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Environmental Protection Agency
Waste Licensing
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Comhairle Chontae Luimnigh
LIMERICK COUNTY COUNCIL

GORTADROMA LANDFILL

Landfill Extension
Environmental Impact Statement

VOLUME 2
MAIN REPORT

RPS mcos

June 2004

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ENVIRONMENTAL IMPACT STATEMENT

for the

Extension of Gortadroma Landfill, Limerick

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May 2004

VOLUME 1	NON-TECHNICAL SUMMARY
VOLUME 2	MAIN REPORT
VOLUME 3	TECHNICAL APPENDICES

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VOLUME 2 – MAIN REPORT

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1 GENERAL INFORMATION

1.1 INTRODUCTION

An Environmental Impact Assessment (EIA) is required for a proposed extension of Gortadroma Landfill, Co. Limerick under European and Irish legislation. An EIA is carried out in order to anticipate significant impacts on the surrounding environment caused by a development. The EIA is carried out during the design stage so that the project design can be altered where necessary, in order to mitigate against any negative impact from the development.

The EIA has been carried out and this Environmental Impact Statement (EIS) has been prepared having regard to all relevant National legislation and EU Directives and is based on the best available information at the time. The EPA will consider the EIS as part of the application for a waste licence review and An Bord Pelanála will consider the EIS as part of the planning application.

1.2 CONTENT OF EIS

The scope and content of this Environmental Impact Statement for Gortadroma Landfill Extension has been prepared having regard to the information requirements specified in the European Communities (Environmental Impact Assessment) Regulations 1989 to 2000 i.e., effects on human beings, plants, animals, geology, hydrogeology, water, air, climate, landscape, material assets, cultural heritage and the interaction of these elements. The document "Guidelines on the information to be contained in Environmental Impact Statements" as published by the Environmental Protection Agency (2002) was used as a guideline document in the preparation of this E.I.S.

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1.3 STRUCTURE OF THE REPORT

This EIS follows the structure outlined below:

- Volume 1 – Non Technical Summary
- Volume 2 – Main Report
- Volume 3 – Technical Appendices

Volume 1 - The Non Technical Summary outlines the main findings of the EIS and identifies the principal impacts and mitigation measures for each environmental aspect.

Volume 2 - The Main Report follows the format outlined below;

- Chapter 1 is an introduction to the project and addresses;
    - Need for the EIS;
    - Structure of the report;
    - Need for the proposed project from both a national and regional perspective;
    - Identifies the relevant policies and legislation;
    - General description of the existing landfill; and
    - Extension options
- Chapter 2 describes the proposed development.

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- Chapters 3 outlines the main elements of the EIA with regard to each of the environmental aspects. This chapter addresses the existing environment; discusses the potential impacts of the proposed development and identifies measures that shall be used to mitigate potential impacts.
- Chapter 4 is a summary of the potential impacts and mitigation measures for each environmental aspect and conclusions.

Volume 3 – The Technical Appendices contains the individual specialist EIA reports. The reports and authors are outlined below;

- Appendix A – Social and Community, Patricia Calleary, Chartered Engineer and Town Planner
- Appendix B – Human Health, Professor Dr. Dr. Dieter Schrenk
- Appendix C – Landscape and Visual, Nicholas Pearson Associates
- Appendix D – Air Quality, Envirocon Ltd.
- Appendix E – Noise, Enterprise Ireland Ltd.
- Appendix F – Traffic, RPS-MCOS Ltd.
- Appendix G – Geology/Hydrogeology, RPS-MCOS Ltd.
- Appendix H – Aquatic Ecology, Conservation Services Ltd.
- Appendix I – Terrestrial Ecology, Roger Goodwillie and Associates
- Appendix J – Material Assets, Agriculture, RPS-MCOS Ltd.
- Appendix K – Archaeology and Cultural Heritage, Margaret Gowan and Co. Ltd.
- Appendix L – License 17.2, EPA.

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1.4 NEED FOR THE PROPOSED EXTENSION

1.4.1 National Waste management Policies

It has been recognised in the National Spatial Strategy (NSS) that the pace of development in Ireland over the last decade has been remarkable but that progress has been uneven, with some areas developing faster than others. This has led to rapid development and congestion in some places, but underdevelopment in others. This affects the ability for different regions in the country to compete effectively. One of the areas identified in the NSS to ensure competitiveness and to cope with the rapid expansion that has occurred in Ireland over the last decade was the need for – "*effective waste management structures and facilities*" (National Spatial Strategy, Section 2, Irelands Changing Spatial Structure, Sub-Section 2.6).

The Department of Environment, Heritage and Local Government have also outlined national policy with regard to waste management, in the documents entitled 'Changing Our Ways' (1998) and 'Delivering Change' (March 2002). These policies seek to guide the direction of waste management in Ireland away from the current reliance on landfill towards a combination of reuse, recycling, energy recovery and residual waste disposal. However, the policy document 'Changing Our Ways' has identified the need "*to extend the life of existing strategically important landfills which are capable of meeting EPA operational requirements*" (Changing Our Ways, Chapter 3, Section 3.11). Also, recent legislation regarding the design, construction and operation of landfill sites has become increasingly stringent. While this has resulted in greatly increased landfill operating costs and charges, it has also resulted in a reduced number of facilities, which now operate too much higher standards under licences issued and policed by the Environmental Protection Agency. The extension of current landfill facilities allows for a more effective management of "environmental risk" because economies of scale

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allow for the implementation of "best practice" in terms of minimising the environmental risk posed by landfills and to maximise the benefit of current infrastructure.

1.4.2 Regional waste management plan

The Limerick/Clare/Kerry Waste Management Plan was adopted in 2001, by the participating Local Authorities, Limerick, Clare and Kerry County Councils together with Limerick City Council. The Plan, which was prepared in accordance with Section 22 of the Waste Management Act, 1996 and the Waste Management (Planning) Regulations (1997), supersedes and replaces all previous Waste Plans prepared by these local authorities. The Plan is based on a waste management strategy which recommends an integrated approach to waste management involving improved public education, new recycling initiatives, biological and thermal treatment of wastes and finally landfill of residual waste.

Gortadroma Landfill is one of three regional landfills in the Limerick/ Clare/ Kerry Region. The other two regional landfills are:

- Muingnaminnane Landfill, Kerry County Council, which has an annual licence capacity of 77,000 tonnes and has remaining void space for 223,000 tonnes approximately which will be exhausted in three years time. There are plans for the future extension of the site.

- Inagh Landfill, Clare County Council, which has an annual licence capacity of 62,500 tonnes opened in October 2002 and has a remaining void space of 720,000 tonnes approximately which will be exhausted in twelve years.

Both Muingnaminnane and Inagh landfills have a limited capacity for accepting waste from Limerick in the long term. Limerick County Council has therefore identified the necessity for additional landfill capacity to deal with the future waste production within the city and county. The size of the required landfill depends on the extent of waste produced within the region and the projected decrease in waste production over the lifetime of the landfill in line with the Limerick /Clare /Kerry Waste Management Plan.

Extensions of other existing landfills within Limerick County, Ballynanty (Limerick City) and Morenane (Croom) were considered in an earlier E.I.A. and were found unsuitable.

Figure 1.1 illustrates the amount of waste, which has been deposited in the above mentioned landfills serving the Limerick/ Clare/ Kerry Region over the last four years.

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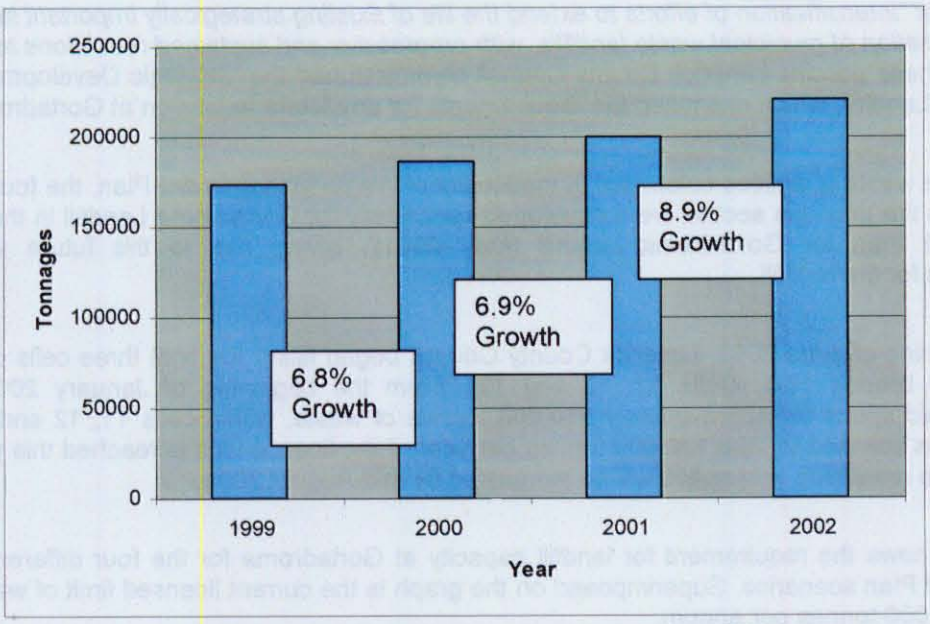

Figure 1.1 Regional waste going to landfill

The figures in **Figure 1.1** reflect the recorded intake at the three regional landfills, Gortadroma, Co Limerick, Muingnaminnane Landfill, North Kerry and Inagh, Co. Clare. The waste from County Clare was being diverted to Gortadroma and Ballaghveny Landfill in North Tipperary between the closure of Doora Landfill (June 2001) and the opening of Inagh (Oct 2002). The fraction of waste diverted from Clare to Ballaghveny Landfill, which is outside the region, has been included here.

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In the Regional Waste Management Plan, future waste growth was predicted, based on estimates of:

(i) Population Growth

(ii) Commercial/Industrial Growth

(iii) Waste generation per capita and per business

To determine the required landfill capacity four possible future scenarios were considered:

- The target implementation of the Limerick/Clare/Kerry Waste Management Plan.
- Slow implementation of the Limerick/Clare/Kerry Waste Management Plan.
- Slow implementation of the *Plan* with No Thermal Treatment.
- Do-nothing scenario.

1.4.3 Future Waste Disposal At Gortadroma Landfill

Limerick County Council has identified the necessity for extra landfill capacity to deal with the future waste production within the county. The size of the required landfill depends on the level of waste produced within the region and the projected increase/decrease in waste production over the lifetime of the landfill together with a reduction in disposal due to the implementation of the Limerick/Clare/Kerry Waste Management Plan.

Two options were originally considered for the extra landfill capacity required. These were the extension of the existing landfill at Gortadroma and the development of a 'Greenfield' site at Slieve

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Felim in East Limerick. National Policy is described in the document 'Changing Our Ways' and states a preference for "*intensification of efforts to extend the life of existing strategically important landfills*" and the "*rationalisation of municipal waste landfills, with progressive and sustained reductions in numbers*". In line with these policies Limerick County Council commissioned the 'Strategic Development Plan of Gortadroma Landfill', which examined the requirements for any future extension at Gortadroma.

Based on the waste quantities calculated in the Regional Waste Management Plan, the four scenarios mentioned in the previous section were developed specifically for Gortadroma Landfill in the 'Strategic Development Plan for Gortadroma Landfill (May 2001)', giving rise to the future void space requirements for the landfill.

At the beginning of June 2002, Limerick County Council began filling the final three cells constructed under waste licence 17-1 (Cells 11, 12 and 13). From the beginning of January 2004 there is remaining void space for approximately 210,000 tonnes of waste, within cells 11, 12 and 13. Given that the site is licensed to take 130,000 tonnes per year, if the licence limit is reached this year and in 2005 then the remaining void space will be exhausted by mid-August 2005.

Figure 1.2 shows the requirement for landfill capacity at Gortadroma for the four different Strategic Development Plan scenarios. Superimposed on the graph is the current licensed limit of waste intake, which is 130,000 tonnes per annum.

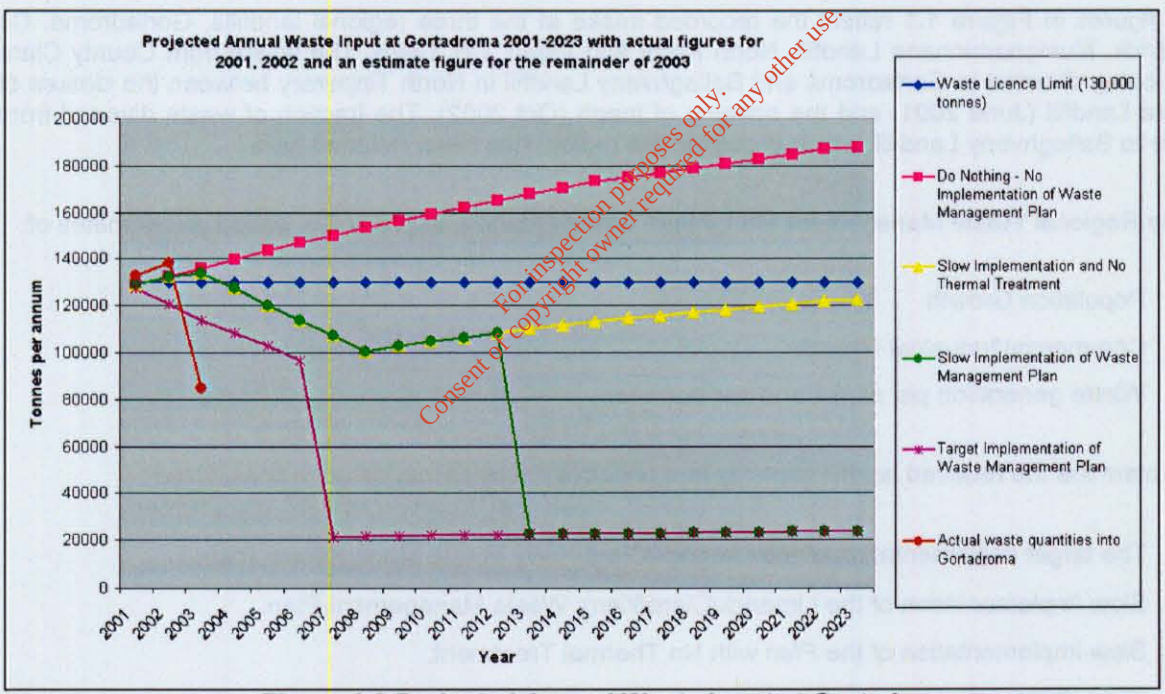

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Figure 1.2 Projected Annual Waste Input at Gortadroma

It can be seen from **Figure 1.2** that the required intake of waste for disposal at Gortadroma varies according to how well the Limerick/Clare/ Kerry Waste Management Plan has been and will be implemented. If the landfill intake from 2001 onwards had reflected the most optimistic scenario, the remaining void space would have lasted until April 2006, this is based on the *Plan* being fully implemented including thermal treatment by 2007, while under the do-nothing scenario, the existing void space offered would have been exhausted by May 2005.

