C ATTACHMENTS

ATTACHMENT C.1 Organisational Chart

A copy of the Management Structure and Organisational Chart for Ballymurtagh is presented in Attachment C.1(i)

Attachment C.1(i) Organisational Chart

ATTACHMENT C.2 Environmental Management Plan 2008

The Environmental Management Plan prepared for Ballymurtagh Landfill for 2008 is included in Attachment C.2(i)

Attachment C.2(i) Environmental Management Plan 2008

ATTACHMENT C.3 Hours of Operation

The landfill was closed in 2002 and is not open to members of the public. The hours of opening at the Recycling Centre are as follows:

Tuesday to Saturday 10am to 1pm
1pm to 4pm

The Recycling Centre is closed on Mondays.

ATTACHMENT C.4 Restoration and Aftercare Plan

A copy of the Restoration and Aftercare Plan Prepared in 2003 is included in Attachment C.4(i)

Attachment C.4(i) Restoration and Aftercare Plan

7 STAFFING AT BALLYMURTAGH LANDFILL

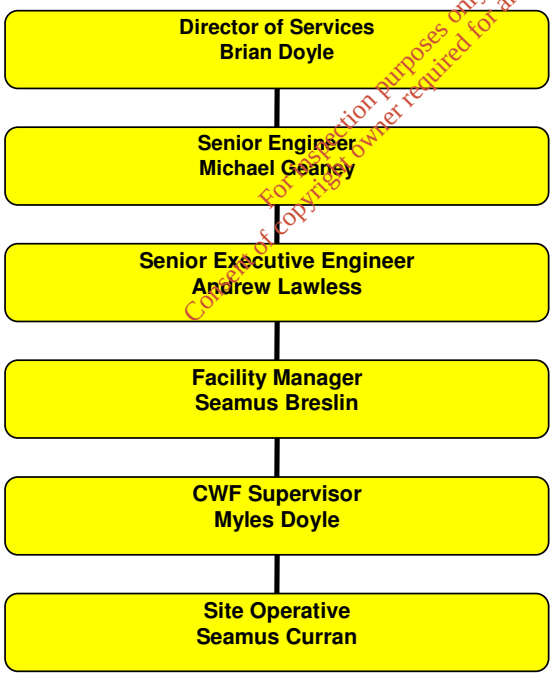
The site is under the overall operational control of the Director of Services and the Senior Engineer who provide office support as required. The Facility Manager is responsible for the day-to-day supervision and management of the site. The Facility Manager maintains regular contact with County Buildings, with regular site visits from the Senior Executive Engineer. RPS Consulting Engineers advises Wicklow County Council on operations at the facility and waste licence compliance issues. Table 7.1 provides details of the management as at June 2008.

Table 7.1: Managerial Staff

Position	Contact details
Mr Brian Doyle, Director of Services (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow. Telephone No: 0404 20100 Fax No: 0404-67792
Mr Michael Geaney, Senior Engineer (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Andrew Lawless, Senior Executive Engineer (Environmental & Sanitary Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Seamus Breslin, Facility Manager	Wicklow County Council, County Buildings, Wicklow.

Figure 7.1 outlines the management structure for the site. A supervisor is also employed to run the civic waste facility. Any changes to this structure will be submitted to the Agency for agreement in accordance with Condition 2.6 of Waste Licence Reg. No. W0011-1.

Figure 7.1: Management Structure & Organisational Chart



DOCUMENT CONTROL SHEET

Client	Wicklow County Council					
Project Title	Ballymurtagh Landfill Licence Compliance					
Document Title	Environmental Management Plan 2008					
Document No.	MDR0046Rp0045					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1		1	1	2

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
D01	Draft	R..Kennedy	Paddy Lambe	Cathriona Cahill	West Pier	July 2008
A01	For Client Approval	R Kennedy	Paddy Lambe	Cathriona Cahill	West Pier	July 2008

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1 INTRODUCTION

This Environmental Management Plan (EMP) serves to act as a site manual for the operation of Ballymurtagh Landfill. The disposal of waste ceased at Ballymurtagh in December 2002 and the operation of the Avoca Civic Waste Facility is the main activity at the facility. The EMP also outlines the aftercare requirements for the landfill and sets out a programme for achieving the Schedule of Objectives and Targets proposed for 2008 to 2013.

The EMP prepared for Ballymurtagh Landfill is reviewed annually and submitted to the Agency for agreement in accordance with Condition 2.3 of the W0011-01. Hence, this report has been updated to revise the plan submitted in 2007.

The plan has been prepared in accordance with the EPA Landfill Manual, 'Operational Practice' and the EPA 'Draft Guidance on Environmental Management Systems and Reporting to the Agency'. The plan should be read in conjunction with W0011-01 and the Restoration & Aftercare Plan (2003).

This is a working document and should accommodate the need for some matters to be amended as required. A complete copy of the plan will be kept at the Civic Waste Facility site office at Ballymurtagh and at the County Buildings in Wicklow.

2 DETAILS OF OPERATOR

Wicklow County Council operate Ballymurtagh Landfill/Civic Waste Facility. The site is under the overall operational control of the Director of Services and the Senior Engineer/Senior Executive Engineer who provide office support as required. The Facility Manager/Civic Waste Facility Supervisor is responsible for the day-to-day supervision and management of the site. There is also a general operative employed at the Civic Waste Facility. The Facility Manager maintains regular contact with county buildings, with regular site visits from the Senior Executive Engineer. RPS advise Wicklow County Council on operations at the facility and with Waste Licence Compliance Issues. Table 2.1 provides details of management. Figure 2.1 outlines the management structure for the site. Any changes to this structure will be submitted to the Agency in accordance with Condition 2.6 of W0011-01.

Table 2.1: Details of Management at Ballymurtagh Landfill.

Position	Contact details
Mr Michael Nicholson Director of Services (Water & Environmental Services)	Wicklow County Council, County Buildings, Wicklow. Telephone No: 0404 20100 Fax No: 0404-67792
Mr Micheal Geaney Senior Engineer (Water & Environmental Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Andrew Lawless, Senior Executive Engineer (Water & Environmental Services)	Wicklow County Council, County Buildings, Wicklow.
Mr Seamus Breslin Facility Manager Ballymurtagh Landfill/Civic Waste Facility	Avoca Civic Waste Facility Avoca Co. Wicklow
Mr Myles Doyle Civic Waste Facility Supervisor Ballymurtagh Landfill/Civic Waste Facility	Avoca Civic Waste Facility Avoca Co. Wicklow

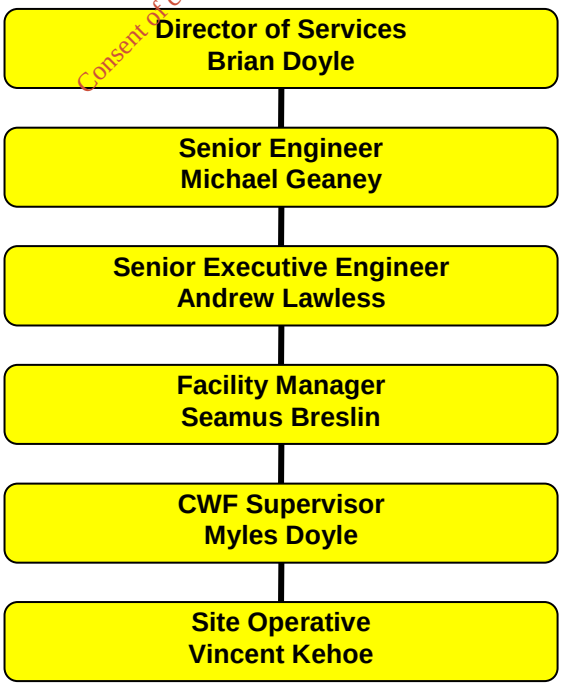

Figure 2.1: Management Structure for Ballymurtagh Landfill

3 TYPES & QUANTITIES OF WASTE ACCEPTED

Waste for recovery/recycling is accepted at the Civic Waste Facility. Appendix B lists the waste types accepted at the facility during 2007, the permit details of all waste collectors and licence/permit details of the off-site facilities used by Wicklow County Council for the recovery/disposal of these wastes.

The Waste Licence, W0011-01, limits the quantity of waste to be accepted at the Civic Waste Facility to 10,000 tonnes per annum unless otherwise agreed with the Agency (Condition 5.20 of W0011-01).

Copies of the waste permits/licenses for facilities used to handle civic waste and details of the waste carrier's collection permits and the written consents from the operators of the facilities where waste are contained are kept at Wicklow County Buildings.

4 SITE DESCRIPTION

Ballymurtagh Landfill is located in the townlands of Ballymurtagh, Ballygahan Upper, Ballygahan Lower, and Tinnahinch in the Vale of Avoca, approximately 1.5 km north-west of the village of Avoca in County Wicklow at National Grid Reference 319760.00E, 181520.00N as shown in Figure 4.1. The total area is approximately 6 hectares in size of which 5 hectares consist of waste to depths ranging from 2m to 40m. Security fencing surrounds the site. It is estimated that approximately 480,000m^3 of waste has been deposited at the site since it commenced operation in 1989.

The landfill is situated in the catchment of the Avoca River, which rises in the Wicklow Mountains and enters the Irish Sea at Arklow. The landfill itself is located within a disused Open Lode pit of the former Avoca Mines. Prior to landfilling the pit had been used for the settlement of mine tailings, a layer of which underlies the body of the waste. The bedrock underlying the landfill consists of the volcanic rock that is part of the Avoca Formation. The lithologies based on drilling carried out by the Geological Survey of Ireland consists of light greenish grey, fine grained, well foliated metavolcanic rock. The aquifer potential in the area is considered poor to locally important.

Annual rates of precipitation in the Ballymurtagh area are generally between 1100-1200mm with the winter months (Oct-Jan) normally receiving the greatest monthly rates. The maximum daily rainfall rate varies little throughout the year although the duration and intensity may differ significantly between summer and winter due to the prevailing conditions. During the winter the rainfall will be commonly associated with Atlantic frontal depressions whereas during the summer months high rainfall amounts will tend to be associated with intense thundery showers.

The following subsections describe the layout of the site and its infrastructure as illustrated in Figure 4.1. The Civic Waste Facility layout is outlined in Figure 4.2. A water tank, which is situated inside the entrance gate, supplies a number of houses along the access road as well as the landfill facility.

4.1 FENCING, GATES AND OTHER SECURITY

Wire security-fencing surrounds the entire site boundary, which is secured by an entrance gate. Likewise, with the flare compound and the Civic Waste Facility. All gates are locked during closing hours. As per Condition 4.3 of W0011-01, the Facility Manager/Civic Waste Facility Supervisor ensures that temporary repairs to gates/fencing will be carried out where necessary, before the end of each working day and final repairs will be completed within three working days. It is the responsibility of the Facility Manager/Civic Waste Facility Supervisor (or other nominated person) to ensure gates are locked shut when the facility is unsupervised.

Figure 4.1: Site Layout

Figure 4.2: Civic waste facility layout

4.2 SITE ACCESS ROADS AND SECONDARY SITE ROADS

The access road to the landfill is via the 'Red road' from the R752 Avoca Road and is underlain with Clause 804 aggregate and surface dressed to a high standard. The access road to the Civic Waste Facility is directly off the R752 Avoca Road. The Facility Manager/Civic Waste Facility Supervisor ensures that the site roads and any hard standing areas are maintained to ensure the safe movement of vehicles within the facility.

4.3 SITE MACHINERY

A forklift is used at the Civic Waste Facility to assist with the movement of waste.

4.4 POLLUTION ABATEMENT SYSTEMS

4.4.1 Leachate Collection

The landfill was designed on a 'dilute and disperse' principle and therefore no leachate containment measures exist. The leachate, which is attenuated by the underlying soil and groundwater, drains naturally to the Avoca River. However, as the main factors, which affect the rate of leachate generation are precipitation, surface run-off and evapotranspiration, the capping and surface water drainage works prevent the ingress of surface water and therefore reduce leachate generation.

4.4.2 Gas Extraction System

The gas extraction system consists of a network of wells, connected to a flaring system from where the gas is flared (see Figure 4.1).

Irish Power Systems (IPS) visits the site on a weekly basis to maintain the gas extraction system and to undertake monitoring. A programme for the maintenance of the flare is outlined in Appendix A.

4.5 MONITORING POINTS

Surface water, groundwater, leachate, noise, gas and flare monitoring points are shown in Figure 4.3.

4.6 SURFACE WATER CONTROL MEASURES

A surface water collection system in conjunction with a land drain sub-surface drainage system was installed as part of the restoration works (see Figure 4.1). A herringbone network of field drains collect sub-surface water while a series of contour drains collect surface water. Interconnecting carrier drains carry the run-off to the storm-water retention pond (see Figure 4.1). All surface water run-off is discharged to the Avoca River via an existing drain located within the Civic Waste Facility.

Figure 4.3: Monitoring infrastructure

Figure 4.4 Landscaping Plan

4.7 LANDSCAPING

Landscaping of the site in accordance with the Landscaping Plan (see Figure 4.4) was undertaken in Spring 2006.

5 OPERATIONAL MATTERS

The main operations at the facility relate to the day-to-day running of the Civic Waste Facility and the aftercare of the landfill. The relevant requirements for these operations are discussed below.

5.1 CIVIC WASTE FACILITY

Only private vehicles can use the Civic Waste Facility to dispose of waste for recovery. Commercial waste disposal contractors or local authority waste collection vehicles are not allowed to use the facility as a transfer station for disposal of waste.

A full time supervisor manages the site and advises the public on procedures and waste accepted at the facility. The types of waste accepted at the facility are outlined in Appendix B and the layout of the facility is shown on Figure 4.2. Once containers are almost full, the site attendant organises that the agreed waste carrier collects the container and transfers it to the agreed authorised facility for recovery/disposal. All details of waste leaving the facility are recorded on the documentation contained within Appendix A, which has been prepared and revised in accordance with Condition 3.13 of W0011-01. All wastes sent off-site for recovery/disposal will only be conveyed to a waste contractor (as agreed by the Agency), details of which are contained in Section 3.

5.2 SITE OPENING AND OPERATING HOURS

Waste may be accepted at the Civic Waste Facility between the hours of 8.30a.m. to 6.00p.m. Monday to Saturday inclusive. The site is currently open between the hours of 10.00a.m. to 1.00p.m. and 2p.m. to 4p.m. Tuesday to Saturday inclusive.

5.3 WASTE ACCEPTANCE PROCEDURES

The Waste Acceptance Procedure for the Civic Waste Facility is contained within Appendix A.

5.4 SITE PERSONNEL

The following operatives are employed at the facility:

The Civic Waste Facility supervisor has undertaken all modules of the Fás Waste Management Training Programme. It is the Supervisor's responsibility to be in attendance at the Civic Waste Facility during opening hours, assist the public with any queries regarding the facility, organise and document all waste departing the facility and to ensure that the facility is not causing any environmental nuisances.

The Facility Manager oversees the operation of the entire facility, implements all procedures and liaises with Senior Staff on its performance.

5.5 ENVIRONMENTAL MONITORING PROGRAMME

Appendix A outlines the environmental monitoring programme, which has been developed to assist the Licensee in meeting the Conditions of W0011-01.

5.6 ENVIRONMENTAL NUISANCES

The Civic Waste Facility Supervisor/Facility Manager undertakes weekly inspections of the landfill and Civic Waste Facility to identify any environmental nuisances caused by litter, dust, odour and vermin. The inspection form is contained in Appendix A and forms part of the Corrective Action Procedure.

5.6.1 Litter

The Facility Manager/Civic Waste Facility Supervisor ensures that the facility is kept free from litter. In the event of fly tipping, the Facility Manager will be notified who will then organise for the proper disposal of the waste.

5.6.2 Odour

In the event of odour detection, the Facility Manager/Civic Waste Facility Supervisor will have regard to the Corrective Action Procedure.

5.6.3 Vermin Control

The Facility Manager will ensure that the procedure for the control and eradication of pests as outlined in Appendix A is implemented.

5.7 SETTLEMENT

Settlement of the landfill will continue as the waste decomposes and biodegrades.

Settlement has taken place more or less uniformly across the landfill with levels averaging approximately -0.2m in 2007 when compared to 2006 levels.

