site D - Possible Burial Mound:

Site D is located within the Northern end of the land owned by Mayo County Council. It contains a sub-circular mound measuring approximately 20m in diameter. It is highest on its eastern side c. 2.2m high. The mound could be a pre-historic burial mound (2,000 BC to 500 AD) or may be a natural feature. If the mound is to be interfered with in any future works at the landfill site it will be pre-development tested by a qualified Archaeologist under licence from the Heritage Service. Only then will it be clear if the mound is of archaeological importance or not. If the mound were a pre-historic burial mound it would be of regional significance.

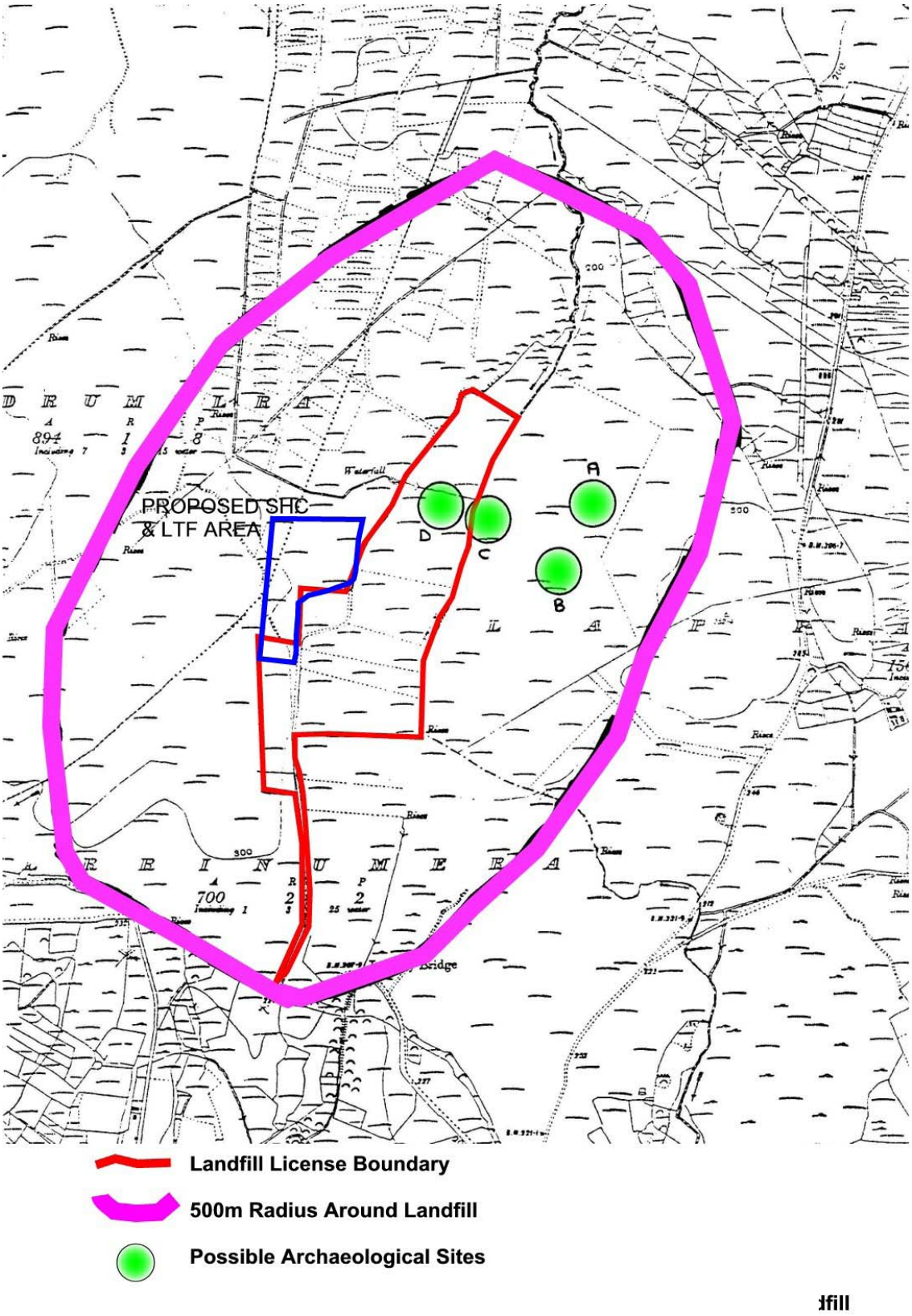


Figure 4.11.1 Location of Possible Archaeological Sites within 500m of Landfill

4.11.2.2 Proposed Treated Leachate Pipeline Route

Figures 1 to 3 inclusive (refer to Appendix No. 16 of Volume IV) illustrate the proposed pipeline route and local Sites and Monuments recorded locations. A route selection for the proposed effluent rising main from Derrinumera Leachate Treatment Facility will proceed from the existing landfill site in the townland of Derrinumera, through the townlands of Cartron, Cuilmore, Cloonshil, Drumlong and into Newport from where it will continue to the townland of Caulicaun at the site of the proposed Newport Waste Water Treatment Plant.

In terms of pipeline construction, the dedicated treated leachate rising main will not intercept any areas of archaeological interest or possible archaeological interest over it's entire length, from the Derriumera Leachate Treatment Facility outfall to the Newport WWTP outfall.

With regard to the combined outfall pipeline, to be constructed from the Newport WWTP at Caulicaun to the final discharge location north of Rosmore, the crossing of an inter-tidal area between Caulicaun and Lisduff has the potential to impact on three identified known Recorded Monuments and Places (all within one area of constraint), therefore this crossing will be relocated north so that it is not within the area of archaeological constraint.

Three areas of archaeological interest or possible archaeological interest, which are all within the same area of constraint, are located in the vicinity of the proposed pipeline route (See Figure 1, Appendix 16, Volume IV).

Site No. 1 (RMP[20] No. MA067-03701) has been classified as an Enclosure. Site No. 2 (RMP No. MA067-03702) has been classified as a Possible Hut Site. Site No. 3 refers to a river crossing southeast of RMP MA067-03701 and MA067-03702. All three sites are located in the same area of constraint in the townland of Lisduff.

4.11.3 IMPACTS OF THE PROPOSED DEVELOPMENT

4.11.3.1 Proposed Development Site

