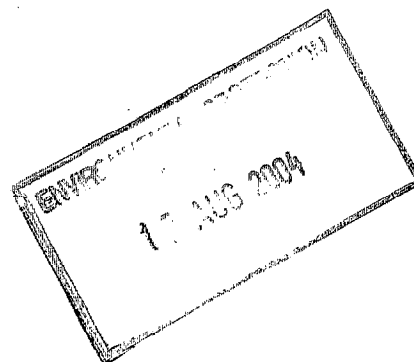


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Licensing Unit,
Office of Licensing & Guidance,
EPA,
Headquarters,
PO Box 3000,
Johnstown Castle,
County Wexford



16th August 2004

Our Ref: 060504001LT0055GAL
File Ref: 350

Re: Ballaghveny Landfill Waste Licence Review Application - Waste Licence 78-2

Dear Sir/Madam,

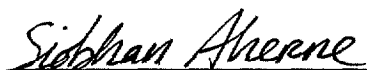
We refer to the above application for a review of the Waste Licence Reg. No. 78-2 for Ballaghveny Landfill and to EPA correspondence dated 6th July 2004 requesting additional information in accordance with Article 14(2)(b)(ii) of the Waste Management (Licensing) Regulations. We also refer to our correspondence dated 6th August 2004 in this regard.

We now enclose 1 no. original and 2 no. copies of the Restoration and Aftercare Plan for Ballaghveny Landfill as requested by the Agency.

We are providing this information on behalf of North Tipperary County Council.

I trust this is satisfactory, but please do not hesitate to contact the undersigned if you have any queries.

Yours sincerely,

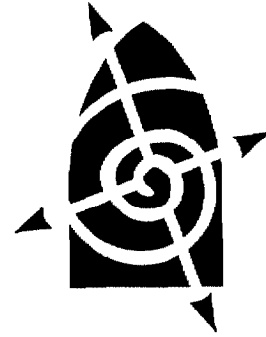


Siobhan Aherne
Senior Project Scientist
For RPS-MCOS Ltd.

sa/wm

Encl. 060504001RP0010F01

Comhairle Contae Thiobraid Árann Thuaidh
North Tipperary County Council

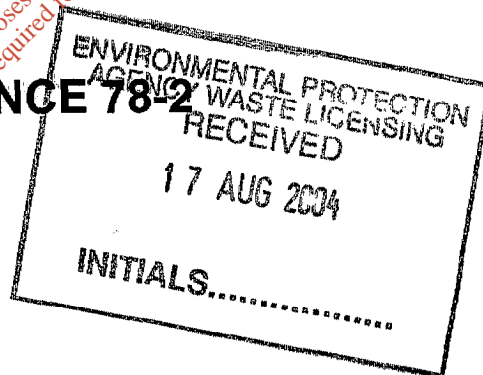


BALLAGHVENY LANDFILL

RESTORATION & AFTERCARE PLAN

WASTE LICENCE 7812

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August 2004

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DOCUMENT CONTROL SHEET

Client	North Tipperary County Council					
Project Title	Ballaghveny Landfill Licence Compliance					
Document Title	Restoration and Aftercare Plan					
Document No.	060504001RP0010F01					
This Document Comprises	DCS	TGC	Text	List of Tables	List of Figures	No. of Appendices
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APPENDIX A DRAWINGS & FIGURES

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1. INTRODUCTION

This Restoration and Aftercare Plan sets out a framework to successfully restore Ballaghveny Landfill through a scheme of grass seeding and woodland planting and to maintain this condition through a programme of maintenance, monitoring and aftercare. This Plan has been prepared in accordance with the EPA Landfill Manual on "Landfill Restoration and Aftercare" (1999) and the EU Council Directive (1999/31/EC) on the Landfill of Waste. It is essential that this Plan is a flexible working document that can easily adapt to change if required. It will form part of the Environmental Management Plan for Ballaghveny Landfill and a complete copy of the Plan will be kept on site at all times. The Plan has also been prepared having regard to Waste Licence No. 78-1 and the Environmental Impact Statement for the Remediation and Extension of Ballaghveny Landfill (September 1998).

According to the EPA Landfill Manual on "Landfill Restoration and Aftercare" (1999), restoration is "a process which will return a site to a condition suitable for its proposed afteruse" and it includes for "design, initial landscaping works, soil spreading and aftercare", while aftercare is described as "the work that is carried out after replacement of the soil to bring the land up to the required standard for afteruse"

1.1 OBJECTIVES

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

1. To restore the landfill to a grassland and woodland scheme.
2. To establish an environmentally safe area.
3. To protect the surrounding environment.
4. To integrate the site with the surrounding landscape.

1.2 SITE DESCRIPTION

Ballaghveny Landfill is located in the townlands of Ballaghveny and Woodville approximately 4km north of Toomevara and 11km north-east of Nenagh and is mainly accessed by upgraded local county roads from the N7 National Primary Route and from Nenagh (Drawing No. DG0150-01). The principal land-use of the surrounding area which consists of pasture, low-lying bog and forestry is mainly agriculture. The first two cells (Cell 1 & 2) developed were constructed with a clay lining system while the remaining cells (3-5 and 6-8) contain a composite lining system consisting of both clay and HDPE liner.

In September 1998 a Waste Licence Application and accompanying Environmental Impact Statement was prepared and submitted to the Environmental Protection Agency in accordance with the Waste Management (Licensing) Regulations 1997. The EIS outlined remediation measures to reduce the impact of the existing landfill on the surrounding environment and proposed the development of an extension to the landfill on adjacent lands owned by North Tipperary County Council consisting of lined cells, leachate storage lagoon, new entrance area and site infrastructure. A Waste Licence (Register No. 78-1) was subsequently issued by the EPA in May 2001 for the operation of the facility allowing an annual waste intake of 37,000 tonnes.

Cells 6, 7 and 8 are approximately 20,000m² in size and have been accepting waste since September 2001. Works have been completed at the facility providing a new site entrance, access road, administration building, waste inspection area and civic amenity area as proposed in the EIS. It is also proposed to remediate the filled landfill (Cells 1-5) by providing a capping layer and leachate and gas management systems in accordance with the Waste Licence. Cells 9-11 are currently being developed to provide additional capacity in the future.

1.3 EU LANDFILL DIRECTIVE

The EU Landfill Directive on Waste (1999) introduced the requirement for landfill closure and aftercare procedures. Article 13 of the Directive requires that once a landfill has been closed the operator shall be responsible for maintenance, monitoring and control in the aftercare 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 that the costs of closure and aftercare of the site for a period of at least 30 years be covered by gate fee revenue.

