



SECTION 5

REHABILITATION STRATEGY

CONTENTS

5	REHABILITATION STRATEGY	5-1
5.1	REHABILITATION AT THE APPROVED WILPINJONG COAL MINE	5-1
5.1.1	Rehabilitation Objectives	5-1
5.1.2	Rehabilitation Status	5-2
5.1.3	Enhancement and Conservation Areas	5-6
5.1.4	Regeneration Areas	5-6
5.1.5	Existing Rehabilitation Monitoring and Management	5-6
5.2	REHABILITATION OF THE PROJECT	5-7
5.2.1	General Rehabilitation and Mine Closure Criteria for the Project	5-7
5.2.2	Post-Mining Land Use and Conceptual Final Landform	5-7
5.2.3	Rehabilitation Domains and Conceptual Domain Objectives	5-8
5.2.4	Project Rehabilitation in the Biodiversity Offset Strategy	5-16
5.2.5	Key Rehabilitation Performance Measures and Strategic Completion Criteria	5-16
5.3	GENERAL REHABILITATION PRACTICES AND MEASURES	5-17
5.3.1	Vegetation Clearing Measures	5-17
5.3.2	Soil Stripping and Handling Measures	5-18
5.3.3	Selection of Native Plant Species for Woodland Revegetation	5-19
5.3.4	Establishment of Agricultural Land	5-19
5.3.5	Enhancement and Conservation Areas	5-19
5.3.6	Regeneration Areas	5-20
5.3.7	Geotechnical Stability	5-20
5.3.8	Erosion and Sediment Control Works	5-20
5.3.9	Waste Rock Management	5-20
5.3.10	Coal Handling and Preparation Plant Reject Management	5-20
5.3.11	Realigned Cumbo Creek	5-21
5.3.12	Final Void Management	5-21
5.3.13	Land Contamination Management	5-21
5.3.14	Weed and Pest Control	5-21
5.3.15	Bushfire Management	5-21
5.3.16	Post-closure Maintenance	5-21
5.4	MINING OPERATIONS PLAN	5-21
5.5	REHABILITATION MONITORING AND TRIALS	5-22
5.6	MINE CLOSURE PLAN	5-22

LIST OF TABLES

Table 5-1	Wilpinjong Coal Mine Rehabilitation Objectives
Table 5-2	General Rehabilitation and Mine Closure Goals for the Project
Table 5-3	Project Preliminary Soil Inventory

LIST OF FIGURES

Figure 5-1	Pit 1 Annual Rehabilitation Monitoring Sites – Photographic Records (2010 to 2013)
Figure 5-2	General Arrangement Post-mining
Figure 5-3	Conceptual Final Rehabilitation and Regeneration
Figure 5-4	Conceptual Cross Section A of the Rehabilitated Mine Landform
Figure 5-5	Conceptual Cross Sections B, C and D of the Rehabilitated Mine Landform
Figure 5-6	Conceptual Broad Scale Rehabilitation Domains

LIST OF PLATES

Plate 5-1	Organic Growth Medium Application Trials
Plate 5-2	Existing Rehabilitation (Woodland) (August 2015)
Plate 5-3	Existing Rehabilitation (Mixed Woodland/Pasture) (August 2015)
Plate 5-4	Selective Planting

5 REHABILITATION STRATEGY

5.1 REHABILITATION AT THE APPROVED WILPINJONG COAL MINE

The MOP describes the approved Wilpinjong Coal Mine activities and progress toward rehabilitation outcomes required under ML 1573 and Project Approval 05-0021.

A summary of rehabilitation activities undertaken at the Wilpinjong Coal Mine and relevant rehabilitation monitoring results are documented in the Annual Review.

Where relevant, the existing rehabilitation objectives of the Wilpinjong Coal Mine would be augmented or built upon for the Project (Section 5.2).

A summary of the current objectives for rehabilitation, and rehabilitation progress to date for the Wilpinjong Coal Mine is provided below.

5.1.1 Rehabilitation Objectives

Condition 58 of Schedule 3 of Project Approval 05-0021, the MOP and Biodiversity Management Plan outline the rehabilitation objectives for the Wilpinjong Coal Mine.

The rehabilitation objectives outlined in Condition 58 of Schedule 3 of Project Approval 05-0021 are reproduced in Table 5-1.

**Table 5-1
Wilpinjong Coal Mine Rehabilitation Objectives**

Mine Component	Objective
Mine Site (as a whole)	<ul style="list-style-type: none"> safe, stable and non-polluting; constructed landforms are to drain to the natural environment (excluding final voids); minimise the visual impact of final landforms as far as is reasonable and feasible; and ensure the final landforms are generally consistent with the surrounding topography of the area, taking into account relief patterns and principles.
Final Voids	<ul style="list-style-type: none"> minimise the size and depth of final voids so far as is reasonable and feasible, subject to meeting the objectives below; minimise the drainage catchment of the final void so far as is reasonable and feasible; negligible highwall instability risk; the size and depth of the final voids must be designed having regard to their function as long-term groundwater sinks, to ensure that groundwater flows through the backfilled pit towards the final void; and minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood level.
Peabody Energy-owned Surface Infrastructure	<ul style="list-style-type: none"> to be decommissioned and removed, unless the Executive Director, Mineral Resources agrees otherwise¹.
Agricultural Land	<ul style="list-style-type: none"> establish agricultural land in areas to a similar agricultural suitability to that existing prior to mining.
Other Land	<ul style="list-style-type: none"> restore ecosystem function in the ECAs including maintaining or establishing self-sustaining ecosystems comprised of a combination of: <ul style="list-style-type: none"> native woodland, including EECs; habitat for threatened fauna species; and wildlife corridors. restore ecosystem function in Regeneration Areas, establishing a trajectory towards self-sustaining ecosystems comprised of a combination of: <ul style="list-style-type: none"> native woodland/riparian areas; and wildlife corridors.
Community	<ul style="list-style-type: none"> ensure public safety; and minimise the adverse socio-economic effects associated with mine closure.

Source: Project Approval 05-0021.

¹ Excludes public or privately-owned infrastructure that may be relocated for the Project, but remains the property of a third party (e.g. TransGrid Wollar to Wellington 330 kV ETL).

5.1.2 Rehabilitation Status

Rehabilitation occurs progressively at the Wilpinjong Coal Mine as ancillary disturbance areas and final mine landforms become available for revegetation.

The approved revegetation strategy recognises the alternative land uses that exist in the region, with the aim of establishing the potential for both sustainable agriculture and the continuity of nature conservation.

Rehabilitation has been progressively undertaken since 2008 and approximately 221 ha of completed landforms for woodland and mixed woodland/ low impact grazing land uses have been rehabilitated to date. An additional 79 ha is scheduled to be rehabilitated in 2015. Rehabilitation has been undertaken in areas that are available for rehabilitation (e.g. Pits 1 and 5 and completed [consolidated] tailings dams) (WCPL, 2015f).

The results from rehabilitation monitoring undertaken between 2010 and 2013 indicate initial revegetation success (i.e. adequate tree and shrub species density) (Landline Consulting, 2013b). Figure 5-1 shows initial rehabilitation progress at selected rehabilitation monitoring sites in the period 2010 to 2013.

However, low soil nutrient levels were observed to be limiting rehabilitation progress in some rehabilitation areas (Landline Consulting, 2013b). In response, WCPL engaged an agronomist to recommend remedial measures to improve soil nutrient levels. Subsequent soil analysis confirmed the soil nutrient deficiencies (e.g. phosphorous, potassium, calcium, copper and zinc) and organic matter deficiencies identified during rehabilitation monitoring. The agronomist recommended that fertiliser, organic matter and lime be applied to some soils.

WCPL has commenced implementing the recommended remedial measures on existing and new rehabilitation areas at the Wilpinjong Coal Mine (WCPL, 2015f).

Trials have commenced to investigate the effectiveness of various materials and appropriate application rates to improve organic matter content in soils. Organic growth medium (a pasteurised soil conditioner that contains nutrients and organic matter which have been recycled from the urban waste stream) was trialled in rehabilitated areas of Pit 5 and Tailings Dam 1 (Plate 5-1). Additional trials of feedlot cow manure combined with lime and soluble fertiliser have also commenced.