The potential impact of the landfill site on the cultural heritage of the area is small. The only possible archaeological site within the licensed landfill boundary is Site D. As seen in Figure 4.11.1, the proposed footprint of the Sludge Hub Centre and Leachate Treatment Facility will not interfere with Site D. In the unlikely event that any works are to be undertaken in the area of Site D, this area will be pre-development tested by a qualified archaeologist under licence from the Heritage Service.

[20] RMP denotes a Recorded Monument and Place sourced from 'Recorded Monument and Place Maps and Manual for County Mayo'.

The development of the SHC and the LTF will also have no affect on the local cultural heritage. The archaeological sites found during the clearing of the borrow area have been logged and removed, and no other sites were found in the vicinity.

4.11.3.2 Proposed Treated Leachate Pipeline Route

It is not envisaged that the proposed inter-tidal crossing will have a negative impact on the identified Recorded Monuments and Places, as the pipeline route will be relocated accordingly so that the tidal crossing will not be located within the area of archaeological constraint. As an additional mitigation measure, any section of the proposed rising main that does not run through and alongside the existing road shall be field walked prior to the commencement of any works.

The digging of trenches for the treated leachate pipeline in greenfield areas where no recorded archaeology is located could potentially result in the permanent destruction of subsurface artefacts, which might as of yet be un-recorded in the area. This would be a significantly negative impact, however the predicted impact is not considered highly likely to occur.

4.11.4 MEASURES TO MITIGATE ADVERSE IMPACTS

It is envisaged that the proposed facility will have no impacts on the local cultural heritage, therefore, no specific mitigation measures have been identified related to the development site of the SHC and the LTF.

It is not envisaged that the proposed inter-tidal crossing will impact directly on the identified Recorded Monuments and Places, as the pipeline route will be relocated accordingly so that the river crossing will not be located within the area of archaeological constraint. As an additional mitigation measure, any section of the proposed pipeline that does not run through and alongside the existing road shall be field walked prior to the commencement of any works.

The excavation of the pipeline trenches associated with the treated leachate rising main in greenfield locations, will be subjected to archaeological monitoring under licence by an archaeologist. In the event of archaeological deposits and/or artefacts being encountered during this monitoring, the National Monuments Section of the Department of the Environment, Heritage and Local Government and the National Museum of Ireland (NMI) will be consulted to determine the requirements, if any, for further mitigation.