Although the term 'closure' is not defined in the Directive, Article 13(a)(I) states that a landfill or part of it shall 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 operator; or
- (iii) By reasoned decision of the competent authority

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 shall 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 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 operator and has communicated to the operator its approval for the closure i.e. the Environment Protection Agency will determine the closure date of the facility. North Tipperary County Council will be responsible for the facility during and after closure, and the requirements of the Waste Licence are still applicable to the site after closure.

The initial stages of the restoration and aftercare programme at Ballaghveny Landfill will include for the capping of Cells 1-5 and the commencement of the aftercare period. On completion of landfilling and restoration on a phased basis, an aftercare plan to establish and maintain the afteruse of the site will be implemented.

2. RESTORATION DESIGN AND POLLUTION CONTROL

There are a number of restoration requirements to be considered while preparing a restoration plan for a landfill. These requirements are mainly site specific and will have regard to the characteristics of the site such as topography, geology/hydrogeology, land use, land quality, landscape and visual impact assessment. Recommendations for the restoration of Ballaghveny Landfill have been included in the Environmental Impact Statement (September 1998). A central feature of the restoration plan is the integration and protection of pollution control systems such as capping, landfill gas extraction systems, leachate abstraction systems, a surface water drainage network and monitoring systems. Other considerations are the requirements of the Waste Licence, the capping system and landscaping.

Ecology

The restoration of the landfill site shall be to woodland and pasture. It is considered that once final capping takes place local flora and fauna will develop in the area. The planting plan detailed in Section 3 of this report has been created to encourage local fauna to use the restored area. Aquatic ecology has also been considered in the design of the site and ongoing monitoring of surface water quality during the aftercare of the site shall ensure the integrity of the aquatic ecology.

Drainage Requirements

The final profile of the restored landfill has been developed to assist drainage at the site and the local hydrology has been considered in the calculation of runoff from the capped and restored landfill.

Archaeology and Cultural Heritage

The Environmental Impact Statement for Remediation and Extension of Ballaghveny Landfill September 1998 assessed the local archaeology. No archaeological items or sites were found within the landfill boundaries.

It is proposed to restore the site on a phased basis so as to minimise the effects on the visual amenity of the site.

On completion of landfilling and restoration on a phased basis, North Tipperary County Council will implement an aftercare plan, which is detailed in Section 3.

As each phase is filled it may initially be subjected to an interim restoration scheme i.e. the placement of part of the full subsoil depth to assist the installation of pollution control systems and allow for settlement and any remedial works which are required. The integration and protection of the following pollution control systems is a central feature of the restoration plan:

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

Final restoration will involve the replacing of the final soil profile and carrying out landscaping works as described in the following sections. The timing of restoration works is influenced by site operations, settlement and seasonal variations, as the site will be divided into a series of phases and it will be progressively restored as each phase is filled to final levels.

North Tipperary County Council will appoint a person with relevant landfill/restoration experience to oversee the implementation of this plan. The appointed operator who shall familiarise himself/herself with the EPA Landfill Manuals will be responsible for the supervision of all works and the employment of specialist staff when necessary.

2.1 DESIGN

Detailed design of the restoration of the site includes leachate and gas management, capping and final landscaping. The details of the design shall be included in the contracts for each restoration phase. This Plan provides an outline of the requirements for restoration design which are specific to Ballaghveny Landfill and, more importantly, sets out the restoration sequence and the materials requirements essential to the future management of the landfill site.

The design of the restoration of the landfill shall account for the recommendations and findings of the EIS (1998). The EIS reviewed the existing environment at the site from terrestrial and aquatic ecology, archaeology and cultural heritage, hydrology and geology points of view. It also examined the impact of the landfill on the surrounding environment and the requirements for pollution control systems such as leachate collection and gas abstraction.

2.2 FINAL CONTOURS AND SETTLEMENT

Condition 8.2 of the Waste Licence requires that the finished level of the landfill does not exceed 114m OD. North Tipperary County Council submitted a Waste Licence Review Application (March 2004) for an increase in post-settlement (restored) height of cells 3-5 from the currently approved 114mOD to 120mOD. The increased height of the restored landfill is a result of the continued disposal of waste at the landfill during construction of the current filling Cells 6-8.

Settlement values of between 10 and 25% of the depth of the landfill can be expected for municipal landfills with the highest rates occurring in the first five years. Settlement rates have been accounted for in the detailed final profile.

Final profiles for the restored facility, which is shown in Figure 2A Landscape Layout (Mitchell & Associates, Landscape Architects) will produce a final shape to merge with the local landscape and provide adequate runoff.

The design of the final profile shall require regrading of the side slopes of Cells 3, 4 and 5 to assume the profile as shown in the final contour plan. Final capping shall include a gas migration layer and a drainage layer. Figure 3A shows sections through the proposed final landfill profile. Details of the capping system are given in Section 2.3.4.

Cells 1 and 2 have been capped for a number of years and are supporting grass growth. It is proposed to provide an additional subsoil/topsoil layer over these cells to supplement the existing capping in place.

2.3 POLLUTION CONTROL SYSTEMS

2.3.1 Landfill Gas Management

The objectives of a landfill gas management system can be considered to be the following:

- Minimise the risk of gas migration beyond the boundary of the site
- Minimise the risk of gas migration into buildings/services on site
- Minimise impact on air quality through reduction of greenhouse gas emissions
- Reduction of nuisance potential to the surrounding environment
- To allow energy recovery where feasible

Drawing No. DG0152-01 provides details on the existing landfill gas management system and the locations of perimeter gas migration monitoring boreholes.

It is proposed to provide a landfill gas management system at Ballaghveny Landfill consisting of gas extraction wells connected to a gas flare unit which has already been purchased and installed by North Tipperary County Council on site. This system will be designed and installed once the restoration works in Cells 1-5 are completed since the collection pipework is to be laid within the capping system. Initially Cells 1-5 will be connected to the proposed gas management system. Current Cells 6-8 and future Cells 9-11 will also be connected to the gas management system following phased restoration. Currently gas monitoring boreholes are in place at the perimeter of the landfill to monitor the risk of gas migration beyond the site boundary. Until the capping system is provided the leachate monitoring/extraction wells will provide for landfill gas venting.

Gas wells will be placed at approximately 40m centres. The wells shall be connected to a gas collection main whereby the gas shall be pumped to the flare. Gas extraction wells will not be placed within 25m of the edge of the capping to ensure integrity of the well. The proposed gas management system will be submitted to the EPA for approval prior to commencement of the works as required in the current Waste Licence 78-1.

Gas generation volumes at Ballaghveny Landfill have been estimated in the EIS (1998) based on the waste intake at the facility. It is estimated that peak gas generation will be up to 500m³/hr.

