

ATTACHMENT 62  
ENVIRONMENTAL MANAGEMENT PLAN

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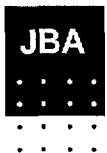
ENVIRONMENTAL PROTECTION  
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**ROADSTONE DUBLIN LIMITED**

**REMEDICATION OF UNAUTHORISED LANDFILL SITES  
AND DEVELOPMENT OF ENGINEERED LANDFILL,  
BLESSINGTON, CO. WICKLOW**

**ENVIRONMENTAL MANAGEMENT PLAN**

**December 2004**



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## 1. INTRODUCTION

### 1.1 Background

This Environmental Management Plan has been prepared by John Barnett and Associates in support of a Waste Licence Application for the remediation of unauthorised landfill sites and development of an engineered landfill on lands owned by Roadstone Dublin in the townlands of Dillonsdown, Deerpark, Newpaddocks and Santryhill, north of the town of Blessington, Co. Wicklow. The plan has been prepared having regards to the EPA Landfill Manual, "Landfill Operational Practices".

### 1.1 Purpose and Scope

An Environmental Management Plan (EMP) is a working document which accommodates the need for certain matters in respect of the proposed remediation scheme to be determined or amended as it progresses through planning, development and implementation stages.

It is anticipated that no construction or remediation works will commence on site without prior approval of the EMP by the Environmental Protection Agency (the Licensing Authority) and that this will be covered by the terms of any licence issued in respect of the proposed remediation scheme.

It is envisaged that amendments to the EMP will either be made by the Licensee, subject to approval by the Licensing Authority, or at the request of the Licensing Authority. No operational procedure will be implemented that is not contained within the approved EMP.

A complete copy of the EMP will be kept on site, and at the principal office of the Wicklow County Council (the Local Authority) The Licensing Authority will be issued with a copy of the EMP and any subsequent modifications thereto.

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## 2 SITE MANAGEMENT

### 2.1 Site Location and Name

The location of the site is indicated in Figure 1, at National Grid Reference 2988E 2157N. The facility will be known as Roadstone Dublin Remediation Landfill.

### 2.2 Licence Holder

The Waste Licence for the remediation scheme and the remediation landfill will be held by Roadstone Dublin Ltd. The plan extent of the proposed licensed area is indicated in Figure 2.

### 2.3 Operator

The management and operational responsibilities for the facility will be borne by Roadstone Dublin Ltd.

Contact: Mr Pat Martin, Director (Pits and Quarries)  
Telephone: (01) 404 1200 Fax: (01) 404 1356

Contact: Mr Mark Prendergast, Remediation Manager  
Telephone: (01) 404 1200 Fax: (01) 404 1356

Site Contact: Mr Paddy Murphy  
Telephone: (045) 865 175 Fax: (045) 865 013

### 2.4 Site Description

The remediation site is located within Roadstone Dublin's landholding, north of Blessington, Co. Wicklow. The plan extent of the company's landholding is outlined in blue on a 1:10,560 scale map of the area, reproduced as Figure 1. The plan extent of the application site is also outlined in red on the same figure.

Roadstone Dublin's total landholding at Blessington currently comprises 276 hectares (682 acres). At the present time, the company extracts sand and gravel from an area in excess of 200 acres to the west of the N81 National Secondary Road. The excavated materials are transferred by conveyor, under the N81, for processing at the washing and screening plant in Doran's Pit.

Reserves of sand and gravel in some areas of the company's landholding have been completely worked out and the company has progressively restored these areas to agricultural and forestry use. To date, approximately 53 hectares (130 acres) have been restored to agricultural use, with a further 60 hectares (147 acres) restored to forestry.

The Waste Licence Application Area comprises the three areas where the unauthorized waste was uncovered, the site of the proposed non-hazardous landfill and the interlinking road network.

### 2.5 Operational Hours

Remediation activities (including development and construction of remediation landfill) are undertaken between 07.30 hours and 17:30 hours each weekday (Monday to Friday) and from 08:00 hours to 13:00 hours on Saturdays. No landfilling is undertaken on Sundays or on Bank / Public Holidays.

### 2.6 Permitted Waste

The proposed remediation scheme provides for excavation and removal of waste buried on Roadstone Dublin's lands. It also provides for processing and recycling of this waste (where possible) and transfer of residual non-hazardous waste to an engineered landfill. All hazardous waste is removed off-site.

No waste, other than that buried on Roadstone Dublin's lands, is accepted at the proposed engineered landfill.

## 2.7 Design Philosophy

The proposed remediation scheme seeks to apply best environmental and landfill operational practices. To this end, maximum effort is made to classify and segregate waste streams, to recover / recycle buried waste wherever possible (predominantly construction and demolition waste) and minimise the amount of waste disposal.

The proposed engineering landfill only accepts non-hazardous waste. Any hazardous waste uncovered at the existing unauthorised landfills is disposed of off-site at properly licensed facilities. The design of the proposed non-hazardous landfill is in excess of the minimum requirements for such a facility set out by the EPA publication 'Landfill Manuals : Landfill Site Design'.

## 2.8 Life Expectancy

The basal and formation works for the engineered landfill facility and the associated long-term infrastructure are constructed prior to excavation and removal of buried waste from the unauthorised landfill sites. Any temporary infrastructure required to facilitate the proposed remediation scheme is also constructed at this stage. The construction period for these works is between three and four months.

Thereafter, the buried waste is to be excavated at the unauthorised landfill sites, inspected, tested and segregated. Construction and demolition waste is recycled where possible. All residual non-hazardous DCI waste is transferred to the engineered landfill facility. Hazardous material is transferred off-site. It is currently estimated that these works will take a further four to six months.

## 2.9 Site Management and Responsibilities

Given the limited duration of the proposed site remediation works, all staff and operatives are employed or seconded on a temporary basis only.

The key staff and their respective responsibilities are highlighted in the table below:-

Name	Position	Duties and Responsibilities
Mark Prendergast	Remediation Manager	Liaison with Regulatory Authorities Ensuring Compliance with Waste Licence Management of all Staff (including seconded consultants and sub-contractors) Management of Plant and Equipment Safety
External Consultant (TBA)	Environmental Scientist	Classification of waste Establishment and monitoring of on-site waste handling and acceptance procedures, including waste transfer, quarantine, testing, processing and acceptance procedures
External Consultant (TBA)	CQA Engineer	Direction and supervision of landfill construction and CQA testing
External Consultant (TBA)	Environmental Manager	Ongoing management of existing / proposed environmental monitoring programme

Safety is the shared responsibility of the Remediation Manager and existing safety personnel employed by Roadstone Dublin.

## 2.10 Record Keeping

The site records to be maintained on site for the duration of the proposed remediation scheme include all of those listed in Section 2.3 of the EPA publication 'Landfill Manuals : Landfill Operational Practices'.

All site procedures, operational plans, environmental and legal consents, Environmental Impact Statement, contract documents (including construction drawings), staff records, external correspondence are maintained by and are the responsibility of the Remediation Manager.

Records in respect of landfill construction / construction CQA will be maintained by, and be the responsibility of, the CQA Engineer.

Records in respect of all waste inspections / classification / testing are maintained by and are the primary responsibility of the Environmental Scientist.

Records in respect of waste processing / acceptance at the non-hazardous are maintained by, and are the responsibility of the Remediation Manager.

Records in respect of environmental monitoring are maintained by, and are the responsibility of the Environmental Manager.

Site inspections are carried out by the Remediation Manager on a daily basis. A site inspection report form is completed by the Remediation Manager in respect of each daily inspection.

All records are maintained and available for inspection at the site office. A copy of all records are forwarded / transmitted electronically to Roadstone Dublin's main office on a weekly basis.

## 2.11 Annual Report

Roadstone Dublin, on an annual basis, in January of each year, provides the following information in an Annual Environmental Report (AER) issued to the EPA :

- Reporting period (year)
- Site name, location and licence number
- Site Manager(s)
- Tonnage and composition of waste processed (Year 1-2 only)
- Rejected waste consignments (Year 1-2 only)
- Plans showing active and restored areas
- Leachate amounts and composition
- Environmental monitoring records
- Copy of complaints register for reporting period.
- Copy of register of pollution incidents for period
- Copy of accident / incident reports for period.

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### 3 SITE INFRASTRUCTURE

#### 3.1 Site Security

Access to the engineered landfill facility on the Roadstone lands at Blessington can be gained via one of two gate entrances, one off the western, northbound carriageway of the N81 National Secondary Route, the other via a minor county road ('Darkers Lane') to the north.

The gates are opened at 07.00 hours each weekday and Saturday morning and are locked again each evening at 18.30 hours (16.30 hours Saturday). During the site remediation works, all materials and plant required to construct and progress the works access and egress the site via the entrance fronting onto the N81.

A paved access road / right of way from Darker's Lane to Roadstone Dublin's landholding which runs through a neighbouring sand and gravel pit (operated by J.W. Carnegie and Co. Ltd.) has been blocked off. Sections of the unpaved track on Roadstone Dublin's land leading to and from this right of way are currently being restored to agricultural grassland.

For the duration of landfill construction, filling and capping operations, manned security is provided at both gates on a 24 hour / 7 day basis. Site security cameras (operational 24 hours/day) and lighting are fixed to the roof of a temporary site office adjacent to the landfill facility. Access to the waste licence application area is restricted by fencing along the application boundary or beyond it, at the boundary of Roadstone Dublin's landholding.

#### 3.2 Site Roads and Parking Areas

The dump trucks transferring waste from excavation areas to the landfill facility are confined within Roadstone Dublin's landholding for the duration of the site remediation works and travel over the existing network of unpaved internal roads and tracks. The extent of paved and unpaved internal roads across the site is indicated on Figure 3.

A temporary unpaved access road runs from the existing internal haul road to the engineered landfill facility. This temporary road is 8m wide and comprises 300mm of Class 6F1/6F2 granular material (as per the National Roads Authority Specification for Roadworks) overlaid by approximately 150mm of Clause 804 sub-base (as per same specification). Temporary access roads required to access or egress each unauthorised landfill area are of a similar construction and specification to that outlined above.

Provision for additional employee car-parking is provided near established offices and staff accommodation facilities in the centre of Roadstone Dublin's landholding (beside the rising conveyor). This parking area is unpaved and is of similar construction to the proposed temporary access roads (ie. 150mm of sub-base over 300mm of capping).

#### 3.3 Hardstanding Areas

A temporary compound for storage of plant, equipment and materials, covering an area of approximately 200m by 75m, is provided west of the unauthorised landfill at Area 1 and the proposed landfill facility. In order to form a hardstanding area, approximately 300mm of Class 6F1 granular fill (as per the National Roads Authority Specification for Roadworks) has been placed and compacted over the existing ground surface and laid to a fall.

A hardstanding area of similar construction is provided east of Area 4 for recovery of any C&D waste encountered above the main body of DCI waste at each unauthorised landfill site.

#### 3.4 Wheelwash and Weighbridge

Dump trucks transferring waste from excavation areas to the landfill facility or the proposed waste inspection / quarantine area is entirely confined within Roadstone Dublin's lands and travels over internal roads and tracks.

In order to prevent transport of mud and potential contaminants on internal and public roads, temporary self-contained wheelwash facilities have been established at the egress from each unauthorised landfill site and the engineered landfill facility, as shown on the site infrastructure layout in Figure 3.

During the initial construction of the landfill liner and site infrastructure and later landfill capping activities, a temporary self-contained wheelwash facility is provided at the end of the existing paved internal access road as shown on Figure 3, in order to prevent the transport of fines onto the public road network by HGV's delivering construction materials to the site. (Details of the temporary wheelwashes are provided in Appendix 2A of the EIS).

A weighbridge is provided along the access track to the proposed landfill facility to record the waste tonnages placed therein. (Details of the weighbridge are provided in Appendix 2A of the EIS).

### 3.5 Laboratory Testing

Laboratory testing of soil, surface water, groundwater and leachate is undertaken off-site at a UKAS accredited geo-environmental laboratory (AlControl Laboratories, Ballycoolin, Co. Dublin). Any validation testing and laboratory testing required to assist classification of waste as either hazardous or non-hazardous is also undertaken by Alcontrol. All samples taken on-site are forwarded to the laboratory on the same day and test results should be forwarded to site within five working days.

Portable monitoring equipment such as pH and temperature meters, conductivity meters, flow meters and dissolved oxygen meters is stored at the site office for the duration of the landfill construction and waste removal, segregation and transfer activities.

### 3.6 Fuel and Oil Storage

Fuel and oil for plant and equipment undertaking the site remediation works is stored at an existing bunded tank facility in Doran's Pit, on the eastern side of the N81 National Secondary Route. Insofar as possible, re-fuelling of all wheeled plant and vehicles takes place at Doran's Pit. Tracked plant and equipment are re-fuelled from a mobile bunded fuel bowser at either of the hardstanding areas located on Figure 3 (at car-parking area or temporary site compound). (Details of the proposed bowser are provided in Appendix 2B of the EIS).

All wheeled plant and vehicles is serviced as necessary using existing facilities at the maintenance yard in Doran's Pit. Tracked plant is serviced off site. Oil and lubricant changes for tracked plant is undertaken at either of the proposed hardstanding areas.

### 3.7 Waste Inspection and Quarantine Area

A temporary waste inspection and quarantine area (partially enclosed to minimise leachate volumes) lies north-east of Area 4 and west of the landfill facility, at the location shown on Figure 3. The waste inspection and quarantine area is sealed by a 150mm thick reinforced concrete slab over 150mm of Clause 804 sub-base (as per NRA Specification for Road Works) and bunded to a design storm volume. Surface water falling on the roof of the enclosed structure is discharged directly to the existing groundwater pond at the centre of Roadstone Dublin's landholding. Any other surface water running over the top surface of the concrete slab is directed toward buried storage tanks with double skin protection. Surface water collected in the buried tanks is transferred to a tanker for disposal off-site at an approved treatment facility.

If there is any concern about the nature of the waste being excavated (ie. hazardous), it is loaded onto a truck and directed to the waste inspection and quarantine area for closer examination and inspection.

If inspections or testing at the waste inspection area identify any hazardous waste which is not acceptable at the proposed engineered landfill facility, it is segregated and temporarily stockpiled (at the quarantine area) or transferred to skips pending removal off-site to a suitably licensed hazardous waste disposal or recovery facility.

### 3.8 Traffic Control

Traffic carrying construction materials to the landfill facility access the site via the main entrance fronting onto the N81 National Secondary Route. Warning notices, speed restriction signs and construction traffic signposting have been established along the paved and unpaved roads leading to the temporary site compound and the landfill facility.

All construction traffic egressing the site is required to pass through a temporary wheelwash facility at the end of the paved internal road, shown on Figure 3.

Waste is excavated at the unauthorised landfills (Areas 1,4 and 6) using conventional tracked excavation plant. On-site inspection and testing determines whether the excavated waste is transferred directly to the engineered landfill or to the waste inspection and quarantine area. All waste is transferred by sealed (i.e. watertight) and covered dump trucks working on a turnaround basis. (Details of the proposed trucks are provided in Appendix 2C of the EIS).

At each area, the dump trucks access and egress the waste body via a temporary down ramp. Once filled, the trucks travel to either the waste inspection and quarantine area or the engineered landfill over the existing internal roads. At the landfill facility, trucks access and egress the tipping face via a temporary down ramp.

### 3.9 Sewerage and Surface Water Drainage Infrastructure

Existing toilet and hand washing facilities are provided for Roadstone Dublin staff currently employed in quarrying activities at the site. Washrooms (with showers) are provided in a portacabin behind (east of) the existing offices at the centre of the site (see Figure 3). A number of temporary self-contained toilet units ('porta-loos') are also provided at the hardstanding area. (Details of the portacabins are provided in Appendix 2D of the EIS).

During the landfill construction and filling, surface water run-off arises from the construction site, lined (but unfilled) parts of the landfill facility, the working landfill face, temporary and permanently capped areas, temporary hardstanding areas and access roads.

In order to reduce the amount of precipitation falling on exposed waste during excavation works at the unauthorised landfill sites (and potential for leachate generation),

- (i) waste is excavated in small areas ('strip mining') so that the rest remains covered;
- (ii) exposed waste in sides of excavation is temporarily covered with inert fill (or alternatively with hessian, plastic sheeting) at the end of each day;
- (iii) any surface water falling within an open excavation is directed to a temporary sump and will be transferred via a collection tanker for disposal off-site at an approved treatment facility;
- (iv) temporary diversionary drains are constructed around open excavations at the unauthorised landfill sites to prevent surface water run-off from surrounding ground, including perimeter screening berms, spilling into the excavations;
- (v) these drains are directed to temporary sumps and soakaways

The engineered landfill, including leachate drainage and collection systems, is constructed prior to the removal, transfer and placement of non-hazardous waste at the engineered landfill, thereby providing significant storage for precipitation collected from the drainage system during the landfilling operation. This surface water run-off is taken off-site to an approved wastewater treatment facility.