Monitoring of settlement will be ongoing and a stability assessment will be undertaken on an annual basis in accordance with condition 9.14 of the W0011-01 or as directed by the Facility Manager.

5.8 RECORDS & DOCUMENTATION

The Facility Manager will ensure that all records are completed as required by the specific tasks and copies of the following will be kept at the Civic Waste Facility site office and the county buildings:

1. the current Waste License relating to the facility.

2. the current EMP for the facility including all written procedures produced by the Licensee that relate to the licensed activities.

3. the previous year's AER for the facility.

5.9 THE REPORTING OF INCIDENTS

The Facility Manager will report all incidents in accordance with the Incident Reporting Procedure as outlined in Appendix A.

5.10 HEALTH & SAFETY

The Facility Manager will ensure that all on-site staff, contractors and visitors to the site are made aware of potential hazards at the landfill site and the Emergency Response Procedure (see Appendix A). All external contractors will be provided with a Health & Safety Plan to ensure safe operations while on-site.

5.11 CORRECTIVE ACTION PROCEDURES

In the event of an incident the Facility Manager will have regard to the Corrective Action Procedure outlined in Appendix A.

5.12 COMMUNICATIONS

To ensure that members of the public can obtain information regarding the environmental performance of the facility, the Facility Manager will be responsible for the implementation of the Communications Procedure (see Appendix A). The Civic Waste Facility Supervisor informs the public on a regular basis on waste accepted at the Civic Waste Facility.

5.13 TRAINING & AWARENESS

The Facility Manager will implement the Training and Awareness procedures as outlined in Appendix A.

5.14 ANNUAL ENVIRONMENTAL REPORT

In accordance with Condition 2.8.1 of W0011-01, the Facility Manager will ensure that the Annual Environmental Report is submitted to the Agency annually. The Annual Environmental Report is prepared in accordance with any relevant written guidance issued by the Agency and includes at a minimum the information specified in Schedule B: Content of Annual Environmental Report of W0011-01.

5.15 CHARGES & FINANCIAL PROVISIONS

The Senior Engineer will organise all payments to the Agency in accordance with Condition 11 of W0011-01.

6 CLOSURE & AFTERCARE

The Restoration & Aftercare Plan (2003) set out a framework to successfully restore Ballymurtagh Landfill to integrate with the surrounding landscape. The landscaping was established during Spring 2006 and will be maintained by a Landscaping Contractor. The licensee will oversee the aftercare of the facility in accordance with the EPA W0011-01 and the EPA Landfill Manuals.

7 SCHEDULE OF OBJECTIVES AND TARGETS

The purpose of this section is to establish a summary of objectives and targets for the prevention of pollution and for the continual environmental improvement of the site. As waste acceptance has ceased at the site, the schedule mostly relates to the aftercare of the site and improving environmental performance. It is the responsibility of the Senior Engineer to ensure that the schedule of objectives and targets are updated on an annual basis. Table 7.2 outlines the schedule of objectives and targets for the 2008–2013 period and assigns responsibility for achieving the objectives and targets, while Table 7.1 discusses the implementation of the schedule of objective & targets for the previous reporting period (2007).

Table 7.1. Schedule of Objectives & Targets and % Completion for 2007.

SCHEDULE OF OBJECTIVES AND TARGETS 2007				
Objective	**Target**	**Responsible Party**	**% Completion**	**Comment**
Improve the environmental performance of the facility	Undertake regular reviews of conditions of Waste Licence to assess compliance of site	Facility Manager	75	WCC/RPS held last progress meeting on December 2007.
Reduce potential odour at the facility	Clearly identify the source of any carbon dioxide trigger level exceedences recorded at perimeter boreholes	Facility Manager	100	A Phase 1 desk study report on the investigation into elevated carbon dioxide levels was submitted to the Agency in December 2007.
Encourage public to recycle their waste	To inform the public of the waste accepted at the civic waste facility by issuing information at the civic waste facility office to members of the public, radio and newspaper advertisements	CWF Supervisor Facility Manager	Ongoing	
Provide for the protection of the receiving environment.	Wicklow County Council will support any remedial action taken to improve the quality of the Avoca River	Senior Engineer	Ongoing	A report into the investigation of treatment of groundwater discharges from the adits was completed in February 2007.
	Actively participate in the identification and implementation of appropriate measures to minimise the impact of the landfill on groundwater and surface water in the area	Facility Manager		

Reduce the potential for long-term environmental impacts	Implement the Landscaping Plan	Facility Manager	100%	Landscaping is now complete.
	Minimise the number of landfill gas flare shutdowns and ensure that the flare is operating as near to 100% of the time as possible	Facility Manager	Ongoing	
Accept additional waste materials at the Civic Waste Facility	Source further recycling/re-use opportunities	CWF Supervisor Facility Manager	Ongoing	

Table 7.2: Schedule of Objectives and Targets 2008-2013

SCHEDULE OF OBJECTIVES AND TARGETS 2008 - 2013			
Objective	**Target**	**Responsible Party**	**Completion Date**
Improve the environmental performance of the facility	Undertake regular reviews of Facility to assess compliance of site with Waste Licence	Facility Manager	Ongoing
	Submit Application for Review of Waste Licence (and accompanying EIS)	Director of Services	December 2008
Reduce potential odour at the facility	Minimise the number of landfill gas flare shutdowns and ensure that the flare is operating as near to 100% of the time as possible.	Facility Manager	Ongoing
Encourage public to recycle their waste	To inform the public of the waste accepted at the civic waste facility by issuing information at the civic waste facility office to members of the public, radio and newspaper advertisements	CWF Supervisor/Facility Manager	Ongoing
Provide for the protection of the receiving environment.	Wicklow County Council will support any remedial action taken to improve the quality of the Avoca River. A report into the investigation of treatment of groundwater discharges from the adits was completed in February 2007.	Senior Engineer	Ongoing
Accept additional waste materials at the Civic Waste Facility	Source further recycling/re-use opportunities	CWF Supervisor Facility Manager	Ongoing

APPENDIX A

PROCEDURES

Appendix B

Waste Types and their Recovery/Disposal Details 2007

Comhairle Chontae chill Mhantáin
WICKLOW COUNTY COUNCIL

BALLYMURTAGH LANDFILL

RESTORATION AND AFTERCARE PLAN

RPS Group Plc

March 2003

mcos

DOCUMENT CONTROL SHEET

Client	Wicklow County Council					
Project Title	Ballymurtagh Landfill Licence Compliance					
Document Title	Restoration & Aftercare Plan					
Document No.	067514001Rp0005Dun					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	17	1	1	1

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F01	Final Issue	C.Cahill	L.O'Toole		Carnegie Hse	March 2003

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1 INTRODUCTION

This plan sets out a framework to successfully restore Ballymurtagh Landfill to a state, which will integrate with the surrounding landscape. Prior to landfilling the site was used as an open pit for the former Avoca Mines, which was mined in the 1970/80s. Therefore returning the site to its state prior to landfilling is not an option. Instead it is proposed to create a woodland type of habitat, which will blend in with the surrounding landscape.

The plan has been prepared in accordance with the EPA Landfill Manual 'Landfill Restoration and Aftercare' (1999), the Council Directive (1999/31/EC) on the Landfill of Waste and the facility's Waste Licence 11-1. It is a working document and should accommodate the need for some matters to be amended as required. This plan will form part of the Landfill site's Environmental Management Plan and a complete copy of the plan will be kept at Wicklow County Council. It should be read in conjunction with the landfill's Waste Licence and it's Environmental Impact Statement (1998).

According to the EPA Landfill Manual, restoration is a process, which will return a site to a condition suitable for its proposed afteruse, while aftercare is the work that is carried out to establish and maintain the afteruse of a restored site. Restoration will commence at Ballymurtagh Landfill once waste disposal has ceased i.e. on the 31st December 2002. However, a period of interim restoration will allow for settlement before final restoration and the aftercare plan of the site will be implemented.

The following sections outline the approach to be taken to restore Ballymurtagh landfill.

1.1 OBJECTIVES

The purpose of this plan is to serve as a site manual for use in the restoration and aftercare phase of Ballymurtagh landfill. The objectives of implementing this plan are as follows:

1. To restore the site to a woodland type habitat.
2. To establish an environmentally safe area.
3. To protect the surrounding environment.
4. To integrate the site with the surrounding landscape.

1.2 LANDFILL DIRECTIVE

The EU Landfill Directive on Waste (1999) introduced the requirement for landfill closure and after-care procedures. Article 13 of the Directive requires that once a landfill has been closed the site operator will be responsible for maintenance, monitoring and control in the after-care phase for as long as may be required by the competent authority, 'taking into account the time during which the landfill could present hazards'. The Landfill Directive requires the costs of closure and after-care of the site for a period of at least 30 years to be covered by the prices charged by the site operator. Although such costs were not considered during the operation of Ballymurtagh Landfill Wicklow County Council are required to cover these costs under the conditions of their Waste Licence.

The term 'closure' is not defined in the Directive, however article 13(a) states that a landfill or part of it will start the closure procedure

i. 'When the relevant conditions stated in the permit are met; or
ii. Under the authorisation of the competent authority, at the request of the site operator; or
iii. By reasoned decision of the competent authority'

In the case of Ballymurtagh Landfill, it ceased accepting waste on the 31st December. However, it will not close until the EPA decides that Ballymurtagh Landfill is no longer 'likely to cause a hazard to the environment'. Article 13(d) states that, 'for as long as the competent authority considers that a landfill

is likely to cause a hazard to the environment…the operator of the site will be responsible for monitoring and analysing landfill gas and leachate from the site and the groundwater regime in the vicinity of the site.'

The Landfill Directive also requires the site operator to notify the competent authority of any significant adverse environmental effects revealed by the control procedures in the after-care phase.

Article 13(b) states that 'a landfill or part of it may only be considered as definitely closed after the competent authority has carried out a final on-site inspection, has assessed all the reports submitted by the site operator and has communicated to the site operator its approval for the closure' i.e. the EPA has the final say in determining when a site is closed. Wicklow County Council remains responsible for the site during and after closure, and the requirements in the landfill licence are still applicable to the site after closure.

1.3 BACKGROUND TO SITE

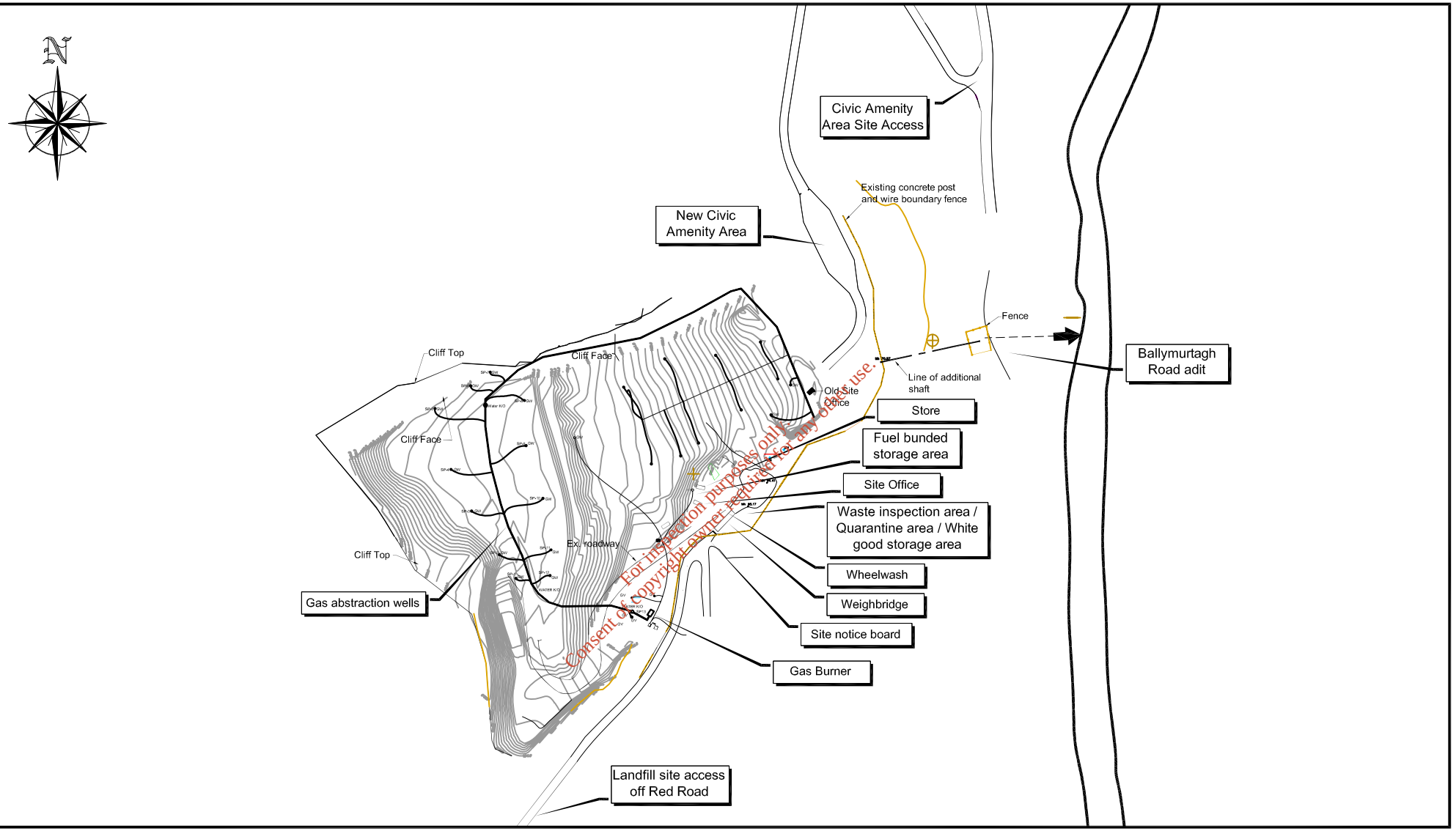
Ballymurtagh Landfill is located in the townlands of Ballymurtagh, Ballygahan Upper, Ballygahan Lower, and Tinnahnich in the Vale of Avoca approximately 1.5 km north-west of the village of Avoca in County Wicklow. It is situated in the catchment of the Avoca River, which rises in the Wicklow Mountains and enters the Irish Sea at Arklow. The landfill itself is located within a disused Open Lode pit of the former Avoca Mines. Prior to landfilling the pit had been used for the settlement of mine tailings, a layer of which underlies the body of the waste. Consequently high concentrations of the minerals which were mined are found in the Avoca river as a result of acid mine drainage (AMD).

The bedrock underlying the landfill consists of the volcanic rock, which is part of the Avoca Formation. The lithologies based on drilling carried out by the Geological Survey of Ireland consists of light greenish grey, fine grained, well foliated metavolcanic rock. The aquifer potential in the area is considered poor to locally important.

The landfill is owned by Wicklow County Council and operates in accordance with Waste Licence (11-1) issued by the EPA, which allows for the annual disposal of 42,000 tonnes. The landfill accepts only non-hazardous waste emanating mainly from the domestic sector although smaller amounts of industrial non-hazardous sludge are also accepted. There is also a civic waste amenity site, which accepts bottles, cans, textiles and scrap metal. Fridges are also stored and degassed once a substantial quantity has been collected. The layout of the site and its infrastructure is illustrated on Figure 1.1.

The landfill was designed on a dilute and disperse principle with no leachate containment measures put in place. The leachate, attenuated by the underlying soil and groundwater, drains naturally to the Avoca River.

The landfill can be broadly separated into three filling areas, the 'upper', 'middle' and 'lower' slopes. Historically the upper and middle slopes contain the main body of waste. The total fill area is approximately 3.0 hectares (7.4 acres) in size. It is estimated that approximately 480,000m^3 of waste have been deposited at the site.



Wicklow County Council County Buildings, Wicklow, Co. Wicklow	mcos Carnegie House, Library Road, Dun Laoghaire, Co. Dublin. Phone 01-2020870 Fax 01-2020707	Job: Ballymurtagh Landfill Licence Compliance	Title: Site Plan	File Ref.: 076/514/001/FG0101 Figure No. FIG 1.01

2 PROPOSED AFTERUSE

As part of the EIS (1998), terrestrial ecology specialists Roger Goodwillie & Co. Ltd, carried out an ecological assessment of the site. The report outlined that the landfill site had no factors of ecological importance due mainly to the fact that flora and fauna were reduced by the adverse conditions created by elevation and the metallic residues in the tailings. Although, the report concluded that no special measures on ecological grounds are required to restore the site, it recommended the establishment of woodland on the valley side and heathland at the top of the slope.