The existing gate intake from 2001, 2002 and 2003 has been superimposed on the graph (**Figure 1.2**) and it can be observed that the amount of waste going to Gortadroma Landfill superseded all of the predicted scenarios for 2001 and 2002, while in 2003 there was a decrease in waste of almost 40% on the previous year which is much less waste intake than predicted in all four scenarios.

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The reasons for the variance in waste going to landfill from that predicted in the Waste Management Plan are numerous. The increase in waste intake during 2001 and 2002 was most probably caused by the closure of another regional landfill at Doora County Clare, lower gate fees at Gortadroma and an increase in population in the region from the predicted figures in the Waste Management Plan, which were originally based on the 1996 CSO data.

The decrease in waste for 2003 is primarily due to an increase in gate fees at Gortadroma, the opening of another regional landfill at Inagh, County Clare in July 2003 with a lesser gate fee and more diversion of waste in the region from landfill due to increased recycling initiatives such as the introduction of "kerb-side" collection in Limerick City and environs and greater recycling in the industrial/commercial sectors.

While the continued low intake of waste at Gortadroma in 2004 is due to the high gate fees, which encourage private waste collectors to travel further distances outside the region to dispose of waste for their own economic benefits, this fee is reviewed annually. The fees at Gortadroma are likely to be more competitive with other landfills in the future, making it preferable for operators to dispose of waste at the nearest landfill.

The rate of waste generation in the region is believed to be even higher than predicted in the Limerick/ Clare / Kerry Waste Management Plan. The population projections used in the Plan were based on the population and labour force projections (1996-2026) produced by the CSO from the 1996 census. An increase in population of 8,630 between 1996 and 2002 was predicted while in reality the increase was 25,936 (CSO 2002 data), a threefold increase. It can be also be assumed that the "slow implementation of the *Plan*" scenario exists in the region at present since the planning of an incinerator has not commenced yet although numerous recycling services have been implemented in accordance with the *Plan*. Therefore the intake of waste recorded at the three regional landfills in 2003 may not be truly reflective of the amount of waste generated from the Limerick/Clare/Kerry region, which is ultimately landfilled.

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In order to provide regional flexibility and because waste intakes can vary significantly depending on a number of factors including changes in gate charges, changes in population and demographics, changing nature of waste and legislative requirements it is recommended that landfill waste disposal capacity of up to approximately 2 million tonnes be provided at Gortadroma. This amount will ensure that there is sufficient void space to cater for Gortadroma Landfill's existing share, max. 130,000 tonnes per annum, of the regions waste for the next fifteen to twenty years.

1.5 WASTE DETAILS FOR EXISTING SITE AND PROPOSED EXTENSION

In September 2003 a Waste Licence review (17-2) was issued to Limerick County Council for the disposal and recovery of waste at Gortadroma Landfill, Ballyhahill Co. Limerick. Condition 1.5 of this licence lays down the waste acceptance criteria for the existing landfill and Schedule A details the 'Waste categories and Quantities for Disposal/ Recovery at the facility'. It is envisaged at this stage that the proposed extension will not require any significant change in these conditions. **Table 1.1** (from Schedule A of Waste Licence 17-2) outlines the waste quantities and types accepted for disposal and recovery at Gortadroma Landfill.

The amount of waste that is accepted at the site for disposal is capped at 130,000 tonnes per annum. The amount of waste that is accepted at the site for recovery is capped at 57,000 tonnes per annum.

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Table 1.1 - Waste Categories and Quantities for Disposal/Recovery at the facility.

Waste Type	Maximum (tonnes per annum) Note 1
Household	72,000
Commercial	39,000
Sewage sludge	4,770
Industrial non-hazardous sludge	1,200
Industrial non-hazardous solids Note 2	11,000
Water treatment sludge	2,030
TOTAL FOR DISPOSAL	130,000
Green waste for composting Note 3	
Wood chippings	2,000
Automobile shredder residue Note 4	20,000
Soil/stones Note 5	50,000
Wastes accepted for storage at the civic waste facility prior to recycling, reuse or reclamation	5,000
TOTAL FOR RECOVERY	57,000

Note 1: The quantities of the individual waste types may be adjusted with the prior agreement of the Agency only subject to the total waste quantity remaining the same.

Note 2: The once-off disposal of 3,000 tonnes of 'calcium phosphate/sand mixture or bonedust' shall be included in this waste type subject to the material being tested and proven to be non-hazardous to the satisfaction of the Agency.

Note 3: Limited to 1000m3 of compost and waste at any one time.

Note 4: This may be used as weekend cover subject to the material being tested and proven to be non-hazardous to the satisfaction of the Agency.

Note 5: These may be accepted for recovery for use as cover in site construction works and landfill restoration.

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1.6 EXTENSION OPTIONS FOR GORTADROMA

The Strategic Development Plan for Gortadroma Landfill (May 2001) initially identified six possible options for a future extension to the landfill, with an additional option in the east identified at a later stage.

Option 1 has already been constructed and is currently in use. The remaining five of these options together with one additional option have subsequently been assessed in more detail. The assessment has been based on the framework provided in the draft *EPA Manual on Site Selection (1996)* and has included information gathered during the walkover surveys and ground investigations carried out on the potential sites.

The options are summarised below:

- **Option 1** - East of existing landfill: Already developed and currently being filled.
- **Option 2a/2b** - East of the existing landfill. Option 2a signifies a disposal area separate from the existing landfill whilst option 2b signifies a disposal area, which overlaps and joins the existing landfill area. (**Figure 1.3**)
- **Option 3** - East of the existing landfill (**Figure 1.4**)
- **Option 4** - North of the existing landfill (**Figure 1.5**)

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- **Option 5** - North & East of existing landfill (**Figure 1.6**)
- **Option 6** - East of existing landfill (**Figure 1.7**)
- **Option 7** East of existing landfill (**Figure 1.8**)

Fig 1.3 Option 2a/2b

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Fig 1.4 Option 3

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Fig 1.5 Option 4

Fig 1.6 Option 5

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Fig 1.7 Option 6

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Fig 1.8 Option 7

1.7 RESULTS OF STUDY

Option 6, to the west of the existing site is ruled out, due to evidence of a burial ground, holy well and two fulachta fiadh within the site. Option 4, to the north would have yielded insufficient void space, in addition the majority of the site would be on high ground, which would lead to a substantial visual impact. Option 5 is a combination of Option 4 and Option 2a/2b, but extends further to the east and so would have required the relocation of the (220kV) ESB pylons, which are located to the north east of the site. Option 3 extends over a large area and it is considered that this level of void space is not required.

The remaining two options are Option 2a/2b and Option 7. The soft ground conditions towards the south of options 2a/2b would make construction of an extension extremely difficult compared to Option 7. However Option 7 is constrained due to the necessity to raise the height of, or relocate, the ESB 220kV lines.

Taking the more northern areas of option 2a/2b and extending the footprint northwards and eastwards, similar to option 7, a final area was selected which was brought forward as the proposed area to be assessed as part of the Environmental Impact Statement (**Figure 1.9**).

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Fig 1.9 Final Option

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1.8 DESCRIPTION OF THE EXISTING LANDFILL

Gortadroma landfill is located in the townland of Gortadroma, within the parish of Kilcolman, 12km north of Newcastle west, 9km south of Foynes and 54km from Limerick City. The existing site covers an area of 35 hectares (11 hectares of which is landfilled area) and lies in a rural setting. Limerick County Council at Gortadroma Landfill commenced landfill operations in September 1990 on a site, which had previously been used as a sand and gravel pit. In 1994 in advance of the introduction of the statutory Waste Management (Licensing) Regulations 1997 (S.I. No. 133), Limerick County Council recognised the need to upgrade the facilities at Gortadroma. A development plan was prepared by MC O Sullivan & Co. Ltd (RPS-MCOS) in 1994 and this plan (which was based on the draft EU Directives) was the background document for guiding development of the site until the subsequent Waste Licence Application and EIS were processed and the first Waste Licence for the site was issued in November 1999.

The EPA issued a Waste licence, Reg. 17-1, for Gortadroma Landfill in November 1999. A review of certain conditions of the waste licence was requested by Limerick County Council under the Waste Licencing (Amendment) Regulations 2002 (SI 336 of 2002) and the EPA subsequently reviewed these conditions and issued a revised licence 17-2 in September 2003 under which the site now operates.

There are 11 full time Limerick County Council employees at the site; Facility Manager, Executive Engineer, Clerical Officer, Weighbridge Operative, 2 Site Foremen and 5 General Operatives. Machinery on site includes a compactor, dozer, track machine and dumper, this machinery is contracted with drivers.

The waste is landfilled within an area of one cell called the working face. In accordance with the Waste Licence (17-2) only one working face exists at the landfill at any one time and the working face is no greater than 2.5m in height after compaction, no more than 25m wide and no more than 50m long. The working face has a slope within 1 in 3.

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The existing site has 13 individual cells. Cells 1-10 are capped with a composite capping system consisting of a gas regulation layer, low permeability layer, surface water drainage layer, top soil and subsoil. The nine most recent cells, 5-13, are fully lined cells with leachate collection and recirculation systems installed. Cells 1-4 are surrounded by a 600mm bentonite slurry wall, which is keyed in to approximately 1m of clay at the base, this wall is up to 8m deep in parts. Cells 1 –4 are capped with a composite cap incorporating an LLDPE layer to minimise water ingress into the waste. There are also four leachate abstraction pumps in place extracting leachate from within these cells. Cells 1-10 have a gas collection system installed which consists of 60 boreholes at approximately 30m spacings which allows the landfill gas to be collected and flared. As part of Licence 17-2 the landfill gas generated must be utilised for energy generation by October 2004. There is extensive leachate collection, recirculation and treatment system with associated pumping in operation at Gortadroma, which is controlled by a SCADA system located in the Administration building.

On site there is currently an administration building, which incorporates a weighbridge office, two staff offices, two canteens, toilets and an operations room where the leachate and flare management systems are contained. The weighbridge is located adjacent to the administration building. The following infrastructure is also in place:

- Two wheel washes, one at the landfill exit and one at the construction exit;
- Civic amenity area;
- Bunded fuel storage area;
- Machinery compound;
- Waste inspection and Quarantine area;
- Farm plastics storage area;

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- Composting slab;
- Leachate treatment plant – Anoxic tank, aeration basin, clarifier, sand and peat filters;
- Raw and treated leachate storage lagoons;
- Surface water settlement lagoons;
- Gas Compound (incl. Flare) and
- CCTV.

Figure 1.10 shows a map of the existing site.

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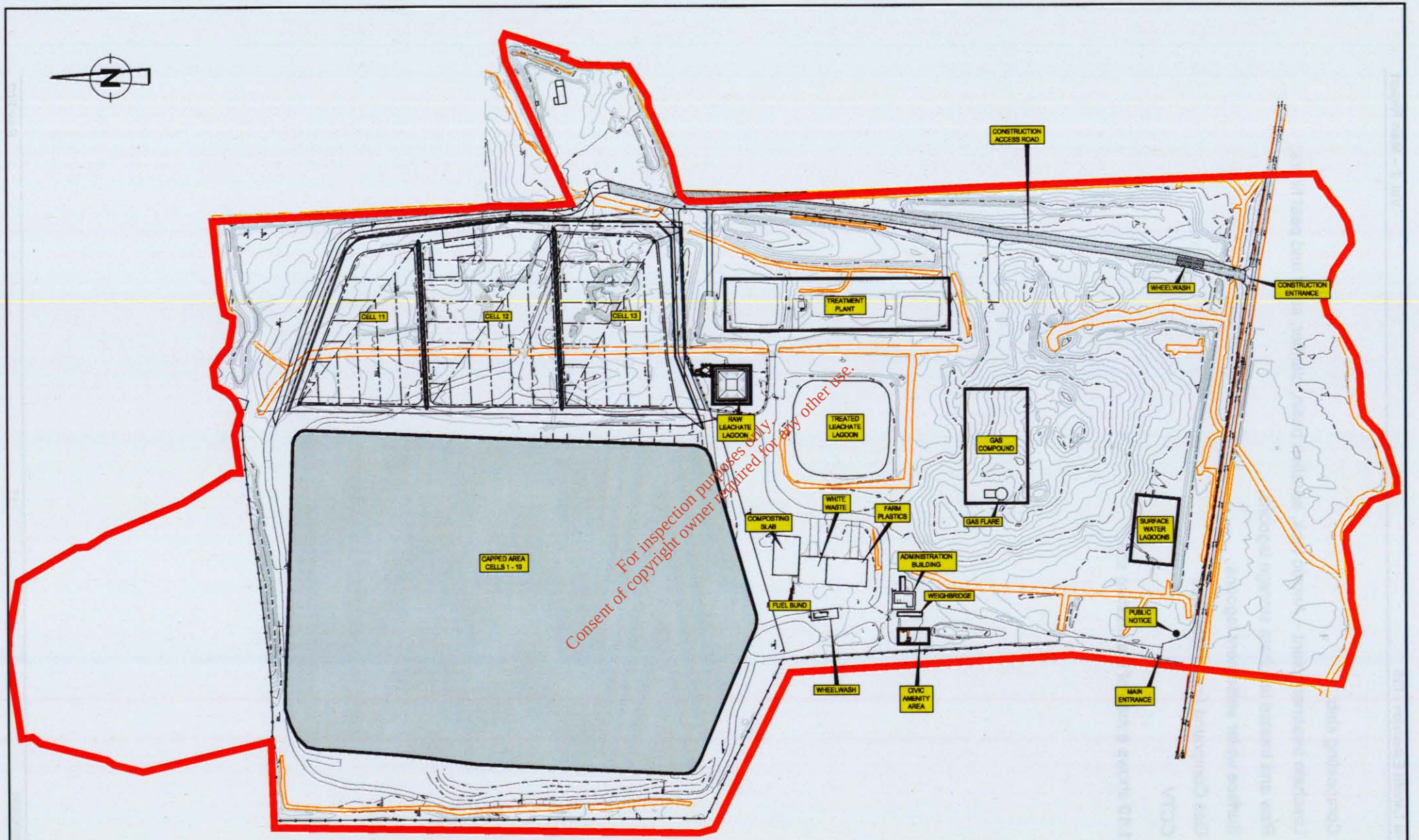

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NOTES
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3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date		Amendment / Issue	App.
F01	May'04		FINAL ISSUE	LOT

Project: Gortadroma Landfill EIS

Title: Site Layout

Drawn by:	HF	Job No:	mde0148
Checked by:	GMcE	File No:	mde0148Fig1.10
Approved by:	LOT	Fig. No:	1.10
Scale:	1:2500	Rev:	F01
Date:	May '04		

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2 DESCRIPTION OF PROPOSED DEVELOPMENT

2.1 INTRODUCTION

The proposed development will comprise of an extension to Gortadroma Landfill incorporating a landfill area of approximately 19 hectares which will be developed in discrete lined cells, over 4 to 5 phases and will include for the provision of leachate collection and treatment and gas collection and utilisation. A remaining area of approximately 22 hectares is to be used as a buffer area for screening/ landscaping and for the provision of site infrastructure. The landfill extension will be capable of accepting 130,000 tonnes of waste annually in accordance with its existing EPA licence (17-2) and will have enough capacity to serve Limerick City and County as a non-hazardous landfill for 15-20 years depending on the progress of implementation of the Limerick/Clare/Kerry Waste Management Plan.