At the landfill facility, a surface water management scheme is in place to minimise the volume of surface water entering the waste body. The surface water management system comprises a series of lined ditches which allow run off around the landfill to drain to an intermediate surface water pond, from which discharge to the existing lagoon to the west can be controlled.

The surface water management system is to be in place prior to the transfer of waste to the engineered landfill. (Details of the surface water management system to be established at the site are provided in Appendix 2E of the EIS).

The temporary hazardous waste inspection and quarantine area, including delivery and collection areas, is constructed on a 150mm thick reinforced concrete slab over sub base, with a surface water collection system in place to ensure no run-off will infiltrate into the aquifer. The storage and sorting areas are bunded to a design storm volume. If waste is stored outside of an enclosed area, it is covered with plastic sheeting outside of working hours and in times of heavy rainfall to minimise leachate production.

### 3.10 Site Services

Electric power, lighting and heating are provided to the temporary site office at the site of the engineered landfill facility by a temporary generator / connection to nearby overhead power lines.

Key personnel directing or overseeing the site remediation works are contactable by mobile phone. A telephone landline and fax facilities have been established at the proposed accommodations facilities in the middle of the site.

### 3.11 Plant Sheds, Garages and Equipment Compounds

Plant and equipment are stored at a temporary site compound adjacent to the waste inspection and quarantine area west of the unauthorised landfill at Area 1 and west of the engineered landfill facility. If necessary, plant and equipment may also be stored at existing sheds and garages in Doran's Pit on the opposite side of the N81 National Secondary Road.

Workshops are provided by the construction Works Contractor and/or Roadstone Dublin at the temporary site compound. If necessary, the existing workshops at Doran's Pit are available for servicing of plant employed on the site remediation works.

Small items of mobile or hand-held plant and equipment are stored in storage containers at the temporary site compound.

### 3.12 Site Accommodation

Temporary site offices (portacabins) for administrative and site management staff are located on high ground behind, and north of, the proposed landfill facility, adjacent to the proposed access road. This position allows staff employed by the construction Works Contractor and/or Roadstone Dublin to monitor all construction activity, traffic movements and operational activities at the landfill.

Landfill gas detection sensors are fitted as a precaution in site office accommodation and storage containers at the compound area. Fire extinguishers are also provided for use in fighting small-scale fires should any occur either in the site offices or immediately outside at the landfill site.

Temporary accommodation facilities are provided for personnel employed by the construction Works Contractor and/or Roadstone Dublin at the hardstanding area adjacent to existing facilities in the centre of the site (see Figure 3) for the duration of the landfill construction and remediation works. These facilities include changing (drying) rooms, a canteen and washrooms (with showers). Temporary self-contained toilet units ('portaloos') are also provided in the same area.

### 3.13 Waste Recovery Infrastructure

If a significant volume of C&D waste is mixed through the soils overlying the main body of DCI waste at each unauthorised landfill site, it is transferred to the hardstanding area immediately east of Area 4 in Deerpark or west of Area 1 in Dillonsdown (see Figure 3).

The C&D waste is processed by passing it through a mobile trommel screen fitted with a series of large screening grids and magnets to draw off any recyclable concrete or metal waste. Large boulders, concrete blocks, metal panels, large tyres and other waste which are too large to pass through the trommel are removed by excavation plant and stockpiled separately.

Metal wastes and tyres are transferred by public road to suitably licensed recovery facilities. Where practicable, oversize stone and concrete waste are stockpiled on-site with oversize cobbles and boulders for future crushing. Alternatively, such wastes are transferred to a construction and demolition recycling facility operated by Roadstone Dublin at Fortunestown in south County Dublin. The relatively small volume of residual non-recoverable waste (timber, rope, plastics etc) originally intermixed through the overburden soils are stockpiled separately and transferred to the engineered landfill.

## 4 ENGINEERED LANDFILL DESIGN

### 4.1 General

The design of the proposed engineered landfill has been carried out in accordance with the Environmental Protection Agency's (EPA) Guidance on Landfill Site Design on the basis that the waste placed within the repository is classified as non-hazardous, biodegradable.

The dimensions of the engineered landfill are dictated by the requirement to create a void sufficient to accommodate the volume of waste identified by the environmental investigations undertaken in 2003 plus an allowance for intermixed and contaminated soils and some C&D waste that may be intermixed with, or encountered during the excavation of, DCI waste. The landfill has been designed for a maximum capacity of 175,000m<sup>3</sup>.

### 4.2 Formation Levels and Gradients

The topography of the landfill site provides a relatively flat area bounded on the eastern and western sides by existing slopes formed in sand and gravel. To create the required formation for the landfill, excavation and filling, it is required to generate the basal falls and side slopes. Figure 4 presents the formation model at the underside of the proposed landfill lining system.

The base of the landfill is split into two cells, with a sump located at the western end of each cell. In line with Environmental Protection Agency guidelines, the base of the landfill has been designed to fall at a gradient of 1 in 50 to the sump. In order to aid the lining of the side slopes, a maximum gradient of 1 in 3 has been used. Access ramps into the landfill are constructed at a maximum gradient of 1:10.

In order to minimise the volume of water entering the waste mass and to prevent high concentrations of suspended solids entering the existing groundwater pond to the west of the proposed engineered landfill, a surface water management scheme has been installed. The system comprises a series of lined ditches which allow run off from the landfill to drain to an intermediate pond, in order to encourage settling out of suspended solids and control discharge of the water to the lagoon. Construction details and the location of the ditches and pond are shown in the Surface Water Management Plan.

### 4.3 Bund Design

Around the western boundary of the landfill, containment is provided by a bund constructed as part of the lining system. A bund has also been used to split the basal area of the landfill into two cells. Containment bunds are formed from clay liner material to a height of 2m and overlain with the geomembrane, geotextiles and the leachate drainage layer. Cross-sections through the containment / internal bunds are provided on Figure 5.

### 4.4 Landfill Capacity and Lifespan

Given the degree of uncertainty as to:-

- (i) the exact volume of buried DCI waste at the unauthorised landfill sites;
- (ii) the degree of contamination of in-situ soil (if any) intermixed with the waste;
- (iii) the degree of contamination of soil immediately overlying and underlying the waste;
- (iv) the proportion of non-recoverable material within the C&D waste,

an upper bound volume has been assumed for the unauthorised waste buried at the site and sufficient capacity has been provided within the engineered landfill to accommodate it.

For this reason, the engineered landfill has been designed to provide up to a landfill storage capacity of up to 175,000m<sup>3</sup>. Ultimately however, it is expected that the total volume of waste placed at the landfill will be less than that provided for in design. Any deficit in the volume of waste placed in the constructed landfill shall be made up by excess soil generated by excavation of the landfill void.

In order to provide a degree of flexibility in respect of timing of the excavation of each of the waste bodies and mixing of soils with the waste during excavation, the landfill design has been developed to provide flexibility to accommodate variations in the volumes and timing of the excavation, whilst minimising leachate generation (by minimising infiltration).

The basal and formation works for the engineered landfill facility and the associated long-term infrastructure are constructed prior to excavation and removal of buried waste at the unauthorised landfill sites. Any temporary infrastructure required to facilitate the proposed remediation scheme is also constructed at this stage.

Thereafter, the buried waste is excavated at the unauthorised landfill sites, inspected, tested and segregated. Construction and demolition waste is recycled where possible. All residual non-hazardous DCI waste is transferred to the engineered landfill facility. Hazardous material is transferred off-site.

#### 4.5 Basal and Side Slope Liner Design

The design of the lining system exceeds the requirements for a residual non-hazardous biodegradable landfill set out by the Environmental Protection Agency. The lining system comprises the following elements: geotextile separator, leachate drainage, geotextile protection layer, 2mm thick HDPE geomembrane, geosynthetic clay liner and 1m thick clay liner of permeability (k)  $< 1 \times 10^{-9}$  m/s.

Prior to commencing on site, the Works Contractor is required to prepare a detailed method statement covering all aspects of the construction works. He is also required to prepare a detailed health and safety statement in advance of the Works.

The construction of the landfill shall be subject to a process of construction quality assurance (CQA) by an external independent consultant appointed by the Applicant. Details of CQA procedures to be implemented on site are set out in the CQA Plan approved by the Environmental Protection Agency. The construction Works Contractor is required to prepare and submit a detailed method statement and health and safety plan addressing all aspects of the Works prior to commencement of construction.

In addition to presenting the specification for the works, the CQA Plan presents details of monitoring procedures, compliance (pre-commissioning) testing (including leak detection surveys) and records to be maintained by a CQA Engineer based on site for the duration of the landfill construction works.

The following sections describe each of the materials used within the lining system and highlights the principal performance criteria to be considered for each.

##### *Geotextile Separator*

Due to the likelihood of a high percentage of the waste mass comprising fine graded soils, there is a greater risk of fine particles being washed from the waste into the underlying leachate drainage blanket. To prevent this from occurring, a geotextile separator is included above the leachate drainage blanket. This material is a non-woven thermally bonded geotextile, this type of geotextile is ideally suited as a separator as it has good hydraulic properties and a small apparent pore size. Details of the material specified and CQA procedures to be implemented are set out in the CQA Plan.

##### *Leachate Drainage Blanket Material*

A 500mm thick leachate drainage blanket extends over the base of the landfill, up the perimeter slopes. The blanket is initially to be installed to a height of 2m vertically above the base of the landfill to minimise the possibility of strains in the liner, prior to the placement of the waste. Subsequent lifts in the leachate drainage blanket are to be undertaken in line with the input of waste. The drainage media comprise a clean graded aggregate produced by Roadstone Dublin from its existing facilities on site.

The leachate drainage blanket is to achieve a minimum permeability  $1 \times 10^{-3}$  m/s. The drainage stone should have a nominal grading of 10-20mm, but this should be reviewed following cylinder testing of the geotextile protector. A detailed specification and CQA procedures for the supply and installation of the leachate drainage blanket is set out in the CQA Plan.

##### *Geotextile Protector*

The geotextile protector lies between the leachate drainage blanket and the geomembrane. This material will be a non-woven needle punched geotextile, which will act as a cushion to the drainage stone reducing the strains on the underlying geomembrane as the waste load is applied. The selection of the specific product to be used will be based upon a successful cylinder test, which will demonstrate that the strains induced on the geomembrane element of the lining system will not exceed a tolerable limit of 0.25%. Details of the cylinder test and CQA procedures for the supply and installation of the geotextile protector are set out in the CQA Plan.

#### *Geomembrane*

A 2mm thick high density polyethylene (HDPE) geomembrane is installed directly above and in intimate contact with the underlying geosynthetic clay liner. It extends over the whole of the lined area and is anchored around the perimeter of the site. The geomembrane is fully welded and subjected to a rigorous CQA procedure. A detailed specification and CQA procedures for the supply and installation of the geomembrane is set out in the CQA Plan.

#### *Geosynthetic Clay Liner*

The geosynthetic clay liner consists of a factory manufactured composite matting comprising a bentonite layer, approximately 6mm thick between two layers of geotextile. It is installed directly above and in intimate contact with the underlying natural clay liner

#### *Clay Liner*

A suitable source of clay liner material (glacial till) has been identified off-site at the Roadstone Dublin's Huntstown site in North County Dublin. This material is imported to site via road for the basal liner construction. This material is subject to controlled compaction in-situ to achieve a permeability of less than  $1 \times 10^{-9}$  m/s.

On site the clay is placed in a series of discrete lifts 250mm thick, using a sheepsfoot roller to prevent forming laminations and therefore ensure the clay forms a homogenous mass. A detailed specification and CQA procedures for the supply and installation of the clay liner is set out in the CQA Plan.

### **4.6 Leachate Management System**

The leachate management system has been designed to collect the leachate from the base of the waste mass and to allow it flow to two extraction sumps, one in each cell. In addition to the leachate drainage blanket, a herringbone system of pipework has been included in the base of each cell to aid the flow of the leachate to the sump at the lowest point of the collection system, as detailed on Figure 6. A maximum head of 1m of leachate is maintained above the top of the basal liner.

The leachate drainage pipework is manufactured from HDPE and required to withstand the loadings anticipated from the overlying waste. Spacing of the pipework has been designed to provide a degree of redundancy against blockage or malfunction of the drainage systems.

At the sump a vertical extraction system is constructed comprising concrete rings. Two monitoring wells have also been included, one in each of the proposed cells.

Due to the presence of fine soils within the waste mass, there is an increased likelihood of clogging of the leachate drainage pipework. In order to minimise the risk of clogging the main leachate collection pipework extends from the eastern boundary to the west, making it accessible from either end to enable inspection and cleaning.

Leachate produced and collected within the lined landfill is transferred via submersible pumps at the leachate extraction wells directly to road tankers and taken off-site to an existing local wastewater treatment plant. A telemetry system is installed to monitor leachate levels within the landfill at leachate monitoring and extraction wells. This allows site personnel to monitor leachate build up on a daily basis and to ensure timely removal and transfer of leachate off-site to the wastewater treatment facility.

Notwithstanding this, provision has been made in design for re-circulation of the leachate within the waste body. The re-circulation system comprises a number of trenches excavated in the final waste levels within which a 150mm diameter perforated HDPE pipe is installed and then backfilled with granular material, as detailed on Figure 7. Leachate is pumped from the extraction wells into the perforated pipe which then seeps out into the waste through the granular fill.

During construction uncontaminated rainwater run-off collecting in the empty landfill cells is discharged via the surface water collector channel to the intermediate surface water pond. Thereafter, as waste is placed within the landfill, leachate is transferred to road tankers and taken off-site to an approved treatment facility.

### **4.7 Landfill Gas Management System**

The landfill design has incorporated details for the passive venting of gas from beneath the capping system. The volume of gas released to the atmosphere is relatively low and is significantly diluted. The

proposed passive venting system will have the capability to connect the vents to a small flare should monitoring ever indicate that landfill gas production rates are sufficiently high.

Passive vents are installed as landfilling operations progress and comprise 180mm diameter perforated HDPE pipe installed either

- (i) through the waste body in a 300mm diameter bore, backfilled with pea gravel or
- (ii) along the gas drainage layer beneath the capping,

and connected to 180mm diameter solid HDPE pipes protruding through the capping layer and extending approximately 1.5m to 3m above ground level. Details of the gas management system are presented on Figure 8.

#### 4.8 Capping and Restoration

As waste is transferred and placed in the lined landfill, there is a requirement for daily cover of exposed waste at the end of each working day or before a weekend or extended holiday period. Exposed waste in the landfill is covered by 100mm to 150mm of available soil cover or alternatively with hessian, degradable plastic sheeting or recovered construction and demolition waste.

The landfill may be developed in a number of phases and may require the installation of a temporary cap. If so, it is envisaged that this will comprise 1mm thick LLDPE geomembrane and the gas collection layer, such that if the remainder of the waste is never placed within the landfill then the overlying layers of the permanent system can be installed.

The permanent capping system comprises the following elements: 150mm thick topsoil layer, 850mm thick subsoil layer, 500mm thick drainage layer of minimum permeability  $1 \times 10^{-4}$  m/s, and 1mm thick linear low density polyethylene (LLDPE) geomembrane over a geosynthetic clay liner (GCL) and a 300mm thick gas collection layer of minimum permeability  $1 \times 10^{-4}$  m/s.

Suitable restoration soils and materials for each of the drainage layers are to be sourced elsewhere within the Doran's Pit site. Construction details for the capping and restoration, including final restoration contours, are presented on Figure 7.

The capping installation works shall be addressed by the method statement and health and safety statement prepared by the construction Works Contractor. A detailed specification and construction quality assurance (CQA) procedure covering the supply and installation of materials used in the capping and restoration is set out in a CQA Plan.

Following completion of capping and restoration works, provision shall be made for long-term monitoring of the quality of environmental media in the immediate vicinity of the landfill – soil, air, surface water and groundwater.