2.3.2 Leachate Management

Drawing No. DG0152-02 provides details on the leachate management system (existing and proposed) at Ballaghveny Landfill.

A total of 9 no. leachate monitoring/extraction boreholes have been installed within Cells 1-5 as required by the Waste Licence for the extraction of leachate from the waste body. Currently leachate is extracted from Cells 1-5 to the leachate lagoon located adjacent to the cells. Leachate is also collected from Cells 6-8 to the lagoon located at the northern end of the site. Leachate is tankered from both lagoons to Nenagh WWTP for final treatment.

The proposed restoration works contract includes for the decommissioning of the lagoon adjacent to Cells 1-5 and replacing it with a pumping/collection chamber from which leachate will be pumped to the lagoon constructed to the north of Cells 6-8. A leachate rising main will transfer the collected leachate from the new pumping/collection chamber to the lagoon. Leachate collected and stored in the lagoon will then be tankered to Nenagh WWTP. Leachate will continue to be extracted from Cells 1 and 2 to the new pumping/collection chamber and pumped via the rising main to the lagoon. A telemetry control system is also proposed to monitor leachate levels within the landfill and the lagoon and to provide a control to the leachate management system. Future Cells 9-11 will also be connected to the leachate management system when constructed.

Leachate generation in Cells 1-5 will significantly reduce after capping due to the increased rate of surface water runoff from the capped surface.

2.3.3 Surface Water Management

The proposed design for Contract 3 restoration works also includes for the provision of a surface water management system consisting of 150mm diameter slotted collection pipework. This system has been designed to collect and manage surface water runoff from the restored landfill at a maximum post-settlement height of 120mOD and connects to two proposed surface water lagoons for settlement prior to discharge to the local network. Drawing DG0121-01 provides details on the proposed surface water management system.

Peak surface water runoff rates were calculated for three catchment areas of the landfill which are shown in Drawing No. DG0121-01. The calculation was based on a reduced equation from the Flood Studies Report (1975). The formula was $Q_{bar} = 0.00066 \times [area]^{0.92} \times (\text{Soil Factor}) \times [SAAR]^{1.22}$ where: $Q = 1.2 Q_{bar}$.

Q_{bar} = estimated flow (litres/sec),
 Q = peak flow (litres/sec),
 Soil Factor = percentage absorption,
 SAAR = Average Annual Rainfall.

Based on this equation, the peak surface water runoff from the restored landfill separated into three catchment areas is calculated as follows:

Northern Catchment = $3.95 \times 10^{-3} \text{ m}^3/\text{sec}$ = 3.95 litres/sec
 Eastern Catchment = $1.36 \times 10^{-3} \text{ m}^3/\text{sec}$ = 1.36 litres/sec
 Southern Catchment = $2.7 \times 10^{-3} \text{ m}^3/\text{sec}$ = 2.7 litres/sec

The proposed increase in the final restored height of Cells 1-5 will have no effect on the volume of surface water runoff generated. Environmental control systems are in place which will ensure that the impact of the restored landfill on the environment will be not significant.

2.3.4 Capping

The principal function of the capping system is to minimise infiltration into the waste and consequently reduce the amount of leachate being generated. Other objectives include the promotion of surface drainage and runoff, the control of landfill gas migration and the provision of a physical separation between waste and plant and animal life.

The capping system on cells 3-5 will consist of the following:

- 0.15m topsoil on
- 0.85m subsoil on
- geocomposite surface water drainage layer on
- geosynthetic clay liner (GCL) on
- geocomposite gas collection layer on
- re-shaped waste.

This capping system contains approved artificial layers (geocomposite drainage layers, GCL) giving a capping depth of 1m. This system is preferred over providing a 'natural' cap (low permeability clay, granular drainage layers) which would result in a 2.4m thick cap which would further increase the final height.

It is proposed to provide capping systems at the landfill site on a phased basis.

The design for Contract 3 for the restoration of Cells 1-5 has shown that the proposed maximum pre-settlement height of 121m OD with a reduced post-settlement height of 120m OD approx. is acceptable from an engineering point of view. The proposal to use artificial materials ensures that the capping system will be placed correctly and existing slopes will be regraded to more acceptable gradient which will provide greater slope stability of the waste and will assist in blending the final restored form into the surrounding landscape.

The maximum quantity of waste to be reshaped as part of the restoration works has been measured at $14,231 \text{ m}^3$. This quantity comprises mainly of waste to be deposited following regrading of the existing side slopes to 1:2.5. On average the depth of the reshaped waste will be 1m deep over the surface of cells 3, 4 and 5.

As settlement is presumed to already have taken place in cells 1 and 2 it is proposed that regrading be performed where required on cells 1 and 2 and that a layer of subsoil/topsoil be placed on these cells prior to landscaping as part of the restoration contract.

It is proposed to assess existing stockpiled material on-site for suitability for placement within the topsoil and subsoil layers. This material has been excavated during the construction of cells 6-8 and consists of a mix of clays, silts and gravels. Excavated topsoil has been stockpiled separately. It is important that material placed within the subsoil layer will be of sufficient strength and texture to

support the placement of the upper topsoil layer. It is also proposed to use future excavated material for the construction of new cells as subsoil material in the capping layers of completed cells.

2.3.5 Soil Management

It is considered that if any additional topsoil be required for restoration purposes it may be necessary to import it into the site. As it is likely to take considerable time to accumulate adequate amounts of soil required for restoration of the remaining Phases accumulation of material should begin as soon as possible. The Operator should know the source of all imported soils. The EPA Manual advises that the Operator undertake 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.
4. Carry out a site specific risk acceptance to determine the level of contamination.

The Operator shall ensure that imported soils have been stripped when the soil is in a reasonably dry condition to minimise soil structure damage.

2.3.5.1 Soil Storage

Recommendations for the storage of soil are as follows:

1. The Operator shall supervise all soil handling operations and make staff, particularly machine operators aware of the need to minimise soil damage.
2. All imported soils shall be segregated, recorded and stockpiled separately in locations so that they can be replaced in the correct sequence on completing restoration.
3. All soils shall be stockpiled in mounds 2-3m in height and 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.
4. Stockpiles shall be built as loosely as possible as to minimise compaction.
5. Soil storage areas shall be fenced to prevent contamination.
6. The Operator shall undertake regular soils checks in the form of structure assessment and measurements of density, soil moisture and permeability.
7. If mounds become anaerobic, they should be respread and carefully managed to prevent it reoccurring.
8. Only machinery used for stockpiling shall be allowed on the mounds.