The pipeline routes along the existing roads will be intermittently inspected by an archaeologist, at a schedule, which will be agreed prior to commencement of construction activities. The detailed design of the proposed development will ensure that the pipeline route does not impact directly on RMP, **MA067-037** or any other RMP site.

4.11.5 CONCLUSIONS/RECOMMENDATIONS

The proposed development will have no impact on the local cultural heritage.

Section Five

INTERACTION OF ENVIRONMENTAL EFFECTS & SUMMARY OF MITIGATION MEASURES

5 INTERACTION OF ENVIRONMENTAL EFFECTS & SUMMARY OF MITIGATION MEASURES

5.1 SUMMARY OF ENVIRONMENTAL INTERACTIONS

The interactions of environmental effects are briefly summarised in Table 5.1.1 below. The interactions of environmental effects are detailed in Section 5.2. The table below highlights the causes of the environmental impacts and indicates where these impacts interact with other areas of the environment. The interactions are colour coded to highlight positive, neutral and negative interactions.

Table 5.1.1 Matrix of Interaction of Environmental Effects

CAUSE	EFFECT								
	Population	Economy	Ecology	Soil & Geology	Water Quality	Climate	Landscape	Roads	Cultural Heritage
Physical Development	X	X	X	X	X	X	X	X	X
Population		X							
Soil									X
Water Quality	X								
Noise	X								
Dust	X							X	
Odour	X								
Road Traffic	X								

Legend

Colour	Interaction
X	Positive
X	Neutral
X	Negative

5.2 INTERACTION OF ENVIRONMENTAL EFFECTS AND SUMMARY OF MITIGATION MEASURES

The significant impacts of the proposed SHC and LTF and the measures proposed to mitigate these impacts have been outlined in this report. However, in any development with the potential for environmental impact, there is also the potential for interaction between impacts of the different environmental aspects.

The result of these interactions may either exacerbate the magnitude of the impact or may in fact ameliorate it. As part of the requirements of an Environmental Impact Statement the interaction of the impacts on the surrounding environment need to be addressed.

There is the potential for interaction between the impacts of the proposed development (shown graphically in Table 5.1.1) within and adjacent to the proposed SHC and LTF as follows:

- Dust suppression and the use of the existing vehicle wheel wash are proposed to mitigate the impact of wind blown dust around the site and to nearby dwellings. All sludge and dried sludge handling will take place within the confines of the SHC building, therefore there will not be external generation of dust. These measures will reduce the impact on human beings and material assets in the community;
- Travel patterns will not be disrupted in the community by the proposed facility, however vehicle numbers will increase during the construction of the facility. Possible mitigation measures to improve the entrance road and to repair any damage, caused by the construction traffic, to the local roads in the vicinity of the landfill site will reduce the impact of the facility. These measures will improve road safety for all road users. It is not envisaged that the proposed SHC and LTF will result in any increases in HGV traffic volumes. The number of car movements at the site will increase slightly due to an increase in employee numbers at the facility, however it is not considered that this minor increase in car movements will have a negative impact on the community;
- The use of road-worthy and sealed containers and tankers for the transport of sludge to the proposed SHC will mitigate against odour generation during transportation. This measure will reduce the impact on human beings and material assets in the community;
- Odours will be reduced by ensuring that there will be no external handling of sludge, any composting operations will be undertaken within fully enclosed buildings and all process air will be collected and treated in a scrubber and biofilter. These measures will reduce impacts of odour on human beings;
- Professional vermin control experts will be employed, if deemed necessary to ensure vermin activity is minimised;
- The potential exists that certain terrestrial species of animal could be impact upon if the food source or habitat is affected by the proposed development. This impact could be positive or negative, for example habitat or food source enhancement arising from improved water quality or habitat or food source reduction due to alterations affecting water conditions, e.g. bioaccumulation, etc. As described in Section 4.4 of this statement, any impacts on same, where they exist, on successful implementation of the proposed mitigation would be imperceptible;
- Compliance monitoring will be undertaken, as per regulatory conditions and will be reported on, as part of the annual environmental report for the whole landfill site. These reports will be made available to all interested parties, which will allay public concerns as to the operation of the site and will result in a positive interaction with respect to human beings;

- The facility will be operated to Best Available Techniques (BAT) as per EPA recommendations. All information will be available to interested parties, a complaints register will be maintained and the EPA will undertake regular environmental audits, which will demonstrate how the facility is performing. These measures will result in interaction in all environmental criteria;
- Finally, throughout the EIS, potential interaction between various environmental criteria is discussed. The baseline assessment for this project was completed prior to the design of the facility, which allowed major impacts to be avoided. Avoidance of impacts was used during the design of the proposed facility. The impact and mitigation measures proposed are designed to further ameliorate the impact of the Waste Management Facility on the wider environment.