2.2 PROPOSED DEVELOPMENT - PRELIMINARY DESIGN

2.2.1 Introduction

BAT is the abbreviation of 'best available techniques' as defined in Article 2(11) of Council Directive 96/61/EC concerning integrated pollution prevention and control. BATNEEC or 'best available technology not entailing excessive costs' is defined in Section 40(4) of the Waste Management Act 1996. The BAT and BATNEEC principles are used at Gortadroma *'to prevent or eliminate or where that is not practicable to limit, abate or reduce an emission from the activity concerned.'*

The principles of BAT and BATNEEC have been interpreted as a Statutory Requirement in the Waste Licence Application Form produced by the EPA and requires applicants to make clear how the proposals contained in the site satisfy both principles.

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The approach adopted for the construction and management of the proposed extension to Gortadroma Landfill is outlined below and is one that is consistent with the principles of BAT and BATNEEC.

2.2.2 General Description

The proposed extension to the landfill covers an area of approximately 41 hectares and comprises two distinct areas as shown on **Figure 2.1**.

- Buffer zone consisting of landscape/screening/buffer areas – 22 hectares; and
- Waste disposal area – 19 hectares

The waste disposal area will cater for approximately 2 million tonnes of waste over its lifetime. The waste disposal area will consist of 11 individual cells each with areas ranging from approximately 1.1 to 2.3 ha. The cells will be developed on a phased basis. It is proposed that there will be four to five phases of cell construction with two to three cells constructed in each phase.

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Figure 2.1 shows the proposed extension area identified as the most suitable site during the preliminary design process. The process was initiated as part of the siting study and the following constraints were identified:

- Extremely soft ground conditions and the presence of artesian ground water pressure at the south eastern side of the existing landfill would make construction difficult;
- Development is constrained on the northern side by the presence of (220kV) ESB lines, which would be time and possibly cost prohibitive to raise or relocate;
- Development is constrained on the eastern side by high ground, because of a potential negative visual impact;
- Development is constrained but not prevented to the south east of the existing landfill due to the presence of a significant tributary to the White River;
- 200m buffer zone from the active area of the landfill to the Kerry Line (R306);
- 30m buffer zone from the active area to the ESB 220kV lines;
- 15m buffer zone to the stream running to the south east of the site; and
- Buffer zone from active cells to nearest residence.

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2.2.3 Buffer Zone and excavated material

The 22 hectares surrounding the proposed landfill area serves two functions. The first is to provide a physical separation between the landfill area and local residents and the second is to provide area for the disposal of excavated material, which will also have a purpose. It is envisaged that the excavated material will be regraded and naturally shaped, seeded and planted so that a natural landscape can be created to mitigate against negative views and operational and construction noise of the landfill which local residents or local road users may experience. It is recognised that the excavated material will be soft in nature and that careful handling will be required. The proposed screening/landscaping areas are detailed in **Figure 2.1** and are based on a maximum disposal height of 3m and will cover a total area of approximately 11ha. The screening/landscape areas will be developed on a progressive basis over the lifetime of the site in line with the cell construction phases, with some of the excavated material being reused (190,000m^3, 40% of total excavated material) as permanent and temporary capping within the landfill area.

Landscaped areas along the periphery of the extension area will be developed first in order to allow a mature visual screen to develop as soon as possible.

2.2.3.1 Soil Stability

All excavated material will be soft in nature and require careful handling and placement to ensure bund stability and prevent slippage and the risk of surface water contamination from material entering local streams and ditches. The excavated material will be handled carefully and in accordance with a method statement devised during the detailed design stage of the project.

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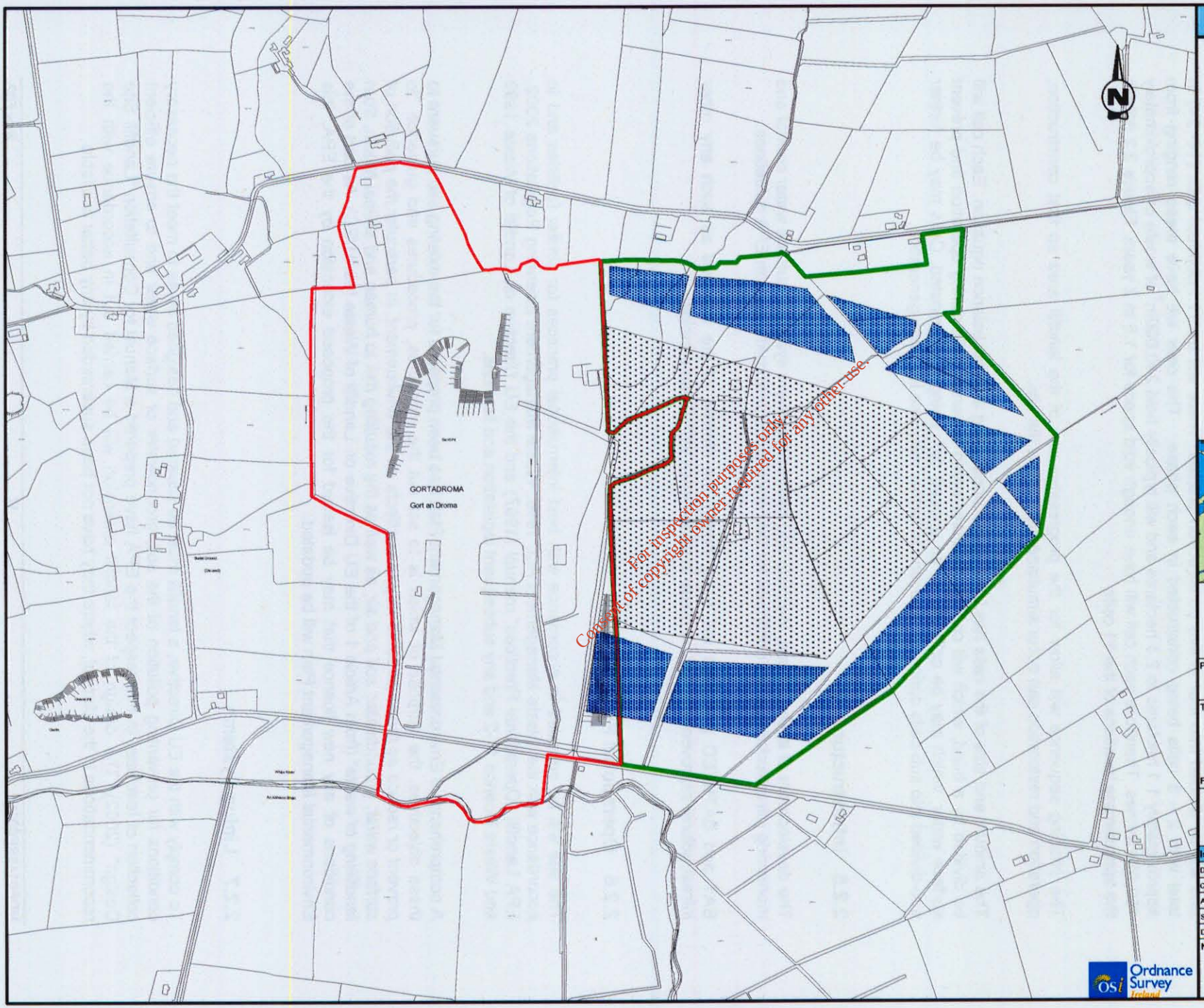

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Legend

- Disposal Area
- Proposed Extension
- Existing Landfill Boundary
- Screening/ Landscape/ Buffer Areas

Limerick County Council

Project: *Gortadroma Landfill Extension EIS*

Title: **Existing Site and Proposed Extension**

Figure 2.1

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Issue Details			
Drawn:	CW	Project No.	MDE0148
Checked:	SK	File Ref.	MDE0148MI0133A01.WOR
Approved:	LoT		
Scale:	NTS	Drawing No.	Rev.
Date:	20/02/2004	MI0133	F01

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2.2.4 Waste disposal area and phasing of cell construction

The waste disposal area for the proposed extension comprises an area of approximately 19ha in size and will be divided into four to five construction phases. There will be 11 individual cells (14- 24) in total with 2 - 3 cells being constructed in each phase. The cells will have areas ranging from approximately 1.1 hectares to 2.3 hectares and will typically hold 240,000m^3 of waste or approximately 180,000 tonnes. Therefore each cell will have enough void space for 1.5 to 2 years. **Figure 2.2** details the approximate locations of the 11 cells.

The phasing sequence will allow for the progressive use of the landfill area so that construction, operation and restoration can occur simultaneously within the site.

The amount and size of the cells has been determined using a water balance equation. Each cell will be divided by a bund, which will contain leachate within separate cells during operation and prevent surface water, which may be collected in an unused cell, being contaminated. Cells may be further sub-divided into sub-cells during construction to further minimise leachate generation.

2.2.5 Infrastructure

The development of access roads, leachate and gas management systems, surface water control and monitoring infrastructure will be continued for the new phases in accordance with EPA guidelines.

BAT and BATNEEC principles will apply during the lifetime of the site and as such any other infrastructural improvements will be made in accordance with these principles.

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2.2.6 Operational Principles

The site will be operated in accordance with best international practices for similar facilities and in accordance with the Waste Management Act, 1996, Waste Management Licensing Regulations 2002, EPA Landfill *"Operational Practices"* manual (1997) and the EU Directive on Landfill of Waste 1999 and Waste Licence 17-2 and any subsequent legislation and licences.

A comprehensive Environmental Management Plan has been prepared for the existing site pursuant to these objectives, the purpose of which is to set out the measures, procedures and guidance *"to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, as well as the resulting risk to human and animal health, from landfilling of waste"* (from Article 1 of the EU Directive on Landfill of Waste (99/31/EC). As part of the conditions of any new licence that may be issued for the proposed extension by the EPA, this Environmental Management Plan will be updated.

2.2.7 Lining Systems

To comply with the EU Directive, a landfill must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater or surface water and to ensure efficient collection of leachate. In this respect the EPA have prepared a Manual for Consultation "Landfill Site Design" (2002). The design of the landfill extension will be carried out in accordance with the recommendations in the Manual, where they have not been superseded by any better available

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Legend

- Proposed Cells
- Existing Site

Limerick County Council

Project *Gortadroma Landfill Extension EIS*

Title

Proposed cells

Figure 2.2

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techniques. - *The lining system protects the surrounding environment including soil, groundwater and surface water by containing leachate generated within the landfill, controlling ingress of groundwater, and assisting in the control of the migration of landfill gas.*

The lining systems installed in Gortadroma will comply with the BAT principle and at a minimum in accordance with the EPA Landfill Design manual, and the existing licence 17-2, the liner system will consist of the following components:

- A minimum 0.5m thick leachate collection layer having a minimum hydraulic conductivity of $1x10^{-3}$m/s or equivalent;
- Geotextile protection layer;
- A minimum 2mm thick HDPE liner or equivalent; and
- 1m thick compacted clay liner with a permeability of less than $1x10^{-9}$m/s or equivalent.

Any proposed lining system design will be sent to the EPA for their approval in accordance with the licence requirements for Specified Engineering Works.

A preliminary site investigation was conducted for the proposed extension area in November 2002 and a Geological and Hydrogeological report was written as part of this EIS. The main findings of this report in relation to the liner is that the depth to bedrock in the western zone, adjacent to the existing landfill, is up to 30m. This is a boggy area with very thick overburden. There is a second zone to the east where a depth of bedrock of 5m has been interpreted. This is a drier area with shallow or more gravely overburden. The overburden is mainly composed of low permeability deposits of peat, silt and clayey sand and gravel. Deposits of clean gravels are also found but these appear to be discontinuous and limited in extent. The groundwater flow direction corresponds to the surface water drainage pattern and the topography of the site. i.e. a south westerly direction. All of the groundwater levels in the overburden deposits remain close to the surface throughout the year and are generally within 1m of ground level.

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The basal liner system of the new cells will be constructed on top of the clayey silt layer and a control drainage layer will be installed under the liner system so that groundwater can be continually pumped during construction and initial filling of the cells. The base of the new cells will be below the piezometric level in the overburden and this will result in an upward groundwater gradient towards the liner system in the southern cells. The net effect of this will be to provide added confidence to the design since the inward and upward pressure of the groundwater will help prevent leachate escaping outwards from the waste in the unlikely event of the lining system failing.

The control drainage layer, which will be placed below the lining system, will consist of the following:

- Geotextile separation layer; and
- Up to 1m of large diameter gravel/rock incorporating slotted collection pipes

2.2.8 Capping of Landfill

The final capping to the new cells will be as that for the existing landfill as required under the Waste Licence 17-2 and will comply with the BAT principle over the lifetime of the site:

- Gas collection layer;

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- Compacted mineral layer of minimum 0.6m thickness with a permeability of less than $1x10^{-9}$m/s or equivalent;
- Drainage layer of 0.5m thickness having minimum hydraulic conductivity of $1x10^{-4}$m/s or equivalent;
- Subsoil; and
- Topsoil – such that the subsoil and topsoil have a total thickness of 1m.

2.2.9 Leachate Generation & Characteristics

Leachate is generated as a result of rainfall on the landfill, which percolates through the solid waste thereby becoming contaminated by various chemical and biological processes within the waste and also includes moisture, which leaches directly from the waste. It is now mandatory to collect the leachate in a liner system within the landfill to avoid risk of pollution of the groundwater. Loss of leachate to the groundwater could result in the pollution of the groundwater and stream adjacent to the landfill and ultimately to the White River.