2.3.5.2 Soil Placement

Recommendations for the placement of soil are as follows:

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 shall be removed from stockpiles and replaced in the correct sequence to specified depths as discussed in Section 2.3 on Capping.
3. Soils shall be placed in lifts over the drainage layer and loosened after each placement by rippers. The EPA Manual recommends the following
 - Lift should not exceed 300mm in thickness and ripping should 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.
 - Permeability tests should be used to confirm that the soil is permeable.
 - Ripping should 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 should be carried out at a clearance of at least 75mm above the drainage and filter layer.
4. Soils shall 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 shall be loaded from the stockpile into dump trucks and transported to the strip being restored. From the surface of the waste body, the soil shall then be spread and levelled using a tracked excavator/wide bucket. Similarly with the remaining layers of soil.
 6. All soil placement activities shall be completed by the autumn to allow the establishment of crop cover before the winter months.

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3 PHASING OF REMEDIATION MEASURES

The typical progression of each phase of the on-going remediation measures shall be as follows

- Stage 1:** Modification of the shape of the existing waste so it will meet the final contour plan and provide a regular surface for capping and surface water management.
- Stage 2:** Capping of recently filled cells with capping system as per Licence Condition 4.18.2
- Stage 3:** Installation of leachate and gas extraction systems.
- Stage 4:** Implement Surface Water Management Plan
- Stage 5:** Implementation Landscaping Plan

It is anticipated that the restoration works for Cells 1-5 will commence in 2005 subject to EPA approval.

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4 LANDSCAPING

A preliminary report on landscape/visual impact was prepared by Mitchell & Associates, Landscape Architects, as part of the preparation of the EIS (1998) which provided an assessment of the site in visual terms and recommended mitigation measures to reduce the impact of the site on the surrounding landscape. The report identified the main feature on the site as an esker running east to west which forms a ridge line and therefore provides natural screening to the extension area. Views into the existing landfill (Cells 1-5) are isolated along the local access road to the east where gaps occur in the existing hedgerow. The extension areas are well screened by mature trees along the south and eastern boundaries and the main esker to the west. The only other views are to the north which consists of extensive bogland behind a development of woodland. A final landscape layout was proposed for the existing and proposed extension areas which consisted of a mound running in a northerly direction at a height of 114mOD.

A more detailed restoration layout including planting schemes and sections has been prepared by Mitchell & Associates based on an updated topographical survey and on the design of the proposed restoration works contract for Cells 1-5 which forms the basis of this Restoration and Aftercare Plan (Figures 2A and 3A). The proposed landscape layout creates a form that mimics other natural forms in the area with the scale and sweep of the landscape absorbing the mass of the mound into its natural fabric.

The proposal includes for the provision of woodland screen planting consisting of a number of different natural species such as *Alnus glutinosa* ("Black Alder"), *Crataegus monogyna* ("Common Hawthorn") and *Fagus sylvatica* ("Common Beech") along the northern, eastern and southern boundaries of the site. In particular the existing views into the site from the local county road along the eastern boundary will be screened. Additional scrub woodland species will be planted along the slopes to blend in with the existing native planting while a wildflower mix will be planted along the lower slopes and around the base of the woodland planting. The remaining area will be seeded with grass to restore to pastureland (See Figure 2A). A specification for final planting and vegetation maintenance is detailed in Appendix B.

It is proposed to retain the profile of the restored levels of Cell 1 and 2 which is mainly a level area fully grassed. Dense woodland will be provided around the existing entrance area and along the site boundary adjacent to the local county roads.

5 AFTERCARE

North Tipperary County Council propose to restore the site to grassland. The requirement for long-term environmental pollution control systems and monitoring infrastructure will be part of the afteruse. All financial costs associated with the restoration, aftercare and annual maintenance of the site shall be met by North Tipperary County Council.

North Tipperary County Council will be responsible for the aftercare of Ballaghveny 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'. The sections below discuss the necessary operations.

5.1 RESPONSIBILITY FOR AFTERCARE

Under the Landfill Directive it is the responsibility of the Landfill Operator to provide maintenance and aftercare of the landfill site until a final site inspection is carried and the operator responsibility for the site is reduced. The Landfill Operator is also required to provide financial provision for all maintenance and monitoring at the site.

5.2 LANDSCAPING WORKS

As the afteruse of 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 Operator shall advise on the implementation of a landscape plan to establish, maintain and monitor vegetation. A detailed specification for landscaping and vegetation monitoring is provided in Appendix B.

5.3 MONITORING

The EPA Manual on Landfill Monitoring (1995) specifies the following minimum monitoring requirements during the aftercare phase:

Parameter	Aftercare Phase
Surface water levels	Six monthly
Surface water volume	Six monthly
Surface water composition	Six monthly
Groundwater level	Quarterly
Groundwater composition	Annually
Leachate levels	Monthly
Leachate volume	Six monthly
Leachate composition	Six monthly
Landfill Gas	Six monthly
Atmospheric emissions	Six monthly
Meteorological Data	Monthly
Landfill Stability & Settlement	Annually
Noise, dust,	N/A
Odours	Site specific

This monitoring will continue until the Waste Licence is surrendered. The Operator shall 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 aftercare phase to ensure 'that environmental protection systems are functioning fully as intended'.

5.4 SITE MAINTENANCE OPERATIONS

5.4.1 Infrastructural Maintenance

Construction records of all underground systems must be kept for reference so as to prevent damage during works on-site. To protect against vandalism the Operator shall ensure that security and stockproof fencing and gates are maintained adequately.

Gas Extraction System

Regular maintenance of the gas extraction system will be based upon weekly inspections and checks to ensure equipment is operating satisfactorily. Routine maintenance checks will comprise visual checks on the booster and motor assembly of the gas flare and pumps, control panel readouts and general gauges, valves and other fittings as recommended by manufacturers

Servicing of the gas flare should take place bi-annually by the manufacturers and regular servicing of the pumps and manifolds in the gas extraction system.

Leachate Extraction System

Regular inspection of the leachate extraction system is required including a weekly checking of boreholes and a visual inspection for damage or blockage. Regular maintenance of pumps and checking of control systems is also required by the manufacturer.

Servicing of the pumping system should be carried as recommended by the manufacturer.

Capping System

Regular inspection of the capping system is required. This includes a weekly visual inspection for any damage to cover.

5.4.2 Monitoring Programme Maintenance

During the aftercare phase the Operator shall examine all monitoring equipment on a monthly basis to identify areas where maintenance works are required. The Operator shall ensure that all works undertaken will have minimal impact on the afteruse of the restored site. Once pollution control systems are exhausted, redundant equipment and ancillary structures shall be removed.

The pollution control systems as described in Section 2 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 2 are maintained and protected. If remedial works are required then the Operator shall ensure that these works be carried out where possible during the interim restoration phase rather than after full restoration has occurred.

