Appendix 4

Rehabilitation & Mine Closure

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Northparkes Mines Step Change Project

July 2013

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Northparkes Mines Step Change Project

July 2013

Prepared by
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on behalf of
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1.0 Introduction

Mine closure planning has been a key consideration in the design of the Project, with the objective of maximising opportunities to achieve a sustainable rehabilitated landform post closure. The proposed base case mine closure strategy for the Project, as discussed in this section, has been developed in consideration of the opportunities and constraints associated with the existing local and regional environment as well as operational considerations.

Some of the key Project design considerations for mine closure planning included:

- The rehabilitation and landform design has been developed in consideration of existing land uses, land resources and the agricultural value of the area (refer to **Section 2.0**). The indicative final landform shown in **Figure 1.1** was developed in recognition that the Project Area may be suitable for a variety of different land uses following cessation of mining activities and has been designed to retain flexibility in the post closure use of the site.

- The ecological significance of the site and its surrounds, including potential impacts from the Project and measures that can be incorporated into the mine rehabilitation process to minimise ecological impacts (refer to **Section 3.0**), have been considered as part of the design of both the post-mining native revegetation and biodiversity offset strategies.

- Waste rock handling, tailings emplacement and rehabilitation procedures have been designed in consideration of geotechnical and geochemical characteristics in order to enhance the quality of post-mining revegetation as well as surface and groundwater resources.

This section outlines the conceptual closure plan for the Project. In particular, the following sections include:

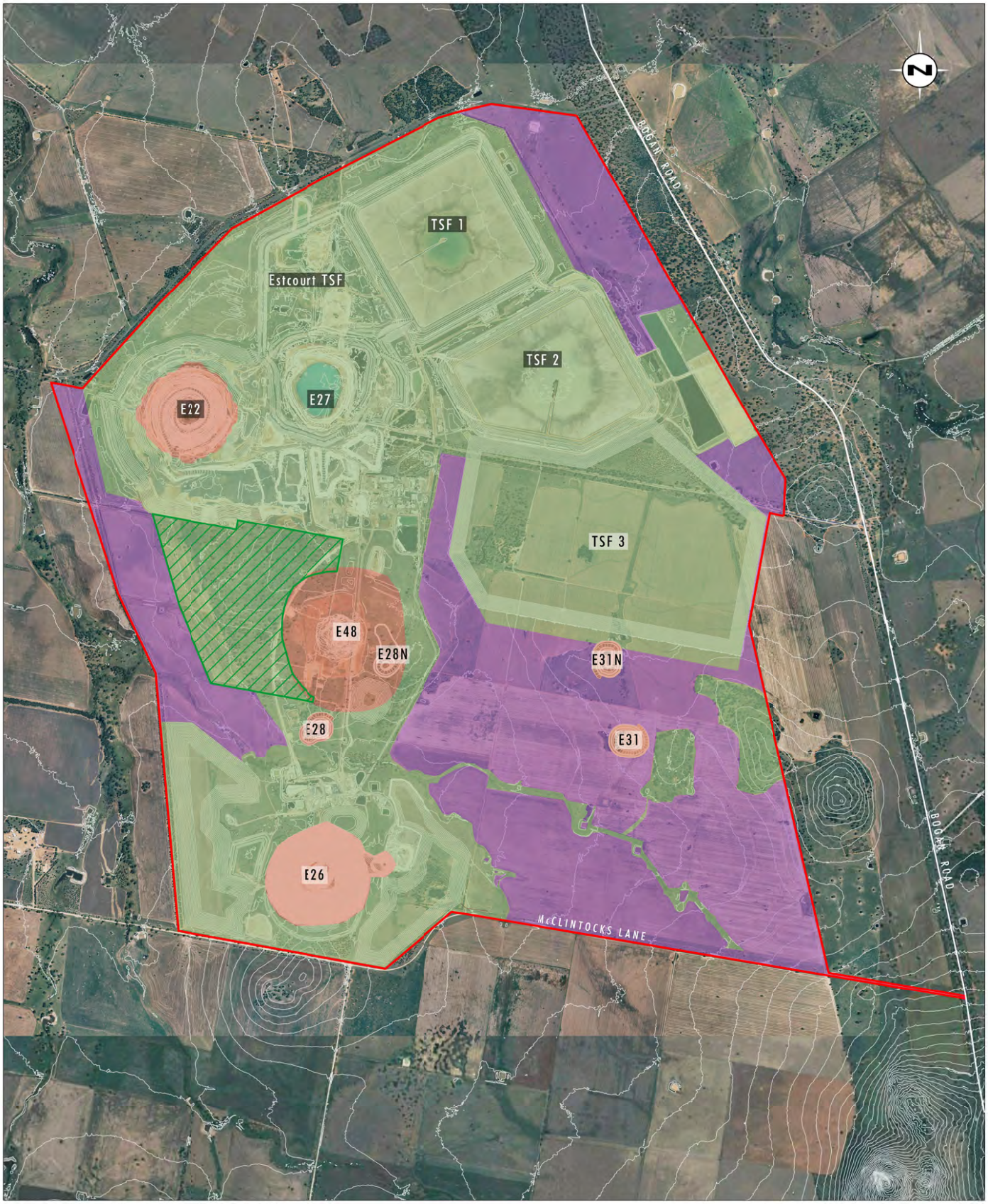
- an outline of the proposed closure and rehabilitation strategy for the Project including the proposed final land use along with the associated objectives and preliminary completion criteria (refer to **Sections 2.1** to **2.3**);

- description of the proposed indicative final landform (refer to **Section 2.4**);

- discussion on how the proposed closure and rehabilitation strategy aligns with strategic land use objectives for the local area and region (refer to **Section 2.1**);

- an outline of the rehabilitation strategy that will be implemented for the Project (refer to **Section 3.0**); and

- an outline of the scope of mine closure works to be implemented on the completion of mining (refer to **Section 4.0**).



