

3.1 Closure Objectives and Commitments

BOPL recognises that effective environmental rehabilitation and closure of its sites is an essential requirement of a responsible mining company. Therefore, BOPL is committed to setting high standards and continually improving the quality of its rehabilitation and closure activities.

Rehabilitation and closure requirements will be documented in a Rehabilitation and Mine Closure Plan (RMCP). An outline of the RMCP will be submitted to DPIFM as part of BOPL's first annual MMP, and will be finalised when operations commence. The RMCP will be developed in consultation with DPIFM and other relevant stakeholders.

The RMCP will form the basis for accounting for rehabilitation and mine closure budget provisions, as well as guiding the security bond determination.

Upon cessation of all operations, BOPL will execute the RMCP in its approved form. As the proposed mine lives of both Princess Louise and North Point are planned to be less than one year, and the mine sites are relatively small, the implementation of a progressive rehabilitation plan will not be required.

With the exception of the open pit voids and the rehabilitated waste rock dumps, there will be no permanent facilities left on site. The proposed end land uses are described in Section 3.4.

BOPL has developed a set of principal objectives for decommissioning and closure, which apply to all of its sites. These principal objectives are to:

- Protect the environment and public health and safety by using safe and responsible closure practices;
- Minimise potential environmental effects, such as surface or ground water impacts, when operations have ceased;
- Remove any waste or potentially hazardous substances from site;
- Develop landforms that, within reasonable and practical limits, blend with the surrounding terrain;
- Work towards achieving water quality standards in downstream watercourses consistent with Australian and New Zealand Guidelines for Water Quality (ANZECC 2000);
- Establish vegetation that is self-sustaining, perpetual and provides habitat for local fauna and successive flora species, and to achieve long-term stabilisation and protection of the previously disturbed or artificial landforms, consistent with the proposed end land use;
- Develop an end land use that takes into account the beneficial uses of the site and surrounding areas (which is predominantly pastoral use);
- Achieve long-term stabilisation of the encapsulated waste rock and minimise erosion and infiltration;



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- Leave a closed mine that achieves general acceptance by the community, which will have interest in the future of the site; and
 - Reduce the requirement for long-term monitoring and maintenance by establishing stable rehabilitated areas.

In addition to these objectives BOPL will also consider any requirements of this PER (developed during the environmental approvals process), the requirements of the MMP (to be developed prior to mine operations), relevant Territory and Federal legislation, any pre-existing stakeholder commitments, the Australian and New Zealand Minerals and Energy Council's Strategic Framework for Mine Closure (ANZMEC 2006), and the Department of Industry, Tourism and Resources' Leading Practice Sustainable Development Program for the Mining Industry, in particular the *Mine Closure and Completion and Mine Rehabilitation Handbooks* (DITR 2006a, 2006b).

3.2 Closure Timeframe

BOPL will stabilise both the Princess Louise and North Point mine sites, and carry out rehabilitation ripping and seeding, by the second wet season after mining ceases.

BOPL has proposed a nominal period of rehabilitation maintenance and monitoring post-mining of three years for the purposes of this PER, however these activities will continue until decommissioning. Decommissioning will occur when the site is rehabilitated to a level that is considered acceptable by DPIFM, in accordance with the requirements of the RMCP. Section 2.5.2 provides additional detail on the project schedule.

3.3 Stakeholder Involvement

The process of closing the Princess Louise and North Point mines will involve consultation with all relevant stakeholders. A communications strategy will be developed during the preparation of the RMCP.

A fundamental part of the stakeholder communication strategy developed during the RMCP preparation will be the establishment of agreed indicators of effective mine decommissioning and reclamation. Post-closure, these indicators will be assessed and will provide certainty to stakeholders that the closure process has been effective in implementing the rehabilitation objectives outlined in Section 3.1.

The following indicators or endpoints are proposed; these are based on those currently in place at other BOPL sites:

- Water quality in streams and rivers leaving the lease are no worse than baseline data over a full wet season;
- Water in the open pit is suitable for water fowl or for pastoral use;
- Mine components are rehabilitated according to the procedures in the RMCP;



- Erosion gullies on disturbed land are less than 300 mm deep over a full wet season; and
- Vegetation is established in accordance with criteria set out in the RMCP.

3.4 Post-Mining Land Uses

Due to the remoteness of the project sites, it is unlikely that permanent human settlement will be established at the sites post-mining, and it is anticipated that the land will primarily revert to its previous land use, pastoral grazing, or be maintained for nature conservation purposes. However, the main objectives identified for post-mining land use are pastoral grazing.

