DRAFT REPORT

Central West Coal Project
Preliminary Closure Plan

Prepared for

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1.1 Background

Central West Coal Pty Ltd (CWC), a wholly owned subsidiary of Aviva Corporation Limited (Aviva), proposes to develop the Central West Coal Project (Project), located approximately 15 km south-west of Eneabba, in the Mid West region of WA.

The Project is based on the mining of the Central West Coal Deposit as an energy source for the adjacent proposed Coolimba Power Station. The Coolimba Power Station is a related project proposed by Coolimba Power Pty Ltd, a wholly owned subsidiary of Aviva. Coolimba Power Pty Ltd proposes to construct a 450 MW coal fired power station. A preliminary closure plan for the Coolimba Power Project has been prepared under separate cover.

The resource comprises 75 Mt of sub-bituminous coal. The mine will be approximately 12 km long and ranging from 0.3-2 km wide.

The main components of the Project include:

- Open cut mine;
- Waste dump;
- Mine backfill with co-disposal of coal combustion ash and saline residue;
- Stockpile Management Corridor
- Run-of-Mine (ROM) pad;
- Coal handling plant and coal stockpiles;
- Access roads;
- Raw water storage dam;
- Mine dewatering bores and associated pipelines;
- Laydown areas;
- Workshop;
- Stores;
- Fuel storage;
- Borrow pits;
- Landfill; and
- Administration offices.

Mining will occur progressively and will comprise an open-cut mine to extract approximately 2 to 2.5 million tonnes per annum (Mtpa) of sub-bituminous coal. Based on the current estimate of reserves, the anticipated life of the mine is 30 years.

The mine will progress along the orebody with an active excavation area of approximately 120 ha at any one time, with continuous progressive backfill and rehabilitation occurring in parallel with mining. During the mine development phase, waste rock will be placed in a waste rock dump until the open cut pit is established and then the majority of waste rock will be used to backfill the pit. The SMC will be used for management of the various material stocks including topsoil, waste and coal. The coal will be trucked to the ROM area, crushed, screened and stockpiled ready to be conveyed to the power station. The complete project description is provided in Section 3 of the PER.

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The mine will require de-watering to provide safe working conditions. The water abstracted from the mine will be used by the Coolimba Power Project for power station cooling. Power Station ash and saline residue will be returned to the mine for co-disposal with mine waste rock.

Heavy minerals are known to exist in and near the project area. The rights to the heavy mineral resources in the project area are held by Iluka Resources Ltd (Iluka). Where the Project has the potential to adversely affect future recovery of heavy mineral resources, CWC will confer with Iluka to determine appropriate action. CWC will liaise with Iluka and the other relevant stakeholders to revise and amend this Preliminary Closure Plan where required.

1.2 Closure Planning Overview

CWC is committed to protecting the environment as reflected in Aviva's Environmental Policy (Aviva, 2008), which states that Aviva 'recognises our environmental responsibilities and promotes environmental awareness among its employees and contractors'. In addition, the policy states that 'our project planning and implementation seeks to prevent or minimise impacts on the environment in all project activities, and compliance with environmental laws and regulations is the minimum requirement for our environmental performance. Our goal is to exceed these requirements'. These principles will be applied to the development of an integrated approach to mine rehabilitation and closure for the Project.

CWC recognises the importance of planning for closure during the early stages of project development. This Preliminary Closure Plan is designed to meet the guidelines in the Australian and New Zealand Minerals and Energy Council (ANZMEC) and the Minerals Council of Australia (MCA) (2000) Strategic Framework for Mine Closure.

1.3 Purpose of Preliminary Closure Plan

Given the conceptual nature of this Plan, the purpose of this Preliminary Closure Plan is to:

- Provide a framework for closure planning for the Project.
- Identify issues that are necessary to meet legal requirements and other obligations for mine closure.
- Identify significant closure risks and mitigating actions.
- Identify research requirements to address any significant rehabilitation and closure issues/risks.

1.4 Scope of Preliminary Closure Plan

The specific areas (domains [refer to Section 5.1]) covered by this plan comprise:

- Open cut mine, including final mine void.
- Waste dump, mine backfill, stockpile management corridor,
- ROM pad and product stockpiles.
- Coal crushing plant.
- Raw water storage dam and mine dewatering infrastructure.
- Borrow pits.
- Access and internal roads.
- Administration offices, workshops, fuel storage, communication systems, stores, landfill, laydown area, and other infrastructure.

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1.5 Relevant Environmental Management Plans

The Preliminary Closure Plan addresses mine closure and rehabilitation requirements for the Project. However, it is recognised that the implementation of ongoing management strategies during the life of the Project will contribute to the achievement of the closure objectives. Therefore, the Preliminary Closure Plan should be considered in conjunction with the Environmental Management Plan for the CWC Project.

Section 2 Closure Objectives

2.1 Closure Objectives

The project area comprises a total disturbance footprint of approximately 1,700 ha, which includes previously cleared land with pockets of native vegetation and rehabilitated native vegetation. The current land uses on the site include farming, mineral sand mining and exploration. The areas surrounding the project area are predominantly farming land, nature reserves and mineral sand mining.

CWC proposes to return the land disturbed to its current use. Existing cleared farming land will be returned to farm land, and existing native vegetation will be returned to native vegetation. It is acknowledged that there will be a requirement to discuss the objectives with stakeholders as part of the consultation strategy for the development of the Final Closure Plan.

The closure objectives for the Project are to:

- Establish a safe, stable and sustainable environment that is compatible with the pre-mining land use.
- Ensure that the risk of adverse environmental impacts developing after closure, as a result of Project activities, are negligible.
- Minimise post closure costs to CWC, and avoid any financial liability resulting from the Project accruing to the WA Government and the public.
- Efficiently use resources in the execution of closure activities.
- Comply with legal requirements.
- Undertake monitoring of rehabilitated areas and take appropriate remedial action until the agreed completion criteria have been met.

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3.1 Legal Obligations and Commitments

3.1.1 Legislation

The legislation relevant to the closure of the Project includes:

- *Environmental Protection Act* 1986.
- *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).
- Environmental Protection (Controlled Waste) Regulations 2004.
- Environmental Protection (Unauthorised Discharges) Regulations 2004.
- *Contaminated Sites Act* 2003.
- *Mining Act* 1978.
- Mining Regulations 1981.
- *Mines Safety and Inspection Act* 1994.
- *Conservation and Land Management Act* 1984.
- *Rights in Water and Irrigation Act* 1914.
- *Wildlife Conservation Act* 1950.
- *Aboriginal Heritage Act* 1972.
- *Commonwealth Native Title Act* 1993.

The legislation listed above is not considered to be exhaustive and a review will be undertaken during the first two years of operations to identify the legislation that is applicable to CWC's closure obligations.

3.1.2 Tenement Conditions

There are likely to be existing tenement conditions that relate to rehabilitation and closure of the site. The Project will also be assessed under the *Mining Act* 1978 by the Department of Mines and Petroleum (DMP), and it is anticipated that there will be a number of additional tenement conditions imposed on the Project by the DMP. Tenement conditions will need to be considered and included within this plan prior to finalisation.

3.1.3 Ministerial Conditions

There are likely to be legal requirements that arise from the approvals under the *Environmental Protection Act* 1986 and the EPBC Act. The Project is currently being assessed by the WA Environmental Protection Authority (EPA) and by the Commonwealth Department of the Environment Water, Heritage and the Arts (DEWHA). It is anticipated that there may be Ministerial Conditions imposed on the Project upon receiving State and Commonwealth environmental approval.

3.1.4 Closure Standards

There are no statutory requirements for mine closure planning in WA. However, there are a number of mine closure guidelines referenced by industry:

- Strategic Framework for Mine Closure. (2000) ANZMEC and MCA.

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- Mine Closure Guideline for Minerals Operations in Western Australia. (2000) The Chamber of Minerals and Energy.
- Mine Closure and Completion, Leading Practice Sustainable Development Program for the Mining Industry. (2006a) Commonwealth Department of Resources, Energy, and Tourism (DRET).
- It's Not Over When It's Over: Mine Closure Around the World. (2002) World and International Finance Corporation (WIFC).
- Mine Rehabilitation, Leading Practice Sustainable Development Program for the Mining Industry. (2006b) DITR.
- Managing Acid and Metalliferous Drainage Handbook, Leading Practice Sustainable Development Program for the Mining Industry (Draft). (2006c) DITR.
- Mining in Arid Environments, Mining Environmental Management Guidelines. (2006) Department of Mines and Petroleum (DMP).
- Guidelines for Mine Closure Plans. (2007) DMP.

Although there are no statutory requirements to adhere to the above guidelines, CWC agrees, in principle, with these guidelines and will develop a Closure Plan based on their advice, its suitability and the relevance to the Project.

This Preliminary Closure Plan aims to incorporate the key aspects of the guidance provided in these standards including:

- Identify desired outcomes from closure and develop performance objectives and criteria to be achieved.
- Identify baseline environmental and socio-economic conditions to enable appropriate completion criteria to be developed.
- Identify legal requirements that must be achieved.
- Identify stakeholder concerns/requirements that should be taken account of during closure planning.
- Define closure options.
- Integrate closure planning into operational and life-of-mine decision making.
- Monitor the implementation of the plan.
- Regularly review and revise the plan to take account of changes to site activities, infrastructure or processes, technological options for mitigating risks, information from monitoring or research activities etc.
- Allocate adequate resources for implementing the plan and adequately represent the cost of closure in company accounts.

3.2 Environmental Setting

3.2.1 Climate

The Eneabba area, in which the Project is located, experiences a Mediterranean climate of hot, dry summers and mild winters (Bureau of Meteorology [BoM], 2008a).

Monthly climatic data averages are recorded by the BoM at the Eneabba weather station (Site No. 008225), which include data from 1964 to 2008. The maximum temperature ranges from moderate in winter to high in summer. The average maximum monthly temperature is coolest in July at

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19.6°C, and hottest in February at 36.1°C. The lowest mean minimum monthly temperature is 9.0°C in August, and the highest is 19.5°C in February.

Rainfall in the region is low, with extremely low levels over the summer months. Eneabba has an average of 60.5 rain days per year and a total annual average of 504.3 mm. The highest average monthly rainfall of 104 mm, occurs in June. January tends to be the driest time of the year, with an average rainfall of 7.1 mm, in one rain day.

Evaporation is not recorded at the BoM Eneabba weather station, nor at the three nearest stations (Jurien, Carnamah and Badgingarra). Therefore, average climatic zone evaporation data has been used. According to BoM (2008b) evaporation mapping, Eneabba is located within the zone which experiences an average of 2,000 to 2,400 mm total annual evaporation.

The climate conditions experienced in the region may hamper the success of rehabilitation. The restrictions on the quantity of water available, particularly during the summer months, will require rehabilitation to be carefully planned.

3.2.2 Topography

The Project Area is located on the Eneabba Plain, between the Coastal Belt to the west and the Gingin Scarp to the east. The Eneabba Plain is formed by a series of ancient shorelines, lagoon and dune deposits and slopes gently downwards to the north and west (URS, 2006a).

3.2.3 Soils

The following has been sourced directly from D.C. Blandford & Associates Pty Ltd (Blandford [2008]).

The soils present in the Project Area are the result of a complex geomorphic prehistory, and soil characteristics have been strongly influenced by erosion of laterites on the Gingin and Dandaragan Scarps and subsequent deposition of these weathering products on the coastal plain in outwash fans and extensive channel deposits. These materials have then been buried by both fluvial and aeolian sands. Ferricretes (post upland laterite erosion) also form a major component in the landscape, occurring as both exhumed and buried masses.