5.4.3 Landscaping Maintenance

The long-term aftercare of the site will require vegetation management and use management of the amenity area. This will require fencing, weeding, cutting and fertilising if necessary having regard to the chosen afteruse of the site.

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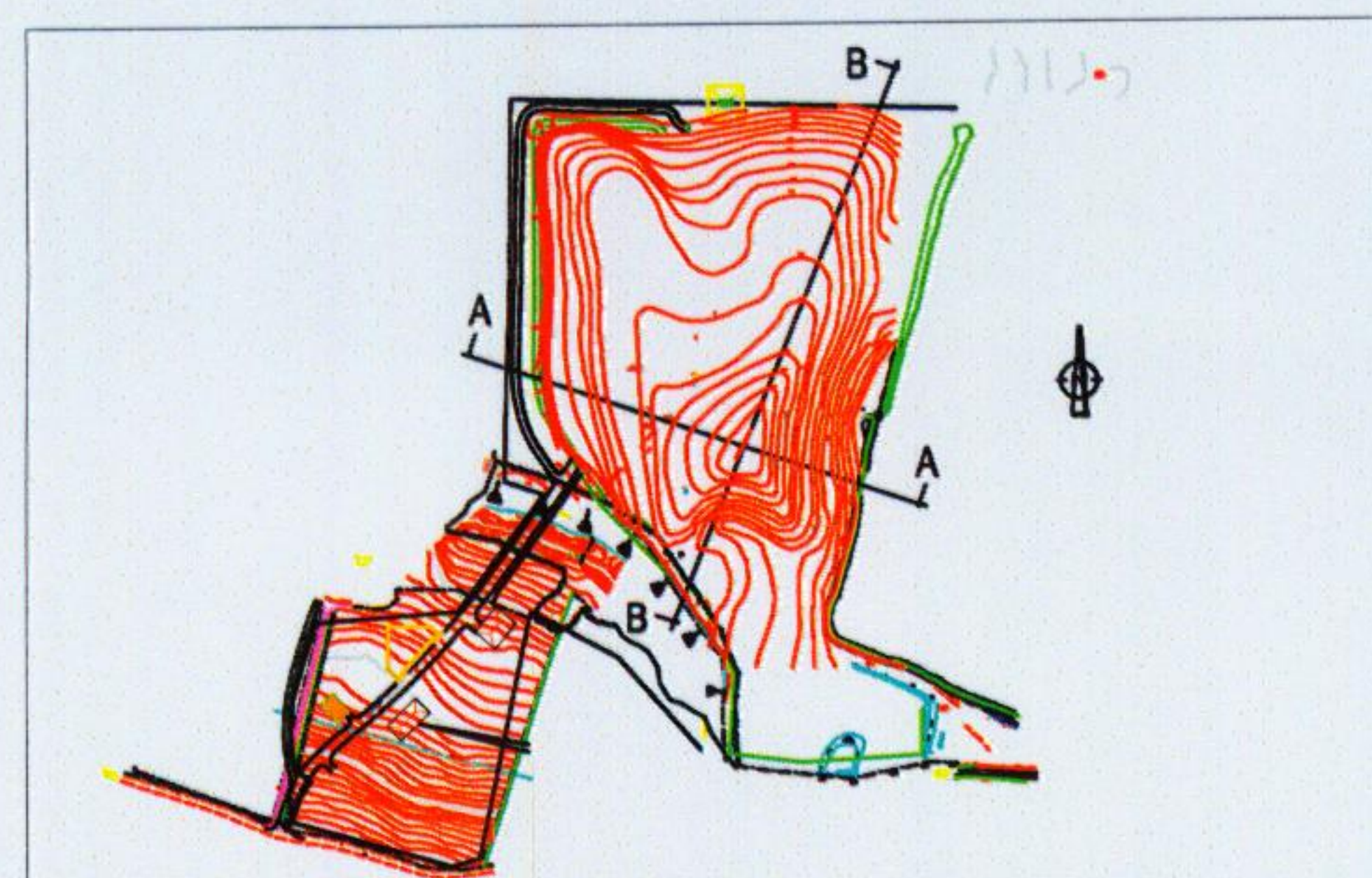
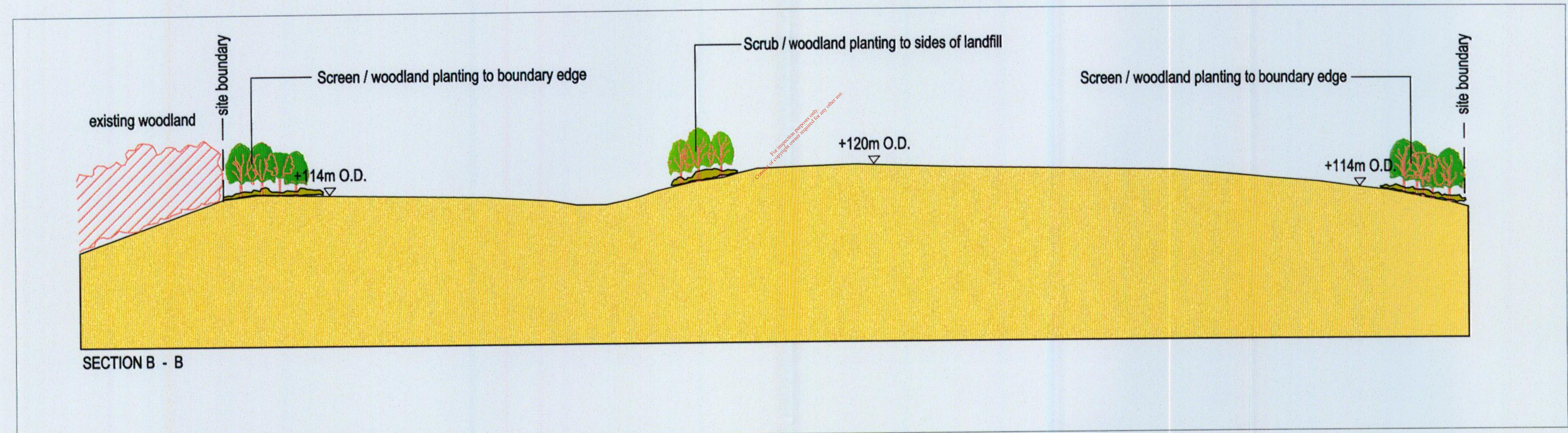
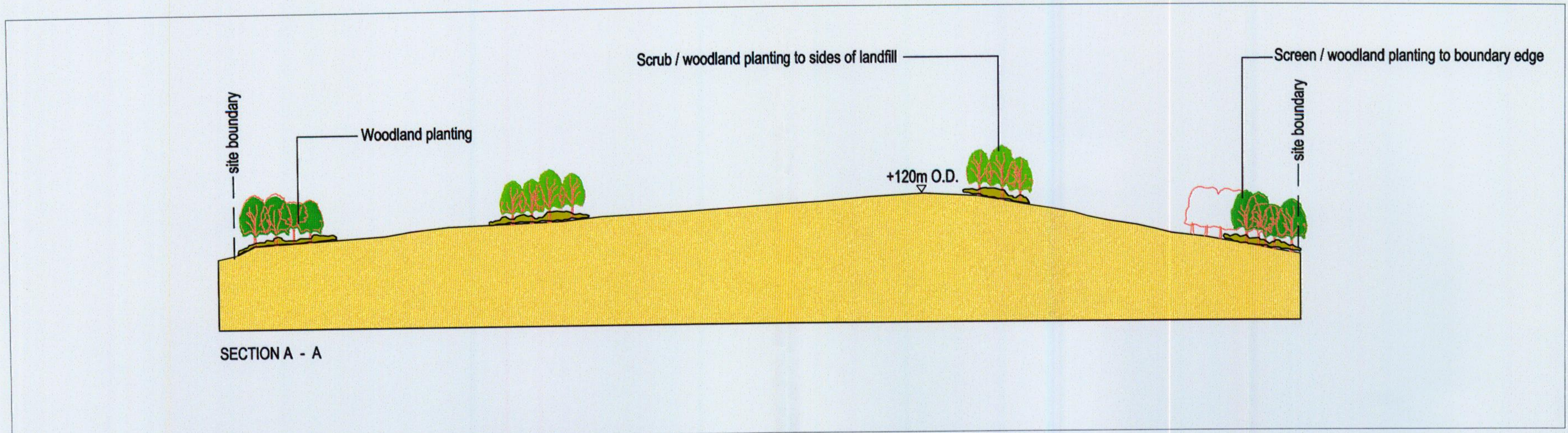
APPENDIX A