Plate 5-1: Organic Growth Medium Application Trials

WCPL has also developed a Rehabilitation Knowledge Base in conjunction with the University of Queensland to assist with the planning and implementation of rehabilitation activities at the Wilpinjong Coal Mine. The Rehabilitation Knowledge Base includes (WCPL, 2015f):

- a summary of the rehabilitation and closure commitments and obligations;
- details of rehabilitation works, monitoring and trials undertaken at Wilpinjong Coal Mine; and
- collation of rehabilitation-related reports and other resources (e.g. monitoring, results of trials, surveys and studies).

The most recent Independent Environmental Audit (AECOM Australia Pty Ltd, 2015), conducted in accordance with Condition 9 of Schedule 5 of Project Approval 05-0021, included a review of the adequacy of rehabilitation activities at the Wilpinjong Coal Mine and concluded:

- Rehabilitation has noticeably progressed since the commencement of rehabilitation activities.
- Erosion was well controlled in the rehabilitation areas.
- Weed management in regenerating and rehabilitating pasture areas could be improved.
- Overall rehabilitation completed to date is of a high standard.

WCPL considers that the current rehabilitation performance at the Wilpinjong Coal Mine indicates good progress towards achieving the relevant rehabilitation objectives and completion criteria with the continued application of adaptive rehabilitation management.

Monitoring Site R1 (Pit 1)
Rehabilitated Waste Emplacement
(Seeded in 2008)



2010



2011



2012



2013

Source: Landline Consulting (2013)

Monitoring Site R2 (Pit 1)
Rehabilitated Waste Emplacement
(Seeded in 2008)



2010



2011



2012



2013

Monitoring Site R4 (Pit 1)
Rehabilitated Waste Emplacement
(Seeded in 2010)



2010



2011



2012



2013

Photographic plates showing established rehabilitation taken in mid-2015 at the Wilpinjong Coal Mine are provided on Plates 2-2 to 2-11 and Plates 5-2 and 5-3.

A summary of key landforms and current rehabilitation status at the Wilpinjong Coal Mine is provided below.

Backfilled Mine Voids

Waste rock (including overburden and interburden) mined at the Wilpinjong Coal Mine is used to backfill the mine voids behind the advancing open cut operations. Plate 2-14 shows dozers pushing waste rock to backfill the mine void behind the active mining strip.

Final landform levels and topography of the backfilled mine landforms will generally approximate the pre-mining topography within the open cut areas, with some variations, and are designed with an allowance for the long-term settlement of mine overburden.

The elevated waste rock emplacement located in the south of Pit 2 is approved to be constructed to a temporary elevation of up to 450 m AHD and then be temporarily rehabilitated, before being reshaped and pushed down to a maximum elevation of approximately 430 m AHD at the end of the mine life.

As described in the MOP, PAF or PAF-LC material is placed at least 2 m below the surface of the backfilled mine void landform and at least 5 m below the surface of the elevated waste rock emplacement.

An approximate 0.1 to 0.3 m layer of soil is placed on the backfilled mine voids/elevated waste rock emplacement prior to revegetation.

Approximately 93 ha of backfilled mine voids have been rehabilitated as of December 2014 (WCPL, 2015f).

Existing rehabilitation of backfilled mine voids at the Wilpinjong Coal Mine are shown on Figure 2-4 and in Plates 2-10, 2-11, 5-2 and 5-3.

Tailings Disposal Areas

Prior to the introduction of the tailings filter press in April 2015, tailings generated at the CHPP were exclusively disposed of in purpose-built tailings storages constructed within mine voids (tailings dams).

Tailings Dam 6 is currently active and is used if the tailings filter press is not operational (Section 2.1.5).

Tailings Dams 1 and 2 have been rehabilitated and Tailings Dams 3, 4 and 5 are currently undergoing consolidation prior to rehabilitation.

Once ready for rehabilitation, the tailings dams are progressively capped with inert overburden material to a minimum depth of cover of 2 m creating a stable landform ready for final profiling, topsoiling (0.1 to 0.3 m layer) and revegetation.

The final landform levels and topography of the rehabilitated tailings disposal areas will generally approximate the pre-mining topography, with some variations, and are designed with an allowance for the long-term settlement of tailings and an inert capping layer.

Approximately 39 ha of tailings disposal areas have been rehabilitated as of December 2014 (WCPL, 2015f).

Final Voids

Two final voids are approved as part of the existing Wilpinjong Coal Mine. The final voids are currently approved to be located in the north-east of Pit 3 and south of Pit 6 (refer to Appendix 4 of Project Approval 05-0021).

In accordance with Condition 58 of Schedule 3 of Project Approval 05-0021, WCPL is required to design the size and depth of final voids having regard for their function as groundwater sinks and to minimise flood interaction and highwall instability risk.



Plate 5-2: Existing Rehabilitation (Woodland) (August 2015)



Plate 5-3: Existing Rehabilitation (Mixed Woodland/Pasture) (August 2015)

Infrastructure Areas

Wilpinjong Coal Mine infrastructure (e.g. CHPP, buildings) is approved to be removed and the sites ripped and seeded as required. Some concrete hardstands, site access roads and water management structures may be retained for alternate post-mining uses (subject to the agreement of the DRE).

Realigned Cumbo Creek

As described in Section 2.1.6, Cumbo Creek is approved to be relocated and the existing alignment of the creek mined as part of the existing Wilpinjong Coal Mine.

In accordance with Condition 29 of Schedule 3 of Project Approval 05-0021, WCPL is required to prepare a Cumbo Creek Relocation Plan prior to works associated with the relocation. The plan is to detail the final alignment of the relocated creek and required water management infrastructure, hydrological and ecological baseline conditions, design specifications, performance and completion criteria and associated monitoring.

5.1.3 Enhancement and Conservation Areas

Three ECAs that are managed under a Voluntary Conservation Agreement with the NSW Minister administering the NPW Act have been established and comprise approximately 480 ha of land (Section 2.1.10 and Figure 2-5).

In accordance with Condition 38 of Schedule 3 of Project Approval 05-0021, a Biodiversity Management Plan has been developed which includes the management measures, rehabilitation criteria and monitoring program for the ECAs.

Management measures undertaken within the ECAs include enhancement strategies such as fencing, selective planting (Plate 5-4), weed and animal pest control and fire management.

Additional detail on the ECAs is provided in Section 4.9.



Plate 5-4: Selective Planting

5.1.4 Regeneration Areas

Regeneration Areas (which at the commencement of mining predominantly comprised cleared agricultural land) have also been established on areas of land that will be proximal to the Wilpinjong Coal Mine rehabilitation (Section 2.1.10).

The Regeneration Areas are designed to link the mine woodland rehabilitation areas to remnant vegetation associated with the Goulburn River National Park, Munghorn Gap Nature Reserve and the ECAs.

Additional detail on the Regeneration Areas is provided in Section 4.9.

5.1.5 Existing Rehabilitation Monitoring and Management

Rehabilitation monitoring at the Wilpinjong Coal Mine is undertaken in accordance with the MOP. The MOP describes:

- rehabilitation objectives and post mining land use;
- rehabilitation planning and implementation;
- completion criteria;
- rehabilitation monitoring and research; and
- management and reporting.

5.2 REHABILITATION OF THE PROJECT

As a component of Project planning, WCPL has reviewed mine closure and rehabilitation objectives, current rehabilitation practices and the opportunity for integration of mine rehabilitation areas with existing ECAs and adjoining reserved lands.

This review considered the *Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation* (Commonwealth Department of Industry, Tourism and Resources [DITR], 2006a), *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion* (DITR, 2006b) and the *Strategic Framework for Mine Closure* (Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia, 2000).

The review has also made use of WCPL operational rehabilitation experience.

5.2.1 General Rehabilitation and Mine Closure Criteria for the Project

The Project would require the incremental and progressive removal of approximately 354 ha of native vegetation communities and approximately 668 ha of non-native vegetation and existing disturbed areas.

Table 5-2 describes the general rehabilitation and mine closure goals for the Project. The rehabilitation and revegetation for the Project build upon, and are consistent with, these goals.

Relinquishment of rehabilitated land would require meeting relevant mining lease and Development Consent conditions and the approval of the relevant Minister(s).

Mined lands would be considered suitable for relinquishment when the nominated standards and/or completion criteria for land use, landform stability, revegetation, and beneficial use have been met, or if the relevant Minister(s) otherwise accepts the rehabilitation status.

5.2.2 Post-Mining Land Use and Conceptual Final Landform

Post-Mining Land Use

WCPL has assessed potential post-mining land uses (e.g. nature conservation, agriculture) taking into account relevant strategic land use objectives of the area in the vicinity of the Wilpinjong Coal Mine and the potential benefits of the post-mining land use to the environment, future landholders and the community.