While there is potential for the above impacts to interact and result in a cumulative impact, it is unlikely that any of these cumulative impacts will result in significant environmental degradation.

The proposed SHC & LTF will also have a very positive effect on the wastewater treatment plant (WWTP) in Castlebar. Once the proposed LTF has been commissioned, the organic loading on the WWTP will be reduced, making the treatment process more efficient. This is because leachate produced at the Derrinumera Landfill will no longer be tankered to Castlebar WWTP and will be treated on-site at Derrinumera.

Also, once the Sludge Hub Centre has been commissioned at the Derrinumera landfill site, sludge cake transportation outside the county will cease. This will result in further reductions in traffic levels in the county overall, thus reducing the impact on the environment.

Section Six

CONCLUSION

6 CONCLUSION

Mayo County Council are now seeking approval for a County Mayo Sludge Hub Centre at the centrally located Derrinumera Landfill Facility in accordance with the recommendations of the Mayo Sludge Management Plan (Review), 2002. In order to facilitate the future compliance with a condition issued by An Bord Pleanála to cease leachate imports to Castlebar WWTP, and following best environmental practice, the Council also wish to implement leachate treatment at source at Derrinumera. It is proposed that the leachate treated here will be co-discharged with treated municipal effluent from Newport town, at the Newport WWTP proposed coastal outfall location. These measures will address sludge treatment and disposal, and leachate treatment and disposal, in a sustainable way.

The development of a Leachate Treatment Facility and County Mayo Sludge Hub Centre is critical to the infrastructural needs of County Mayo in terms of facilitating existing populations and sustainable growth of the county as a whole. An Environmental Impact Statement (EIS) has been prepared for the proposed development, which has established the environmental sustainability of such a proposal.

In terms of effects on Human Beings, as stated above, the proposal is vital to the development of the county. The project will create and continue to support local employment, both directly and indirectly. The EISS has shown that there will be no negative impacts on property or on the amenity value of the region as a result of the construction of the above development.

As the development is be sited at an existing landfill facility, impacts on ecology will be minimal, as the area has already been developed with consistent land uses, thus eliminating the need for disturbing a green-field site. There does exist a potential to impact on fauna/flora along the treated leachate pipeline route, however, the project team will strive to put in place all possible measures, which will effectively eliminate negative impacts on ecology.

Concerns from Stakeholders mainly centre on the marine discharge of treated leachate to Clew Bay. Given these concerns, and the potential to impact negatively on the species and habitats in the areas surrounding the proposed outfall, a philosophy has been developed, not only to treat the leachate to the appropriate Urban Waste Water Treatment Standards, but to also treat it such that the environmental quality standards specified in other Irish legislation (as detailed in Section 3.4) are actually attained in the pipeline prior to discharge to the receiving environment.

Fail-safe measures have already been planned for and will be implemented with regard to power failure or mechanical failure of all elements of the development, to ensure that no negative impacts will be felt as a result of development.

The EIS has established that the provision of a Sludge Hub Centre and Leachate Treatment Facility at Derrinumera will not cause odour nuisance to local residents, and will be operated and managed at all time in accordance with best practice. Estimates of existing and proposed traffic movements have shown that the siting of the development at Derrinumera will not negatively impact on traffic in the area and is likely to actually cause a slight decrease in annual traffic movements to and from the site.

Based on the mitigation measures proposed to be implemented as part of the development of the proposed Sludge Hub Centre and Leachate Treatment Facility and associated pipeline to Newport WWTP outfall, it is considered that the proposed development will not have any significant effect on the integrity of the Newport River cSAC or on the environment in general.