The factors, which will affect the volume of leachate generated in the proposed extension, include primarily rainfall, surface water run-off and evapotranspiration, waste moisture content and decomposition rates.

The water balance was equated for the proposed extension area and included the leachate, which will be generated from the existing cells 1-13. The capacity of the existing Leachate Treatment Plant is $120m^3$/day so the objective of the water balance equation and the sizing of the cells is to ensure that the amount of leachate generated at any stage over the lifetime of the site does not excessively exceed the generation of $120m^3$/day. During the winter months when rainfall and leachate generation are high some tankering of leachate to the local wastewater treatment plants may be required, however the recirculation of leachate into capped cells and the introduction of intercell bunding to divert surface water from newly lined cells should keep this to a minimum.

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Each cell has a four phase leachate generation cycle. The amount of leachate generated in each phase is based on the typical absorptive ability of waste at different depths and compaction. The average rainfall for each month and the estimated evapotansporation are taken from Met Eireann data. **Graph 2.1** below illustrates the leachate generation curve for a typical proposed cell at Gortadroma with the four phases highlighted.

The four phases are described below:

- Phase 1 – bottom of cell only partially covered with waste; (yellow)
- Phase 2 – entire bottom of cell covered with a minimum 2m of waste; (orange)
- Phase 3 – cell completed but without final capping; and (red)
- Phase 4 – completed cell with final capping. (blue)

The white phase illustrated between the red (phase 3) and blue (phase 4) signifies the stage after the cell is capped but before the leachate generation has settled.

The graph is describing one cell, which takes 1.5 years to fill and is uncapped for eight months.

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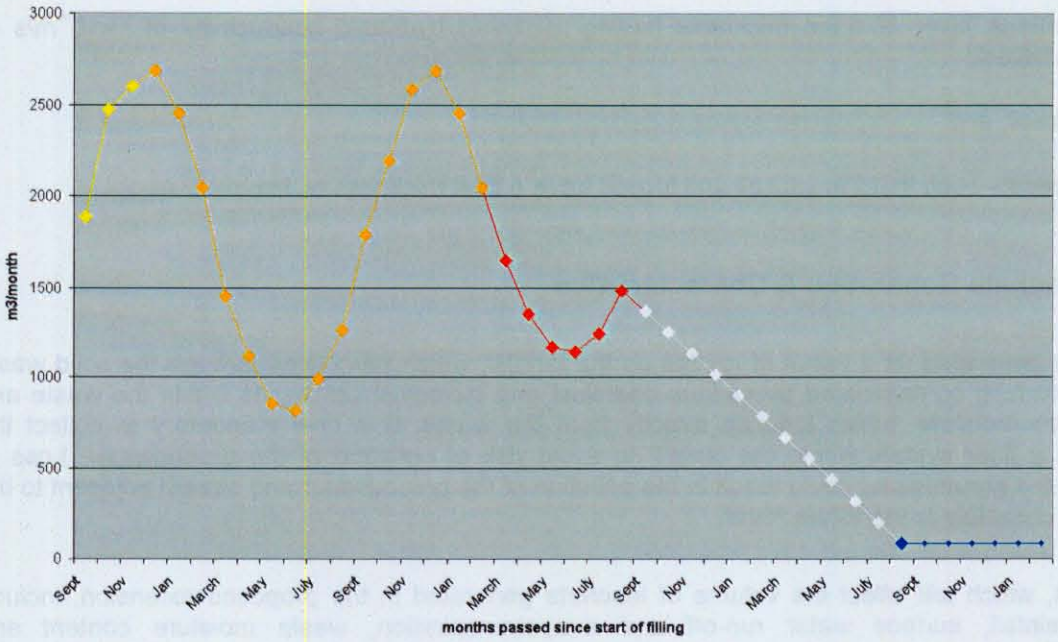

Graph 2.1 – Typical Leachate Generation over lifetime of a cell.

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Graph 2.2 illustrates the average daily amount of leachate generated over the lifetime of cells 1-13 (existing site) from January 2001 to September 2008, and **Graph 2.3** illustrates the average daily amount of leachate being generated over the lifetime of the existing and proposed areas starting from October 2003 to April 2023.

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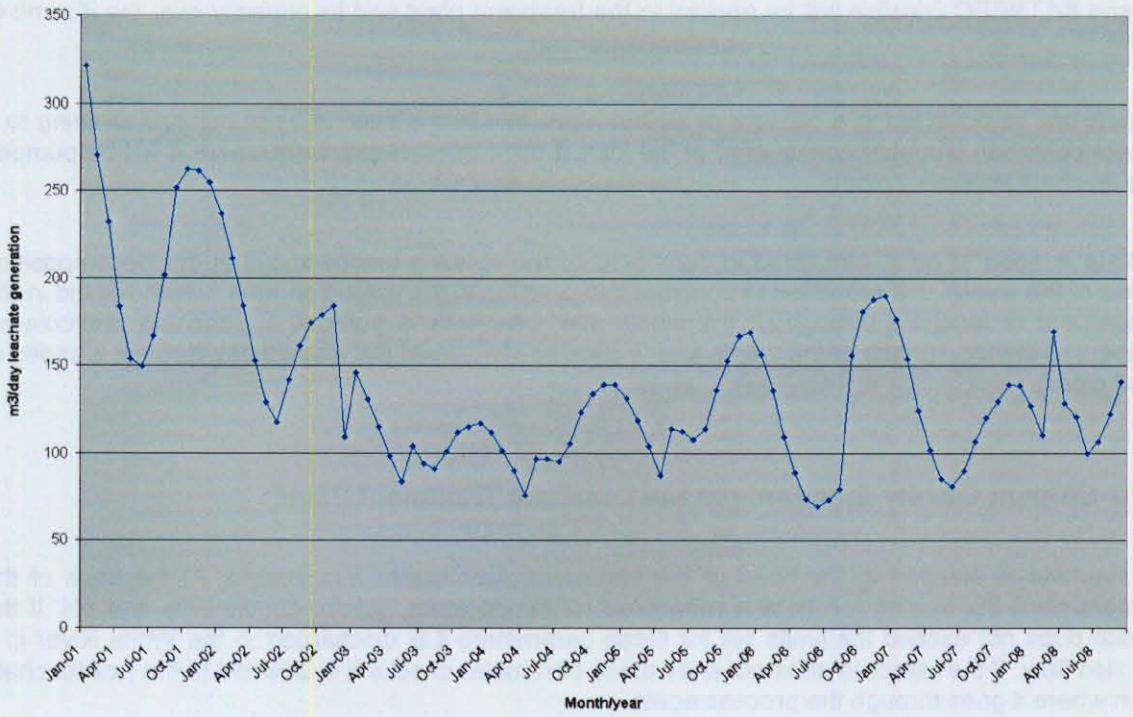

Graph 2.2 – Leachate Generation cell 1-13

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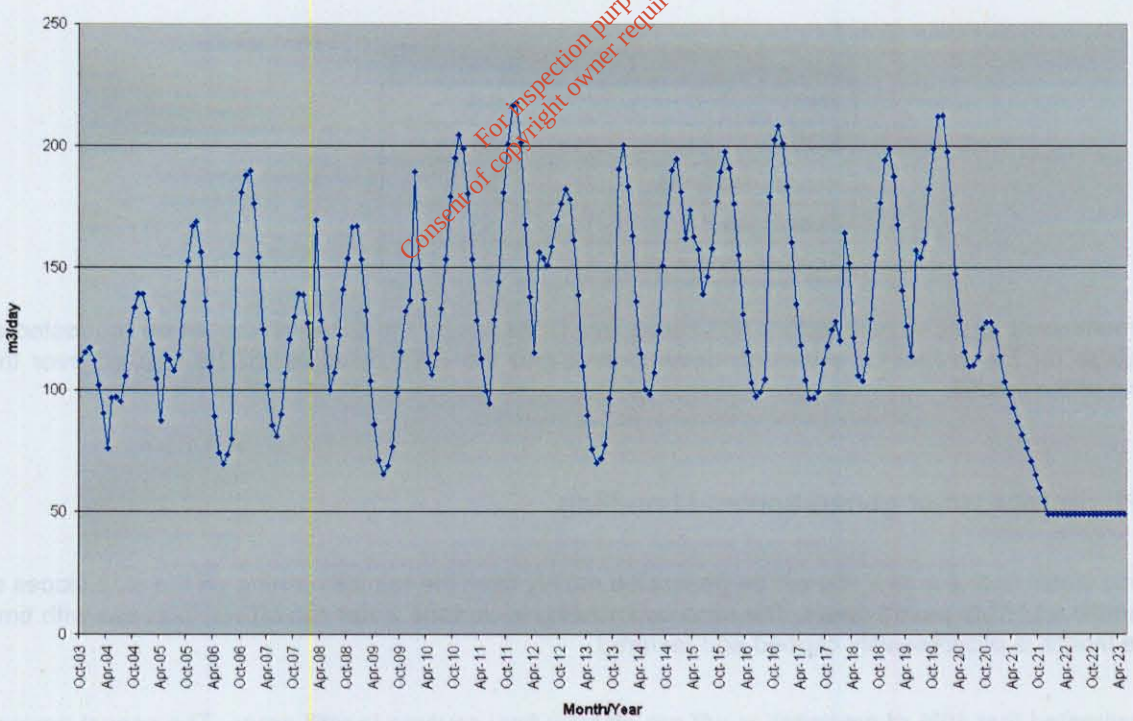

Graph 2.3 – Leachate Generation Cells 1-28

As illustrated in Graph 3.3 the majority of the winter peaks of leachate generation surpass the 120m^3/day treatment ability of the plant. While tankering may be required during winters of high rainfall it should be noted however that the above graphs take no account of the re-circulation of leachate into capped cells which will reduce the net leachate required to be treated.

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BAT and BATNEEC principle will be applied to the treatment plant and its capacity over the lifetime of the site.

Leachate will be collected in a network of slotted pipes laid in the base of each cell and draining to a leachate collection chamber constructed at the lowest point of each cell, from where it will be pumped to the leachate treatment plant.

Leachate is soon to be re-circulated in cells 5-10 of the existing landfill to aid in the decomposition process of the waste. It is proposed to continue this practice in the extension area, which will aid in the management of leachate throughout the whole site. Leachate is pumped to leachate recirculation chambers at the top surface of the waste and is allowed filter down the waste body through a series of slotted pipes.

2.2.10 Effluent Quality Standards at the Leachate Treatment Plant

Raw leachate is pumped to the head of the treatment plant where it is treated. At the base of the treatment plant the treated leachate is monitored for temperature, electro-conductivity and pH. If the leachate does not exceed the limits set for these parameters it is discharged to the White River in a controlled flow. If the leachate does not pass these parameter checks it is diverted to the raw leachate lagoon where it goes through the process again.

Emission limits are set in Waste Licence 17-2 for the discharge of treated leachate to surface water. The maximum volume being discharged to the surface water is 120m^3/day at a maximum rate of 1.38l/s. The river flow must be at a minimum of 50 l/s and must be greater than 40 dilutions of effluent at all times. The limits that should not be exceeded are as follows:

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Parameter	Limit
pH	6-8
BOD	25
Suspended Solids	35
Total P (as P)	2
Total Ammonia (asN)	3

An amendment to these parameters and respective limits set by the EPA will be not be requested at this stage for the proposed extension development and the BAT principle will be applied over the lifetime of the landfill.

2.2.11 Surface water generation and handling

Surface water from the new site will be generated mainly from the rainfall running off the side slopes of the landfill and from paved areas. The area contributing to surface water run-off will increase with time as the landfill is progressively capped and restored.

It is estimated that 40% of precipitation will run-off from final covered landfill areas. The annual amount of surface water run-off increase from the proposed extension following final capping and restoration will be 106,000m^3/year. All surface water will be collected by surface water drains connected into the drainage layer within the capping system and will discharge to the surface water settlement lagoons at the existing entrance to the site, from where the quality of the surface water is continuously monitored and subsequently discharged to the White River. A land drain currently crosses north to south through the proposed extension area. This drain will be diverted through the existing interceptor drain located in the area between the existing and proposed landfilled areas.

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Effluent from the wheelwash facilities, run-off from the roof of the administration buildings and the machinery compound, the gas compound and the surfaced roads around the site are and will be passed through an oil/petrol interceptor prior to outfalling to the surface water settlement tanks. Surface water from the waste inspection area and the composting slab will be regarded as leachate and as such are diverted to the leachate treatment plant.

2.2.12 Landfill gas generation and handling

Article 14 of EU Directive on the Landfill of Waste (99/31/EC) discusses the requirements for existing landfill sites and notes that the operator of a landfill shall, within 8 years from entry into force of the Directive, *"take the necessary measures to comply with the requirements of Annex 1(4) of this Directive".* Annex 1(4) deals with gas control and specifies that all landfills receiving biodegradable waste shall have the gas collected, treated and used or, as a minimum, flared.

Condition 3.13 of Waste Licence 17-2 lays down the requirements for landfill gas management at the site. There is an enclosed flare of 1500m^3/hr capacity on site at present and by October 2004 a gas ulitisation plant will be in place in accordance with the requirements of the licence.

The biodegradation processes in a landfill produces gas, which is primarily composed of methane, carbon dioxide and water vapour. The rate of gas generation varies depending on the size and height of the landfill site, the rate of filling, the age of the waste, the moisture content, pH and temperature of the waste and the degree of cover placed during the filling operations. Typically gas will continue to be generated for up to 20 years after placement with a peak in production after 2 to 5 years. A gas management extraction and flaring system has recently been installed at the site consisting of 60 wells drilled into the waste and connected to a ring main via manifold/valve system whereby the gas is drawn to a flare which burns the methane to convert it to carbon dioxide. The gas management system will be extended over the new cells as they are progressively capped and the BAT principle will apply to all future gas extraction and utilisation systems.

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GasSim, a landfill gas modelling software package, which has been developed by the Environmental Agency of the UK was used to simulate the production of landfill gas at Gortadroma. The model required the input of the following information:

- Volume of waste landfilled per year from 1980 to 2019;
- Composition breakdown of the waste per year;
- % of waste which is capped per year;
- Waste moisture content, infiltration and rainfall data;
- Decay rates (if any information is available);
- Landfill geometry;
- Capping details (including thicknesses and hydraulic conductivities);
- Liner details (including thicknesses and hydraulic conductivities);
- Gas flare and engine details (capacity and gas destruction efficiencies); and
- Gas system collection efficiency.

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GasSim considers the landfill as one unit since, unlike leachate, cells are rarely isolated with respect to landfill gas. The model determines the generation of landfill gas for an individual site based on the information input.