Although Wicklow County Council has proposed to return the site to a state, which will integrate with the surrounding landscape, it is not proposed at this stage to use the site as an amenity area. However, the requirement for long-term environmental pollution control systems and monitoring infrastructure will be part of aftercare stage.

The facility manager, who will oversee the implementation of this plan will be familiar with the EPA Landfill Manuals and be responsible for the supervision of all works. Once implemented, Wicklow County Council will be responsible for the long-term aftercare of the facility. This will involve vegetation management i.e. mowing, soil aeration, drainage maintenance, weeding, general repair work, etc.

Wicklow County Council will meet all financial costs associated with the restoration, aftercare and annual maintenance of the site in accordance with Condition 11.2 of the waste licence.

3 RESTORATION

3.1 RESTORATION DESIGN

The objective of the restoration design is to produce an integrated method for pollution control, restoration and aftercare whilst ensuring the protection of the environment and human health, as outlined by the EPA manual on Landfill Restoration and Aftercare. Final restoration will involve the replacement of the final soil profile and carrying out landscaping works as described in the following sections. The restoration of the site will be completed by December 2004 in accordance with Condition 8.7 of the waste licence.

It is proposed to restore the site progressively, although the timing of restoration works may be influenced by settlement and seasonal variations. The integration and protection of the following pollution control systems will be a central feature of the restoration plan:

1. Capping system
2. Landfill gas management
3. Surface water management
4. Fixed monitoring points.

Access requirements for monitoring purposes will be considered in the choice of pollution control systems implemented.

On completion of the restoration phase, Wicklow County Council will implement the aftercare plan, which is detailed in Section 7. The following sections outline the key design elements of the restoration phase.

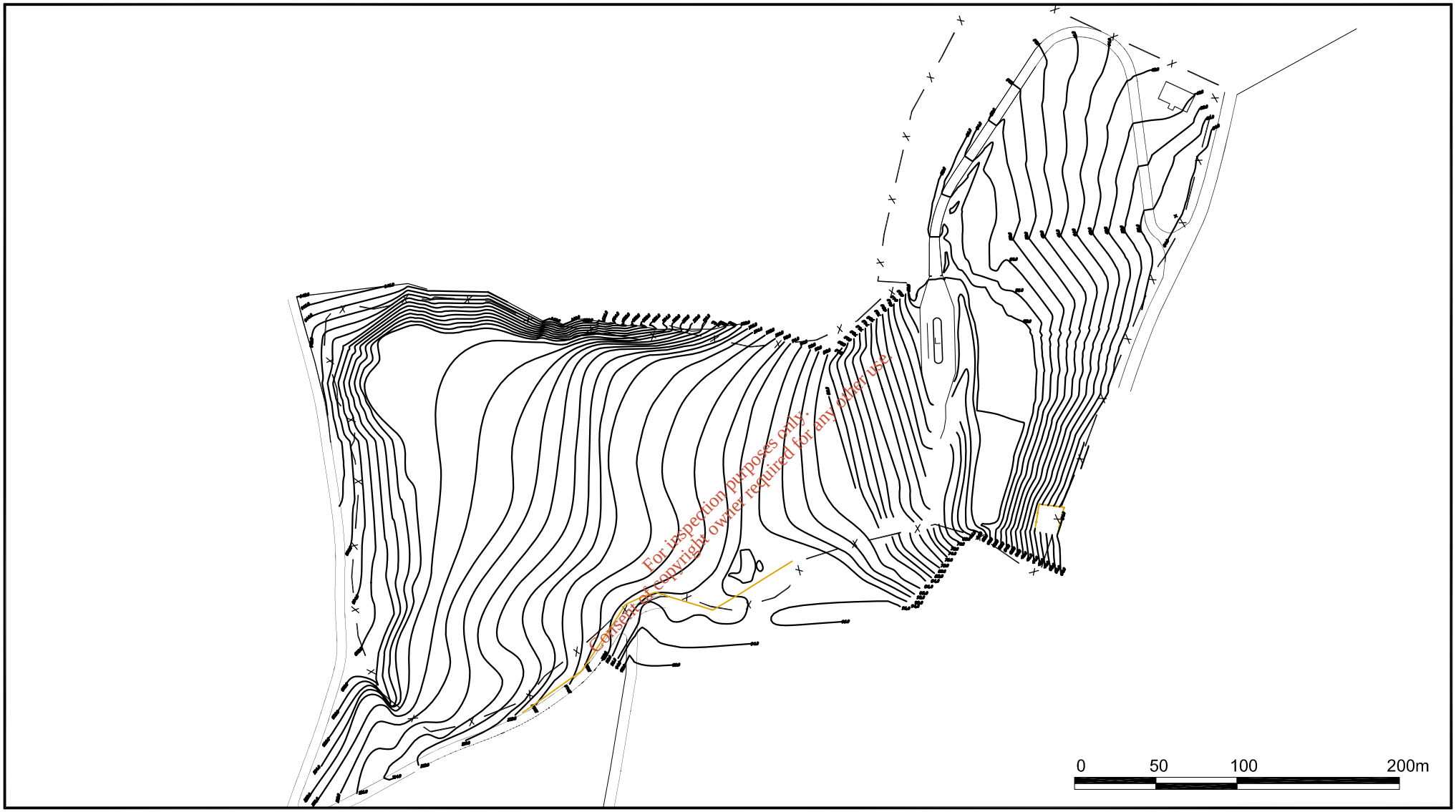
3.2 FINAL CONTOURS & SETTLEMENT

Condition 8.2 of the Waste Licence requires that the final contours of the restored landfill do not exceed those shown on Figure 3.1. The contours on this drawing are post-capping post-settlement contours. Typically settlements of up to 20% can be anticipated although a proportion of this will occur during placement and prior to final capping. The final profiles for the restored facility will allow the existing slopes to be regraded to a gentler slope and will integrate with the height and form of the surrounding topography.

3.3 SEQUENCE OF OPERATIONS

The 'lower' 'middle' and 'upper' slopes will be progressively capped and restored to the required level during the course of 2003. This will allow for the installation of pollution control systems, etc. However, all areas will be permanently capped to the required final restoration specifications within twelve months of filling or completion in accordance with condition 4.16.3 of the waste licence. Although some landscaping will take place during this time i.e. screen planting perimeter planting, light cultivations and greening, the majority of it will be undertaken once the final placement of the full soil profile has occurred i.e. during 2004. The followings outlines the proposed sequence of operations during the restoration phase at Ballymurtagh Landfill:

1. Interim profiling/regrading.
2. Construction/placement of capping materials including subsoil, topsoil.
3. Construction of surface water network.
4. Installation of environmental pollution control systems.
5. Seeding of topsoiled areas.
6. Vegetation planting/screen planting.



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7. Final restoration.
8. Aftercare and maintenance post 2004-2032.

The timescale of these operations will be subject to the following constraints:

- All soil replacement activities will be completed by autumn so that crop cover can be established before the winter rains. Ideally soils should not be left bare over the winter months.
- Tree planting should not commence until after the period of initial settlement of the landfill has occurred. This delay will allow for the installation of environmental pollution control systems without causing damage to planted areas.
- Restored soils, which have been recently loose tipped, are usually in a suitable condition for immediate tree planting.
- Trees should be planted between late autumn and early spring (before the end of March).

Stockpile areas, locations of which are shown on Figure 3.2 will be maintained over the course of the operations for materials to be used in the capping and restoration works. If stockpiles fail to contain the requisite volume of capping materials for the coming months, the facility manager will propose alternative sources of capping materials or geosynthetic materials for the Agency' s agreement.

Closure of the landfill will include the finalising of final cover final planting, removal of buildings, constructions etc. in the reception area. An access road will remain in place for use in the aftercare phase i.e. for a minimum of 30 years after closure.

3.4 SITE INFRASTRUCURE

The site office, canteen area, toilet and washing facilities (including domestic septic tank), staff car park, and bunded fuel area, all of which are located at the site entrance will remain in place during the restoration phase until they are of no further use. The wheel wash will also remain in place during 2003 for trucks delivering soil and materials for capping. However, the waste inspection area, waste quarantine area, weighbridge and the area for the storage of fridges will be removed as part of the restoration phase as they will no longer be required. The civic amenity site, which has been relocated to the old site entrance, will remain in operation.

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4 POLLUTION CONTROL SYSTEMS

The following subsections outline the pollution control systems that will be managed and maintained throughout the restoration and aftercare phase in accordance with the conditions of the waste licence. These controls will be maintained on-site until the EPA approves decommissioning on the basis that their associated hazards have reduced to an acceptable level.

4.1 CAPPING

Factors which influence the rate of infiltration of rainfall into the waste and hence the generation of leachate are topography and configuration of the final top cover, which will affect the sites run-off pattern and the amount of water percolating into the landfill. Generally steep slopes allow for high surface water run-off. In order to reduce the volume of leachate generated in the waste the final cover will consist of a low permeable layer to reduce infiltration of rainwater and to increase surface water run-off.

Condition 4.13.2 of the Waste Licence specifies that the final capping will consist of the following:

(i) top soil (150 – 300 mm);
(ii) subsoils, such that total thickness of top soil and subsoils is at least 1m;
(iii) drainage layer of 0.5m thickness having a minimum hydraulic conductivity of $1x10^{-4}$ m/s;
(iv) compacted mineral layer of a minimum 0.6m thickness with a permeability of less than $1x10^{-9}$ m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection; and
(v) gas collection layer of natural material (minimum 0.3m) or a geosynthetic layer.

Geosynthetic material will be installed instead of the compacted mineral layer and the gas collection layer. In addition a synthetic barrier will be installed to augment the clay cap where tree planting is proposed above waste-filled areas (Condition 8.6). In the event of water accumulation, depressions will be rectified by the emplacement of suitable capping materials (Condition 8.4).

4.1.1 Groundwater Management

A groundwater modelling study of the aquifer in the vicinity of Ballymurtagh Landfill was undertaken in order to obtain a quantitative hydrogeological assessment of the aquifer-landfill system. The objectives of the study were to:

1. Obtain a clearer picture of the hydrogeology of the West Avoca mine area.
2. Discern the type and amount of contamination from the West Avoca mine workings and Ballymurtagh Landfill.
3. Identify the optimal solution for a remediation system in order to minimise the environmental impact of the landfill on soil, groundwater and surface waters in the area.

A groundwater flow and contaminant transport model was calibrated in steady state using the existing historical data from previous studies and monitoring programmes. After the calibration, the models were used to simulate the capping of Ballymurtagh landfill, which is considered to be the most effective remediation system for Ballymurtagh site.

The results of the study concluded that the proposed capping of the landfill produces significant environmental benefits to the groundwater and surface waters in the area, as shown by:

1. Lowering of Total Dissolved Solids (TDS) concentration in groundwater.
2. Lowering of TDS and sulphate concentration in Avoca River.

The study concluded that the capping of Ballymurtagh landfill will not only minimise the environmental impact of the landfill on the aquifer and Avoca River, but will also have a significant effect in lowering the concentration of the acid mine drainage pollution coming from the whole West Avoca mine area into the aquifer and the Avoca River.

4.2 LANDFILL GAS MANAGEMENT

12 landfill gas abstraction wells were installed in 1998 in the upper section and connected to a Hasse Flare, which is fenced off for security. A further 9 wells were installed in December 2002 in the middle section, which also feed into the gas flare. A proposal for the utilisation of landfill gas as an energy source, which was submitted to the Agency in December 2001 considered the site non-viable for utilisation under the current economic climate using best available technology.

4.3 SURFACE WATER MANAGEMENT

A surface water management plan, which was prepared for Ballymurtagh Landfill (December 2001) in accordance with Condition 4.17.2 of the Waste licence, sets out the following proposals to be implemented in the restoration phase:

- A storm water retention pond for the collection and storage of surface water from the facility and in the event of contamination of surface water.
- An outlet facility for preventing surface water discharges in the event that monitoring should indicate contamination of the surface water is proposed within this system.
- Installation of capping system to prevent leachate seepage.
- A network of collection/diversion ditches around the boundary of the landfill and contour drains across the face of the landfill to prevent channelisation.
- The installation of surface water perimeter drains around the boundary of the site.

Once details have been agreed with the Agency, they will also be implemented during the restoration phase.

4.4 STABILITY ASSESSMENT

Restoration of the landfill will take account of the risk of instability of the side slopes both in the short-term prior and during the works and also in the long-term after capping and restoration. Particular attention will be paid to the stability of the individual capping layers on the side slopes particularly where geosynthetics are used.

An assessment of the stability of the slopes undertaken in October 2001 and subsequent site visit in November 2002 indicates that the existing slopes at the site are stable. However, it highlighted that some of the low to medium rise slopes along the site boundary west of the existing entrance gates are unlikely to remain stable in the long term and recommended that they should be regraded to a shallower slope as part of the restoration phase. The report also recommended the frequent monitoring of groundwater levels and frequent inspections of slopes during the restoration phase. The facility manager will implement remedial measures if increases in groundwater levels are observed. The facility manager will also organise an annual stability assessment of the side slopes of the facility and submit a report on the assessment to the Agency in accordance with Condition 9.14 of the Waste Licence.

4.5 ECOLOGY ASSESSMENT

In accordance with Condition 9.13 of the licence an assessment of the ecology of the restored landfill and adjoining habitats is required to be submitted to the Agency within one year of cessation of waste acceptance at the landfill. A progress report on the ecology of the restored landfill will be required to be reported annually in the Annual Environmental Report.

4.6 LEACHATE

The main factors, which affect the rate of leachate generation, are precipitation, surface run-off and evapotranspiration. Therefore, the capping and re-vegetating of the landfill area along with the implementation of the recommendations outlined in the surface water management plan will prevent the ingress of surface water and therefore reduce leachate generation. The monitoring program will continue into the after-use phase to confirm the effects of the aforementioned remediation works.

5 SOIL MANAGEMENT

5.1 INTRODUCTION

The following section aims to outline a plan for successful soil management by taking account of the following:

- Identifying all soils available on site or which are likely to become available by importation.
- Conserving and making the best use of soil resources.
- Organising careful handling of soils during stripping, storage and respreading.
- Careful planning and supervision of soil handling operations.

5.2 SOIL REQUIREMENTS

Table 5.1. summarises the soil requirements to cap each cell/phase of the landfill based on the materials outlined in section 4.1. The total quantities are approximate and assume a natural material is used for each of the capping layers.

Table 5.1: Material Requirements for Capping and Restoration Layers.

	Surface Area (m^2)	Topsoil (300mm) (m^3)	Subsoil (700mm) (m^3)	Drainage (500mm) (m^3)	Mineral Layer GCL	Gas Collection Layer	Total (m^3)
Total	**64,000**	19,200	44,800	32,000	-	-	96,000

If soil resources become limited on-site, provision will be made to obtain suitable materials elsewhere. This will include consideration of artificial materials such as geocomposites. All soils received for disposal will be segregated, stockpiled (see Figure 3.2) and recorded for use in the restoration phase.

The EPA Manual recommends that imported soils 'should be of a loamy texture, be relatively stone free and fertile. Soils with a high clay content will be avoided as these are difficult to handle and vegetation establishment can be slow and poor'. The facility manager should know the source of all imported soils. The EPA Manual advises the following in the situation where the source of soil is known:

1. Undertake an in-situ soil survey at the source if possible to identify soil properties.
2. Identify soil types and volume of topsoil, subsoil and parent material at the source. In general the more consistent the soil type the easier and more successful the restoration results.
3. Assess the stone content.

The facility manager will ensure that imported soils have been stripped when the soil is in a reasonably dry condition to minimise soil structure damage and that stockpiles contain the requisite volume of capping materials for twelve months at a time.