It is expected that areas impacted by mining operations will be classified as either restorable or non-restorable land. Non-restorable areas include the pit voids. These areas will be stabilised and made safe. The total area that is considered to be non-restorable, and will result in a change of current use, is 4.9 ha. This figure comprises 1.2 ha for the pit void at Princess Louise and 3.7 ha for the pit void at North Point. However it is noted that DPIFM has suggested that the pit voids may also be utilised for stock drinking purposes. Further information on rehabilitation of the pit voids is presented in Section 3.7.1.

As stated above, restorable areas will be primarily targeted for pastoral use or conservation purposes. In order to provide long term stability and rehabilitation success, pastoral use is not considered suitable for the waste rock dumps over the longer term, and these areas will be targeted for rehabilitation as mixed native woodland for limited future use and nature conservation.

A summary of proposed end land uses and associated revegetation types are outlined in Table 3.1. Final land use objectives will be defined in consultation with relevant stakeholders as part of the development of the RMCP.

Table 3-1 Proposed end land uses for mining infrastructure

Domain	Proposed end land use
Open pit voids	Physically and chemically stable land, but closed to public use. Open pits will naturally fill with water to provide a potential water source for water fowl or pastoral use. The area may have access restrictions imposed.
Mining infrastructure, including ROM pad, sediment dam, and amenities area	Mixed native woodland and/or grassland for pastoral grazing.
Waste rock dumps	Mixed native woodland and grassland, specifically for limited use and nature conservation.



3.5 Anticipated Rehabilitation Works

Anticipated rehabilitation works required for the proposed mining activities at the time of mine closure are presented in Table 3.2.

Table 3-2 Anticipated rehabilitation works at Princess Louise and North Point

Domain	Disturbance area (ha)		Rehabilitation techniques applied
	Princess Louise	North Point	
Waste rock dump	3.4	9.4	Waste rock dump shaped and rehabilitated
Sediment dam	0.3	0.6	Base to be assessed for soil contamination and capped if required. Walls to be folded in over base and area to be recontoured and seeded
Open pit void	1.2	3.7	Pits to be made safe and stable and safety bunds to be installed around the perimeter
ROM Pad	0.4	0.5	Area to be recontoured, ripped and seeded
Water storage tanks	0.01	0.01	Tanks to be removed from site and cleared areas to be recontoured and seeded
Amenities area	0.3	0.3	Area to be recontoured, ripped and seeded
Access roads	0.2	0.6	Areas to be ripped and seeded
Exploration drill holes (total of 47 holes)	1.9 (approx. 400 m ² disturbance per drill hole)		Drill holes to be capped and drill pads and access tracks rehabilitated on an ongoing basis and during operations
Total rehabilitation area (ha)	21.0		

