



Golder Associates (UK) Limited

Attenborough House
Browns Lane Business Park
Stanton-on-the-Wolds
Nottinghamshire NG12 5BL
England

Tel: [44] (0)115 9371111
Fax: [44] (0)115 9371100
E-mail: nottingham@golder.com
<http://www.golder.com>



REPORT ON

**PROPOSED RESTORATION PROGRAMME
CELL 8
MITSUI DENMAN IRELAND SITE
LITTLE ISLAND
CORK**

Submitted to:

Thornbush Holdings
Shinagh House
Bandon
West Cork
Ireland

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List of Authors Ross Bailie

Client Thornbush Holdings

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Project Manager Approval Adrian Needham (name)  (signature)

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Definition of Version Code:
 D. Applied during initial drafting of the report before it has been reviewed.
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 A. Applied to reports after external/client review.
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EXECUTIVE SUMMARY

The former Mitsui Denman Ireland facility is located in an industrial estate in Little Island, Co. Cork. The Electrolytic Manganese Dioxide (EMD) manufacturing facility was previously owned and operated by Mitsui Denman Ireland, a subsidiary of the Mitsui Mining and Smelting Co. Ltd, Tokyo Japan. For potential development purposes, the Site was separated into two principal areas – Phase 1 which comprises the old production area and Phase 2 which covers the old lagoon disposal area. In January 2004 the EPA undertook an exit audit of Phase 1 and this was completed to their satisfaction. Subsequently the entire site was purchased by Thornbush Holdings Ltd. Phase 1 has now been sold for redevelopment.

The former waste lagoons area (Phase 2) remains under IPPC licence (licence no. 389) and requires restoration. All activities relating to site restoration will be subject to prior approval by the Environmental Protection Agency (EPA). As communicated to the EPA, Thornbush Holdings Ltd. intends to restore the waste lagoons for beneficial afteruse. Once restoration has been completed to the satisfaction of the EPA, the licence will be surrendered.

Thornbush Holdings Ltd intends to put in place a waste lagoon restoration plan to meet the requirements of site restoration. In February 2005, Golder Associates (UK) Limited (Golder) was commissioned to undertake a geotechnical investigation of the Site and to prepare a ground improvement scheme examining the remediation options for the Site. Copies of these reports were submitted to the EPA in August 2005.

It is also proposed that a construction and demolition (C & D) plant will be constructed in Cell 8 of the former waste lagoon area to provide C & D material for future capping of the Site. It is proposed that this area is prepared so that an exit audit by EPA can be conducted and the area de-licensed.

Thornbush Holdings Ltd has therefore commissioned Golder to prepare a report for submission to the EPA detailing the C & D area preparation. This report describes the proposed capping of Cell 8, the methodology for preparing the C & D area, and ground stability, monitoring and environmental, health and safety considerations.

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1.0 INTRODUCTION

The former Mitsui Denman Ireland facility is located in an industrial estate in Little Island, Co. Cork. The Site was separated into two principal areas – Phase 1 comprising the old production area (which has now been sold by Thornbush Holdings) and Phase 2 which covers the old lagoon disposal area. Phase 2 remains under IPPC licence 389 until restoration of the site is completed to the satisfaction of the EPA.

The EPA has confirmed that restoration of the landfill can be undertaken (if necessary using recovered waste) and landscaped within the terms of the existing IPC licence.

A factual report of the Site investigation of the waste lagoon area was issued by Golder in May 2005 and presented the data gathered from the field work and subsequent laboratory analyses. The geotechnical investigation of the 31.6 hectare Phase 2 former waste lagoon area involving cone penetration testing and borehole drilling was undertaken to gather information required for the development of a ground improvement scheme. Chemical analyses of selected samples of the waste materials and recovered groundwater were undertaken. Subsequent groundwater monitoring has taken place at the site.

An interpretive report based upon the site investigation data was issued by Golder in July 2005. That report addressed the characteristics of the waste materials, underlying old reclamation fill material, natural soils and the materials forming the lagoon bunds. The report included consideration of potential ground improvement options and the development of a recommended ground improvement strategy for the former lagoon area to enable restoration of the Site for beneficial afteruse. The strategy covers the geotechnical treatment of the Site and does not address planning, groundwater contamination or environmental issues arising from the intended changed use of the site.