5.2.1 Soil Storage

Guidance on soil storage is given in Section 4 of the EPA Manual 'Restoration and Aftercare'. Generally, the facility manager will have regard to the following guidelines:

1. Supervise all soil handling operations and make staff, particularly machine operators aware of the need to minimise soil damage.
2. Segregate, record and stockpile separately all imported soils in locations so that they can be replaced in the correct sequence on completing restoration.
3. Stockpile all soils in mounds 2-3m in height. Those which will be stored for lengthy periods of time will be sown with grass to help minimise the effects or erosion and to maintain a soil structure in

the surface layers. Weeds will be controlled with the use of herbicides. Stockpiles will be built as loosely as possible as to minimise compaction.
4. Soil storage areas will be fenced to prevent contamination.
5. Undertake regular soil checks in the form of structure assessment and measurements of density, soil moisture and permeability.
6. If mounds become anaerobic, they will be respread and carefully managed to prevent it reoccurring.
7. Only machinery used for stockpiling will be allowed on the mounds.
8. Provide an annual report to the Agency on the quantity of capping materials stockpiled at the facility in accordance with condition 4.18.5 of the licence.

5.2.2 Soil Placement

Guidance on soil placement is given in Section 4 of the EPA Manual 'Restoration and Aftercare'. Generally the facility manager will have regard to the following guidelines:

1. Machinery with low ground bearing pressure will be used to deploy restoration layers thereby minimising damage to soils and environmental pollution control systems.
2. When soils are in a suitable physical condition i.e. dry they will be removed from stockpiles and replaced in the correct sequence to specified depths as discussed in section 4.1 on Capping.
3. Soils will be placed in lifts over the drainage layer and loosened after each placement by rippers. The EPA Manual recommends the following

    - Lift will not exceed 300mm in thickness and ripping will take place to a minimum depth of 600mm using a ripper blade of at least 50mm wide and an appropriate shoe.
    - Checks are necessary to verify that the soil slab is fractured and fissured.
    - Ripping will be carried out only when the surface of the land is dry enough.
    - A spacing of about 1.5 times the depth of working is normally recommended with the intervals between rips not exceeding 1000mm
    - Subsoil ripping will be carried out at a clearance of a least 75mm above the drainage and filter layer.

4. Soils will be placed in strips, the width of which will be determined by size of machinery being used and will start at the furthest point from the stockpiles/entrance gate so as to minimise impact on soils already emplaced.
5. Soils will be loaded from the stockpile into dump trucks and transported to the strip being restored. From the surface of the waste body, the soil will then be spread and levelled using a tracked excavator/wide bucket. Similarly with the remaining layers of soil.
6. All soil placement activities will be completed by the autumn to allow the establishment of crop cover before the winter months.

Where possible imported soils will be applied directly to the area being restored to avoid the need for stockpiling and minimise soil handling operations.

6 LANDSCAPING

6.1 INTRODUCTION

The objective of landscape design is to create a landscape to integrate with its surroundings. It is intended that landscaping will be carried out on a phased basis in tandem with the capping where possible. The ecology assessment undertaken as part of the EIS (1998) outlined that no special measures were required to conserve the local flora and fauna during site restoration.

6.2 DESIGN

A landscape and visual assessment, which was undertaken by Mitchell & Associates as part of the EIS (1998) (see Appendix C, Volume 3 of the EIS) describes the general landscape quality in the area as one of 'extremely high visual amenity, with a gently rolling landscape dissected by woodlands, hedgerows and stream valleys'. However, in comparison the visual structure of the site is characterised by steep slopes, the upper levels of which consist of bare ground and have the character of an extractive landscape.

The assessment proposed the final landscape layout for the site as shown in Figure 6.1 and recommended the following measures be implemented to integrate the site into the surrounding landscape during the development and restoration of the site:

1. The grading and shaping of the landfill, as it develops to provide a naturalistic configuration to the hillside, which will mimic a naturally weathered hillside in the landscape.
2. The planting of the final configuration with ecologically appropriate species, tolerant to the site conditions as woodland, heathland and wild grasses.

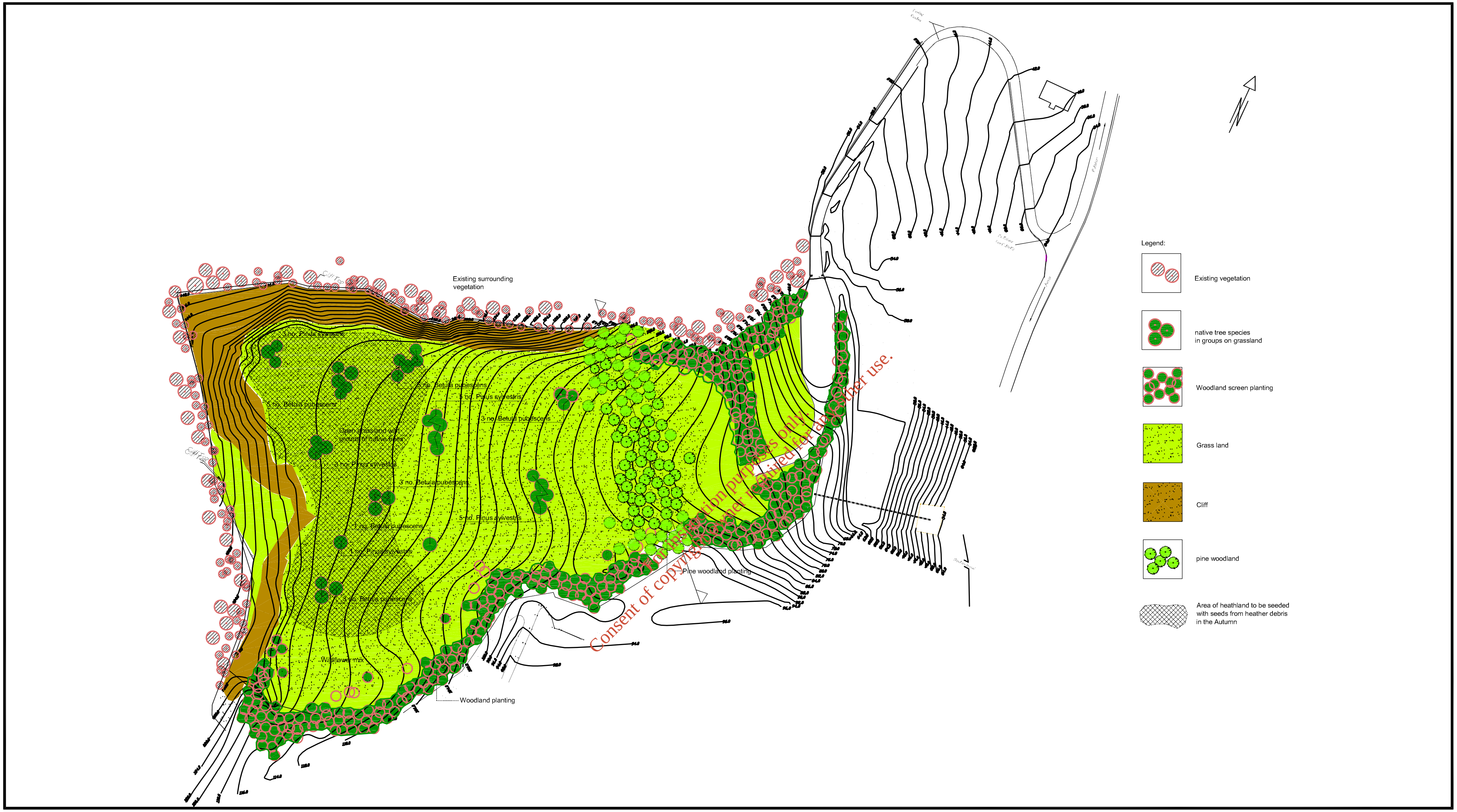
Some trees shown on Figure 6.1 may need to be moved slightly to incorporate pollution control systems. Only trees, which will sustain healthy growth at the site i.e. tolerant to acidic conditions and trees which wont threaten the integrity of the capping system, were chosen for landscaping.

The ecology report undertaken as part of the EIS (1998) recommended the planting of Scot's pine (in sizes less than 20cm) to create woodland on the valley side. Scot's pine should withstand the dry and nutrient-poor conditions and over time should acclimatise to these conditions. This type of woodland will unify the existing strands of woodland to the north and south of the site and will cut off views into the upper section of the site from the Avoca to Rathdrum Road.

The ecology report also recommended creating heathland at the top of the slope with interspersed Pine trees. As heathlands are nutrient poor no fertilisers or topsoil would be required in the top 20cm of surface cover. This will be seeded into a peat/sand mix in order to provide the ideal growing medium for a heathland plant association and the surface protected with biodegradable netting until stabilised. The report also recommended the use of local acidic spoil in soil creation and the collection of heather debris (bent *Agrostis capillaris* (*tenuis*) and ling heather *Calluna* with a little gorse *Ulex europaeus* and broom *Cytisus scoparius*) from mature heather stands to re-creating heathland. The objective of creating these habitats is to allow the grass to die away and other plants to come to the fore.

The above recommendations have been taken into consideration and form part of the Landscaping Plan.

The regrading of the site will effectively re-contour the slopes at the site to provide smooth, running grades, which will replace the topography characterised by an extractive landscape. The final reshaping and planting of the site will visually blend with the surrounding landscape.



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6.3 LANDSCAPING PLAN

In accordance with Condition 8.8 of the Waste Licence, a detailed landscaping plan was prepared by Mitchell & Associates (see Appendix I), which included the following:

1. Drawings detailing the final contours, the proposed landscaping plan, tree planting detail and cross section showing details of landscaping at the site.
2. A 'Preliminaries & Specification', which outlines a description of the works (i.e. site preparation, soil preparation, seeding, planting, etc) necessary to landscape Ballymurtagh and which will be used when tendering for a suitable landscape contractor.
3. A 'Maintenance Preliminaries & Specification', which outlines a description of the works (i.e. maintenance operations, grass cutting, weeding, watering, replacement planting, etc) necessary to maintain the landscape at the site once established and which will also be used when tendering for a suitable landscape contractor.
4. A 'Bill of Quantities' for the provision of earthworks, grass seeding, whip planting, staking, rabbit guards and plants and planting.
5. Programme of works.

The contractor employed for the maintenance works will be appointed for an initial 2 year contract after which it will be reviewed annually. The appointed contractor will be required to have regard to Appendix B of the EPA's Landfill Manual on Restoration & Aftercare. Maintenance will be required for at least 10 years after planting, depending on the progress of establishment.

6.4 LANDSCAPING WORKS

As the site will require the establishment of vegetation, there needs to be a recuperation period during which the soil is allowed to recover from the effects of movement, storage and replacement. However, once conditions are suitable for landscaping, specialist Landscape Architects appointed by the facility manager will implement the landscape plan to establish, maintain and monitor vegetation in order to successfully restore the site to its intended afteruse. This will include cultivating and improving the soil to allow for the establishment of vegetation. However, timing of the final landscaping works will be influenced by a number of factors:

- Settlement rates across the site.
- Installation of environmental pollution control systems.
- Seasonal conditions.

The landscape architects will liaise with the facility manager on operations required for the planting scheme.

7 AFTERCARE

7.1 GENERAL

Wicklow County Council will be responsible for the aftercare of Ballymurtagh Landfill up until the date when the EPA accepts the surrender of the licence under Section 48 of the waste Management Act, 1996. According to section 48(7) 'if the Agency is satisfied that the condition of the relevant facility is not causing or likely to cause environmental pollution, it shall accept the surrender of the waste licence, but otherwise shall refuse to accept the surrender of the waste licence'.

According to the EPA Manual the aftercare plan 'details the operations required after the replacement of the soil to bring the land up to the required standard for afteruse'. However, as the site will be returned to a state to integrate with its surrounding landscape it will not be developed for amenity use. Notwithstanding the aforementioned, the aftercare plan will include:

1. Environmental monitoring.
2. Site maintenance.

7.2 ENVIRONMENTAL MONITORING

Table 7.1. specifies the minimum monitoring requirements during the aftercare phase as outlined in the EPA Manual on Landfill Monitoring (1995). The facility manager will ensure that such monitoring at those locations shown on Figure 7.1 or other locations as agreed with the Agency will continue until the waste licence is surrendered.

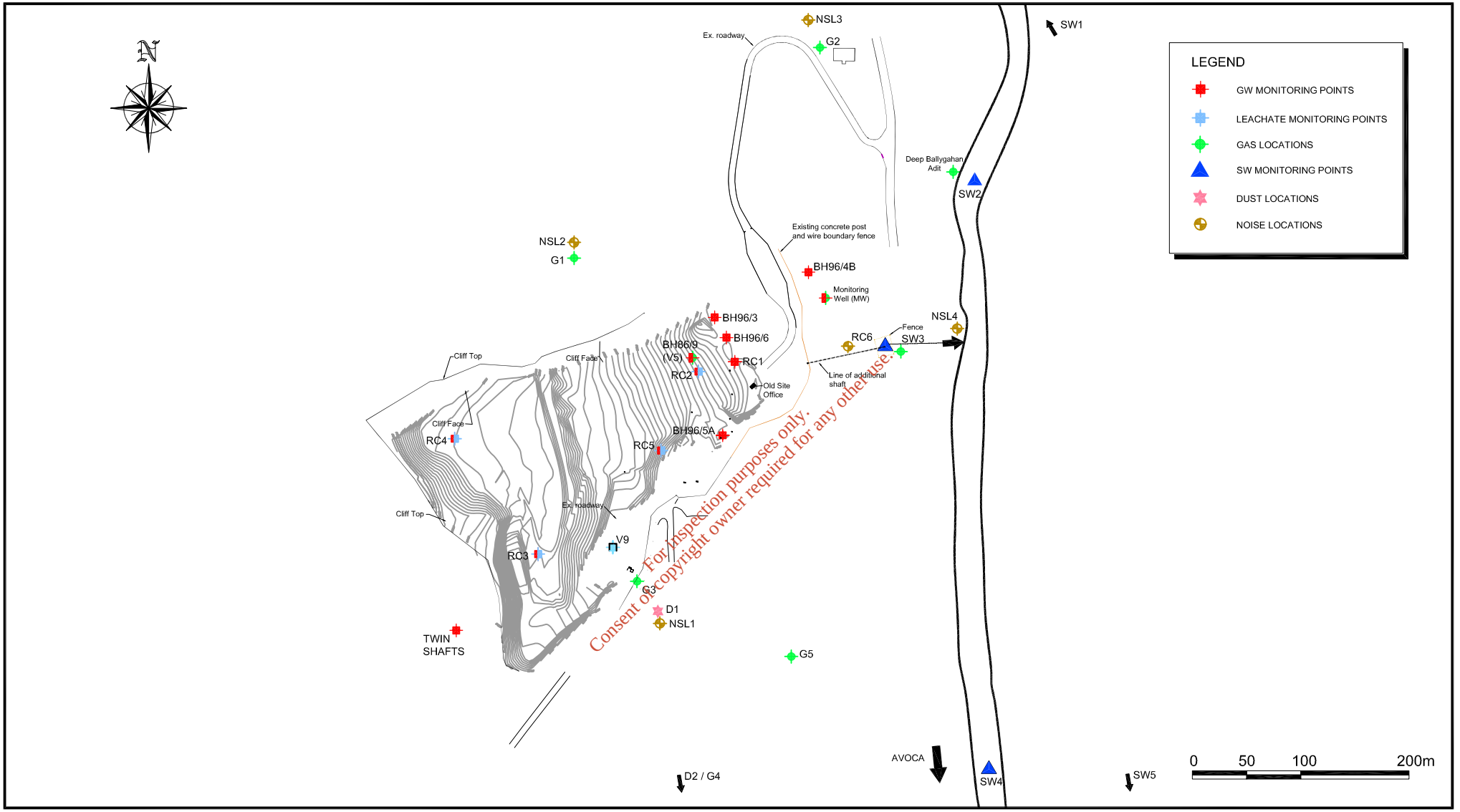
Table 7.1: Monitoring Requirements during the Aftercare Phase.

Parameter	Aftercare Phase
Surface water composition	Bi-annually
Biological Assessment	Annually
Groundwater composition	Quarterly
Leachate levels	Quarterly
Leachate composition	Quarterly
Landfill Gas	Bi-annually
Gas Flare	Weekly
Meteorological Data	Monthly
Landfill Stability & Settlement	Annually
Noise, dust.	N/A
Odours	Annually

A topographical survey will also be required on an annual basis particularly in the first 5 years of restoration to assess the settling behaviour of the level of the landfill body. A stability assessment will also be necessary to assess the structural integrity of the landfill body.

