Veolia Environmental Services Pty Ltd

Woodlawn Bioreactor

Landfill Closure and Rehabilitation Management Plan

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Revision	Revision Date	Details
1	May 2007	
2	8 August 2016	Revised to incorporate PA 10_0012

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1 Introduction

1.1 Overview

VES's Development Consent for the Woodlawn Bioreactor covers the mine void, ED3, an area surrounding the administration buildings for offices and landfill infrastructure such as landfill gas generators. This area is shown in Drawing 10407001-560-A.

VES's EPA Licence for the Woodlawn Bioreactor (Licence number 11436) covers the same area as the Development Consent.

This Post Closure Landfill Rehabilitation Management Plan (incorporating the required Rehabilitation Management Plan), covers the area regulated by the Development Consent and EPA Licence (as shown in Drawing 10407001-560-A).

VES has taken over ownership of the whole of the Woodlawn property, most of which is covered by Special Mining Lease 20 (SML20). VES now becomes responsible for the rehabilitation of the entire Woodlawn mine site, in addition to the post-closure rehabilitation of the Bioreactor licenced area.

The plan for rehabilitation of areas of the Woodlawn site which are outside of VES's Development Consent are not covered in this Management Plan. The rehabilitation of these other areas (including plant area, tailings dams, ED1 and ED2) is being undertaken in accordance with the Mine Operations Plan (MOP) for Woodlawn Mine, under the guidance of the Mine Rehabilitation Environmental Management Process. For information about rehabilitation of the wider mine site areas outside of VES's Woodlawn Bioreactor consent area, please refer to the Woodlawn Mine Operations Plan (2004).

1.2 Background

This Post Closure Landfill Rehabilitation Management Plan (PCLRMP) describes the proposed post closure management and rehabilitation activities to be undertaken to manage the site following either early or final closure of the site. The site will be managed and maintained in accordance with VES environmental policies and the requirements of regulatory authorities, principally the NSW Environment Protection Authority (EPA).

Note: Under the terms of the current Consent Conditions for the 20 year operation of the site, the mine void will not be filled to the level of the mine void rim. Refer to the Filling Schedule in this LEMP for details of approximate levels expected to be reached based on the maximum input rates in the current Consent Conditions.

The Plan has been developed to reflect the requirements of the "Environmental Guidelines: Solid Waste Landfills" (EPA, 1996) and contains references to the Environmental Goals and Benchmark Techniques described in the guidelines. It provides a basis for the EPA to assess the environmental performance of the bioreactor site and to review the management and monitoring activities that are carried out on site.

This PCLRMP is based on a continuation of progressive rehabilitation compatible with long term use of the site. The document will be updated periodically in light of new information and new standards for environmental performance.

Subsequent to the Development Consent granted for the Woodlawn Bioreactor, VES has taken over responsibility for whole-of-mine site rehabilitation. The involvement of VES in the planning and execution of both the Bioreactor post-closure rehabilitation and the whole-of-mine site rehabilitation will ensure that these rehabilitation efforts are integrated.

1.3 Objective

The Plan addresses the rehabilitation and after care management issues associated with stormwater, leachate, biogas, management of ED3 and revegetation for the site. The staging of the rehabilitation works is dependent on the proposed filling plan. The operational phases of these issues are fully described in the Woodlawn Bioreactor Environmental Management Plan (LEMP).

The primary objectives of this plan are to meet the requirements of Consent Conditions 15 and 22. These conditions call for the preparation of a PCLRMP and a Rehabilitation Management Plan (RMP) respectively. Due to the similarity between the two plans, they have been combined in one document, while still addressing all of the consent condition requirements.

Consent Condition 15 specifies that this PCLRMP will address the following:

a) Closure strategies in the event that landfilling activities conclude prior to filling of the mine void
b) Site capping and revegetation in accordance with benchmark technique 28 of the Environmental Guidelines: Solid Waste Landfills
c) Post closure environmental monitoring
d) Post closure management of surface water in the event that the void is not filled with waste
e) Post closure management of Evaporation Dam No3 (ED3)
f) Post closure leachate management, including the management of the bioreactor processes
g) Post closure maintenance
h) The estimated costing for these works must be provided and should be based on a nominal period of at least 50 years after the landfill ceases to accept waste. The actual duration of this period will be determined from actual monitoring data at the time.

1 Introduction

Consent Condition 22 requires the preparation and implementation of a Rehabilitation Management Plan (RMP). The RMP shall address, but not necessarily be limited to the following matters:

a) Clear identification of the proposed new rehabilitation works to be undertaken by the Applicant, details of the Woodlawn Mine site rehabilitation works being undertaken by the mine leaseholder, and a clear definition of the respective obligations of the parties;
b) An outline of financial arrangements for site rehabilitation works proposed in the plan;
c) The rehabilitation standards to be adopted;
d) A rehabilitation schedule (to be reviewed on a regular basis);
e) A post-establishment maintenance and monitoring program for rehabilitated areas;
f) Procedures for the removal of all derelict buildings and infrastructure;
g) Closure strategies in the event that landfilling activities conclude prior to the capacity of the mine void being filled; and
h) Integration of rehabilitation works with the rehabilitation of the Woodlawn mine site.

The Environmental Guidelines (EPA, 1996) adopt a performance based approach. The performance outcomes are defined as Environmental Goals and include Benchmark Techniques appendices. The Benchmark Techniques applicable to rehabilitation and after care have been addressed in this document.

1.3.1 Licence for Closure Management

Prior to closure, VES will need to obtain a licence under the Protection of the Environment Operations Act 1997 to cover closure and post closure management of the facility. The Application for the licence by VES will be based on the proposals set out in this PCLRMP to cover post closure management.

1.4 Site Description

Bioreactor Site

The Woodlawn mine site is located approximately 7km (10km by road) west of the township of Tarago in the Mulwaree LGA.

The mine void is located in a 3,000 ha property owned by Veolia Environmental Services Pty Ltd. In addition to the void, the property contains waste rock dumps, tailings dams, evaporation ponds, disused mine buildings and infrastructure and surrounding rural land and pine plantations. Areas of the site subject to the DA include the void, the access road into the site and an area to the northeast of the void where facilities such as a weighbridge and site office will be located, and Evaporation Dam 3 (ED3). These areas are shown on in Drawing 10407001-560-A.

Access to the mine site is off Collector Road, which runs in an east-west direction from its intersection with Bungendore Road. The mine void is located approximately

1 Introduction

500m south of Collector Road on top of a ridgeline that forms part of the Great Dividing Range at an elevation of 800m AHD. The mine void in which the landfilling is proposed has a depth of about 200m and a volume of approximately 25 million cubic metres.

At the end of 20 years (the period of operation for which the current consent has been granted), it is estimated that should the allowed tonnages of waste be placed (in accordance with that consent) approximately 6 million cubic metres of the available void space will have been filled.