The soils of the Project Area generally fall into two main types, texture contrast profiles and deep siliceous sands. The deeper sands, which grade into material with increased clay contents at depth, are associated with aeolian sheet sand deposits. These sands generally have a single grain fabric. Pisolitic to nodular ferricrete is present in many of the profiles at varying depths below the surface where the relationship of the gravels to the containing sandy matrix suggests a fluvial origin.

The texture contrast soils are characterised by a sandy A horizon overlying a clay B horizon. The sandy A horizons range in depth from less than 0.30 m to 1.20 m. Spontaneous dispersion is present in many of the clay subsoils. Spontaneous dispersion is addressed in the materials handling and rehabilitation section of the EMP and Section 7.6.

Topsoils within the project area are generally chemically and physically infertile. Nitrogen is deficient, phosphorus and potassium levels are low, and organic carbon levels are low (<1%) at six sites, and moderate (1-2%) at four sites. The pH of soils across the project area ranges from 6 (slightly acid) to 8.5 (strongly alkaline) (D. C. Blandford, pers. comm.). These characteristics are important for the Project in terms of what will be required when the project area is rehabilitated and how the soil quality may be maintained during storage.

Acid Sulphate Soils

From a desktop review, field observations and soil analytical results, URS made assessments of the ASS potential of the project area and all the possible related areas surrounding the Project. A description of the ASS potential for each of the identified areas is below.

Project Area and Erindoon Creek Drainage Lines

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The subsurface profile along the drainage line of Erindoon Creek generally comprises of an A-horizon of organic sandy top soil overlying grey bleached or yellow brown fine grained sand with no structure, and a B-horizon which comprises a sandy clay/clayey sand profile.

The pH values recorded in the field were 5.54 - 6.68 in the sand or loamy sand and 6.08 - 7.96 in clayey sand/sandy clay and lateritic gravel profiles. This indicates a slightly acid to alkaline soil profile, less acidic than the organic A-horizon. The $pH_{(fox)}$ values recorded 3.65 - 5.35 for the sand or loamy sand profile, and 4.25 - 6.51 for the clayey sand/sandy clay and lateritic profiles.

Analytical results reported $pH_{(KCl)}$ values of 6.7 - 5.3 and $pH_{(ox)}$ values of 5.2 - 5.8 . These values are indicative of the naturally acidic soil profile of this region.

One sample site had titratable actual acidity (TAA), and the low acid concentrations are most likely due to naturally occurring acid within the soil profile. All sample sites reported S_{pos} below the limit of reporting, and low chromium and lead concentrations were recorded.

Measured acidity and low S_{pos} values, recorded along the drainage line, are due to naturally occurring organic matter, and not inorganic sulfides which have the capacity to generate large quantities of sulphuric acid if oxidised. In comparison, organic acidity is considered less of an environmental risk, particularly in the quantities reported along the drainage lines of Erindoon Creek.

Lake Logue Nature Reserve and Associated Systems

The soil profiles of the lake systems associated with Lake Logue are similar in texture and are generally comprised of hard cracking clays which are slightly sticky when wet, did not slake and were slightly dispersive.

The pH values recorded in the field were 7.75 - 9.47. Reactions with hydrogen peroxide were fast and vigorous with resultant $pH_{(fox)}$ values ranging between 6.48 - 7.95. Changes in pH were generally less than 2 and remained above 5.5.

Analytical results reported $pH_{(KCl)}$ values of 7.0 - 8.0 and $pH_{(ox)}$ values of 7.2 - 8.2. The slightly alkaline profile is indicative of the grey non-cracking clays and hard cracking clays of the lake systems.

No TAA was reported within the lake systems although there is some potential for acid generation, in areas which exceed the adopted trigger values of 0.03% sulphur. There is potential buffering capacity of the subsurface however; these concentrations are low suggesting the soil material may be partially, but not completely self-neutralising.

Other Historical Drainage Line and Low Lying Areas

There was no evidence of recent water movement along the historical drainage lines, located to the southeast of the LLNR. The subsurface soil profile generally comprised of a fine to medium grained, loose, dark grey to light grey loamy sand/sand, with some gravels at shallow depths.

The creek line, located to the northwest of Lake Logue, was also dry although there is evidence of water movement through this area during the winter months. The soil profile of this creek line comprise a clayey sand crust which was friable, fine grained, grey, hardset crust overlying a fine grained, yellowish brown, loose to medium, slaking, loamy sand.

The pH values recorded in the field were 5.72 - 6.75 for loamy sands and sands identified at shallow depths along the historical and current creek and drainage lines, indicating naturally slightly acidic soil. The $pH_{(fox)}$ values were 4.0 - 5.0.

Analytical results for $pH_{(KCl)}$ values were 5.8 - 6.4 and $pH_{(ox)}$ values of 4.6 - 5.1 for the historical drainage lines and low lying areas. These values are inline with the naturally acidic occurring soil profiles of this region.

Low concentrations for TAA were reported at two sample locations and are most likely due to naturally occurring acid within the soil profile. All sample sites along the historical drainage lines and low lying areas reported S_{pos} below the limit of reporting of 0.02% pyrite sulphur.

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Lake Indoon

Lake Indoon is groundwater dependent, and the previously waterlogged substrate of Lake Indoon is drying out resulting in a soil profile which comprises a semi-decomposed algal mat and salt crust overlying a soft-loose, fine grained, black, loamy clayey sand material indicative of newly formed acid sulphate soils material. This material overlies a light grey, fine grained, slightly sticky clayey sand material.

The pH values recorded in the field were 7.17 - 8.32. Reactions with hydrogen peroxide were violent and frothing, suggesting there was significant organic matter present in the samples, with resultant $pH_{(fox)}$ values of 2.50 - 5.80. This suggests there is some potential for acid generation if the profile is subject to oxidising conditions.

Analytical results for $pH_{(KCl)}$ values at Lake Indoon were reported as 7.0 with reported $pH_{(ox)}$ values ranging between 4.6 and 5.6. Using the S_{cr} reducible method, $pH_{(KCl)}$ values at Lake Indoon were reported as 8.8.

TAA and S_{pos} concentrations reported for Lake Indoon were below the limit of reporting (0.02% pyrite sulphur), indicating that there is no potential for acid generation if oxidation occurs. Additional analysis using the S_{cr} suite method detected no actual acidity, although concentrations for potential acidity were reported and are in exceedance of the adopted trigger value of 0.03% sulphur.

Although laboratory analysis indicates there is a significant amount of acid neutralising capacity (2.32% pyrite sulphur) at the surface of Lake Indoon, the availability of this material is not known and should not be relied on to provide *in-situ* natural buffering of the potentially acid generating material. No metals were detected at the shallow depths of Lake Indoon.

Lake Indoon has current issues relating to natural contamination which includes decomposing algal mats and monosulfide formations at very shallow depths. While initial results, using the SPOCAS methodology, detected no potential acidity, additional analysis using the S_{cr} methodology detected levels of potential acidity which are likely associated with the thin layer of monosulfidic formations.

Soil Moisture Regime

Blandford (2008) also conducted investigations into the soil moisture retention qualities of the soils of the project area. The discussion below is from Blandford (2008).

As with many areas within the Swan Coastal Plain, the upper sections of the soil profile present a complex system for water storage. The complexity arises in part from the turbulent geomorphic prehistory of the plain and in part from the proximity of the plain to the Gingin and Dandaragan Scarps, resulting in deposition of the products of erosion.

First, a turbulent prehistory has resulted in the development of profiles with up to six clearly definable horizons. The majority of profiles examined in the project area contain at least one, sometimes two palaeo surfaces where periods of erosion and subsequent deposition are clearly evident. Further, the fact that the plain was the depositional environment for runoff events from the highlands to the east means that those areas closest to the highlands became a complicated system of channels, flood-out areas, back swamps, levees, and alluvial fans. Each of these in turn contained its own suite of sediments according to the depositional regime and accordingly, each had its material-specific subsurface hydrology system.

Second, proximity to the eastern highlands has resulted in the deposition of ferricrete enriched sediments together with unweathered pisolitic and nodular ferricrete. While much of this material was deposited as well-sorted gravels in what are now palaeochannels under contemporary drainage systems, a lot of ferricrete was deposited as alluvial fan and flood-out deposits. These sheet-like structures then became recemented over time to form erosion resistant masses of ferricrete within the landscape.

The modern land surface represents the end result of an earlier land surface that was developed under wetter climatic conditions and subsequently modified by the onset of aridity.

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A conceptual model for perched water within the project area based on current understanding of the prehistory noted above and on field evidence of profile complexity was developed. This model covered a good range of the impacts that soil profile morphology has on both total and available soil moisture. At the outset, it is important to note that as a general rule, surface infiltration rates are high and range from a low of 110mm/h to a high of 1,404mm/h (URS, 2009a). This means that meteoric input to surface soils is the major component to soil moisture regimes in the upper profile.

Every profile has a unique relationship to meteoric input, and each profile stores water according to its bio-physical system. Within any given profile, there are horizons that store soil water, horizons that impede the vertical movement of soil water, and horizons that have high permeability and allow the free and rapid passage of water through the profile as lateral through-profile drainage.

There are several key components of project area soils that are important in soil moisture regimes. First, the presence of ferricrete gravels within palaeo channels results in lateral drainage at the depth of the palaeo channel. Second, the presence of iron-oxide clays derived from the in situ weathering of ferricrete results in a greater water holding capacity, and third, pans within the profile, eg silica pans or earthy pans, act as an impeding layer to the vertical movement of soil water. In this latter case, water moving vertically down through the profile to an impeding layer may be prevented from further drainage or it may simply be held up and seep very slowly into the impeding layer.

The complexity of this natural system is compounded by the fact that there are no definable scales of time or space. Accordingly, no impeding layer is continuous in space at a given depth, the same as no clay horizon is continuous in space. In addition to the soil profile characteristics, the masses of now exhumed ferricrete are able to store large volumes of moisture, and depending on the characteristics of the ferricrete, release this stored water to the surrounding soils at a slow rate.

The conceptual perched water model then, allows for meteoric input as the major source of soil water in the near-surface profiles at the Aviva project area. Rainfall may enter the soil profile directly through infiltration or it may percolate into massive and recemented ferricrete lenses. Sandy surface soils will allow the water to move vertically while ever rainfall is sufficient to maintain saturated conditions at the surface. As soon as saturation ceases, then vertical downward movement will also stop. If the near-surface horizon has a small amount of clay, then vertical movement will be slower but more water will be stored. If the vertical movement of water is stopped, at say a silica pan 1.5m below the surface, then water will build up at this depth while ever saturation occurs. Once rainfall stops, then the water that reached the pan will remain in the profile, essentially forming a ‘perched’ reservoir of water. The model then allows for the ponding of water within the soil profile and at varying depths, as well as the storage of soil moisture according to the texture of the soil material. Over time, the perched water reservoir may leak to a lower horizon given enough surface input.

The only time the perched water system is linked to an underlying aquifer is when the upper soil profile between the aquifer and the surface is saturated. However, lowering of the aquifer surface will not impact the perched water system when the profile ceases to be saturated because the forces holding soil moisture within the soil (matric potential) are greater than the forces of gravity to cause vertical drainage.

The opposite also holds true. Prolonged periods of low meteoric input will result in very low moisture contents in near surface soils above an impeding layer, which may for example, be the silica pan at 1.5m, and with increased temperatures and evaporation, vegetation moisture stress will be prominent. However, as a silica pan is an impeding layer, it may also prevent the upward migration (through capillarity) of groundwater.

This perched water is critical as it forms the major water source for shallow rooted species and is also a water source for non-shallow rooted species that do not tap into the capillary fringe above a true groundwater aquifer.

The contemporary drainage lines (eg Erindoon Creek) that run south-east to north-west through the project area, are modern remnants of the ancient and very dynamic palaeo system that drained from the eastern highlands to the lakes. The soil profiles present along these watercourses are complex in the extreme and all display the ability to retain and store soil moisture as well as release it under saturated conditions. Of the 18 profiles examined in detail in the survey area, five profiles located on the Erindoon

drainage line contained a well developed impeding layer. Three profiles, away from the drainage line, also contained well developed impeding layers.