The facility manager will have regard to the conditions of the licence, the EPA Manual on Landfill Monitoring (1995) and Annex III of the Landfill Directive, which outlines control and monitoring procedures in the after-care phase to check 'that environmental protection systems are functioning fully as intended.

During the aftercare phase the facility manager will examine all monitoring equipment on a monthly basis to identify areas where maintenance works are required. The facility manager will ensure that all works undertaken will have minimal impact on the afteruse of the restored site.



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7.3 SITE MAINTENANCE

The pollution control systems as described in Section 4 will be operated and maintained until the waste has stabilised. As ongoing monitoring of emissions is required during the aftercare phase it will be essential that all pollution control systems as described in Section 4 and all monitoring locations as shown on Figure 7.1 are maintained and protected. If remedial works are required then the facility manager will ensure that these works be carried out where possible during the interim restoration phase rather than after full restoration has occurred. However, should maintenance or remedial works be required on the pollution control systems after full restoration has occurred, the following measures will be implemented to ensure minimal impact:

- Supervise all operations to minimise damage to the restored land. Work will progress only when soil conditions are suitable.
- Use the minimal practical working area and suitable access to reduce disturbance.
- Use machinery and plant, which will cause minimum soil compaction.

Construction records of all underground systems must be kept for reference so as to prevent damage during works on-site. Once pollution control systems are exhausted, redundant equipment and ancillary structures will be removed.

The current access road to the site will be maintained for monitoring/maintenance purposes.

7.3.1 Gas Management System

During the aftercare period, the maintenance of the gas management system will include regular monitoring of boreholes and gas wells and monitoring of the flare stack for combustion efficiency and emissions. Performance and gas yield will identify areas where maintenance works are required. Any remedial work required to wells and pipework will be carried out in a manner with minimal impact on the proposed afteruse.

Once gas extraction is exhausted decommissioning and removing of redundant structures will take place. All work in relation to gas management will be carried out in an environmentally safe manner and will not adversely impact the afteruse or users of the restored site.

7.3.2 Surface Profile & Capping System

In the event that maintenance to the capping system is required, it will be ensured that the repaired cap is properly sealed to prevent the ingress of water and the various layers relaid. The effectiveness of the drainage system will be monitored and any remedial works to the drainage layer or surface water collection system will be carried out where required.

If required the facility manager will employ soil specialists to undertake soil maintenance checks to assess the physical and chemical status of the soils.

7.3.3 Surface Water Control

All drainage ditches, etc carrying run-off from the site will be regularly checked to ensure effective surface water flows are being maintained.

7.3.4 Vegetation & Ecology

The long-term aftercare of the site will require vegetation management i.e. weeding, cutting, fertilising and fencing if necessary. Personnel with appropriate landscape experience will undertake such

maintenance work. In addition an annual ecological assessment will be undertaken to assess the progress on the establishment of the ecology on the restored areas.

7.3.5 Infrastructure

All pathways, access points, and equipment associated with the aftercare phase will be checked regularly for maintenance works.

7.3.6 Security

To protect against vandalism the facility manager will ensure that security and stockproof fencing and gates are maintained adequately.

7.4 CONSULTATION

It is proposed at this stage that regular meetings will be held with the landscape architects/contractors and any other interested parties e.g. community groups to discuss the progress of the restoration of the site.

Any proposed changes to the restoration and aftercare plan will be agreed with the Agency prior to implementation. The facility manager will notify the Agency of any significant adverse environmental effects revealed by the control procedures in the aftercare phase.

7.5 FINANCIAL PROVISIONS

In accordance with Condition 11.2 of the waste licence, Wicklow County Council will establish and maintain a fund, that is adequate to assure the financially capability of implementing the Restoration and Aftercare Plan as agreed with the Agency. The Council will revise the cost of the plan annually and forward details to the Agency for its agreement within two weeks of the revision.

APPENDIX I

[Landscaping Plan]

Mitchell + Associates
Architects **Landscape Architects** **Master Planners**
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PRELIMINARIES AND SPECIFICATION

BALLYMURTAGH LANDFILL SITE LANDSCAPE WORKS

1.0 PRELIMINARIES

1.1 Description of Work

The work consists of general works, site preparation, supply and spread of topsoil, soil preparation, seeding, whip planting and tree planting, collection and spreading of heather debris (in Autumn 2003 see Maintenance Specification). Exact dates for completion of works will be finalised after the award of the contract but it is estimated that works will be completed by end of March 2004.

1.2 Standards of Workmanship and Materials

The Landscape Contractor shall satisfy the Landscape Architect that all works have been carried out to comply with BS 4428(General Landscape Operations), BS 3936 (Nursery Stock), and BS 3882 (Topsoil). It is essential that the site is tidy at all times, and that the planting appears healthy. The Landscape Contractor should be prepared, at all times, to ensure that such conditions are met and should include for this in his rates. Any materials not meeting the specifications or qualifying for the approval of the Landscape Architect, for whatever cause, shall be rejected. The Landscape Contractor shall familiarise himself/herself with the layout of services and the positions of all structures on the site and shall be liable for any damage to the above. No existing plants shall be removed or damaged, other than those specified by the Landscape Architect

1.3 Notice of Intentions and Recording Actions

The Landscape Contractor shall give 48 hours notice of his intention to commence setting out, planting and maintenance visits. The Landscape Contractor shall return a weekly record of all site actions.

1.4 Leaving the Site Tidy

The site shall be left in a neat and orderly condition at the end of each day's work.

1.5 Season

Landscape work shall take place in the appropriate season and only when the conditions are suitable, i.e. it is dull, moist and mild without undue risk of frost or drying winds. There shall be no cultivation or planting when the soil is frozen or waterlogged. If exceptional weather conditions occur after planting, e.g. heavy frosts, measures shall be taken as approved by the Landscape Architect.

1.6 Replacement

The sub-contractor shall make good at his own expense any losses of trees and plants which die or appear unhealthy at any time up to practical completion in the twelve months after planting.

The sub-contractor shall make good at his own expense any losses of trees and plants which die or appear unhealthy at any time prior to hand over.

Plant failures will not be charged to the Landscape Contractor if the failure is due to; damage by hares, rabbits, deer, livestock where not protected by guards or fencing, damage/ losses due to theft, vandalism or disturbance by other contractors.

Persistence of weed in planted areas will be regarded as a contributory cause of failure due to drought. Prolonged dry weather will not exonerate the Landscape Contractor if the scheduled maintenance operations have not been carried out as programmed.

1.7 Damage

All trees and plants are to be adequately and carefully packed and protected to survive transport, whatever means, to the site, during loading, transit or unloading. If in spite of these precautions roots, branches, or shoots suffer slight damage, they are to be carefully pruned. If major damage has occurred, the plant or tree shall be rejected and replaced at the Landscape Contractor's own expense.

1.8 Defects Liability Period

The Landscape Contractor shall be responsible for any plants that fail to take during the first full growing season (12 months) from date of completion.

1.9 Protection

The Landscape Contractor shall provide adequate temporary protection to the whole of his work and shall include temporary coverings, planked barrow runs and all other measures for protecting the work from damage. The Landscape Contractor shall also protect from damage all existing roadways, kerbs, services and other completed works on site. Any work damaged or soiled by weather, traffic or other causes due to inadequate temporary protection shall be removed and made good at the cost of the Landscape Contractor. The form of protection is left to the discretion of the Landscape Contractor.

1.10 Programme of Operation

The Landscape Contractor shall execute his works in conformity with a programme to be agreed with the Landscape Architect and shall include in his estimate for working within an agreed time limit. No individual areas will be handed over unless there is an agreed sectional completion. The Landscape Contractor shall allow for keeping individual areas adequately maintained until the whole has been completed.

1.11 Site Inspection

Prior to the submission of tenders to the Landscape Architects, the Landscape Contractor is expected to visit the site and familiarise himself with the nature of the existing roads and pathways, the soil conditions, slope gradients, any hazards and other matters affecting the works. No extra charges will be made for any misunderstandings, or incorrect information or any of these points, or on grounds of insufficient description or lack of information will be allowed.

1.12 Setting Out

The Landscape Contractor will be responsible for checking all schedules and drawings by the Landscape Architect. In the event of any discrepancies being found between such schedules and drawings, or if the Landscape Contractor considers that additional detail drawings are required, the Landscape Contractor shall report such discrepancy in writing at least ten days before the works are to be executed. The right is reserved to adjust the exact position of trees and specimen shrubs after they have been set out on site. Any trees which are planted without approval of the setting out may be required to be re planted at the Landscape Contractor's expense.

1.13 Supervision and Contractor's Staff

The Landscape Contractor shall ensure full and adequate supervision of the site during the duration of the works.

The Landscape Contractor shall at all times during the Contract period employ sufficient persons of appropriate abilities, skills, care, and experience as are required for the proper performance of the Services in accordance with the Contract and shall ensure that a sufficient reserve of persons is available to provide the Services during holiday periods, absences due to sickness and special events/emergencies.

The Landscape Contractor will appoint a Contract Manager to supervise those persons employed to perform the Services in accordance with the Contract. The Contract Manager must be available and present in the Contract Area at all times that the Services are being carried out.
The Landscape Contractor shall notify the Supervising Officer of the name, address and telephone number of the appointed Contract Manager who will be responsible for receiving notification from the Employer of complaints and instructions under the Contract.

The Employer shall be entitled to notify the Landscape Contractor by notice in writing to remove from the Contract or discipline any employee of the Landscape Contractor (which for avoidance of doubt shall include the Contract Manager or his deputy) who, in the reasonable opinion of the Supervising Officer, has shown himself to be unsuitable to perform his duties under the Contract. The Employer shall in no circumstances be liable either to the Landscape Contractor or to the

employee in respect of any liability, loss or damage occasioned by such removal or disciplinary action and the Landscape Contractor shall fully and promptly indemnify the Employer against any claim made by such employee.

The Landscape Contractor shall ensure that every person employed by the Landscape Contractor in and about the provision of the Services is at all times properly and sufficiently trained and instructed with regard to: the task the person has to perform; any relevant provisions of the Contract; relevant rules, procedures and standards of the Employer; all relevant rules, procedures and statutory requirements concerning Health and Safety at work; fire risks and fire precautions; and the necessity to observe the highest standards of courtesy and consideration to the public to promote and enhance the Employer's image and reputation.

1.14 Sequence of Operations

The sequence of operations shall be as described unless written authority to vary is obtained from the Landscape Architect.

1.15 Insurance, Indemnities, etc.

The Landscape Contractor shall indemnify, and keep indemnified the Employer against all actions, suits, claims, demands, costs and expenses whatsoever, by reason of, or arising out of the execution of the Contract Works, or any of the matters connected therewith, whether such claim or proceedings be brought or costs or expenses incurred under or virtue of Workmen's Compensation Act, Employer's Liability Act, or any other statute or at Common Law, or otherwise howsoever.

The Landscape Contractor shall indemnify the Employer in respect of accidental injury, loss or damage caused by, through or in connection with his work. The Landscape Contractor shall arrange insurance to cover the risk of such accidental injury, loss or damage and shall have the Employer indemnified by such insurance policies with approved insurance companies as detailed hereunder and shall take all necessary steps to keep such policies validly in force during the period of Contract work. The Landscape Contractor shall produce such insurances when requested by the Employer.

Employer's Liability Policy

This policy should provide for indemnification of the Employer in respect of claims, which could be made against it as principal by employees of the Landscape Contractor.

Public Liability Policy

This policy should provide for the following:

- Indemnification of the Employer as principal.
- Unlimited cover generally and a limit not less than £1,000,000.00 in respect of any one accident.

Full Motor Insurance Policy

This should provide for the following in respect of vehicles and plant governed by the Roads Traffic Act:

- Indemnification of the Employer as principal.
- Names and addresses of drivers where limited cover only is provided.
- Passenger cover in relation to seating capacity of cab.
- Cover for towing including trailers where applicable.
- Loading and unloading risks both on and beyond public thoroughfares.

1.16 Health and Safety

The Landscape Contractors shall at their own cost arrange for the safe keeping during and after delivery to works of all manures, plants and equipment necessary to complete the job in hand. All oil and petrol containers must be kept in suitable sheds and the Landscape Contractor shall observe all regulation regarding the storage of poisonous and/or inflammable liquids.

The Landscape Contractor shall in performing the Services adopt safe methods of work in order to protect the health and safety of his own employees, the employees of the Employer and of all other persons, including members of the

public and shall comply with the requirements of the Health and Safety at Work Act 1974, The Management of Health and Safety Regulations 1992, Control Of Substances Hazardous to Health (COSHH) Regulations 1988 and 1994, and of the Road Traffic Act 1988 and of any other Acts, Regulations, Orders or any European Directive pertaining to the health and safety of employed persons.

The Landscape Contractor shall at the time of submitting his Tender provide to the Employer a written copy of his health and safety working procedures relating to the performance of the Contract.

The Landscape Contractor shall review his Health and Safety policy and safe working procedures as often as may be necessary and in the light of changing legislation or working practices or the introduction of new Work Equipment and shall notify the Supervising Officer in writing of any such revisions. The Supervising Officer may require the Landscape Contractor to amend its health and safety policy and safe working procedures to comply with any change in legislation or working practices or required as a result of the introduction of new Work Equipment.

1.17 Equal Opportunities Policy

The Landscape Contractor shall keep his equal opportunities policy in force for the duration of the Contract to comply with statutory obligations. Any findings of unlawful discrimination against the Landscape Contractor during the three years prior to the commencement of the Contract shall be reported to the Employer, together with details of the steps taken to avoid repetition.

1.18 Waiver

Failure by the Employer at any time to enforce the provisions of the Contract or to require performance by the Landscape Contractor of any of the provisions of the Contract shall not be construed as a waiver of any such provision and shall not affect the validity of the Contract or any part thereof or the right of the Employer to enforce any provision in accordance with its terms.

1.19 Acceptance

Payment will be made to the Landscape Contractor following certification of completed works by the Landscape Architect. There shall be no sectional handover unless previously agreed. In appropriate circumstances and where the contract involves the application of a defects liability period following practical completion of landscape works, there shall be a retention amounting to 5% of the total contract price, which shall be released when defects have been made good at the end of the defects liability period.

1.20 Default in provision of the service

Without prejudice to any other powers of the Employer, if the Landscape Contractor, for whatever reason fails to provide or perform the Services in whole or in part completely in accordance with the terms of the Contract then without prejudice to any remedy contained herein the Employer may by his own or other workmen provide and perform such Services or part thereof in which the Landscape Contractor has made default. The costs and charges incurred by the Employer in so doing shall be paid by the Landscape Contractor to the Employer on demand or may be deducted by the Employer from any moneys due or which may become due to the Landscape Contractor.

In the event of non-completion of specified works, non-compliance with specification, faulty workmanship or use of defective materials, the Landscape Contractor will be deemed to be in breach of contract and payment may be withheld in full or in part pending completion or execution of remedial works.

2.0 SPECIFICATION

2.1 Topsoil

Topsoil to be a native topsoil. All imported topsoil to be of medium texture, pH matching that of the native topsoil, stone content 10mm in size not greater than 5% by weight, and no stones greater than 40mm in any dimension, and shall conform to BS 3882:1965. Topsoil shall be a free draining. Depth of topsoil to be as specified. Topsoil shall be free of perennial weed roots, i.e. couch grass, sticks, sub soil or any waste, toxic, putrescent or foreign matter.

2.2 Plants Generally

All plants shall conform fully to the specification in respect of species, size and quality. The Landscape Contractor shall investigate the sources of supply and satisfy himself that he can supply all of the plants specified on the planting schedule in the size, variety and quality before submitting a bid. Substitutions will not be permitted. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety, with an equitable adjustment of contract price. All plants shall be well grown, sturdy and bushy, according to type, and free from all disease and defects.

The Landscape Architect reserves the right to reject any plant material before or after planting if it does not conform with the specification. All plants shall be adequately hardened off prior to planting, where frost or cold winds may be a problem. All plants shall be supplied with temporary labels with the full botanical name , on each bundle or batch of plants.