The site is situated at the head of the Allianoyonyiga and Crisps Creeks catchments. The watershed of the Wollondilly River/Lake George catchment also traverses the site. Lake George is located approximately 7.5km to the west and Lake Bathurst approximately 8.5km to the northeast of the mine site.

Intermodal Facility

The Intermodal facility is located approximately 2km to the south of Tarago and approximately 6km to the southeast of the mine site. The site has an area of 10 ha and is bounded by the Mulwaree River to the north and west and the Goulburn-Bombala railway line to the east and south.

2 Post Closure Environmental Monitoring

2 Post Closure Environmental Monitoring

2.1 Site Closure

The EPA Environmental Guidelines : Solid Waste Landfills (EPA 1996) reflect good management practice for conventionally constructed landfills. In particular, the guidelines contain techniques that are appropriate to sites which accept sufficient mass of solid wastes, to permit the construction of slope angles sufficient to promote surface drainage. Because of differences in the bioreactor design, local topography and site geology, some “Benchmark Techniques” require adaptation to suit the unique conditions at Woodlawn.

In accordance with Benchmark Technique 29 (Landfill Closure and Post-Closure Monitoring and Maintenance) of the Landfill Guidelines (EPA 1996), the monitoring and maintenance activities will be provided until the bioreactor does not pose a threat to the environment. Additionally, as outlined below, all leachate collection, gas collection, stormwater sediment controls, monitoring and reporting practices will be maintained to a standard equivalent to that employed during the operational life of the bioreactor.

2.1.1 Revegetation

All necessary revegetation works will be completed in accordance with the final design contour plan to ensure erosion protection and stabilisation of eroded drains, ponds and dams. The final contour plan is shown in Figure 3.18.

Details of the revegetation and landscaping of the final landform are contained in *Section 5.2* of this plan.

2.1.2 Stormwater

At the completion of landfilling activities, the necessary environmental controls regarding stormwater collection and treatment will be installed in accordance with EPA Environmental Guidelines.

Details of the post closure stormwater and surface water management and monitoring are contained in *Section 8: Closure Strategies* in this plan.

2.1.3 ED3 Management

The post closure management of ED3 will be carried out in accordance with Consent Condition 70. Details of the management techniques proposed are contained in *Sections 5.4* and *Section 7* of this Plan.

2.1.4 Leachate

The leachate collection and treatment utilised during the operational phase of the site will continue following closure. The monitoring regime established during the operation of the site will initially be maintained and reviewed as appropriate.

2 Post Closure Environmental Monitoring

Details of the leachate monitoring program and leachate management practices are contained in the Leachate Management Plan and the Environmental Monitoring Schedule.

2.1.5 Groundwater

The groundwater monitoring regime established during the operation of the site will be maintained post closure.

Details of the monitoring regime and management are contained in the Groundwater Monitoring Program.

2.1.6 Landfill Gas

The gas management and control systems installed during the operation of the site will continue to operate during the post closure after care until the active gas generation phase is completed.

The gas monitoring program established during the operation of the site will also continue post closure. Details of this monitoring program are contained in the Gas Management Plan.

3 Site Rehabilitation Plan – Post Closure Management

3 Site Rehabilitation Plan – Post Closure Management

3.1 Introduction

Collex currently have approval to operate the bioreactor for a period of 20 years in accordance with Consent Condition 3. Extension of filling activities beyond 20 years would be subject to further approvals applicable at the time. It is estimated that complete filling of the void would take in the order of 50 to 60 years.

3.2 Objectives

The ultimate aim of the ongoing post closure management activities is to stabilise the bioreactor and ensure that it does not pollute the surrounding environment.

Once the Bioreactor has achieved stability, VES may seek to complete all obligations and seek return of financial assurance lodged with the EPA. VES will need to issue a certified statement of completion, stating that all necessary site remediation work has been completed (gas, leachate, stormwater and revegetation management) and no further environmental management of the site is necessary.

The certified statement will be required to show the following:

- Gas concentration levels in all perimeter gas wells have fallen to less than 1% methane (v/v) and less than 1.5% carbon dioxide for a period of 24 months;
- Waste stabilisation to be completed. The leachate and gas monitoring data documented indicate low level contamination, posing no hazard to the environment;
- Groundwater monitoring results indicate threat to groundwater quality;
- Bioreactor capping layer has been assessed over several years and found to be stable with acceptable surface water drainage;
- Necessary documentation to demonstrate that all requirements in the closure planning segment of the LEMP have been completed; and
- Site has been placed on the Unhealthy Building Land Register.

Following approval by the EPA of the certified statement of completion, the licensee can cease all maintenance and monitoring requirements for site, and all financial assurance requirements will lapse.

3.3 Monitoring And Maintenance

3.3.1 Introduction

Ongoing management of the site will be undertaken following closure of the site. This would consist primarily of monitoring of the site and undertaking of required maintenance. The aim of the ongoing monitoring and maintenance program is to demonstrate compliance with licence conditions and ensure management activities are working effectively.

VES will ensure that all leachate collection, gas collection, stormwater controls and reporting practices are maintained to the same level employed at the end of the operational life of the bioreactor. The environmental management measures will continue until VES can demonstrate that the bioreactor does not pose a threat to the environment.

VES will ensure that waste materials are not received for disposal at the site after the landfilling operations cease. Any waste materials that are intended for use in the rehabilitation will be documented and reported in the same method used during the operation of the bioreactor.

VES will undertake ongoing environmental management responsibilities related to the bioreactor site such as gas extraction, remedial work on areas of settlement and surface water management and leachate control in accordance with the LEMP.

Regular maintenance of the final landform and landscape will be undertaken in accordance with the LEMP. This will comprise:

- Monitoring of surface water and leachate dams and drains and undertaking repairs where necessary
- Filling of depressions created by settlement of the filled waste (to ensure shedding of surface water runoff)
- Replacement of vegetation, if necessary, to maintain the vegetation density
- Repairing erosion scours
- Clearing and maintenance of water courses and swales

The above activities would continue until the bioreactor has been stabilised.

3.4 Records And Reporting

3.4.1 Monitoring Results

Results for the post closure monitoring of surface water, groundwater, leachate, biogas and settlement, are to be maintained in accordance with the practices detailed in the operational monitoring plans for the site.

3.4.2 Records of Pollution Complaints

The records of all complaints received by VES will be kept on site these records will include:

- Date and time of the complaint;
- Details of the complaint;
- Nature of the complaint;
- The action taken by VES including any follow-up contact with the complainant.

3 Site Rehabilitation Plan – Post Closure Management

3.5 Staffing And Training Requirements

It is VES's responsibility to provide adequate staff/contractors to ensure that all requirements described in this PCLRMP are met. It is also VES's responsibility to provide adequate training to all personnel performing critical tasks such as site inspections and the operation and maintenance of environmental control equipment.

3.6 Environmental Review

VES intends to evaluate the success of its after care management approach on an annual basis.

The annual environmental review will have the following objectives:

- Quantitatively evaluate the significance of the environmental impacts associated with site activities;
- Formulate and periodically review environmental objectives, targets and programs for the site;
- Evaluate the effectiveness, completeness and need for the improvement of existing environmental management practices, to ensure compliance with current environmental legislation and guidelines;
- Assist in the continual improvement and optimisation of the site's existing environmental management practices;
- Provide confidence to the general public, community groups and regulatory agencies in regards to the impact of site activities on the environment and the effectiveness of the site's environmental management practices.

3.7 Management System Audits

Internal management system audits and supplier audits will be conducted on a regular basis to verify that the site's operations comply with the requirements of this PCLRMP. The results of the audits will be recorded and recommendations for improvement communicated to the relevant management personnel.

4 Financial Assurances

4 Financial Assurances

4.1 Bioreactor Rehabilitation

VES has provided to the EPA financial assurance commensurate with the ongoing environmental management and rehabilitation responsibilities for the bioreactor and associated activities. The financial assurance consists of:

a. A bank guarantee. The financial assurance is to be adjusted annually so that it keeps pace with inflation until agreed between VES and the EPA. The amount of the assurance has been determined by an independent review of the costings applicable to activities identified in the LEMP, and

b. An accumulating fund generated by monies set aside annually on deposit, or other form of financial assurance acceptable to the EPA, in respect of post closure works and responsibilities. The initial and ongoing annual deposit into this fund has been determined by an independent expert review of the costings applicable to activities identified in the Post Closure Landfill Rehabilitation Management Plan.

The financial assurance shall be maintained during the operation of the facility and thereafter until such time as the EPA notifies VES in writing that it is satisfied that the premises have been appropriately rehabilitated and are environmentally secure.

4.2 Whole of Mine Site Rehabilitation

VES has provided to the NSW Department of Mineral Resources (DMR) financial assurance pursuant to the rehabilitation responsibilities for the Woodlawn Mine (Special Mining Lease 20). The financial assurance consists of a bank guarantee.

The financial assurance shall be maintained during the life of the mining lease and thereafter until such time as the DMR notifies VES in writing that it is satisfied that the premises have been appropriately rehabilitated and are environmentally secure.

5 Closure Strategies

5 Closure Strategies

5.1 Early Closure strategies

Closure strategies in the event of filling operations ending prior to the complete filling of the mine void are outlined below.

Water management techniques are the primary activities that are affected by early closure of the filling operations. All other techniques including leachate collection, biogas collection, capping and revegetation will remain as outlined in this and other relevant documents.

Early closure of the bioreactor refers to the closure of the bioreactor prior to filling the mine void. The exposed walls of the mine void will produce acid mine drainage and pose a risk to the environment. As a result, the acidic surface water generated from the cliff face will be collected and managed separately to the runoff from the rehabilitated surface of the mine void.

Three options for managing early closure of the bioreactor are illustrated in Figure 3.15, Figure 3.16 and Figure 3.17. These figures indicate several options for storing and managing the surface water generated within the rehabilitated mine void.

5.1.1 Early Closure Strategies: Mine Void

Option 1

The proposed mine void surface water management during early closure of bioreactor Option 1 is shown in Figure 3.15, within 8 low-lying depressions, where the contaminated water is collected and kept separate to the clean surface water collected within the rehabilitated areas.

Unrehabilitated Area of the Mine Void

Within Figure 3.15, the 4 depressions indicated by the hatched contour lines collect the contaminated surface water generated from the cliff face of the mine void. Contaminated surface water is collected through a series of perimeter rock drains into the four depressions and pump to ED3 for storage through level activated pumps.

Rehabilitated Area within the Mine Void

The 4 depressions indicated by the solid contour lines (Figure 3.15) collect the surface water generated from within the rehabilitated areas. The surface water can be managed through the use of spray evaporation, surface water evaporation and pumping to the adjoining clean catchments as required.

The overall slope of the finished surface can be seen in cross section 1, Figure 3.15, showing a gentle peak in the middle and low points on either side, collecting the clean surface water. From here the slope peaks and falls again to provide storage for the contaminated surface water generated from the exposed mine wall areas.

5 Closure Strategies

Option 2

The proposed mine void surface water management during early closure of bioreactor Option 2 is shown in Figure 3.16, within 8 low-lying depressions, where the contaminated water is collected and kept separate to the clean surface water collected within the rehabilitated areas.

The difference between options 1 and 2 is in the location of the depressions rather than the number which indicates that a number of possible alternatives exist for the layout of the depressions.

Unrehabilitated Area of the Mine Void

The 4 depressions indicated by the hatched contour lines (Figure 3.16) collect the contaminated surface water generated from the cliff face of the mine void. Contaminated surface water is collected through a series of perimeter rock drains into the 4 depressions and is pumped to ED3 for storage through level activated pumps.

Rehabilitated Area within the Mine Void

The 4 depressions indicated by the solid contour lines, collect the surface water generated from within the rehabilitated areas where the surface water can be managed through the use of spray evaporation, surface water evaporation and pumping to the adjoining clean catchments on a as needs basis.

The overall slope of the finished surface can be seen in cross section 1, Figure 3.16, showing a gentle peak in the middle and low points on either side, collecting the clean surface water. From here the slope peaks and lowers again to provide storage for the contaminated surface water generated from the exposed mine wall areas.

Option 3

The proposed mine void surface water management during early closure of bioreactor Option 3 is shown in Figure 3.17, within 2 low-lying depressions, where the contaminated water is collected and kept separate to the clean surface water collected within the rehabilitated areas.

The difference between option 3 and options 1 and 2 is in the number and location of the depressions, further indicating that a number of possible alternatives exist for the layout of the depressions.

Unrehabilitated Area of the Mine Void

The depression indicated by the hatched contour lines, collects the contaminated surface water generated from the cliff face of the mine void. Contaminated surface water is collected through a series of perimeter rock drains into the depressions and pumped to ED3 for storage through level activated pumps.

5 Closure Strategies

Rehabilitated Area within the Mine Void

The depression indicated by the solid contour lines collects the surface water generated from within the rehabilitated areas. The surface water can be managed through the use of spray evaporation, surface water evaporation and pumping out to the adjoining clean catchments on a as needs basis.

The overall slope of the finished surface can be seen in cross section 1, Figure 3.17, showing a peak at one end of the rehabilitated layer that slopes down to the other end providing depression for the clean surface water and the contaminated surface water.

Management options 1 to 3 will be implemented through the use of level control pumps that automatically trigger during wet weather events and pump the contaminated surface water to ED3. The surface water generated from the rehabilitated areas will also be pumped out of the mine void through level activated pumps and will flow off-site to adjoining clean catchments.