Drawings & Figures

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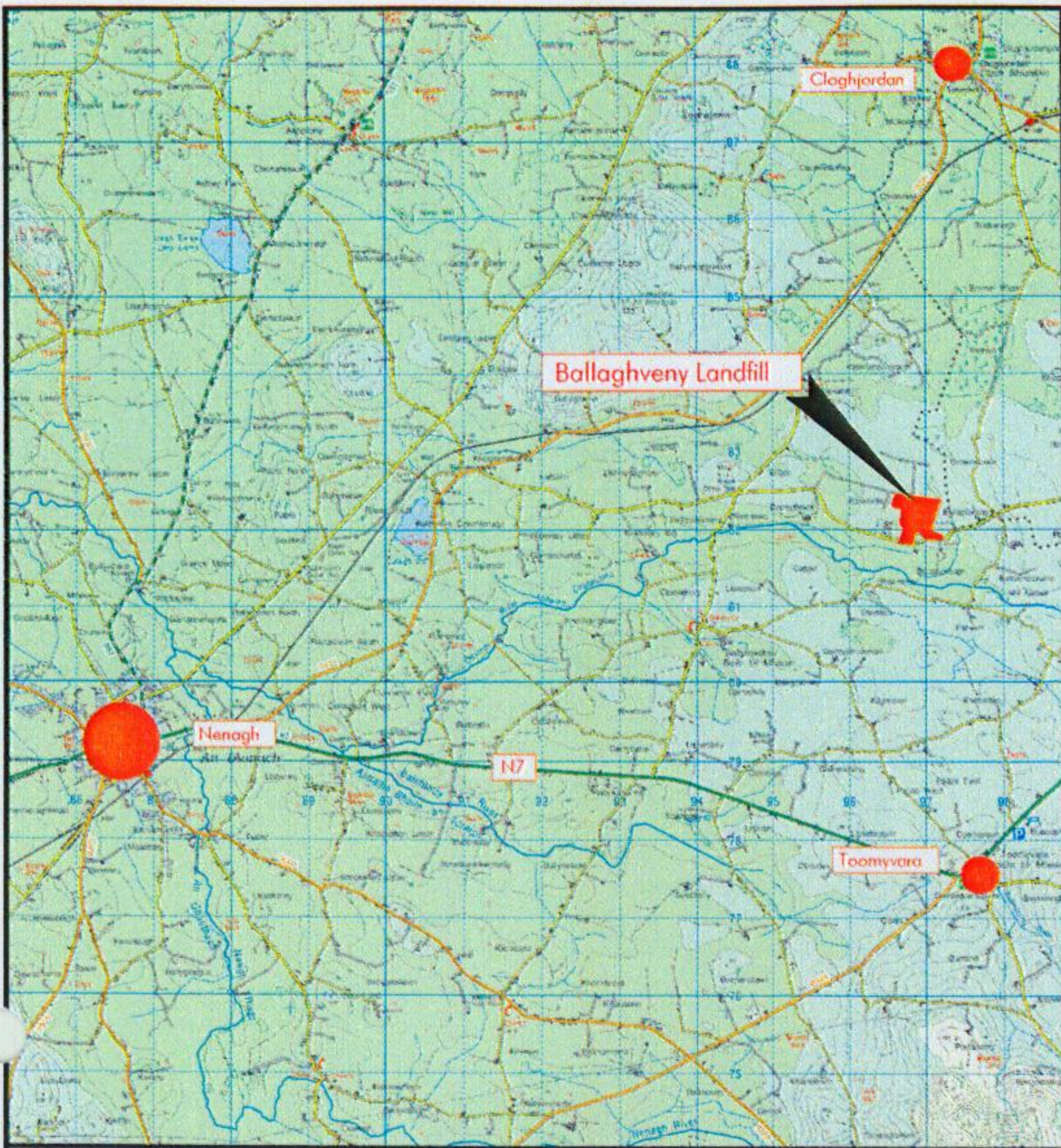