Based on this assessment, WCPL propose the post-mining land use of the Wilpinjong Coal Mine incorporating the Project would continue to comprise a combination of nature conservation (woodland) and agricultural (mixed woodland/pasture) land uses.

**Table 5-2
General Rehabilitation and Mine Closure Goals for the Project**

Short to Medium-term	Long-term
<ul style="list-style-type: none"> Restrict clearing to the minimum disturbance areas required and recover vegetation and fauna habitat resources (e.g. trees, hollows) during clearing activities for re-use in rehabilitation areas. Minimise the time soil is stored in temporary stockpiles before being re-used, and where practicable use stripped soil directly for rehabilitation. Reshape completed backfilled mine voids progressively to their final landform shape, so that revegetation is staged. Progressively rehabilitate disturbance areas as they become available. Establish woodland species and mixed woodland/pasture in the rehabilitation areas. 	<ul style="list-style-type: none"> Create stable mine landforms that are non-polluting. Construct final mine landforms that drain in a stable manner. Revegetate mine landforms to include productive pastoral land. Revegetate mine landforms to include endemic woodland species. Enhance the habitat values and biodiversity values (including woodland areas) at relinquishment of the mining leases. Woodland areas are self-sustaining and on a path towards obtaining comparable flora and fauna values with unmined control sites of remnant vegetation.

The Project post-mining land uses would be consistent with the approved Wilpinjong Coal Mine post-mine land uses (Section 5.1 and Table 5-1) and the surrounding existing land uses (Section 4.12.1).

The post-mining land uses are also generally consistent with the aims of the *Mid-Western Regional Local Environmental Plan 2012* (Section 6.5.2).

Figures 5-2 and 5-3 illustrate the conceptual rehabilitated final landform.

Conceptual Final Landform

The final landform has been designed to be generally consistent with the topography of the Project open cut extension and infrastructure areas. Key features of the final landform include:

- backfilled mine landforms generally approximate the pre-mining topography, with some variations;
- an elevated waste rock emplacement located in the south of Pit 2 to a maximum final elevation of approximately 440 m AHD; and
- three final voids located in the southern end of Pit 8, the north-west of Pit 6, and in Pit 2 (Pit 2 West Dam) (Section 2.13).

Further detail on the final landform is provided in Section 5.2.3.

Figures 5-4 and 5-5 provide cross-sections of the conceptual final landform. These cross-sections illustrate that the final landform of the Wilpinjong Coal Mine incorporating the Project lies well within the range of natural topographic variation in the area.

5.2.3 Rehabilitation Domains and Conceptual Domain Objectives

Conceptual broad scale rehabilitation domains for planning purposes are shown on Figure 5-6. The conceptual broad scale domains are as follows:

- infrastructure;
- backfilled mine voids;
- tailings dams;
- final voids; and
- realigned Cumbo Creek.

Key features within these broad domains and the domain objectives are described below.

The progressive refinement of these domains into sub-domains and the development of associated sub-domain objectives would be presented in the MOP.

Infrastructure Domain

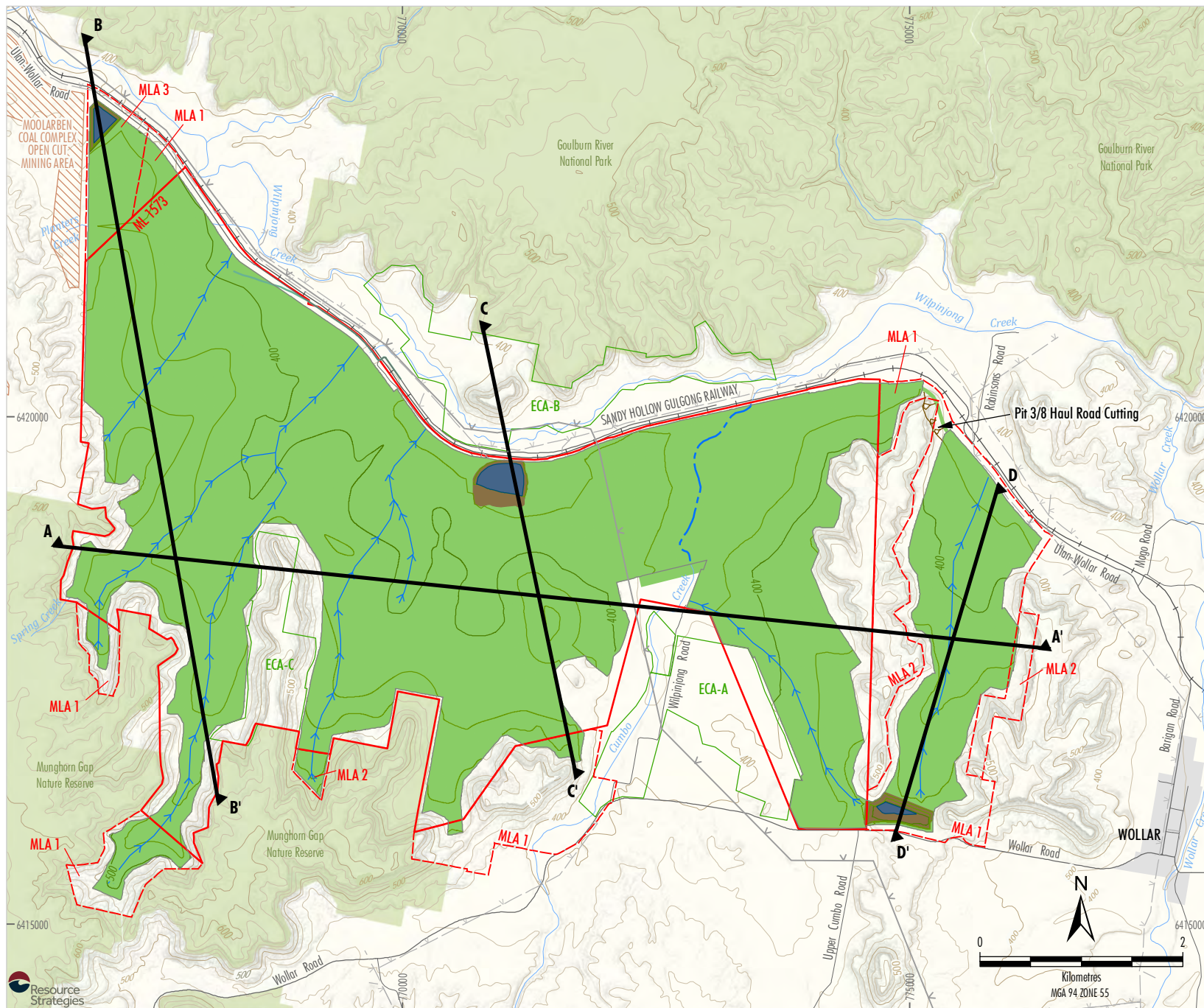
This domain is dominated by the infrastructure associated with coal handling, processing, rail loading and general supporting infrastructure associated with the existing Wilpinjong Coal Mine.

The infrastructure domain would include, but is not limited to:

- CHPP infrastructure area;
- coal handling infrastructure;
- workshop, storage and office buildings;
- muster area;
- service facilities (including potable water, sewerage amenities, fire services and hydrocarbon management);
- mine access road;
- internal access roads;
- parking facilities;
- hydrocarbon (i.e. diesel, lubricant) storage facilities;
- satellite mine infrastructure areas;
- explosives storage facilities;
- communication towers and associated equipment; and
- in-pit bulk fuel handling and personnel crib huts/ablution facilities.

The conceptual mine closure and rehabilitation objectives for the infrastructure domain are as follows:

- Infrastructure with no on-going beneficial use would be decommissioned and removed, unless otherwise agreed by the determining authority (e.g. removal of the CHPP, conveyors, coal handling and stockpile infrastructure).



- LEGEND**
- Mining Lease Boundary
 - Mining Lease Application Boundary
 - Established Rehabilitation
 - Final Void
 - Final Void Waterbody ¹
 - Conceptual Cumbo Creek Realignment
 - Drainage Line
 - Existing Surface Contour
 - Final Landform Contour
 - Local ETL
 - V — Realigned TransGrid 330 kV ETL
 - Enhancement and Conservation Area
 - ▲ Cross Section Location

¹ Pit 8 Final Void is predicted to be dry during periods of low rainfall.

Refer Figures 5-4 and 5-5 for Cross Sections.