The Landscape Contractor should indicate in their tender source of material to be used and where it can be inspected prior to award of contract. All plants that do not conform to the specification will be automatically rejected and must be removed from site and replaced at the Landscape contractor's expense. All trees, shrubs and other plant material shall comply with the minimum requirement of the relevant British Standards below:

BS 3936	Part 1: Specification for trees and shrubs
BS 3936	Part 4: Specification for forest trees
BS 3936	Part 5: Specification for Poplars and Willows
BS 3936	Part 6: Specification for herbaceous, perennials and alpines
BS 3936	Part 9: Specification for bulbs, corms and tubers
BS 3936	Part 10: Specification for groundcover plants

2.3 Time of Lifting

Bare root plants must only be lifted when the ground is moist and the plant is dormant between November and end March of the current year. Lifting must never take place when there is a severe ground frost. Particular attention must always be paid to the protection of the roots on lifting when there is a strong drying wind or sun.

2.4 Protection

Care must be taken to ensure that bare roots are protected from physical damage and desiccation at all times. All bare roots must be covered within two hours of lifting.

2.5 Bundling

Whip planting must be in bundles of the same species and size, all shoots must face in the same direction so that roots and shoots are not in contact, and must be of equal numbers. Bundles are to be securely tied with supple material which will not, by its nature or tension, cause damage to the plants.

2.6 Labelling

Each individual plant, bundle, bag, or lot of one species shall be labelled with a securely attached label, clearly indicating the plant name, grade and quantity.

2.7 Grass Seed

Grass seed shall conform to the requirements of British Standard 4428:1969 and subsequent amendments, and to the European communities (seed and fodder plants) regulations 1976. The Landscape Contractor shall supply, with each seed mixture, a certificate stating the composition, purity, germination, year of collection and country of origin. The germination capacity of each constituent of the mixture should be not less than 80%, and the purity of the mixture not less than 90%.

Total weed seed content should not be more than 0.5% and the total content of other crop seeds should not be more than 1%. These minimum figures shall be for the current 14 month period of annual tests.

The seed is to be thoroughly re-mixed before sowing to avoid patchiness on the ground and is to be Coburns mix or similar approved containg a high percentage of Agrostis capillaris, sown at a rate of 35 - 50g per square metre. (James Coburn + Sons Ltd., 32 Scarva Street, Banbridge, Co. Down BT32 3DD Telephone: 08 - 018206 – 62207 Fax: 08 - 018206 - 27250)

2.8 Container grown Shrubs and Groundcovers

Shrubs shall be bushy, well established, nursery stock with a good fibrous root system. They shall be container grown, true to size, name and description as scheduled. Shrubs shall conform to the appropriate British Standards. Plants shall not be pot bound, nor with roots deformed or restricted.

Bare root material will only be accepted where specified.

Herbaceous plants shall be supplied as well rooted clumps, showing several healthy buds, and grown in pots. Pots shall be appropriate to the size of the plant supplied, minimum size 0.5litres (80mm square or 90mm diameter).

2.9 Whips and Transplants

All plant material must comply in all respects with the current edition of BS 3936 Parts 1, 4, and 5.

Transplants shall not be less than 3 years old and have been transplanted at least once. Trees shall be sturdy, with a balanced root and shoot development, sizes shall conform to schedule.

Willows shall have been stumped and transplanted at the end of the first year in the nursery.

2.10 Trees

Trees shall conform to the appropriate British Standards. All trees should be full and well shaped, bark unmarked and have healthy root systems. The Landscape Architect must inspect and approve all trees prior to lifting or planting. Trees must all be of identical size and shape and should originate from the same stock nursery and stand.

Rootballed trees shall be rootballed immediately when lifted at the nursery. The rootball shall be suitable for the size of crown and the rootball shall be flat bottomed. The rootball shall be formed through regular transplanting; every 2-3 years minimum. The rootball shall be wrapped in hessian and steel wire netting or other suitable and approved decomposable material.

Standard pleached trees shall have a clear stem 1.7m to 1.85m in height from ground level to the lowest branch, a minimum girth of 8cm at 1m from ground level and a total height of 2.75m to 3m. They shall have a well defined, straight and upright central leader, with branches growing out of the stem with reasonable symmetry. The crown shall be well shaped, balanced, of a form and habit natural for the species.

All advanced nursery trees shall comply with BS 5236: 1975. They shall have a well defined, straight and upright central leader, with branches growing out of the stem with reasonable symmetry. The crown shall be well shaped, balanced, of a form and habit natural for the species. Trees shall have a sturdy, reasonably straight stem not less than 1.8m from ground level to the lowest branch.

All advanced nursery stock trees shall be supplied with roots balled. All coniferous trees shall be supplied rootballed or container grown, with a good fibrous root system. Trees shall conform to specified height with well developed, uniform branching systems.

2.11 Shrub/Groundcover Sizes

All shrubs and groundcovers shall be supplied as sizes indicated in the Bill of Quantities and Contract drawings.

2.12 Whip Sizes

Unless otherwise specified, all trees shall be as follows :- Whips, 600 - 1200mm high, 150 x 150 x 150mm minimum root dimension. To have a sound central leader and well formed branches.

2.13 Tree Sizes

Unless otherwise specified, all trees shall be as follows :-

Type	Girth	Height
Whip planting -		600-1200mm
Half Standard Tree	4-6cm	1.8-2.1m
Light Standard Tree	6-8 cm	2.25-2.5m
Standard Tree	8-10 cm	2.75-3m
Selected Standard Tree	10-12 cm	3-3.5m
Heavy Standard Tree	12-14 cm	3.5-4m
Extra Heavy Standard Tree	14-16 cm	4-4.5m
Advanced Extra Heavy Standard Tree	16-18 cm	5m
Semimature Tree	20-22 cm +	6.5-7m +

2.14 Tree Anchors, Stakes, Guys, etc.

All trees other than semimature trees and whips trees shall be supplied and fitted with one tree stake per tree.

Tree stakes shall be peeled poles of oak, sweet chestnut, pine or douglas fir, or tanalised larch. All stakes shall be preserved with water borne copper chrome arsenic to IS 131, to a net dry salt retention of 5.3kg per cubic metre of timber.
Stakes shall be supplied as sizes specified.

They shall be at least 1.8 metres long unless otherwise specified, with a minimum diameter of 75 mm at both butts.

Stakes shall be driven prior to planting with a drive all, wooden maul or cast iron mell, not with a sledge hammer.

Trees shall be tied to each stake with a purpose made tie and spacer, the tie to be overlapped and thrice nailed to the stake. Tree ties shall be rubber or PVC or proprietary fabric laminate composition, and shall be durable enough to hold the tree secure in all weather conditions for a period of three years.
They shall be flexible enough to allow for proper tightening of the tie. Tree ties shall be 25mm - 40mm wide depending on tree size. They shall be fitted with a simple collar spacer to prevent charring, and with a buckle for adjustment.

All Semimature trees shall be supplied and fitted with anchoring system: "Platipus root anchoring system kit" (as by Duckbill Anchors Ltd., Perrywood Business Park, Honeycrock Lane, Salfords, Nr. Redhill, Surrey, England, RH1 5DZ Tel: 01737 762300).

2.15 Mulch

Mulch shall be graded bark chippings from coniferous trees, particles 25 - 75mm , free of fine material, dust or wood.

Mulch will be rejected if in the Landscape Architect's opinion it is likely to be wind blown. The Contractor should arrange to have an on site sample (or samples) inspected by the Landscape Architect prior to spreading. Spreading without the approval of sample is at the Contractor's own risk.

2.16 Approved chemicals

All chemicals used shall be non-toxic to human beings, birds and animals under normal use, and chemicals which are not agriculturally approved shall not be used.

The use of the following herbicides is acceptable:

Roundup
Basta
Actrilawn 10
Casoron G
Kerb Flo

The use of the following fertilizers is acceptable:

Fisons PS5 : grass areas
Osmocote Plus- fertiliser N:P:K 15:9:11 plus trace elements: Shrub areas
Enmag - 4:19:10 + 7.5% : Tree planting

The Landscape Contractor may only use alternative formulations and manufacturers with prior approval by the Landscape Architect.

All weed killer and fertiliser shall be applied with properly designed equipment, maintained in good order and calibrated to deliver the specified volume, evenly and without localised overdosing. All quantities shall be accurately measured.

3.0 WORKMANSHIP

3.1 Site Clearance

Remove and dispose of off-site any rubbish still occurring in topsoiled areas, including weeds, old masonry and rubble, metal, wood, and stones, excavating as necessary to permit the specified depth of final cultivations.

All scrub areas shall be grubbed and all existing plants of same shall be removed and disposed of including all root systems unless otherwise specified.

Before topsoiling, remove all stones over 75mm in diameter. Dig out any areas polluted by oil or chemicals and make up with clean soil. Break up the formation under any areas liable to ponding of rainwater, so that they drain.

Topsoil shall be moved and spread only in dry weather. No work to topsoil shall be carried out when it is waterlogged, or if it's moisture content is conducive to structural deterioration. minimise compaction of topsoil and subsoil when spreading, running machinery over the surface as little as possible.

3.2 Cultivation Generally

The aim of cultivation is to produce a well-drained and textured soil suitable for plant growth. All areas to be planted, or seeded shall be cultivated to a minimum depth of 450mm or deeper if specified. Areas where obvious compaction has occurred shall be ripped. Stones above 75mm longest dimension shall be removed from the top 100mm layer of shrub planting areas.

3.3 Final preparation - Seeding Areas

One week before seeding, Fisons PS5 or similar approved pre-seeding fertiliser shall be spread at a rate of 70g per square metre and incorporated in the surface layer. The soil shall be firmed and raked to a fine tilth suitable for seeding.

3.4 Final preparation - Wild flower seeding Areas

The soil shall be firmed and raked to a fine tilth suitable for seeding. No fertilisers shall be used on areas for wildflower seeding.

3.5 Final Preparation - Shrub planting areas

Coarse clean moist compost or approved peat substitute shall be forked in at a rate of 5kg per square metre and incorporated to a depth of 200mm. Controlled release fertiliser N:P:K 15:9:11 plus trace elements - Osmocote plus or similar approved shall be applied at specified rates and raked into the top 50mm layer. The surface shall be raked to a tilth suitable for planting.

3.6 Final Preparation Whip planting areas

Coarse clean moist compost or approved peat substitute shall be forked in at a rate of 5kg per square metre and incorporated to a depth of 200mm. An approved fertiliser shall be spread at a rate of 70g per square metre and raked into the top 50mm layer. The surface shall be raked to a tilth suitable for planting.

3.7 Planting Season

Forestry transplants and feathered trees other than evergreens will be planted between November and march inclusive. Evergreens will be planted in October or in April/May. Planting shall normally be carried out during the period 1st October to 31 March in suitable weather.

Containerised plants may be planted throughout the year provided the weather is suitable, the soil is sufficiently moist and each planted is watered following planting.

Planting outwith the specified planting period will only be permitted in exceptional circumstances at the discretion of the landscape Architect; such exceptional circumstance shall include unsuitable weather and no penalty shall be incurred under provided that any delay is formally accepted by the Landscape Architect as attributed to this cause. in the event that works are

delayed by inclement weather, the landscape Contractor shall complete them at the earliest opportunity afforded by suitable weather.

3.8 Planting Generally

All planting operations shall be carried out in accordance with BS 4428 and good horticultural practice.

The Landscape Contractor shall provide the Landscape Architect with the species and quantities reserved from each named nursery, and the Landscape Architect shall have the right to inspect such nursery stock as deemed necessary, prior to its purchase by the contractor.

All plant labels are to be kept on their respective plants by the Landscape Contractor until the final inspection has been carried out. Only on approval from the Landscape Architect may such labels be removed by the Landscape Contractor.

Bare root stock shall be delivered to the site on the day of planting.

If under exceptional circumstances planting cannot take place within 12 hours of delivery, stock shall be healed in or their roots shall be adequately covered with moist hessian or good quality topsoil fir a maximum period of ten days. The roots are to be kept moist throughout this time by adequate watering. Waterlogging shall be prevented. Any plants which fail due to inadequate protection prior to planting shall be rejected and replaced at the Landscape contractor's own expense.

Any plants stored temporarily on site shall be protected from adverse weather conditions. Plants with damaged root systems shall not be accepted. After planting, any minor damage shall be rectified by pruning. Plants which, in the opinion of the Landscape Architect, have been seriously damaged during planting shall be rejected and replaced at the Landscape Contractor's expense.

All planting shall be firmed up if loosened by frost or wind.

Prior to planting all bare rooted plants shall be completely immersed in a container of Alignure Root Dip (1:99) solution and container grown plants shall be sprayed with the solution according to manufacturers instructions.

3.9 Seeding and Establishment

Grass seeding rate shall be: 25-35gm per square metre.
Wildflower seeding rate shall be: 5gm per square metre.

Seeding shall only be carried out at the correct season and in suitably calm but moist weather conditions. Seed shall be cross sown in two directions at right angles to each other (half the seed to be used in each directions) to prevent striping. After sowing, all areas shall be lightly raked with a chain harrow or by hand. About 48 hours before first cut, large stones (more than 40 mm in any dimension), should be removed and all areas rolled with a light roller to firm grass and press in all remaining stones.

When the grass is established and from 40 mm to 75 mm high, according to the seed mixture, it should be topped with a roto-scythe so as to leave from 25 mm to 50 mm of growth, to cut weeds, to control the growth of coarser grass and to encourage tillering.

Grass areas shall only be accepted as reaching practical completion when germination has proved satisfactory and all weeds have been removed.
No payment for re-seeding shall be made to the landscaping Sub-Contractor if the seed fails due to any cause whatsoever. He shall be required to make good the soiling and repeat the seeding until a good sward is obtained.

3.10 Bulbs / Corms

Bulbs/Corms shall be planted in a random pattern and allowed to naturalise. Avoid planting in straight lines. To plant, take out core in grass/shrub area, placing bulb/corm at base of hole

ensuring no space is left under bulb. Hole mst be wide enough to allow for base of bulb/corm to be placed directly on soil. Replace core and firm flush.

3.11 Shrubs

All shrubs shall be pit planted in precise locations as shown in plans. Pits shall be excavated 150mm wider in all directions than the natural root spread of the plant, and the bottom of the pit must be well forked to improve drainage. Back filling of all pits shall be with soil and compost or an approved peat substitute in the ratio of 4:1.

All plastic and non-degradeable wrappings and containers shall be removed before planting. Make four vertical cuts with a sharp knife on the quadrants through the edge of container grown rootballs to sever girdling roots.

3.12 Whip Planting

All whips shall be notch planted in staggered pattern. Whip trees shall be planted randomly with no more than 5 plants of the same species planted in groups. Blocks of similar species are not to be planted. Pits shall be excavated 150mm wider in all directions than the natural root spread of the plant.

3.13 Tree Planting

Planting pits for trees in undisturbed ground will be backfilled with excavated material. Tree pits in mounds or other made up ground shall be backfilled with topsoil.

All tree pits for all trees other than semimature trees shall be excavated 200mm wider in all directions than the natural root spread, or rootball, and the base forked to improve drainage. Stakes shall be positioned before backfilling. Topsoil backfill shall be mixed with peat substitute in the ratio of 4:1. 60g Enmag or similar approved slow release fertiliser shall be incorporated. The backfill shall be settled and well firmed around the roots avoiding air pockets.

All semimature tree pits shall be excavated 500mm wider than the natural root rootball, and 150mm deeper to allow for 250mm of backfill mix, tamped firm to 150mm. In all semimature tree pits an additional depth of 150mm should be dug to allow for a 150mm gravel layer at the bottom of the pit to aid in drainage. Sides of tree pit shall be ripped and loosened to ensure a good bond with the backfill and to avoid root girdling.

All semimature tree pits shall be backfilled with mix consisting of: 10 parts native topsoil and 5 parts sharp sand. 60g Enmag or similar approved slow release fertiliser shall be incorporated. Backfilling shall be firmly tamped every 150-200mm and when pit is half full the backfill shall be flooded for further settlement. After excess water has drained further soil shall be added, tamped, and a final watering shall be given just before the final 75mm of backfill added. The backfill shall be settled and well firmed around the roots avoiding air pockets. All trees shall be well watered after planting.

All semimature trees shall be transported to the site of planting one tree at a time, and only when the pit has been dug and the backfill mixed on site. All semimature trees shall be supported on transit by the rootball only. Manhandling of the rootball will not be permitted. The stem shall not be supported. The crown may be supported by hand only if the Landscape Contractor deems it necessary.