## 5 WASTE HANDLING AND EMPLACEMENT

### 5.1 Proposed Remediation Works

The remediation works at each of the three unauthorised landfill areas on the Roadstone lands at Blessington essentially comprises

- (i) excavation and removal of all buried domestic, commercial and domestic waste from unauthorised landfills at Areas 1, 4 and 6;
- (ii) segregation and transfer of unacceptable waste off-site
- (iii) recycling and temporary stockpiling of construction and demolition waste
- (iv) transfer of residual non-hazardous waste and acceptable hazardous waste to the proposed engineered landfill facility.

At each of the three unauthorised landfill areas, site preparatory works include construction of approximately 3m to 5m high earth mounds around the boundary using the inert soils overlying the main body of waste. The earth mounds are principally intended to screen on-site activities from external view, but also provide an extra degree of security and safety.

The overburden soils are excavated in a safe and systematic manner using conventional tracked excavation plant.

If significant volumes of construction and demolition waste are mixed through the overburden soil, it is transferred to the recycling areas east of the unauthorised landfill at Area 4 or west of Area 1 and separated out by passing it through a mobile trommel screen. The trommel is fitted with a series of large screening grids and magnets to draw off any recyclable concrete or metal waste. Large concrete blocks, metal panels, oversize tyres and other wastes which are too large to pass through the trommel are removed by excavation plant and stockpiled separately to the overburden soil.

Metal wastes and tyres are transferred by public road to suitably licensed recovery facilities. Where practicable, oversize stone and concrete waste are stockpiled on-site with oversize cobbles and boulders for future crushing and/or re-use in construction of temporary haul routes within Roadstone Dublin's landholding. Alternatively, such wastes are transferred to a construction and demolition recycling facility operated by Roadstone Dublin at Fortunestown in South County Dublin. The relatively small volume of residual non-recoverable waste (timber, rope, plastics etc) originally intermixed through the overburden soils are stockpiled separately and ultimately transferred to the engineered landfill.

A programme of soil sampling and validation testing has been established to confirm that separated overburden soils are inert and free of contamination before they are re-used for site restoration and reclamation works.

A minimum of 150mm of soil is left in place over the main body of domestic, commercial and industrial waste prior to its excavation and removal, in order to prevent windblown litter, odours etc. Where necessary, any existing leachate within the waste bodies is removed by active pumping from existing boreholes to a mobile tanker prior to excavation and transferred to an approved / agreed wastewater treatment plant. Where required, sumps are constructed in advance of excavation works to facilitate collection and extraction of any residual leachate within the waste bodies.

The DCI waste in each area is excavated in a systematic and controlled manner ('strip mining') using conventional tracked excavation plant.

If the excavated DCI waste is considered on the basis of visual inspection, in-situ monitoring and testing to be non-hazardous, it is placed directly onto sealed (watertight) dump trucks, covered and immediately transferred to the proposed engineered landfill facility. The waste acceptance criteria (including those for acceptance of hazardous waste at non-hazardous landfill facilities) are based on the European Council decision of 19 December 2002 (made pursuant to Article 16 of and Annex II to Directive 1999/31/EC).

Where visual inspection, in-situ monitoring and testing indicates the presence of potentially hazardous or unacceptable material within the excavated DCI waste, it is segregated, placed onto sealed trucks and transferred to the enclosed waste inspection and temporary quarantine area, refer to Figure 3, whereon the waste will be subject to more detailed classification testing. Any hazardous material which

is not acceptable at the proposed engineered landfill is transferred off-site to an appropriately licensed hazardous waste disposal or recycling facility.

During excavation operations, efforts are made to ensure that the area of waste exposed to the atmosphere is minimised insofar as possible in order to limit odour emissions. Exposed waste is covered at the end of each working day with any available soil cover or alternatively, with hessian, impermeable PVC sheeting or recovered construction and demolition waste.

Excavation side slopes are benched and graded as necessary to prevent instability. The width and gradient of temporary access roads into each excavation are sufficient to ensure safe access and egress of plant and personnel. A programme of gas monitoring has been established around and within each excavation to monitor ambient concentrations of landfill gas and to safeguard the health and safety of site staff and operatives. In order to minimise dust emissions at each excavation area, water from a tractor drawn bowser is sprayed on dry exposed soil and waste as and when required.

#### *Area 1 : Dillonsdown*

At Area 1 in Dillonsdown, the environmental investigations indicated that the depth of generally inert and uncontaminated overburden cover above the main body of waste varies from approximately 9m in the centre of the site to approximately 2m or less around the perimeter. The maximum depth of excavation at this site is of the order of 15m below existing ground level.

While the waste body is generally dry, confined pockets of leachate were observed within the waste during the environmental investigations. The volume of domestic, commercial and industrial waste imported to Area 1 is estimated to be 48,000m<sup>3</sup> (36,000 tonnes). The overburden material mainly comprises glacial till and dried out fine sandy silt intermixed with occasional construction and demolition waste. (The sandy silt is a by-product of sand washing activity elsewhere at the Doran's Pit complex)

#### *Area 4 : Deerpark*

At Area 4 in Deerpark, the environmental investigations indicated that the depth of generally inert and uncontaminated overburden cover above the main body of waste varies randomly from 2.5m to 6m depth. The maximum depth of excavation at this site is of the order of 7m below existing ground level.

The waste body is generally dry, although confined pockets of leachate were observed within the waste during the environmental investigations. The volume of domestic, commercial and industrial waste imported to Area 4 is estimated to be 3,750m<sup>3</sup> (2,800 tonnes). The overburden material mainly comprises glacial till and dried out fine sandy silt intermixed with occasional construction and demolition waste.

#### *Area 6 : Newpaddocks*

At Area 6 in Newpaddocks, the environmental investigations indicated that the depth of generally inert and uncontaminated overburden cover above the main body of waste is between 2m and 3m deep. The maximum depth of excavation at this site is of the order of 8m to 9m below existing ground level.

The waste body was generally found to be dry above 5m or 6m depth, but below this depth it became increasingly wet to approximately 8m depth. It appeared from initial investigations that leachate generated by waste decomposition was ponding over an underlying, relatively impermeable layer of silt.

Three sumps extending to underside of waste level are constructed close to the site boundary prior to commencement of the bulk excavation in order to collect any leachate held within the buried waste. Leachate flowing into these sumps is pumped to a mobile tanker and transferred to a local wastewater treatment plant (or similar facility licensed to accept such liquid waste).

The volume of domestic, commercial and industrial waste imported to Area 6 is estimated to be 18,000m<sup>3</sup> (13,500 tonnes) The overburden material mainly comprises glacial till and dried out fine sandy silt, intermixed with occasional construction and demolition waste.

The residential housing immediately beyond the site boundary is likely to be sensitive to dust and odour emissions generated by the excavation, stockpiling and processing activities at this site. A gas venting trench was installed beyond the eastern and southern boundary of the waste body at Area 6 in November / December 2003. The vent trench extends from ground level to approximately 1m to 2m below the waste body and was installed to inhibit lateral migration of landfill gas through the ground toward the adjacent residential development. The gas venting trench will remain in place following removal of the domestic, commercial and industrial waste to inhibit lateral migration of any residual

landfill gas. A number of passive landfill gas vents were also installed in December 2003/ January 2004 to reduce the potential odour impact of the excavation works.

Given its proximity to recently constructed residential housing, a mist scrubbing system may need to be established to reduce potential odour nuisance caused by waste excavation activities in Area 6. This system operates by spraying mist droplets of odour suppression solution through nozzles on a boom located in close proximity to uncovered waste and shall be automated to ensure that it is operational only when winds blow from a critical pre-set direction and below a certain speed.

## 5.2 Waste Transfer to Engineered Landfill

Only the residual non-hazardous DCI waste excavated within Roadstone Dublin's landholding at Doran's Pit is accepted at the engineering landfill facility. No waste from external sources is accepted or placed at the landfill.

Landfilling operations are undertaken between 07.30 hours and 17.30hours Monday to Friday and 08.00hours to 13.00 hours on Saturdays. No landfilling is undertaken on Sundays or public holidays. The haul routes to the proposed engineering landfill from each of the three unauthorised landfill areas are indicated on Figure 3.

All waste unloaded from trucks at the engineered landfill facility is visually inspected by site staff to ensure that no hazardous waste or other unacceptable waste is placed within it. Any potentially hazardous or unacceptable waste identified amongst the existing buried waste is segregated and brought to the waste quarantine area for detailed classification. Any material which is not acceptable at the non-hazardous engineered landfill is removed off site to a suitably licensed hazardous waste disposal or waste recycling facility.

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## 6 RESTORATION AND AFTERCARE

Following excavation and removal of buried waste at each unauthorised landfill area, the resultant void will be partially backfilled using the inert overburden soils used in the construction of the 3m to 5m high boundary earth mounds.

As soon as practicable thereafter, backfilling of the remaining void space will be completed either using fine sandy silt (dried) generated by washing activity elsewhere on the landholding or excess soils arising from excavation of the landfill void.

In the longer term, placement of dried out silt will continue at and around each site in order to better merge them back into the surrounding undulating pastoral landscape. The ground surface will be profiled to give a domed shape in order to facilitate surface water run-off to existing ponds and lagoons within Roadstone Dublin's landholding. Due regard will be had in profiling to possible settlement and consolidation of the inert backfill materials. At no time will surface water run-off be directed to watercourses or ponds beyond Roadstone Dublin's landholding. When restoration in each area is finally complete, the soils will be grassed.

Permanent capping of the engineered landfill and subsequent site restoration will be undertaken in accordance with the detail provided in Figure 7. A detailed specification and construction quality assurance (CQA) procedures covering the supply and installation of materials used in the capping and restoration will be set out in a CQA Plan.

The restoration of the area around the engineered landfill will also make provision for the restoration of disturbed ground in the vicinity of the rare plant *Erigeon Acer* using gravel of a similar size so as to create conditions for natural colonisation.

Any temporary site accommodation, infrastructure and services established for the duration of the site remediation and landfill construction works will be decommissioned and/or removed off-site.

Wherever possible, hardstanding surfaces will be broken up using a hydraulic breaker and subjected to validation testing to confirm the materials are acceptable for re-use in ongoing land restoration works. Any of these materials which are found to contain unacceptable levels of contamination will be transferred to a suitably licensed waste disposal facility.

The final phase of the works, final landfill capping and site restoration will be undertaken by an external Works Contractor. This work is expected to take no more than one to two months.

Following completion of capping and restoration works, provision will be made for the long-term monitoring of the quality of environmental media in the immediate vicinity of the landfill – soil, air, surface water and groundwater.

## 7 ENVIRONMENTAL CONTROLS

### 7.1 General

The environmental remediation works on Roadstone Dublin's lands includes a number of environmental controls to eliminate or minimise the nuisance to the public arising from the excavation of buried waste and its subsequent transfer and placement in the engineered landfill. These control measures are outlined in detail in the following sections.

### 7.2 Bird Control

The excavation and placement of putrescible (food / kitchen) waste may attract scavenging birds such as gulls and crows during the site remediation works. In order to minimise the number of birds attracted to the exposed waste areas, the following measures are implemented:-

- (i) the area of exposed waste (active area) is minimised, both during excavation and subsequent placement in the engineered landfill;
- (ii) exposed waste is covered at the end of each working day with any available soil cover or, alternatively, with hessian, plastic sheeting or recovered construction and demolition waste and netting is provided as and when required around the active excavation and landfilling areas to restrict access to the exposed wastes.

If these measures are insufficient to control the number of scavenging birds, consideration will also be given to employing external contractors to provide trained birds of prey such as falcons or hawks to disperse them.

### 7.3 Dust Control

In dry, windy weather conditions, the remediation activities may give rise to dust blows across, and possibly beyond the site. In order to control dust emissions, the following measures are implemented:-

- (i) water from a tractor drawn bowser is sprayed on dry exposed soil / waste surfaces (including unpaved road surfaces) as and when required;
- (ii) the area of exposed waste (active area) is minimised, both during excavation and subsequent placement in the engineered landfill;
- (iii) open excavations are backfilled and grassed as soon as practicable after waste excavation and removal has been completed;
- (iv) the engineered landfill will be temporarily or permanently capped as soon as practicable after the waste emplacement is complete. Capping layers will be grassed to minimise soil erosion and potential dust emissions;
- (v) a temporary wheelwash facility is installed at the end of the paved internal access road (refer to Figure 2.2). This measure will prevent transport of fines on both the paved access road and the public road network by HGVs delivering construction materials to the site.
- (vi) temporary wheelwash facilities are installed at the access and egress to each unauthorised landfill and the proposed landfill facility.

The amount of dust or fines carried onto the public road network is further reduced by ongoing, regular sweeping of the paved internal access road and the existing N81 National Secondary Road immediately in front of Roadstone Dublin's landholding.

### 7.4 Litter Control

In order to reduce the amount of windblown litter arising from the excavation and placement of the waste at this site, the following measures are implemented:-

- (i) the area of exposed waste (active area) is minimised, both during excavation and subsequent placement in the engineered landfill;
- (ii) exposed waste is covered at the end of each working day with any available soil cover or, alternatively, with hessian, plastic sheeting or recovered construction and demolition waste;
- (iii) all trucks transferring waste between the unauthorised disposal sites and the engineered landfill are required to use netting or a tarpaulin cover;

- (iv) netting is provided around the active excavation and landfilling areas in order to catch any windblown litter. Litter caught in the netting is collected on a regular basis and placed in the active landfilling area and
- (v) loose litter falling around the excavation areas, the proposed haul routes, the engineered landfill and surrounding areas is manually collected on a regular basis and placed in the active landfilling area.

If, despite these measures, windblown litter manages to escape beyond the boundary of Roadstone Dublin's landholding, site staff should seek the permission of adjacent property owners to enter their land / gardens to recover any litter.

### 7.5 Odour Control

In order to reduce the odour emissions from the biodegrading waste at this site, the following measures are implemented:-

- (i) the area of exposed waste (active area) is minimised, both during excavation and subsequent placement in the engineered landfill;
- (ii) exposed waste is covered at the end of each working day with any available soil cover or, alternatively, with hessian, plastic sheeting or recovered construction and demolition waste;
- (iii) passive venting wells were installed at the most critical unauthorised landfill site (Area 6) in December 2003 and January 2004. The installation of these wells prior to the excavation and transfer of waste to the engineered landfill encourages prior vertical dispersion of potentially odorous landfill gas;
- (iv) site staff walk over the landfill on a regular basis (at least once per week) to identify any leakage areas as part of the landfill gas management plan;
- (v) sufficient cover is provided when placing temporary or permanent capping at the engineered landfill to limit formation of leakage areas;
- (vi) a soil binding agent (i.e. grass) is placed over capping layers to minimise soil erosion and potential fugitive gas emissions and
- (vii) when removing leachate from wells or sumps for off-site treatment, the tanker pipe is lowered beneath the free surface of the leachate in order to minimise agitation and the potential volatilisation of odorous compounds.

Should odour emissions cause a nuisance during the excavation and removal of waste, close to residential housing at Area 6, a mist-scrubbing system shall be established and used to absorb odorous gases emitted by biodegrading waste

### 7.6 Vermin Control

The excavation and placement of putrescible (food / kitchen) waste may also attract vermin (rats) and flies during the site remediation works. In order to control the population of vermin in the vicinity of the site remediation works, the following measures are implemented by external contractors appointed by Roadstone Dublin:-

- (i) regular application of rodenticides and, when required, of insecticides around the remediation sites and
- (ii) laying of bait at regular intervals around the remediation sites.

Dead or dying rats are collected and removed by an appointed vermin control company in order to avoid attracting interest from scavenging animals / birds and minimise the spread of disease.

### 7.7 Fire Control

Site operational practices will focus on prevention of fires at the three unauthorised waste disposal sites and at the engineered landfill facility. In order to reduce the risk of fire at the site, the following measures are implemented:-

- (i) smoking in the vicinity of the unauthorised waste disposal sites and the engineered landfill facility is prohibited
- (ii) exposed waste is covered daily using any available soil cover;
- (iii) plant and equipment are fitted with spark arrestors and are removed if they exhibit signs of overheating etc.

In the unlikely event that a fire does occur, the local fire station in Blessington will be contacted and emergency response procedures will be implemented.

If necessary, water in the surface water lagoon at the western end of the site and the clear water pond in the centre of the site shall be used to augment any tankered supply. Fire extinguishers (water and foam) are provided in the existing site office and at the temporary site office to deal with any small outbreaks which may occur.

### 7.8 Road Mud Control

Dump trucks transferring waste from excavation areas to the landfill facility or the waste inspection / quarantine area are entirely confined within the Roadstone lands and will travel over internal roads and tracks.