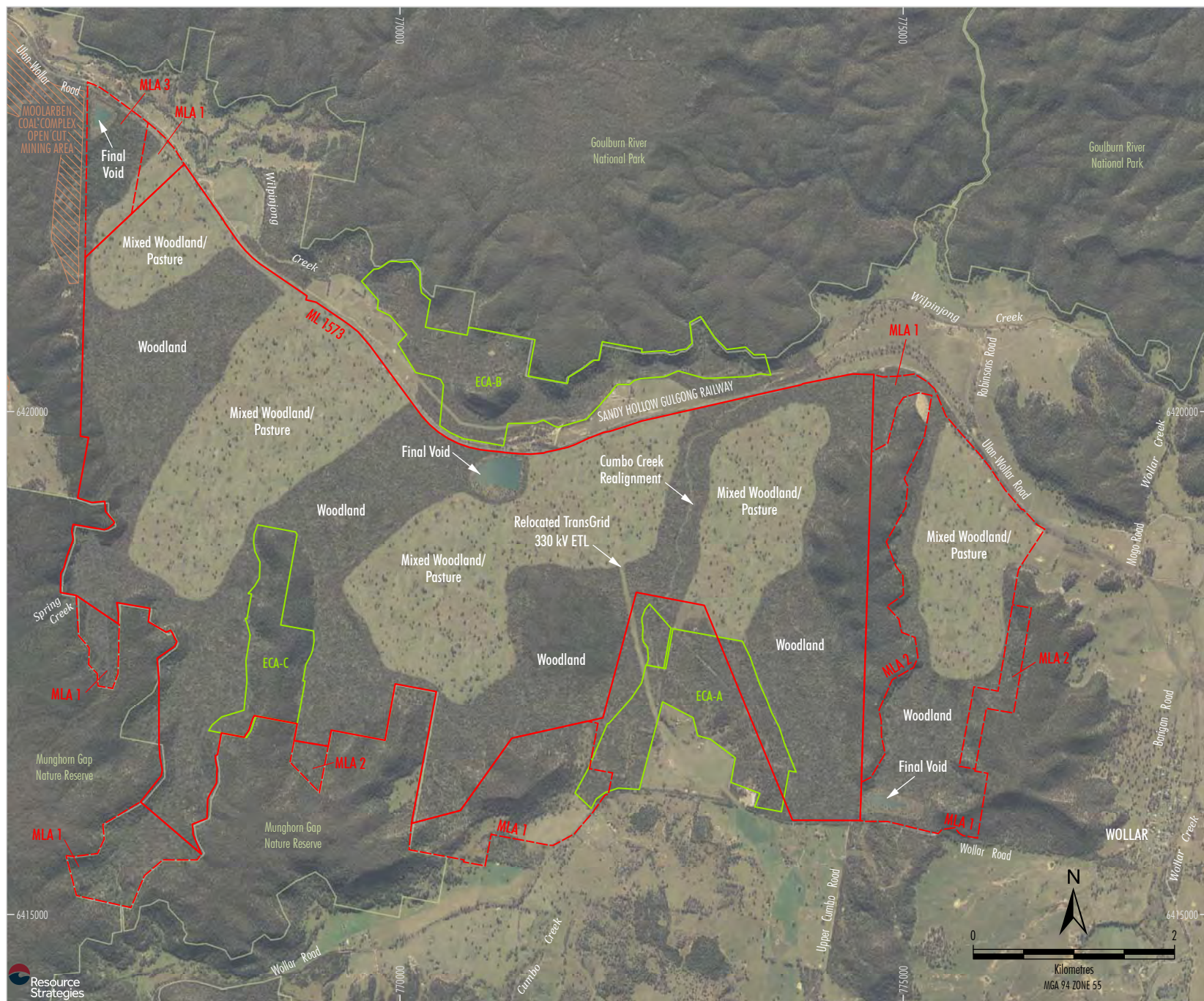
Source: WCPL (2015); NSW Dept of Industry (2015);
NSW Land & Property Information (2015)

Peabody
ENERGY

WILPINJONG EXTENSION PROJECT

General Arrangement
Post-mining

Figure 5-2



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Enhancement and Conservation Area

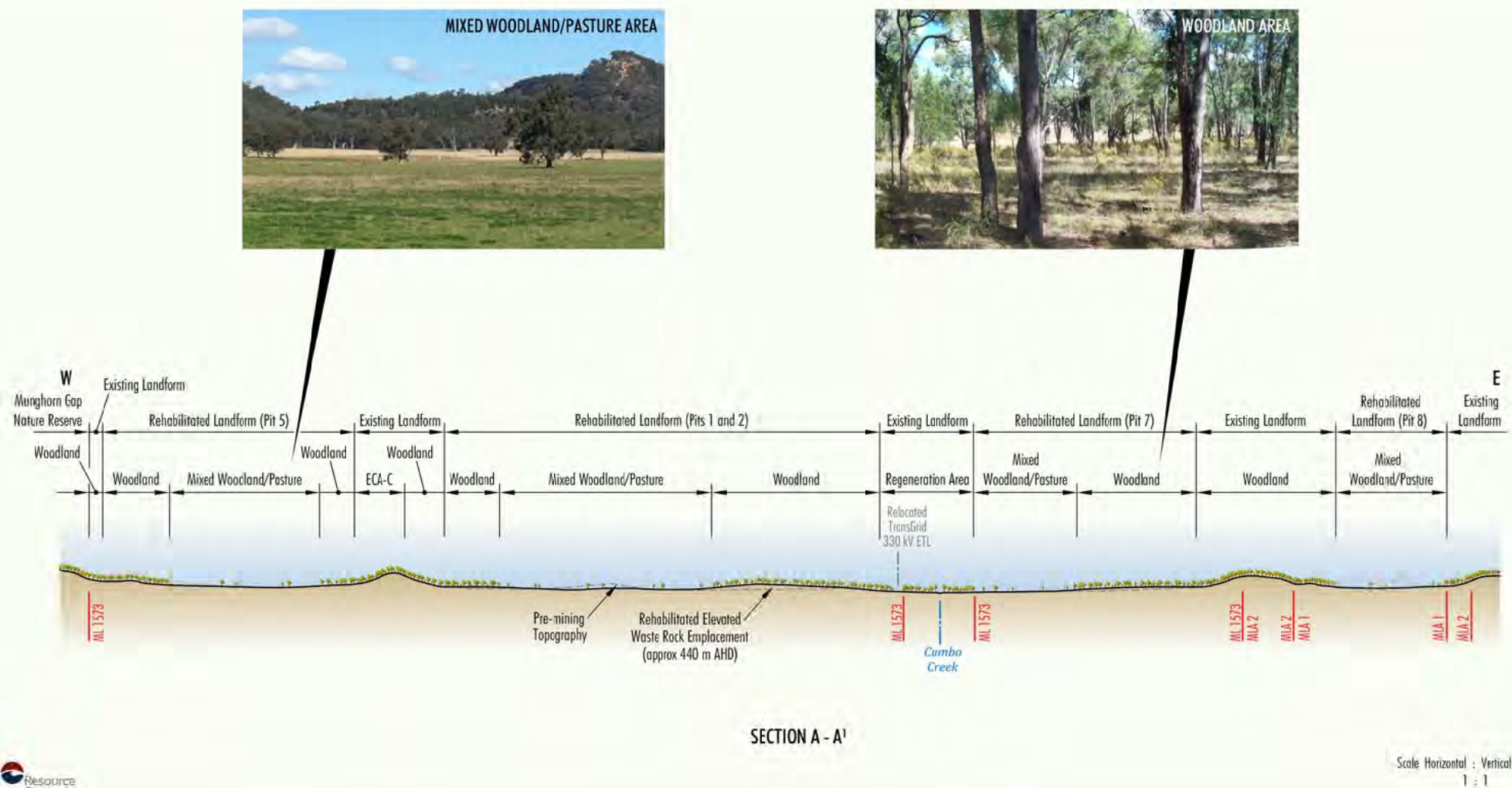
Source: WCPL (2015); NSW Dept of Industry (2015)
 Orthophoto: WCPL (Jun 2015; Jun 2014)