The GasSim model uses an advanced equation to determine the generation of methane, carbon dioxide and hydrogen produced from the waste mass, its composition and moisture content. The flexibility allowed in terms of input of waste composition and the landfill characteristics allowed the model to be tailored specifically for Gortadroma.

The model produces results based on the information entered, it does this by performing a series of iterations and then divides the results up through percentiles. **Figure 2.3** below illustrates the bulk landfill gas generated over the lifetime of the site at a 50th percentile (median). It illustrates that in 2003 the total landfill gas generated is 1951m^3/hr and that this is due to fall by 200m^3/hr in 2004 since the waste intake at Gortadroma in 2003 was approximately two-thirds of the average intake of 130,000 tonnes.

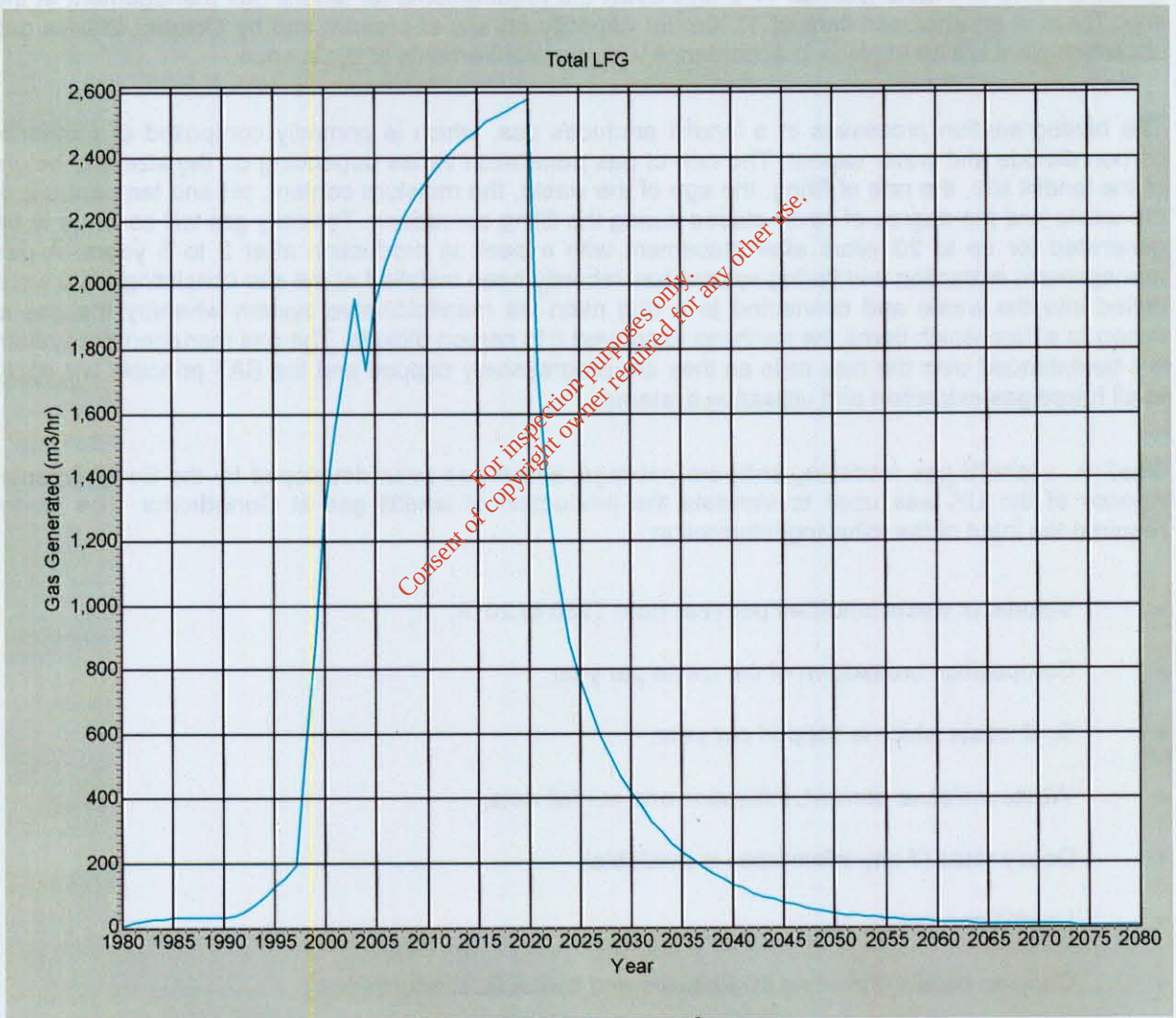

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Figure 2.3 - Bulk landfill gas generated in (m^3/hr) at Gortadroma Landfill

The model can produce percentile graphs, which show the bulk gas and trace gas emissions from flares and engines. Engines can be added to the model, which are switched on automatically when there is sufficient gas for combustion. The model illustrates when these engines should be switched on and off over the lifetime of the landfill by showing a series of steps of engine gas emissions. These steps can be interpreted and an evaluation of the number of engines required can be made. The number of engines can then reflect the amount of electricity produced. The engine, which is used in

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the model, must be specified by the user and in this case an engine has been modelled which requires 580m^3/hr of landfill gas to produce 1MW. **Figure 2.4** illustrates the engine output at the 50th percentile (median). The steps illustrated show when engines are switched on and off. In 2004 two engines should be on which will generate 2MW. In 2009 an additional engine can be switched on and again in 2020, even though in 2020 it may not be financially viable to purchase and run an engine for one year. As the landfill gas generation begins to fall off after its peak of 2020 all engines will be switched off by 2027 when it is no longer viable to generate electricity.

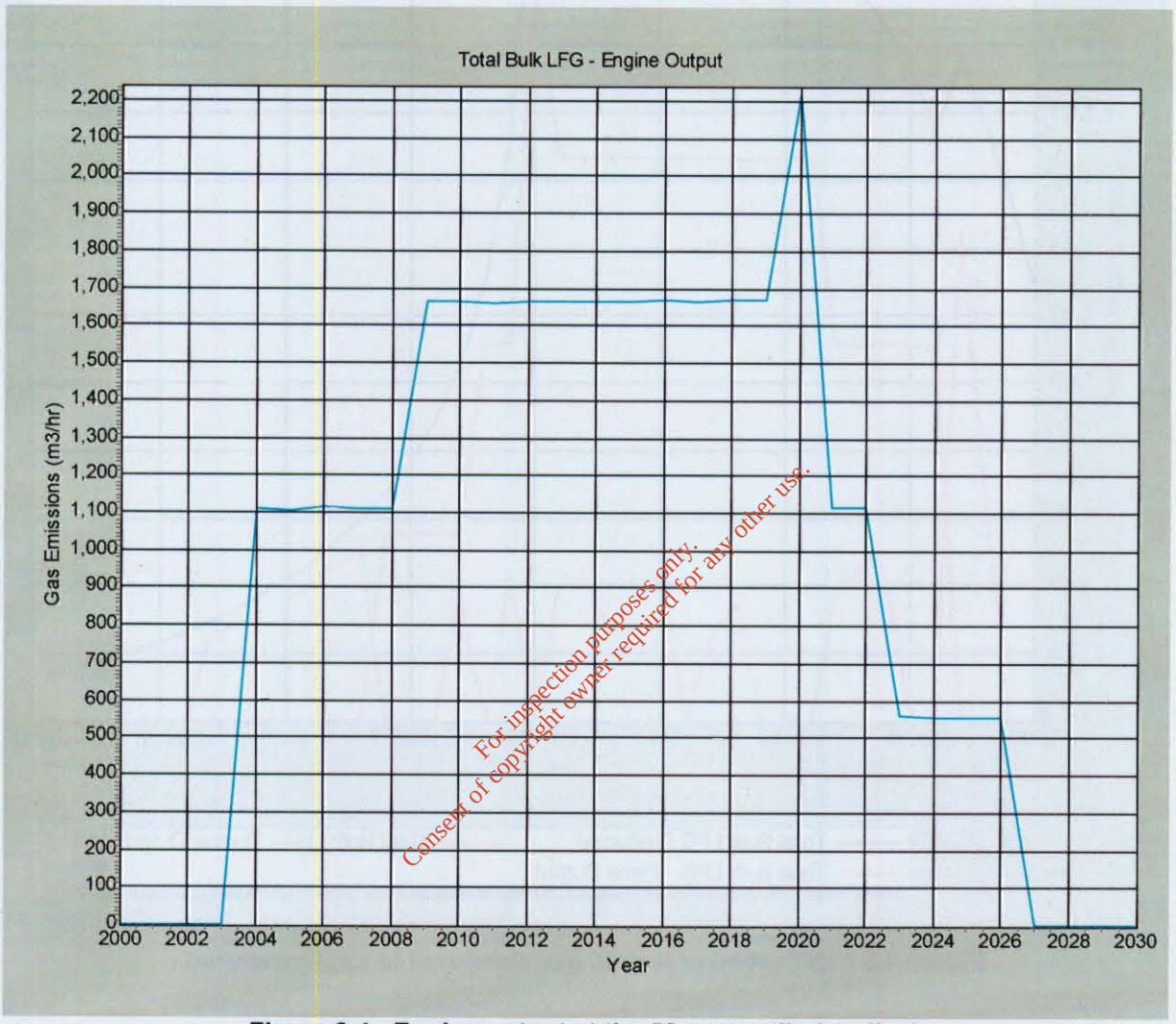

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Figure 2.4 - Engine output at the 50 percentile (median)

Figure 2.5 illustrates total bulk landfill gas produced, flare emissions and engine emissions on the same graph. This illustrates how the highest percentage of total bulk landfill gas can be utilised through the engines and how the remainder is flared.

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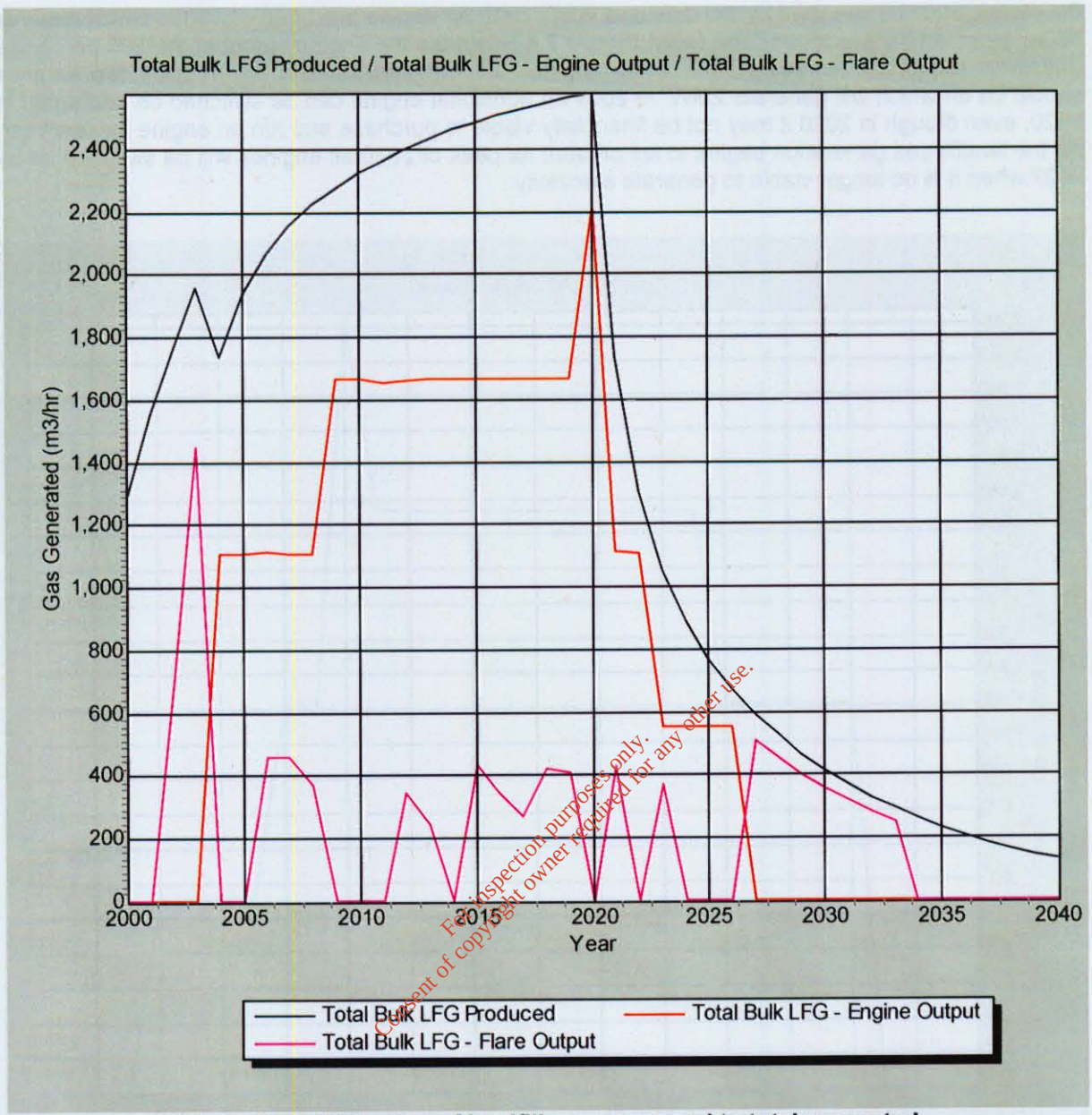

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Figure 2.5 – Utilisation of landfill gas compared to total generated

The modelled and predicted gas production quantities will be regularly compared to the actual gas volumes that are being generated on site and the GasSim model will continually be calibrated to generate more accurate results so that the best utilisation of gas can be implemented. Again, BAT will apply to all future gas extraction and utilisation systems.

2.3 CLOSURE AND AFTERCARE

Closure and restoration of the landfill will be carried out in accordance with the EPA Manual "Landfill Restoration and Aftercare" (1999) or with any conditions set down by the EPA.

The fundamental principle of the closure process however will be that final capping will be progressively placed and sown/planted on a need basis as the landfill cells are filled. **Figure 2.6**

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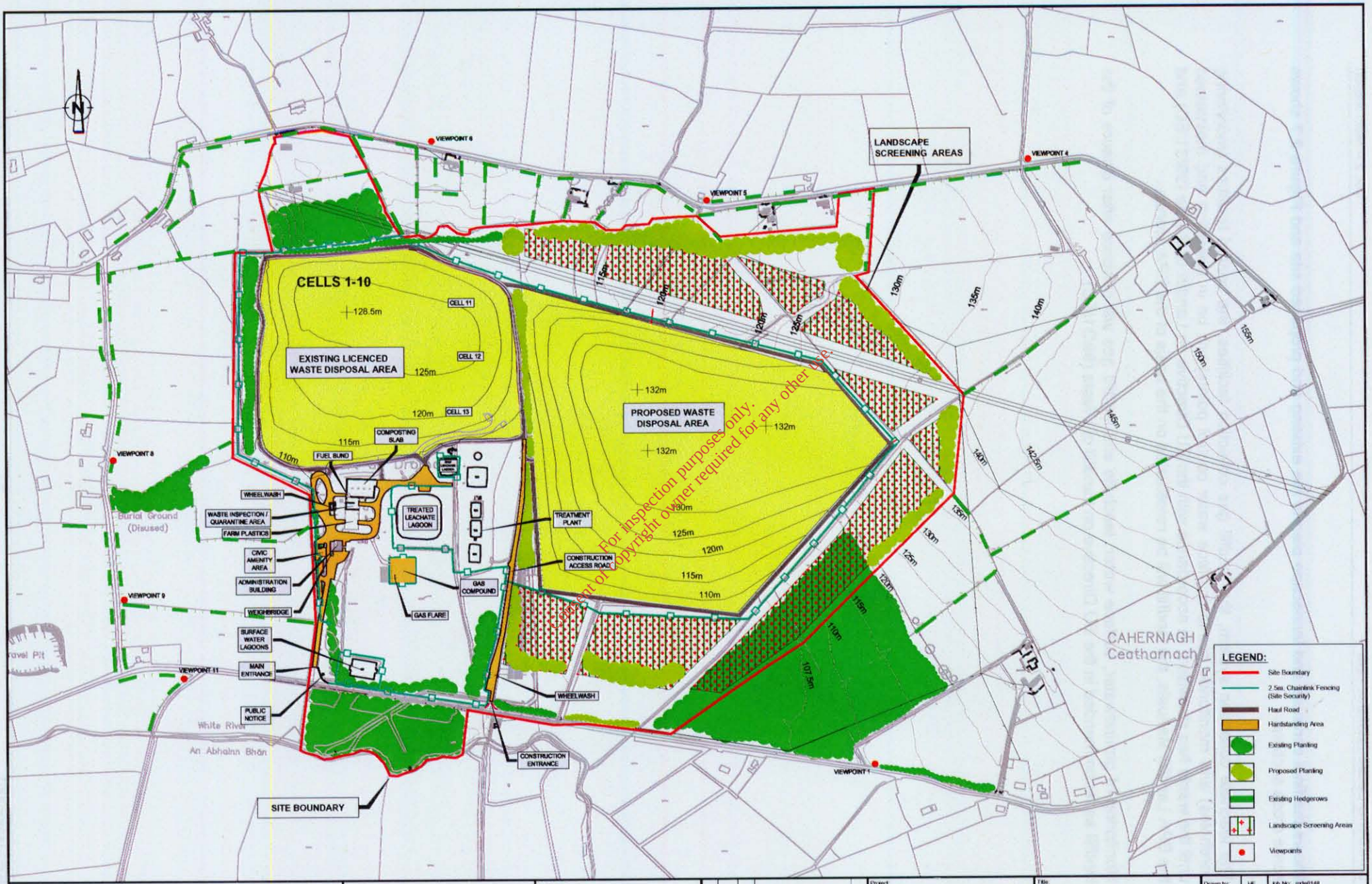

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Nicholas Pearson Associates — Environmental Planners • Landscape Architects • Ecologists

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No.	Date		Amendment / Issue	App.
F01	May'04		FINAL ISSUE	LOT

Project: Gortadroma Landfill EIS

Title: Proposed Final Contours & Landscape Layout

Drawn by:	HF	Job No:	mde0148
Checked by:	CW	File No:	mde0148Fig2.6
Approved by:	LOT	Fig. No: 2.6	Rev: F01
Scale:	NTS		
Date:	May '04		

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shows the final contours and landscape plan of the existing and proposed site and **Figure 2.7** shows some cross sections.

The leachate collection system, the landfill gas collection facilities, the control facilities (monitoring boreholes) and monitoring points (surface water control points) will be in operation and maintained until the waste has stabilised. In accordance with the EU Directive on Landfill of Waste (99/31/EC) and the EPA Landfill Manuals, the landfill will be remediated on the basis of the EPA license.

Monitoring of groundwater, surface water, leachate and landfill gas will continue after closure of the landfill as recommended in the EU Directive on Landfill of Waste (99/31/EC).

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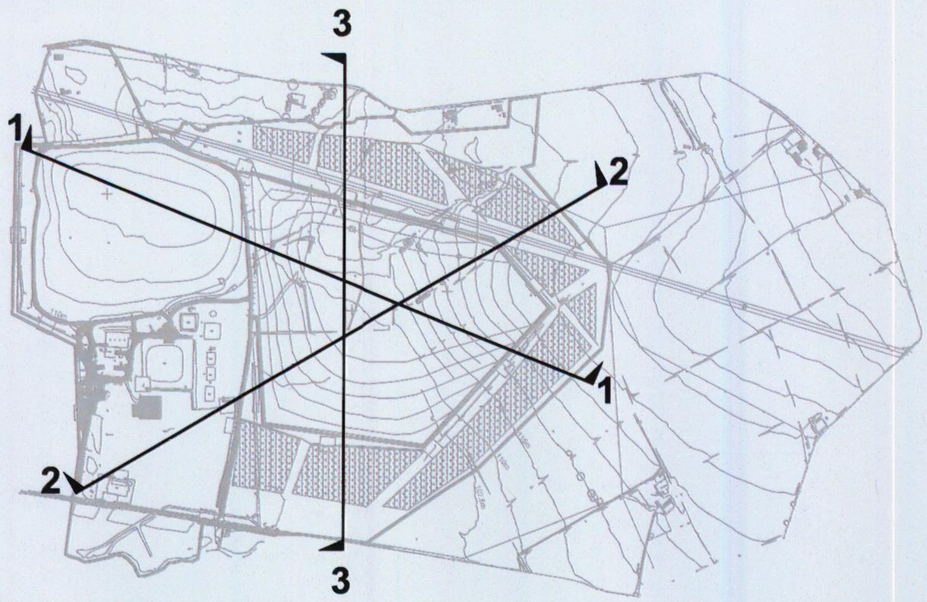
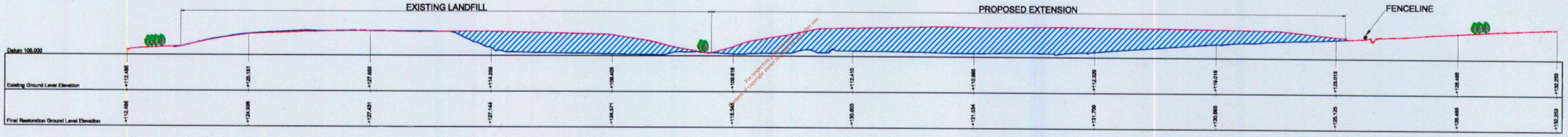
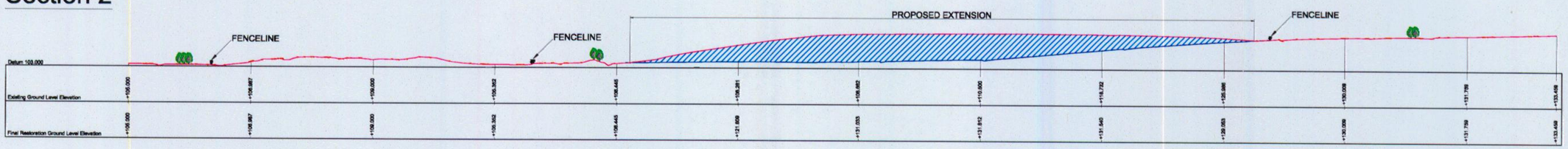


Plan

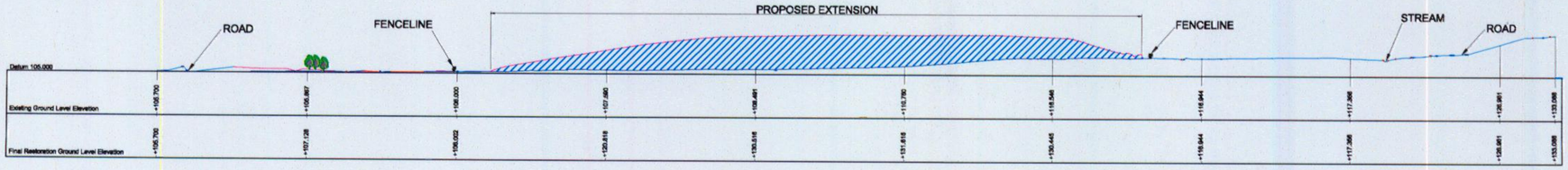
Section 1



Section 2



Section3



LEGEND

EXISTING SURFACE

FINAL RESTORATION SURFACE

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No.	Date	By / Chk	Amendment / Issue	App.
F01	May'04	HF / CW	FINAL ISSUE	LO'T

Project: Gortadroma Landfill EIS

Title: Cross Section of Proposed & Existing Landfill

Drawn by:	HF	Job No:	mde0148
Checked by:	CW	File No:	mde0148Fg2.7
Approved by:	LO'T	Fig. No:	2.7
Scale:	NTS	Rev:	F01
Date:	May '04		

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3 ENVIRONMENTAL IMPACTS

This section describes potential significant impacts of the development and the measures proposed to mitigate significant negative impacts under the following headings: -

- Social and Community;
- Human Health;
- Landscape and Visual;
- Air Quality;
- Noise;
- Climate;
- Traffic;
- Geology/Hydrogeology;
- Aquatic Ecology;
- Terrestrial Ecology;
- Material Assets – Agriculture
- Archaeology/ Cultural Heritage;

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The reports above are abbreviated versions of reports submitted to RPS-MCOS by various sub-consultants. The full reports are presented in Volume 3 of this EIS.

3.1 SOCIAL AND COMMUNITY

3.1.1 Introduction

Patricia Calleary, chartered engineer and town planner undertook the assessment of potentially significant impacts from the proposed landfill extension affecting the following social and community aspects:

- Social, recreational and community facilities in the study area;
- Population structure of the area; and

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- General economic interactions/infrastructure within the community including any potential to stimulate additional developments, changes in employment, landuse, economic activity and population.

3.1.2 Methodology

The methods that were used to examine the community impacts were as follows:

- Desk research including the examining of the census data for the area and background research of available documents;
- Site visits to the existing facility at Gortadroma and visits to the surrounding areas and villages;
- A visit to Limerick Co. Council Planning Section to examine the planning and development policies and zoning policies as outlined in the Limerick Development Plan. The policies of the Limerick/Clare/Waste Management Plan were also researched and considered;
- A community consultation took place on 20th, 21st of August and 5th of September 2003. The methodology used in the community consultation was that of individual and group meetings. A description of the consultation may be found in Volume 3, Technical Appendices.
- A questionnaire was prepared and given to the local residents in order to survey the perception and concerns of the proposed extension. The evaluation of these questionnaires assisted the scoping of the EIS and the community aspects examined.

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3.1.3 Existing Environment

The Gortadroma Landfill is located within the Rathkeale Rural District and adjacent to the Dunmoylan East and Dunmoylan West Rural Districts. Residential development in the environs of the landfill consist primarily of medium size single storey dwellings, which are scattered sparsely throughout the area. A number of small village clusters provide the community services (Church, Post Offices and shops) in the area. There are no significant industrial or commercial developments in the immediate vicinity. The location of the local residences and the distances these properties are from the proposed disposal and screening/landscaping areas are shown in **Figure 3.1.1**

3.1.4 Potential Impact of the Proposed Development.

3.1.4.1 Do-Nothing Impact:

The Gortadroma Landfill site currently serves an area with a population of almost 175,529 people and disposed of 132,000 tonnes in 2000. If the proposed development were not to proceed, the remaining void space will be exhausted by mid-August 2005. An alternative landfill site to serve the catchments areas of the Gortadroma site would need to be found and developed. This would likely be an additional greenfield site, which would raise concerns of sustainability and go against National Government Policy.

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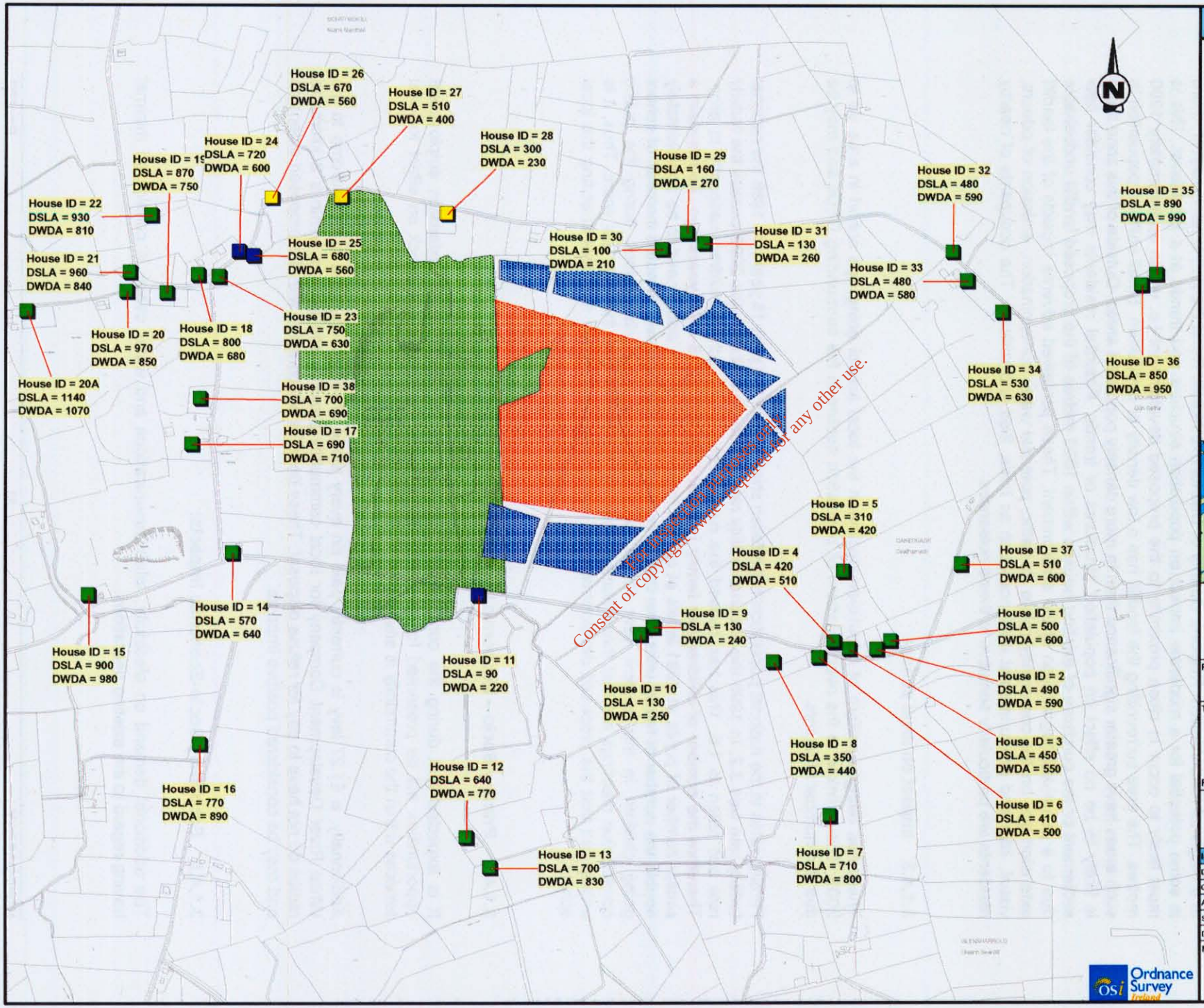

Legend

- Screening/ landscape/ buffer areas
- Existing Landfill
- Waste Disposal Areas

Houses

- Derelict/Unoccupied
- Private
- Rented/Limerick Co Co

DSLA = Distance from Screening/ Landscape Area

DWDA = Distance from Waste Disposal Area

Limerick County Council

Project: *Gortadroma Landfill Extension EIS*

Title: **House Proximities**

Figure 3.1.1

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3.1.4.2 Impacts on population structure and trends

The proposed development is unlikely to have a significant impact on population trends and structures at a Regional (Mid-Western Region), County or District (Rathkeale Rural District) level. However, there is some potential for a moderate impact on population structure and trends at a local level. This is most likely to occur in close proximity to the proposed development i.e. within approximately 1000 metres. The area surrounding the landfill has a low density of population. Small shifts in population in such areas have greater significance than in more densely populated areas. Outside of this zone there is likely to be no effect on population structures or trends. Potential residents may consider new settlement or the purchase of existing houses within 1000 metres of the proposed landfill undesirable due to a perceived degradation of the environment. These perceived adverse impacts of the landfill extension site on the community relate to traffic, potential water contamination, emission of odours, visual, litter and environmental nuisance such as birds, flies and rodents. The occupants of nearby residents are particularly sensitive to these nuisances.

3.1.4.3 Impact on local school

There has being a pattern of population decline in the local school going age cohort in area up to 2003. This is linked to the overall pattern of population decline in the surrounding DEDs and may be due to a number of factors.

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Fertility rates in the national population have fallen sharply over the past 15 years. In 1986 the national fertility rate was 3.2. In 1996 the national fertility rate has fallen to 2.6. In the 2002 census the fertility rate had fallen to 1.6. This has caused the number of primary school children nationally to drop. Therefore the number of children per family is lower than that of 15 – 20 years ago. To maintain a similar number of pupils at 1991 levels at current fertility rates, there would need to be approximately double the number of family units than that at present. There is, however, a noted increase of school going children in this current year (2003) and indications from discussions during the public consultation meetings are that these numbers will be maintained over the next few years. Thus, it is anticipated that the proposed development will not adversely affect the numbers attending the local school.

3.1.4.4 Primary Socio – Economic Impacts.

It is expected that during the construction phase of the proposed landfill extension employment opportunities will be presented for the local labour force. Furthermore, a knock on effect to local services within the community is envisaged.

Additionally, a €1.27 levy is currently paid on every tonne of refuse disposed at Gortadroma to the White River Development Company for local community projects and houses within a 2 kilometre radius do not have to pay for refuse disposal. These benefits will continue with the proposed extension and may be considered positive impacts.

3.1.4.5 Secondary Socio-Economic Impacts:

The additional demand on electricity, telecommunications and water usage is considered minimal having regard to the existing operations.

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3.1.5 Mitigation and Residual Impacts

3.1.5.1 Mitigation Measures

There are a number of existing houses in the vicinity of the existing landfill extension. The additional impact of the extension to the landfill site is considered to be moderate to these houses depending on the management of the landfill. Mitigation measures will take the form of responsible landfill management. Daily cover of tip-head and good compaction practice will reduce much of malodours. Nuisance such as birds, flies and rodents can also be minimised by compaction and covering of the landfill site. Netting around the landfill area will act to reduce litter and so will the litter collection programme. Environmental monitoring of the landfill site will be carried out in accordance with the EPA's "Landfill Monitoring Manual. A consultation programme whereby the community can liaise with the landfill management team, which currently exists, will be continued.

Many of the other environmental assessments for this EIS interact with social and community issues. And as such potential impacts and mitigation measures concerning the local community have being dealt with in greater detail in these assessments. These assessments include, health, traffic, noise, odours, etc.

3.1.5.2 Mitigation Measures During Construction Phase of Development.

It is considered that there will be negligible impact on the population structure and trends during the construction phase. However there are a number of concerns in the community regarding potential impacts from traffic, noise and emissions during construction.

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3.1.5.3 Mitigation Measures on Site Restoration:

During site restoration, sub-soils and top-soils removed during the development phase will be replaced over the completed landfill area. The area will be graded and could be returned to agricultural use. If this were to happen the loss of agricultural land in the long term would not be significant.

3.1.5.4 Residual Impacts

Once the mitigation measures are put in place and good site management procedures are adopted, no significant residual impacts on the population of the immediate vicinity of the site are predicted. Reinstatement measures including rehabilitation/landscaping measures are proposed as part of this development, which will blend in with the surrounding agricultural land.

3.1.6 Summary

The proposed site is conveniently located adjacent to the existing landfill operation and is relatively remote from existing residential nuclei. There is convincing evidence to indicate that the proposed extension would pose no significant adverse impacts to the neighbouring community in terms of social, recreation and community facilities in the area. However there are some potentially moderate impacts on the population structure within 1000m of the extension of the landfill. Mitigation measures are proposed to minimise these impacts. It is predicated that there will be no negative impact on the population structure outside of this zone and it is predicted there will be no negative impact on the general economic interactions/infrastructure within the community.

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3.2 HUMAN HEALTH

3.2.1 Introduction

An assessment of the potentially significant impacts on human health from the proposed extension of Gortadroma Landfill was complied by Dieter Schrenk, MD, PhD, Professor of Toxicology.

3.2.2 Methodology

The assessment of the potentially significant impacts on human health due to the proposed extension of the Gortadroma Landfill was based on consultation with the local community and a desk-top study of relevant publications such as:

- County of Limerick (1999) County Development Plan;
- EPA, Environmental Protection Agency (2001) Air Quality Monitoring, Annual Report;
- EPA (2001a) Investigations of Animal Health Problems at Askeaton;
- Georisk GmbH (01/97) PM_{10} levels in Germany;
- Irish Health Statistics (2002) Section B, Life Expectancy and Vital Statistics; and
- National Cancer Registry (2001) Fifth Report on Cancer in Ireland.

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3.2.3 Existing Environment

3.2.3.1 Human health status in the Mid Western Health Board Region

According to the Irish Health Statistics 2002 (Section B, Life Expectancy and Vital Statistics), life expectancy at birth is slightly lower in Ireland (79.2 years for females, 73.5 years for males) than EU average. The standardised mortality rate for Ireland was at 743.3 per 100 000 population in 2001 and the value for the Mid- Western Health Board/Region was in the same range. Overall, men and women had similar risks of developing cancer, although men were more likely to die from it. Older people were much more likely to develop cancer, with the risk doubling in every successive decade of life. Between 1994 and 1998 there was no significant change in the risk of developing or dying from cancer. Although some cancers showed trends of increase or decrease with time, the overall pattern was of an unchanged risk. A comparison of age-standardised mortality rates for overall causes of death and a number of major causes nationwide and in the Mid Western Health Board is given in **Table 3.2.1**.

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Table 3.2.1. Age-standardised mortality rates for Ireland in comparison to the Mid-Western Health Board/Regional Authority

Parameter	Ireland	Mid-Western
Total mortality	**734.3**	**761.6**
All circulatory system diseases	286.8	312.3
Ischaemic heart disease	150.2	174.6
Stroke	60.9	50.2
All malignant neoplasms	198.0	193.5
Trachea, bronchus and lung	39.4	37.1
Female breast	35.2	37.2

Whereas the mortality from ischaemic heart disease was higher than the Irish average, no increased mortality for all cancers, neoplasms of the trachea, bronchus and lung, and neoplasms of the female breast were observed.

A detailed analysis of the incidence of individual types of cancer (National Cancer registry, 2001) shows that the incidence of colorectal cancer in females was significantly lower statistically in the Mid Western Health Board than the National average. For female breast cancer no significant difference was obtained. The incidence of lung cancer was significantly lower for both sexes. For prostate cancer the incidence was 13 % below the national range, for bladder cancer no significant difference was obtained. The incidence of stomach cancer in males was significantly below the national average. For Non-Hodgkin's lymphoma and melanoma of the skin no significant differences were observed. In summary, the statistics show that the overall incidence and mortality from all cancers combined and from a number of types of cancer is lower in the Mid Western Health Board than in the rest of Ireland.

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An analysis of disability in childhood revealed a shift from physical health problems to psycho-social and lifestyle-related problems in young people as observed in most developed countries.

As part of the Askeaton Human Health Investigation published in 2001 by the Environmental Protection Agency (EPA, 2001), an area forming a rough concentric ring around the Askeaton area was investigated. This area called 'Area 2' in the report and comprised of a number of DEDs including the DEDs Dunmoylan West and Dunmoylan East where Gortadroma Landfill is located.

A health status survey as part of the investigation did not reveal any differences in health status between Area 2 and other rural areas in the Mid-Western Health Board. In Area 2 there was a lower rate for birth defects (congenital abnormalities) compared to other European registries but within the norm accepted internationally (1-2 % births) and the rate did not differ significantly from that found in the control area. A lower cancer incidence was observed in the health status survey when compared to the control area and with respect to overall cancer mortality Area 2 showed a more favourable experience than other areas in the Mid-Western Health Board. Respiratory mortality did not differ significantly between all areas investigated.

3.2.3.2 Air quality - Nationally

The Annual Report 2001 on air quality in Ireland (EPA, 2001) revealed that limit levels for smoke and sulphur dioxide were not exceeded at any location tested. The level for ambient particulate matter mass concentration (PM_{10}) exceeded the 50 $\mu g/m^3$ limit at one site in Dublin. The same was true for nitrogen oxides (NO_x) and nitrogen dioxide (NO_2). Both types of air pollutants were strongly related to the very heavy traffic at the respective sites in Dublin City. Ozone levels exceeded the eight-hour

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health protection threshold of 110 µg/m^3 on a total of only fifteen days over the six stations in Ireland, while the one-hour population information threshold of 180 µg/m^3 was exceeded on the two days at Valencia, Co. Kerry. Benzene levels above the limits anticipated for 2010 were detected at two locations in Dublin.

In summary, no indication has been found for any air quality problems in rural areas with the possible exception of ozone, which represents a general problem also in remote areas at periods of intense sunlight.

3.2.3.3 Air quality - Gortadroma

The Gortadroma Waste Licence Reg 17-2 requires that Dust and PM_{10} monitoring is carried out annually. In 2001, PM_{10} sample collection was carried out in July, and dustfall was collected in August/September. The levels were in the range of 13 – 25 µg/m^3, i.e., below the threshold level of 50 µg/m^3 (Waste License 17.2). The figures for dustfall were in the range of 6.3 – 42.2 mg/m^2, i.e., clearly below the limit of 350 mg/m^2.

PM_{10} exposure has been discussed (Georisk GmbH (01/97) *PM_{10} levels in Germany*) as a possible cause of asthma and other chronic diseases of the respiratory tract. In industrialized zones in Central Europe, PM_{10} levels average at 60 – 90 µg/m^3 and achieve maximum values in the range of 400 – 500 mg/m^3 (Georisk, 1997). The levels measured in the Gortadroma area are indicatative of high air quality usually found in rural areas.

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3.2.3.4 Leachate

Monitoring results from the extended aeration lagoon were taken from reports by EURO Environmental Services, Southbank House, Southbank Ind Est, Drogheda, Co. Louth. These results showed a variety of fluctuations in some parameters, primarily ammonia. These fluctuations were due to changing conditions such as the addition of sewage sludge in order to improve the biological activity. Further analysis of leachate revealed levels of metals < 0.01 mg/l for Cd, < 0.01 mg/l for Cu, < 0.001 mg/l for Hg, and between 0.04 and 0.09 mg/l for Pb.

The fact that toxic metals Cu (copper), Hg (mercury) and Cd (cadmium) could not be detected (within the limits of detection), suggests that the water *per se* is not harmful to humans except for a probable microbial contamination. The levels found for Pb (lead) are slightly higher than the EU drinking water limit of 10 µg/l (0.01 mg/l). They are, however, in a range typical for wastewater.

3.2.3.5 Surface water

Surface waters are monitored on a quarterly basis at twelve locations in and around the Gortadroma Landfill (**See Figure 3.2.1**). The results obtained from the quarterly monitoring for the period December 1999 to August 2002 show elevated levels of silt, COD and ammonia-N in some of the samples taken. However, the sites S1 and S6 on the White River, downstream and upstream of the Landfill, respectively, indicate that the Landfill had no measurable impact on the White River.

Some of the values measured indicate that surface water from the landfill and adjacent area is not suitable for human consumption when compared to national and international drinking water standards. However, this does not mean that this water will necessarily have an adverse effect on health.

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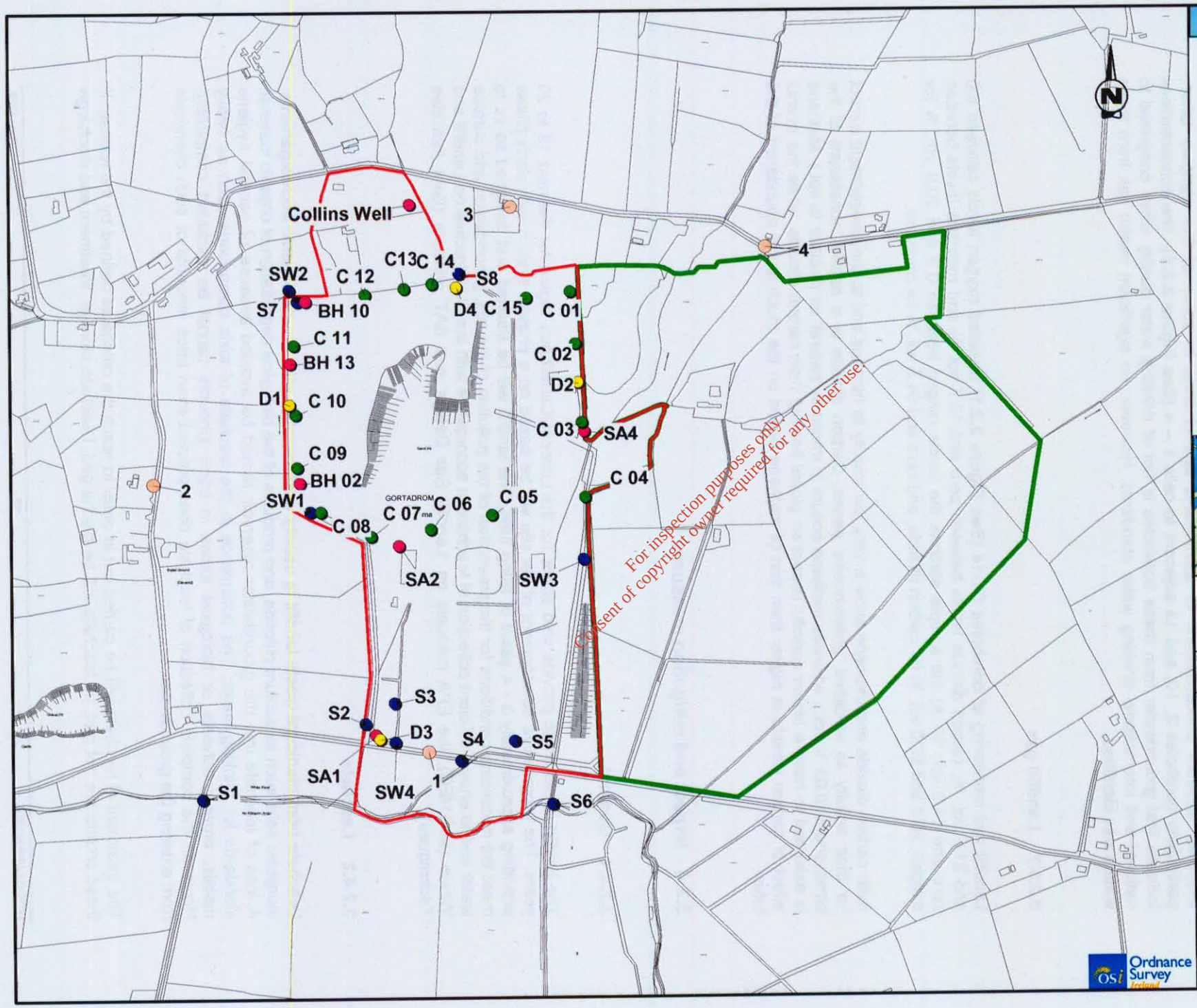

Legend

- Existing Landfill Boundary
- Proposed Extension
- Surface Water Monitoring Point
- Borehole Monitoring Point
- Gas Monitoring Point
- Dust Monitoring Point
- Odour Monitoring Point

Limerick County Council

Project: *Gortadroma Landfill Extension EIS*

Title: **Monitoring Points**

Figure 3.2.1

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3.2.3.6 Ground water (boreholes)

Groundwater from boreholes is also monitored every quarter. The results from this monitoring indicated elevated concentrations of ammonia-N and chloride in some of the samples taken, particularly boreholes 2, 10, and 13 adjacent to cells 1 – 4 (**See Figure 3.2.1**). The concentrations indicate that groundwater from these boreholes is not of drinking water quality when compared to national and international drinking water standards. However, no significant health risk from these waters was identified.

3.2.3.7 Landfill gas

Landfill gas monitoring at boreholes C1-14 (**See Figure 3.2.1**) revealed oxygen levels between 8.0 and 21.1 vol. %, carbon dioxide levels between zero and 10.7 vol. % and methane levels between zero and 14.2 vol. %. At the sample stations the levels ranged between 0.3 and 20.9 vol. % for oxygen, zero and 52.0 vol. % for carbon dioxide, and zero and 64.5 vol. % for methane.

Both carbon dioxide and methane show a very low toxicity to humans and to the environment except for their activity as so-called 'green-house' gases. Carbon dioxide is a natural constituent of the atmosphere (0.03 % vol.), whereas methane occurs in traces in 'natural' air (0.0002 % vol.). Methane is assumed to have a higher specific impact on global heating than carbon dioxide, while the overall effect of carbon dioxide is higher than that of methane based on the much lower abundance of the latter.

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3.2.4 Impact and mitigation measures

3.2.4.1 General

The landfill is planed to provide void space for the Limerick/Clare/Kerry region for the next 15 to 20 years. The progressive development of the site will be based on a phased system with each phase providing approximately 3 - 4 years of filling time. The landfill will be situated and designed so as to meet the necessary conditions for the prevention of the pollution of the soil, groundwater and surface water and to ensure efficient collection of leachate in accordance with the EU Directive on Landfill and Waste (99/31/EC), the EPA manuals on 'Landfill Site Design' and BAT principle (Best Available Techniques).

3.2.4.2 Leachate

Leachate from municipal waste landfill is usually contaminated with non-pathogenic microorganisms, inorganic salts such as sodium chloride, and products of the biological degradation of organic material. A loss of leachate into the groundwater reservoir should be avoided because of general hygiene standards for drinking water. The occurrence in the leachate of toxic compounds such as heavy metals, organic solvents or biological toxins in trace amounts cannot be excluded completely. However, the complete collection of leachate does prevent even trace amounts of such chemicals from entering the groundwater.

The treatment of leachate will be carried out in order to reach the criteria as defined by the license. If these criteria are not met, no leachate will be discharged. Leachate storage, treatment and discharge

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will have no significant impact on health quality of the population living in the vicinity of the landfill or on the environment.

3.2.4.3 Landfill gas

Landfill gas contains the gases carbon dioxide and methane as major constituents. Both gases show extremely low toxicity and are natural constituents of the lower atmosphere. Landfill gas also contains trace amounts of other gaseous compounds generated during the microbial degradation of organic waste. Some of these compounds, though not occurring in toxic concentrations can be sensed by humans because of the low smelling threshold for such compounds, e.g., for hydrogen sulphide.

Odour, in most instances, does not represent any direct harm to human health but can be very disturbing. Therefore, landfill gas should be collected as completely as possible. Currently, all gas is collected and 'flared'. Flaring destroys most if not all smelling organic constituents converting them to carbon dioxide and water. It is planned to install a gas utilisation plant, which will generate electric power. Both the current technology, and a possible use of landfill gas for the generation of power will have no significant impact on human health or on the environment.

3.2.4.4 Groundwater protection

Groundwater is a major source of drinking water in the Gortadroma area. The quality of groundwater, therefore, has to be protected rigorously. In addition, many plants and other organisms as well as a percentage of the surface water depend on groundwater reservoirs. The lining of the waste cells will prevent any leachate from reaching groundwater thus ensuring that groundwater quality, human health, and the environment will not be significantly impacted.

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3.2.4.5 Control of rodents

Rodents can be harmful since they may transfer pathogenic viruses, microorganisms, parasites etc. and may, therefore, represent an important factor for the spreading of various diseases. Control of rodents is a mandatory prerequisite for any landfill. A commercial pest control company will be contracted to avoid the occurrence of any rodents, which may impact on human health or the environment.

3.2.4.6 Dust and odour

Dust originating from landfills usually contains organic and inorganic particles such as cellulose, salts, oxides etc. In addition, microorganisms and spores may be found in landfill dust. No specific diseases originating from exposure to dust have been reported from the vicinity of well-maintained landfills. Nevertheless, any avoidable exposure to dust should be prevented by appropriate measures since, in general, particulate matter is discussed as a contributing factor in the development of diseases of the inhalation tract such as asthma, chronic bronchitis and allergic reactions. To avoid this, the waste will be covered at the end of each day to prevent any litter or waste dispersal by wind.

3.2.4.7 Contamination of roads and neighbourhood

All HGVs leaving the landfill will go through a wheelwash station to prevent any transfer of contaminated material to streets and neighbourhood. Contamination of roads and the neighbourhood will be kept to a minimum. Therefore, no significant impact on human health is expected.

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3.2.4.8 Traffic

The maximum of 130,000 tonnes of waste per year will be delivered over approximately 255 working days resulting in an average tonnage of 510 tons per day at maximum. A traffic assessment predicted movements of 26 articulated HGVs, 16 subsoil trucks, 12 compactors and 13 other HGVs per day as well as approximately 19 smaller motor vehicles. The hours of opening are from 8:00am to 4:30 pm on weekdays and on Saturday's preceding bank holidays for delivery of waste.

On average this would result in 67 HGVs per (approx.) 8 hrs. If evenly distributed over the working hours, approximately 8.38HGVs per hour can be expected at maximum. This figure is below the frequency of HGVs in urban areas or on major roads. Therefore there will be no significant health impact from traffic.

3.2.4.9 Monitoring

All parameters listed in the EPA license will be monitored as part of an ongoing monitoring programme.

3.2.4.10 Residual Impacts

Analysis of monitoring data indicates that the existing landfill has little or no affects on air and surface water quality in he surrounding environment. It is anticipated that the mitigation measurements will maintain this situation for the extension.

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The burning of landfill gas has priority over the unmodified release of the gas since raw gas from landfills has a much higher 'green house impact' than carbon dioxide and may contain compounds with adverse odour. Furthermore, burning contributed to the removal/conversion of odorous compounds such as hydrogen sulphide. The future use of landfill gas as an energy source is strongly recommended.

3.2.5 Summary

No significant impact on human health is expected from the proposed extension to the Gortadroma landfill.

3.3 LANDSCAPE AND VISUAL

3.3.1 Introduction

Nicholas Pearson Associates undertook the landscape and visual assessment of the proposed extension of the landfill at Gortadroma.

Findings of the assessment have been incorporated into the process of design evolution, to ensure that landscape considerations are properly accommodated within the final scheme design.

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3.3.2 Methodology

The assessment has been carried out with due reference to the Guidelines for Landscape and Visual Impact Assessment prepared by the Landscape Institute and the Institute of Environmental Management & Assessment (LI & IEMA, 2002). The assessment has been carried out by use of mapped information, photographs and field survey, together with professional judgement made by experienced landscape assessors.

3.3.3 Existing Environment

3.3.3.1 The Site and Surrounding Land Uses

Gortadroma is an existing landfill site located 12 km north of Newcastle West, 9 km south of Foynes and 54 km south west of Limerick City. The existing site covers an area of approximately 35 hectares of which 14 hectares is used for waste disposal. It has been operating as a landfill site since 1990 and was previously used as a sand and gravel pit. The proposed extension covers an area of approximately 41 hectares of which approximately 19 hectares will be for waste disposal.

Surrounding the site is a rural landscape with small to medium pastoral fields, narrow rural roads and scattered detached dwellings. Vegetation comprises of pastoral fields, coniferous plantations, some mature tree belts and marshy scrubland with reeds. There are a number of small river corridors, particularly to the north and south of the site and the River Shannon Estuary, to the north, can be glimpsed from higher land. Significant areas of broadleaved woodland exist to the north east around the Ahacronane River corridor. Coniferous plantations are scattered across upland agricultural areas.

A pylon line runs from east to west across the area and dissects the site. Existing built development in the locality is varied in architectural character but generally comprises small to medium sized detached dwellings located along roads singly or in small clusters. There are some small towns to the north and south east but otherwise residential development is not a prominent feature of the area. Along the River Shannon Estuary, to the north, are a number of large industrial premises.

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3.3.3.2 Topography

Topography within, and surrounding, the site is undulating which limits certain views but provides open panoramas on elevated ground. Eight kilometres to the south of the site the land rises up to 344m at Knockanimpuha (Cnoc an Lompaithe). Also to the south are a series of small river corridors created by tributaries of the River Daar, which dissect the area and run southwards towards the River Deel. From what are known as the "Western Hills" (Knockanimpuha, Cnoc an Chaca, Cnoc an Droma Fhada etc) the land slopes northwards down towards the Shannon Estuary. Two river corridors - White River (An Abhainn Bhán) and Ahacronane River (Abhainn Ath an Cronain) - descend from the "Western hills" to the Shannon Estuary.

3.3.3.3 Trends and Pressures

The growing trend for coniferous plantations is the most significant force for change in this area. These plantations are generally privately owned and comprise non-native Sitka Spruce and Douglas Fir. Some are also planted with Japanese Spruce and some native broadleaved trees to integrate the plantations with the surrounding landscape character. The plantations follow existing field boundaries so they do not blend well into the undulating pattern of the landscape. There is little pressure from housing development in this area.

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3.3.4 Potential impacts

The proposed extension of the Gortadroma Landfill will potentially impact on both the character of the existing landscape and on the views seen by people living, working and passing through the area.

3.3.4.1 Potential impacts on landscape character

The significance of impacts on the character of the landscape are determined by the relationship and combinations of sensitivity and magnitude. The potential impact increases in line with the sensitivity of the area and the magnitude of impact. Differentiation is made between the sensitivity of particular receptors based upon their value within the landscape. Reduced landscape sensitivity or a smaller magnitude of landscape impact moderates and / or lessens the impact significance.

The development will be visible from a number of locations but will have a slight and indirect effect upon the quality and character of the area, which already has moderate to low quality landscape character.

The proposed extension will be located on land, which is currently pastoral. Landfill operations have been evident on this area for over 10 years and so are not uncharacteristic. However, extensions to the existing landfill site will have cumulatively negative impact on the landscape character by further reducing the amount of farmland and vegetation in this area.

The site is a relatively small element of the whole landscape character area and the development will only have a significant impact in the immediate locality. It is possible that, through design, the development will have a positive impact to the landscape quality of this area by incorporating replacement tree planting of mixed woodland, increasing the numbers of broadleaved species in the area as well as ensuring an ongoing, adequate management regime that would ensure that tree belts survive.

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3.3.4.2 Potential visual impacts

The viewpoint analysis provides a detailed assessment of the visual effects of the proposed development from a representative sample of views from 13 publicly accessible locations at different distances and orientations to the site. These viewpoints were selected through a comprehensive survey of the area. The existing views and the analysis of each is described in **Figures 3.3.1 - 3.3.13** and accompanying text.

The significance of the visual impact is the result of a combination of factors such as the nature and extent of the development visible and its prominence in the view together with the sensitivity of the landscape to change. Consideration is also given to whether the impact would be transitory (either because the effect itself is short term or would be mitigated, or because the receptor is exposed to the effect for a short time) or long term.

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