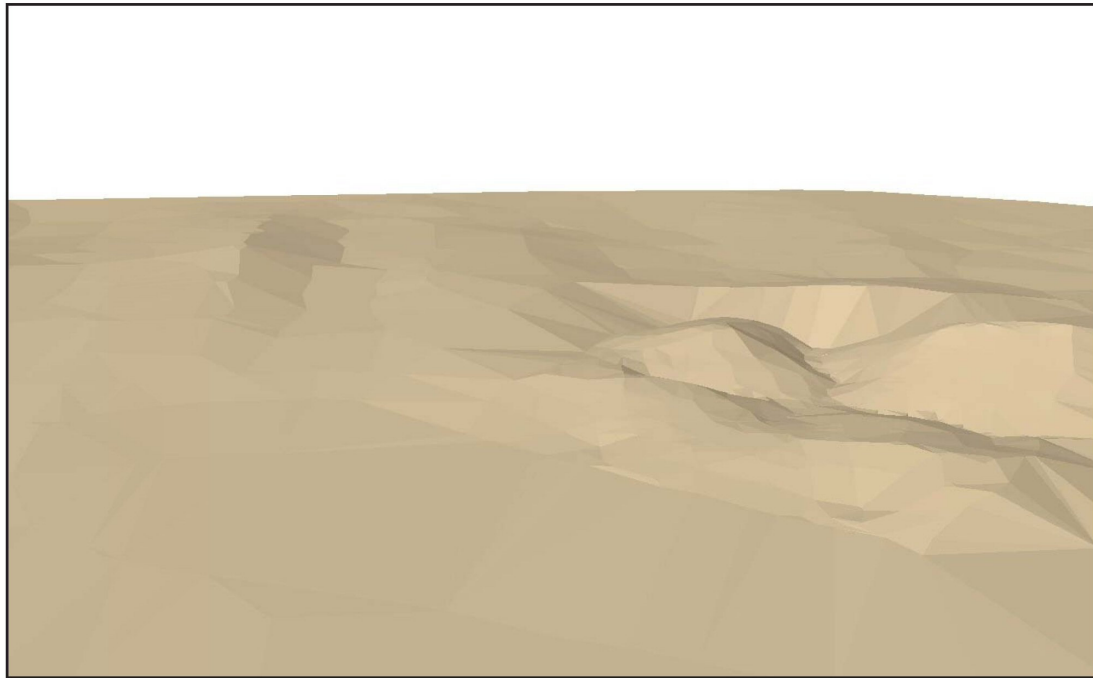
3.6 Landform Design

Landform design will focus on achieving long term stabilisation of the site and minimal erosion/infiltration of the encapsulated waste dumps.

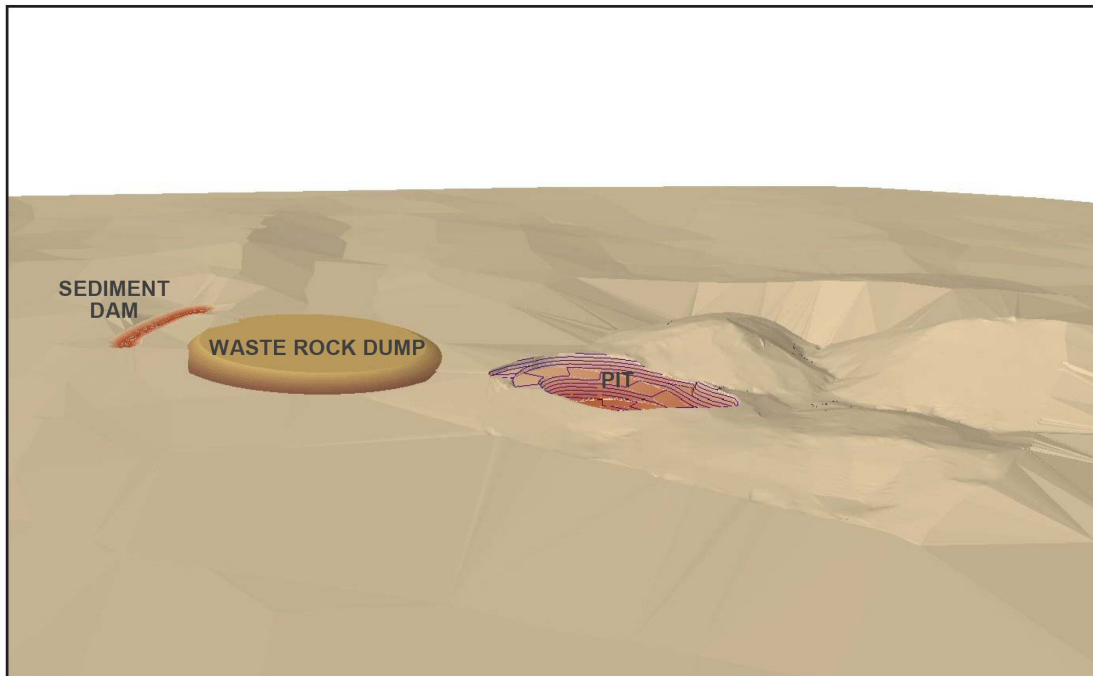
Illustrated views of the proposed landscape pre-mining and post-mining for Princess Louise and North Point mine sites are presented in Figures 3.1 and 3.2 respectively.

Landform stability will be assessed periodically throughout the rehabilitation process and during the post-mining rehabilitation monitoring and maintenance period. Actions will be taken as required to address any identified issues, such as erosion and any changes to the integrity of bund walls.





Natural Surface



Surface after Mining

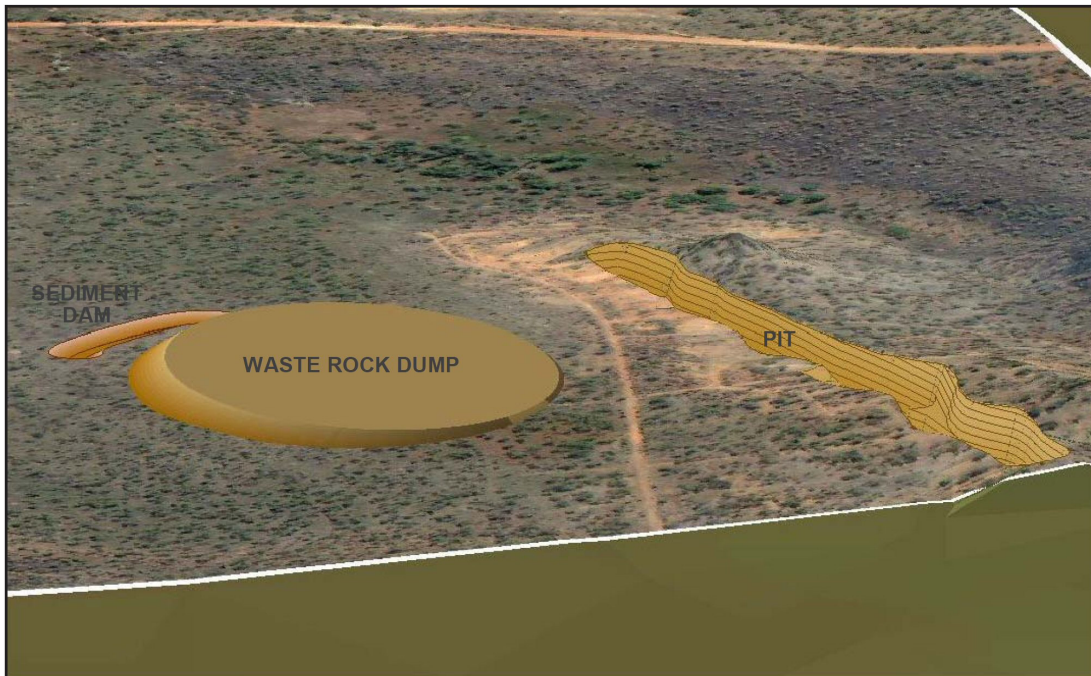
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Client Burnside Operations Pty Ltd	Project PRINCESS LOUISE & NORTH POINT PROJECT AREA			Title PROPOSED LANDSCAPE BEFORE AND AFTER MINING AT PRINCESS LOUISE	
	Drawn: JD	Approved: CD	Date: July 07	Plate: 3.1	Rev. A
	Job No.: 42213760	File No.: 42213760-3D-002			A4





Natural Surface



Surface after Mining

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Client Burnside Operations Pty Ltd	Project PRINCESS LOUISE & NORTH POINT PROJECT AREA			Title PROPOSED LANDSCAPE BEFORE AND AFTER MINING AT NORTH POINT	
	Drawn: JD	Approved: CD	Date: July 07	Plate: 3.2	Rev. A
	Job No.: 42213760	File No.: 42213760-3D-001.dgn			A4



3.7 Rehabilitation Strategies

Detailed rehabilitation plans will focus on the following rehabilitation guidelines:

- Reshaping of slopes not greater than 1:4 (V:H);
- Contouring and ripping 'on the contour' of prepared faces;
- Seeding with a native seed mix that is suitable for pastoral use, when ground conditions are favourable;
- Seeding areas identified for mixed native woodland (e.g. waste rock dumps) with a suitable native woodland seed mix;
- Seeding with a stabilisation grass mix should this be required;
- Bunding or fencing of pit voids;
- Fencing and signage for public safety; and
- Removal of infrastructure from the site at the completion of mining.

Any soils contaminated with hydrocarbons will be remediated, encapsulated within the waste dump or disposed of to a suitable landfill or similar facility as appropriate.

3.7.1 Open pits

Rehabilitation of the open pits will focus on minimising inadvertent public access to the abandoned open pits, and ensuring the long term stability of the pit voids.

In consultation with relevant stakeholders, consideration will be given to directing surface water to the pit void and constructing beaches on the outside edge of the voids so that they can be used for stock watering purposes, within the context of public safety considerations. However, at this time, it is proposed that the voids would be fenced to exclude stock and the public, to minimise risks (refer to Section 11).

The proposed method of minimising public access to the abandoned open pits is through the construction of an abandonment bund around the perimeter of the open pit void, outside the area designated as susceptible to wall collapse. The fence described above would be external to the abandonment bund. However, as noted above, in consultation with stakeholders, the voids may be left unfenced if they are to be used for stock watering purposes.

Although it is noted that site specific studies will be required to confirm abandonment bund requirements, it is proposed that the construction of the abandonment bund will incorporate the following design criteria, as contained within the safety bund wall guidelines for abandoned open pit mines, produced by the WA Department of Industry and Resources (DIR 1997):



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- Abandonment bunds will be constructed at least 10 m outside the area designated as the potentially unstable pit edge zone;
 - The potentially unstable pit edge zone will be defined by the distance between the existing pit edge and the point where a plane drawn at an angle of 25° from the slope toe intersects the ground surface. However the pit stability will be investigated during operations and the angle required will be reviewed prior to closure (refer to Figure 3.3);
 - Abandonment bunds will be constructed from suitable, freely draining end dumped rock fill, which is the least weathered or hardest material available;
 - Abandonment bunds will be constructed to a minimum height of two metres, and a minimum base width five metres;
 - Suitable signs, stating risk to public safety and prohibiting access, will be erected at appropriate locations; and
 - Shrub and/ or tree planting at the outer edge of the bund wall will be implemented where practical to lessen the visual impact.

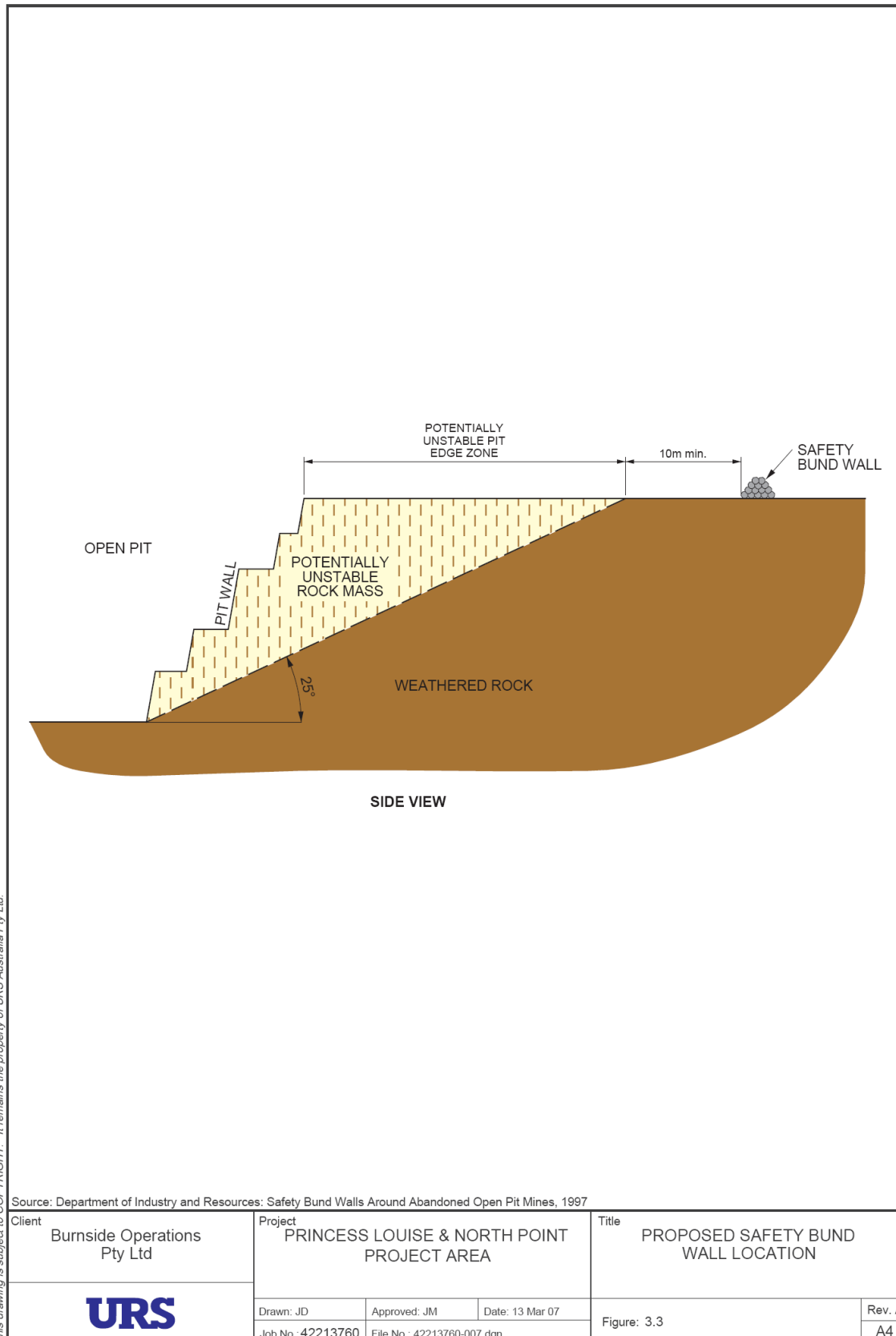
The proposed abandonment bund set-backs as presented in the WA Department of Industry and Resources guidelines, are shown graphically in Figure 3.3 (DIR 1997).

Studies to confirm the suitability of these criteria will include (DIR 1997):

- the presence and orientation of major geological planes of weakness in the rock mass forming the pit wall;
- the strength of the rock mass within the pit wall;
- variation in the strength of the rock mass with time;
- the geometry of the pit wall;
- the influence of groundwater and incident rainfall on pit walls; and
- the influence of seismic events.

If abandonment bund set-backs are not able to be achieved as per the guidelines described above because of local topography or other factors, BOPL will consult with DPIFM in relation to determine acceptable alternatives.





3.7.2 Waste rock dumps

The key objectives of the rehabilitation works undertaken on the waste rock dumps would be;

- to ensure any potential ‘problematic’ (potentially acid or arsenic generating) waste material is contained;
- the prevention of erosion, which would have the potential to expose sulfidic materials to oxygen;
- to provide a suitable final land form for establishment of mixed native woodland; and
- to ensure that water quality in downstream watercourses from the waste rock dumps meet the Australian and New Zealand guidelines for water quality (ANZMEC 2000).

Rehabilitation efforts will be focused on five main design strategies to minimise any potential impact the waste rock dump may have on the environment:

- encapsulating ‘problematic’ waste material;
- minimising erosion of slope faces through contour mounding and revegetation;
- reducing infiltration through revegetation and capping strategies;
- minimising the discharge of poor quality water into the environment emanating from the waste dump through sediment traps and passive wetland filtration systems; and
- minimising the aesthetic impacts of the waste dump by rehabilitation with native tree species of local provenance.

The end land use objective for the waste dump is limited use and nature conservation; therefore rehabilitation efforts will aim to reclaim the waste rock dumps to open woodland with grassy understorey typical of the surrounding vegetation.

The waste rock dump design proposed to be used at the Princess Louise and North Point mine sites will be based on a ‘store and release’ encapsulation system. This encapsulation system has been successfully implemented by BOPL as part of the rehabilitation of the Faded Lily and Union Reefs waste rock dumps.

The ‘store and release’ system encapsulates any ‘problematic’ waste within a ‘non-problematic’ outer shell. The design incorporates at least a 5 m non-problematic base layer, and the outer non-problematic ‘skin’ thickness varies between at least 2-3 m towards the top and at least 5-10 m wide at the base.

The outer ‘non-problematic’ shell or capping material will consist of the first 2-2.5 m of oxide overburden material obtained during the excavation of the open pit. This material will be stockpiled as it is stripped, and will be used progressively to cap the waste rock dump as it is constructed. As described in Section 4.3, this material has been characterised for its suitability as a capping material in relation to its acid mine drainage (AMD) potential and metal composition. Further characterisation of the capping material will



be undertaken as part of the development of specific rehabilitation plans. These will include physical and biological analysis, assessments of susceptibility to erosion, sodicity and the availability of plant nutrients.

The capping strategy is designed to prevent infiltration of water into the inner portion of the waste rock dump from rainfall, to minimise the potential for AMD (refer to Section 4.4). The 'store and release' cover captures annual rainfall in a 'sponge' cover (paddock-dumped non-problematic material) and allows for release of the stored water through evapotranspiration via a vegetative cover and evaporation.

This capping option is considered preferable to shedding water off the top of the dump via drainage structures due to the inherent erosion problems associated with concentrating run-off and the costs of installing and maintaining reinforced drop structures. The 'store and release' design concept is also considered to be well suited to a tropical monsoonal climate, where there is a distinct dry and wet season, and the wet season is characterised by periods of intense rainfall.

On the top surface of the inner portion of the waste rock dump, non-problematic material will be placed in two lifts. The surface of the first lift will be heavily compacted to significantly reduce the permeability of the waste rock layer. The second lift will consist of paddock dumped non-problematic material. This will vary in thickness from a maximum of about 2 m at the peaks and a minimum of about 1 m in the hollows.

The paddock dumped cover stores water in a porous surface layer, such that rainfall events can be held for subsequent evaporation. Vegetation established in this surface layer will enhance the removal of stored water through evapotranspiration. Some water will, however, continue to percolate downwards and escape beyond the reach of evaporation and plant roots.

The compacted under layer primarily governs downward seepage. The low permeability of the compacted layer results in the average annual flux from the bottom of the dump being significantly reduced. This amount of seepage can be effectively directed into a wetland system to achieve acceptable water release quality in the first few years of rehabilitation. However, over time, as plants become established on the dump, this water will be taken up by the vegetation cover, and seepage will reduce.

The sides of the dump will be contour ripped, mounded and seeded with specifically targeted species. A seeding rate of 2.5 kg/ha is targeted for native trees and a rate of approximately 6 kg/ha for grasses. The low seeding rate for grasses is designed to limit the competition effects the grasses may have on the native trees, and reduce fire risk during establishment.

3.7.3 Yam Creek mine water dam

As described in Section 2, the former Yam Creek mine open pit will be utilised as a mine water dam for any excess pit dewater from the North Point mine site that is not used in dust suppression (see Figure 8.2 for site layout). In consultation with stakeholders, this open pit and the stored water may remain open for use by livestock at the completion of mining at North Point. Alternatively, the dam may be fenced to exclude stock.



Water quality testing will be carried out at the time of mine closure to identify the suitability of the dam for livestock watering.

A safety bund around the edge of the Yam Creek pit is already in place.

3.7.4 Sediment dams

Rehabilitation of the sediment dams will focus on the following design strategies:

- Folding in the wall of the dams over the base of the dams and contouring the area to ensure that surface water flows are consistent with those of the surrounding area; and
- Minimising the aesthetic impacts of the sediment dams by rehabilitating with native tree species of local provenance.

Prior to rehabilitation, soil samples will be taken from the base of the dam to determine pH, EC and the presence of metal or hydrocarbon contamination. If contamination is considered an issue, 'problematic' material in the base of the dams will be covered with the material from the walls of the dams and compacted to form a cap. The areas will then be covered with oxide materials and mounded to shed water from the site and reduce infiltration.

The end land use objective for the sediment dam area is also pastoral use; therefore rehabilitation efforts will aim to reclaim the sediment dam area to open woodland with grassy understorey typical of the surrounding vegetation.

The area will be ripped parallel to contours and seeded with specifically targeted species. As for the waste rock dumps, a seeding rate of 2.5 kg/ha is targeted for native trees and a rate of approximately 6 kg/ha for grasses. The low seeding rate for grasses is designed to limit the competition effects the grasses may have on the native trees and reduce fire risk during establishment.

3.7.5 Other infrastructure areas

Other infrastructure areas, such as the amenities areas and access roads, will be cleared, ripped parallel to contours and seeded with specifically targeted species to recreate open woodland with grassy understorey typical of the surrounding vegetation.

3.8 Monitoring and Maintenance

The objective of rehabilitation programs is to achieve long term stabilisation and protection of the previously disturbed or artificial landforms consistent with the final end land use, closure objectives and rehabilitation guidelines. Achievement of this objective will be measured over time as part of the environmental monitoring program.



3.8.1 Groundwater quality

Groundwater monitoring bores will be utilised to establish whether closure objectives have been reached. Post closure groundwater quality should be similar to pre-mining, or within the ANZECC 2000 guidelines for stock drinking water, as applicable. It is noted that arsenic levels are naturally elevated in groundwater in the region.

Monitoring of groundwater quality will be undertaken prior to commencement, during and following the completion of mining. Groundwater levels, electrical conductivity and pH will be measured from all production bores on a monthly basis. A comprehensive chemical analysis of samples from all of the production bores will be taken on a six monthly basis. The proposed sampling parameters are described in Table 5.1.

Further information on the proposed groundwater monitoring program is presented in Section 5.7. A copy of BOPL's draft Groundwater EMP is included in Section 18.1.

3.8.2 Surface water quality

As water quality is intrinsically linked to the success of rehabilitation works, it is imperative that surface water quality is monitored throughout the rehabilitation works.

BOPL will continue the surface water quality monitoring programme in place during mine operations, into the rehabilitation stage. As described in Section 6, monitoring points include a base source location (upstream), points in the pit voids, as well as downstream points in the mine water dam (Yam Creek pit), Ban Ban Creek and the Margaret River. Water quality parameters such as EC, pH, total suspended solids and a range of metals are included in this monitoring programme (see Section 6 for more detail). Surface water quality monitoring will continue for a period of at least one year following pit closure.

A copy of BOPL's draft Surface Water EMP is included in Section 18.2.

3.8.3 Rehabilitation success

BOPL aims to establish vegetation that is self-sustaining, perpetual, and which provides habitat for local fauna and successive flora species, wherever practicable, and to achieve long term stabilisation and protection of the previously disturbed or artificial landforms consistent with the final end land use. The progress of landform rehabilitation will be monitored during an ongoing monitoring program.

Currently, rehabilitation areas are inspected and photographed annually to monitor rehabilitation success. Criteria developed by BOPL for assessing the effectiveness of revegetation include:

- Litter to be captured and decomposed within the systems.
- Vegetation complexities, as determined by the development of a tree layer, demonstrating a trend towards that of surrounding ecosystems.



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- Habitat complexity is trending towards that of surrounding ecosystems.
 - Weed infestations are minimised or controlled.

Over time BOPL will develop rehabilitation monitoring procedures based on a method developed by the CSIRO called Ecosystem Function Analysis (EFA). The basis of EFA is to measure how well a rehabilitated landscape is using water and nutrients, its ability to resist erosion and the landscape's progress towards becoming self-sustaining, in comparison with selected control sites with similar topography (Tongway and Hindley, 2004).

3.8.4 Weed monitoring

BOPL has an existing weed management program. The occurrence of weeds within the rehabilitated areas will be noted annually and appropriate control methods will be implemented and reported upon in the MMP.

A final weed survey will be provided to the Weeds Branch of the Department of Natural resources, Environment and the Arts (NRETA) prior to decommissioning. The expected outcome of the survey is to provide baseline data on appropriate densities of weeds in the lease.

A copy of BOPL's draft pest and weed EMP is included in Section 18.5.

3.8.5 Fire management

Rehabilitated areas will be protected under BOPL's Fire Management Plan. This is most important in the first few years, to enable establishment and stabilisation of the vegetative cover.

A copy of BOPL's draft Fire Environmental Management Plan is included in Section 18.7.

3.9 Security Calculations

BOPL will calculate security requirements based on the completion criteria defined in the RMCP, using the guidelines published by DPIFM.

Securities calculations will involve:

- Calculating the physical area proposed to be disturbed;
- Defining close out criteria that will be confirmed with relevant stakeholders prior to calculation of the securities and commencement of mining. This will include formalizing of any agreements with landowners;



- Determining what specific rehabilitation activities will be required for the areas of disturbance; for example recontouring, ripping, revegetation and monitoring (rehabilitation requirements will be based on the commitments made in this PER, the MMP and the RMCP); and
- Calculating the costs associated with these activities on an area basis in accordance with the Mines Division Advisory Notes PA6-009 (Self Assessment Procedure) and PA6 – 008 (Security Calculation Procedure) (DPIFM 2005).

Costs will be based on man-hours and equipment costs and will include any mobilisation and demobilisation costs. If possible and appropriate, local contractors that have experience in undertaking rehabilitation works will be approached to tender for these works.

Securities will be reviewed on an annual basis, or when significant changes occur to operations to ensure that they reflect current mining activities.

3.10 Commitments

After commencement of mining, BOPL commits to documenting rehabilitation and closure requirements into a RMCP. This RMCP will be consistent with DPIFM requirements for rehabilitation and closure. An outline of the RMCP will be included in the MMP.

On completion of mining, BOPL commits to rehabilitation in accordance with the approved RMCP.

After commencement of mining, BOPL commits to consulting with relevant stakeholders during development of the RMCP.

On completion of mining, BOPL commits to consulting with relevant stakeholders on the potential use of the pit voids and Yam Creek mine water dam for stock watering, and whether or not to fence the pit voids and mine water dam around the abandonment bunds.

After commencement of mining, BOPL commits to calculating security requirements in accordance with DPIFM criteria.

After completion of mining, BOPL commits to rehabilitation monitoring and maintenance programs, which include assessments of surface water quality, groundwater quality, rehabilitation success, weed management and fire management.