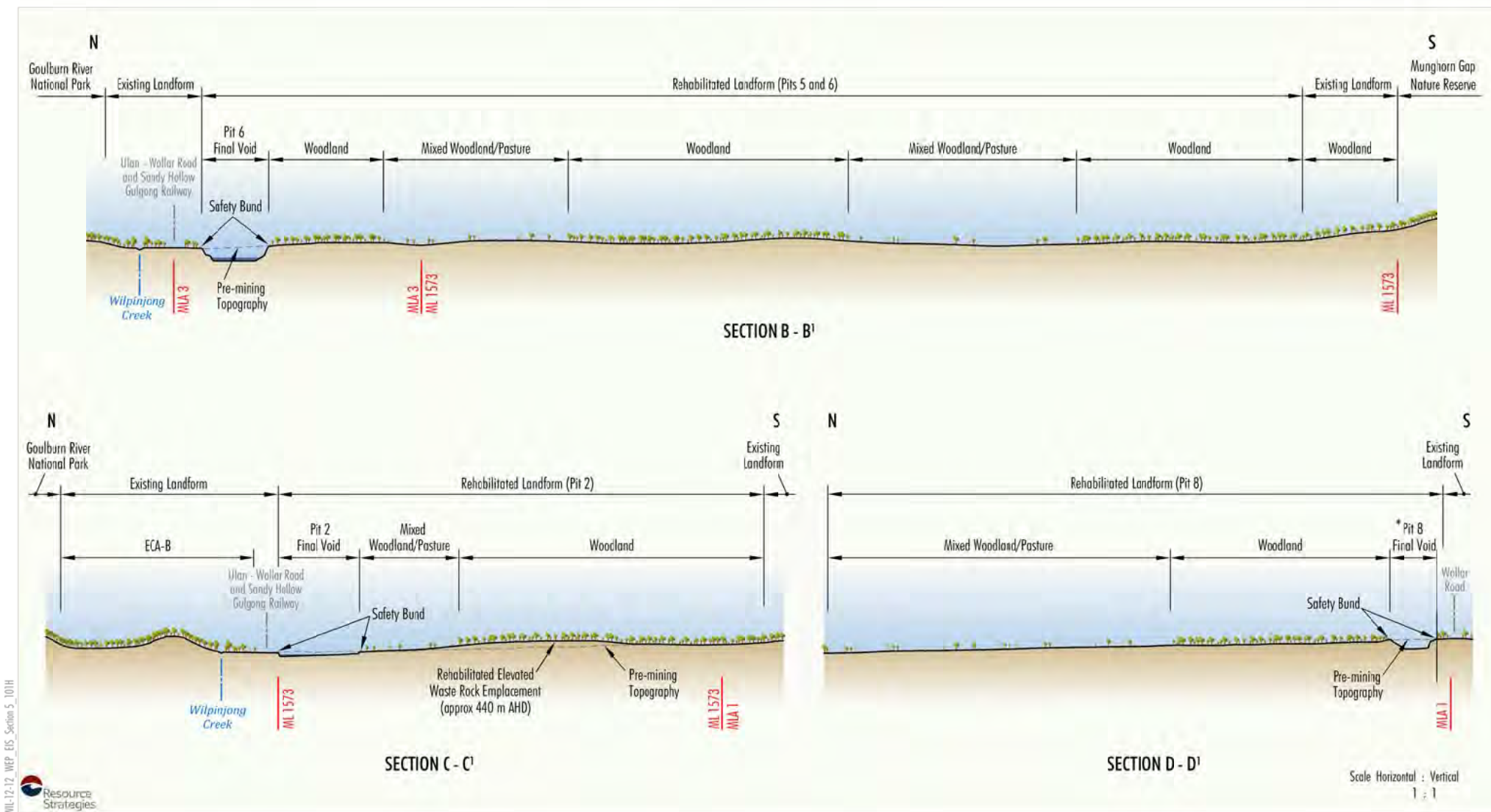
Peabody
 WILPINJONG EXTENSION PROJECT
 Conceptual Final Rehabilitation
 and Regeneration

Figure 5-3

Source: WCPL (2015)

Refer Figure 5-2 for Cross Section locations.





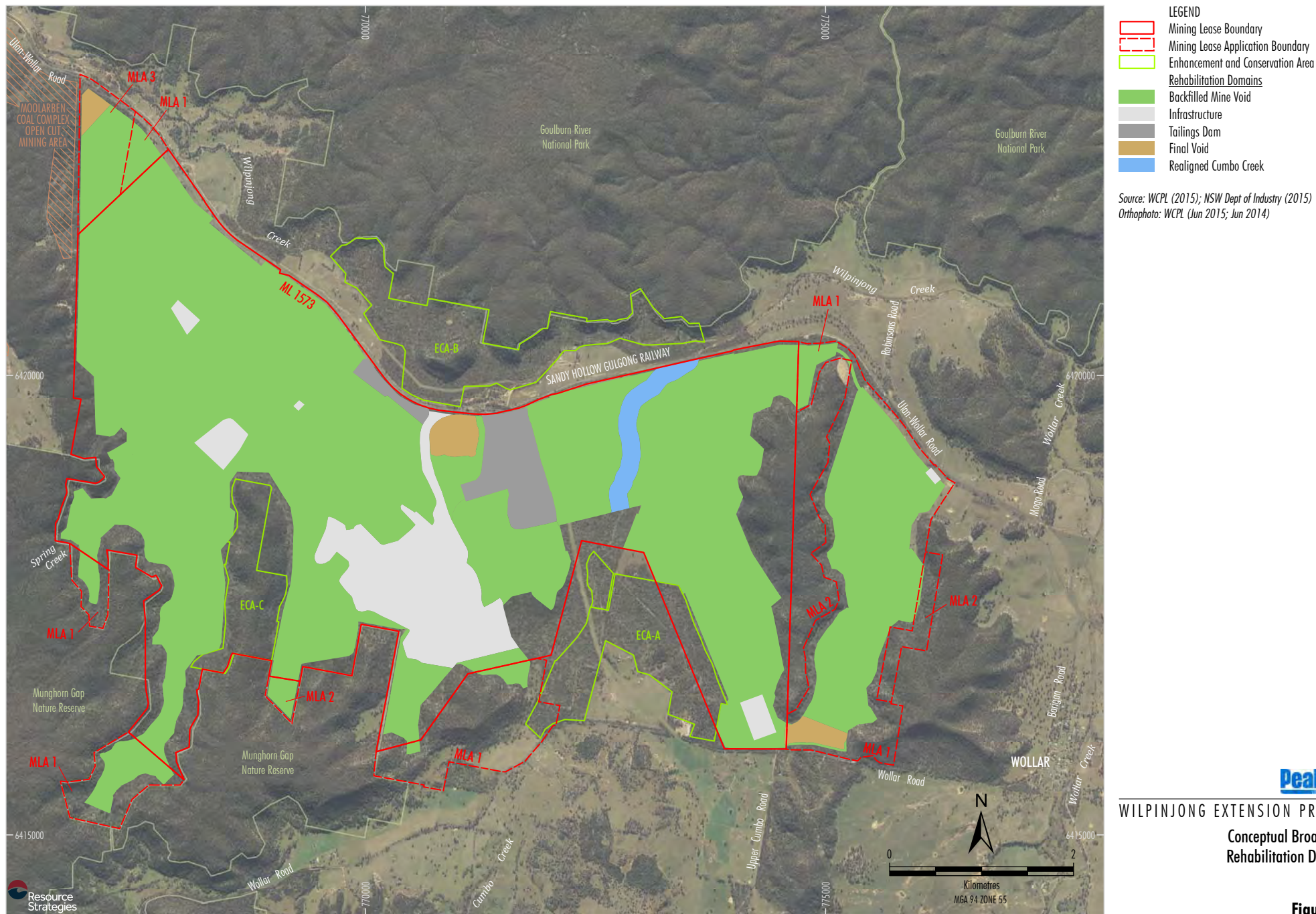
Source: WCPL (2015)

* Pit 8 Final Void is predicted to be dry during periods of low rainfall.

Refer Figure 5-2 for Cross Section locations.

Peabody
WILPINJONG EXTENSION PROJECT
Conceptual Cross Sections B, C and D
of the Rehabilitated Mine Landform

Figure 5-5



Peabody
 ENERGY

WILPINJONG EXTENSION PROJECT
 Conceptual Broad Scale
 Rehabilitation Domains

Figure 5-6

- Residual coal may also be extracted from underneath haul roads and other infrastructure prior to completion of mining, final profiling and rehabilitation.
- Hydrocarbons (petrol, diesel, oils, greases, degreasers and kerosene), explosives, chemicals and liquid and non-liquid wastes unused at the completion of mining would be returned to the supplier in accordance with relevant safety and handling procedures.
- If there are any contaminated soils associated with the Project, these would be identified and remediated in accordance with the requirements of the NSW *Contaminated Land Management Act, 1997*.
- Water management structures and sediment control structures would either be retained as water sources for future land uses or decommissioned and rehabilitated.
- The domain would be profiled to a free-draining landform with runoff reporting to the natural environment and would be revegetated to either woodland or mixed woodland/pasture areas.
- An approximate 0.1 to 0.3 m layer of soil would be placed on the backfilled landform prior to revegetation.
- Following rehabilitation, conservation and agricultural land uses would occur in the infrastructure domain.