No tyred machinery except approved balloon-tyred machinery shall be used in the excavations of the tree pits. While excavating, tracked or balloon wheeled machinery shall operate on protective mats or wooden sheets to prevent compaction.

All semimature trees shall be secured with a Platipus rootball fixing kit as per manufacturer's instructions. See schedule for rootball fixing in Bill of Quantities.

All timber frames to be used with the Platipus rootball fixing system shall be fixed with nail plates at each junction so that the individual members of the finished frame shall be flush with each other and of one level. Where possible the timber frames shall be constructed so that an optimum

condition is achieved between preventing the timber frame from appearing above finished ground levels, and also ensuring that an uncompromised frame for anchorage exists (i.e. the frame shall be made as large as possible so that it can sit on the lowest part of the top rootball).

All ratchet tensioning systems shall be nailed to the timber frame so that the ratchet shall remain upright and in the position intended when installed. All timber frames of the rootball fixing system shall be installed to ensure that when the tree pit is backfilled the frame shall be covered by a minimum of 50mm of mulch.

All rootballs of semimature trees are to be surrounded with a 4 inch perforated land drain pipe to aid in future waterings.

3.14 Mulch

On completion of planting, the total area of the disturbed soil is to be mulched to a depth of 50mm. The soil and the mulch shall be thoroughly wetted prior to application, and also prior to application a complete clearing through and weeding of the area shall be carried out, leaving the soil weed free, smooth and conforming to acceptable finished levels.

3.15 Watering

During dry periods at any other times deemed necessary prior to practical Completion, the Landscape Contractor shall water all plant areas. The Landscape Contractor must give notice to the local water Authority that a supply of water will be required for the execution of the works. The Landscape Contractor is to ensure that he is aware of any restrictions on the use of water and hose pipes which may be applied by the water Authority and is to comply with any such restrictions. Any water carried out shall take care to avoid soilwash off the shrub area and disturbance of the peat mulch.

Any damage caused by soil-wash shall be immediately rectified by the Landscape Contractor at his own expense, to the approval of the Landscape Architect. Watering shall be carried out to add moisture to the full planting depth. No minor surface watering shall be carried out.

The Landscape contractor shall allow for watering of all plants to field capacity as and when necessary, until practical completion is achieved.

3.16 Weeding

All planting areas are to be kept free of weeds and rubbish prior to Practical Completion. All planting areas are to be hoed, forked or hand weeded. The use of chemicals shall be only be upon approval from Landscape Architects.

Roundup - by Monsanto chemicals Ltd. 4 - 5litre/Ha. Do not apply when rain is forecast within six hours. Do not apply when wind is likely to cause spray drift (over 24kph / 15mph). Allow for leaf symptoms to develop before carrying out any cultivations. Apply to manufacturers recommendations. Apply 'Roundup' to kill existing grass preseeding, and weeds germinating in topsoil.
If germinating weed grasses are less than 100mm high and broad leaved weeds have not produced full-sized leaves, do not apply 'Roundup'. Apply 'Basta' @ recommended rates, 4 to 7 days before cultivating.
Basta - by Hoechst Ltd. 3 - 7.5litre/Ha. Do not apply when rain is forecast within six hours. Apply to manufacturers recommendations.
'Actrilawn 10' - by May + Baker Ltd., 11litre/Ha. Shall be used in accordance with manufacturer's instructions. Apply 'Actrilawn' when grasses have reached the two leaf stage or beyond, and when seedlings have emerged and have reached cotyledon or two leaf stage (approx. 4 weeks after sowing). Do not mow grass within 7 days of treatment.
Casoron G - Granular weedkiller to be applied 5.6-22.5 kg /1000sq.m. Shall be used in accordance with manufacturer's instructions.
Kerb Flo - weedkiller to be applied 3.75 - 4.25litre/Ha. Shall be used in accordance with manufacturer's instructions.

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MAINTENANCE PRELIMINARIES AND SPECIFICATION

BALLYMURTAGH LANDFILL SITE LANDSCAPE WORKS

1.0 PRELIMINARIES – maintenance operations/reinstatement works

1.1 Description of Work

The work consists of general works, maintenance operations; grass cutting, grass fertilising, grass weeding, tree area weeding, semi-mature tree watering. The work also consists of making good to damaged, vandalised areas as requested and necessary on a rate basis, including; replacement planting and replacement planting preparation works; site preparation, soil preparation, grass seeding, bulb/corm planting, whip planting and tree planting.

The work will also involve collection of heather debris from mature stands and spreading seeds on area shown on drawing as heathland in the Autumn.

The works shall be for a one year contract and reissued for tender after the one year contract period is over. Commencement of contract to be agreed.

2. SPECIFICATION – maintenance operations

2.1 TREE PLANTING

Tree Planting - Maintenance period

The Landscape Contractor shall be responsible for the aftercare and maintenance of the trees planted as completed works for 12 months from the date of practical completion.

Tree Planting - Weed control

Weeding may only be done by hand, except in exceptional circumstances where persistent perennial weeds may be treated chemically. The use of chemicals shall only be upon approval from the Landscape Architect.

In the winter a first application of the residual weedkiller 'Kerb Flo' shall be applied in the according to the manufacturer's instructions, for tree areas, immediately after the area has been planted and before any weed germination has taken place.

Annual or perennial weeds which grow shall be spot treated by the contact weedkiller 'Basta', according to the manufacturer's instructions, care been taken to ensure no spray touches any part of the leaves.

An application of 'Roundup' may be applied from August on, strictly according to the manufacturer's instructions for tree areas. It is to be noted that the surface of the ground shall not be physically disturbed.

Noxious weeds (dock, thistle, ragwort) shall not be allowed to establish. All soil surfaces shall be generally free of weeds at all times and shall be entirely free of weeds after each maintenance visit. No grass shall be allowed to encroach into soil areas.

Weed free circles around trees shall be 1000mm diameter in grassed areas. Weeds shall not cover 10% of circle at any time during maintenance period.

Tree Planting - Watering

Careful attention to water is essential during dry spells and may be critical in the case of trees. Trees shall be watered as necessary and to their full planting depths. Water trees as required after any period of 4 weeks without significant railfall (less than 5mm). Trees shall receive 9 litres of water during the watering period.

Tree Planting - Fertilizer

Apply top-dressings of organic matter such as cow, horse or sheep manure or proprietary materials to trees and shrubs once in spring, twice during the summer and once again in winter.

This treatment is to be carried out for the duration of the maintenance contract. Alternatively, if so wished, inorganic fertilizer can be applied as 'Osmocote' 18:11:10, @ 50g / square metre in spring and late summer.

Tree Planting - Pruning / trimming

Any pruning should involve removal of dead, diseased or badly crossing branches or shoots. Dead heading reduces competition for nutrients between the developing seeds and the rest of the plants so that further growth and flowering is often stimulated.

Tree Planting - Wind firmness, stakes and tree ties

All plants shall be regularly inspected for wind firmness and firmed as necessary at the same time. Stakes shall likewise be checked for firmness and all tree ties inspected and made good as required.

2.2 SHRUB PLANTING

Shrub Planting - Maintenance period

The Landscape Contractor shall be responsible for the aftercare and maintenance of the completed works for 12 months from the date of practical completion.

Shrub Planting - Weed control

Weeding may only be done by hand, except in exceptional circumstances where persistent perennial weeds may be treated chemically. The use of chemicals shall only be upon approval from the Landscape Architect.

In the winter a first application of the residual weedkiller 'Kerb Flo' shall be applied in the according to the manufacturer's instructions, for shrub areas, immediately after the area has been planted and before any weed germination has taken place.

Annual or perennial weeds which grow shall be spot treated by the contact weedkiller 'Basta', according to the manufacturer's instructions, care been taken to ensure no spray touches any part of the shrubs.

An application of 'Roundup' may be applied from August on, strictly according to the manufacturer's instructions for shrub areas. It is to be noted that the surface of the ground shall not be physically disturbed.

If foliar acting weedkillers are applied, all plants shall be protected during their application with 'Arboguard', 'Politec' or similar approved. No residual herbicide shall be used in the first season of planting.

Noxious weeds (dock, thistle, ragwort) shall not be allowed to establish. All soil surfaces shall be generally free of weeds at all times and shall be entirely free of weeds after each maintenance visit. No grass shall be allowed to encroach into soil areas.

Weed free bands along hedges shall be 750mm wide. Weeds shall not cover 10% of circle at any time during maintenance period.

Shrub Planting -Watering

Careful attention to water is essential during dry spells and may be critical in the case large shrubs. Shrubs shall be watered as necessary and to their full planting depths. Shrubs shall receive 4.5litres of water during the watering period.

Shrub Planting -Fertilizer
Apply top-dressings of organic matter such as cow, horse or sheep manure or proprietary materials to trees and shrubs once in spring, twice during the summer and once again in winter. This treatment is to be carried out for the duration of the maintenance contract.

Alternatively, if so wished, inorganic fertilizer can be applied as 'Osmocote' 18:11:10, @ 50g / square metre in spring and late summer.

Shrub Planting -Hypericum Rust
All Hypericum spp. plants shall be treated with 'Bayleton 5' for rust, according to manufacturers instructions

Shrub Planting -Pruning / trimming
Any pruning should involve removal of dead, diseased or badly crossing branches or shoots. Dead heading reduces competition for nutrients between the developing seeds and the rest of the plants so that further growth and flowering is often stimulated.

Deciduous shrubs are best pruned in winter when new and old growth can be easily distinguished. Allow shrubs which flower on the current season's growth to be pruned back to older wood soon after flowering. Any pruning should involve removal of dead, diseased or badly crossing branches or shoots.

Dead heading reduces competition for nutrients between the developing seeds and the rest of the plants so that further growth and flowering is often stimulated. All hedges shall be clipped to maintain uniform and tidy appearance.

Shrub Planting -Wind firmness
All plants shall be regularly inspected for wind firmness and firmed as necessary at the same time.

2.3 GRASS SEEDING

Grass areas - Maintenance period
The Landscape Contractor shall be responsible for the aftercare and maintenance of the completed works for 12 months from the date of practical completion.

Grass areas - First roll and cut
When grass has grown to 38mm it shall be lightly rolled and two days later mowed with an approved mower having no roller and sufficiently sharp to avoid root pulling. Mowing shall be carried out under dry weather conditions.

Grass areas - Further cuttings
Thereafter grass shall be cut regularly (a total of 20 times during each growing season) to a length consistent with the season and quality of growth, and rolled as necessary.

Cuttings shall not normally be removed unless otherwise directed. Cuttings shall be spread evenly on grassed areas. All grass cuttings shall be swept and removed from hard standing areas. **Note:** Grass shall be established with a height of cut at about 20mm.

Mowing shall be carried out under dry weather conditions. Prior to mowing all litter shall be removed from grass areas.

Grass cutting in areas of bulbs/corms shall not be undertaken until June or until such time as dieback has occured.

Grass areas - Fertilizing
The sward shall be given one application of an approved top dressing 10:10:20 applied in two equal passes in transverse directions at a combined rate of 17 g/ square metre, also
avoid any banding.

Grass areas - Weed control

The sward shall be maintained weed free by the application 'Actrilawn 10' - by May + Baker Ltd., 11litre/Ha. Weedkiller shall be used in accordance with manufacturer's instructions. Apply 'Actrilawn' when grasses have reached the two leaf stage or beyond, and when seedlings have emerged and have reached cotyledon or two leaf stage (approx. 4 weeks after sowing). Do not mow grass within 7 days of treatment.

A selective weedkiller shall be applied for the presence of Clover; a formulation of 'Mecoprop' and 2, 4-D suitable for turf. Apply when clover is growing vigorously, in accordance with manufacturer's instructions. Do not spray in windy conditions, or within 1.5m of shrub planting without protection. Apply in two half doses, at right angles to each other.

Grass areas - Settlement

Any settlements or local depressions shall be made up by the Landscape Contractor at his own expense. The whole new grass areas shall be handed over as complete well established sward at the end of the maintenance period and all necessary work (whether specifically mentioned or not) shall be carried out to secure this end.

Grass areas - Acceptance

Unless otherwise stated in the programme of completion, individual areas will not be accepted until the whole of the works have been completed. The Landscape Contractor shall include for keeping such areas correctly maintained and protected until handed over.

3. GENERAL – maintenance operations/reinstatement works

Debris removal

All paper and trash in the planted areas shall be removed on a monthly basis from the planted beds. All paper and trash shall be disposed of by the contractor outside of the Client's facilities.

Remove excessive amounts of leaf and litter (dead twigs, branches, leaves, bark, etc.) as it accumulates in maintained areas. Leaves and other organic material useful as a mulch may be left in place upon approval of the Client. Additional visits will be facilitated as requested by Client.

Stone or debris over 50mm diameter shall be removed or buried after each maintenance visit.

Monthly Maintenance - Maintenance Certificate

Throughout the one year maintenance period following completion of planting, the Contractor shall maintain the site in a weed free, tidy and tended condition. He shall include in the Schedule of Rates a realistic amount to cover the cost of such maintenance for the full year period.

Maintenance Report

All maintenance operations shall be noted in a schedule itemising works completed, time of maintenance visit, comments, etc. and shall be submitted to the Landscape Architect.

BILL OF QUANTITIES

LANDSCAPE WORKS

AT BALLYMURTAGH LANDFILL SITE

Mitchell and Associates
Landscape Architects,
Fumbally Court,
Fumbally Lane,
Dublin 8.
Tel: (01) 4545066
Fax: (01) 4545065
Email: info@mitchellassoc.net

1.0 Earthworks	**area/qnty**	**unit**	**price**
Spraying off all existing areas for weeds removal of stones, debris, etc. as per spec.	63,500m^2		
Ripping of all areas to 300mm deep	63,500m^2		
Supply of Topsoil as per spec. Topsoil to be a peat/sand mix where feasible	17,100 m^3		

2.0 Grass Seeding / heathland	**area/qnty**	**unit**	**price**
One week before seeding, Fisons PS5 at 70g per sq. m.	63,500m^2		
Soil preparation / fine raking and supply and seeding of specified grass seed	52,200m^2		

3.0 Whip Planting	**area/qnty**	**unit**	**price**
Soil preparation / fine raking	15,170m^2		

4.0 Staking

Supply and install tree stakes As per spec.	1,517 no.		

5.0 Rabbit Guards

Plastic spiral rabbit guards	15,170 no.		

6.0 Plants and Planting

Supply and plant the following
br - bareroot, cg - container grown, g - girth in cm, rb - rootballed

Woodland Planting

Botanical Name	Qty	Size	unit	price
Alnus glutinosa	990 no.	1.2m high whip		
Alnus glutinosa	110 no.	8 – 10g br		
Betula pubescens	990 no.	1.2m high whip		
Betula pubescens	110 no.	8 – 10g br		
Crataegus monogyna	990 no.	1.2m high whip		
Crataegus monogyna	110 no.	8 – 10g br		
Fagus sylvatica	990 no.	1.2m high whip		
Fagus sylvatica	110 no.	8 – 10g br		
Fraxinus excelsior	990 no.	1.2m high whip		
Fraxinus excelsior	110 no.	8 – 10g br		
Larix deciduas	990 no.	1.2m high whip		
Larix deciduas	110 no.	8 – 10g br		
Pinus sylvestris	990 no.	900mm high br		
Prunus avium	990 no.	1.2m high whip		
Prunus avium	110 no.	8 – 10g br		
Quercus rubra	990 no.	1.2m high whip		
Quercus rubra	110 no.	8 – 10g br		
Sorbus aucuparia	990 no.	1.2m high whip		
Sorbus aucuparia	110 no.	8 – 10g br		

Pine Woodland

Botanical Name	Qty	Size	unit	pric
Pinus sylvestris	3750 no.	transplants 200 – 300mm high		
Sambucus nigra	420 no.	8 – 10g br		

Woodland Understorey

Botanical Name	Qty	Size	unit	price
Sambucus nigra	990 no.	1.2m high whip		
Sambucus nigra	110 no.	8 – 10g br		
Ilex aquifolium	1100 no.	600mm high br		

Native Tree Groups

Botanical Name	Qty	Size	unit	price
Pinus sylvetris	17 no.	2m high		
Betula pubescens	20 no.	8 – 10g		

7.0 Collection	**Price**
1.0 Topsoil	
2.0 Grass / Wildflower seeding	
3.0 Whip planting (soil preparation)	
4.0 Staking	
5.0 Rabbit guards	
6.0 Plants and Planting	
Sub Total	
VAT	
TOTAL	

Ballymurtagh Landfill – Restoration Programme of Works

It is envisaged that the landscape works will take approximately 4 to 6 weeks after site is ready for the landscape contractor to commence the works.