In order to prevent transport of mud and potential contaminants on internal and public roads, a temporary self-contained wheelwash facility is provided at the egress from each unauthorised landfill site and the engineered landfill facility, as shown on the site infrastructure layout in Figure 3.

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## 8 ENVIRONMENTAL MONITORING

### 8.1 General

Immediately after evidence of unauthorised waste disposal had been uncovered at the Roadstone Dublin lands at Blessington, the company began to extend its established environmental monitoring programme to measure what, if any, impacts the buried waste had on surrounding environmental receptors. The scope of the existing environmental monitoring programme was agreed with officials from Wicklow County Council and the Environmental Protection Agency (EPA) and is outlined below.

Environmental sampling, monitoring and testing is undertaken by Roadstone Dublin staff wherever possible. External consultants are used only as required. Records of environmental monitoring and testing are maintained on-site and forwarded to Wicklow County Council and the EPA as required under the terms of the Waste Licence.

Pre-existing monitoring locations and remediation-specific monitoring locations are shown on Figures 8 and 9 respectively.

### 8.2 Dust Monitoring

Dust emissions from established quarrying activities at the Roadstone site are measured using Bergerhoff dust gauges at 2 No. locations across the site, shown on Figure 2.11. These gauges are currently monitored by Roadstone Dublin staff on a quarterly (i.e. three monthly) basis.

4 No. additional dust monitoring stations have been established for the purposes of the site remediation works, 1 No. at each of (i) Area 4, (ii) the site of the proposed engineered landfill, (iii) the eastern boundary of Area 6 and (iv) the rear of the residences along Darker's Lane (closest to Area 1) at least three months prior to commencement of the site remediation works.

All dust monitoring stations are monitored at monthly intervals for the duration of the site remediation works and for an agreed aftercare period thereafter.

### 8.3 Ecological Monitoring

During the site remediation works, the bird and vermin populations are closely monitored by site staff. As and when necessary, measures are implemented to reduce the environmental nuisance posed by these species.

A freshwater macroinvertebrate survey and biological pollution assessment was undertaken in February 2003 by White Young Green Ireland along the Burgess Stream to the south of the application site. Sampling locations along the stream are indicated. This survey is undertaken on an annual basis until the site remediation works have been completed and for an agreed aftercare period thereafter.

The local population of *Erigeron Acer* to the west of the proposed landfill will be examined one and five years after completion of the remediation works and the results of the mitigation measures assessed.

### 8.4 Groundwater Monitoring

At the present time, groundwater sampling and testing is undertaken by external consultants on a quarterly basis at 18No. monitoring wells on, or immediately beyond, the Roadstone landholding. Groundwater levels are also recorded on a quarterly basis.

Of the 18No. wells, 4No. are positioned around the buried waste at Area 1, 4No. are positioned around the buried waste at Area 4, 6No. are positioned around the buried waste at Area 6 and a further 4No. are positioned at random points some distance down-gradient of the buried waste.

Any pre-existing groundwater monitoring wells destroyed to facilitate the proposed remediation works (specifically well GW1/3) are to be replaced. Any wells inadvertently damaged during the works are also to be replaced. An additional 5No. groundwater monitoring wells have been installed within Roadstone Dublin's landholding prior to the commencement of the remediation works, one (designated GWR4) immediately up-gradient of the engineered landfill, two (GWR5 and GWR6) immediately down-gradient and two others (GWR7 and GWR8) approximately 300m down-gradient of the landfill.



Groundwater samples are currently tested for a wide range of physical and chemical parameters in order to assess water quality and detect contamination which may be attributable to the presence of buried waste. Details of the existing test parameters are provided in Appendix 6J of the EIS.

The groundwater monitoring regime will remain in place up to and for an agreed period after completion of the site remediation works.

The results of groundwater quality testing are forwarded for review by external consultants and Wicklow County Council and/or the Environmental Protection Agency on a quarterly basis. If any party advises that additional groundwater monitoring wells are required to better fully assess the impact of the proposed remediation scheme on the local groundwater aquifer, Roadstone Dublin will install, develop and monitor such wells and incorporate them into its environmental management and monitoring systems.

### **8.5 Landfill Gas Monitoring**

Landfill gas emissions at passive vents will initially be monitored at quarterly intervals following placement of final capping.

Landfill gas detection sensors are fitted as a precaution in site office accommodation and storage containers at the compound area.

### **8.6 Leachate Monitoring**

At the present time, 'perched' groundwater / leachate within the buried waste at Areas 1, 4 and 6 is sampled and tested by external consultants at 11No. monitoring wells on an intermittent basis. 'Perched' groundwater / leachate levels are also recorded on a quarterly basis.

Of the 11No. monitoring boreholes installed into buried waste, 5No. are at Area 1, 3No. are at Area 4 and a further 3No. are at Area 6. It is currently envisaged that these monitoring boreholes will remain in place until such time as they are destroyed by excavation works. Perched groundwater / leachate samples are currently tested for a wide range of physical and chemical parameters in order to assess the nature and degree of contamination resulting from the degradation of the buried waste.

Leachate sampling and testing is undertaken at each of the extraction and monitoring wells quarterly intervals during waste placement and following completion of final capping. Details of the proposed leachate test parameters are provided in Appendix 6J of the EIS.

At the engineered landfill, the leachate management system has been designed to collect leachate from the base of the waste mass and to allow it flow to two extraction sumps at the front (west) of the facility. Leachate levels within the landfill facility are recorded at the extraction sumps and at two leachate monitoring wells, initially on a weekly basis. When this monitoring indicates that the head of leachate above the basal drainage layer is at or close to 1m, leachate is tankered off-site to a local wastewater treatment plant or re-circulated within the landfill.

### **8.7 Meteorological Monitoring**

A small weather station has been installed on site to record all relevant meteorological parameters, including rainfall evapotranspiration, temperature, wind speed and direction, barometric pressure and humidity.

### **8.8 Noise Monitoring**

Noise emissions from established quarrying activities at the Roadstone site are currently monitored by in-house environmental technicians on a quarterly (i.e. three monthly) basis at two noise sensitive sites along the site boundary. These noise sensitive locations are the newly constructed residential housing immediately east of Area 6 and the detached residences along Darker's Lane, north of Area 1.

Noise monitoring during the site remediation works is undertaken at the 4 No. monitoring locations. Noise monitoring is undertaken using a Larson Davis Model 824 Sound Level Meter, calibrated using a Larson Davis Acoustic Calibrator CAL 200 (or equivalent).

All noise monitoring stations are monitored at monthly intervals for the duration of the site remediation works and at quarterly intervals thereafter, for an agreed aftercare period.

### 8.9 Odour Monitoring

Roadstone Dublin's site staff report and record any odour emissions at remediation sites, at the engineered landfill and close to adjacent residences as they arise. Records are also kept of any complaints about odour emissions from nearby residents. Efforts are made to identify what weather conditions give rise to noticeable odour emissions and, at such times, additional effort is made to suppress or minimise odour emissions.

### 8.10 Surface Water Monitoring

At the present time, surface water sampling and testing is undertaken by external consultants on a quarterly basis at six locations, three within Roadstone's landholding and three immediately beyond it, along the Burgess Stream, upstream, adjacent to and downstream of Area 6.

Surface water samples are currently tested for a wide range of physical and chemical parameters in order to assess water quality and detect contamination which may be attributable to the presence of buried waste at the site. Details of the test parameters are provided in Appendix 6J of the EIS.

In addition to the existing surface water quality monitoring at three locations along the Burgess Stream, the surface water monitoring has been extended to include monitoring of surface water quality at the head of the Burgess Stream and intermediate surface water settlement pond, to the west of the proposed engineered landfill site (also on a quarterly basis). It is also proposed to undertake biological monitoring at the three monitoring points along the Burgess Stream on an annual basis.

It is currently envisaged that this environmental monitoring regime will remain in place up to, during and for an agreed period after completion of the site remediation works.

### 8.11 Stability and Settlement Monitoring

On completion of the capping layer, a number of fixed stations will be set into the ground surface above the landfill and will be surveyed annually in order to assess the magnitude of landfill settlement and instability (lateral movement).

The landfill will be visually inspected for indications of potential instability once a month by Roadstone site staff, and once a year by a suitably qualified geotechnical engineer. Should these inspections give cause for concern, an immediate survey of the landfill site will be undertaken to quantify the extent, if any of any instability arising.

## 9 HEALTH AND SAFETY

Details of Health and Safety Procedures implemented during the proposed site remediation works are contained in the Outline Health and Safety Plan (reproduced as Appendix 2F of the Environmental Impact Statement).

This plan is subject to ongoing development, revision and updating in the course of the proposed remediation scheme. A copy of the Health and Safety Plan and any additions thereto is provided to all key staff and to sub-contractors. A copy is also available for inspection at all site offices.

The Remediation Manager is responsible for the on-site implementation of the Health and Safety Plan. Roadstone Dublin personnel with safety responsibilities are fully briefed on the safety risks and responsibilities associated with the proposed remediation activity and have attended relevant courses on landfill management and operations. The need for additional training is to be kept under review.

Safety meetings and briefings are held at the outset of the landfill construction and waste excavation / transfer operations and approximately once per month thereafter. Particular attention is paid to the risks presented by

- handling partially degraded domestic, commercial and industrial (DCI) waste
- handling potentially hazardous substances
- landfill gas.

All staff, operatives and drivers (either site-based or delivering materials to site) are issued with instructions to wear high visibility safety gear, helmets, steel cap boots etc. while on site. Where instructions are not obeyed, a written warning is sent to the relevant employee / sub-contractor. In the event of further breaches, the employee / sub-contractor is removed off site.

In an emergency situation, the 999 emergency call-out number is used. A record book of accidents is maintained by the Remediation Manager and any sub-contractors. In the event of an accident, a written report is prepared for and processed by Roadstone Dublin Limited.

A number of first aid boxes are provided on site at the proposed compound immediately west of the engineered landfill, the site offices at the entrance to / egress from the landfill and at the toilet / washing area adjacent to the established site facilities. First Aid is provided by Roadstone Dublin personnel currently employed in sand and gravel quarrying activities at Doran's Pit and also by the construction works sub-contractor(s).

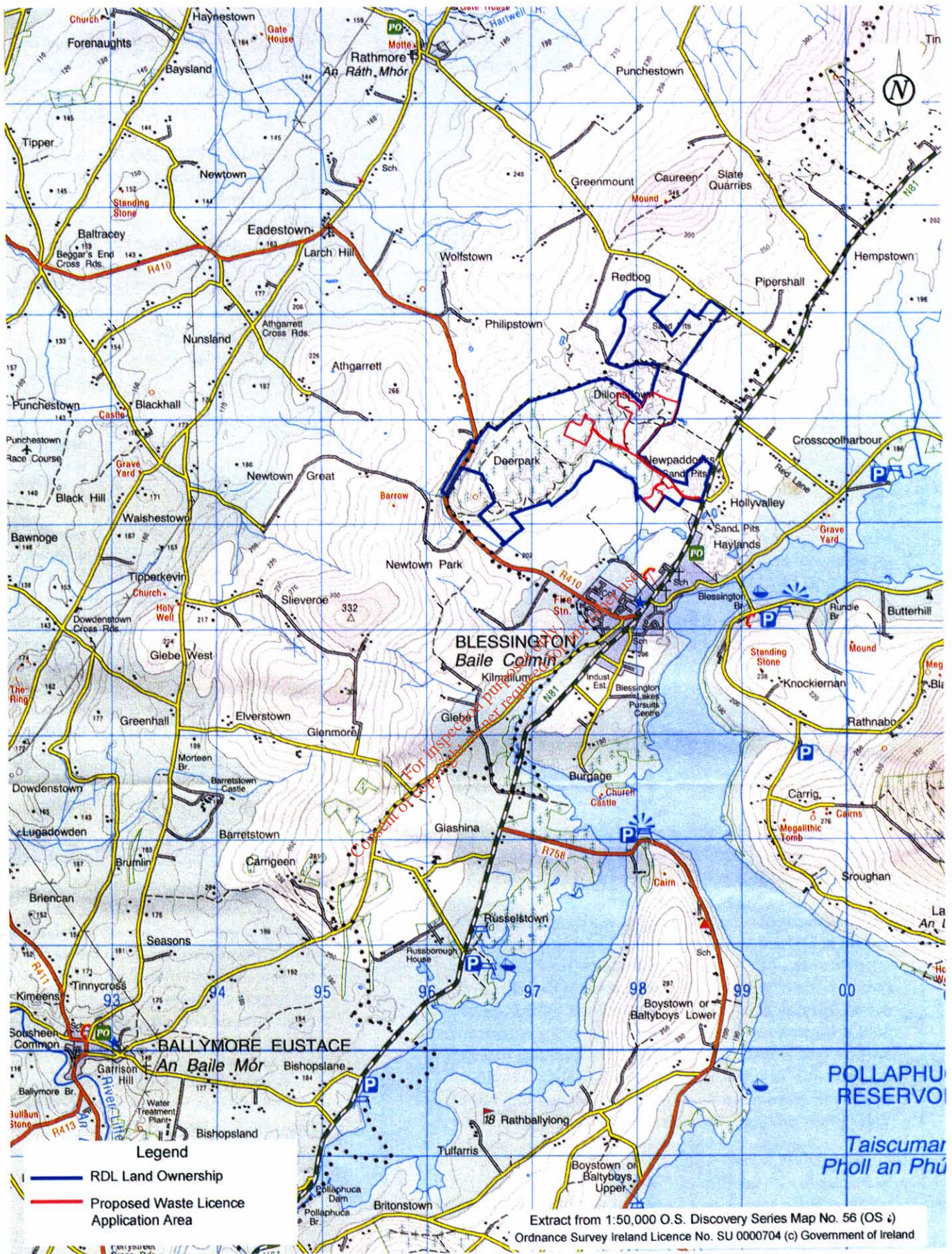
All personnel involved in the remediation activity will be required to have injections for both Hepatitis and Tetanus.

Staff and sub-contractors are issued with, or required to have, the following personal protective equipment

- High visibility vests
- Necessary safety boots with steel caps and soles – rubbers and leathers.
- Necessary safety hats (with anti-dust visors if necessary)
- Necessary coats / overalls
- Masks
- Goggles
- Wet Gear

**FIGURES**

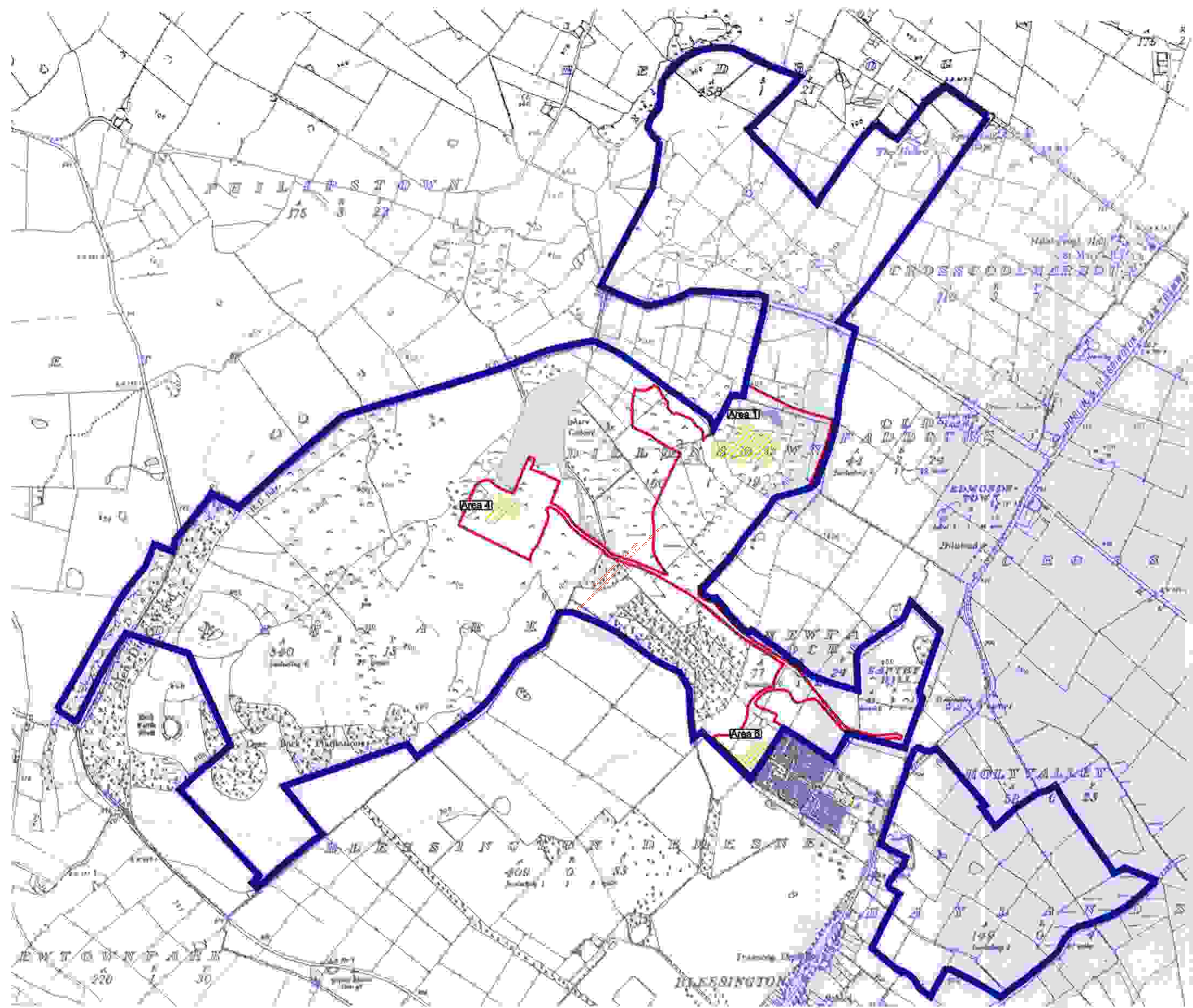
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TALLAGHT  
DUBLIN 24