5.1.2 Early closure strategy: ED3

If the bioreactor is closed before the void is filled the surface water generated from the mine void will be required to be pumped out and stored in ED3 due to acid mine drainage (attributed to the exposed walls of the mine void). The diversion and collection of surface water at the surface of the rehabilitated area will allow for:

- Contaminated surface water that has come into contact with the sides of the wall to be segregated away from the rest of the surface water

- Contaminated water to kept separate from the rehabilitated sections of the mine void through the use of perimeter drains

- Contaminated water collected within the perimeter drains will be collected to sump points and pumped out to ED3 on a level control system.

Storage will be provided for the clean surface water that can be pumped out as required by level activated pumps. The finished surface of the mine void and the surface water management have been detailed in Figures 3.15, 3.16 and 3.17 detailing the continued management of contaminated water through the use of ED3.

5.1.3 Maintenance

The pump system will require activation through level control. Pumps, pipelines and storage levels will need to be checked after a significant rainfall event. Due to the chemical characteristic of the exposed mine wall and the surrounding rehabilitated areas, pumps and pipelines must be well maintained. Inspection during and after a significant rainfall event ensures that the system is fully operational. In addition, regular routine inspections are to be undertaken to ensure that the system will operate during storm events.

To assess the performance of the system during a storm event, systems can be set up to indicate to maintenance personnel once a pre-determined depth of rainfall has been reached. The pumping system could then be inspected.

5.2 Final Closure of Bioreactor

5.2.1 Mine void

The proposed mine void surface water management at the completed rehabilitated bioreactor is projected to be approximately 50 years. After which time, subject to extension to current consent conditions for operations at the site of 20 years, the bioreactor zones should have filled the mine void to ground level (RL 845.0). Once the exposed mine walls and bioreactor have been capped and rehabilitated, the surface water generated from this area is considered clean. The flow of water from this area will be similar to the flow of surface water on any of the Woodlawn rehabilitated areas, by the use of contour drains, surface water is diverted to adjoining clean catchments. The final surface contours and flow of surface water at the mine void is shown in Figure 3.18, where the rehabilitated area form the existing contours of land surrounding the mine void similar to the surface of the rehabilitated waste dump area.

The overall slope of the finished surface is indicated in cross section 1, Figure 3.18, forming a ridge where the surface water generated flows via constructed contour drains onto adjoining Wollondilly and Lake George Catchments. Integration of the final surface of the rehabilitated mine void into the surrounding rehabilitated areas at Woodlawn site is shown in Figure 3.20 where the flow generated from the rehabilitated areas flows onto the adjoining Wollondilly and Lake George catchments.

5.2.2 ED3

At final closure of the bioreactor, the surface of the rehabilitated bioreactor will be level with the existing adjoining ground surface. The mine void is considered to be fully rehabilitated and the surface water generated is considered to be clean. Surface water generated can be diverted through contour drains off site to the Lake George and Wollondilly catchments.

The function of ED3 will be to collect and store any rainfall collected from the surface area of the dam. The water stored in ED3 will be managed via evaporation. Average annual precipitation (0.7m) and evaporation (1.4m) levels indicate that evaporation alone is sufficient to manage the water level within ED3.

5.2.3 Rehabilitation of Plant/Office Area

5 Closure Strategies

At the completion of rehabilitation of the disused plant area, the surface water will be collected and diverted into a permanent sedimentation pond, formerly known as the plant collection dam.

Surface water flow within the rehabilitated mine/office area is shown in Figure 3.20 where the clean flow will be collected in the sedimentation dam.

6 Rehabilitation Standards and Schedule

6 Rehabilitation Standards and Schedule

6.1 Site Capping

Site capping and revegetation should ensure that the final surface of the bioreactor provides a barrier to the migration of water into the waste, controls emissions to water and atmosphere, promotes sound land management and conservation, prevents hazards and protects amenity. This would include the following:

- VES will commence capping completed filling areas within 30 days of completion of filling in that area, weather permitting
- The bioreactor should have a final capping comprising five parts:
  - The seal bearing surface
  - The gas drainage layer
  - The sealing surface
  - The infiltration drainage layer, and
  - The revegetation layer

In accordance with Benchmark Technique 28: Site Capping and Revegetation, of the NSW EPA Guidelines: Solid Waste Landfills, the capping will comprise the following:

- The seal bearing surface should consist of a properly designed and engineered layer of material
- The gas drainage layer will have a maximum thickness of 30cm. The calcium carbonate content of the gas drainage layer must not exceed 10% by weight to prevent encrustation
- A sealing layer will consist of a clay layer at least 50cm thick and having a permeability less than $K = 10^{-8}$ m/s^{-1}
- A drainage layer of permeability not less than $K = 10^{-5}$ m/s^{-1} will be placed over the sealing layer. The drainage layer will not be less than 30cm thick.
- A revegetation layer of depth not less than 100cm will be placed over the drainage layer. Plants selected for revegetation shall have root systems which will not penetrate beyond the revegetation layer or block the drainage layer. The final settlement of the seal bearing surface should leave a gradient of greater than 5% to defined drainage points
- If the sealing layer is left for a period exceeding seven days before being covered by the revegetation layer, it should be covered by a flexible membrane liner protection layer.

These procedures will be reviewed when capping of the bioreactor is required, and amended to reflect the best available technology at the time.

6.2 Revegetation

The rehabilitation of the Bioreactor site will involve the establishment of a stable vegetated landform over a compacted capping layer. Due to the limitations of topsoil depth, no trees or tall shrubs can be grown on the capped area of the Bioreactor. Therefore the predominant vegetation on the Bioreactor site will be native and

6 Rehabilitation Standards and Schedule

introduced grasses, with some potential for trees and taller shrubs beyond the capping layer on the margins of the site.

While preference is given to the use of native grass species on the site, consideration should be given to the proposed end-use of the site and therefore the suitability of the species for that use. For example if livestock grazing for production purposes is considered desirable, then the use of introduced species will be necessary.

The topsoil must be of a standard suitable for growing a consistent and healthy cover of vegetation. If the soil quality is poor, eg low nutrient and organic matter levels, then soil improver products such as the Nitro Humus™ and BioVerm™ are recommended.

Placement of Topsoil

- Obtain Nitro Humus™ or similar composted green waste from an approved supplier

- Remove site topsoil from stockpile and mix with Nitro Humus™ at a rate of 10% by volume. Install the improved topsoil to top of landfill to no less than 100cm depth

- Cultivate area to a depth of 100mm. Remove stones exceeding 100cm diameter, weeds, rubbish or other deleterious material, brought to the surface during cultivation

Planting

- Seeding to be undertaken by means of hydromulching immediately after topsoil has been placed and the surface prepared

- Hydromulching: a one-step process involving the application of seed, fertiliser, mulch, binder and soil conditioner in one operation. BioVerm™ soil conditioner, or similar, is to be incorporated with the hydromulch mix to improve seed emergence and plant establishment

- Thoroughly mix seed, fertiliser, wood-fibre mulch, binder and soil conditioner to provide a slurry and apply under pressure using a purpose-made machine according to manufacturer's instructions

- Seedmix composition should be confirmed with DEC prior to commencement of works and may include some of the species identified below:
  - Native Grass species such as Wallaby Grass, Spear Grass, Tussock Grass, Kangaroo Grass and Red Anthered Wallaby Grass
  - Introduced Grass species such as Perennial Rye Grass, Cocksfoot, Phalaris, Demeter Tall Fescue, Cereal Ryecorn, White Clover and Sub Clover
  - Native Shrub species such as Acacias, Melaleucas, Leptospermums and Kunzea

6 Rehabilitation Standards and Schedule

Maintenance

- A maintenance establishment period will be necessary to ensure the successful development of all planting areas including the following tasks:
  - Water seeded area so that mulch fibre is kept moist and until seedlings are established
  - Reseed areas where treatment has failed
  - Remove any extensive infestation of weeds, including all tree and tall shrub seedlings which could penetrate the capping layer

On-going maintenance will be less intensive than the establishment period and will be limited to occasional plant replacement, slashing the grassed areas to reduce fire hazard and weed proliferation

6.3 ED3

Post closure management of ED3 will primarily be through evaporation.

Options exist for further post-closure rehabilitation of ED3. A general scope of works could include:

- Progressively reducing catchment
- Dewatering pond
- Removing contaminated layer of sediment
- Utilising wall material for other rehabilitation efforts
- Sowing seed, liming, enriching soil using biosolids

6.4 Site Decommissioning

At the completion of operations, as part of the rehabilitation of the bioreactor site, there is a requirement for decommissioning and removal of all derelict buildings and infrastructure constructed specifically for the Bioreactor Facility. These activities would need to be tied in with any remaining rehabilitation activities being undertaken for the remainder of the mine site.

Additionally, there will still be a requirement for selected office buildings and laboratory to be maintained as part of the post closure maintenance and monitoring activities. Structures such as the gatehouse and weighbridge can be removed at the completion of filling activities.

Finalisation of the site decommissioning activities would be dependant upon the final end landuse proposed for the site.

6.5 Rehabilitation Schedule

The schedule for the rehabilitation of the bioreactor is reliant upon the final landform and proposed end land use of the site, and will, therefore, be determined closer to the time of final rehabilitation.

7 Integration of Rehabilitation Works

7 Integration of Rehabilitation Works

The filling of the Woodlawn mine void with waste and the final rehabilitation of the land subject to the DA shall be undertaken in a manner which is complementary with the rehabilitation of the Woodlawn mine site. The filling activities will not impede or limit the rehabilitation works on any part of the Woodlawn Mine site.

The rehabilitation of the mine void at the completion of filling is to be finalised on the basis of the final landform and the proposed after care land use.

At the completion of filling, ED3 will be managed primarily through evaporation.

The Department of Mineral Resources (DMR) requires a Mining Operations Plan (MOP) for the wider Woodlawn mine site. The MOP aims to delineate the progressive and integrated approach to whole-of-mine-site rehabilitation

An Annual Environmental Management Report (AEMR) supports the MOP by reporting rehabilitation progress each year as part of the Mining Rehabilitation and Environmental Management Process (MREMP).

The MOP outlines the strategy for whole-of-mine rehabilitation. The areas identified are:

- Evaporation Dams 1 & 2
- Plant Area
- Hickory Paddock
- Rehabilitated Waste Rock Dump
- Tailings impoundments
- Dolerite Stockpile
- Other disturbed areas

The information in this Management Plan relating to VES's licenced areas of operation is consistent with the above strategies for whole-of-mine remediation.

As VES is now both the licence holder for the Bioreactor as well as the owner of the wider Woodlawn mine site, VES will be responsible for undertaking Bioreactor post-closure rehabilitation works as well as whole-of-mine rehabilitation works. VES's involvement in the preparation of both this LEMP and the Woodlawn Mining Operations Plan will further ensure that the Bioreactor post-closure rehabilitation strategies are integrated with whole-of-mine rehabilitation activities.

8 References

8 References

(2007) VES, *Woodlawn Bioreactor: Environmental Management Plan*

(2007) VES, *Woodlawn Bioreactor: Leachate Management Plan*

(2007) VES, *Woodlawn Bioreactor: Filling Schedule*

(2007) VES, *Woodlawn Bioreactor: Environmental Monitoring Schedule*

(2007) VES, *Woodlawn Bioreactor: Gas Management Plan*

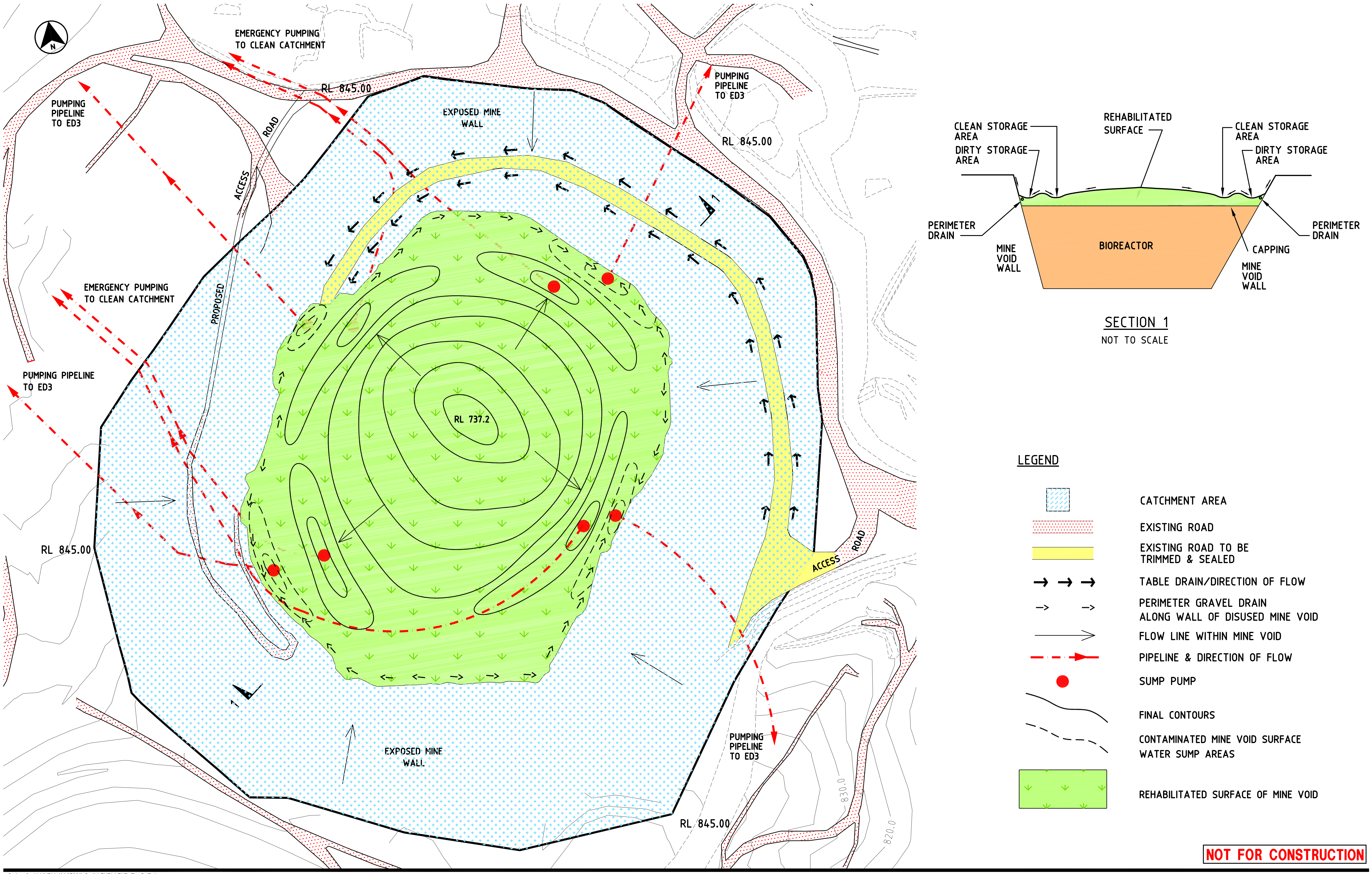
(2007) VES, *Woodlawn Bioreactor: Groundwater Monitoring Program*

(2000) DUAP, Woodlawn Waste Management Facility: Conditions of Development Consent

(2004) Collex: *Woodlawn Mine*: *Mine Operations Plan (Draft @ May 04)*

(1996) NSW EPA, *Environmental Guidelines: Solid Waste Landfills*

(2004) NSW EPA, *Woodlawn Bioreactor: Environment Protection Licence No. 11436*



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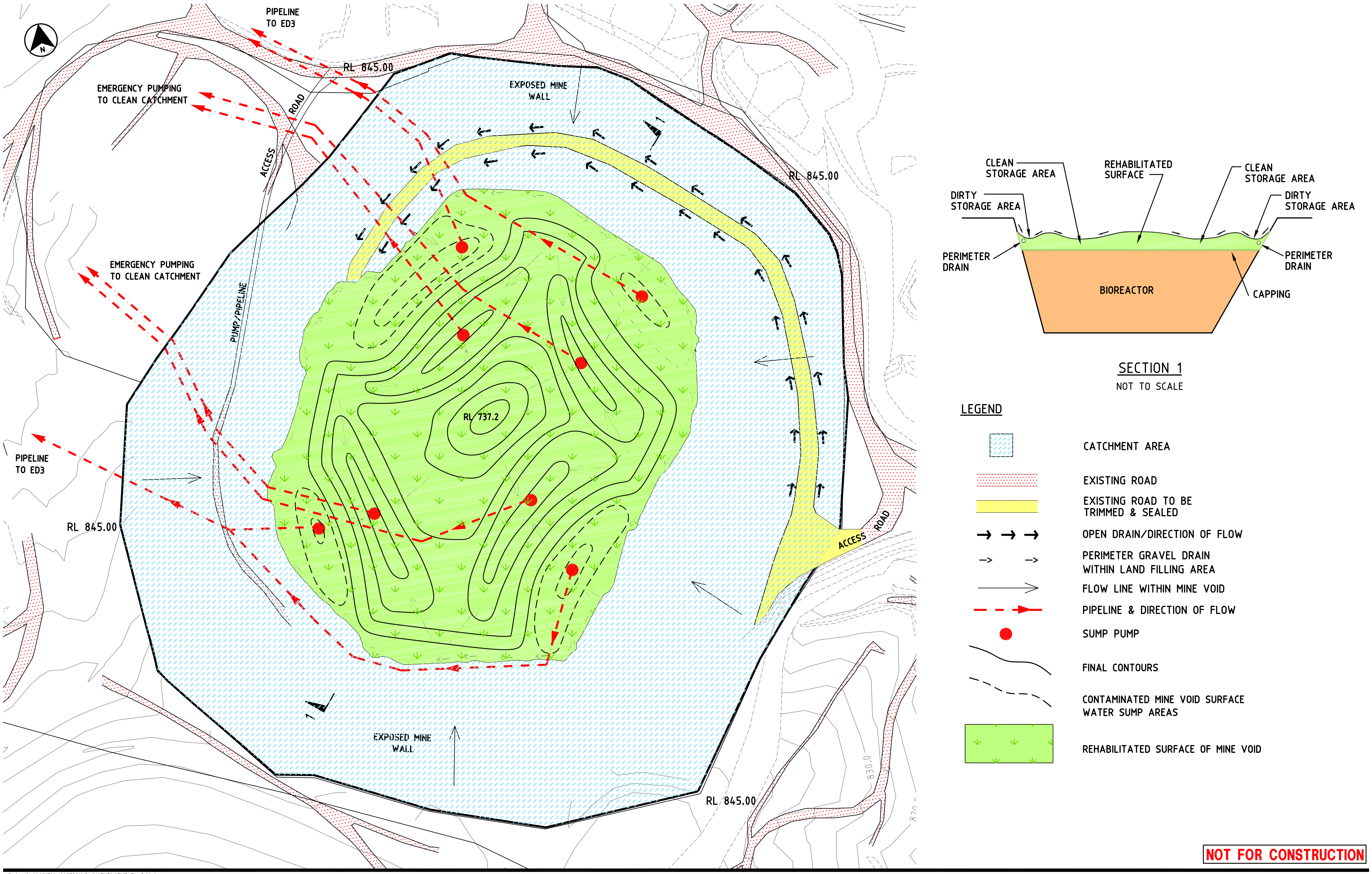
50m 0 50 100 150m

SCALE AT A3

Woodlawn Bioreactor and Intermodal

Proposed Mine Void Surface Water Management
Early closure of Bioreactor - Option 1

Figure 3.15



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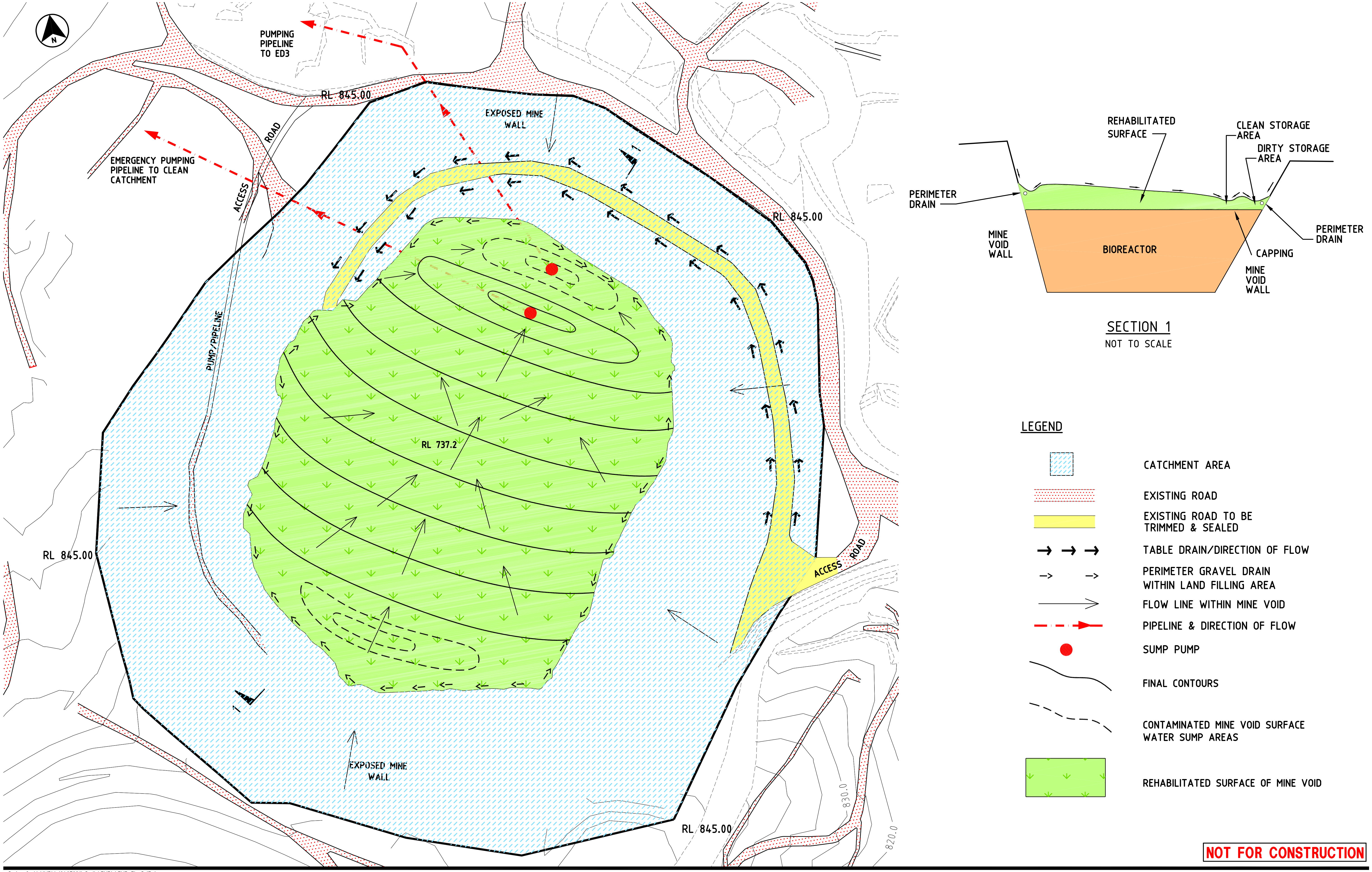
maunsell COLLEX ONYX WOODLAWN BIOREACTOR

50m 0 50 100 50m
SCALE AT A3

Woodlawn Bioreactor and Intermodal

Proposed Mine Void Surface Water Management
Early closure of Bioreactor - Option 2

Figure 3.16



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maunsell COLLEX ONYX WOODLAWN BIOREACTOR

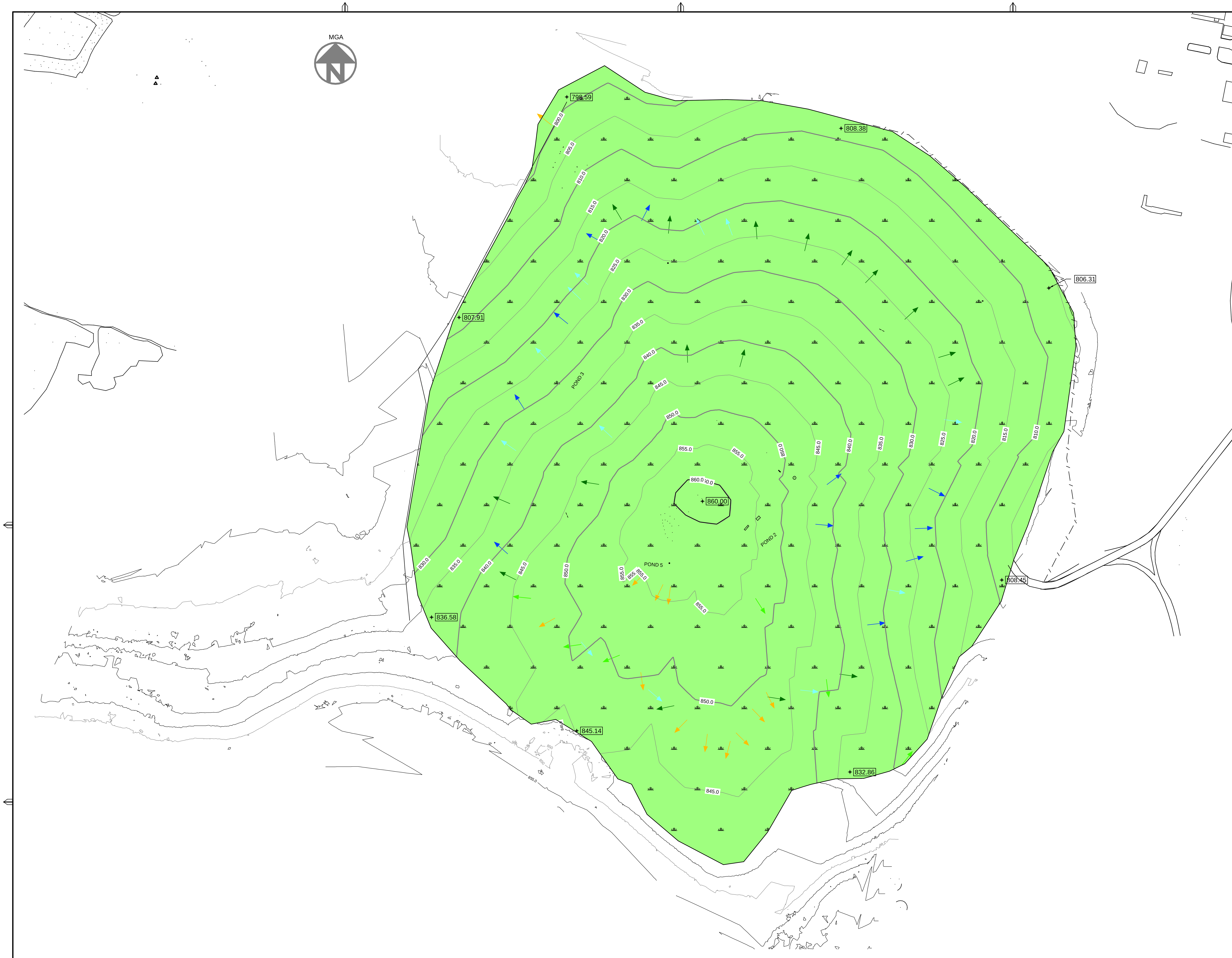
50m 0 50 100 150m

SCALE AT A3

Woodlawn Bioreactor and Intermodal

Proposed Mine Void Surface Water Management
Early closure of Bioreactor - Option 3

Figure 3.17



NOTE:
ARROWS INDICATE DIRECTION OF FALL WHILST ARROW
COLOUR INDICATES GRADE AS SET OUT IN TABLE BELOW.

SURFACE SLOPE ARROW DATA

NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	COLOR
1	0.000%	5.000%	red
2	5.000%	7.500%	orange
3	7.500%	10.000%	light green
4	12.500%	15.000%	dark green
5	15.000%	17.500%	light blue
6	17.500%	20.000%	blue

X:\JOBS\201146\ACAD\201146_CAPPING.DWG

VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR

A1 SHEET

SCALE: 1:2500 (0 50 100 150 200 250 METRES)

ISSUE	AMENDMENT	DRAWN	DATE
A	INITIAL ISSUE	J.C.	27/01/11

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Campbell & Anderson

LandTeam

Founding member servicing the Southern Highlands

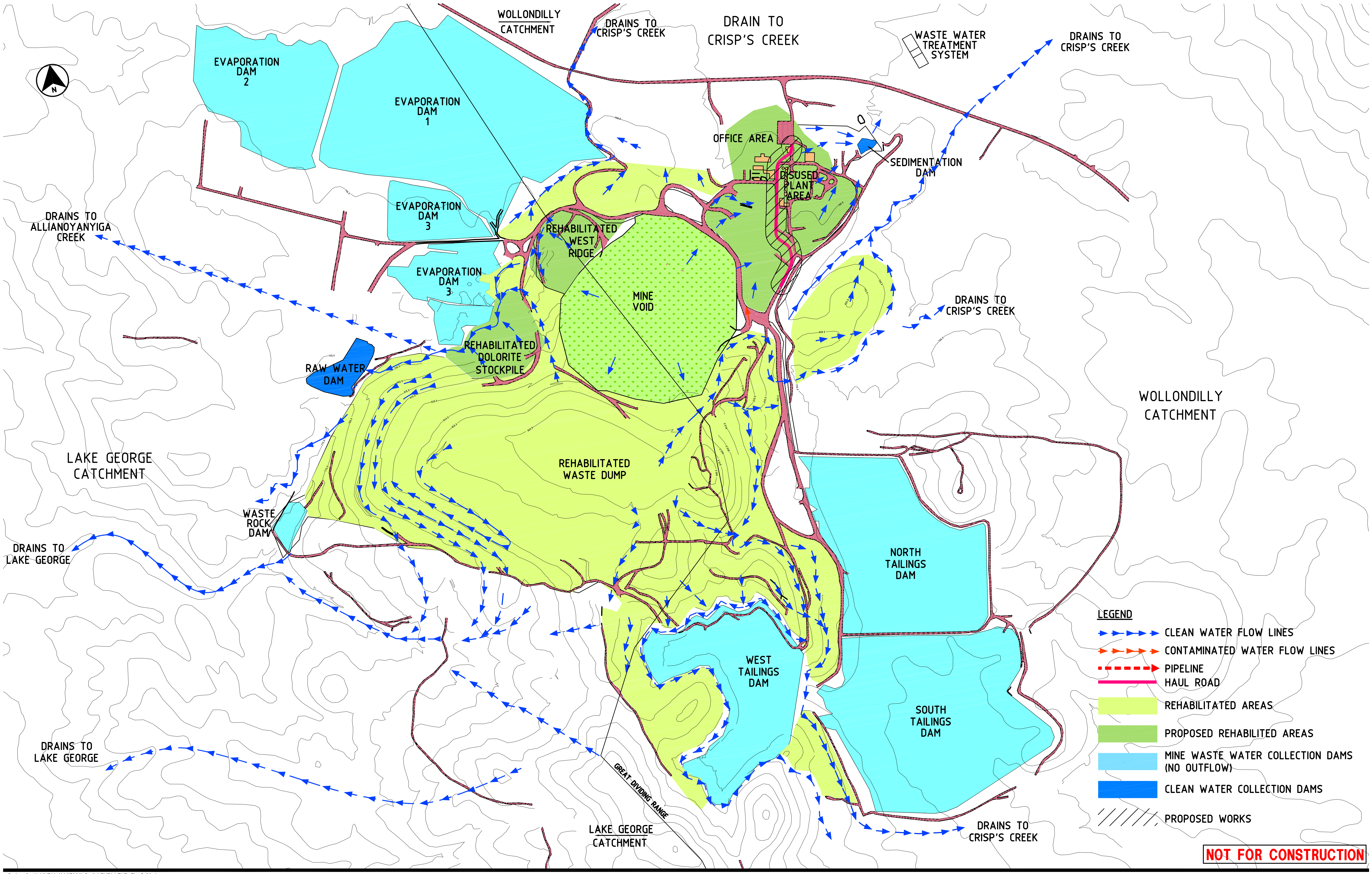
VEOLIA ENVIRONMENTAL SERVICES

WOODLAWN BIOREACTOR VOID WORKS CATCHMENTS PLAN

WOODLAWN BIOREACTOR COMPLETED REHABILITATION SURFACE PLAN

DESIGNED: J.C.
DRAWN: J.C.
CHECKED: R.A.
ISSUE: A
DRAWING No. 201146-CRS1

SCALE: 1:2000 | DATUM: A.H.D. | DATE: 27/01/2011



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maunsell COLLEX ONYX WOODLAWN BIOREACTOR

75m 0 75 150 225 300 375m
SCALE 1:7500 AT A3

Woodlawn Bioreactor and Intermodal

Proposed Surface Water Management at Woodlawn Mine Site
At Completion of Rehabilitation of Mine Areas

Figure 3.20