From the site investigation and visual inspection, it was decided to divide the area into six distinctive zones for geotechnical design and remediation purposes. The design parameters for each zone were selected from the results of the site investigation. Based on the laboratory chemical results and the European Waste Catalogue, the process waste material has been classified as non-hazardous waste, should it now still be considered as waste.

A report detailing ground improvement options and field trials for the Phase 2 area was issued in April 2006. In August 2006 planning permission for a C & D plant adjacent to the Site, required to provide C & D material for future capping of the Phase 2 area, was refused. It is now required by the planning authority that the plant be located within the Phase 2 boundary. This report therefore addresses the development of the area within Phase 2 for the C & D plant.

It is preferred to locate the C & D plant in Cell 8 in the western corner of the Site (Figure 1) as this cell is located close to the public road where there is the intention to form a vehicle

entrance into the Site from the road. It is planned that the C & D plant area in Cell 8 can be prepared so that an exit audit for Cell 8 and adjacent ground as shown on Figure 2 can be agreed with the EPA and the area removed from the licensed area. The whole area involved to be subject to the exit audit occupies more than the extent of Cell 8 but the peripheral areas have not been subject to waste disposal and do not need capping or other remediation. The proposed revised boundary of the licensed area is shown on Figure 3.

It is planned that the waste in the former lagoons will be capped by a layer of inert secondary fill to a depth not exceeding 2 m as part of the site restoration. This fill is planned to comprise secondary fill derived from recovered C & D material (termed secondary fill as opposed to primary fill comprising natural materials) being essentially crushed brick, concrete, soils, stones and similar inert materials. Several ground improvement options in conjunction with the inert fill capping have been considered, all based on the work being undertaken with the process wastes largely left *in situ* (apart from relatively minor site regarding to form localised level platforms), rather than the waste material being excavated and treated *ex situ* which would raise a number of significant environmental concerns.

This report details the proposed development of Cell 8 to enable the area to pass an exit audit so that it may be removed from the licensed area and so that the capped area may be used for the C&D recycling operation.

The capping formed to support the C & D facility may, in the long-term on completion of the C & D processing operations in Cell 8, be upgraded to be suitable for the planned permanent redevelopment.

2.0 SITE PREPARATION

The C & D facility will be located in the area of the former Cell 8 shown on Figure 1. The lower part of Cell 8 contains water and it is proposed that this will be dewatered by pumping the water from Cell 8 into Cell 15. If necessary, some water will also be transferred from Cell 15 to the adjacent Cell 14. It is estimated that the volume of water to be removed from Cell 8 is approximately 6,300 m³, which can be accommodated by Cell 15 alone, but this will vary depending mainly on rainfall and evaporation.

Following dewatering, it is planned to regrade the top surface of the old waste to form a level area at an elevation of approximately 4.2 m aOD. This will require the excavation of material in the north part of the cell to a maximum depth of about 1.2 m and placing it in the lower part in the south. The weak condition of the old waste material will require the employment of suitable construction techniques. The excavation is planned to be carried out using a large tracked 360 excavator and low ground pressure dump trucks. On completion of the dewatering, there may be a layer of very soft, saturated waste which will be scraped out and taken to an adjacent cell to be spread out to dry. A layer of suitable separation/reinforcement composite geotextile/geogrid will be laid on the exposed waste surface to provide the necessary confinement and strength for the placement of the overlying layers. This composite geosynthetic layer will be overlain by 200 mm of selected crushed C & D material (maximum particle size 100 mm) followed by a layer of separation geotextile, overlain by the requisite depth of old waste material tracked in using a wide-track bulldozer or other suitable plant.

Limited dewatering may need to continue during the cell preparation works to prevent water ingress and accumulation that would compromise the earthwork operations.

The levelled area will then be covered by an orange geotextile marker layer with the triple functions of:

- Providing a warning marker layer between the inert C & D fill and the underlying old process wastes to assist in preventing inadvertent excavation into the wastes in future works;
- A separator to prevent punching-in of the larger pieces of the C&D material into the softer wastes; and
- Reinforcement to facilitate the formation of a sound working platform.

On top of the marker layer, a 1 m thick cap of C & D fill material will be placed. The C&D material will be produced to a technical specification for General Fill which can consist of a graded coarse granular material with a maximum particle size of 500 mm and less than 15% fine material (63 micron sieve). The fill material would be placed in lifts compatible with the maximum particle size and well-compacted by suitable compaction plant in accordance with the NRA Specification for Road Works.

The C & D material will serve two functions:

- Provide a suitable cap to facilitate an exit audit and de-licensing from the IPPC permit;
and
- Provide a suitable platform for the C & D plant,

The detail of the formation of the capping is shown on Figure 4.

The C & D material will be sourced from Phase 1 area where C & D material has already been processed and stockpiled as part of the site preparation there, or sourced from elsewhere as necessary to provide sufficient quantity of the secondary fill. It is estimated that about 16,500 m³ of C & D fill material will be required for the capping and 200 mm initial layer.

Access to Cell 8 will be provided initially from Phase 1 (Figure 1) and in the long-term from a new entrance directly into the Cell 8 area and Phase 2 from the public road following receipt of the necessary planning permission. The access road will also be constructed using C & D material.

3.0 STABILITY CONSIDERATIONS

The C & D cap will be founded on old waste reinforced by three layers of geosynthetics, the lowest being a very strong composite geogrid/geotextile material. The capped area will provide a firm, stable platform suitable for the installation and operation of the C & D process equipment. Stability assessments will be undertaken to select the maximum height and loading of stockpiles to avoid either basal or slope failure of stockpiles, or excessive settlements.

4.0 MONITORING

It is planned that the completed cap would be monitored for settlement to provide data that will be useful for the future capping and development of the whole Site. Physical surface settlement markers would be installed and surveyed, initially on completion of the capping layer and subsequently at intervals to be decided.

5.0 ENVIRONMENTAL, HEALTH AND SAFETY CONSIDERATIONS

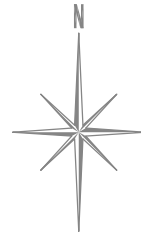
The main consideration of the ground improvement schemes in the former waste lagoon area is to leave the waste materials in the lagoons largely *in situ* with as the only disturbance being limited to regrading to form level areas such as planned at Cell 8.

The construction of the capping consists of transporting and working with secondary fill (comprising processed inert C & D wastes) using conventional earthworks plant and equipment. These activities are not likely to cause a threat to health or the environment. The isolated locations and limited sizes of Cell 8, and the use of the processed C & D material, will prevent there being a concern regarding silt-laden surface water run-off from the completed cap affecting watercourses.

Potential nuisance issues include dust and noise. Should dust generated by the cap construction be a problem that extends to the Site boundary, dust abatement measures involving water spray and damping-down would be implemented. It is considered that the use of normal construction plant will prevent noise being a nuisance issue.

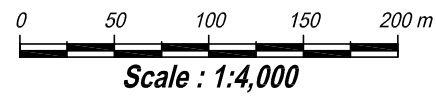
Preparing the C & D plant base will require dewatering of the currently flooded part of Cell 8. It is proposed that this water will be discharged to Cell 15 and will not affect other areas. Very soft material on the base of the flooded areas of Cell 8 may require removal and this will require placement in a different part of the Phase 2 area to allow drying of the material.

FIGURES



LEGEND

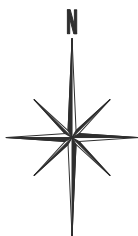
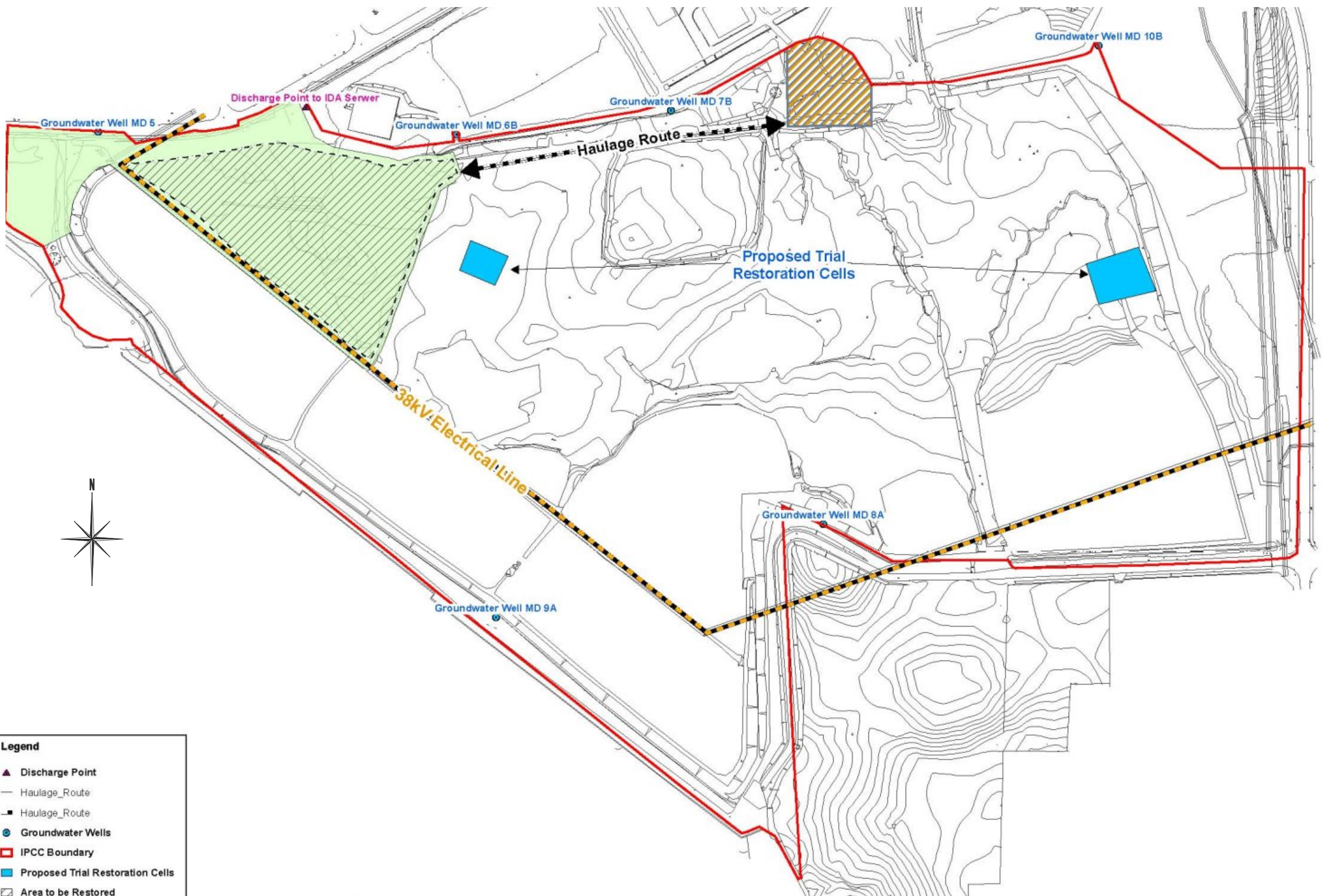
 Site Access Road



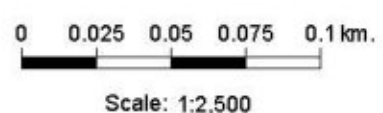
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Title
**Site Layout Showing Cells
Little Island Cork**

**Figure
1**



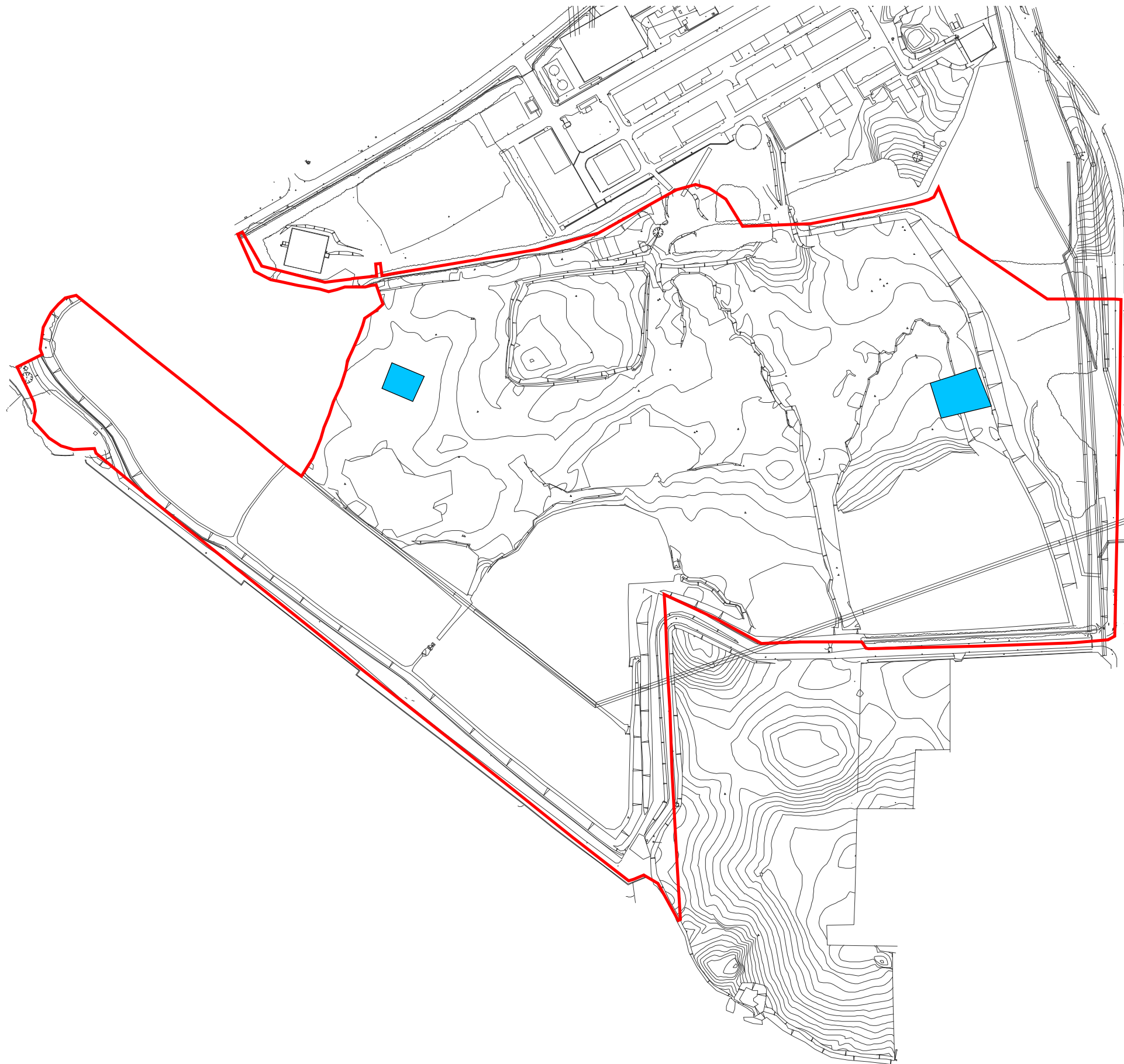
Legend	
▲	Discharge Point
—	Haulage_Route
—	Haulage_Route
●	Groundwater Wells
□	IPCC Boundary
■	Proposed Trial Restoration Cells
▨	Area to be Restored
▨	Area to be Excluded from License
—	38kV_Electrical_Line_20070117
▨	Tipping Area





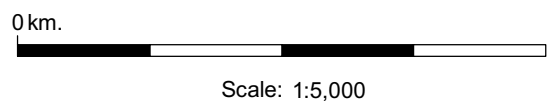
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Title
**Proposed Cell 8 Capping
 Little Island Cork**

**Figure
 2**



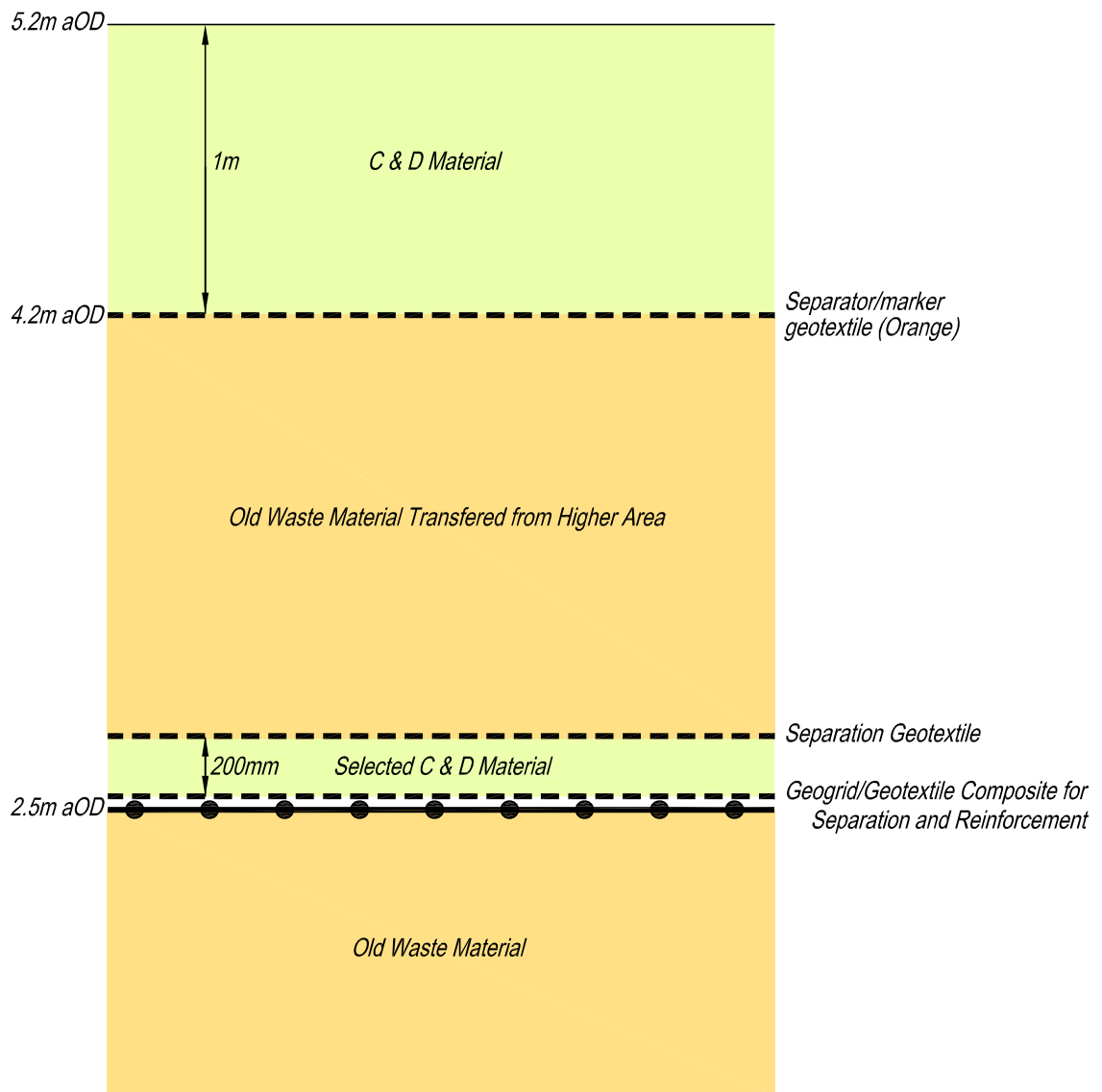
Legend	
	Proposed Trial Restoration Cells
	IPCC Boundary



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Title
**Revised IPCC Boundary
Little Island Cork**

**Figure
3**



NOTE

Elevations Approximate



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Title
Cross Section of Waste Cap Cell 8
Little Island Cork

Figure

4