**JBA**  
**JOHN BARNETT & ASSOCIATES**  
7 DUNDRUM BUSINESS PARK  
WINDY ARBOUR  
DUBLIN 14

Site:	Lands at Blessington, Co. Wicklow	
Project:	Remediation of Unauthorised Landfill Sites	
Title:	Site Location	
Drawn: pmc	Scale: 1: 50,000	<b>FIGURE 1</b>
Job. No: 2901/10	Date: Dec 2004	



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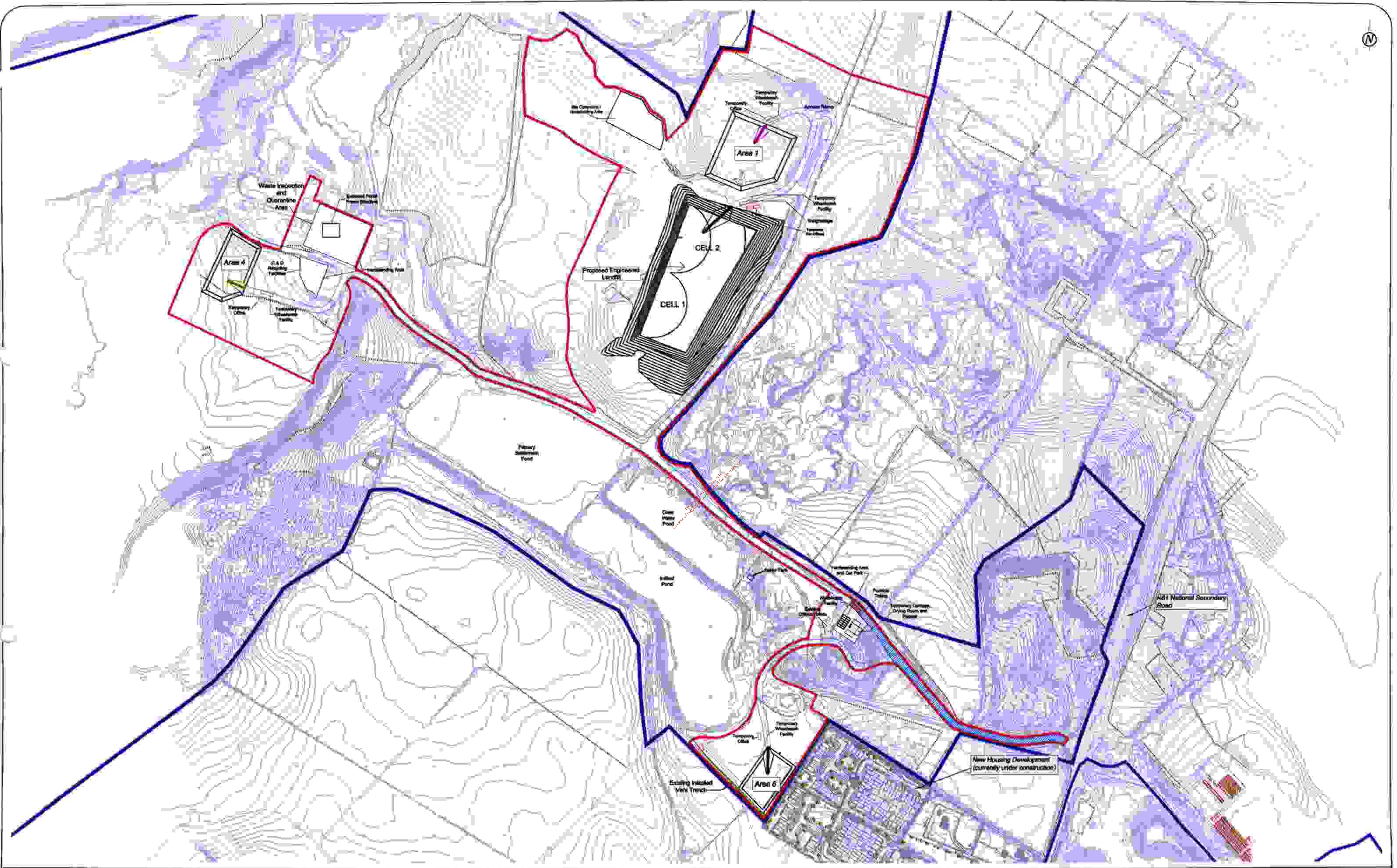
**JBA**  
 JOHN BARNETT & ASSOCIATES  
 7 DUNDUM BUSINESS PARK  
 WINDY ARBOUR  
 DUBLIN 14

**Legend**  
 — Land Ownership (c. 267ha)  
 — Application Area (c. 27.6ha)  
 Unauthorised Landfill Sites  
 Ordnance Survey Ireland Licence No. SU 0000704 (c) Government of Ireland

Rev.	Date	By	Description
0	Dec 03	SMD/PM	

Site: Lands at Blessington, Co. Wicklow  
 Project: Remediation of Unauthorised Landfill Sites  
 Title: Application Area/Applicants Land Holding  
 Drawn: PMC Scale: 1:12,500  
 Job. No: 2901/10 Date: Dec 2004

**FIGURE 2**



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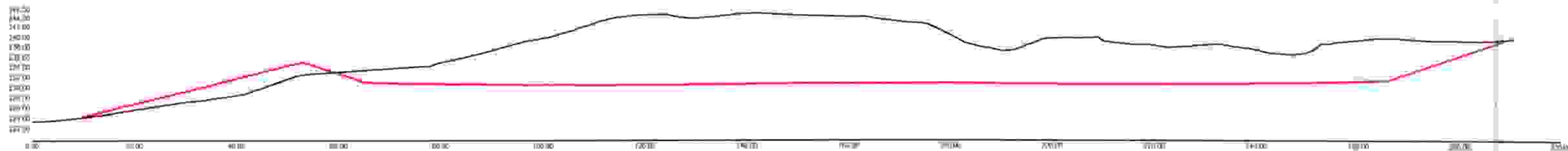
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 DUBLIN 14

**SLR**  
 Roadstone Landholding Boundary  
 Waste Licence Application Area

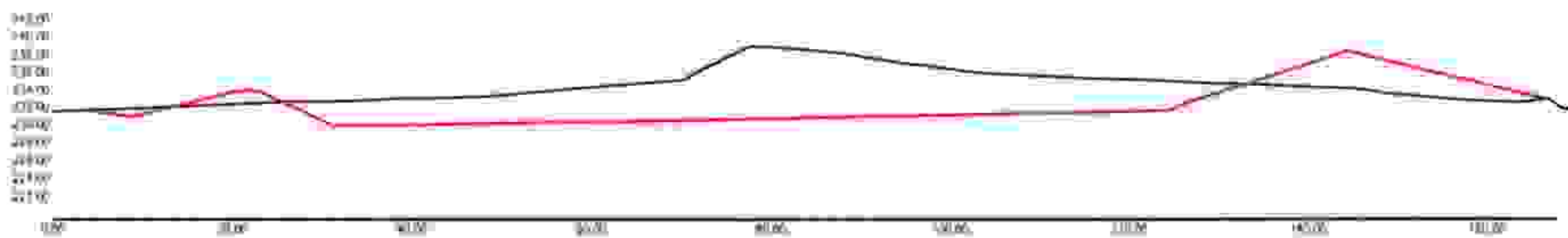
Rev.	Date	By	Description
0	Dec 03	PM	

Site: Lands at Blessington, Co. Wicklow  
 Project: Remediation of Unauthorised Landfill Sites  
 Title: Site Infrastructure Layout

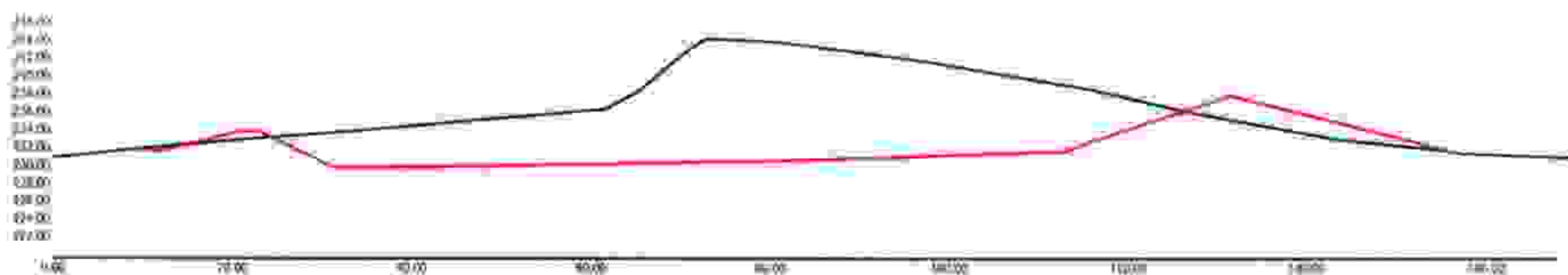
Drawn: JC/PM	Scale: 1:5000	<b>FIGURE 3</b>
Job No. 2901/09	Date: Dec 2004	



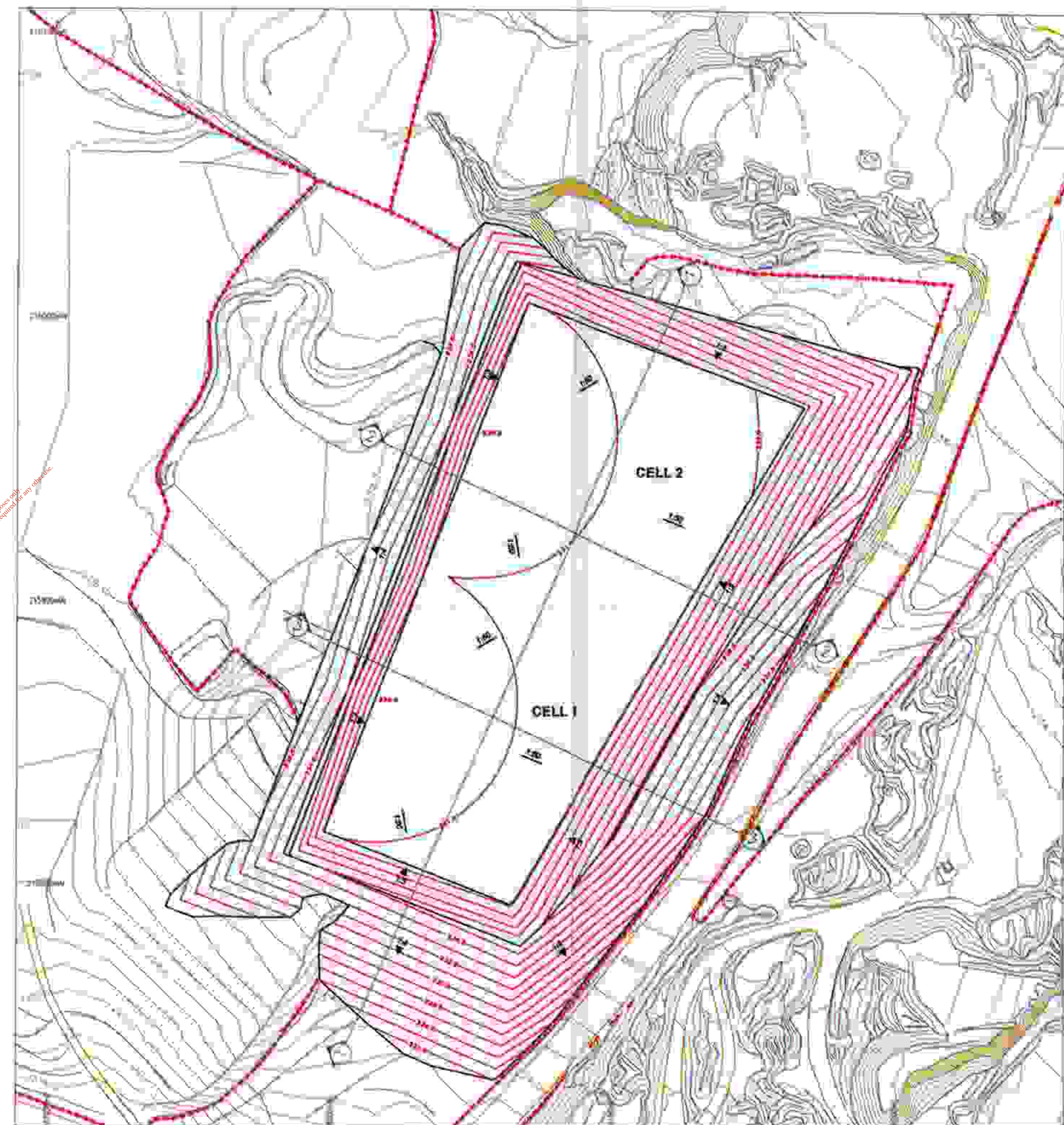
SECTION 1-1  
1:500



SECTION 2-2  
1:500



SECTION 3-3  
1:500



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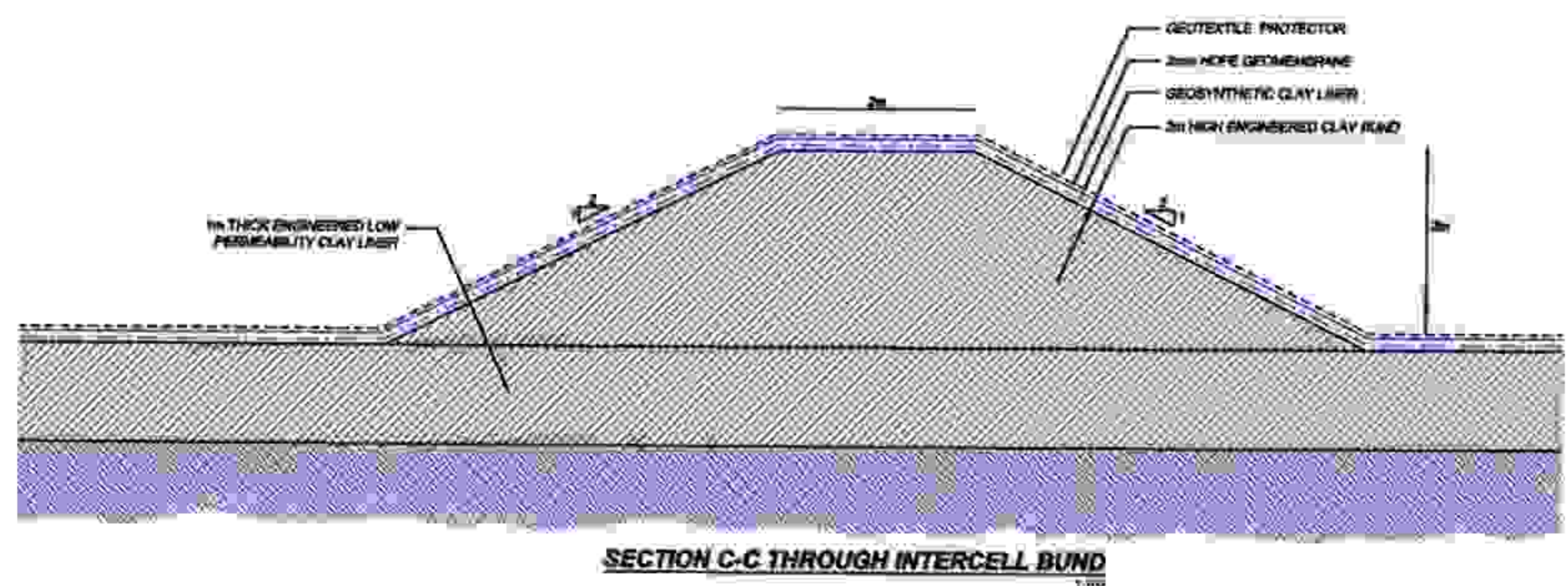
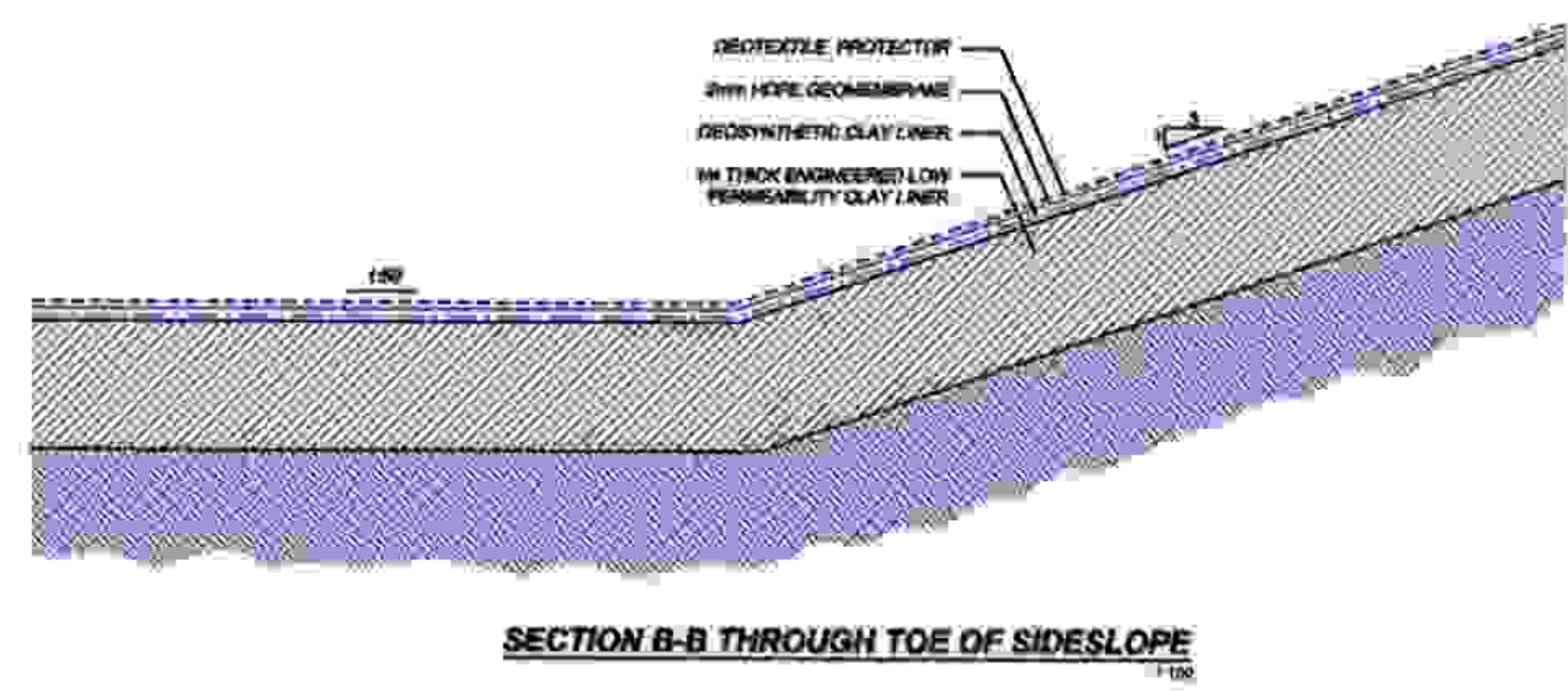
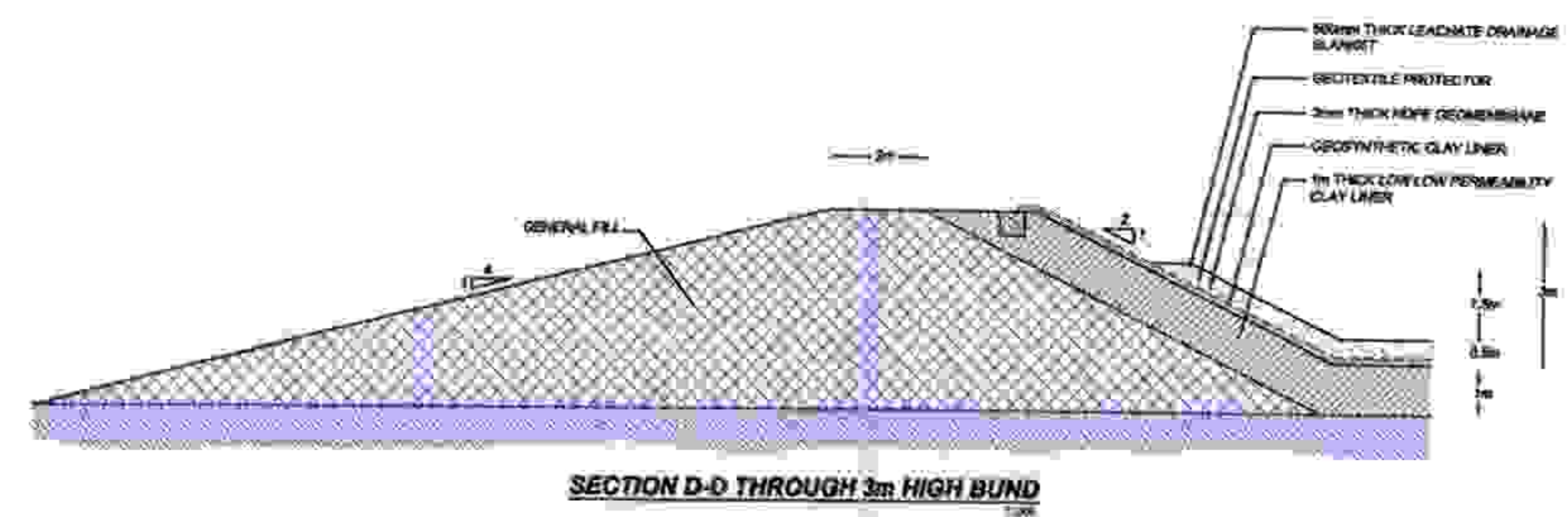
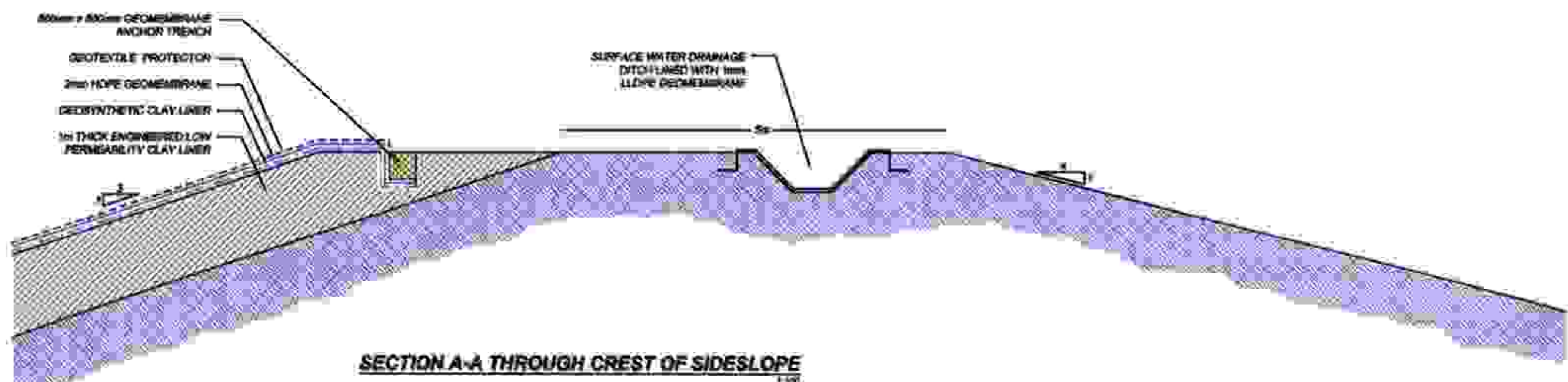
- 255.0 - EXISTING GROUND CONTOURS  
 - 235.0 - FORMATION CONTOURS  
 - 230.0 - TOP OF CLAY LINER CONTOURS  
 - 250.0 - TEMPORARY WASTE CONTOURS  
 - 255.0 - FINAL RESTORATION CONTOURS  
 ■ ACCESS POINT TO LEACHATE RECIRCULATION SYSTEM    LEACHATE RECIRCULATION TRENCH

Rev.	Date	By	Description
2	April 04	PM	Contour Correction
1	Dec 03	PM	Cell Layout Revised
0	Jul 03	SMD	Cell Layout Revised

Site: Lands at Blessington, Co. Wicklow  
 Project: Remediation of Unauthorised Landfill Sites  
 Title: Engineered Landfill : Basal Liner Formation Levels  
 Drawn: JC/PM    Scale: 1:2,000  
 Job. No: 2901/09    Date: Dec 2004

**FIGURE 4**





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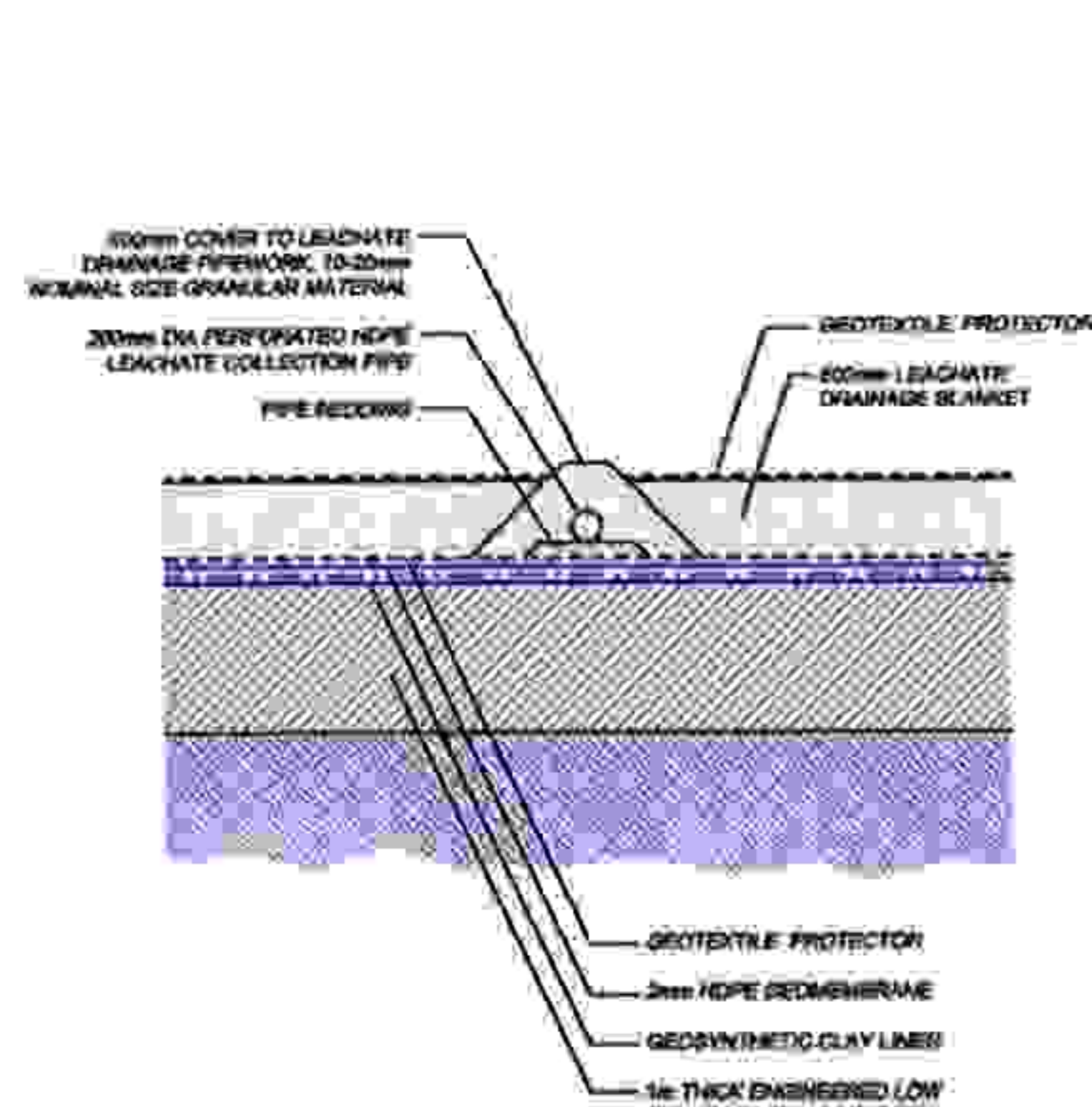
**JBA**  
**SLR**  
JOHN BARNETT & ASSOCIATES  
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— 2.25.0 — EXISTING GROUND CONTOURS  
— 2.35.0 — FORMATION CONTOURS  
— 2.38.0 — TOP OF CLAY LINER CONTOURS  
— GEOMEMBRANE ANCHOR TRENCH

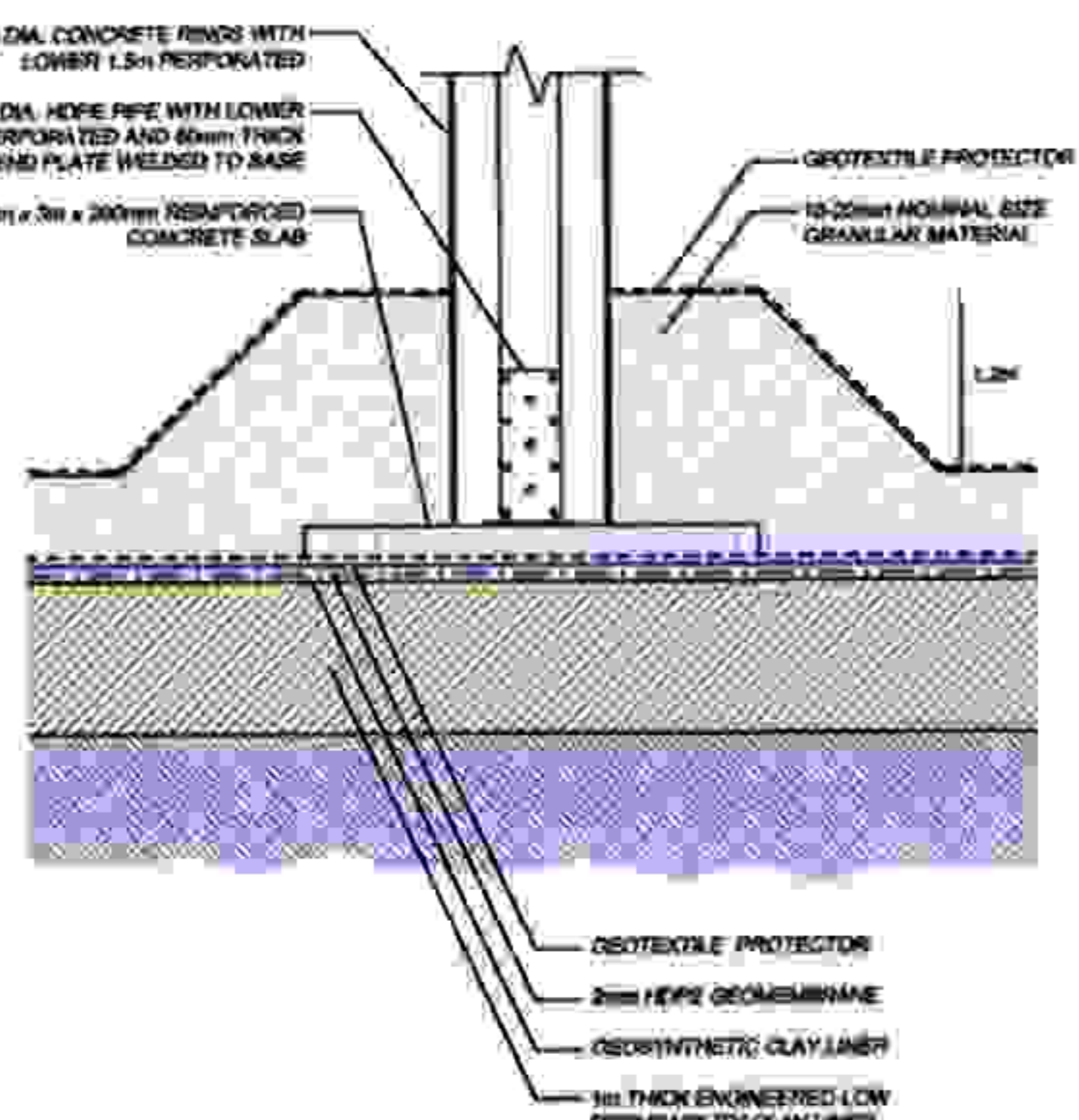
Rev.	Date	By	Description
2	April 04	PM	Contour Correction
1	Dec.03	PM	Cell Layout Revised
0	Jul 03	SMD	Cell Layout Revised

Site: Lands at Blessington, Co. Wicklow  
Project: Remediation of Unauthorised Landfill Sites  
Title: Engineered Landfill - Bund Construction Details / Top of Liner Level  
Drawn: JC/PM  
Scale: 1:2,000  
Job. No: 2901/09  
Date: Dec 2004

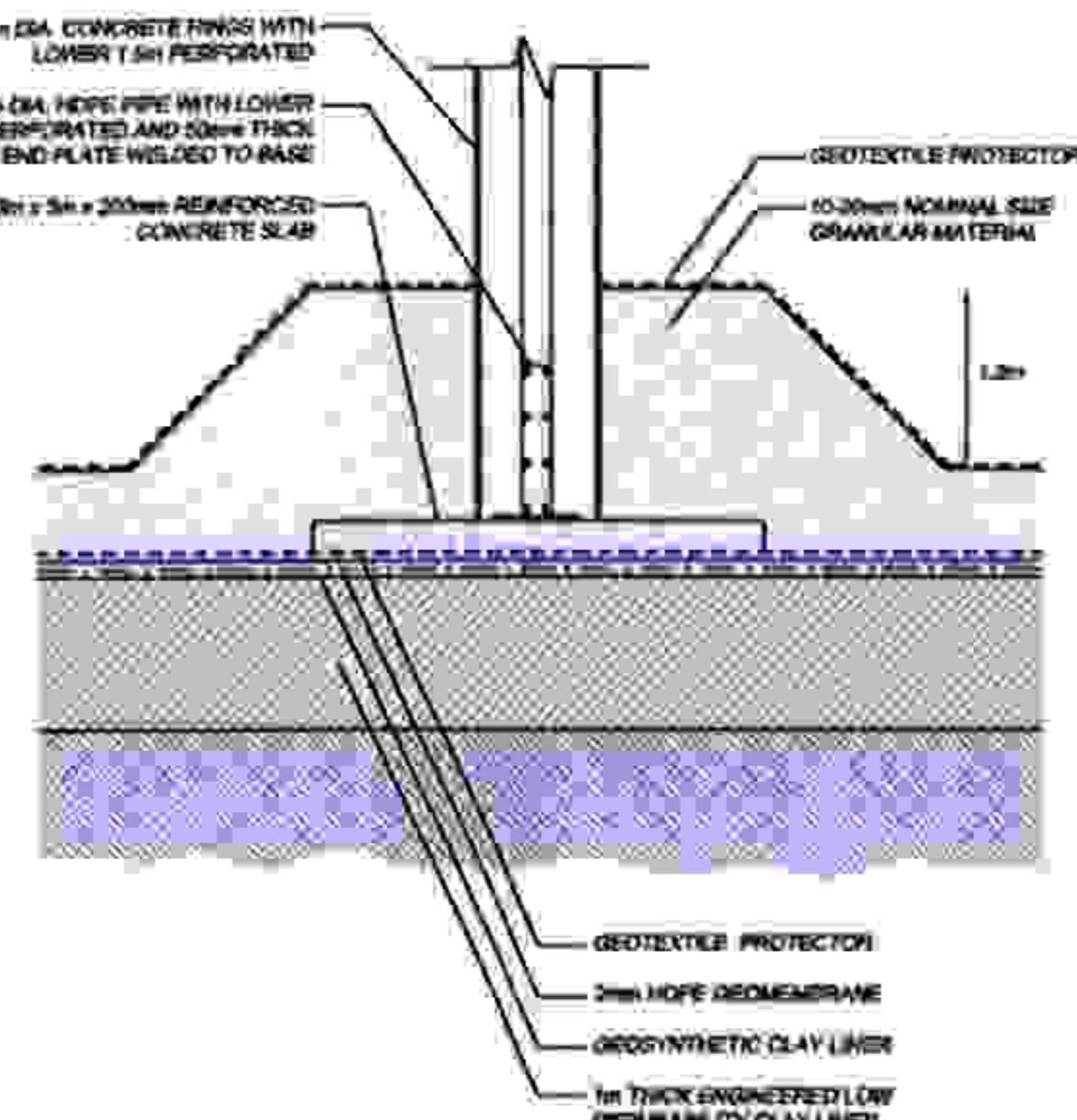
**FIGURE 5**



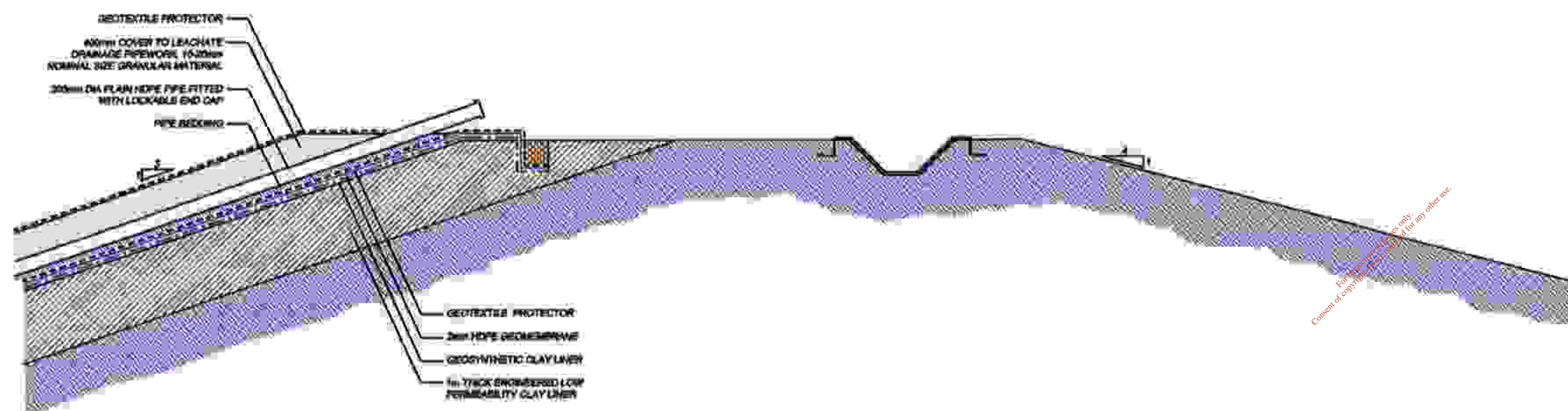
**SECTION A-A THROUGH LEACHATE COLLECTION PIPEWORK**  
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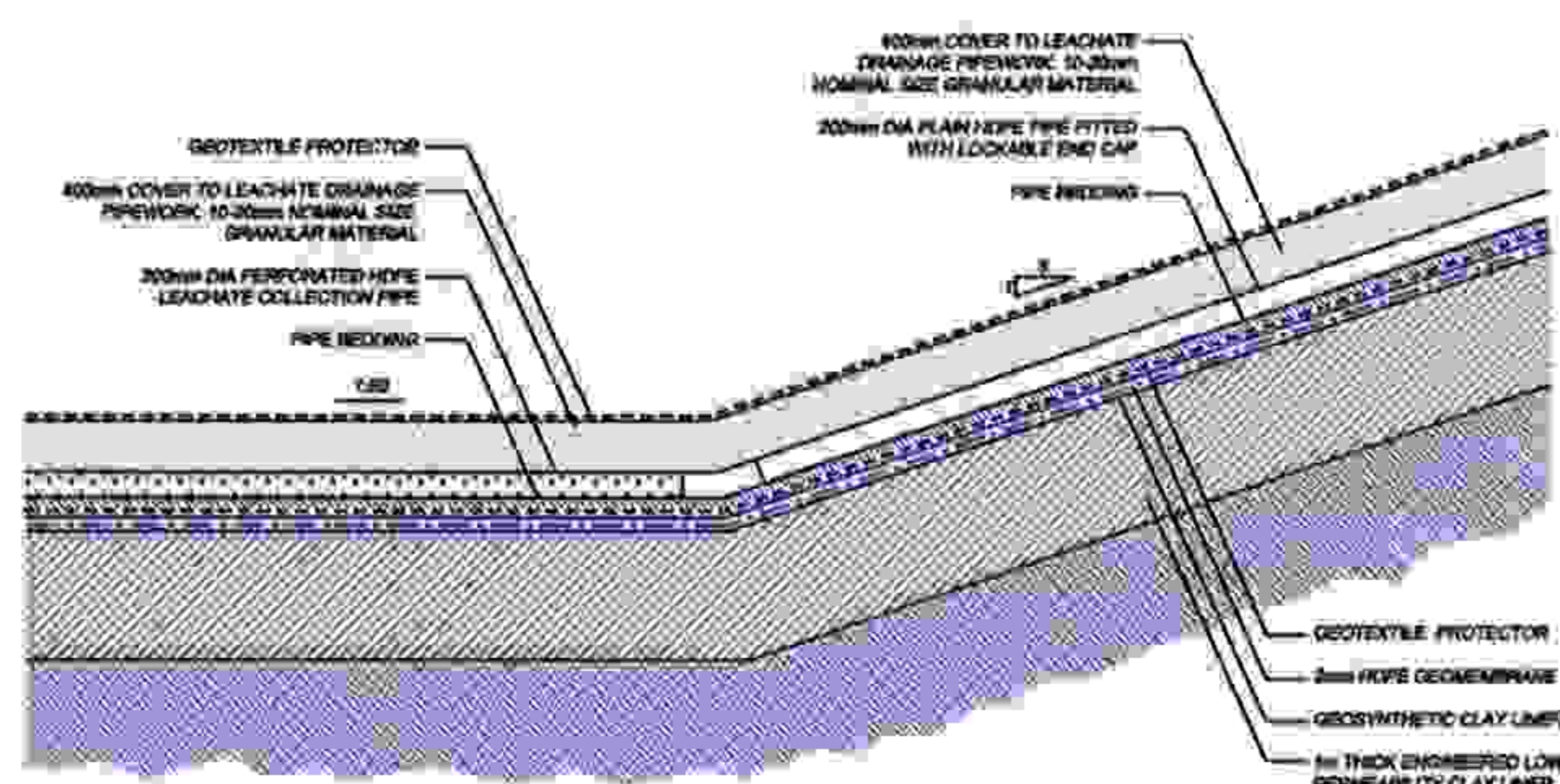
**SECTION B-B THROUGH LEACHATE EXTRACTION WELL**  
1:100



**SECTION C-C THROUGH LEACHATE MONITORING WELL**  
1:100



**SECTION D-D THROUGH LEACHATE COLLECTION DRAIN AT CREST OF SIDESLOPE**  
1:100



**SECTION E-E THROUGH LEACHATE COLLECTION DRAIN AT BASE OF SIDESLOPE**  
1:100



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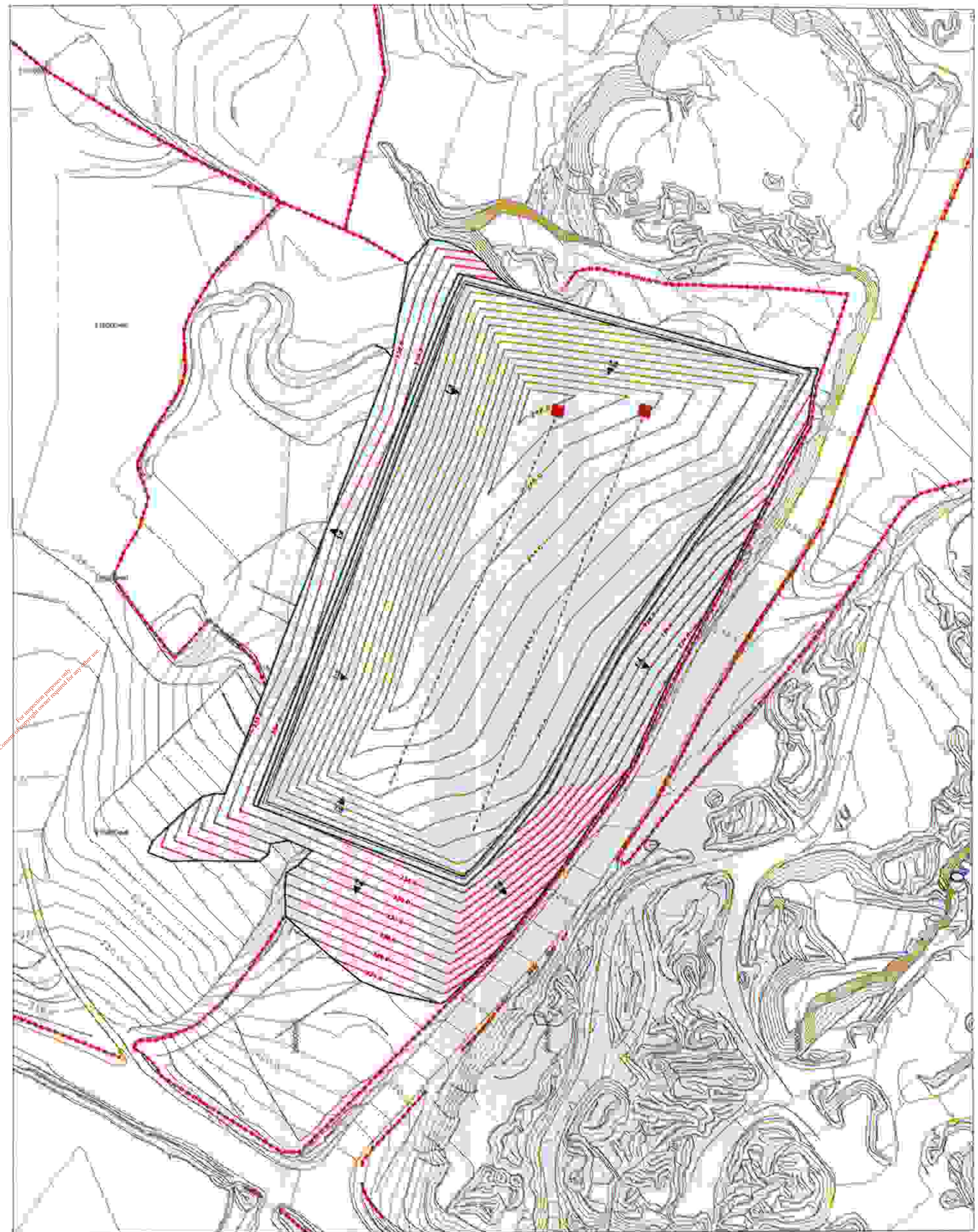
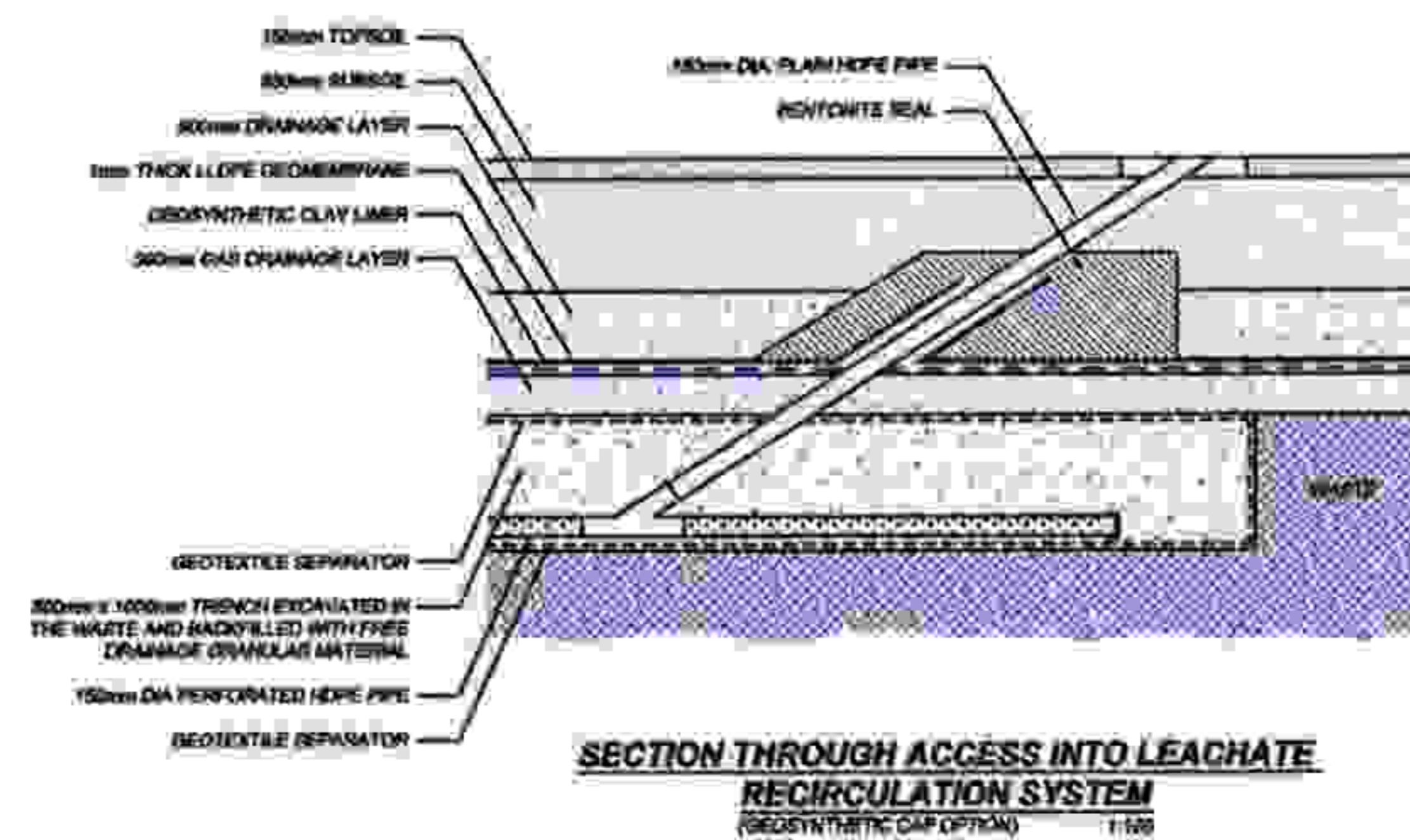
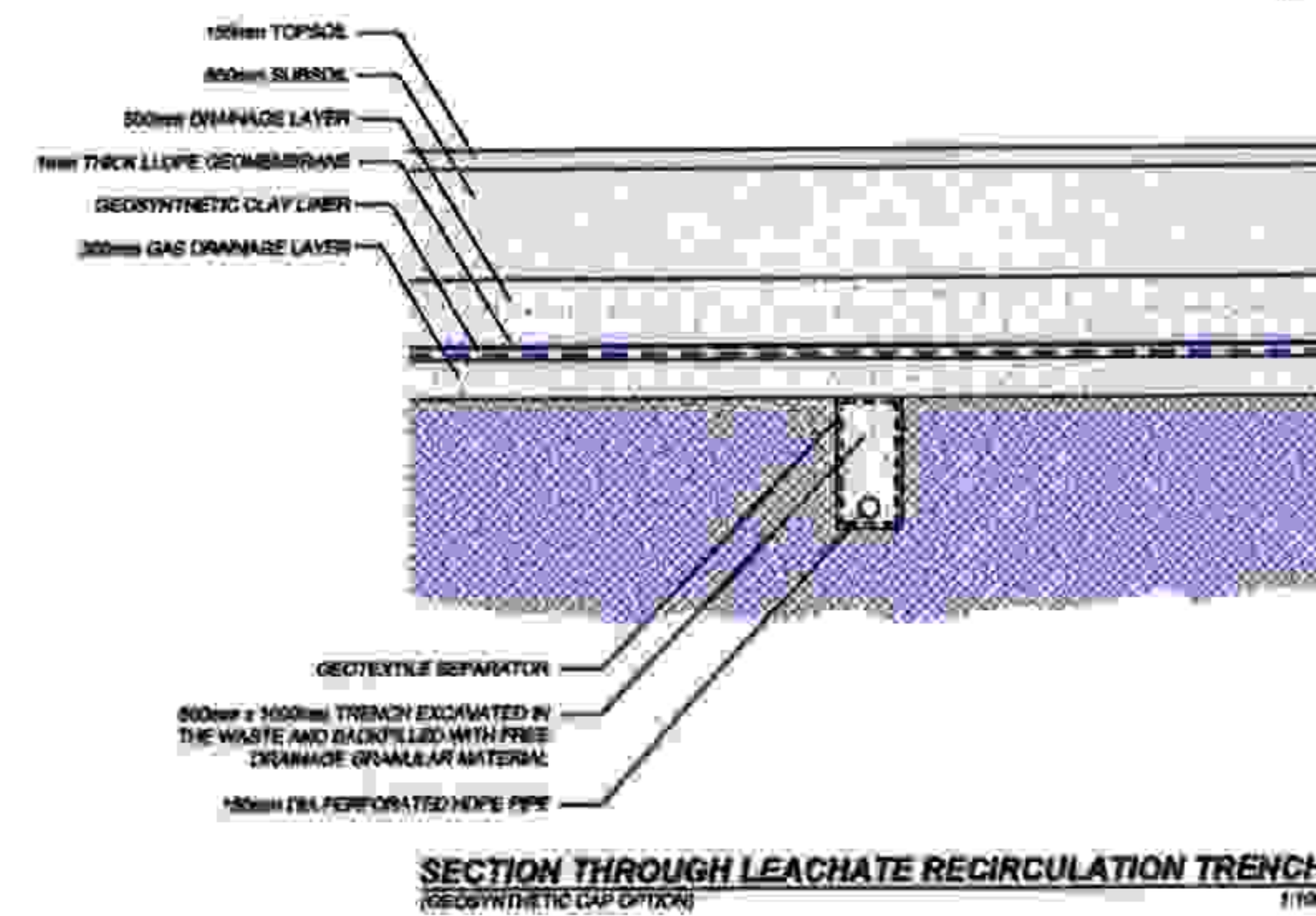
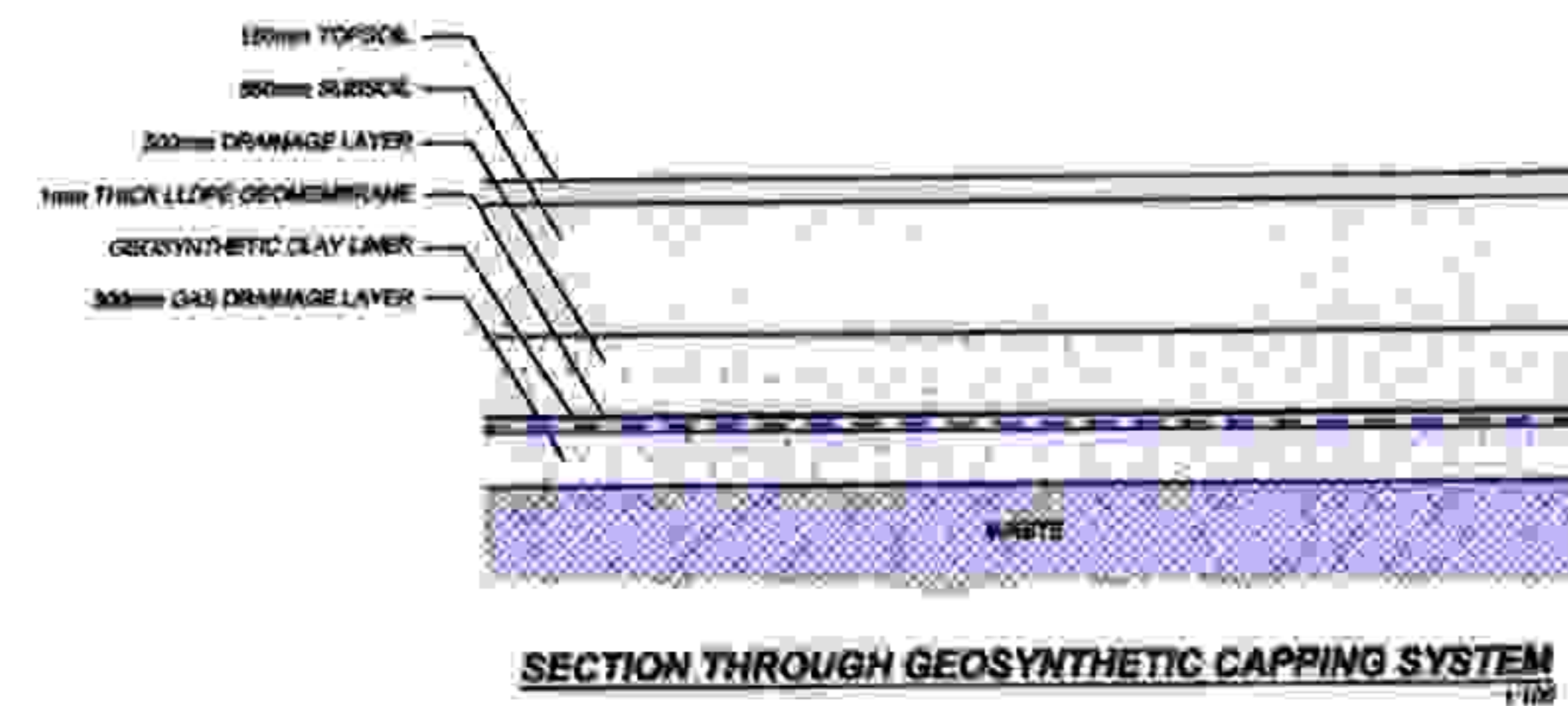
EXISTING GROUND CONTOUR  
FORMATION CONTOUR  
TOP OF CLAY LINER CONTOUR  
GEOMEMBRANE ANCHOR TRENCH  
EXTENT OF LEACHATE DRAINAGE ISLAND

300mm DIAMETER PERFORATED PIPE LEACHATE COLLECTION PIPEWORK  
300mm DIAMETER PLAIN HPE LEACHATE EXTRACTION PIPEWORK  
LEACHATE EXTRACTION WELL LOCATION  
LEACHATE MONITORING WELL LOCATION

Rev.	Date	By	Description
2	April 04	PM	Contour Correction
1	Dec 03	PM	Cell Layout Revised
0	Jul 03	SMD	Cell Layout Revised

Site	Lands at Blessington, Co. Wicklow		
Project	Remediation of Unauthorised Landfill Sites		
Title	Engineered Landfill : Leachate Management System		
Drawn	JC/PM	Scale	1:2000
Job No	2901/10	Date	Dec 2004

**FIGURE 6**

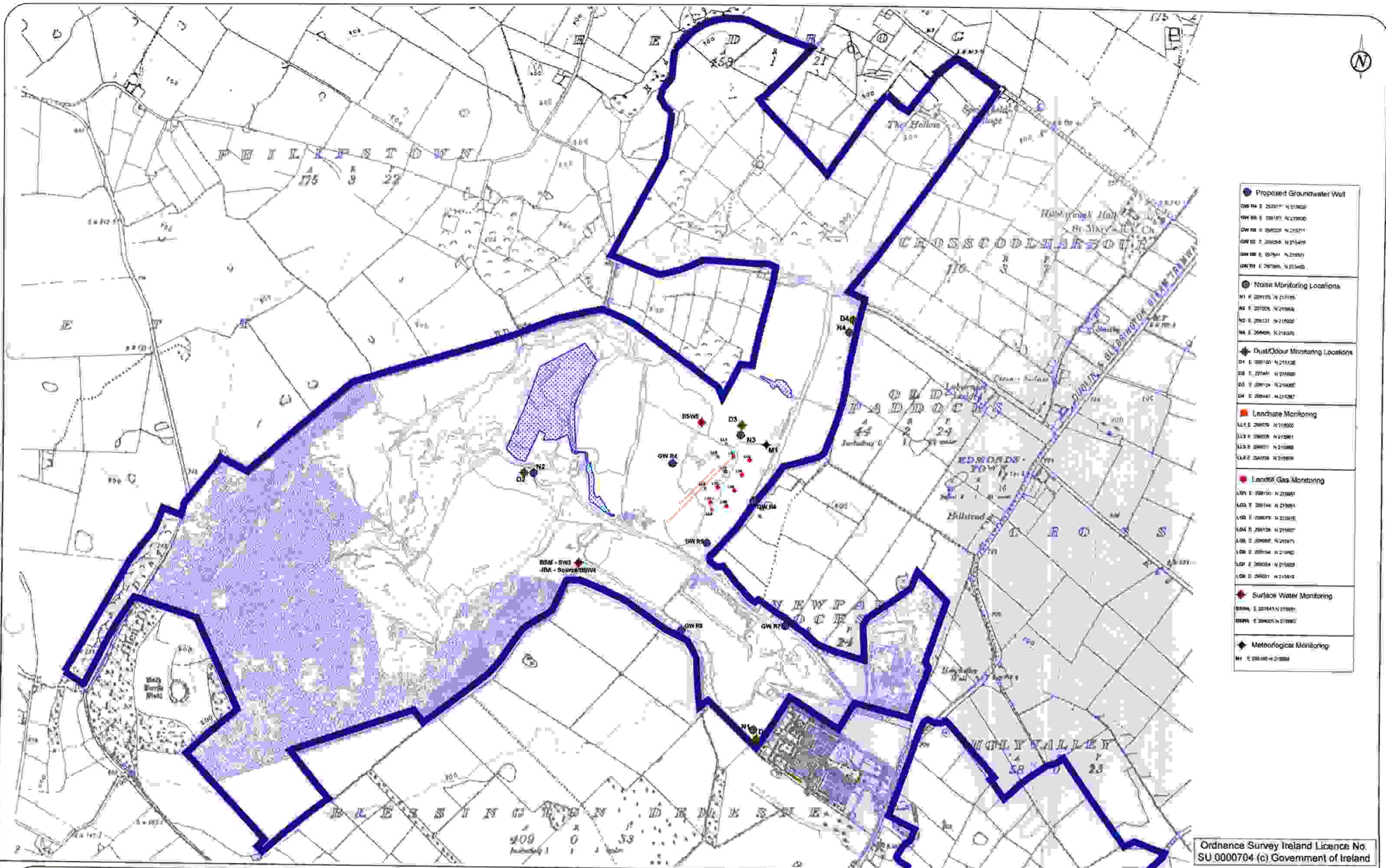


Rev.	Date	By	Description
2	April 04	PM	Contour Correction
1	Dec 03	PM	Cell Layout Revised
0	Jul 03	SMD	Cell Layout Revised

Site:	Lands at Blessington, Co. Wicklow
Project:	Remediation of Unauthorised Landfill Sites
Title:	Engineered Landfill Capping & Restoration Scheme
Drawn:	JC/PM
Scale:	1:2,000
Job No:	2901/09
Date:	Dec 2004

**FIGURE 7**





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■ Roadstone Dublin Landholding  
● Noise Monitoring Locations  
● Dust Monitoring  
● Landfill Gas Monitoring  
● Proposed Surface Water Sampling Location  
● Proposed Ground Water Sampling Location  
■ Leachate Monitoring  
■ Surface Water

Rev.	Date	By	Description
1	Mar 04	SMD/PM	
0	Dec 03	SMD/PM	

Site: Lands at Blessington, Co. Wicklow  
 Project: Remediation of Unauthorised Landfill Sites  
 Title: Environmental Monitoring - Proposed  
 Drawn: SMD/PM      Scale: 1:10,000  
 Job No: 2901/10      Date: Dec 2004

**FIGURE 9**