Programme of Operation will be as follows:

1. Ground preparation for topsoiling, stone removal etc.
2. Topsoil importation and spreading.
3. Tree pits to be prepared
4. Trees to be planted in
5. Areas to be seeded to be sprayed with a pre-seeding fertiliser
6. Seeding to be carried out
7. Collection of heather debris and spreading of seeds to be carried out in the following Autumn.

Attachment C4(i)

Existing surrounding vegetation

3 no. Pinus sylvestris

5 no. Betula pubescens

5 no. Pinus sylvestris

3 no. Betula pubescens

5 no. Betula pubescens

Open grassland with groups of native trees

3 no. Pinus sylvestris

3 no. Betula pubescens

5 no. Pinus sylvestris

1 no. Betula pubescens

1 no. Pinus sylvestris

3 no. Betula pubescens

Wildflower mix

Pine woodland planting

Woodland planting

Cliff Top

Ex. Entrance from Public Rd.

Legend:

- Existing vegetation
- native tree species in groups on grassland
- Woodland screen planting
- Grass land
- Cliff
- pine woodland
- Area of heathland to be seeded with seeds from heather debris in the Autumn

Rev A - Pine woodland added

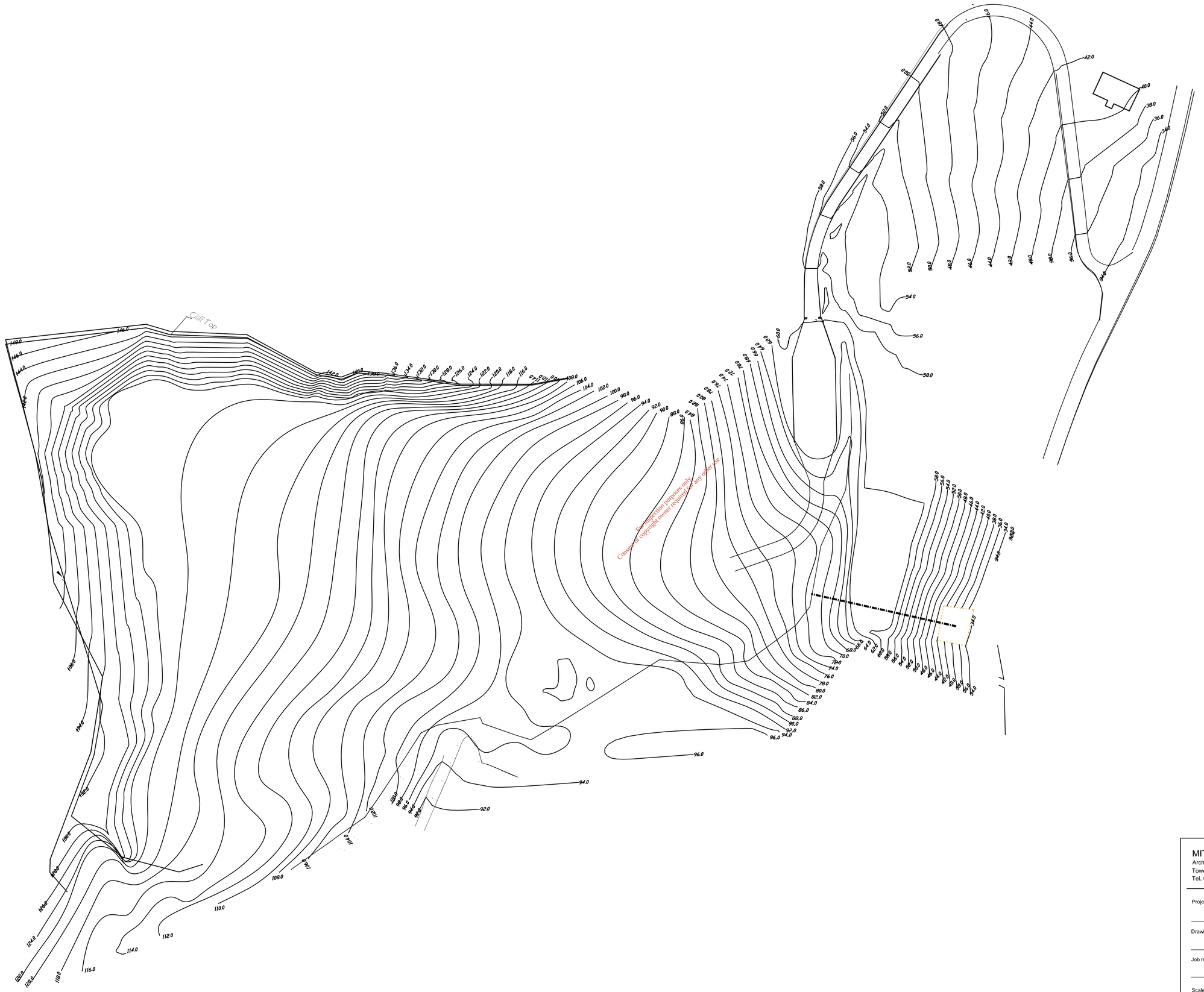
MITCHELL + ASSOCIATES
Architects Landscape Architects Land planners
Tower 4, Fumbally Court, Fumbally Lane Dublin 8
Tel. 00353 1 4545066 Fax. 00353 1 4545065

Project : Ballymurtagh Landfill Site

Drawing : Landscape Layout

Job no. L9905 | Dwg. No. 02

Scale : 1:1000 | Date : June 2002



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Project :
Ballymurtagh Landfill Site

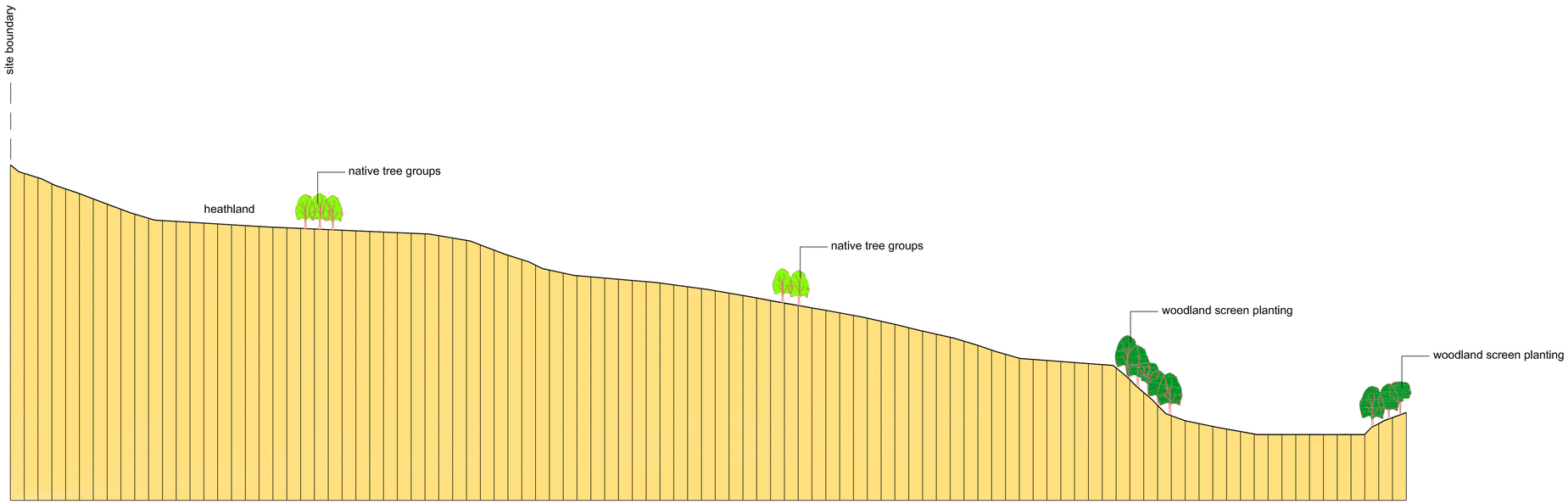
Drawing :
Proposed Contours

Job no. L9905

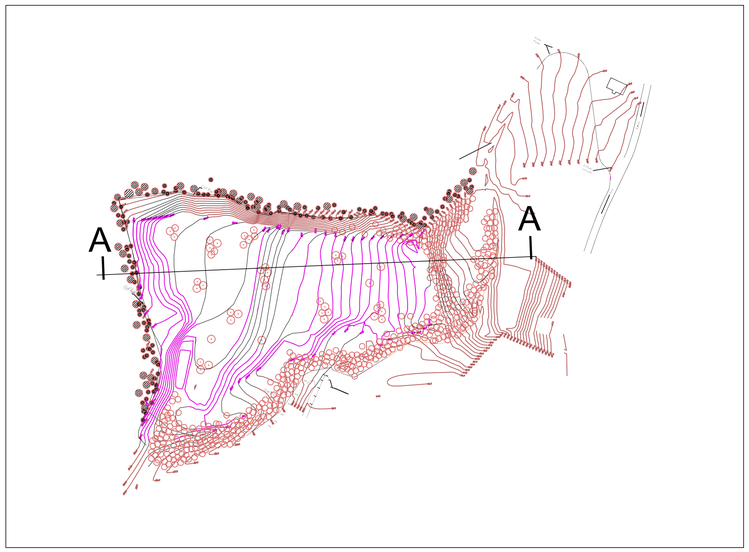
Dwg. No. 01 A

Scale : 1:1000

Date : June 2002



SECTION A - A



KEY PLAN

MITCHELL + ASSOCIATES
Architects Landscape Architects Land planners
Tower 4, Fumbally Court, Fumbally Lane Dublin 8
Tel. 00353 1 4545066 Fax. 00353 1 4545065

Project :
Ballymurtagh Landfill Site

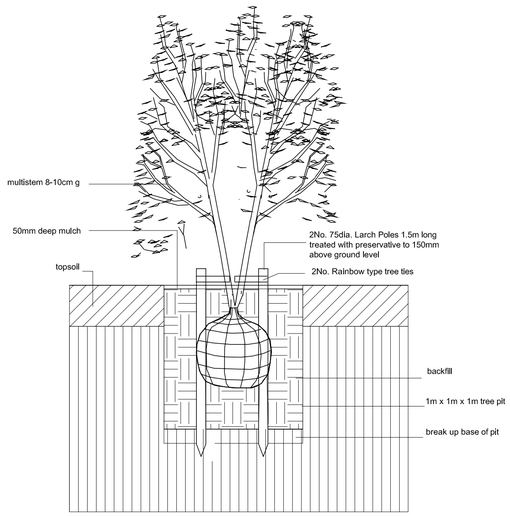
Drawing :
Section through landfill site

Job no. L9905

Dwg. No. 03

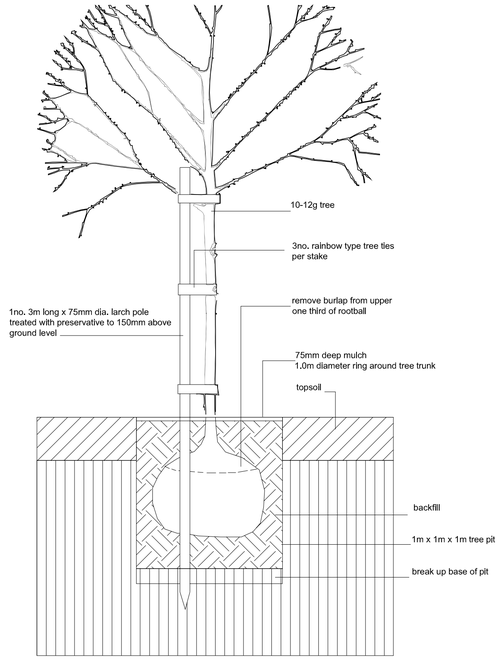
Scale : 1:2000

Date : July 2002



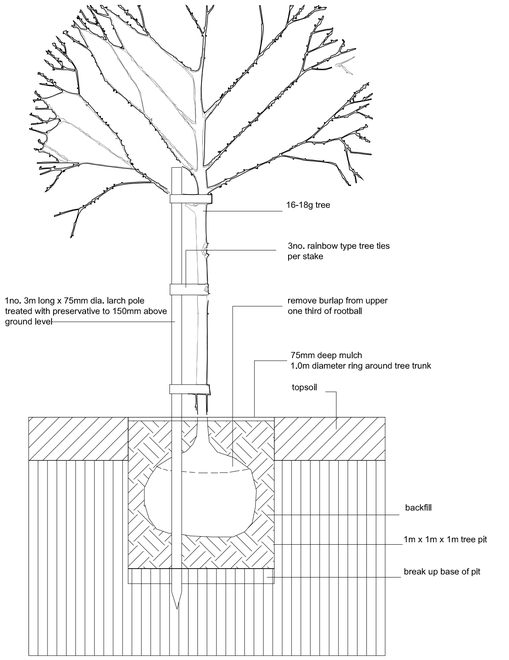
TREE PLANTING DETAIL

Section through multistem tree



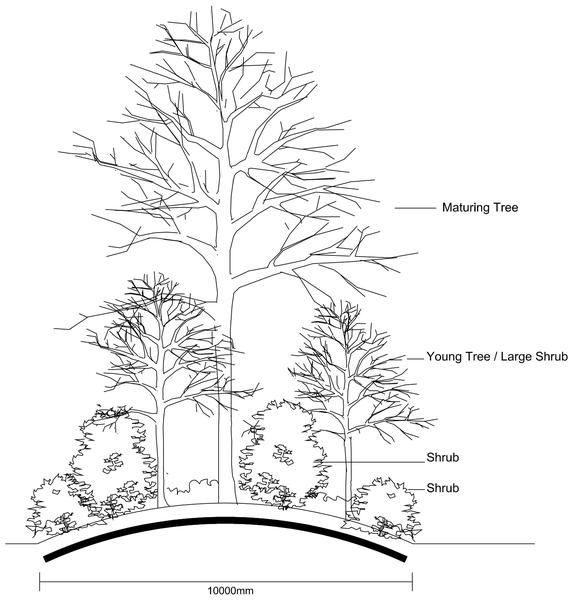
TREE PLANTING DETAIL

Section through selected standard tree



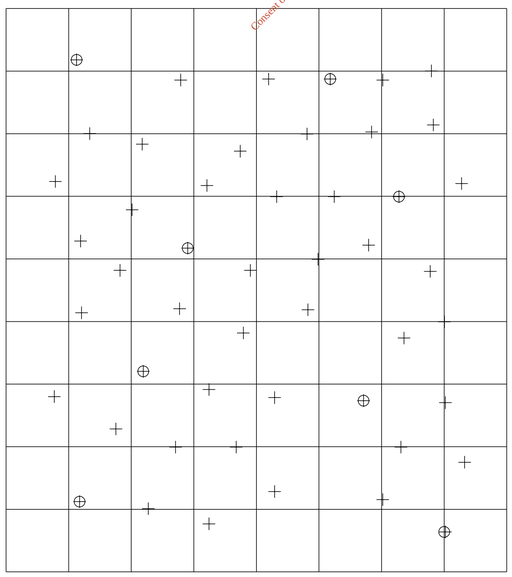
TREE PLANTING DETAIL

Section through advanced extra heavy standard tree



BOSPLANTZOEN

SECTION



1m Grid

Note: Whip trees shall be planted randomly with no more than 5 plants of the same species planted in groups. Blocks of similar species are not to be planted. Pits shall be excavated 150mm wider in all directions that the natural root spread of the plant.

⊕ 10% Feathered

90% Whips

SHELTER BELT SCREEN PLANTING

Whips planted at 1 metre centres and staggered as shown

MITCHELL + ASSOCIATES
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Tower 4, Fumbally Court, Fumbally Lane Dublin 8
Tel. 00353 1 4545066 Fax. 00353 1 4545065

Project :
Ballymurtagh Landfill Site

Drawing :
Landscape Details

Job no. L9905

Dwg. No. 04

Scale : 1:20

Date : June 2002