A discussion of the native plant species for revegetation is provided in Section 5.3.3.

Backfilled Mine Voids

As described in Section 2.10.2, waste rock (including overburden and interburden) mined at the Project would be used to backfill the mine voids behind the advancing open cut operations.

Final landform levels and topography of the backfilled mine landforms would generally approximate the pre-mining topography, with some variations, and would be designed with an allowance for the long-term settlement of mine overburden.

The elevated waste rock emplacement would be temporarily rehabilitated at a height of up to approximately 450 m AHD, before being reshaped and pushed down to a maximum elevation of approximately 440 m AHD at the end of the mine life as a component of finalising site landforms and slopes.

Conceptual mine closure and rehabilitation objectives for the backfilled mine voids domain are as follows:

- The domain would be profiled to a free-draining landform with runoff reporting to the natural environment and would be revegetated to either woodland or mixed woodland/pasture areas.
- Rehabilitated slopes would be constructed to no greater than 17%.
- Graded banks would be constructed at 50 m intervals down the slope of the elevated waste rock emplacement and would be constructed at 1% longitudinal grade to the contour of the slope.
- Rock drainage structures would be excavated on the elevated waste rock emplacement as required following the completion of landform reshaping.
- Non-sodic waste rock material would preferentially be placed on the surface of the backfilled mine void landform (or sodic waste rock material would be treated with a material containing soluble calcium [e.g. gypsum, calcium chloride or limestone]).
- Any PAF or PAF-LC material would be placed at least 2 m below the surface of the backfilled mine void landform and at least 5 m below the surface of the elevated waste rock emplacement.
- An approximate 0.1 to 0.3 m layer of soil would be placed on the backfilled landform prior to revegetation.
- Water management structures and sediment control structures would either be retained as water sources for future land uses, or decommissioned and rehabilitated.
- Vehicular access to the TransGrid Wollar to Wellington 330 kV ETL alignment and tower sites across backfilled areas would be maintained, and revegetation along the corridor would be restricted to low growing species and/or pasture in accordance with TransGrid's requirements.
- Following rehabilitation, conservation and agricultural land uses would occur in the backfilled mine voids domain.

A discussion of the native plant species for revegetation is provided in Section 5.3.3.

Final Voids

At the completion of mining, the Project final landform would include final voids located in the southern end of Pit 8, the north-west of Pit 6, and in Pit 2 (Pit 2 West Dam) (Figures 5-2 and 5-3).

Once mining operations cease, groundwater inflows to the final voids would no longer be collected and pumped out, and as a result, two of the final voids would gradually begin to fill with water. Water in other on-site operational storages may also be transferred to the final voids in Pits 2 and 6 to facilitate decommissioning and rehabilitation.

Inflows into the final voids would comprise incident rainfall, runoff within the final void catchment area and groundwater. The catchment area of the final voids would be defined by permanent perimeter bunds, diversion channels and/or bunds/embankment walls.

Final void water recovery analyses have been conducted as part of the Surface Water Assessment (Appendix D). The assessment is based on predicted groundwater inflows developed as part of the Groundwater Assessment (Appendix C). The final void water recovery analyses include simulations of the long-term salinity of the final void waterbodies (Appendix D).

Figure 5-3 is a simulation of the rehabilitated Wilpinjong Coal Mine incorporating the Project showing the Pit 6 and Pit 2 final voids once the waterbodies have established and reached equilibrium. The Pit 8 final void is predicted to be regularly dry during periods of low rainfall (Appendix D) and hence a permanent pit void waterbody would not be expected to form.

The final void waterbodies are not predicted to spill under any of the simulated climatic sequences (Appendix D).

The salinity of the Pit 2 and Pit 6 final void waterbodies is predicted to slowly increase over time, reaching some 50,000 $\mu\text{S}/\text{cm}$ and 17,000 $\mu\text{S}/\text{cm}$ respectively at the end of the recovery simulations (Appendix D).

Figures 5-4 and 5-5 provide cross-sections illustrating the major Project landforms, including the three final voids.

Conceptual mine closure and rehabilitation objectives for the final voids domain are:

- Mine planning would target minimising the size of the final voids as far as reasonable and feasible.
- The catchment of the final voids would be minimised with the provision of permanent perimeter bunds, diversion channels and/or bunds/embankment walls.
- Further final void access restrictions (e.g. fencing) for safety and exclusion of livestock would be designed and implemented in consultation with relevant authorities.

Tailings Dams

The disposal of CHPP rejects at the Wilpinjong Coal Mine would continue to be managed in accordance with the approved Life of Mine Tailings Management Strategy with appropriate updates to reflect the Project. CHPP rejects (including dewatered tailings) would continue to be used to backfill the mine voids behind the advancing open cut operations (Figure 2-15).

Consistent with existing operations (Section 2.1.5), tailings would be pumped as a slurry and deposited in purpose-built tailings storage facilities (tailings dams) (Figure 2-4) constructed within mine voids when the tailings filter press is not operational (e.g. for scheduled maintenance).

Existing and new tailings dams at the Project would be progressively rehabilitated once they are complete and available for rehabilitation.

Conceptual mine closure and rehabilitation objectives for the tailings dams are as follows:

- The tailings in a complete tailings dam would be allowed to consolidate prior to the commencement of rehabilitation.
- The domain would be profiled to a free-draining landform with runoff reporting to the natural environment.

- The tailings dams would be progressively covered with overburden material to a minimum depth of cover of 2 m to create a stable landform. Non-sodic waste rock material would preferentially be used for the overburden cover (or sodic waste rock material would be treated with a material containing soluble calcium [e.g. gypsum, calcium chloride or limestone]).
- An approximate 0.1 to 0.3 m layer of soil would be placed on the tailings dam landform prior to revegetation.
- Areas would be revegetated to a combination of woodland and mixed woodland/pasture areas.

A discussion of the native plant species for revegetation is provided in Section 5.3.3.

Realigned Cumbo Creek

As described in Section 2.1.6, Cumbo Creek is approved to be realigned as part of the existing Wilpinjong Coal Mine. The planned timing for the approved Cumbo Creek relocation has been included in the development sequence of the Wilpinjong Coal Mine incorporating the Project (Figures 2-8 to 2-12).

Conceptual mine closure and rehabilitation objectives for the relocated Cumbo Creek domain are as follows:

- The relocated Cumbo Creek alignment would mimic the existing Cumbo Creek alignment and would be a safe, stable and non-polluting landform.
- The relocated Cumbo Creek alignment would provide in-stream and riparian vegetation and fauna habitats.

A discussion of the native plant species for revegetation is provided in Section 5.3.3.

5.2.4 Project Rehabilitation in the Biodiversity Offset Strategy

The existing Biodiversity Offset Strategy for the Wilpinjong Coal Mine would be augmented with an additional Biodiversity Offset Strategy for the Project, which comprises:

- land-based offset areas; and
- mine site rehabilitation (not relevant to Commonwealth offset requirements).

Details of the proposed Biodiversity Offset Strategy for the Project are provided in Section 4.9.

5.2.5 Key Rehabilitation Performance Measures and Strategic Completion Criteria

Key rehabilitation performance measures and strategic completion criteria have been developed for the Project. These have been developed with regard to *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure and Completion* (DITR, 2006b).

It is appropriate that the rehabilitation performance measures and completion criteria described below remain at the strategic level for this EIS.

The MOP would describe the rehabilitation performance measures and completion criteria including more detailed and quantified criteria where applicable (based on the Development Consent requirements for the Project). The rehabilitation performance measures and completion criteria included in the MOP would be specific, measureable, achievable, realistic and time-bound.

Over the life of the Project, rehabilitation performance measures and completion criteria would periodically be updated and refined in consultation with relevant regulatory stakeholders to reflect evolving site rehabilitation practices and standards.

The key rehabilitation performance measures and strategic completion criteria for the Project are described below.

Decommissioning

1. Project infrastructure is to be decommissioned in accordance with the Mine Closure Plan to the satisfaction of the regulating authorities.
2. Any potentially contaminated areas are to be tested and where required, remediated, in accordance with the NSW *Land Contamination Management Act, 1997* following infrastructure decommissioning.