Fig. 2A - LANDSCAPE LAYOUT

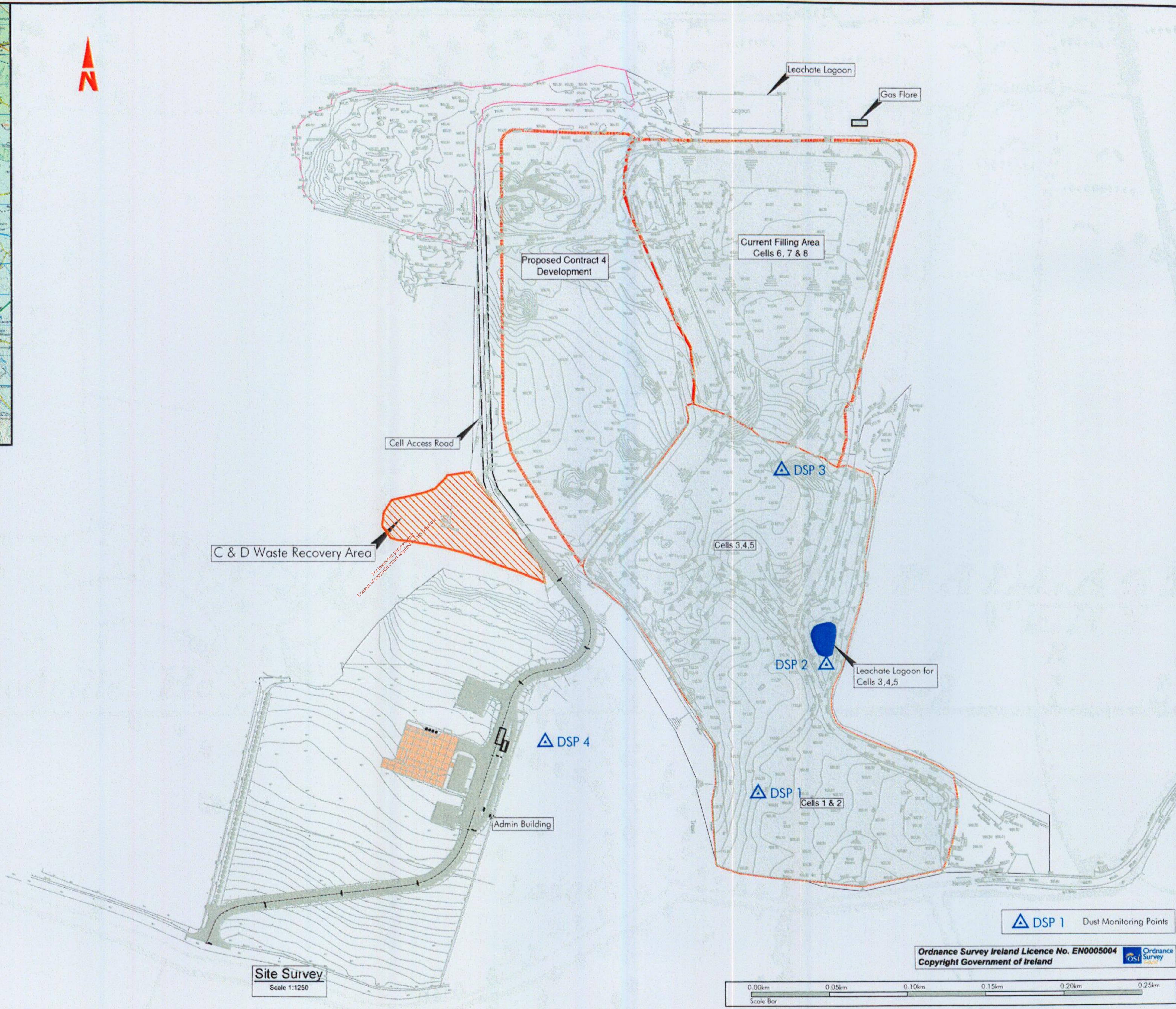


KEY PLAN

Fig. 3A - SITE TRANSECTS



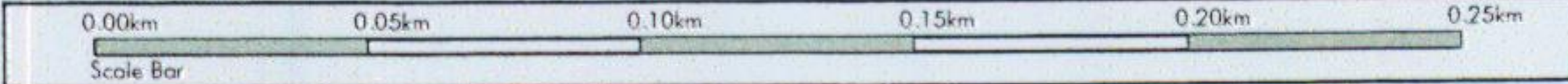
Site Location Map
Not to Scale



Site Survey
Scale 1:1250

△ DSP 1 Dust Monitoring Points

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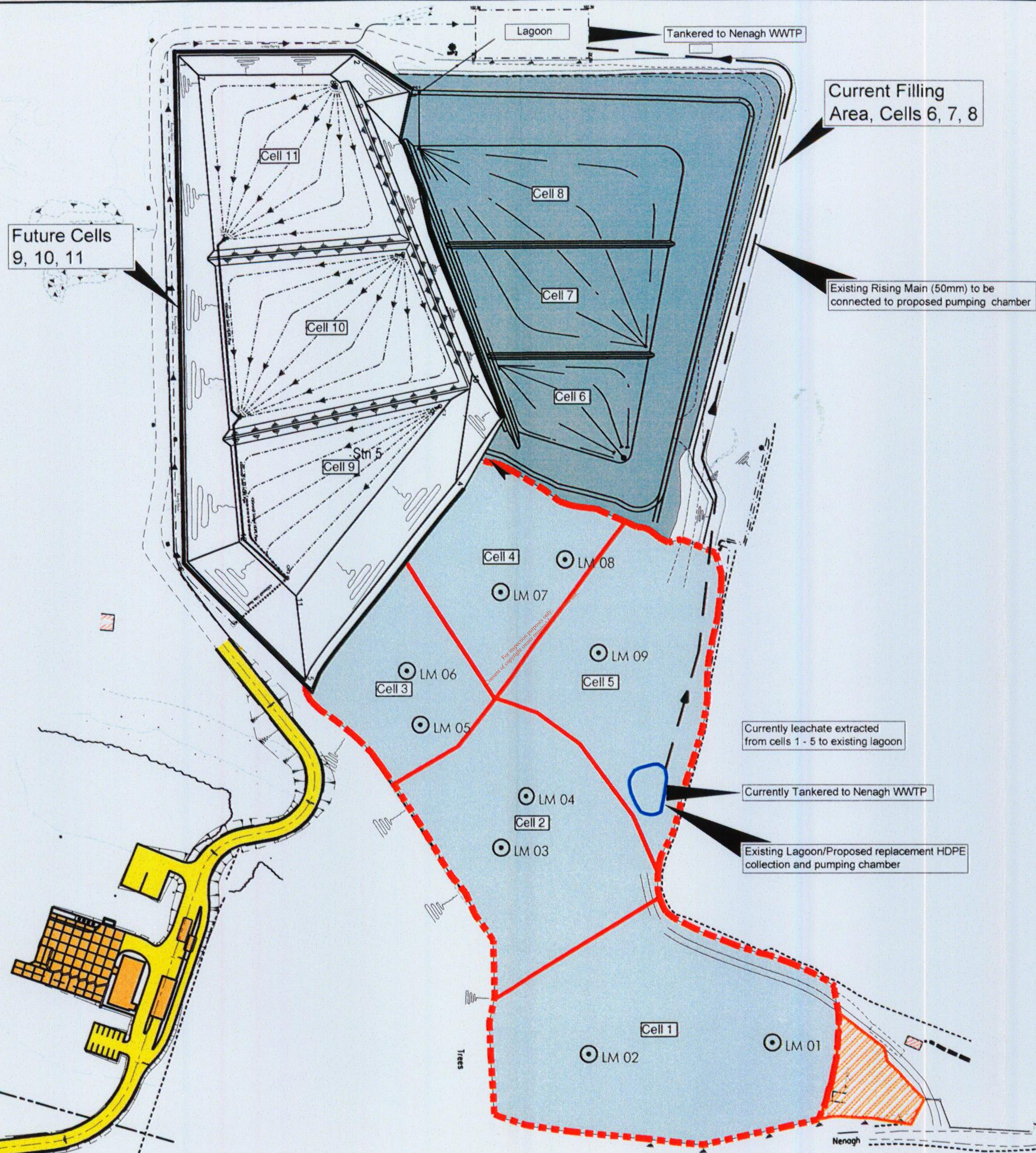
- NOTES**
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F01	5/08/04	CV SA	Final Issue	LM
No.	Date	By	Amendment / Issue	App.

Ballaghveny Landfill-
Waste Licence
Compliance

Title:
**Site Location Map
and Site Survey
Including
Dust Monitoring Points**

Drawn by:	C.N.	Job No:	060504001
Checked by:	SA	File No:	060504001DG0150
Approved by:	LM	Drg. No:	DG0150-01
Scale:	1:1250	Rev:	F01
Date:	Jul '04		



LEGEND

○ LM 00 Leachate Extraction & Monitoring Point

Leachate Extraction & Monitoring Points

Point ID	Easting	Northing
LM 01	197104.656	181918.062
LM 02	197058.842	181913.236
LM 03	197018.321	182005.460
LM 04	197030.485	182028.511
LM 05	196982.074	182060.842
LM 06	196976.093	182084.696
LM 07	197018.732	182119.212
LM 08	197048.194	182133.836
LM 09	197063.816	182092.053

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No.	Date	Amendment / Issue	App.
F01	5/09/04	Final Issue	LM

Ballaghveny Landfill-
Waste Licence
Compliance

Title: Existing & Proposed
Leachate Management System

Drawn by:	C.N.	Job No:	060504001
Checked by:	SA	File No:	060504001DG0152
Approved by:	LM	Org. No:	
Scale:	1:1000 @ A1		
Date:	Jan'04		

	DG0152-02	F01
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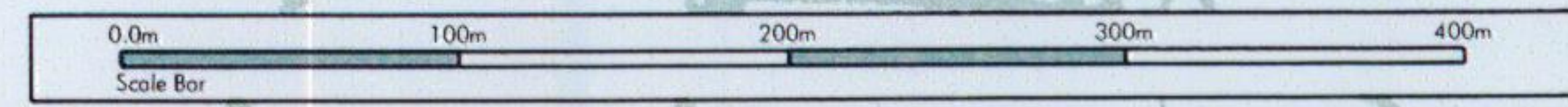


Note:
 Gas extraction wells and connecting pipework to be Designed and provided following final capping of Cells 1 - 5

LEGEND
 ● MP 00 Perimeter Gas Monitoring Boreholes

Landfill Gas Monitoring Points		
Point ID	Eastings	Northings
MP 2	196997.353	182361.999
MP 3	196883.754	182017.25
MP 4	196958.702	181926.926
MP 6	196635.288	182344.196
MP 7	196645.647	182279.134
MP 8	196614.041	182163.582
MP 10	197059.030	182141.466
MP 12	197052.341	182104.486
MP 13	197080.348	182057.682
MP 15	197272.596	181839.335
MP 16	197056.735	181661.865
MP 17	197288.220	181907.165
MP 18	197146.173	182333.275
MP 19	197136.189	182183.235
MP 20	197089.962	182045.080

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No	Date	Amendment / Issue	App
F01	5/08/04	Final Issue	LM

Ballaghveny Landfill-
 Waste Licence
 Compliance

Title:
 Proposed Gas
 Management System

Drawn by:	A D	Job No:	060504001
Checked by:	SA	File No:	060504001DGO152
Approved by:	LM	Drg. No:	
Scale:	1:2000 @ A1		
Date:	Jul '04	DG0152-01	F01



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No.	Date	Amendment / Issue	App.
F01	12/03/04	Final Issue	WM

Ballaghveny Landfill
 Waste Licence
 Compliance

Title: Proposed
 Surface Water
 Management System

Drawn by:	C.N.	Job No:	060504001
Checked by:	SA	File No:	060504001DG0121
Approved by:	WM	Dwg. No:	DG0121-01
Scale:	1:1000	Rev:	F01
Date:	Jan'04		

Drawn by:	C.N.	Job No:	060504001
Checked by:	SA	File No:	060504001DG0121
Approved by:	WM	Dwg. No:	DG0121-01
Scale:	1:1000	Rev:	F01
Date:	Jan'04		

APPENDIX B

Landscaping Specifications

*For inspection purposes only.
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Mitchell + Associates

Architects

Landscape Architects

Master Planners

Fumbally Court, Fumbally Lane, Dublin 8. tel: 01 454 5066 fax: 01 454 5065 e-mail: info@mitchellassoc.net

**PRELIMINARIES AND
SPECIFICATION**

**BALLAGHVENY LANDFILL SITE
LANDSCAPE WORKS**

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1.0 PRELIMINARIES

1.1 Name of Practice

Landscape Architects:

Mitchell and Associates
Fumbally Court
Fumbally Lane
Dublin 8

1.2 Description of Work

The work consists of general works, site preparation, soil preparation, grass seeding, wildflower mix seeding, bulb/corm planting, shrub/groundcover planting, whip planting and tree planting

Exact dates for completion of works will be finalised after the award of the contract.

1.3 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

1.4 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.

1.5 Leaving the Site Tidy

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

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 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.

1.15 Sequence of Operations

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

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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.

1.21 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 shall be native topsoil as removed and stored.

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 sandy loam. 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

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 Urban Parks mix' or similar approved, 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 Wild Flower Seed

Wild Flora Mix is to be 'Coburn's Light Soil mix' or similar approved as supplied by Coburn's, seed merchants. 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 seed is to be thoroughly re-mixed before sowing to avoid patchiness on the ground. The seed can be bulked up with sand to ease distribution, lightly raked or rolled in with a ringed roller, taking care not to bury the smaller seeds. The seed is to be sown at a rate of 5gms per square metre.

2.9 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).

2.10 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.

2.11 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.

2.12 Shrub/Groundcover Sizes

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

2.13 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.

2.14 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 +

2.15 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 melle, 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).

2.16 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.

2.17 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.

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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 plant is watered following planting.

Planting out with 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 for 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 direction) 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 must

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 keaves, 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.