For the drainage line investigated, field evidence suggests that all surface flow will not automatically report to the underlying deeper aquifer and that depending on the competence and spatial continuity of impeding layers, once surface flow penetrates the profile under Erindoon Creek, much of the water will be stored as perched water within the profile.

3.2.4 Geochemistry

Terrenus Earth Sciences (Terrenus) characterised the geochemistry of the waste rock (overburden and interburden), potential coal reject material and coal combustion ash to be generated by the Project. The findings are summarised in this section.

Survey and sampling

In total, the 169 samples comprised:

- 127 waste rock samples (two of which are samples of poor quality coal from the uneconomic ETYE seam);
- 24 potential coarse reject samples; and
- 18 coal samples from the EMS.

Geochemical Characterisation and Assessment of Waste Rock

Over 80% of the waste rock samples tested have been classified as non acid forming (NAF), with a further 8% classified as uncertain non acid forming (UC-NAF). The remaining 10% (approximately) are classified as potentially acid forming (PAF).

The results from the waste rock analysis indicate that:

- The waste rock is likely to be relatively benign, generating pH-neutral and low to moderately saline runoff and seepage following surface exposure.
- Over half of the waste rock material is expected to have very low total sulphur content and can be classified as barren.
- The risk of acid generation is expected to be low given the general lack of oxidisable sulphur content.
- The concentration of metals in waste rock materials (solids) are within the applied guideline criteria for soils (NEPC, 1999a).
- The concentration of soluble metals and salts in runoff and seepage from waste rock is likely to remain well within the applied water quality guideline criteria (NEPC, 1999b and ANZECC, 2000a).
- All waste rock materials tested are strongly sodic, with significant exchangeable cation imbalances.

Geochemical Characterisation and Assessment of Potential Coal Rejects

An assessment was made of potential coal rejects. This assessment comprised testing samples of coal seam roof, coal seam floor and poor quality coal. The key findings from the assessment were as follows:

- These materials are expected to generate weakly acidic and moderately saline runoff/seepage following surface exposure.
- The potential rejects are classified as PAF, although the floor of the EMS lower seam has a mixed NAF-PAF acid-generation classification.

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- The concentrations of metals in potential reject materials are generally within the applied guideline criteria for soils.
- The concentration of soluble metals and salts in runoff and seepage is generally likely to remain within the applied water quality guideline criteria, provided these materials do not undergo further oxidation, given their PAF classification.

Suitability of Waste Materials for use in Revegetation and Rehabilitation

Overburden sample composites were all found to have Exchangeable Sodium Percentage (ESP) well above 20% and may be described as strongly sodic indicating that they are potential un-suitability for use in rehabilitation due to possible structural stability problems.

3.2.5 Groundwater

Superficial formations of Quaternary and Tertiary deposits cover the project area. Underlying the superficial formations is the Cattamarra Coal Measures (CCM).

The superficial formations consist mainly of silt, sand and clay in varying proportions. The superficial formations form an unconfined aquifer system. The aquifer predominantly consists of a shallow marine and aeolian sequence that has been deposited in strandlines parallel to the coast.

The groundwater flow system is bound by the Indian Ocean in the west and by the Gingin Scarp to the east. Upward leakage by discharge from the CCM into the flow system takes place in the coastal area and locally. Through-flow and upward leakage also occurs from the Yarragadee Formation across the Warradarge Fault (URS, 2006a).

Groundwater levels in the project area reflect regional groundwater gradients, seasonal and long-term climate changes, groundwater abstraction and land clearing. Limited salinity data prior to 1990 suggest that land clearing has resulted in both local and regional increases in groundwater levels (Northern Agricultural Catchments Council [NACC], 2002).

At the Project site, groundwater levels are approximately 7 - 12 m below ground surface (URS, 2006a).

3.2.6 Surface Water

A north-south chain of wetlands perched on aoelian sands, including Lake Indoon and Lake Logue are located to the northwest of the project area. The Lake Logue-Indoon System is listed on the Directory of Important Wetlands in Australia.

Lake Logue is a large seasonal freshwater lake and lies within the Lake Logue Nature Reserve. Lake Indoon is a permanent brackish lake within a recreation reserve.

The project area lies within the Lake Indoon catchment, which is drained by the ephemeral Erindoon Creek, Bindoon Creek and an un-named creek. A number of tributaries of Erindoon Creek will be temporarily intersected by the mine until backfilling and rehabilitation restores them, and another small tributary obstructed by the waste rock dump will be permanently diverted to Bindoon Creek.

3.2.7 Flora and Vegetation

A significant proportion of the area surveyed by Mattiske for the CWC Project Area is cleared farmland (49%). Within the native vegetation remaining within the survey area, 14 plant communities were recorded. These are listed below:

- **H1 -** Mixed heath of *Melaleuca leuropoma* with emergent *Banksia* species with occasional *Eucalyptus todtiana* and *Actinostrobus arenarius* on sand with exposed lateritic rises.
- **H2 -** heath or low shrubland of *Conospermum triplinervium, Verticordia nitens, Adenanthos cygnorum, Stirlingia latifolia* and *Jacksonia floribunda* on sand.

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- **H3 -** Mixed heath of Proteaceae and Myrtaceae species with occasional *Eucalyptus todtiana* on sand.
- **H4 -** Low shrubland of *Conospermum triplinervium*, *Ecdeiocolea monostachya* and *Austrostipa macalpinei* on sandy drainage lines.
- **H5 -** Mixed heath or shrubland of *Xanthorrhoea drummondii, Allocasuarina humilis* and *Hibbertia* spp. and Proteaceae species on lateritic uplands.
- **T1 –** Scrub or thicket of *Banksia attenuata, Banksia menziesii* over *Banksia sphaerocarpa* var. *sphaerocarpa, Adenanthos cygnorum, Banksia hookeriana* and *Conospermum triplinervium* on sand.
- **T2 -** Thicket or scrub of *Acacia blakelyi* over *Melaleuca leuropoma, Banksia sphaerocarpa* var. *sphaerocarpa, Verticordia densiflora* var. *densiflora* on sand.
- **T4 -** Thicket or scrub of *Melaleuca rhaphiophylla* and *Melaleuca lanceolata* over sedges and rushes on low-lying sandy loams.
- **E1 -** Low woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over *Adenanthos cygnorum, Eremaea beaufortioides* var. *lachnosanthe, Melaleuca leuropoma, Banksia sphaerocarpa var. sphaerocarpa* and *Hibbertia hypericoides* on sand.
- **E4 -** Open low woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over *Banksia menziesii* and *Stirlingia latifolia* on sandy drainage lines.
- **E5 -** Open low woodland of *Eucalyptus todtiana, Nuytsia floribunda* over *Banksia menziesii* and *Conospermum triplinervium* on sandy uplands.
- **E6 -** Open low woodland of *Eucalyptus todtiana* and *Nuytsia floribunda* over mixed low shrubs and herbs on sandy lowlands.
- **S1** - Open scrub of *Acacia blakelyi* and *Hakea psilorrhyncha* over *Gahnia trifida, Melaleuca leuropoma, Concostylis aculeata* subsp. *breviflora, Ursinea anthemoides, Trifolium campestre* and *Vulpia bromoides* on rehabilitated land.
- **S2** - Open scrub of *Acacia blakelyi* and *Eucalyptus todtiana* over annual grasses and herbs.

All of these communities extend outside the project area, but the extent of these communities in the region have been modified by agricultural activities and mining activities.

One Threatened Ecological Community (TEC) occurs in the general Eneabba area and is known as Community 72 Ferricrete Floristic Community or the Rocky Springs Ferricrete Community. This TEC is listed as Vulnerable by the DEC (2008c), but is not currently listed under the EPBC Act. On the basis of database search and a comparison with regional datasets, the majority of the flora recorded within this TEC is represented either on the northern Swan Coastal Plain or in the adjacent regions. The H1 heath community included pockets of lateritic rises, which may overlap with the TEC.

A total of four Priority 2, eight Priority 3 and four Priority 4 taxa were recorded within the project area. These comprise:

- *Acacia lasiocarpa* var. *lasiocarpa* Cockleshell Gully variant (P2).
- *Calytrix purpurea* (P2).
- *Comesperma rhadinocarpum* (P2).
- *Verticordia argentea* (P2).
- *Acacia flabellifolia* (P3).

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- *Calytrix superba* (P3).
- *Grevillea biformis* subsp. *cymbiformis* (P3).
- *Haemodorum loratum* (P3).
- *Hemiandra* sp. Eneabba (H. Demarz 3687) (P3).
- *Mesomelaena stygia subsp. deflexa* (P3).
- *Schoenus griffinianus* (P3).
- *Verticordia fragrans* (P3).
- *Calytrix eneabbensis* (P4).
- *Georgeantha hexandra* (P4).
- *Stylidium aeonioides* (P4).
- *Verticordia aurea* (P4).

The definition of Rare and Priority Flora Species are (Department of Environment and Conservation, 2008):

- Rare (R) - Extant Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such.
- Priority 1 (P1) - Taxa with few, poorly known populations on threatened lands.
- Priority 2 (P2) - Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.
- Priority 3 (P3) - Taxa with several, poorly known populations, some on conservation lands.
- Priority 4 (P4) - Taxa in need of monitoring.

3.2.8 Dieback

Three discrete infestations of *P. cinnamomi* have been identified within the project area, and one was also noted adjacent to the project area. These were identified by Glevan in work undertaken for Iluka Resources Ltd within the Eneabba West Mine area, which the project area overlaps. A further survey by Glevan in December 2007 for CWC found no further infestations within the project area.

The long-term average annual rainfall for the project area is 504mm, and data over the last seven years ranges from 489 mm maximum in 2003 to 307 mm minimum in 2007. This indicates that the project area may be susceptible to, but likely marginal to the survival of, *Phytophthora Cinnamomi* and other 'dieback' pathogens. It would therefore be expected that the disease expression throughout the project area would be episodic rather than the progressive disease expression observed in areas of higher rainfall. This expression may be also be emphasized by localised conditions, such as water gaining sites or areas with a higher water table (Glevan Consulting [Glevan], 2007).

3.2.9 Fauna

Vertebrate Fauna

A total of 11 native mammal species, 31 bird species and 25 herpetofauna species were identified during fauna surveys (ecologia Environment, 2008).

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Two species known to occur in the vicinity of the Project Area are protected under the EPBC Act, comprising:

- **Carnaby's Black-Cockatoo** (*Calyptorhynchus latirostris*) is listed as Endangered under the EPBC Act. This species has been recorded in previous studies in the region, and is known to live in proteaceous scrubs and heaths, eucalypt and pine forests. They mainly feed in shrubland or heath, foraging on seeding proteaceous species.

  Carnaby's Black-Cockatoo was recorded in the South Eneabba Reserve once during the spring 2007 survey, while 26 individuals were seen feeding on *Banksia* sp. during the Autumn 2008 survey. As the vegetation in the nature reserve is similar to the adjacent natural vegetation of the Project Area, Carnaby's Black-Cockatoos are likely to use both areas for feeding. Therefore Carnaby's Black-Cockatoos are likely to be seasonal but regular visitors to the Project Area, feeding in remnant native vegetation after moving from inland breeding areas (such as Three Springs and Carnamah) to non-breeding, feeding areas closer to the coast.

- The **Rainbow Bee-eater** (*Merops ornatus*) is listed as Migratory under the EPBC Act. This species has been recorded from multiple surveys in the Eneabba region, and are generally common in the region. This species migrates within Australia and up to Indonesia and Papua New Guinea, and is found almost anywhere suitable for obtaining insects. Breeding occurs in both Papua New Guinea and Australia between the months of October and December. The nests are burrows which are dug, usually at a slight angle, on flat ground, sandy banks or cuttings, and often at the margins of roads or tracks.

  It is expected that the individuals recorded during the surveys of the Project Area are breeding in the area, due to the timing of the survey and the sandy soil types of the region that are suitable for nest burrows.

Desktop studies have identified that two other species listed as Migratory under the EPBC Act that may also occur in the Project Area, these are:

- The **Eastern Great Egret** (*Ardea alba*) are most commonly found in both fresh and saline shallow waters, neither of which are found in the Project Area. This species has been recorded in the region, but due to a lack of suitable habitat it is unlikely to be present in the Project Area.

- The **Fork-tailed Swift** (*Apus pacificus*) is a migratory species that spends winter in Australia after breeding in Mongolia and China. Fork-tailed Swifts have previously been recorded from the Lesueur area. Due to the aerial lifestyle and migratory nature of this species, it is expected to be an infrequent visitor and would not directly utilise the fauna habitats of the Project Area.

Desktop studies have identified that the following three species listed under the *Wildlife Conservation Act 1950* may also occur in the Project Area:

- The **Peregrine Falcon** (*Falco peregrinus*). Listed as Schedule 4, this falcon breeds on all continents except Antarctica. Australia is considered one of the strongholds of the species, as numbers have declined in many other parts of the world. Peregrine Falcons commonly prefer cliffs along the coast, rivers, ranges, wooded watercourses and lakes, and will nest primarily on cliff ledges, granite outcrops and in quarries. Peregrine Falcons have been recorded in the region. No potential breeding sites are present in or near the Project Area but the species may utilise the Project Area for foraging.

- The **Woma** (*Aspidites ramsayi* south-west population). Listed as Schedule 4, the Woma python is a moderately large snake that prefers woodlands, heaths and shrublands on sandplains. Several populations have been identified across Australia, including the south-west population, which has a range that covers the Project Area. However, this population has not been recorded since 1989. Clearing of much of its natural habitat and predation by foxes and cats has resulted in a major population decline. Suitable habitat in the form of heath on sand plains is present within the Project Area, but due to its scarcity and the prevalence of introduced predators in the Project Area, it is unlikely to be present.

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- The **Gilled Slender Blue-tongue** *(Cyclodomorphus branchialis).* Listed as Schedule 1, the Gilled Slender Blue-tongue is a large skink found in semi-arid shrublands in an area between the Murchison and Irwin Rivers. This species has also previously been recorded in the area. Due to the close proximity of these records and the suitable habitat in the Project Area, the Gilled Slender Blue-tongue could potentially occur in the area. However, if a population is present, it is likely this would have experienced a large population decline due to the large-scale burn in 2005.

The fauna surveys also identified the following two species gazetted under the DEC Priority Fauna List:

- The **Black-striped Snake** (*Neelaps calonotos)* is listed as Priority 3 by the DEC and has previously been recorded between Mandurah and Lancelin, with a single specimen recorded from Port Denison (70 km south of Geraldton). Therefore, this record is approximately 200 km from the nearest previous record.

  This species is rarely seen, and its preferred habitat comprises dunes and sandplains vegetated with heaths and eucalypt/banksia woodlands. This snake is locally abundant on the Swan Coastal Plain and was located east of the Project Area, outside of the South Eneabba Nature Reserve. It is expected to occur throughout the heathy sandplains surrounding the Project Areas.

- The **Rufous Fieldwren** (*Calamanthus campestris montanellus*, western wheatbelt population) is listed as a Priority 4 species on DEC's Priority Fauna List. The western wheatbelt subspecies of the Rufous Fieldwren prefers heath and low shrubland on sandplains, lateritic ridges and saltmarsh or samphire, with or without emergent trees. This species of Rufous Fieldwren was once widespread across most of the south-west of WA, but is now restricted to remnant vegetation due to clearing.

  The Rufous Fieldwren was recorded in kwongan heath in two southern areas of the Project Area, and in the South Eneabba Nature Reserve. It is expected that the individuals recorded are post-breeding residents occupying territories in the remnant vegetation.

Desktop studies have identified that six other species that are gazetted under the DEC Priority Fauna List may also occur in the Project Area. These comprise:

- **Australian Bustard** (*Ardeotis australis*). Listed as a Priority 4 species, the Australian Bustards are large nomadic birds that utilise a number of open habitats, including heathlands in the south of WA. There are no recent records of the Australian Bustard from Eneabba, however, there are a number of historic records in the region. It is possible that the species could use the open vegetation, particularly the cleared agricultural land and regenerating heath, within the Project Area and the adjacent South Eneabba Nature Reserve.

- **White-browed Babbler** (*Pomatostomus superciliosus ashbyi* - western wheatbelt subspecies). Listed as a Priority 4 species, the White-browed Babbler is most often found in thickets of mulga and Acacia as well as uncleared road verges in farmlands. However, more than 50% of its former habitat has been cleared for agriculture. The White-browed Babbler has been previously recorded in the region. No suitable habitat was identified within the Project Area, although vegetation with sufficient structural complexity was observed nearby.

- **Crested Bellbird** (*Oreoica gutturalis*). Listed as a Priority 4 species due to the contraction of its current range to less than 50% of its past distribution. Crested Bellbirds have frequently been recorded in the region, and in the Eneabba area occur on open banksia scrubs and heathland. Crested Bellbirds are likely to occur in the few parts of the Project Area that have adequate trees and shrubs, and are less likely to occur in very open, largely treeless areas and in the South Eneabba Nature Reserve.

- **Brush Bronzewing** (*Phaps elegans).* Formerly widespread across the south-west of WA, the Priority 4 listed Brush Bronzewing is now locally extinct across much of this range. This species prefers dense shrublands with significant vertical vegetation structure and access to water. This habitat is not found within the Project Area. However, sightings of Brush Bronzewings in the nearby Iluka mine site and the Southern Beekeepers Reserve have been recorded.

- **Hooded Plover** (*Charadrius rubricollis).* Listed as a Priority 4 species, Hooded Plovers are restricted to coastal areas, estuaries and salt lakes, and were recorded at Eneabba in 2006. However, they are not expected to occur within the Project Area due to a lack of suitable habitat.
- **Woma** (*Aspidites ramsayi* south-west population). As discussed previously. Also listed as a Priority 1 species.

Fauna Habitats of Significance

Approximately half of the Project Area contains remnant native vegetation, while the other half is disturbed land considered to be of little value as fauna habitat. No particularly significant individual habitat was located within the Project Area.

As vertebrate fauna habitat, the vegetation is relatively uniform, whereas the soil substrate varies from lateritic uplands to sandplains. Therefore, the presence of burrowing fauna within the different habitats is expected to vary accordingly. A few burrowing species were recorded during the study, but none of these species were recorded at the site characterised by a hard lateritic ridge. It is therefore likely that these landforms may represent a significant barrier to burrowing species.

Short Range Endemic Invertebrate Fauna

Two SRE surveys over the 1,700 ha CWC Project footprint were conducted using conventional trapping and foraging techniques. The surveys revealed five Arthropod orders. Three of these species were of conservation significance. These were an undescribed species of scorpion from the *Urodacus* genus, an unknown species of *Bothryembrion* snail and an unknown species of millipede from the *Antichiropus* genus.

Stygofauna

Rockwater Pty Ltd (Rockwater [2008]) conducted two stygofauna surveys in 2007 and 2008. Samples were taken from both the superficial aquifer and sedimentary rocks of the underlying CCM, with a total of 96 samples collected. The survey results are summarised below:

- The 45 samples collected from 31 bores in the 2007 surveys yielded six aquatic invertebrate taxa including Crustacea (Copepoda, Ostracoda, Syncarida), Acariformes (Prostigmata), Diptera (Muscidae) and Nematoda.
- The 51 samples collected from 30 bores in the 2008 surveys yielded six aquatic groups including the Oligochaeta, Syncarida and Nematoda recovered during the 2007 survey, plus Oligochaeta (two additional taxa), Platyhelminthes, Ceratopogonidae, Chironomidae and Amphipoda.
- Fourteen aquatic invertebrate taxa in total were recorded over the 2007 and 2008 surveys; five of these (36%) were taxa not confined to the groundwater environment (stygophiles), three (21%) are considered stygoxenes (aquatic larvae of terrestrial insects) and five (36%) are currently not able to be assessed as their dependence on groundwater is unclear due to limitations in taxonomy for these groups (Oligochaeta, Nematoda and Platyhelminthes).
- Stygobitic taxa, (commonly referred to as stygofauna) are those restricted to groundwater with morphological adaptations for subterranean life (Hancock, Boulton and Humphreys, 2005). There was only one known stygobitic taxon recorded by the investigation; the undescribed Syncarida, Bathynellidae sp. 1.
- No stygofauna were recovered from the bores known to access the deeper formation.

Given the sampling intensity employed for the investigation, the aquifers of the Project Area are not considered to contain a diverse stygobitic fauna.

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Troglofauna

Subterranean Ecology Scientific Environmental Services (Subterranean Ecology [2007]) conducted a desktop assessment to identify the likelihood of prospective troglofauna habitat in the Project Area. The Project Area geology is typical of the regional geology and comprises sand overlying the CCM of the Cockleshell Gully Formation. The sand, composed of fine to silt sized particles is believed to be less than 10 m thick and overlies interbedded to interlaminated sandstone and siltstone, claystone and coal seams (URS, 2006b). The upper strata typically become less weathered with increasing depth below ground level. The sandstone is generally fine grained and tends to be more weathered than the siltstone. The bedding planes of the interbedded/interlaminated sandstone and siltstone are generally near horizontal (URS, 2006b).

The potential for the presence of troglofauna within the Project Area is dependent upon suitable habitat, determined by the geology and geomorphology. Suitable subsurface cavities for troglofauna habitat are unlikely to be developed in unconsolidated fine sands. While subsurface cavities may develop by piping processes in unconsolidated sediments, such cavities are typically short-lived and of highly localised extent, and thus unlikely to provide suitable long-term habitat for troglofauna (Subterranean Ecology, 2007).

3.2.10 Pests and Weeds

Four introduced mammal species were recorded within the Project Area. These were the fox (*Vulpes vulpes*), cat (*Felis catus*), rabbit (*Oryctolagus cuniculus*) and house mouse (*Mus musculus*).

Twenty taxa recorded by Mattiske (2008) within the flora and vegetation survey area are introduced species. None of these introduced species are listed under Section 37 of the *Agriculture and Related Resources Protection Act 1976.*

3.3 Social Setting

3.3.1 Regional Land Use

The Mid West region of WA is recognised as an area rich in mineral sands deposits, as well as supporting a variety of pastoral activities and tourism attractions. The area supports large livestock properties as well as crops for wheat, canola, lupins, oats and wildflowers. The wildflower industry also attracts tourists, and wildflower tours are a common feature over the spring period. Tourism in terms of camping is also a feature of the area, as there are several nature reserves and natural lake systems in the wider area.

Commercial activities in the area generally support these primary industries; agriculture, mining and tourism as well as a historically successful fishing industry from the region's coastal towns.

3.3.2 Aboriginal Heritage

The Project Area is covered in its entirety by a combination of the Yued, Amangu and Franks registered native title claims, which have been filed with the Federal Court pursuant to the *Native Title Act 1993*. The Yued claim covers approximately the southern quarter of the Project. The Amangu and Franks claims cover approximately the northern three quarters of the proposed Central West Coal mine and overlap each other entirely in this area. The boundary between the Yued and Franks / Amangu claims appears to coincide with the boundary between the Carnamah and Coorow Shires.

Two Aboriginal heritage surveys have been undertaken within the Project Area. The surveys included preliminary archival research followed by a formal field survey and consultation with the Yued Consultants. The Yued consultants are the representatives of the Yued native title claimant group.

The formal survey areas covered land which is included in the Yued people's claimant area. The ethnographic survey, undertaken by Anthropos Australis staff and the Yued consultants comprised a walk over the entire survey area. The purpose of the survey was to identify if any 'Not Clear Work Areas' could

be identified in the survey area. 'Not Clear Work Areas' are identified as areas that contain or are likely to contain features of ethnographic significance. During the site visit, features of potential ethnographic significance were photographed and precise locations were recorded.

The surveys do not cover the entire Project Area, and further surveys will be conducted of the remaining areas. The first survey for the purpose of clearing proposed drill lines revealed the existence of one feature of potential ethnographic interest which was excluded from cleared access areas. The second survey revealed that the Project Area contains moodjar Trees, which are potential ethnographic features. The moodjar Trees are considered to hold ethnographic significance for the Yued people and are referred to also as "spirit trees", as they are the potential site of human burials.

3.3.3 Socioeconomic Environment

The Mid West region (West Midlands sub-region) includes three local government authorities, comprising the shires of Carnamah, Coorow and Dandaragan, and the main towns of Eneabba, Leeman, Green Head and Jurien. The West Midlands sub-region's estimated resident population taken from 2006 census data was 4,503, which is concentrated in the key settlements of Eneabba, Leeman, Green Head and Jurien (Australian Bureau of Statistics [ABS], 2008). The region comprises 0.2% of the State's population and 0.9% of the population living in regional WA.

The Mid West region has a diverse economy with the major industries comprising, mining, agriculture and fishing. Much of the land east of the Perth to Geraldton Railway was cleared for agriculture towards the end of the 19th Century as part of the railway project. These areas now support extensive cropping and livestock enterprises.

Overall, the agricultural industries are productive and profitable, although poor seasons in recent years (and especially in 2007) have caused financial stress. As in all broad-acre agricultural areas in WA, the long-term decline in terms of trade in agricultural commodities is leading to structural adjustment with a smaller number of larger farming businesses that are increasingly mechanised. The reduced on-farm population reduces shire populations, and the requirement for services such as schools and education.

The mineral sands mining industry is important to the Eneabba and Cataby areas, and there is a talc mine east of Three Springs. The mineral sand mining industry is an important regional employer, and it supports towns such as Eneabba and Leeman. The Iluka operations near Eneabba employ 90 Iluka employees and 290 contractors. Material from the mine is processed at Narngulu near Geraldton and then exported. Further south, Ti-West operates the Cooljarloo mineral sands mine near Cataby.

Rock lobster fishing is an important industry and a major activity in coastal communities including Cervantes, Jurien, Green Head and Leeman. The industry enjoyed high profitability through the 1990s, although increasing costs, and poorer catches in the last two years, and predicted low catches in coming years is causing adjustment in the industry with a reduced number of businesses. However, the industry will continue to be an important contributor to the economy in the area.

Section 4 Stakeholder Consultation

4.1 Identified Stakeholders

Central West Coal Pty Ltd is committed to a comprehensive stakeholder consultation programme and maintaining engagement with all relevant stakeholders throughout the life of the Project. The objectives of Central West Coal Pty Ltd's stakeholder consultation programme are as follows:

- To identify individuals, groups and agencies with an interest in the proposed Project.
- To enable stakeholders to have access to relevant information regarding the Project.
- To provide a means for stakeholders to raise issues and concerns.
- To identify main areas of environmental concern so that these concerns can be addressed in the EIA documentation being prepared for the Project.

4.2 Key Stakeholders

The consultation programme for the Public Environmental Review has involved a range of stakeholders, including:

- Eneabba Community Members.
- Leeman Community Members.
- Greenhead Community Members.
- Western Flora Caravan Park.
- Yued Native Title Claimant Group.
- Amangu Native Title Claimant Group.
- Franks Native Title Claimant Group.
- South West Aboriginal Land and Sea Council.
- Conservation Council.
- Wildflower Society.
- Northern Heathlands Conservation Group.
- Northern Wildflower Conservation Group.
- Urban Bush Land Council.
- Mid West Development Commission.
- Mid West Chamber of Commerce and Industry.
- Western Power Corporation.
- Synergy.
- Shire of Carnamah.
- Shire of Coorow.
- Office of Development Approvals Coordination.
- Office of the Appeals Convenor.

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- Office of Energy.
- Department of Mines & Petroleum
- Department of Environment and Conservation.
- Department of Water.
- Department of Planning and Infrastructure.
- Department of Indigenous Affairs.
- Department of Consumer and Employment Protection.
- Department of Agriculture.
- Department of Health.
- Main Roads Western Australia.
- Environmental Protection Authority.
- Chamber of Minerals and Energy WA.
- West Midlands Natural Resource Group Team.
- Minister for State Development.
- Office of Minister for the Environment.
- Minister for Energy, Resources.
- Minister for Mid West.

CWC will consult with the relevant abovementioned stakeholders during the preparation of the Final Closure Plan, which will be prepared at least five years prior to the planned closure date.

4.3 Summary of Stakeholder Consultation

A stakeholder consultation programme was implemented during the preparation of scoping documents for the Project. A number of meetings, presentations and information sessions were conducted to provide an overview of the Project and document any issues or concerns raised by stakeholders. Open Days were held on 26 October 2007 in Eneabba and in Leeman, and on 12 December 2007 in Greenhead. The key issues that were raised in relation to mine closure are presented in Table 4-1.

4.4 Consultation Plan

The overall aim of the stakeholder consultation plan for the closure planning process is to provide a framework that will enable stakeholders to be provided with accurate information about, and be involved to an appropriate degree, in mine closure planning.

The aims for stakeholder consultation in relation to mine closure are to:

- Provide stakeholders with accurate, timely and comprehensive information about the mine closure process and closure related issues.
- Identify areas of concern for stakeholders, and allow them to provide input to the mine closure process and in assessing relevant closure related issues.
- Reduce the potential for misunderstanding and subsequent stakeholders' dissatisfaction due to the real or perceived exclusion from the closure planning process.

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- Ensure that the necessary regulatory requirements are fulfilled.
- Generate a framework for ongoing consultation through operation, closure and post closure.

Effective consultation with stakeholders throughout the life of the operations facilitates the incorporation of stakeholder concerns and objectives into the closure plan from the outset, and reduces the risk of delay to closure

Table 4-1 Mine Closure Issues Raised by Stakeholders during PER consultation

Key Issues	Reference in the Preliminary Closure Plan	Other Sources of Information
The potential impacts of fly-ash disposal into the mine void needs to be addressed.	Section 5.2.2	○ Terrenus Earth Sciences (2008) *Geochemical Assessment of Overburden, Potential Coal Reject and Coal Combustion Ash.* Central West Coal Project and Coolimba Power Project. Draft Report Prepared June 2008. ○ URS (2009) Predicted Impacts of Ash Co-disposal on Groundwater. Central West Coal and Coolimba Power Projects. Report prepared November 2008.
Acid drainage issues will need to be considered for the ROM Pad and pit void.	Sections 3.2.4, 5 and 7.4	○ Terrenus Earth Sciences (2008) *Geochemical Assessment of Overburden, Potential Coal Reject and Coal Combustion Ash.* Central West Coal Project and Coolimba Power Project. Draft Report Prepared June 2008. ○ URS (2009) Predicted Impacts of Ash Co-disposal on Groundwater. Central West Coal and Coolimba Power Projects. Report prepared November 2008.
How will the pit be backfilled?	Sections 5.2.1 and 7.4.1	○ Public Environmental Review (PER) Sections 2.4 and 2.5.
The proponent would need to provide a mine closure plan in the PER and must include achievable rehabilitation criteria.	Section 6	○ PER Appendix D. ○ Preliminary Closure Plan
Rehabilitation of mine.	Sections 5.2.1 and 7.4.1	○ PER Appendix D. ○ Draft Progressive Rehabilitation Plan

Section 5 Site Description

5.1 Domains

The Project Area can be segregated into “domains”, which are land management units within a mine site. Domains tend to have similar geophysical characteristics and environmental issues. Therefore, the nature of decommissioning, remediation and rehabilitation activities would also be similar. The domains at the Project at the time of closure are anticipated to be as follows:

- Open cut mine pit;
- Waste dump, ROM pad and coal stockpiles;
- Coal crushing plant, conveyor and fuel farm;
- Dewatering infrastructure;
- Borrow pits;
- Access and internal roads; and
- Administration offices, workshops, communication systems, stores, landfill, laydown area, conveyor systems and other supporting infrastructure.

5.2 Open Cut Mine

5.2.1 Description

The resource will be mined as an open cut mine, where the previously mined areas will be progressively backfilled and rehabilitated. Approximately 120 ha will be open at any given time during mining operations. The mine will progressively move over a length of 12 km from south to north. The pit will vary in width between 0.3 km and 2.0 km with a depth up to 130 m bgl.

The overburden will be progressively spread out in the void behind the mining activity, in the previously mined area. The power station coal combustion ash, and saline residue will be included in this backfill operation.

A number of drainage lines will be intersected by the advancing mine, and temporarily diverted. When mining has passed, the drainages lines will be re-instated to their pre-disturbance alignment, form and functionality, including surface and sub-surface characteristics.

As the mine advances, sub surface soils and topsoil from the advancing mine footprint will be placed on backfilled areas. The surface will be contoured so that similar landforms are re-instated. Revegetation will then be undertaken to return the areas of native vegetation to be similar to the original environment as possible. Revegetation will comprise seeding and the selective planting of seedlings.

At the conclusion of mining, there will be a pit void in the northern section of the pit. This void will be approximately 120 ha and will contain water. The final void will be designed to ensure that it has a safe and stable shoreline. It will be bunded to prevent casual access.

The northern portion of the mine will re-work an area that has already been mined, and largely rehabilitated by mineral sands miners (Iluka Resources Ltd). These mining activities extended to up to 30 m bgl and included the establishment and rehabilitation of a series of tailings ponds. The tailings are generally fine and may have high moisture levels at the time CWC expects to mine them. While the method of handling the tailings is uncertain, it is expected that they will be included in the backfilling operation of the advancing coal mine at an appropriate location in the backfill, dependent on confirmation of physical and geochemical characteristics.

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5.2.2 Closure Issues

The closure issues for the pit will be as follows:

- On occasions it will be impractical to match the final rehabilitated landform with the original topography. For example, when the pit is made deeper or wider, there will be excess overburden compared to the void available and the backfilled level will exceed original ground level. Conversely, if the pit shallows or becomes narrower, there will be insufficient backfill material available to completely fill the deeper or wider pit behind the mining operation and the backfilled level will remain below the original levels. Where practical, CWC will stockpile suitable material to assist to avoid large landform variations.
- The backfilling of the pit with overburden and coal combustion ash may result a reconstructed soil profiles with different soil characteristics, including physical, mineralogical, saline content, dispersive characteristics, and cation imbalances to the pre-disturbance soil profile. These characteristics could affect the success of the rehabilitation through inappropriate plant growth medium characteristics, water retention characteristics or through excessive erosion..
- The reconstruction of palaeo drainage channels. A small number of palaeo drainages will be temporarily distrupted by the passage of mining. These are acting as conduits for the east-west flow of subsurface water (Blandford, 2008b). The location and nature of the palaeo drainages will be confirmed prior to landscape and profile reconstruction with specific attention given to the depth and nature of the gravels. Once this has been determined, channel reinstatement will include replacement of a high permeability horizon, at the appropriate depth, so that the hydrological function of the palaeo drainages is maintained.
- There is potential for erosion of partially rehabilitated surfaces prior to vegetation becoming established.
- There is the potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.
- There is the potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.
- The quality of the pit water. Water quality in the final pit void may be affected by acid mine drainage (AMD) in groundwater and fluctuations in the water balance between water inflows and evaporation.
- There is the potential for adverse impacts to fauna that access the final void lake.
- There is the potential for the public to access the final void, leading to injury.

5.3 Waste Dump, ROM Pad and Coal Stockpiles

5.3.1 Description

Waste Dump

The waste dump site will be constructed progressively during early mine development. The footprint of the waste dump will be approximately 136 ha and will be built up to 45 m above the existing land elevation. The waste rock dump will be constructed to permanently store approximately 40 Mm^3 of waste rock and co-disposed coal combustion ash. The waste dump construction will comprise the following activities:

- Vegetation and topsoil will be stripped and stockpiled beside the waste dump until it can be used in rehabilitation. Stockpiles will be no more than 2 m high to maintain biological integrity.

- The waste dump will accommodate waste rock, including any PAF materials, dispersive soils and other inert waste streams from the mine and Power Station until mine backfill operations are commenced. PAF waste rock, and combustion ash will be encapsulated within an outer embankment of NAF waste rock. The surfaces of the dump will be covered with non-dispersive or conditioned NAF waste rock and sub-soils, and top-soil. The details will be developed during a detailed phase. The objectives will be to minimise exposure of PAF materials to oxygen and water, and to avoid placing dispersive soils close to plant growth medium zones, or where they are at increased risk of exposure by erosion. The waste dump design will include consideration of surface water drainage features, and sediment control structures to manage run-off and sedimentation until protective vegetation establishes

Once the continuous mining process is established, waste rock, coal combustion ash and saline residue will be backfilled to the pit.

ROM Pad

Coal arriving at the ROM pad will, where possible, be delivered directly to the ROM hopper which will introduce the coal into the coal crushing circuit. Coal delivered to the ROM pad that cannot be taken directly to the ROM hopper will be stockpiled on the ROM pad for subsequent delivery to the ROM hopper by a Front End Loader (FEL). The ROM pad will be appropriately sized to:

- Conduct the safe operations of ROM coal receipt (from haul truck or conveyor systems);
- Contain stockpiles of up to 20,000 t; and
- Facilitate FEL loading of the ROM hopper from stockpiled coal.

The stockpile capacity will be approximately 20,000 t and will be approximately 8 m high, 50 m long and 50 m wide. Runoff will be captured in a sedimentation dam built specifically for the ROM. The water will be recycled and used for dust suppression in the coal handling circuit.

Coal Stockpiles

Coal will be transported from the mine face to temporary raw coal stockpiles by haul trucks. It is expected that two or three small stockpiles with a capacity of up to 5,000 t each will be used to receive coal of varying quality and at varying rates from the mine. Trucks will be used to haul coal from the temporary stockpiles to the ROM pad and coal crushing plant at a rate approximately matching power station consumption. At closure, it is intended that all coal in stockpiles will be consumed by the power station.

5.3.2 Closure Issues

The closure issues associated with the waste dump, ROM pad and coal stockpiles are as follows:

- There is potential for the waste dump to generate saline runoff and acid mine drainage.
- There is potential for erosion from the waste dump due to rainfall runoff and wind. The sodic nature of waste rock materials may accelerate erosion if this material is exposed,
- The waste dump may have a visual impact on the landscape, due to the alteration to the natural landscape and topography.
- There is potential for contamination of soil, surface water and groundwater by run-off from stockpile areas which could have accumulations of salts in the hardstand bases.
- There is potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.
- There is the potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other pathogens as a result of natural processes or human activities.

Section 5 Site Description

5.4 Coal Crushing Plant and Fuel Farm

5.4.1 Description

The coal crushing plant will be located adjacent to the power station. It will receive coal from the raw coal stockpiles and reduce it to a nominal -40 mm size suitable for power station feed. At the time of closure, all stockpiled ore will have been consumed and the stockpile base will need to be removed and the area rehabilitated.

Diesel fuel will be stored in a secure area located near the workshop infrastructure.

The main closure issues associated with the coal crushing plant and fuel farm are:

- Potential for soil contamination from saline leachate and hydrocarbon spillage.
- Compacted soils associated with foundations which could result in increased surface runoff and low water infiltration for plant growth.
- Potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.
- Potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.

5.5 Dewatering Infrastructure

5.5.1 Description

At closure a number of dewatering bores will remain in the de-watering corridor, with associated head-works and pipelines.

The raw water storage dam will remain adjacent to the powerstation. It will include an HDPE liner.

5.5.2 Closure Issues

The main closure issues associated with the dewatering infrastructure are:

- Removal of head-works, rising mains, down-hole pumps, electrical infrastructure, powerlines and pipelines
- Removal of the raw water dam liner, and filling or re-contouring the dam excavation
- Removal of any external bore casings and plugging bores to prevent groundwater contamination and to prevent access by any fauna which could access to bores and become trapped.
- Potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.
- Potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.

5.6 Borrow Pits

5.6.1 Description

Foundation material for the access and internal roads, ROM pad, laydown area, mine water storage dam and buildings will largely be sourced from the open pit. However, there may also be the requirement to source foundation material from borrow pits located within existing cleared areas.

Section 5 Site Description

5.6.2 Closure Issues

The main closure issues associated with the borrow pits are as follows:

- The borrow pits surfaces may be compacted, reducing water infiltration capacity and increasing run-off.
- potential for erosion and sediment loss from the borrow pits due to surface water runoff and wind erosion.
- There is the potential for wind-blown dust to occur from the borrow pits.
- Potential for borrow pits to retain water in ponds.
- Potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.
- Potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.

5.7 Access and Internal Roads

5.7.1 Description

A number of roads will remain in service up to closure, including major access roads, mine haul-roads and service roads.

5.7.2 Closure Issues

The main issues associated with the closure of the access and internal roads are as follows:

- Roads may provide third party access to the site.
- The road surfaces will be compacted. This results in low infiltration and the potential for increased surface runoff and erosion.
- Potential for wind-blown dust to occur.
- The roads could have altered the pre-disturbance drainage pattern which could have adverse impacts on vegetation due to interruption of drainage lines.
- Potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.
- There is the potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.

5.8 Associated Infrastructure

5.8.1 Description

Workshops and Administration Buildings

Workshop buildings will be constructed to support the mining and transport fleet and other infrastructure. The administration buildings such as ablutions, offices, crib rooms and other administration buildings will be constructed near the workshop.

Section 5 Site Description

Laydown Area

A laydown area will be constructed within close proximity to the administration and workshop areas.

Landfill

An on-site landfill will be developed for disposal of inert non-hazardous construction waste.

5.8.2 Closure Issues

The closure issues associated with these hardstand areas are as follows:

- Potential for soil contamination at the workshop and laydown areas, due hydrocarbon spillage from servicing and re-fuelling of vehicles.
- The hardstand areas will be compacted.
- There is the potential for the rehabilitated area to become infested with weeds as these species will readily colonise disturbed areas.
- Potential for the rehabilitated and adjacent areas to become infested with the *Phytophthora cinnamomi* or other 'dieback' pathogens as a result of natural processes or human activities.

Section 6

Completion criteria are an agreed set of environmental indicators that, upon being met, would demonstrate successful rehabilitation and allow CWC to relinquish responsibility for the site.

Draft completion criteria have been developed for the Project. These criteria will be refined throughout the life of the Project as a result of stakeholder consultation, any improvements in rehabilitation technology and increased understanding of how the local environmental is able to recover from disturbance. The draft completion criteria are presented in Table 6-1.

Table 6-1 Draft Completion Criteria for the Project

Facility/Component	Completion Criteria
Open cut pit	The final pit void is safe and the pit walls are geotechnically stable, as far as practicable. Groundwater levels and quality not adversely impacted. The void has an abandonment bund constructed to meet the requirements of the DMP (1997) *Safety Bund Walls Around Abandoned Open Pit Mines Guideline*. Access to the pit is restricted and appropriate signage has been erected. Drainage lines and palaeo drainage channels have been reinstated throughout the progressively rehabilitated are of the pit.
Waste dump, ROM pad and coal stockpiles	All PAF material has been encapsulated with NAF material. The rehabilitated landforms are safe, stable and non-polluting. The rehabilitated landforms are re-profiled as far as practical to blend in with the surrounding landscape. The rehabilitated landforms have self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment.
Coal crushing plant and fuel farm	All infrastructure has been dismantled and removed from site for sale and/or disposed of appropriately. Any contamination has been remediated. The site has been deep ripped along the contour to relieve compaction. The rehabilitated landform is safe, stable and non-polluting. The rehabilitated landform has self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment.
Dewatering infrastructure (storage dam, bores and pipelines)	All infrastructure has been dismantled and removed from site for sale and/or disposed of appropriately. The HDPE liners have been removed. The mine water storage dam site has been deep ripped along the contour to relieve compaction. Rehabilitated landforms to be safe, stable and non-polluting. Rehabilitated landforms have self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment.

Section 6 Completion Criteria

Table 6-1 Draft Completion Criteria for the Project

Facility/Component	Completion Criteria
Borrow pits	The pits are safe and the pit walls are geotechnically stable, as far as practicable. Access to the pit is restricted and appropriate signage has been erected, if necessary. Pits have been deep ripped along the contour to relieve compaction. The rehabilitated landform is safe, stable and non-polluting. The rehabilitated landform has self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment.
Access and internal roads	Natural drainage patterns have been restored. Roads not required have been deep ripped along the contour to relieve compaction. Rehabilitated landforms to be safe, stable and non-polluting. Rehabilitated landforms have self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment.
Associated Infrastructure (communications systems, offices, workshops, landfill, laydown and other supporting infrastructure)	All infrastructure has been dismantled and removed from site for sale or recycling, and/or disposed of appropriately. Surfaces have been deep ripped along the contour to relieve compaction. Rehabilitated landforms to be safe, stable and non-polluting. Rehabilitated landforms have self-sustaining native vegetation, of similar species, and at similar densities, to the surrounding environment. No rubbish to remain at surface of the landfill, or at risk of being exposed through erosion. Any contamination has been remediated.

Section 7 Closure Plan Execution

7.1 Overview

This section outlines the:

- Conceptual timeline for closure (Section 7.2).
- Actions that need to be taken to prepare for closure execution including the detailed plans required to be developed and actions that need to be taken, prior to closure, to mitigate environmental and socioeconomic impacts (Section 7.3).
- Closure activities that will be conducted for each domain to meet the closure objectives and criteria (Section 7.4).
- Opportunities for progressive rehabilitation (Section 7.5).

7.2 Indicative Closure Planning Schedule

Detailed final closure planning would commence no later than five years prior to the expected time of closure, with this Preliminary Closure Plan reviewed at least every three years during operation.

The mine will operate for approximately 30 years and rehabilitation will have been ongoing since mine commencement.

At the end of mine life, the final closure execution phase will commence with the cessation of mining activities.

It is estimated that final closure demolition and earthworks activities will take up to six months from cessation of mining. The subsequent post-closure management, maintenance and monitoring phase (refer to Section 8) will continue until the agreed completion criteria are achieved or it can be demonstrated that the completion criteria will be achieved.

7.3 Planning for Closure

Planning required to further develop the Closure Plan prior to the commencement of the closure execution phase are listed below.

- Stakeholder consultation planning - planning to ensure that relevant stakeholders are identified. The plan will contain a strategy for the engagement of stakeholders, including the local community.
- Retrenchment/redeployment planning - planning will be undertaken for the retrenchment or alternative employment of employees.
- Socioeconomic impact management planning - planning to minimise the socioeconomic impact of the closure of the mine. Planning will consider the impacts on local businesses, organisations that provide services, social and sporting organisations and local government.
- Landform design planning - planning that develops final designs for re-constructed landforms taking into account the key characteristics of the natural landforms.
- Decommissioning and demolition planning - planning that includes removal of coal crushing plant and other infrastructure, prior to site rehabilitation.
- Contaminated site investigation and planning – periodic environmental site assessment to identify any residual contamination. Contingency planning anticipating possible contamination areas.
- Geotechnical investigations - geotechnical assessment of the final pit void wall design to ensure that they are stable. Structural integrity assessment of the waste dump will occur during detailed design, and after completion.