Source: NPM (2013), Google Earth (2010)
Note: Contour Interval 2m

0 0.5 1 2km
1:40 000

Legend

- Project Area
- Agricultural Land Use
- Native Vegetation
- Restricted Land Use
- Limestone State Forest

FIGURE 1.1

Proposed Final Land Use

2.0 Mine Closure and Rehabilitation Strategy

Rio Tinto (RT) has implemented a proactive approach to rehabilitation and mine closure by integrating closure planning into the life of mine planning process. Closure planning takes into consideration economic, social and environmental factors so that each of RT's operations meet statutory requirements and achieves a sustainable post-closure land use.

As an existing operation, a Closure Strategy and Closure Plan have been developed for North Parkes Mines (NPM). It is envisaged that these documents will be updated following the approval of the NPM Step Change Project.

The Closure Strategy and Closure Plan will be updated in consideration of the commitments outlined in this Environmental Assessment (EA). This update will include details regarding final land use objectives and closure criteria, rehabilitation and final void management strategies as well as the process for engaging relevant stakeholders in the closure planning process to be adopted throughout the mine life.

It is the intention that the Closure Strategy and Closure Plan will form the basis of the Decommissioning Plan. The Decommissioning Plan will be prepared five years prior to the estimated date of ceasing production and will provide an outline of the additional closure studies required to be undertaken in order to achieve successful closure of the site. As part of the development of the Decommissioning Plan, opportunities for parts of the Project Area to be used for other land uses will also be considered.

The fundamental principles that underpin the closure and rehabilitation strategy are outlined in the sections below.

2.1 Proposed Post Mining Land Use

There are a number of end land use options available to NPM. Based on site constraints and opportunities and for consistency with adjacent land uses, it is considered that the most sustainable final land use option for the majority of disturbed areas across the Project Area will be the establishment of native vegetation, with areas of native grassland as shown on **Figure 1.1**. As shown in draft conceptual final land use plan (refer to **Figure 1.1**) the final land use will also involve the maintenance of agricultural land, primarily for cropping use. As shown on **Figure 1.1**, there are a number of restricted areas identified which are associated with the subsidence and open cut mining voids. As part of site decommissioning, NPM will ensure that that these areas are geotechnically stable, with appropriate buffer areas maintained, and access appropriately restricted.

There are no specific regional strategic plans or resource management plans that define specific policy objectives for rehabilitation and/or land use within the Project Area or surrounds. The proposed final land use has been designed to be consistent with surrounding land uses, which area dominated by agricultural land uses, with isolated areas of native vegetation. The Project Area and surrounds is currently zoned RU1 Primary Production under the Parkes Local Environmental Plan (LEP). The proposed final land use is considered consistent with the objectives and intent of this land use zoning.

The proposed final land use has been designed to contribute and enhance the rehabilitation activities currently completed by NPM, which include revegetation of drainage lines and along paddock margins within NPM landholdings. In addition the proposed areas of native vegetation with open grassland are designed to contribute to the existing biodiversity offset area and vegetation corridors (including Travelling Stock Reserves (TSRs)) immediately east of the Project Area.

2.2 Rehabilitation and Closure Objectives

In consideration of the proposed final land use as outlined in **Section 2.1**, NPM's rehabilitation objectives for the site include the following:

- provide a safe and sustainable final landform and use that can co-exist with surrounding land uses;
- provide suitable conditions for establishment of a vegetation cover where practical;
- maintain sustainable agricultural lands;
- produce a diverse mosaic of sustainable native ecosystems within the agricultural landscape with the aim of conserving biodiversity and maintaining evolutionary potential;
- provide for the safety of employees and the public during and following the closure of the mining operations;
- control erosion and develop self sustaining water management infrastructure;
- mitigate any exposure hazard from residual chemicals or mining wastes; and
- minimise the potential for exclusion of other potential post mining land use options should they be determined to be viable and preferable as part of the detailed mine closure planning process that commences at least five years prior to the planned cessation of mining.

In achieving these objectives, NPM will also aim to:

- minimise the potential environmental impacts from closure activities;
- comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the site; and
- reduce the need for long term monitoring and maintenance by achieving effective rehabilitation.

2.3 Closure and Rehabilitation Completion Criteria

Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. species diversity, groundcover etc.), which can be measured against to demonstrate progress and ultimate success of rehabilitation. As such, they provide a defined end point, at which point in time rehabilitation can be deemed successful and the lease relinquishment process can proceed. Completion criteria, determined in consultation with the relevant stakeholders, will be utilised to demonstrate achievement of rehabilitation objectives. The achievement of the completion criteria will be monitored and reported within the Annual Review.

The preliminary closure and rehabilitation completion criteria for the Project are outlined in **Table 2.1**.

Table 2.1 – Preliminary Mine Closure and Rehabilitation Completion Criteria

Aspect	Objective	Preliminary Closure Criteria
Decommissioning	All infrastructure that is not to be utilised as part of the future intended land use are removed to make the site safe and free of hazardous materials.	• All surface infrastructure which does not have a potential future use associated with the post mining land use will be removed, unless such removal has a greater environmental impact than rehabilitating the area with the infrastructure remaining in place. • Services: removal of all services (power, water, communications), which don't have potential uses. • Office and Workshop: demolition and removal of all offices and workshop related facilities including refuelling facilities. • Pumps, pipes and power: removal of water management infrastructure. Where underground pipelines are to remain *in situ*, the location of the infrastructure has been marked on the final landform plan and a suitable caveat developed to provide that they are readily identifiable for future land holders. • Laydown Areas: removal of all plant and equipment.
	All infrastructure that is to remain as part of the future land use is safe and does not pose any hazard to the community.	• Potential hazards (i.e. electrical, mechanical etc.) have been effectively isolated. • The structural integrity of the infrastructure has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use. • Appropriate security measures have been implemented to minimise the potential for unauthorised access during the period that the site is transitioned to the intended final land use.
	There is no residual soil contamination on site that is incompatible with intended land use or that poses a threat of environmental harm.	• Contamination will be appropriately remediated so that appropriate guidelines for the intended final land use are met.
Landform Establishment	Landform suitable for final land use and compatible with surrounding landscape.	• Landforms have been designed to minimise the impact on visual amenity and blend with surrounding landscape. • No significant erosion is present that would constitute a safety hazard or compromise the capability of supporting the end land use. • Drainage structures are stable and there is no evidence of overtopping or significant scouring as a result of runoff. • Surface layer is free of any hazardous materials. • Any final voids and subsidence pit slopes have been assessed by a qualified geotechnical engineer to validate that they are either stable or that suitable mechanisms have been installed to minimise safety risks to the community as low as reasonably possible. • Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and does not pose a threat to downstream water quality.

Table 2.1 – Preliminary Mine Closure and Rehabilitation Completion Criteria (cont.)

Aspect	Objective	Preliminary Closure Criteria
Growing Media Development	Growing media is capable of supporting sustainable vegetation growth.	• The rehabilitation surface is a suitable growing medium. • Soil pH to be in the range of analogue sites. • Monitoring demonstrates soil profile development in native rehabilitated areas (e.g. development of organic layer, litter layer).
Agricultural land Use	Land is returned to a condition that sustains agricultural land use and requires a level of management that is comparable to adjacent agricultural areas.	• In areas returned to cropping land, cropping yields returns are similar to nearby properties. • In areas returned to broad-acre grazing, grazing returns are sustainable and pastures have similar yields to nearby properties. • Pasture species to consist of grasses and legumes appropriate to the district and recognised as suitable for grazing. • Weed and feral animal populations are appropriately managed.
Ecosystem Establishment	Revegetation is sustainable for the long term and only requires maintenance that is consistent with the intended final land use.	• Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities. • Second generation trees are present or likely to be, based on monitoring in comparable older rehabilitation sites (i.e. evidence of fruiting of native species observed). • Rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species. • The percentage of the tree population in healthy condition is comparable to reference sites as indicated by long term monitoring. • There is no significant weed infestation such that management requirements are similar to reference native vegetation sites. • Feral animal populations are appropriately managed. • Appropriate bushfire hazard controls have been implemented on the advice from the NSW Rural Fire Service (RFS).

The preliminary closure completion criteria will be reviewed and revised throughout the Project life through consideration of the results of rehabilitation monitoring programs; any relevant research trials; and consideration of stakeholder feedback. It is envisaged that this process will occur as part of the development of the Mining Operations Plan (MOP) and subsequent annual report that are submitted to relevant government agencies. The completion criteria will be finalised as part of the detailed mine closure planning process and presented in the Decommissioning Plan for approval by the relevant government agencies.

The gradual achievement (or otherwise) of these completion criteria will be assessed and discussed in the annual report, which will include the identification of any failures in achieving the criteria, and measures taken to address any such issues. Proposed rehabilitation monitoring is discussed in **Section 3.2**.

2.4 Proposed Post Mining Landform

The development of the proposed post-mining landform at NPM will aim to create a safe and stable landform that is generally compatible with the surrounding landscape. However, the proposed final landform will consist of low (15 metres to 30 metres) flat-topped mounds that will be locally prominent in the otherwise flat and generally featureless topography. There is potential for the open cut voids to be filled with tailings although the subsidence voids are expected to remain. Surface water management structures created during the life of mine would remain as part of the final landform drainage.

A draft conceptual plan has been prepared to indicate the potential final landform and land use intended after cessation of mining (refer to **Figure 1.1**). This plan will be refined as part of the life of mine planning process.

2.4.1 Final Voids and Subsidence Zones

Void management at NPM will also be consistent with the rehabilitation and closure objectives of NPM and corporate RT's philosophies, and the relevant local and state regulatory authorities.

On completion of mining each void, the option of utilising the voids as emplacement areas for tailings disposal will be investigated. This would result in complete or partial filling of the voids and subsequent capping and rehabilitation to the final landform. This may be preferable to the conversion of the final voids into lakes but is contingent on mining plans and government approval.

The areas of the Project Area affected by subsidence associated with existing and proposed underground block cave mining are shown in **Figure 1.1**. The E26 subsidence zone is located at the southern end of the Project Area, with a current surface area affected by block-cave mining of approximately 20 hectares, which consists of a subsidence crater approximately 500 metres in diameter and 200 metres deep. Following open-cut mining of this area it is anticipated that the void will cover approximately 51 hectares and be approximately 300 metres deep.

The E48 subsidence zone is located centrally in the Project Area and is similar in appearance to the E26 subsidence zone. The subsidence zone associated with E48 is forming with the continued development of block cave mining operations in this ore body. Predictive modelling indicates that the subsidence zone associated with the approved E48 operations will be approximately 68 hectares. A safety buffer of 50 metres is included as part of the E48 subsidence zone, resulting in a total subsidence affectation area of 84 hectares. The depth of the final subsidence crater is predicted to be between 125 metres and 200 metres deep.

The proposed extension of underground block cave mining into the E22 ore body will result subsidence impacts in this area. The existing disturbance area associated with previous open cut mining within E22 is located directly above the proposed E22 block cave mine. Accordingly, it is anticipated that subsidence effects from the proposed E22 block cave mine will be limited to previously disturbed areas.

As part of the Project, NPM will review and update the relevant aspects of the Landscape Management Plan, including Final Voids Management Plan (FVMP). It is the intention that this will be a live document that will evolve along with the ongoing operations at NPM, which are proposed to continue until 2032. NPM operations will evolve with changing expectations, market demands and the potential discovery and development of future ore bodies. To capture these changes, the FVMP will be reviewed and updated through to actual mine closure.

2.4.2 Tailings Dam Decommissioning

The tailings emplacement areas on site will be filled and shaped to the conceptual final landform plan (refer to **Figure 1.1**) and subsequently capped. The primary objective of the capping design will be to minimise the potential for exposure of potentially environmentally sensitive tailings material in the rehabilitated landform. Following capping, these areas will be revegetated in accordance with the rehabilitation strategy as outlined in **Section 3.0**.

NPM is currently in the process of trialling capping techniques to determine the optimum depth and composition of capping material to be used on the tailings storage facilities (TSFs). The final capping strategy will be determined in consultation with Division of Resources and Energy (DRE) and documented within future MOPs.

3.0 Rehabilitation Strategy

Rehabilitation will be undertaken in accordance with a MOP that will be prepared for the Project and submitted to DRE for approval. Disturbed areas will be progressively rehabilitated over the life of the Project, however opportunities for progressive rehab are likely to be limited due to the nature of mining at the site. Underground mining results in subsidence areas that are not planned to be rehabilitated, while the waste rock dump material will be used for capping of the TSF's once they are decommissioned. Whilst it is intended to maximise opportunities for progressive rehabilitation and reduce the disturbance footprint, potential deviations from the indicative schedule may occur due to:

- changes or delays in the mining schedule; and
- postponement of rehabilitation activities to avoid seeding and planting in conditions (e.g.drought), which may lead to poor quality rehabilitation or failure.

Where rehabilitation is delayed due to the above scenarios, suitable cover crops will be applied on exposed areas to minimise dust and erosion. Revegetation will be undertaken on TSF lifts as they are completed as this will aid in stabilisation of the TSF structure and minimise erosion.

The rehabilitation of the site will primarily involve the establishment of pasture capable of supporting agricultural uses (i.e. grazing) within the flatter portions of the site where waste rock has not been emplaced. While the tailings storage facilities and waste rock dumps will be revegetated with native vegetation with areas of open grassland.

3.1 Proposed Rehabilitation Techniques

3.1.1 Waste Rock Handling

Waste material is separated into waste and clay material during the mining process. These materials are stockpiled separately, with waste rock used for landform establishment and capping of the tailings dams prior to rehabilitation.

A range of studies have been undertaken to assess the acid rock drainage (ARD) potential of the waste material excavated during the mining process at NPM. These studies have identified that acidic drainage from ore and waste material is not a significant issue at NPM. However, there are potential risks associated with neutral drainage containing elevated concentrations of total dissolved solids, sulphate and metals were identified. Section 5.16 of the EA contains more detailed information on the handling of waste material at NPM.

A programme of routine sampling and testing of mineral waste materials will be carried out during operations to confirm the potential for acid or neutral drainage and other geochemical constraints to successful rehabilitation. Where adverse characteristics are identified, selective handling and management strategies will be developed and implemented to address potential risks.

3.1.2 Topsoil Management

Soils onsite will be managed to improve and maintain soil value for rehabilitation and minimise soil loss through erosion. Topsoil and subsoil will be stripped and stockpiled for later use in rehabilitation in accordance with site topsoil handling procedures.

Materials management and monitoring techniques to be adopted under this plan are outlined below.

- Topsoil will be stripped to a depth of approximately 120 millimetres or until subsoil is observed. Where subsoil is considered to be suitable for use in rehabilitation or capping, this material will be stripped and handled (i.e. direct-returned or stockpiled) separately to the topsoil material.
- To maintain soil structure, where practical, handling of topsoil will be minimised through direct replacement onto progressive rehabilitation areas.
- Soil moisture will be considered prior to stripping. Whenever possible, soil will not be stripped during periods of high soil moisture (i.e. during or immediately following wet climatic conditions) as this can result in the loss of soil structure.
- Machinery movement over soils will be kept to a minimum during stripping operations to maximise soil aggregation and prevent compaction.
- Where practical, weed management will be undertaken prior to stripping and removal.
- All equipment should be cleaned to remove potential weedy material (including soil) before and after the operation.
- Where direct return of topsoil is not possible topsoil will be stockpiled. Soil stockpiles will be:
    - no greater than 2 metres in height (3 metres for subsoil) with slopes no greater than 1:4;
    - located as close as practicable and readily accessible to respreading areas;
    - where they will not interfere with present and future mining and ancillary operations;
    - located away from traffic areas and at an appropriate distance from watercourses;
    - left with a ‘rough’ but even surface to assist in runoff control and seed retention and germination;
    - be sown with stabilising ground cover species if natural regeneration from the seed bank is not evident within three weeks of placement;
    - in areas that will allow free drainage and minimal soil erosion; and
    - adequately signposted to prevent vehicle access.

3.1.3 Substrate Preparation

Surface preparation activities for rehabilitated areas will commence as soon as practicable following the completion of mining activities. The general surface preparation activities to be undertaken at NPM include:

- Prior to the commencement of rehabilitation of the shaped overburden surface, representative samples will be taken to characterise the nature of the spoil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth. Results from this process will be used to determine specific amelioration techniques (e.g. addition of gypsum, lime, organic matter etc.) that may be required for spoil to overcome potential limitations for landform stability, plant establishment and growth.

- Subsoil and topsoil material will be sequentially placed over the reshaped final landform surface. Where topsoil availability is limited, suitable alternatives (i.e. biosolids or other organic materials) may be utilised to supplement the volume required.

- Soil ameliorants will be applied where appropriate.

- Where direct seeding of tree species (e.g. portions of the waste rock dumps) is planned, final shaped surfaces will be deep ripped parallel with the contour prior to the application of seed to provide for an adequate seed bed.

- Suitable erosion control measures will be implemented to minimise soil loss from areas undergoing rehabilitation.

- Where appropriate and practical, structures such as tree hollows, logs and other woody debris will be incorporated into the final landform to augment the habitat value of the proposed vegetated corridors.

3.1.4 Revegetation

Revegetation activities will be designed for establishment of the final land use (i.e. agriculture or native vegetation), erosion and dust control and aesthetic improvement. Revegetation will be undertaken on constructed landforms such as waste rock dumps, TSF, topsoil stockpiles (temporary revegetation for erosion control) and other disturbed areas. Revegetation will also be undertaken to create wildlife corridors and for screening and landscaping purposes.

Revegetation will continue to be undertaken as soon as practical after completion of surface preparation. Topsoil conditioning involving the addition of gypsum or fertiliser (in pasture areas) may be used where required. Depending on the proposed land use, revegetation will involve direct seeding or planting of selected shrub, grass and tree species. Sowing and planting is dependent on seasonal factors and will be scheduled, where possible, to coincide with seasons of traditionally higher rainfall (autumn to early winter).

Species utilised are dependent on the type of area to be revegetated with:

- introduced grasses and legumes selected for future agricultural activities (i.e. grazing) as well as potentially for erosion control on steep embankments (i.e. temporary landforms or rehabilitation); and

- local provenance native tree and shrub species for infill planting, wildlife corridors and screening of disturbed areas (i.e. long term rehabilitation).

The rehabilitation strategy for the establishment of grazing areas will be designed to link with similar land uses in the area. Revegetation techniques will be consistent with local agricultural practices and are likely to involve sowing with grasses and legumes appropriate to the district and recognised as suitable for grazing.

Native seed collection and propagation activities will be coordinated through local suppliers. Species used for native revegetation will be endemic to the area, where possible. A list of the key species to be utilised in the revegetation mix for target vegetation communities is contained within **Appendix A**. A seed collection and handling program aimed at maximising the viability and diversity of local seed in the revegetation mix will be implemented as part of the rehabilitation program, however, endemic species will also be sourced from other sources.

Revegetation will primarily involve either direct seeding or planting of native species along with a suitable cover crop or other organic material (e.g. mulch, brush matting or biosolids etc.) as required to prevent soil loss and add biomass to the profile. A range of other techniques including the planting of tubestock may also be utilised where appropriate over isolated areas associated with steep slopes.

3.2 Proposed Rehabilitation Monitoring

Rehabilitation performance will be monitored to ensure that target vegetation is establishing and to determine the need for any maintenance and/or contingency measures. Rehabilitation/regeneration will be monitored in existing remnant vegetation, agricultural land and temporary rehabilitated areas. The objectives of the program will be to:

- assess the long term stability and functioning of re-established ecosystems and or agricultural areas on mine affected land;
- assess rehabilitation performance against the closure criteria; and
- facilitate continuous improvement in rehabilitation practices.

NPM will record the details of each rehabilitation campaign so that they are available for later interpretation of rehabilitation monitoring results with the aim of continually improving rehabilitation standards on site. The key monitoring parameters to be recorded include the following:

- landform design details;
- drainage design details;
- substrate characterisation;
- site preparation techniques (e.g. topsoil and source, time of sowing, soil ameliorants used etc.);
- revegetation methodologies (e.g. rate and type of fertiliser, cover crop and rate, seed viability including watering and weed management);
- weather conditions;
- photographic records; and
- initial follow-up care and maintenance works (including watering and weed management).

3.3 Revegetation Care and Maintenance

Dependent upon the outcomes of the rehabilitation monitoring programs as outlined above, the scope of the rehabilitation care and maintenance phase may include the following:

- weed and feral animal control of rehabilitation;
- erosion and drainage control works;
- re-seeding/planting of rehabilitation areas that may have failed;
- maintenance fertilising (for pasture areas); and
- repair of fence lines, access tracks and other general related land management activities.

It is envisaged that this program will be continued as required until it can be demonstrated that the rehabilitation of the Project Area has satisfied the closure criteria.

Where areas have been identified as being capable of being returned to sustainable agricultural use, it will be the intention to manage these areas in accordance with their intended use as soon as practical after rehabilitation has become established. For example, following the incorporation of infrastructure such as farm dams and fencing into the rehabilitated landform, cattle grazing at low stocking rates may be introduced intermittently until the soil profile and species diversity has developed sufficiently to support sustainable grazing over the long term.

3.4 Proposed Rehabilitation Sign-Off Process

Based on the outcomes of the rehabilitation monitoring programs and in consultation with the relevant government agencies, it will be the intention to seek progressive sign-off of rehabilitation areas once the agreed closure and rehabilitation criteria have been satisfied. The aim will be to achieve consensus on the quality of rehabilitation required as a benchmark for future rehabilitation activities.

4.0 Scope of Mine Closure Decommissioning Works

At the end of the operational life of the mine, NPM proposes to decommission all on site infrastructure and associated facilities as part of the mine closure process with the exception of any required as part of the final land use. During the development of the Decommissioning Plan, consultation will be undertaken with relevant government agencies and the local community. This plan will specifically address the major aspects of decommissioning and rehabilitation and define future rehabilitation care and maintenance requirements for the site, and ongoing monitoring and management.

A summary of the general decommissioning activities that will be undertaken as part of the closure and decommissioning of the NPM is outlined in **Table 4.1**.

Table 4.1 – General Approach to Decommissioning Activities

Mine Closure Aspect	General Approach
Site Services	• Services will be removed unless they will be of use in the post mining land use. • Electricity services to any remaining infrastructure will be removed prior to the commencement of any associated building demolition works. • Telecommunications, water supply and other services will also be disconnected and removed where practical. • Where services are buried (i.e. pipelines, cables etc.) and their retrieval may lead to further disturbance, the infrastructure may be left *in situ* provided that they don't pose constraints to the post mining land use. In this situation, the location of the services will be surveyed and marked on the record tracings and a suitable caveat developed to provide that they are readily identifiable for future land holders.
Buildings and Fixed Plant	• All buildings, fixed plant and other infrastructure that are not required as part of the post-closure land use will be demolished and removed from the site. Where practical the materials recovered during demolition phase will be salvaged for re-use or recycled. • Concrete footings and pads along with other potential inert building waste will be broken up and buried with overburden in the pit area or used in rehabilitation where appropriate. • Where it does not pose a constraint to the proposed final land use, structures such as footings, underground water pipelines and disconnected power cables may be left *in situ*. This may include where it is not practical to retrieve the structures or where their removal may lead to environmental damage. These remaining structures will be surveyed and recorded on a plan.
Equipment Storage Areas	• Any redundant plant or equipment will either salvaged for re-use or recycled. Where this is not practical, they will be disposed of at an appropriate landfill facility. • Storage areas will be assessed for potential contamination (e.g. hydrocarbons) and remediation undertaken as required.
Hardstand Areas, Roadways and Car Parks	• Hardstand areas, roadways and car parks will be removed with the waste material (e.g. bitumen, concrete) being placed and capped in the tailings/overburden emplacement areas or incorporated into the final void.

Table 4.1 – General Approach to Decommissioning Activities (cont.)

Mine Closure Aspect	General Approach
Hazardous Materials Management	• All remaining hydrocarbons such as diesel and lubricants and other hazardous materials will be either utilised or disposed of via an authorised waste contractor. • The storage tanks will be removed and depending on their condition either sold or disposed of at an authorised facility.
Dangerous Goods	• It is envisaged that the majority of dangerous goods remaining on-site will include gas bottles and cleaning agents, which will be utilised during decommissioning activities or disposed of off-site in accordance with the regulatory arrangements in force at the time.
Water Management Infrastructure	• The final design of the water management system will be dependent upon the outcomes of the final land use study and will be provided in the Decommissioning Plan. • Depending on the chosen final land use, issues that will be addressed as part of post-mining water management system will likely include: ▪ the removal of the oily water treatment system following the demolition of the workshop and associated facilities; ▪ removal of excess sediment (i.e. saline sediment) from the surface dams for future use by the subsequent land owner or alternatively filling or removing the dams if they are no longer required; ▪ re-shaping dams (where required) in accordance with their intended use. This may involve facilitating stock access or reshaping to enhance habitat functionality for specific fauna species; ▪ the installation of appropriate sediment and erosion control measures; and • Sediment material extracted from dams will be subject to a risk assessment to determine the potential for contamination and, if present, will be appropriately managed.

APPENDIX A

Flora Species to be used in Revegetation

Appendix A – Flora Species to be used in Revegetation

The following tables show the flora species commonly recorded in the vegetation communities in the Proposed Disturbance Area. The lists of species will be used to determine a seed mix for revegetation purposes on disturbed land within the Proposed Disturbance Area, with the aim of stabilising the landscape and providing native vegetation cover. Revegetation works do not propose to recreate the specific vegetation communities present prior to disturbance. Lists for Grey Box Grassy Woodland (**Table 1**), Grey Box Grassy Woodland – Derived Native Grassland (**Table 2**) and White Box – Yellow Box – Blakely's Red Gum Woodland (**Table 3**) are provided. These lists were compiled based on flora surveys undertaken for the Northparkes Extension Project Flora and Fauna Assessment (Umwelt 2013).

Species have been selected for use in revegetation works based on presence within corresponding vegetation communities rather than ease of propagation and likelihood of seed availability. The species identified for use in revegetation works should act as a guide, however, it is recognised that the species composition and proportions may have to be modified in response to seasonal variability, seed availability and propagation success. Only species indicated in **Tables 1** to **3** are to be used in revegetation works on the site.

The following abbreviations or symbols are used in the following lists:

subsp. subspecies;

var. variety; and

f. form.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Table 1 – Grey Box Grassy Woodland

Class/Subclass	Family	Scientific Name	Common Name	Plant Form
Trees				
Magnoliopsida (Magnoliidae)	Cupressaceae	*Callitris glaucophylla*	white cypress pine	tree
Magnoliopsida (Magnoliidae)	Myrtaceae	*Eucalyptus microcarpa*	western grey box	tree
Shrubs				
Magnoliopsida (Magnoliidae)	Fabaceae (Mimosoideae)	*Acacia hakeoides*	hakea wattle	shrub
Magnoliopsida (Magnoliidae)	Sapindaceae	*Alectryon oleifolius*	western rosewood	shrub
Magnoliopsida (Magnoliidae)	Casuarinaceae	*Allocasuarina luehmannii*	*bulloak*	shrub
Ground Cover Vegetation				
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa bigeniculata*		grass
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa scabra* subsp. *falcata*	speargrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Chloris truncata*	windmill grass	grass
Magnoliopsida (Liliidae)	Poaceae	*Elymus scaber* var. *scaber*	common wheatgrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Eragrostis brownii*	Browns lovegrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Panicum effusum*	poison or hairy panic	grass
Magnoliopsida (Liliidae)	Poaceae	*Rytidosperma bipartitum*	wallaby grass	grass
Magnoliopsida (Magnoliidae)	Amaranthaceae	*Alternanthera denticulata*	lesser joyweed	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Calotis anthemoides*	cut-leaved burr-daisy	ground cover
Magnoliopsida (Magnoliidae)	Chenopodiaceae	*Einadia nutans* subsp. *linifolia*	climbing saltbush	ground cover
Magnoliopsida (Magnoliidae)	Convolvulaceae	*Dichondra repens*	kidney weed	ground cover
Magnoliopsida (Magnoliidae)	Lobeliaceae	*Pratia purpurascens*	whiteroot	ground cover
Magnoliopsida (Magnoliidae)	Malvaceae	*Sida corrugata*		ground cover
Magnoliopsida (Magnoliidae)	Myoporaceae	*Eremophila debilis*	amulla	ground cover
Magnoliopsida (Magnoliidae)	Solanaceae	*Solanum esuriale*	quena	ground cover

Table 2 – Grey Box Grassy Woodland – Derived Native Grassland

Class/Subclass	Family	Scientific Name	Common Name	Plant Form
Ground Cover Vegetation				
Magnoliopsida (Liliidae)	Cyperaceae	*Cyperus inversa*	knob sedge	sedge
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa bigeniculata*		grass
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa scabra* subsp. *falcata*	speargrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Enteropogon acicularis*		grass
Magnoliopsida (Liliidae)	Poaceae	*Eriochloa pseudoacrotricha*	early spring grass	grass
Magnoliopsida (Liliidae)	Poaceae	*Panicum effusum*	poison or hairy panic	grass
Magnoliopsida (Liliidae)	Poaceae	*Rytidosperma bipartitum*	wallaby grass	grass
Magnoliopsida (Magnoliidae)	Asteraceae	*Euchiton involucratus*	star cudweed	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Vittadinia cuneata* var. *cuneata* f. *cuneata*		ground cover
Magnoliopsida (Magnoliidae)	Chenopodiaceae	*Einadia nutans* subsp. *nutans*	climbing saltbush	ground cover
Magnoliopsida (Magnoliidae)	Convolvulaceae	*Convolvulus erubescens*		ground cover
Magnoliopsida (Magnoliidae)	Convolvulaceae	*Dichondra repens*	kidney weed	ground cover
Magnoliopsida (Magnoliidae)	Euphorbiaceae	*Chamaeyce drummondii*	caustic weed	ground cover
Magnoliopsida (Magnoliidae)	Malvaceae	*Sida corrugata*		ground cover
Magnoliopsida (Magnoliidae)	Malvaceae	*Sida trichopoda*		ground cover
Magnoliopsida (Magnoliidae)	Oxalidaceae	*Oxalis perennans*		ground cover
Magnoliopsida (Magnoliidae)	Solanaceae	*Solanum esuriale*	quena	ground cover

Table 3 – White Box – Yellow Box – Blakely's Red Gum

Class/Subclass	Family	Scientific Name	Common Name	Plant Form
Trees				
Magnoliopsida (Magnoliidae)	Cupressaceae	*Callitris glaucophylla*	white cypress pine	tree
Magnoliopsida (Magnoliidae)	Myrtaceae	*Eucalyptus albens*	white box	tree
Magnoliopsida (Magnoliidae)	Myrtaceae	*Eucalyptus melliodora*	yellow box	tree
Magnoliopsida (Magnoliidae)	Sterculiaceae	*Brachychiton populneus* subsp. *populneus*	kurrajong	tree
Shrubs				
Magnoliopsida (Magnoliidae)	Sapindaceae	*Alectryon oleifolius*	western rosewood	shrub
Ground Cover Vegetation				
Filicopsida	Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	poison rock fern	fern
Magnoliopsida (Liliidae)	Anthericaceae	*Dichopogon fimbriatus*	nodding chocolate lily	lily
Magnoliopsida (Liliidae)	Cyperaceae	*Cyperus inversa*	knob sedge	sedge
Magnoliopsida (Liliidae)	Lomandraceae	*Lomandra filiformis* subsp. *filiformis*		ground cover
Magnoliopsida (Liliidae)	Poaceae	*Aristida jerichoensis* var. *subspinulifera*	Jericho wiregrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa aristiglumis*	plains grass	grass
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa bigeniculata*		grass
Magnoliopsida (Liliidae)	Poaceae	*Austrostipa scabra* subsp. *falcata*	speargrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Digitaria brownii*	cotton panic grass	grass
Magnoliopsida (Liliidae)	Poaceae	*Elymus scaber* var. *scaber*	common wheatgrass	grass
Magnoliopsida (Liliidae)	Poaceae	*Panicum effusum*	poison or hairy panic	grass
Magnoliopsida (Magnoliidae)	Amaranthaceae	*Alternanthera denticulata*	lesser joyweed	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Calotis lappulacea*	yellow burr-daisy	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Euchiton involucratus*	star cudweed	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Xerochrysum bracteatum*	golden everlasting	ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Xerochrysum viscosum*		ground cover

Table 3 – White Box – Yellow Box – Blakely's Red Gum (cont.)

Class/Subclass	Family	*Scientific Name*	Common Name	Plant Form
Ground Cover Vegetation (cont.)				
Magnoliopsida (Magnoliidae)	Asteraceae	*Vittadinia cuneata* var. *cuneata* f. *cuneata*		ground cover
Magnoliopsida (Magnoliidae)	Asteraceae	*Vittadinia gracilis*		ground cover
Magnoliopsida (Magnoliidae)	Campanulaceae	*Wahlenbergia luteola*		ground cover
Magnoliopsida (Magnoliidae)	Chenopodiaceae	*Einadia nutans* subsp. *nutans*	climbing saltbush	ground cover
Magnoliopsida (Magnoliidae)	Chenopodiaceae	*Einadia polygonoides*		ground cover
Magnoliopsida (Magnoliidae)	Convolvulaceae	*Dichondra repens*	kidney weed	ground cover
Magnoliopsida (Magnoliidae)	Convolvulaceae	*Convolvulus erubescens*		ground cover
Magnoliopsida (Magnoliidae)	Euphorbiaceae	*Chamaeyce drummondii*	caustic weed	ground cover
Magnoliopsida (Magnoliidae)	Malvaceae	*Sida corrugata*		ground cover
Magnoliopsida (Magnoliidae)	Nyctaginaceae	*Boerhavia dominii*	tarvine	ground cover
Magnoliopsida (Magnoliidae)	Oxalidaceae	*Oxalis perennans*		ground cover
Magnoliopsida (Magnoliidae)	Polygonaceae	*Rumex brownii*	swamp dock	ground cover
Magnoliopsida (Magnoliidae)	Rubiaceae	*Asperula conferta*	common woodruff	ground cover
Magnoliopsida (Magnoliidae)	Solanaceae	*Solanum esuriale*	quena	ground cover
Magnoliopsida (Magnoliidae)	Fabaceae (Faboideae)	*Glycine tabacina*	variable glycine	climber

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