Landform Establishment

1. After the completion of bulk materials handling in each domain, finalised landform areas (e.g. backfilled mine voids) are to be re-profiled to final slopes, and drainage structures installed consistent with the requirements of the MOP.

2. Final landform elevations and slopes are to be surveyed to determine compliance with the specifications (landform slopes, final elevations, etc.) set out in the MOP prior to the placement of growth media.

Growth Media Development

1. Specific soil stripping depths and soil amelioration requirements are to be based on pre-disturbance soil investigation (Section 5.3.2).
2. Suitable and sufficient soil growth media is to be stripped, and where necessary, suitably stockpiled for use in rehabilitation. Annual reporting of the site soil inventory is to be provided in the Annual Review.
3. Soil application depths, amelioration requirements and soil application equipment on rehabilitated landforms are to be in accordance with the MOP.
4. Suitable soil preparation on final landforms (e.g. ripping on contour or tilling) is to be undertaken prior to establishment of vegetation.

Ecosystem Establishment

1. After placement of growth media on profiled landforms, a sterile cover crop is to be sown to stabilise the growth media and minimise soil erosion.
2. Unless in declared drought conditions, after the placement of growth media on profiled landforms, a suitable combination of woodland or mixed woodland/pastures species would be established (i.e. sowing and/or planting of tube-stock) in accordance with the nominated post-mining land use.
3. After revegetation establishment in a domain, representative rehabilitation monitoring transects would be established in that domain and in corresponding representative control sites in accordance with the requirements of the MOP.

Ecosystem Development

1. Monitoring of native vegetation rehabilitation is to be undertaken in accordance with the MOP and the results reported in the Annual Review.
2. In the native vegetation rehabilitation areas, monitoring is to include the use of Landform Function Analysis¹ (LFA) or a similar systems-based approach to determine progress towards a self sustaining ecosystem and compare the condition of the revegetated areas with representative control sites in remnant native vegetation.

5.3 GENERAL REHABILITATION PRACTICES AND MEASURES

Rehabilitation progress of the Wilpinjong Coal Mine and rehabilitation techniques and materials would be regularly evaluated. The results would inform future rehabilitation initiatives and refinement/amendment of the practices and measures via adaptive management as described below.

5.3.1 Vegetation Clearing Measures

The clearance of vegetation would be undertaken progressively, with the area of vegetation cleared at any particular time generally being no greater than that required to accommodate projected development activities for the next 12 months.

Vegetation clearance protocols would be documented in the MOP. Key components of the vegetation clearance protocols would include aspects such as the clear delineation of vegetation areas to be cleared, clearing inspections and re-use of cleared vegetation debris in revegetation.

Further detail on management of potential impacts on flora and fauna during clearing is provided in Section 4.9.2.

¹ LFA is a Commonwealth Scientific and Industrial Research Organisation (CSIRO) developed method used to provide indicators of rehabilitation success and allows the assessment of landscape processes. LFA aims to measure the progression of rehabilitation towards a self-sustaining ecosystem through the assessment of landscape function.

5.3.2 Soil Stripping and Handling Measures

The soils in the Project open cut extension areas are characterised in Appendix I and Section 4.12.1.

Soil Management Strategies

General soil management practices would include the stripping and stockpiling of soil resources for use in rehabilitation. The objectives of soil resource management would be to:

- identify and quantify potential soil resources for rehabilitation;
- optimise the recovery of usable soil reserves during soil stripping operations;
- manage soil reserves so as not to degrade the resource when stockpiled; and
- establish effective soil amelioration procedures to maximise the availability and suitability of soil reserves for future rehabilitation works.

Pre-disturbance soil investigations would be progressively conducted in disturbance areas to confirm soil characteristics, stripping depth and ameliorant requirements (e.g. ameliorant type, application rate and application methodology [i.e. application during stripping or during stockpiling]).

The following management measures would be implemented during the stripping of soils:

- Areas of disturbance requiring soil stripping would be clearly defined following vegetation clearing.
- Where the pre-disturbance soil investigation determines that ameliorants (e.g. lime, gypsum and fertiliser) should be applied during stripping to improve the condition of the soil, they would be applied to the soil surface prior to stripping.
- Areas of disturbance would be stripped progressively, as required, to reduce potential erosion and sediment generation, and to minimise the extent of topsoil stockpiles and the period of soil storage.
- Topsoil and subsoil stripping depth intervals would be minimised (subject to mobile equipment availability).

- Topsoil and subsoil stripping during periods of high soil moisture content (i.e. following heavy rain) would be avoided to reduce the likelihood of damage to soil structure.
- In preference to stockpiling, wherever practicable, stripped soil would be directly replaced on completed sections of the final landforms.

Any long-term soil stockpiles would be managed to maintain long-term soil viability through the implementation of the following management practices as listed below:

- Soil stockpiles would be retained at a height of 2 m, with slopes no greater than 1V:2H and a slightly roughened surface to minimise erosion.
- Topsoil stockpiles would be constructed to minimise erosion, encourage drainage, and promote revegetation.
- Where the pre-disturbance soil investigation determines ameliorants (e.g. lime, gypsum and fertiliser) should be applied during stockpiling to improve the condition of soil being stockpiled, they would be applied to the stockpiles in-between the application of separate layers.
- Wherever practicable, soil stockpiles would not be trafficked, deep ripped or removed in wet conditions to avoid breakdown in soil structure.
- All topsoil and subsoil stockpiles would be protected with a non-persistent cover crop to reduce erosion potential as soon as practicable after completion of stockpiling. Where seasonal conditions preclude adequate development of a cover crop, stockpiles would be treated with a straw/vegetative mulch to improve stability.
- Soil stockpiles would be located in positions to avoid surface water flows. Silt stop fencing would be placed immediately down-slope of stockpiles until stable vegetation cover is established.
- An inventory of soil resources (available and stripped) would be maintained and regularly reconciled with rehabilitation requirements.
- Weed control programmes would be implemented on soil stockpiles if required.

The MOP would describe the soil resource management measures that would be used during the Project life.

Soil Reserves

McKenzie Soil Management (2015) has completed a preliminary material inventory to determine the quantity of soil available for rehabilitation (Appendix I). The results of these calculations are summarised in Table 5-3 and indicate that there would be sufficient soil available in the Project open cut extension areas to meet the requirements of the rehabilitation concepts.

Details of available soil resources, stripping and application schedules, and soil stockpile inventories would be included in the MOP, and a summary of soil management activities would be provided in the Annual Review.

**Table 5-3
Project Preliminary Soil Inventory**

Recommended Stripping Depth (cm)	Approximate Stripping Area (ha)	Approximate Volume (m ³)
50	160	800,000
100	640	6,400,000
Total	800	7,200,000

Source: Appendix I and WCPL (2015f).

cm = centimetres.

5.3.3 Selection of Native Plant Species for Woodland Revegetation

Disturbed areas to be revegetated with native vegetation would initially be stabilised with a non-persistent cover crop. Suitable native tube stock and/or seeds would then be planted/sown.

Native species to be planted in revegetation areas would be selected on a site by site basis depending on nearby remnant vegetation associations, soil types, aspect and site conditions. The species selected would allow for the establishment of vegetation communities characteristic of habitat for the Regent Honeyeater in woodland areas (Section 4.9).

The list of suitable native plant species to be used in the revegetation of disturbance areas would be documented in the MOP.

It is estimated that approximately 1,550 ha of woodland vegetation would be re-established as a component of the revegetation program (inclusive of the approved Wilpinjong Coal Mine) (Section 4.9).

5.3.4 Establishment of Agricultural Land

The rehabilitated Project final landform would include mixed woodland/pasture areas for agricultural production (Figure 5-2). These agricultural land use areas would predominately be located in the backfilled mine voids domain on lower elevation lands (Figure 5-5).

The physical and chemical properties of the soils indicate that with the implementation of appropriate management measures and with suitable amelioration, soils in the Project disturbance areas would be as productive as pre-mining soil conditions for pasture (Appendix I).

Based on the areas described above, approximately 1,342 ha of agricultural land would be re-established with a mixed woodland/pasture (inclusive of the approved Wilpinjong Coal Mine).

5.3.5 Enhancement and Conservation Areas

Three ECAs managed under a Voluntary Conservation Agreement with the NSW Minister administering the NPW Act have been established and comprise approximately 480 ha of land (Figure 1-3).