Section 7 Closure Plan Execution

- Rehabilitation planning - detailed rehabilitation planning and stakeholder consultation to achieve the agreed completion criteria for all rehabilitated areas. This will include mass balance reporting and reconciliation of all waste streams so that the character and location of all waste streams are known.
- Waste management strategy - a strategy to ensure that material is reused or recycled, where practical.
- Post-closure pit lake water quality – modelling and monitoring to confirm that lake water quality issues are understood well in advance of commitment to a particular design for the final pit void.
- Health and safety planning – planning to identify hazards and hazardous materials.
- Soils and waste characterisation – establishing sampling and interpretative systems to confirm waste stream characteristics and confirm appropriate disposal of all major waste streams including waste rock, mineral sand tailings, coal combustion ash, saline residue, and other waste streams that are proposed for disposal on-site.
- Budgetting – planning to estimate and review closure costs during operations to ensure adequate economic feasibility, efficiency and provisioning.

7.4 Rehabilitation and Closure Activities for Each Domain

A description of the closure activities for each domain is provided in Sections 7.4.1 – 7.4.7.

7.4.1 Open-cut Pit

The majority of the open pit will be progressively backfilled and rehabilitated during operation. Once the initial pre-strip is complete and the mine process has commenced, the overburden removed from the advancing mine face will be placed at the rear of the open cut mine in the mine void. The power station coal combustion ash and saline residue will be co-disposed with backfill. As the mine progresses, subsoil and topsoil from the advancing mine face will be placed on top of the backfill. The re-constructed surfaces will be formed and contoured to be similar to the pre-mining landforms. Revegetation will comprise seeding and the selective planting of seedlings.

At the conclusion of mining, there will be a pit void in the northern section of the pit. This void will be approximately 120 ha, and will contain water.

The engineering works required for the closure of the final section of the open-cut pit are presented in Table 7-1. As discussed in more detail in Section 5.2, the safety bund will be constructed during Project construction and pre-strip activities and will revert to act as the abandonment bund at closure. This will also avoid double-handling of waste rock and reduce closure costs.

7.4.2 Waste Dump, ROM Pad and Coal Stockpile Pads

The waste dump will be progressively rehabilitated after the initial excavation of the boxcut. It is anticipated that the rehabilitation of the waste dump will be completed long before closure commences.

The waste dump will be an appropriate area to conduct rehabilitation trials. The rehabilitation trials will aim to provide information on soils and landform profiles, revegetation strategies and surface water management systems. The design of the rehabilitation trials will be developed during the early operational phase of the Project.

It is intended that the ROM pad and coal stockpile pads will be cleared of coal material prior to rehabilitation commencing.

The general rehabilitation and closure activities for the waste dump and ROM pad are described in Table 7-2.

Table 7-1 Preliminary Rehabilitation and Closure Activities for the Pit Void

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Open-cut Pit Void	
Infrastructure to be Retained	Access to the rehabilitated areas for inspections and monitoring.
Engineering Works • Undertake a geotechnical assessment of the pit void to ensure that the walls are stable. • Verify that the safety bund around the final section of the pit is sufficient to act as the abandonment bund and meets the requirements of the DMP (1997) *Safety Bund Walls Around Abandoned Open Pit Mines Guideline*. • Establish a two metre bund at the top of the pit void to prevent access to the pit. • Erect signage around the pit void warning the public of risks associated with the mine pit. **Environmental Works** • Conduct additional pit void hydrochemical modelling and assessment.	

Table 7-2 Preliminary Rehabilitation and Closure Activities for the Waste Dump, ROM Pad and Coal Stockpile Pads

Waste Dump and ROM Pad	
Infrastructure to be Retained	Access to the waste dump, ROM pad and coal stockpile pads for the site contamination assessment, remediation (where required) and rehabilitation monitoring.
Engineering Works • No engineering works required. **Environmental Works** • Conduct geochemical testing of representative samples of waste rock/drill core from any additional drilling programmes in the open pit area during the construction phase of the Project. <u>Waste dump (potentially containing PAF and dispersive materials)</u> • **Base Preparation**: Vegetation, subsoil and topsoil will be removed and stockpiled and a base of selected material placed in accordance with the detailed design. • **AMD Management**: Any PAF materials will be encapsulated within the waste dump in accordance with the detailed design.. • **Surface Water Management**: Surface water will be directed around the waste dump during operations and after closure. • **Outer Batter Slopes**: The outer batters will be designed to be stable in the long term, resist erosion and support suitable plant growth. The nature of the outer batter profile will depend upon the physical nature of the waste rock materials placed on the outer slopes. • **Final Rehabilitation**: Rehabilitation will include placing growth medium cover on the surfaces of the dump. This cover will support a vegetative cover of grasses and other native vegetation. • Contour rip the batter and upper surface of the waste dump. • Seed with local provenance species. • Conduct a site contamination assessment, which may require development and implementation of a remediation action plan. <u>ROM pad and coal stockpile pads</u> • Dispose of any residual coal, and the compacted base into the pit and conduct a site contamination assessment, which may require development and implementation of a remediation action plan. • Push down slopes of the elevated ROM pad. • Place layer of topsoil to a depth of 120 mm over the pads. • Contour rip the batter and upper surface of the pads. • Seed with local provenance species.	

7.4.3 Coal Crushing Plant and Fuel Farm

The rehabilitation and closure activities for the coal crushing plant and fuel farm mainly relate to the decommissioning and removal of infrastructure (see Table 7-3).

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Table 7-3 Preliminary Rehabilitation and Closure Activities for the Coal Crushing Plant and Fuel Farm

Coal Crushing Plant and Fuel Farm	
Infrastructure to be Retained	Access to the coal crushing plant and fuel farm for the site contamination assessment, remediation (where required) and rehabilitation monitoring.
Engineering Works • Identify all infrastructure and services that CWC owns or has responsibility for, and update/correct the applicable asset register. • Determine whether any other parties have rights to retain infrastructure at closure. • Purge and clean plant reservoirs and tanks, and disconnect and terminate all services. • Dismantle plant and infrastructure and remove from site in accordance with the demolition planning. • Remove any transportable buildings and demolish other unwanted structures. • Large concrete footings to be cracked in situ if possible and then buried. Smaller footings and slabs disposed to landfill. • Remove all above ground services. Leave buried services >500 mm depth in place. • Dispose of all waste and debris to the appropriate landfill. **Environmental Works** • Conduct a site contamination assessment and undertake remedial action required. Any hydrocarbon contaminated areas that do not meet relevant criteria will be excavated and bio-remediated onsite. • Re-profile the plant and fuel farm area to remove potential for ponding • Establish additional drainage where required in the final stages of land profiling. • Deep rip along the contour to a minimum of 0.5 m depth and at a maximum spacing of three metres to maximise infiltration. • Prior to spreading growth medium, inspect the plant and fuel farm area and remove any rubbish and debris. • Spread layer of subsoil. • Spread layer of topsoil to depth of 120 mm. • Seed area with local provenance species.	

7.4.4 Dewatering Infrastructure

The rehabilitation of a large proportion of the dewatering infrastructure (bores and pipelines) will be able to be conducted progressively, as the open cut strip mine progresses and the infrastructure becomes redundant. The rehabilitation and closure activities for the dewatering infrastructure are presented in Table 7-4.

7.4.5 Borrow Pits

Most borrow pits will have been consumed by mining or rehabilitated during the operations phase. Any remaining borrow pits will be rehabilitated as part of closure activities. The rehabilitation and closure activities for the borrow pits are described in

Table 7-5.

7.4.6 Access and Internal Roads

Some internal roads will have been rehabilitated progressively during operations. Roads remaining at closure will be rehabilitated as part of closure operations. Culverts and elevated fill will be removed at drainage crossings and the drainage re-profiled to restore inverts and drainage profiles. The remaining road segments will be assessed for saline contamination and either removed to the mine void, or rehabilitated. Portions of roads will be retained to provide site access for rehabilitation monitoring and maintenance. The rehabilitation and closure activities for the access and internal roads are presented in Table 7-6.

Table 7-4 Preliminary Rehabilitation and Closure Activities for the Dewatering Infrastructure

Dewatering Infrastructure – Mine Water Storage Dam, Bores and Pipelines	
Infrastructure to be Retained	Access to the mine water storage dam for rehabilitation monitoring.
Description	Mine Water Storage Dam
Engineering Works • Remove all services. Leave buried services >500 mm depth in place. • After the water has been allowed to evaporate from the mine water storage dam, remove the sediments within the pond, test and neutralise, if necessary, prior to dumping within the open pit. • Remove the HDPE liner. • Cart all waste and debris to the landfill. • Conduct a site contamination assessment and undertake remedial action required. **Environmental Works** • Reprofile the mine water storage dam area and reinstate natural drainage. • Manage dispersive soils, if these have originally been used to construct dam walls. • Contour rip (generally to compacted areas) to minimum of 0.5 m depth at maximum spacing of three metres to maximise infiltration. • Prior to spreading growth medium, inspect area and remove any rubbish and debris. • Spread layer of subsoil. • Spread layer of topsoil to depth of 120 mm. • Seed with local provenance species.	
Description	Bores and Pipelines
Engineering Works • Remove bore headworks. • Concrete slabs to be cracked *in situ* and then buried. • Remove all services. Leave buried services (e.g pipelines) >500 mm depth in place. • Cart all waste and debris except for concrete to the landfill. **Environmental Works** • Some bores may be retained for specific purposes, in which case they will be re-licensed in accordance with DoW requirements. • Bores not required will be demolished in accordance with procedures approved by DoW. The scope of work is expected to include removal of casings to ~1 m below ground level and filling the bore with inert, low permeability grout such as concrete or bentonite to prevent water transfer within the remaining bore casing. • Keep a record of the bore decommissioning activity for future reference and to verify that the hole was properly sealed. • Prior to spreading growth medium, inspect area and remove any rubbish and debris. • Spread layer of topsoil. Soil topping should be compacted and mounded to prevent ponding of surface water above bores.	

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Dewatering Infrastructure – Mine Water Storage Dam, Bores and Pipelines
• Seed with local provenance species.

7.4.7 Infrastructure

Infrastructure including workshops, administration buildings, laydown area, communication systems, landfill and other supporting infrastructure will be removed from site after mine decommissioning. Some topsoil and subsoil stockpile areas will also need to be rehabilitated. The activities associated with the rehabilitation and closure of the hardstand areas are described in Table 7-7.

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Table 7-5 Preliminary Rehabilitation and Closure Activities for Borrow Pits

Borrow Pits	
Infrastructure to be Retained	Road access to the rehabilitated borrow pit sites for rehabilitation monitoring.
Engineering Works • Cart all waste and debris to the appropriate landfill. **Environmental Works** • Progressively rehabilitate borrow pits, where possible. • Partially refill or re-profile borrow pits to restore drainage and prevent ponding. • Batter the pit walls to an angle not greater than 1:10 (~6°). • Reinstate natural drainage patterns. • Contour rip (generally to compacted areas) to minimum of 0.5 m depth at maximum spacing of three metres to maximise infiltration. • Prior to spreading growth medium, inspect the borrow pit areas and remove any rubbish and debris. • Spread layer of subsoil. • Spread layer of topsoil to depth of 120 mm. • Seed area with local provenance species.	

Table 7-6 Preliminary Rehabilitation and Closure Activities for Access Roads

Access and Internal Roads	
Infrastructure to be Retained	Access site for post-closure monitoring.
Engineering Works • Cart all waste and debris to the appropriate landfill. **Environmental Works** • Conduct a contamination assessment of the access and internal roads. Any hydrocarbon contaminated areas that do not meet relevant criteria will be excavated and bio-remediated onsite. • As part of the closure activities, reduce the width of access roads, where practicable and rehabilitate available sections. • Remove culverts and restore drainage invert levels and grade, and restore drainage bank profiles. • Any road construction materials removed are likely to be saline and may require disposal to mine backfill. • Reprofile the area and reinstate natural drainage patterns. • Contour rip (generally to compacted areas) to minimum of 0.5 m depth at maximum spacing of three metres to maximise infiltration. • Prior to spreading growth medium, inspect area and remove any rubbish and debris. • Spread layer of topsoil to depth of 120 mm. • Seed with local provenance species.	

Table 7-7 Rehabilitation and Closure Activities for the Infrastructure

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Associated Infrastructure Areas	
Infrastructure to be Retained	Access to the associated infrastructure areas for rehabilitation monitoring.

Engineering Works

- Disconnect and terminate all services.
- Remove buildings
- Remove concrete slabs where practical. Heavy slabs and footings may be left in situ.
- Remove above ground services. Leave buried services > 0.5 m.
- Remove all fencing.
- Cart all waste and debris to the landfill.

Environmental Works

- Conduct a contamination assessment of all associated infrastructure areas. Any hydrocarbon-contaminated areas that do not meet relevant criteria will be excavated and bio-remediated onsite.
- Remove all inert fill, kerbing and aggregate to the mine backfill. Remove bitumen to an off-site landfill.
- Re-profile the area and reinstate natural drainage patterns.
- Contour rip (compacted areas) to minimum of 0.5 m depth at maximum spacing of three metres to maximise infiltration.
- Prior to spreading growth medium, inspect area and remove any rubbish and debris.
- Spread layer of subsoil.
- Spread layer of topsoil to depth of 120 mm.
- Seed with local provenance species.

7.5 Progressive Rehabilitation

As discussed, most of the open pit, the waste dump, some borrow pits and a significant amount of the dewatering infrastructure will be rehabilitated progressively. However, other options for progressive rehabilitation may also exist. Undertaking progressive rehabilitation and other closure activities during the operational phase of the Project will assist in minimising closure costs. The recommendations for progressive rehabilitation and incorporating closure activities into the life of mine operating plan are listed below:

- Stripped growth medium material will be initially stockpiled for later use in rehabilitation works. However, growth medium will be directly placed on areas that are being progressively rehabilitated to minimise stockpiling and double handling of material.
- Progressive rehabilitation will allow rehabilitation trials to be undertaken. Potential rehabilitation trials on the waste dump, open pit and borrow pits will allow a detailed rehabilitation strategy to be developed, including the following:
  - Identification of the optimum landform profiles.
  - Identification of the most suitable outer batter material.
  - Selection of the optimum outer batter profile.
  - Selection of the most effective revegetation strategies.
  - Identification of effective surface water management systems.
- Borrow pits located outside of the mine path may be rehabilitated progressively. There will be a requirement to keep some borrow pits open to provide material for road maintenance activities.
- A safety bund will be installed during construction and pre-stripping activities. This safety bund around the final pit void can be used as the abandonment bund following review and approval by the DMP.

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7.6 Growth Media

It will be important to ensure that soil characteristics are maintained in reconstructed profiles. Where appropriate, the reconstructed profile will contain:

- A topsoil horizon.
- An upper subsoil sand horizon with high permeability.
- A lower subsoil horizon comprising weathering ferricrete/gravel/sand with lower permeability.

Topsoil will be stripped and placed directly in position where possible. Otherwise they will be stockpiled for future use.

Topsoil along the access and internal roads will be stockpiled in discrete dumps located away from road table drains. Topsoil recovered from borrow pits will be removed and stored adjacent to the pits for later rehabilitation.

Stockpiles of growth media will not exceed two media in height and will be clearly signposted. Any growth media to be stockpiled for more than six months will be seeded with local plant species to protect the material against erosion, encourage soil biological processes and viability, and discourage weeds.

In the event that there is a shortage of growth media for use in rehabilitation activities, CWC will investigate alternative sources of growth media.

Section 8 Monitoring and Maintenance

8.1 Rehabilitation Performance Monitoring

8.1.1 Overview

The following monitoring programmes, which will be conducted in areas undergoing progressive rehabilitation and in areas undergoing post closure rehabilitation, will ascertain rehabilitation performance. Where appropriate, these monitoring programmes will also be conducted in rehabilitated farming areas.

8.1.2 Landscape Monitoring

A monitoring programme will be developed to monitor the health and functionality of soils and vegetation at the landscape scale.

8.1.3 Vegetation Monitoring

A vegetation monitoring programme will include measuring the abundance and diversity of plants that return to rehabilitated areas. Permanent vegetation plots will be established in rehabilitated areas and also in undisturbed areas. The results from the rehabilitated plots will be compared with the results of the undisturbed plots.

8.1.4 Dieback Monitoring

The assessment for the presence of dieback within rehabilitated sites will continue to be conducted post closure. This will provide a determination of the success of the rehabilitation and of negating the spread and introduction of the dieback pathogen. It will be important to monitor dieback to ensure rehabilitated sites have not been infected. It will also be important to ensure that monitoring procedures do not introduce or spread the dieback pathogen.

8.1.5 Fauna Monitoring

Permanent fauna monitoring plots will be established in rehabilitated and undisturbed areas in order to monitor whether fauna are returning to and utilising the rehabilitated areas. This will provide a determination of the success of the rehabilitation as suitable habitat for fauna.

The rehabilitation performance monitoring programme will continue to occur until the DoIR is satisfied that the rehabilitation will or has already reached the targets outlined in agreed completion criteria.

8.2 Geotechnical Stability Monitoring

Geotechnical monitoring of the waste dump will be undertaken to assess the stability and structural integrity of the waste dump.

Geotechnical monitoring of the stability and structural integrity of the final pit void will also be undertaken.

The frequency and nature of monitoring will be determined during detailed design, and reviewed during construction and immediately after completion.

8.3 Groundwater Monitoring

Groundwater monitoring will be conducted to detect any contamination of groundwater and monitor the performance of waste disposal strategies. The frequency and term of monitoring will be determined as part of detailed operational and closure planning. Monitoring will continue until the agreed completion criteria are achieved or it can be demonstrated that the completion criteria will be achieved. The groundwater monitoring programme would involve the following:

- Post-closure:

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  - Water level recovery in the pit and in surrounding monitoring bores.
  - Salinity and pH profiles of the final pit void lake and adjacent monitoring bores.
  - Groundwater chemistry of the pit lake and adjacent monitoring bores.
  - Groundwater chemistry from monitoring bores adjacent to the mine water storage dam and ROM pad.
- Post progressive rehabilitation:
  - Groundwater chemistry from monitoring bores adjacent to the waste dump.

8.4 Surface Water Monitoring

Surface water quality monitoring will include:

- Run-off from the waste dump, coal stockpile bases, and the crushing plant,
- Flows in drainage lines, including above and below the mine excavation.

Parameters will include pH, electrical conductivity(EC), acidity, soluble metals and soluble sulphate concentration.

8.5 Reporting Procedures and Schedule

Comprehensive records of the planning and implementation of all rehabilitation and closure works will be maintained for each domain and will include:

- Data on the pre-disturbance condition of each site.
- Asset registers of infrastructure that CWC owns or maintains responsibility for.
- Details of the rehabilitation treatment used (i.e. rehabilitation earthworks, seed bed preparation, species used in the seeding programme and any fertiliser/soil modifiers).
- The results of the rehabilitation monitoring programme.
- The scope of any remedial work (e.g. re-ripping, re-seeding and weed control).

The documentation required for each stage in planning for, and implementing, site closure is listed in Table 8-1.

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Table 8-1 Documentation Relevant to Stages of Site Closure

Stage	Documentation
Project planning and development	• Public Environmental Review and Mining Proposal which will include commitments to mine closure and draft completion criteria. • Preliminary Closure Plan.
Operations	• Report on progress made in planning for, and working towards, mine closure in Annual Environmental Reports (AERs). • Every 3 years review and update the Preliminary Closure Plan.
Five years prior to closure or at a time agreed with stakeholders	• Prepare the Final Closure Plan.
Site closure	• Update and implement the Final Closure Plan. • Report on progress in AERs.
Care and maintenance	• Report on progress of mine closure in AERs.
Relinquishment	• Written sign-off by the DMP and other decision-making authorities. • Deletion of fulfilled tenement Conditions from the mining leases. • Retirement of bonds.

Section 9 Closure Plan Review

The Preliminary Closure Plan will at first be reviewed and updated (if required) on a triennial basis. The closure plan will be updated to take into account new information, technology, learnings and changes to operations. Audits of the closure plan and the closure planning process will be undertaken as required.

Review and auditing of the closure plan is the responsibility of the Environment Manager, with auditing reports provided to the site Manager. Any progress made in planning for, and working towards, closure would be reported within the AER that would be submitted to the DMP.

CWC would prepare a Final Closure Plan at least five years prior to the anticipated date of closure or at a time agreed with the regulators.

Should Iluka's mining activities affect the Project or its planned closure activities, CWC will liaise with Iluka and other relevant stakeholders to revise and amend this Preliminary Closure Plan where required.

Section 10 Contingency Plan

10.1 Overview

There may be a number of unforeseen circumstances that could lead to temporary or unplanned closure (care and maintenance). Typically operations would be expected to recommence, but if circumstances remain adverse to the re-opening of the mine, then an accelerated closure process would need to be implemented. In these circumstances, a decommissioning and closure plan would be prepared and implemented based on the most current version of the closure plan for the Project.

The Project could also be put on care and maintenance just prior to closure as part of the mine project life cycle. During the care and maintenance phase of the Project, CWC recognises that it will need to meet ongoing environmental obligations. Therefore, it is necessary to have a care and maintenance plan for the processing plant and the management of all environmental aspects of the site during this phase. It is also essential that public safety is considered during the care and maintenance phase.

10.2 Care and Maintenance

When a decision has been made to place the site on care and maintenance, the following steps will be undertaken as part of the contingency plan for the care and maintenance phase:

- Undertake an environmental audit of the site to determine the status (environmental risk) of all components of the site.
- Develop a care and maintenance plan to manage/mitigate the following environmental risks:
  - The coal crushing plant and the fuel farm could contain significant volumes of hydrocarbons when care and maintenance is initiated and there would be the potential for these materials to cause soil, groundwater or surface water contamination if not stored or disposed of correctly.
  - There is potential for PAF waste rock to oxidise and generate acid rock drainage. A plan for the encapsulation of the PAF waste rock would be developed. This plan would include the use of a crushing/screening plant to crush NAF material to a suitable size to ensure permeability targets are achieved for the 'low-permeability' layers. If required, alkaline material (e.g. lime) will be used to treat any PAF material.
  - There is potential for dispersive soils to cause erosion and sedimentation. A plan for the monitoring and amelioration of dispersive soils would be developed.
  - Should coal materials be present on the ROM pad and at the coal stockpiles when the site is put on care and maintenance, there is the potential to impact the environment through erosion, sedimentation, as well as through acid rock drainage. A plan for the encapsulation or removal of the coal materials would be developed.
  - There is the potential for an un-rehabilitated waste dump to impact the environment, through erosion and sedimentation, which could in turn have adverse effects on surrounding vegetation.
- Establish an emergency response action plan, if monitoring indicates that there is a potentially serious environmental problem. If a catastrophic event does occur, it is essential that there is a plan in place to minimise injury and damage.
- Regular monitoring and reporting to the DMP and other government agencies carried out during operations will need to be continued through the care and maintenance stage.

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