In addition, based on the fact that it is proposed to treat the Newport Sewerage Scheme municipal effluent and the Derrinumera landfill leachate to the discharge standards specified in the *Urban Waste Water Treatment Regulations, 2001*, with further treatment of the landfill leachate to ensure that the treated leachate attains the environmental quality standards specified in the *European Communities (Quality of Shellfish Waters) Regulations, 2006* and the *Water Quality (Dangerous Substances) Regulations, 2001* prior to discharge, combined with regular monitoring it is considered that the combined discharge will not have a significant effect on Clew Bay cSAC or affect its overall integrity.

Finally, the Environmental Protection Agency (EPA) will provide direction with regard to operating standards and compliance monitoring requirements as part of their Waste Licence Review process, which is currently on-going. This will be an extension of the monitoring and guidance that they currently provide with the existing Waste Licence for the facility, with which Mayo County Council have a proven track record of compliance.

Section Seven

REFERENCES AND GLOSSARY OF TERMS

7 REFERENCES & GLOSSARY OF TERMS

7.1 REFERENCES

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7.2 GLOSSARY OF TERMS

This section provides a partial glossary of terms used in this document. The definitions therein are not to be taken as comprehensive but solely as an aid to the non-technical reader.

Activated Sludge
A flocculent microbial mass of bacteria, protozoa and other microorganisms with a significant proportion of inert debris, produced when sewage is continuously aerated.

Aerobic
A condition, in which elementary oxygen is available and utilized in the free form by bacteria.

Anaerobic
A condition in which oxygen is not available in the form of dissolved oxygen or nitrate/nitrite.

Aquifer
A body of permeable rock that is capable of storing significant quantities of water.

Archaeology
The study of past societies of any period through the material, which remains left by those societies and the evidence of their environment. The material things (objects, monuments, sites, features, deposits) which archaeology uses to study past societies are referred to as 'archaeological heritage'.

Baseline Survey
A description of the existing environment against which future changes can be measured.

BAT – Best Available Techniques
Best Available Techniques shall mean 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:

- 'techniques' shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- 'available' techniques shall mean 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' shall mean most effective in achieving a high general level of protection of the environment as a whole.

BAT may be determined in each EU member state with reference to the Bref documents.

BATNEEC - Best Available Technology Not Entailing Excessive Costs

Use of BATNEEC means that a greater degree of control over emissions to land, air and water may be exercised, utilising the best currently available technologies. In the identification of BATNEEC emphasis is placed in pollution prevention techniques including cleaner technologies and waste minimisation. This was required by the EPA as part of Integrated Pollution Control License under the EPA ACT 1992. BATNEEC is superseded by BAT.

Bentonite

Any commercially processed clay material consisting primarily of the mineral group smectite.

BOD

Biochemical Oxygen Demand.

***Bref* (See Article 16 of IPPC Directive 96/61/EC)**

These are reference documents developed under the aegis of the European Commission with input from industry, (MS) Regulators and NGO's, at the European IPPC Bureau in Seville. These documents are intended to advance the development of BAT throughout the EU (see http://www.eippcb.jrc.es).

Capping:

The covering of a landfill, usually with low permeability material (Landfill Cap).

Cells (landfill):

Subdivision of phases of a landfill.

COD

Chemical Oxygen Demand.

Commissioning

The rendering fully operational of a project or process.

Contour

Line on a map drawn through points of equal elevation.

DBO

Design/Build/Operate – a forum of procurement.

Decommissioning

The final closing down, and putting into a state of safety of a development, project or process when it has come to the end of its useful life.

D.O.
Dissolved Oxygen.

"Do nothing" Scenario
The situation or environment, which would exist if no intervention or development, were carried out.

EC
European Community.

Ecology
The study of the relationships between living organisms and between organisms and their environment (especially animal and plant communities), their energy flows and their interactions with their surroundings.

Effluent
Any liquid discharged from a source into the environment.

Environmental Impact Assessment – EIA
The process of examining the environmental effects of development - from consideration of environmental aspects at design stage through to preparation of an Environmental Impact Statement, evaluation of the EIS by a competent authority and the subsequent decision as to whether the development should be permitted to proceed, also encompassing public response to that decision.

Environmental Impact Statement – EIS
A statement of the effects, if any, which the proposed development, if carried out, would have on the environment.

Emission
a) an emission into the atmosphere of a pollutant within the meaning of the Air Pollution Act 1987.
b) a discharge of polluting matter, sewage effluent or trade effluent within the meaning of the Local Government (Water Pollution) Act 1977 to waters or sewers within the meaning of that Act.
c) disposal of waste, or
d) noise.

EPA
The Environmental Protection Agency.

Fauna
A collective term for the animals of a region.

Flora
A collective term for plants of a region.

Geology
The science of the earth, including the composition, structure and origin of its rocks.

Ha
Hectares = 10,000 square metres

Habitat
The area in which an organism or group of organisms live.

HGV
Heavy Goods Vehicle.

Hydrology
The science concerned with the occurrence and circulation of water in all its phases and modes, and the relationship of these to man.

Impact
The degree of change in an environment, resulting from a development.

Infrastructure
The basic structure, framework or system, which supports the operation of a development or project, for example, installations such as roads and sewers, which are necessary to support development projects.

ISO
International Standards Organisation.

Integrated Pollution Control - IPC
This was a National licensing/enforcement regime for specified activities. It aimed at preventing or resolving pollution problems rather than transferring them from one medium to another. All major emissions to land, air and water were considered simultaneously and not in isolation in order to minimise pollution of the environment as a whole. IPC is superseded by IPPC.

Landfill
Waste disposal facility used for the deposit of waste onto or into land.

Land-use
The activities, which take place within a given area of space.

Leachate
Any liquid percolating through the deposited waste and emitted from or contained within a landfill as defined in Section 5(1) of the Waste Management Act.

Liner (landfill)
A low permeability barrier installed to impede the flow of leachate, groundwater and landfill gas.

Mitigation Measures
The means by which decisions about a proposed development are modified to avoid, reduce or remedy the adverse environmental effects that are identified.

m.O.D.
Ordnance datum in metres.

Non-hazardous landfill
Landfill that accepts waste that fulfils the criteria set out in Article 6 of 'Council Directive 1999/31/EC on the landfill of waste'.

Pollution
Any release to the environment, which has a subsequent adverse effect on the environment or man.

Population Equivalent (p.e.)
Population equivalent (p.e.) is the unit of measure used to describe the size of a wastewater discharge. Population equivalent is the biodegradable load (matter) in wastewater having a 5-day biochemical oxygen demand (BOD) of 60g of oxygen per day. Population equivalent doesn't necessarily reflect the actual population of a community. BOD is a widely used measure of 'pollution potential'- BOD is a measure of oxygen use, or demand, by bacteria breaking down the biodegradable load in sewage treatment plants or environmental waters. BOD is the basis for deriving the Population Equivalent of a catchment of the sewage works.

Receptor
Any element in the environment, which is subject to impacts.

Receiving Water
A body of water, flowing or otherwise, such as a stream, river, lake, estuary or sea, into which water or wastewater is discharged.

Ribbon Development
The development of single dwelling units along the roads, which radiate out from a town.

Riparian
Of or relating to a river or watercourse.

Risk Assessment
An analytical study of the probabilities and magnitude of harm to human health or the environment associated with a physical or chemical agent, activity or occurrence.

Scoping
The process of identifying the significant issues, which should be addressed by a particular Environmental Impact Assessment.

Screening
The process of assessing the requirement of a project to be subject to Environmental Impact Assessment based on project type and scale and on the significance or environmental sensitivity of the receiving environment.

Sensitivity
The potential of a receptor to be significantly changed.

Services
The conduits, pipes and lines that carry utilities.

S.I.
Statutory Instrument.

Significance
The sensitivity of a receiving environment to change or the consequence of change for the receiving environment.

Sludge
The accumulation of solids resulting from chemical coagulation, flocculation and/or sedimentation after water or wastewater treatment.

Sustainable Development
Defined by the Brundtland Commission 1987 "Development that meets the needs of the present without comprising the ability of the future generation to meet their own needs".

Quality of Impacts

Positive Impact
A change, which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities).

Neutral Impact
A change, which does not affect the quality of the environment.

Negative Impact
A change, which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health *or* property or by causing nuisance).

Significance of Impacts

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.

Duration of Impacts

Short-term Impact
Impact lasting one to seven years.

Medium-term Impact
Impact lasting seven to fifteen years.

Long-term Impact
Impact lasting fifteen to sixty years.

Permanent Impact
Impact lasting over sixty years.

Temporary Impact
Impact lasting for one year or less.