The proposed relocation of the TransGrid Wollar to Wellington 330 kV ETL requires short sections of easements through parts of two of the ECAs (i.e. ECA-A and ECA-B). The proposed ETL easements are through predominantly cleared land. WCPL is consulting with OEH in relation to a possible amendment of the Voluntary Conservation Agreement, so the total area of the ECAs (480 ha) would be maintained consistent with the existing Project Approval 05-0021.

These ECAs would be maintained for the Project to improve linkages between the mine rehabilitation areas and remnant vegetation associated with the Goulburn River National Park and the Munghorn Gap Nature Reserve.

5.3.6 Regeneration Areas

Regeneration Areas (which at the commencement of mining predominantly comprised cleared agricultural land) have also been established on areas of land that will be proximal to the Wilpinjong Coal Mine rehabilitation. The majority of the existing regeneration areas associated with the approved Wilpinjong Coal Mine would be disturbed by the Project. However, as these mined areas would be rehabilitated to woodland, the original purpose of the regeneration areas would be satisfied (i.e. link mine woodland rehabilitation areas to remnant vegetation associated with reserved lands [Section 5.1.4]).

WCPL would continue to establish endemic woodland vegetation in the remaining Regeneration Areas through natural regeneration and/or selective planting for the Project to improve linkages between the mine rehabilitation areas and remnant vegetation associated with the Goulburn River National Park, Munghorn Gap Nature Reserve and ECAs.

5.3.7 Geotechnical Stability

Existing geotechnical stability management and monitoring measures conducted at the Wilpinjong Coal Mine would continue to be applied at the Project.

The Project would not result in any material additional geotechnical issues with the continued implementation of these management and monitoring measures (Attachment 8).

5.3.8 Erosion and Sediment Control Works

Erosion and Sediment Control Plans would be progressively developed and approved as part of the Water Management Plan. Sediment and erosion controls would be periodically updated and regularly reviewed.

Operational sediment and erosion control works would be maintained during the establishment of revegetation. However, once self-sustaining stable final landforms have been achieved within an area, key elements of the operational sediment control structures would either be left as passive water control storages or would be removed and the area would become free-draining.

5.3.9 Waste Rock Management

The rehabilitation strategy for the Project has been developed in consideration of the likely geochemical characteristics of the waste rock that would be generated by the Project (Section 2.10.3)

The management of PAF and PAF-LC materials at the Project is described in Section 2.10.4.

The spontaneous combustion management procedures for the Project are described in Section 2.10.5.

As described in Section 2.10.3, the waste rock generated from the Project would include some moderately sodic materials. Non-sodic waste rock material would preferentially be placed on the surface of rehabilitated landforms (where reasonable and feasible).

Where this is not reasonable and feasible, the sodic waste rock material present on the outer slopes of re-profiled landforms would be treated with a material containing soluble calcium (e.g. gypsum, calcium chloride or limestone) (Appendix K).

In addition, a layer of soil would be placed over waste rock material on rehabilitated landforms to minimise the long-term exposure of sodic waste rock to rainfall and associated potential stability and water quality impacts.

Further discussion on potential groundwater and surface water quality impacts associated with the final landform is provided in Sections 4.7 and 4.8.

5.3.10 Coal Handling and Preparation Plant Reject Management

The rehabilitation strategy for the Project has been developed in consideration of the likely geochemical characteristics of the CHPP rejects that would be generated by the Project (Section 2.11.2)

The disposal of CHPP rejects at the Wilpinjong Coal Mine would continue to be managed in accordance with the approved Life of Mine Tailings Management Strategy with appropriate updates to reflect the Project.

The management of PAF and PAF-LC CHPP rejects at the Project is described in Section 2.11.3. Rehabilitation of these areas is discussed in Section 5.2.3.

5.3.11 Realigned Cumbo Creek

As described in Section 2.1.6, Cumbo Creek is approved to be relocated and the existing alignment of the creek mined as part of the existing Wilpinjong Coal Mine.

Prior to developing the Cumbo Creek relocation, WCPL would prepare a Cumbo Creek Relocation Plan. The plan would detail the final alignment of the relocated creek and required water management infrastructure, hydrological and ecological baseline conditions, design specifications, performance and completion criteria and associated monitoring.

The Cumbo Creek Relocation Plan would be prepared in consideration of *A Rehabilitation Manual for Australian Streams* (Cooperative Research Centre for Catchment Hydrology and Land and Water Research and Development Corporation, 2000).

After completing the construction of the relocated Cumbo Creek alignment, WCPL would submit an as-executed report, certified by a practising registered engineer, to the Secretary of the DP&E.

Prior to disturbing the existing Cumbo Creek alignment, WCPL would demonstrate that the relocated Cumbo Creek alignment is operating successfully, in consultation with DPI-Water, and to the satisfaction of the Secretary of the DP&E.

5.3.12 Final Void Management

At the completion of mining, the Project final landform would include three final voids located in the southern end of Pit 8, the north-west of Pit 6, and in Pit 2 (Pit 2 West Dam) (Figures 5-2 and 5-3).

In accordance with Condition 58 of Schedule 3 of Project Approval 05-0021, WCPL is currently required to design the size and depth of the approved final voids having regard for their function as groundwater sinks and minimise flood interaction and highwall instability risk. WCPL would also apply these existing requirements to the Project final voids, where they are relevant (i.e. Pit 2 and Pit 6 final voids).

The surface catchment of the final voids would be reduced as far as is reasonable and feasible. This would be achieved by progressively backfilling mine voids to approximate the natural surface and the use of up-catchment diversions and contour drains around the perimeter of the final voids.

A Final Void Management Plan would be developed as a component of the Mine Closure Plan in advance of mine closure in consultation with the DRE and other relevant authorities.

The final void design and mine planning in the Final Void Management Plan would be periodically reviewed in consultation with the DRE and other relevant authorities.

5.3.13 Land Contamination Management

Investigations would be undertaken at mine closure to identify and remediate any contaminated soil materials that may exist (e.g. in infrastructure areas) in accordance with the requirements of the *Contaminated Land Management Act, 1997* (Section 5.2.3).

5.3.14 Weed and Pest Control

Project weed and pest control measures are described in Sections 4.9.3.

5.3.15 Bushfire Management

Bushfire management measures for the Project are described in Section 4.12.1.

5.3.16 Post-closure Maintenance

The management and maintenance of rehabilitation areas post-closure would be outlined in the MOP and Mine Closure Plan (Section 5.6).

5.4 MINING OPERATIONS PLAN

The MOP describes how rehabilitation is undertaken, provides rehabilitation performance and completion criteria and addresses all aspects of rehabilitation including mine closure, final landforms and final land use.

The MOP would be updated to include the Project in consultation with the relevant government agencies, and in accordance with the relevant DRE rehabilitation and mine closure guidelines.

5.5 REHABILITATION MONITORING AND TRIALS

Ongoing monitoring and maintenance of rehabilitation areas at the Project would be conducted to assess the:

- progress of rehabilitation areas; and
- the effectiveness of the rehabilitation techniques being used to determine the need for any maintenance and/or contingency measures.

A summary of rehabilitation activities and performance is provided in the Annual Review.

The rehabilitation monitoring would include:

- recording germination success in woodland and woodland/pasture revegetation areas;
- recording pasture establishment success in mixed woodland/pasture areas and progression towards suitability for low impact grazing, including estimated stock carrying capacity;
- monitoring drains and rehabilitated mine landforms for localised failures or rilling and loss of topsoil after rainfall events;
- identifying potential threats to rehabilitated woodland and mixed woodland/pasture areas (e.g. weed invasion, pest species, erosion);
- monitoring the stability of rehabilitated mine landforms; and
- recording key rehabilitation information (e.g. taking photographic records, documenting rehabilitation LFA surveys).

Annual surveys of rehabilitation areas would be undertaken by an appropriately qualified and experienced person to review the progress of rehabilitation and to identify any additional measures required to achieve ongoing progression towards achieving rehabilitation criteria. A monitoring report would be prepared annually that includes a summary of previous monitoring results, results of the current year's monitoring and any planned remedial works, if required. The monitoring results would be summarised in the Annual Review.

The specific rehabilitation parameters and completion criteria would be determined in consultation with relevant government agencies and documented in the MOP.

WCPL would continue to conduct rehabilitation and revegetation trials at the Project with the objective of improving overall rehabilitation outcomes to meet the Project closure objectives and completion criteria.

5.6 MINE CLOSURE PLAN

A Mine Closure Plan would be developed for the Project in consultation with the MWRC, DP&E and the local community, and would include consideration of amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure.