

## BYLONG COAL PROJECT



Environmental Impact Statement September 2015

> Executive Summary













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## **Overview**

Hansen Bailey has prepared this Environmental Impact Statement on behalf of WorleyParsons Services Pty Ltd in support of a State Significant Development Application for the Bylong Coal Project (the Project), which is owned by KEPCO Bylong Australia Pty Ltd (KEPCO). The Project involves the construction and operation of an open cut and underground coal mine in the Bylong Valley, approximately 55 km (or 95 km by road) to the north-east of Mudgee, New South Wales (see Figure 1).

The Project life is approximately 25 years, comprising a two year construction period and a 23 year operational period, with underground mining operations commencing in Year 7. Various rehabilitation and decommissioning activities will be undertaken during both the course of, and following the 25 years of the Project.

The Project will involve the recovery of approximately 124 Million tonnes (Mt) of Run of Mine (ROM) coal to produce approximately 90 Mt of thermal coal product. It is proposed to mine up to 6.5 Million tonnes per annum (Mtpa) of ROM coal, initially utilising open cut excavator mining techniques supported by trucks and other ancillary mining equipment to develop the two open cut mining areas. Coal resources in the underground area will be extracted using contemporary longwall mining techniques.

During operations, the Project will provide direct employment for up to 470 workers with an average annual direct workforce of approximately 290. It will also provide indirect employment in the regional economy from employee and Project expenditure. The Project will result in total royalties of up to \$763 Million (or \$290 Million net present value). The capital investment associated with the Project is estimated to be in the order of \$1.3 Billion.

This Executive Summary provides a high level overview of the Project, the environmental impact assessment process and the key findings of this Environmental Impact Statement.

#### FIGURE 1 Locality Plan





## **The Proponent**

The proponent for the Project is KEPCO, a subsidiary of Korea Electric Power Corporation (KEPCO Korea). The Project is KEPCO's first 100% equity investment in Australia. KEPCO Korea is responsible for the generation of 85% of South Korea's electricity for its industrial, commercial, residential, educational and agricultural customers.

One of KEPCO Korea's key drivers is to increase its renewable energy capacity. In 2014, approximately 5% of KEPCO Korea's electricity generation was from renewable energy sources. While KEPCO Korea is committed to further developing renewable energy technologies, high quality thermal coal is anticipated to remain a dominant source of energy over the next several decades whilst alternative technologies are developed. South Korea is the fourth largest importer of coal in the world. In 2014, KEPCO Korea imported 80 Mt of thermal coal, with 27 Mt of this coming from Australia. KEPCO Korea is the largest publically listed electricity utility in Asia (Forbes, 2015). KEPCO Korea is aiming to secure stable long term high quality fuel supplies as its electricity generation business expands both within and outside of Korea.



KEPCO Korea's Yeongheung Thermal Power Plant in Korea





## **Project Need**

There are substantial thermal coal resources within the Project site. It is proposed that the Project will efficiently extract these resources in the most environmentally responsible manner.

The International Energy Agency expects the world's energy consumption will grow 37% by 2040. Local and international predictions are that the need for coal as a source of energy for electricity production will continue to increase for some years to come as energy demand grows, despite an expectation of an increase in energy generated by alternate sources and the ultimate transition from carbon based energy to alternative fuel sources.

Thermal coal with high energy capacity and low emission properties remains a highly sought after energy source in Asian countries, including Korea, Japan, China and India. These countries continue to be the world's largest coal importers, and will largely account for an approximately 70% growth in the world's total coal imports from 2009 to 2035.

In South Korea, coal consumption increased by around 55% between 2005 and 2012, and globally, is the fourth largest importer of coal. KEPCO Korea imported approximately 80 Mt of thermal coal in 2014, with approximately 27 Mt coming from Australia. KEPCO Korea is forecasting its demand for thermal coal to rise to approximately 110 Mtpa by 2020.

KEPCO is seeking to develop the energy resources located within the Project site so as to reduce KEPCO Korea's exposure to resource scarcity issues and assist in ensuring energy security for South Korea as a whole.

The development of the resources within the Project site will deliver considerable economic and social benefits to the various levels of the Australian economy. With relatively stable agricultural production and diminishing manufacturing in Australia, the socio-economic benefits that flow from mining (including coal mining) are increasingly important to the Australian economy and the maintenance of Australia's standard of living.



# **Existing Environment**

### NATURAL ENVIRONMENT

The topography within the Project Boundary fluctuates greatly between the valley floors up to the escarpments and steeper slopes on the eastern margins. The Bylong Valley is bisected by two broad valleys associated with each of the Bylong River and Growee River which have each been cleared for agricultural land uses (Figure 2).

Tal Tal Mountain (655 m Australian Height Datum) is located within the south-eastern portion of the Project Boundary, while Mount Penny (570 m Australian Height Datum) is located to the north of the Project Boundary. The western edge of the Project Boundary is bounded by the Growee Ranges. Ridges and escarpments surrounding the Project Boundary form a narrow and relatively isolated valley around the Bylong River floodplain. The main watercourse within the Bylong Valley is the Bylong River, which is ephemeral in nature and confluences with the Goulburn River approximately 4 km to the north of the Project Boundary. The Goulburn River subsequently flows to the east where it joins the Hunter River near the town of Denman.

The Bylong State Forest is located within the eastern portion of the Project Boundary. The Bylong State Forest adjoins the more extensive Goulburn River National Park (north-east of the Project Boundary) and the Wollemi National Park (east of the Project Boundary).

Looking North from the Southern End of Upper Bylong Road



#### FIGURE 2 Topography and Drainage



### LAND USE

The Bylong Valley has a long history of agricultural land use, including grazing, cropping (dryland and irrigation) and horse breeding. The majority of the Project Boundary contains cleared agricultural land with native vegetation prevalent within the remaining area (predominately within the Bylong State Forest and other portions of Crown Land (Figure 3)).

KEPCO owns approximately 7,547 hectares (ha) of land within and surrounding the Project Boundary. KEPCO employs an onsite Farm Manager to manage agricultural activities on its land holdings including property management in accordance with its Property Management Strategy.

There are no approved coal mines within 20 km of the Project. However the Mid-Western Regional Council Local Government Area supports a number of other coal mining developments (Figure 4).

### LAND OWNERSHIP

The Project Boundary encompasses an area of approximately 6,958 ha. KEPCO holds approximately 5,425 ha of freehold land or approximately 78% of the land within the Project Boundary (Figure 5).

The remaining 21% of land within the Project Boundary is made up of Crown Land, State Forest and freehold land under private ownership. There are 23 parcels of Crown Land located in the north, south and south-west of the Project Boundary.

### CLIMATE

The Bylong region experiences a warm temperate climate, characterised by warm wet summers and cool dry winters. In the winter months, high pressure systems alternate with cold fronts, combining to produce cool, dry conditions. Frosts and fog are prevalent in the cooler, drier months from mid-autumn to late spring. The warm wet conditions during the summer months are produced by synoptic high pressure systems over the Great Australian Bight. Synoptic low pressure systems occur intermittently during summer, resulting in periods of heavy rain and thunderstorms.

### GEOLOGY

The Project is located in the north-eastern area of the Western Coalfields, which are part of the Sydney Basin. Within this area, a top layer of alluvium sedimentary soil (of Triassic age) overlays the hard Permian bedrock.



Surface Water Flow Monitoring Station on Bylong River

Local hingelines and geomorphic processes within the region have shaped the topography of the Bylong area over geological time, allowing the creation of sandstone escarpments and plateaus, as well as basalt-capped hills. The unconsolidated sediments within the low lying valleys of the Bylong Valley are comprised of an upper clay layer, shale conglomerates, sandstones and silty material, and a basal layer containing gravelly sand and gravel.

A history of igneous activity within the Bylong Valley is also evident, with examples of both extrusive and intrusive rock formations (e.g. basalt flows and diatremes, plugs, dolerite dykes and sills) scattered across the region.

Within the Project Boundary, six coal seams have been identified to occur within the local Permian strata of the Western Coalfields. The main target coal resource for the Project is the Coggan Seam which will be intercepted by both open cut and underground mining operations. The overlying Ulan Seam, Goulburn Seam and Glen Davis Seam will also be intercepted and recovered by open cut mining methods within the Eastern and Western Open Cut Mining Areas.

The coal seams dip to the north-east, with the Open Cut Mining Areas proposed in the south-western portions where the resource exists closer to the surface and underground mining areas proposed to be extracted in the eastern areas, where topography provides a greater depth of cover.

#### FIGURE 3 Current Agricultural Enterprises





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#### FIGURE 5 Landownership



## **Project Description**

The key features of the Project are conceptually shown on Figure 6 and include:

- The initial development of two open cut mining areas with associated haul roads and Overburden Emplacement Areas (see Figure 7), utilising a mining fleet of excavators and trucks and supporting ancillary equipment;
- The two open cut mining areas will be developed with coal extraction and related activities operating 24 hours a day, 7 days a week over an approximate 10 year period. Critically, these two areas will ultimately provide for the storage of coal processing reject materials from the longer term underground mining activities;
- Construction and operation of administration, workshop, bathhouse, explosives magazine and other open cut mining related facilities;

- Construction and operation of an underground coal mine operating 24 hours a day, 7 days a week for an approximate 20 year period, commencing mining in around Project Year 7;
- A combined maximum extraction rate of up to 6.5 Mtpa ROM coal;
- A workforce of up to approximately 800 during the initial construction phase and a peak of approximately 470 full-time equivalent operations employees at full production;
- Underground mining operations utilising longwall mining techniques with primary access provided via drifts constructed adjacent to the rail loop and Coal Handling and Preparation Plant (see Figures 8 and 9);
- The construction and operation of facilities to support underground mining operations including personnel and materials access to the underground mining area, ventilation shafts, workshop, offices and employee amenities, fuel and gas management facilities;



Example of Excavator Loading Haul Truck

#### FIGURE 6 Conceptual Project Layout



#### FIGURE 7 Conceptual Open Cut Mine Plan - Year 5



#### FIGURE 8 Conceptual Underground Mine Plan



- Construction and operation of a Coal Handling and Preparation
  Plant with a designed throughput of approximately 6 Mtpa of
  ROM coal, with capacity for peak fluctuations beyond this;
- The dewatering of fine reject materials through belt press filters (or other similar dewatering technology) within the Coal Handling and Preparation Plant and the co-disposal of dewatered fine and coarse reject materials within Overburden Emplacement Areas and final open cut voids (avoiding the need for a tailings dam);
- Construction and operation of a rail loop and associated rail load out facility and connection to the Sandy Hollow to Gulgong Railway Line to facilitate the transport of product coal;
- The construction and operation of surface and groundwater management and water reticulation infrastructure including diversion drains, dams (clean, dirty and raw water), borefield; pipelines, pumping stations and other required infrastructure (see Figure 10);
- The installation of communications and electricity reticulation infrastructure;
- Construction and operation of a Workforce Accommodation Facility and associated access road from the Bylong Valley Way;

- The upgrade of Upper Bylong Road and the construction and operation of a Mine Access Road to provide access to the site facilities;
- Relocation of sections of some existing public roads to enable alternate access routes for private landholders surrounding the Project; and
- Infilling of mining voids, progressive rehabilitation of disturbed areas, decommissioning of Project infrastructure and rehabilitation of the land progressively following mining operations.

The Project will require approximately 1,160 ha of land surface disturbance which will generally be undertaken within the defined Project Disturbance Boundary. The Project Disturbance Boundary comprises the area to accommodate the key surface components of the Project with provision for minor adjustments during final design and development. Disturbance areas will be progressively rehabilitated and where practical, will be reinstated to their pre-mining land use.

The majority of subsidence related impacts associated with longwall coal extraction will occur within an identified Subsidence Study Area. The Subsidence Study Area is comprised of approximately 1,714 ha and covers the predicted limit of vertical subsidence, determined by the maximum extent of the 26.5 degree angle of draw from longwall extraction and the predicted 20 mm subsidence contour.



#### FIGURE 9 Longwall Mining Schematic

#### FIGURE 10 Conceptual Water Management System Layout



# **Regulatory Framework**

The Project is defined as development "for the purpose of mining that is 'coal mining'", as listed under Clause 5 of Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011*. The Project is declared a State Significant Development and will be subject to the provisions of Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979*.

The Project is located on land falling within the Mid-Western Regional Council Local Government Area. Mining as proposed is situated entirely on land within zone RU1 (Primary Production), with the exception of the Sandy Hollow to Gulgong Railway Line, which is zoned as SP2 (Infrastructure). All components of the Project are permissible with Development Consent under the *Environmental Planning and Assessment Act 1979* on the land on which they are proposed to be carried out. It is noted that Section 89E of the *Environmental Planning and Assessment Act 1979* makes development permissible even where it is partly prohibited.

In accordance with Clause 3 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, KEPCO made a request for the Secretary's Environmental Assessment Requirements on 17 January 2014. The Secretary's Environmental Assessment Requirements for the Project were issued by the Secretary on 23 June 2014, with reference to the Gateway Certificate received for the Project on 15 April 2014. In light of minor adjustments to the Project, the Secretary's Environmental Assessment Requirements were amended by the Department of Planning and Environment on 11 November 2014 to incorporate the optimised mine design which resulted in reduced impacts to the environment. The State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 and Strategic Regional Land Use Plan - Upper Hunter provide for a "Gateway" process as a pre-requisite to making a State Significant Development application. The Gateway process is described as a scientific assessment of the impacts of mining on Strategic Agricultural Land. There are two types of Strategic Agricultural Land, namely Biophysical Strategic Agricultural Land and Critical Industry Cluster land which is comprised of Viticulture and Equine Critical Industry Cluster which are described on maps attached to the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

The Strategic Regional Land Use Plan - Upper Hunter maps identify the presence of both Biophysical Strategic Agricultural Land and Equine Critical Industry Cluster within the Project Boundary. Verification of the Biophysical Strategic Agricultural Land within the Project Boundary was undertaken in accordance with the criteria prescribed within the Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land.



Example of Coal Train Travelling to Port

As a consequence of Biophysical Strategic Agricultural Land and mapped Equine Critical Industry Cluster occurring within the Project Boundary, it was determined that a Gateway Certificate was required prior to the lodgement of a development application for the Project. KEPCO lodged an application for a Gateway Certificate on 10 January 2014. This application assessed the potential impacts of the Project on Biophysical Strategic Agricultural Land and mapped Equine Critical Industry Cluster. The Mining and Petroleum Gateway Panel issued a Conditional Gateway Certificate for the Project on 15 April 2014 which facilitates the lodgement of the current development application under Part 4 of the *Environmental Planning and Assessment Act 1979.* The Project will seek other relevant approvals under New South Wales legislation as required.

The Project was referred to the Commonwealth Department of the Environment on 12 February 2014. On 12 March 2014, the Project was declared a 'controlled action' and will subsequently require assessment under the *Environment Protection and Biodiversity Conservation Act 1999*. The assessment process under the *Environmental Planning and Assessment Act 1979* has been formally "accredited" for the purpose of assessing the impacts of the controlled action on Matters of National Environmental Significance. The Project was deemed a controlled action due to its potential impacts on two Matters of National Environmental Significance, namely:

- Listed threatened species and ecological communities (sections 18 and 18A of the *Environment Protection and Biodiversity Conservation Act* 1999); and
- Protection of water resources from coal seam gas development and large coal mining development (sections 24D and 24E of the *Environment Protection and Biodiversity Conservation Act 1999*).

The Secretary's Environmental Assessment Requirements for the Project incorporate the Commonwealth Department of the Environment's environmental assessment requirements.



# Stakeholder Engagement

A Stakeholder Engagement Strategy was prepared for the Project. The Stakeholder Engagement Strategy documents identified stakeholders, the engagement approach, the identification of key issues, response to key issues and a monitoring and reporting component.

Throughout the preparation of this Environmental Impact Statement, consultation has been carried out with near neighbours and the surrounding local community, local service providers, the Aboriginal community, government regulators and neighbouring industry. Feedback from the stakeholder consultation undertaken over this time has been incorporated into this Environmental Impact Statement. A series of Project briefings and presentations were provided to landholders, the local community, neighbouring industry, Government and relevant regulators throughout the preparation of this Environmental Impact Statement. These briefings and presentations provided information regarding the Project and the environmental assessment process and sought feedback from stakeholders for consideration within the Environmental Impact Statement.



Looking North-West from Upper Bylong Road

A focused consultation program was also undertaken for the purpose of informing the preparation of the Social Impact Assessment, including developing the socio-economic profile and identifying local community values and the likely issues that will result from the operation of the Project. Local service providers were also engaged during this process.

Several newsletters and fact sheets have been distributed throughout the preparation of this Environmental Impact Assessment. Approximately 130 copies of each newsletter and fact sheet that was prepared from April 2011 to date were distributed to the local community, regulators, service providers and other interested stakeholders.

Personalised letters, phone calls and face to face meetings have also occurred with landholders within the Bylong Valley.

An Exploration Information Day was held in October 2011 for the local community and involved visiting a drill rig, viewing core samples and gaining an understanding of the rehabilitation and environmental processes that are implemented during this activity. Approximately 26 members of the community, including landholders and children from the local Bylong Upper Public School attended this information session.

BYLONG Coal Project

Further community information sessions were held in December 2013, February 2014 and November 2014 to provide the local community an opportunity to gain additional information on the Project and to seek any face to face feedback from Project staff. Approximately 63 members of the local community attended these information sessions to discuss issues in relation to the Project.

Consultation with the Aboriginal community was conducted in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 with 27 Aboriginal organisations registering an interest and participating throughout the assessment process.

The key Project issues and concerns raised by the local community included land access, air and noise impacts, agricultural land practices, impacts to agricultural water, property acquisition, business and employment opportunities.

A Project website (www.bylongproject.com.au) is maintained which contains Project contact details and is updated with the latest Project documents and information.

## community Newsletter Issue 11 - August 2015

WorleyParsons

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#### CONTACT US:

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The Bylong Coal Project welcomes your feedback 1800 BYLONG (1800 295 664) Email: bylong@workeyparsons.com Website: www.bylongproject.com.au

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# Impacts, Management and Mitigation

A Risk Assessment was undertaken to identify potential environmental and social issues associated with the Project.

The purpose of the Risk Assessment process was to prioritise and focus the required environmental assessments for the Project in consideration of the Secretary's Environmental Assessment Requirements and the findings from stakeholder engagement.

### SUBSIDENCE

A Subsidence Impact Assessment of the Project has been undertaken by Mine Subsidence Engineering Consultants. The purpose of the assessment was to predict the likely subsidence effects resulting from the proposed underground mining operations and to assess the impacts of the predicted subsidence effects on natural and built environmental features.

Longwall mining typically results in subsidence which leads to the progressive development of shallow, trough-like depressions on the surface above each extracted longwall panel. The trough-like depressions have gentle grades and develop relative to the natural surface topography. The Subsidence Impact Assessment has comprehensively considered the potential impacts and environmental consequences for surface features in the vicinity of the underground mining operations for the Project. Land within the Subsidence Study Area is predominantly owned by KEPCO, New South Wales Forests and the Crown. The Bylong Quarry and a small portion of a property in the south-eastern extents of the underground extraction area are the only privately owned land overlying the Subsidence Study Area. The maximum predicted depth of vertical subsidence for the Project is 3.3 m, although vertical subsidence varies across the Subsidence Study Area (see Figure 11). The maximum predicted total conventional tilt is 75 mm/m (i.e. 7.5%), which represents a change in grade of approximately 1 in 13. The maximum predicted total conventional curvatures are  $3.5 \text{ km}^{-1}$  hogging and  $2.5 \text{ km}^{-1}$  sagging, which represent minimum radii of curvature of 290 m and 400 m, respectively.

Surface cracking is predicted to be experienced as a result of the subsidence effects. In the flatter areas, surface cracking is generally expected to vary in width from 25 mm to 50 mm, although isolated cracks of up to 100 mm width may occur. In steeper areas, surface crack widths are generally expected to be in the order of 50 mm to 100 mm, with possible isolated examples of cracking wider than 200 mm.

Mine Subsidence Engineering Consultants has estimated that the total area of surface cracking resulting from subsidence is predicted to represent well less than 1% of the Subsidence Study Area.

In some areas, the surface cracking may infill through natural processes, and would not require any proactive remediation. Other areas may not be practically accessible for remediation activities and may likely naturally remediate over time.

#### FIGURE 11 Predicted Subsidence Contours



The only named drainage line within the Subsidence Study Area is Dry Creek, which has a number of tributaries. Subsidence troughs can result in localised alteration of surface drainage paths and create ponding areas. Areas of ponding are expected to be between 50 m to 100 m in length and less than 1 m deep.

Areas of Dry Creek and associated tributaries affected by ponding will be appropriately managed to reinstate natural gradients. Changes in topography due to subsidence may result in changes to stream alignment. Steeper reaches of Dry Creek and its tributaries are unlikely to be affected by changes in topography. However, the lower stream reaches with shallower grades are more susceptible to localised changes in alignment. There is the potential for cracking to occur in the reaches of Dry Creek (and its tributaries) that overlie the Underground Extraction Area. Stream bed surface cracking that occurs as a result of mining will be remediated as soon as practical after being identified.

#### Cliffs

A total of 41 cliffs have been identified within the Subsidence Study Area, including 30 cliffs directly overlying the proposed longwall panels. Most of these cliffs are located within the Bylong State Forest. None of the cliffs in the vicinity of the Project constitute escarpments.

The Project mine plan includes a substantial setback of the longwall panels to the three most prominent cliffs visible to the Bylong Valley in order to minimise the potential for adverse impacts to these features.

Observations at Ulan Mine, which possesses similar mining conditions, have been used to estimate the impacts that may result from the Project. Rock falls are predicted likely from approximately 20% of the length of the cliffs within the Underground Extraction Area. Further, visible mining subsidence movements within the Underground Extraction Area are expected to occur in approximately 50% to 70% of this subset of cliffs.

Cliffs with greater height and continuous length will be more susceptible to impacts. Subsequently, two cliffs (C5 and C6) located directly above the longwalls with heights between 30 m and 40 m and one of these (C5) with a length of between 250 m and 300 m are at risk of greater visible mining subsidence movements and rock falls. The Visual Impact Assessment carried out for the Project indicates that impacts to these two larger cliffs above the longwalls (C5 and C6) will be screened from every-day public vantage points by the ridge to the south-west of the Subsidence Study Area. Some smaller cliff impact locations may be visible from isolated locations outside the Subsidence Study Area but these views will generally be at distances greater than 1.5 km and therefore any impacts should not be discernible to the naked eye.

#### **Agricultural Enterprises**

The Subsidence Study Area includes KEPCO owned properties and two privately owned properties that currently support a quarry and a cattle grazing enterprise. The Subsidence Study Area also includes a proportion of the Bylong State Forest and a small area of land that is mapped as part of the Strategic Regional Land Use Plan – Upper Hunter Equine Critical Industry Cluster. Surface cracking and deformations resulting from subsidence may intermittently present a hazard to livestock and workers on these properties. These impacts (if they occur) can be readily remediated by infilling cracks or regrading and compacting the surface.

KEPCO's properties within the Subsidence Study Area are proposed to be included within the Project's biodiversity offset strategy and as such any impacts from subsidence to existing agricultural activities will be negligible.

KEPCO will seek the relevant Occupation Agreement from New South Wales Forests, which will include a number of requirements, including conditions of access, remediation and rehabilitation which will be addressed within a Property Subsidence Management Plan.

KEPCO will also prepare a Property Subsidence Management Plan as required in consultation with the landowners of the Bylong Quarry and the privately owned property to the south-east of the Underground Extraction Area.

#### Industrial and Commercial Infrastructure

The only non-agricultural commercial enterprise operating within the Subsidence Study Area is the Bylong Quarry. There are no permanent structures at the site. The highwalls at the quarry are approximately 10 m in height. The predicted tilts associated with subsidence may result in instability of the quarry's highwalls. The highwalls may experience rock falls if longwall mining occurs directly beneath the highwalls whilst strains may result in cracking and deformation of the ground surface within the quarry. These impacts may present an intermittent hazard to personnel and equipment working in the quarry. A site specific management plan will be put in place in consultation with the quarry owner to ensure its continued safe operation.



Looking South from Sandy Hollow to Gulgong Railway Line

## Public Roads, Utilities and Telecommunications Infrastructure

The only public road passing through the Subsidence Study Area is the Bylong Valley Way. The predicted tilts may result in increased ponding along flatter sections of the road. Changes in grade due to subsidence can be remediated by regrading/re-levelling the road. There are 12 culverts along Bylong Valley Way within the Subsidence Study Area that will be remediated by re-levelling or repairing the structure if required.

There is a 22 kilovolt distribution line located within the Subsidence Study Area. This distribution line is owned by Endeavour Energy and services properties near Bylong Valley Way. The distribution line is aligned alongside the road and is supported by timber and concrete poles. Impacts to distribution lines can be prevented by implementing preventative measures such as guy wires, cable sheaves, additional poles or adjustment of cable catenaries.

Approximately 3,450 m of copper cables are located within the Subsidence Study Area. These cables, owned by Telstra, are buried and generally follow the alignment of Bylong Valley Way. It is expected that any impacts that may occur will be minor in nature and readily repairable.

The effects of subsidence on natural features, agricultural and other commercial enterprises and infrastructure will be manageable and will not give rise to any significant long term impacts.

KEPCO will work with private property, infrastructure and utilities owners to develop appropriate management and mitigation measures. This information will be detailed in an Extraction Plan prior to the exposure of any assets to any potential impacts from the longwall mining activities. The Extraction Plan will include a monitoring program to measure subsidence effects and identify any environmental or other consequences.

#### **Peer Review**

SCT Operations Pty Ltd was engaged to complete an independent peer review of the Subsidence Impact Assessment. The peer review was completed in two parts: broader review of Subsidence Impact Assessment report; and a specific review of the impact predictions associated with the cliff lines.

The peer review concludes that the Subsidence Impact Assessment provides an adequate discussion over the predicted effects, impacts and mitigation measures relevant to the Project.



## ECOLOGY

An Ecological Impact Assessment was undertaken for the Project by Cumberland Ecology. The Ecological Impact Assessment was also supported by work completed by Eastcoast Flora Surveys.

The purpose of the Ecological Impact Assessment was to determine the likely impacts of the Project on the existing terrestrial and aquatic flora and fauna within the Study Area, including threatened species, populations and ecological communities listed under State and Commonwealth legislation. The assessment has been undertaken generally in accordance with applicable New South Wales and Commonwealth legislation and the evolving planning policies relevant to the protection of biodiversity.

The vegetation present includes intact patches of native woodland and forest, partially disturbed woodland and forest remnants, derived native grassland and cultivated lands. The Study Area has had a history of agricultural development. Such land use has resulted in the degradation and clearing of native vegetation on the valley floor and lower slopes. Intact vegetation within the Study Area is typically associated with the slopes, escarpments, ridgelines and plateaus which have not been extensively used for agriculture or forestry. Areas within the Bylong State Forest have been selectively logged in the past for old growth timber.

Woody vegetation within the Study Area is dominated by a variety of eucalypts forming both grassy and shrubby woodlands. Lower lying alluvial slopes along Bylong Valley support remnant stands of *Eucalyptus conica* (Fuzzy Box), which then grade into *Eucalyptus moluccana* (Grey Box), then *Eucalyptus albens* (White Box) or *Eucalyptus dawsonii* (Slaty Gum) on slopes, with *Eucalyptus melliodora* (Yellow Box) on higher elevation soils derived from basalt.



Wooded Slopes within the Western Portion of the Project Disturbance Boundary



Senna artemisioides subsp. zygophylla (Benth.) Randell

Ironbark-dominated forests are the most widespread in sandstone areas. Riparian vegetation has historically been cleared and now occurs as highly degraded woodland in scattered patches.

Field surveys identified 186 vertebrate fauna species within the Study Area including six amphibian species, 130 bird species, 37 mammal species, nine reptilian species and 13 exotic species.

Although no surveys targeting vertebrate aquatic species were carried out within the Study Area due to the ephemeral nature of the waterways, incidental sighting of Eastern Gambusia (*Gambusia holbrooki*) were observed at a number of locations within the Study Area and Carp (*Cyprinus carpio*) were observed in the Bylong River.

The presence of these species indicates that if populations of native fish are present, they would currently be adversely affected by competition from the Eastern Gambusia (native to south-eastern USA) and Carp (native to central Asia) and as such likely to be under significant stress.

The dominant vegetation communities impacted by the Project are various forms of Derived Native Grasslands and lands which have historically been cultivated or pasture improved.

KEPCO will develop and implement a Biodiversity Management Plan for the Project. The plan will guide all facets of biodiversity management and mitigation for the Project, including avoidance of impact to sensitive ecology wherever possible, staged disturbance, rehabilitation activities and the development and implementation of a biodiversity offset strategy to compensate for any residual impacts.

### BIODIVERSITY OFFSET STRATEGY

A Biodiversity Offset Strategy has been designed to compensate for any residual ecological impacts of the Project with a long term objective to provide a net benefit to flora and fauna within the locality and region by substantially increasing the proportions of native woodland and threatened species habitat under conservation tenure. The biodiversity offset strategy has involved the acquisition of offset properties for permanent conservation of flora and fauna which includes habitat for species predicted to be impacted by the Project (Figure 12). The biodiversity offset strategy has been developed with a primary focus on the Environment Protection and Biodiversity Conservation Act 1999 listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, the Threatened Species Conservation Act 1995 listed White Box Yellow Box Blakely's Red Gum Woodland and other habitats for all threatened fauna known to occur within the Project Boundary.

Based on the detailed vegetation mapping undertaken, the onsite and offsite biodiversity offset areas will contribute approximately 3,684 ha of native woodland and grassland, including approximately 1,271 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and White Box Yellow Box Blakely's Red Gum Woodland listed under the *Environment Protection and Biodiversity Conservation Act 1999* and *Threatened Species Conservation Act 1995* respectively (667 ha woodland and 604 ha grassland); and a further 238 ha of White Box Yellow Box Blakely's Red Gum Woodland (grassland form) listed under the *Threatened Species Conservation Act 1995* only. The biodiversity offset areas will also contribute approximately 426 ha of other *Threatened Species Conservation Act 1995* listed vegetation communities.

The biodiversity offset areas as a whole will provide a substantial amount of habitat for the suite of threatened species to be potentially impacted by the Project, including the Regent Honeyeater, Brush-Tailed Rock Wallaby and Greater Long-eared Bat.

An assessment of the adequacy of the Biodiversity Offset Strategy has been undertaken using the relevant policies. This assessment has confirmed that the Biodiversity Offset Strategy will be more than adequate to compensate the predicted impacts of the Project to biodiversity and will maintain and improve biodiversity values within the region in the longer term.

Offset Area 5



#### FIGURE 12 Biodiversity Offset Areas



### SURFACE WATER

A Surface Water Impact Assessment was undertaken by WRM Water and Environment. The purpose of the assessment was to characterise the existing catchments, develop a water balance for the Project with consideration of the water management system, determine the impacts to surface water and recommend measures to mitigate and manage these impacts.

The Project is located in the Bylong Valley, within the catchment of the Bylong River, a tributary of the Goulburn River, which in turn is a tributary of the Hunter River. The primary areas of disturbance for the Project are along a short reach of Lee Creek and the Bylong River where mine infrastructure and open cut mining areas are located and in the Dry Creek catchment, where underground mining is proposed.

Surface water within the Bylong River catchment is managed under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.* All water extraction that is not for basic landholder rights or is exempt from requiring a licence must be authorised by a Water Access Licence under the *Water Management Act 2000.* KEPCO currently holds eight Water Access Licences for the Bylong River water source, with a total allocation of 2,535 units (currently equivalent to 2,535 Megalitres/Year). These Water Access Licences entitle access to the alluvial groundwater which is highly connected to the surface water regime.

#### Water Balance

A computer-based simulation model was used to assess the dynamics of the site water balance (both volume and salt loads) under varying rainfall and catchment conditions. The model works to dynamically simulate the operation of the water management system and in doing so keeps a complete account of all site water volumes and representative water qualities on a daily time step. The model was configured to simulate the operations of all major components in the water management system.

The water balance model has confirmed that under median conditions, the water supply from a borefield is required in all phases of the Project with the greatest amount required in Year 3. The water balance also suggests that there will be no overflows from the mine water management system throughout the life of the Project under all historical climatic scenarios modelled.

However, depending on the climatic conditions experienced throughout the life of the Project, on occasion surplus mine water may need to be stored within the open cut mining areas. Any water remaining within the void area at the end of the mine life will be pumped to the completed underground mining area. The largest demand from the water management system is for dust suppression. Total mine water demand (including coal processing make-up, dust suppression, Workforce Accommodation Facility, mine infrastructure area usages, underground operations) supplied from the water management system ranges between approximately 1,317 Megalitres/Year and 1,942 Megalitres/Year, with the highest demand in Year 9 (during combined open cut and underground operations).

The water balance modelling indicates with a 99% confidence that extracting up to 1,170 Megalitres/Year from the borefield will meet the external water supply requirements for the Project. The borefield water requirements are shown to substantially reduce on the commencement of the underground mining operations. KEPCO hold greater water access licence entitlements than that which will be required to operate the Project in all worst case modelled scenarios.

#### Loss of Catchment

One of the key principles of the water management system is to maximise the diversion of clean water flows around the proposed mining areas to minimise the loss of surface flows to the natural catchment. During active mining operations, the mine water management system will capture runoff from areas that would have previously flowed to the receiving waters of Bylong River, Lee Creek and Growee River. The reductions in catchment areas indicate that the likely reduction in surface flow would represent only a small proportion of total catchment runoff. The loss of flow in the Goulburn River catchment is immeasurably small.

#### **Subsidence Impacts**

The effects of subsidence beneath the Dry Creek catchment have the potential to affect flow behaviour along Dry Creek and its tributaries. Subsidence associated with underground mining will increase the risk of geomorphic impacts in Dry Creek through increased water ponding at some locations along the waterway channel and increased bed gradient and flow velocities at other locations.

The management strategy for Dry Creek and its tributaries will be based on monitoring of changes in surface levels and erosion. Regular visual inspections and comparative ground level survey will be undertaken to assess changes in the condition of the streams during mining, with a particular focus on the identified areas of higher risk. Targeted management actions will be developed to respond to the observed impacts, ensuring that any intervention minimises surface disturbance.

#### Water Quality

The water management system will be designed and operated to minimise the impacts of the Project on downstream water quality.

Bylong River to the North (downstream) of the Project Bounda 衣



Ephemeral Pool on the Bylong River to the North of the Project Boundary

The model results show that the total average salt load released offsite in surface runoff is reduced by the Project, when compared with the pre-mine case. The average annual salt load released to the Bylong River is reduced by around 5.6% to 8.4%, depending on the mining phase. Once the post-mining landform is established and rehabilitated, it is expected that long term water quality from surface runoff should be similar to pre-mining conditions.

The Water Management Plan will be developed and present the surface water monitoring program to be implemented according to the relevant stage of the Project.

### FLOOD

A Flood Study was undertaken by WRM Water and Environment as part of the Surface Water Impact Assessment. The purpose of the Flood Assessment was to assess the potential of the Project to affect flood flows along the Bylong River, Lee Creek and Dry Creek.

#### **Bylong River**

The open cut mining areas and mine infrastructure have been designed in consideration of avoiding impacts to the Bylong River and Lee Creek floodplains. The construction of the proposed haul roads and the overland conveyor embankment is predicted to result in isolated changes in water levels in the vicinity of this infrastructure for all modelled design events. The increase in flood depth ranges from 1.0 m to 2.5 m immediately upstream of these items during the 100 year Average Recurrence Interval design event. Impacts on water levels from the haul roads and overland conveyor embankment propagate approximately 0.5 km upstream of these structures during the 100 year Average Recurrence Interval design event. The flood impacts are confined to land owned by KEPCO.

Rock protection will be required downstream of the haul road culverts crossing Lee Creek and immediately adjacent to the downstream side of the overland conveyor embankment to prevent erosion during flood events. The extent of required local erosion mitigation measures will be determined by additional flood modelling to be undertaken as part of detailed infrastructure design.

#### **Dry Creek**

Subsidence effects will generally result in lowering the elevations of flood levels along Dry Creek. Changes in water level typically reflect the change in ground elevations caused by the subsidence with a maximum reduction in water level of 3.0 m occurring along the main channel of Dry Creek during the 100 year Average Recurrence Interval design event. This difference is replicated in the 2 year and 50 year Average Recurrence Interval designer also results in isolated increases in water level where the channel capacity has reduced.

Predicted flood flows are typically contained within the channels of Dry Creek and its tributaries under post-subsidence conditions in a similar manner to existing conditions. The exception is a potential breakout of flow located along the western edge of the final subsided longwall panel in the vicinity of Bylong Valley Way during the 50 year and 100 year Average Recurrence Interval design events. Minor drainage works will be undertaken within the tributary at this location to reduce the frequency of overflows.

Given that the on flow will not occur until the extraction of the final longwall panel (i.e. Year 25), detailed design and implementation of these works will be undertaken at a later date.

### GROUNDWATER

A Groundwater Impact Assessment was undertaken by Australasian Groundwater and Environmental Consultants to characterise existing groundwater regimes, assess the impacts of the Project on the groundwater sources and other water users, quantify predicted inflows into the mining areas throughout the life of the Project and recommend measures to mitigate and manage these impacts.

The Groundwater Impact Assessment was supplemented by the extensive water monitoring program which was implemented by Douglas Partners on behalf of KEPCO.

The following hydrostatic units are present in the vicinity of the Project as conceptually show on Figure 13:

- Alluvium and colluvium;
- Weathered Permian bedrock;
- Tertiary basalt capping; and
- Permian coal seams.
The groundwater modelling undertaken for the Project has predicted a zone of depressurisation within the Permian coal seam and a zone of drawdown within the alluvial aquifer around the proposed open cut and underground mining operations.

Drawdown in the alluvium is dependent on proximity to the open cut and underground mining areas and borefield. The proposed open cut mining area highwalls have been designed to be more than 180 m from the alluvium, 200 m from the Bylong River and 260 m from Lee Creek. Drawdown within the alluvium extends approximately 1 km from the eastern open cut mining area. In contrast, the drawdown extends some 2.3 km from the northern limit of the Underground Extraction Area but influences only the very fringes of the alluvial aquifers. Maximum drawdown within the Bylong River alluvium occurs at Year 10, which coincides with the final year of mining within the eastern open cut mining area. Drawdown in the Lee Creek alluvium gradually moves upstream with the majority of the drawdown occurring in response to open cut mining activities. The drawdown in Bylong River alluvium downstream of the open cut mining areas and adjacent the Underground Extraction Area is most extensive in Year 25, when the longwall mine is fully developed (see Figure 14).

The underground mining activities depressurise the overlying strata, inducing steeper hydraulic gradients between the alluvium and Permian. This results in groundwater drawdown within the alluvium to the north-west of the Underground Extraction Area by Year 22.

The open cut and underground mining operations are predicted to depressurise the groundwater in the coal seam in a zone that extends to a maximum of 2.3 km from the proposed open cut mining areas. The predicted depressurisation extends up to 2.4 km from the longwall panels, but is generally restricted to less than 1 km to the north of Underground Extraction Area. This is due to the reduced hydraulic conductivity of the coal seams with depth.

The maximum drawdown within the mined footprint occurs as the longwall passes through the area, but outside the footprint the maximum depressurisation occurs around 5 to 10 years following mining.

No licenced bores on privately owned land are predicted to be significantly impacted by the Project's groundwater impacts. Therefore, the predicted depressurisation and drawdown in groundwater within the coal seams and within the alluvium as a result of the Project are contained to KEPCO owned land and will have no consequences for neighbouring private groundwater users. The two government monitoring bores which are located within the alluvium adjacent to the proposed open cut mining areas are not predicted to be significantly impacted by the Project's groundwater impacts.



#### FIGURE 13 Conceptual Hydrogeology Schematic

The predicted indirect water take from the alluvial groundwater systems due to the depressurisation of the underlying coal seams by mining operations averages approximately 153 Megalitres/Year throughout the 23 operational years of the Project, peaking at approximately 295 Megalitres/Year in Year 25. In addition to this, the extraction of water from the borefield constructed within the alluvium will also occur. Groundwater modelling indicates that up to 15 bores will be required to operate to supply the make-up water from Years 3 to 8 when the requirement peaks at 1,172 Megalitres/Year (Figure 14). The demand for make-up water is anticipated to reduce when the underground mine development commences.

During the period of open cut mining operations, baseflow from the alluvium to the Bylong River reduces by up to 918 Megalitres/Year. Once the open cut mining is completed and the make-up water requirements from the borefield reduce, the model indicates the net loss of baseflow to the Bylong River reduces to less than 150 Megalitres/Year. A second smaller peak in baseflow loss occurs at Year 25 (205 Megalitres/Year) as the longwall panels move closer to the Bylong River. The model predicts baseflow to Lee Creek reduces by up to 103 Megalitres/Year, and averages 51 Megalitres/Year over the Project life. No measurable impacts are predicted to occur to the baseflow in Growee River, because it is more distant from the proposed mining operations. Similarly, there is no predicted impact to the baseflows to Goulburn River as the maximum extent of depressurisation does not extend close to the Goulburn River.

The potential height of connected fracturing induced above the longwall panels may extend to the land surface over a large proportion of the Underground Extraction Area. The groundwater modelling indicates that the volume of water flowing from Dry Creek into the underground longwall mine will be relatively low (less than 0.2 Megalitres/day), compared to predicted inflow from the wider groundwater systems. The loss of surface water from Dry Creek is therefore considered negligible.

KEPCO has secured 2,535 units (equivalent to 2,535 Megalitres/Year) Water Access Licences for the Bylong River Water Source under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source 2009.* These Water Access Licences are more than sufficient to license the predicted direct and indirect takes of water from the alluvium and surface water baseflows.

A water and salinity balance indicates that post-mining, pore water from the backfilled open cut mining areas will seep into the alluvial aquifer and there is potential for a small increase in salinity within the alluvium and the connected surface waters of Bylong River and Lee Creek. Despite this potential increase, the salinity balance suggests the environmental value and beneficial use of the water within the alluvium and connected surface water system will not change as a consequence of the Project.



Water Tower and Storage Shed at Tarwyn Park



**FIGURE 14** Maximum Predicted Groundwater Drawdown in the Alluvium and Depressurisation in the Permian (Coggan Seam)

A Water Management Plan will be prepared to outline the program of monitoring required to validate the predictions of the Environmental Impact Statement and groundwater modelling. The Water Management Plan will detail a process for monitoring, validating, recording predicted impacts to water resources as well as outlining the licences required throughout the life of the Project.

A groundwater technical specialist was engaged to peer review the Groundwater Impact Assessment. HydroSimulations (Dr Noel Merrick) found the "model underpinning the groundwater assessment is 'fit for purpose', where the primary purpose of the model is the prediction of environmental impacts in the context of the Aquifer Interference Policy, and estimation of water takes for licensing. A very thorough analysis of the uncertainty in the estimates has been conducted."

## AIR QUALITY

An Air Quality and Greenhouse Gas Impact Assessment was undertaken for the Project by Pacific Environment Limited. The purpose of the assessment was to quantitatively predict and assess the air quality impacts at receivers in the vicinity of the Project and to recommend measures to account for and manage any potential impacts above the applicable criteria.

Control of dust emissions was a key consideration in the design of the Project. The mine plans for Years 3, 5 and 9 were selected for modelling purposes as they represent the progression of the Project and the years in which the worst case impacts are likely to occur due to the location of operations and the potential to generate air quality impacts. Several iterations of mine plans were modelled throughout the planning phase to consider worst case scenarios and incorporate all reasonable and feasible measures for the Project in order to reduce environmental amenity impacts.

The results of the dispersion modelling indicates that the Project is not predicted to contribute to exceedances of the relevant air quality criteria at any private receivers (either due to the Project alone, or cumulatively). The air quality management measures, controls and commitments adopted by KEPCO for the Project are based on recommendations of the New South Wales Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining (2011), a study that was commissioned by the New South Wales Environment Protection Authority. KEPCO is committed to leading practice dust management for the Project through the use of a real-time proactive dust management system. This would enable the mine operators to pro-actively manage any short term impacts of the Project and prevent or minimise adverse dust impacts at privately owned receivers to the greatest practical extent. A real-time meteorological monitoring station with predictive software capabilities will be established, enabling meteorological forecasts to be made for upcoming days.

The Project air quality monitoring network and dust management system will be detailed within an Air Quality Management Plan and results of monitoring will be published in the Annual Review.

# GREENHOUSE GAS

The main sources of greenhouse gas emissions from the extraction and processing of coal for the Project were identified as resulting from diesel usage, explosives usage, electricity consumption, fugitive emissions of carbon dioxide and methane and the transportation and end use of product coal.

Scope 1, scope 2 and scope 3 emissions were considered in the assessment of carbon dioxide, methane, nitrous oxide and relevant synthetic gases.

Over the life of the Project, the annual average greenhouse gas emissions are predicted as 8.1 Mt of Carbon Dioxide equivalent. Average annual scope 1 emissions from the Project (0.09 Mt of Carbon Dioxide equivalent) will represent approximately 0.02% of Australia's commitment under the Kyoto Protocol (591.5 Mt of Carbon Dioxide equivalent) and a very small portion of global greenhouse emissions, given that Australia contributed approximately 1.25% of global greenhouse gas emissions in 2012 (PBL Netherlands Environmental Assessment Agency, 2013).

KEPCO will develop an Energy and Greenhouse Gas Management Plan, which will describe a number of reasonable and feasible measures to be implemented to minimise greenhouse gas emissions from the Project.



## NOISE

A Noise and Blasting Impact Assessment for the Project was completed by Pacific Environment Limited. The assessment included quantitative consideration of construction noise, operational mining noise, offsite road and rail noise, sleep disturbance, low frequency noise and cumulative noise impacts. It also assessed blasting impacts on people, livestock and property.

The Project is proposed in a rural setting, with a small number of residential receivers located on agricultural properties within and surrounding the Project Boundary. The residences within the Project Boundary are predominantly owned by KEPCO, with surrounding private residences located in the north-west, south and in the Bylong Village. Similar to air quality, the control of noise was a key consideration in the design of the Project. There is currently no significant industrial noise sources present within the vicinity of the Project.

As a result of the originally predicted noise impacts, noise mitigation measures were further investigated. The operational noise investigation considered up to 18 different scenarios including mitigation of sources and the propagation path. Each mitigation scenario was considered for implementation where feasible and reasonable. The adopted noise mitigation measures for the Project include the fitting of sound suppression to fixed and mobile plant sources, the alteration of haul routes and waste emplacement activities.

#### **Construction Noise**

The modelled noise impacts for the construction phase show that the one receiver is predicted to experience moderate noise impacts (between 2 and 5 decibels (dB) above the intrusive criteria) as a result of the earthworks required to construct the rail loop. During the upgrade of Upper Bylong Road, exceedances of the construction noise management criteria are predicted at up to five receivers when works are at their closest to Bylong Village.

Noise levels for construction activities associated with development of the open cut mining area are predicted to comply with the relevant criteria under neutral conditions during the day time activities.

### **Operational Noise**

The Noise and Blasting Impact Assessment concluded that with the adopted noise mitigation measures, 12 receivers are predicted to be residually affected greater than the relevant assessment criteria (Figure 15). Three receivers are predicted to be significantly impacted (greater than 5 dB above the intrusive criteria) and six receivers are predicted to be moderately impacted by the Project (between 2 and 5 dB above the intrusive criteria). The remaining three receivers are predicted to experience negligible impacts from the Project (between 1 and 2 dB above the intrusive criteria).

In accordance with the requirements of the *Voluntary Land Acquisition and Mitigation Policy*, the moderately impacted receivers will be subject to voluntary at-property mitigation rights. Significantly impacted receivers will be subject to voluntary at-property mitigation or acquisition rights.

A Noise and Blasting Management Plan will be developed for the Project in consultation with the relevant regulators for construction and operational activities associated with the Project.

KEPCO will install real-time noise monitoring and a weather prediction system to provide advanced warning of adverse conditions to allow operational responses to be put in place to reduce impacts at private receivers. Results of noise monitoring and quarterly noise surveys will be reported in the Annual Review.

## BLASTING

The Project will require a maximum of six blast events per week, to be undertaken during the hours of 7:00 am to 5:00 pm Monday to Saturday, excluding public holidays.

Blast modelling undertaken for the Project indicates that no exceedances of the relevant criteria are predicted for private residential receivers. The predictions indicate that three KEPCO owned historic heritage sites will exceed the adopted vibration and overpressure limits due to proximity of these sites to the proposed mining areas.

The Blast Management Plan for the Project will consider specific mitigation measures for these sites, including designing the blasts to meet vibration limits, blast monitoring, and ongoing dilapidation / condition surveys.



FIGURE 15 Worst Case (All Years) Predicted Noise Contours

## ABORIGINAL ARCHAEOLOGICAL AND CULTURAL HERITAGE

An Aboriginal Archaeological and Cultural Heritage Impact Assessment was undertaken by RPS Australia East. The purpose of the assessment was to identify the Aboriginal archaeological and cultural heritage resource within the Project Boundary.

The assessment included a detailed desktop review of previous studies, search of the New South Wales Office of Environment and Heritage's Aboriginal Heritage Information Management System and a comprehensive field survey of the Study Area undertaken over a five week period, with members of the Aboriginal community. All potential impact areas within the Study Area were covered, including the Subsidence Study Area and the Project Disturbance Boundary.

The archaeological resources identified include 239 Aboriginal archaeological sites and cultural features, inclusive of the 21 previously registered on the Aboriginal Heritage Information Management System. Sites identified included isolated finds, artefact scatters, rockshelters, grinding grooves, modified trees, Potential Archaeological Deposits and an ochre quarry.

A total of 25 sites were assessed to be of high local significance, nine were determined to be of moderate significance and 184 were determined to be of low significance. Of the 25 sites of high local significance, seven were identified to be of high regional significance equating to less than 4% of total number of sites. Aboriginal archaeological sites of high regional significance included the ochre quarry, three grinding grooves and three rockshelters. The listed sites are valued at both a local and regional level due to their individual rarity, representativeness, research and educational potential.

A total of 144 archaeological sites and cultural features are identified as being at risk from the Project. Of the total 144 sites at risk of impact, 42 are identified as being at risk of indirect impacts (due to subsidence and blasting) and 102 are at risk of direct impacts (within the Project Disturbance Boundary). All remaining sites within and outside the Study Area will not be impacted.

To mitigate and manage impacts to Aboriginal archaeology and cultural heritage items, an Aboriginal Archaeological and Cultural Heritage Management Plan will be developed in consultation with the Registered Aboriginal Parties and relevant regulators. The plan will include detailed salvage methodologies to be carried out prior to commencement of the Project and protection and conservation of archaeological sites that are not impacted by the Project.

# HISTORIC HERITAGE

A Historic Heritage Impact Assessment was undertaken by AECOM Australia. The purpose of the assessment was to identify the historical heritage sites in the vicinity of the Project and to assess the impacts to these sites. A total of 18 sites were assessed to be of heritage significance within and directly adjacent to the Study Area. There are no heritage items or sites within the Project Boundary listed on statutory UNESCO, Commonwealth or New South Wales State or Local government lists, registers or schedules.

The development of the Project will result in direct impacts to seven sites within the Project Disturbance Boundary that have been assessed as having historic heritage values. These sites will need to be demolished prior to disturbance. In order to retain information about the role and contribution of these items in the history of the locality, oral history recordings have been made and Archival recordings, including scaled drawings and photographs of the sites will be undertaken prior to their demolition.

The management of these sites within the Project Boundary will be undertaken through the implementation of a Historic Heritage Management Plan. Conservation Management Plans will also be developed to guide the conservation of Tarwyn Park Farm Complex, Bylong Station Farm Complex and Homestation.

## HISTORICAL BURIALS

The former Catholic Church and Cemetery (now owned by KEPCO) is located within the Project Disturbance Boundary. Burials within the Cemetery will need to be exhumed and the remains relocated following consultation with various stakeholders and the receipt of the necessary approvals.

An Archaeological Assessment for Historical Burials was completed by Edward Higginbotham and Associates, in association with the Historic Heritage Impact Assessment.

The surveys identified burials within the Cemetery of the former Our Lady of the Sacred Heart Catholic Church in Upper Bylong. Historical biographies have been completed of those known to be buried in the Cemetery.



## SOIL AND LAND CAPABILITY

A Soil, Land Capability and Strategic Agricultural Land Assessment was undertaken by SLR Global Environmental Solutions. The purpose of the assessment was to identify the soil types, land capability and the available soil resources to be managed for rehabilitation within the Study Area.

Forty soil units and 14 soil-phases were identified. The Soil Assessment determined that a total of 5.51 Million cubic metres (MCM) of soil resource is available for management across the areas of land which are proposed to be directly and permanently impacted. This exceeds the 4.73 MCM required for rehabilitation.

The Land and Soil Capability Assessment Scheme (OEH, 2012) was applied to assess the inherent physical capacity of the land. The Land and Soil Capability classes for the Study Area ranged from Class 3 to Class 7. All five Land and Soil Capability Classes are present within the Project Disturbance Boundary. The dominant land capability category within the footprint is low capability land (Classes 6 and 7; 43%), followed by moderate capability land (Classes 4 and 5; 33%) and then high capability land (Class 3; 24%). Following the completion of mining, the Land and Soil Capability classes within the Project Disturbance Boundary are predicted to remain within the same pre-mining capability range (Class 3 to Class 7).

The Study Area has been assessed against the mapping and criteria outlined in the Strategic Regional Land Use Plan - Upper Hunter and the Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land as part of the Soil and Land Capability Impact Assessment to gain an appreciation of the extent and likely impact of the Project on potential Biophysical Strategic Agricultural Land. KEPCO has committed to minimising the Projects impacts on Biophysical Strategic Agricultural Land.

Of the potential 2,875 ha of land to be impacted by the Project, only approximately 15% (440 ha) is located on land verified as Biophysical Strategic Agricultural Land (see Figure 16). The quantity of Biophysical Strategic Agricultural Land that will be directly and permanently impacted (206 ha) will be reinstated to mitigate Project impacts. Following rehabilitation, there will be no predicted reduction in the quantity of Biophysical Strategic Agricultural Land; however the spatial distribution of Biophysical Strategic Agricultural Land will differ from the pre-mining landscape. KEPCO will aim to reinstate 10% greater area of Biophysical Strategic Agricultural Land than is predicted to be disturbed as a conservative approach to achieving the rehabilitation objective.

KEPCO will develop a Soil Resource Management Plan prior to the commencement of construction works for the Project. This plan will provide detailed management measures to minimise impacts to soil resources during stripping, stockpiling and emplacement activities.







## REHABILITATION, FINAL LANDFORM AND MINE CLOSURE

A Rehabilitation Strategy and Biophysical Strategic Agricultural Land Reinstatement Strategy has been developed for the Project by SLR Global Environmental Solutions. The purpose of the Rehabilitation Strategy was to provide objectives for the rehabilitation of land that will be disturbed as a result of the Project, create stable, non-polluting post-mining landforms that are cognisant of site constraints and allow the achievement of the agreed post-mining land uses.

KEPCO's overarching post-mining land use goals for the Project include:

- Where practical, returning the land to its pre-mining land capability and land use;
- Returning land subject to temporary disturbance to pre-mining condition;
- Returning a similar quantity of existing productive agricultural land back to that purpose; and
- Returning a similar quantity of permanently disturbed land classified as Biophysical Strategic Agricultural Land back to that classification.

The rehabilitation program for the Project involves the progressive rehabilitation of open cut mining areas and overburden emplacement areas, the establishment of an integrated stable final landform, soil management and translocation, implementation of erosion and sediment controls, revegetation and relevant maintenance and monitoring to achieve a successful and self-sustaining final landscape.

Disturbed areas will generally be reshaped within one year of overburden placement and then rehabilitated to the target Land and Soil Capability classes. The Project has committed to rehabilitating land to Land and Soil Capability Classes 3, 4, 5, 6 and 7 on the landform that is to be directly and permanently disturbed.

In addition, within these areas, the Land and Soil Capability Class 3 areas re-established will be rehabilitated to meet Biophysical Strategic Agricultural Land criteria.

The Project will directly and permanently disturb 206 ha of the verified Biophysical Strategic Agricultural Land within the Project Disturbance Boundary. A total of 227 ha of Biophysical Strategic Agricultural Land will be re-instated over the life of the Project on the rehabilitated landform. This correlates with the post-mining Land and Soil Capability Class 3 land. Mapped Equine Critical Industry Cluster is located within the land being directly and permanently impacted upon by the Project. This area of Equine Critical Industry Cluster (pre-mining) is associated with Land and Soil Capability classes 3 through to 7, inclusive. The dominant pre-mining Land and Soil Capability classes are the grazing classes 4 and 5. The Rehabilitation Strategy is to realise the returning of the land to Land and Soil Capability Classes within the same pre-mining range. The dominant post-mining Land and Soil Capability Classes are 3 and 5, which would be suitable for equine related land uses post-mining. Such an outcome will provide an important land use indicator for future landholders should they wish to re-establish equine related activities on the rehabilitated landform.

The Rehabilitation Strategy has been designed to achieve a stable final landform consistent with the surrounding environment. All finished slopes are designed to a safe, geotechnical maximum angle. The final landform will incorporate contour-graded banks installed during the progressive rehabilitation process. The spacing and ultimate dimensions of these banks will be a function of the final slope and catchment area. On the slopes exceeding 10 degrees, linear contour bank spacing will generally range between 50 m and 80 m. A conceptual final landform has been designed for the Project following the completion of mining at year 25. The final landform will contain no voids with the two open cut mining areas to be backfilled in accordance with the final landform design (see Figure 17).

A suite of measures will be applied during the rehabilitation program, including erosion and sediment controls, topsoil management and translocation, weed and feral pest controls, and revegetation. The success of rehabilitation efforts will be measured against the completion criteria developed for the Project. All Project mine site facilities will be decommissioned and rehabilitated, as necessary, at the time of closure.

KEPCO will actively participate in trials and research to improve mine site rehabilitation techniques and enhance performance outcomes. A Mine Closure Plan will be developed for the Project and shall reflect contemporary expectations, including changes to the final mine plan, regulatory requirements, new technologies and stakeholder expectations as required.

#### FIGURE 17 Conceptual Final Landform



# AGRICULTURE

Scott Barnett and Associates prepared an Agricultural Impact Statement which addressed the impacts of the Project on agriculture through disturbance of land and reduced access to water resources. The Agricultural Study Area contains cleared agricultural land with native vegetation, a section of the Bylong State Forest and other portions of Crown Land. In general, current and historical agricultural activities in the surrounding locality include:

- Beef cattle grazing;
- Fodder cropping;
- Improved pastures;
- Irrigated cropping; and
- Limited equine activities (Australian Stock Horse and pleasure and performance horses).

This typically reflects the enterprises found in the northern end of the Bylong Valley (where the Project is located), which is generally representative of cattle breeding with a lesser emphasis on lucerne hay production and fodder cropping. The existing gross value of agriculture production within the Study Area, based on the current land use, is approximately \$5.3 Million per annum.

Two categories of Strategic Agricultural Land as defined under the Strategic Regional Land Use Plan – Upper Hunter have been identified as occurring within the Study Area. A total of 2,366 ha of Biophysical Strategic Agricultural Land was verified and mapped within the Study Area. Mapped Equine Critical Industry Cluster occurs in approximately 1,933 ha of the Study Area and 584 ha occur within the Biodiversity Offset Areas (see Figure 18).

The majority of the Biodiversity Offset Areas to be managed for conservation purposes is composed of Agricultural Domain C. Agricultural Domain C is the most abundant (1,324 ha or 35%) and is the lowest quality agricultural land within the Agricultural Assessment Area. Due to the limitations of the domain including dense vegetation, slope and rockiness it is unsuitable for cultivation and only capable of a low carrying capacity and is therefore best suited to nature conservation. The agricultural enterprises currently operating within the Biodiversity Offset Areas are associated with Livestock (cattle). The existing gross value of agriculture production based on the current land use is approximately \$1.4 Million per annum.

The combined gross value of production from the agricultural land and water impacted by the Project is approximately \$2.66 Million per annum. This represents approximately 4% of the total agricultural production of the Mid-Western Regional Local Government Area, 0.02% of New South Wales and 0.005% of Australia's agricultural production.

In total, foregone gross value and net value of agricultural production from land and water resources required for the Project is estimated at a present value of \$5.4 Million and \$1.4 Million, respectively (using a 7% discount rate). This is significantly less than the present value of total net production benefits of the Project to Australia, which is estimated at \$596 Million.

Cattle Grazing in the Bylong Valley to South of Project Boundary







As the overall current agricultural contribution of the land within Project Disturbance Boundary and the Biodiversity Offset Areas is small when compared to the total agricultural production on regional, state and national scales, the reduced availability and productivity of this land will have a negligible impact on the agricultural industry.

### **Biophysical Strategic Agricultural Land**

There is a total of approximately 440 ha of verified Biophysical Strategic Agricultural Land within the Project disturbance footprint (Project Disturbance Boundary and Subsidence Study Area (as shown on Figure 16)).

This represents 26% of the total verified Biophysical Strategic Agricultural Land within the Project Boundary (1,675.9 ha). No land within the Biodiversity Offset Areas is predicted to be subject to direct or permanent disturbance nor are there any anticipated impacts to soil fertility, rooting depth, soil profile materials, soil thickness, surface microrelief and/or soil salinity. Therefore, the Project will not significantly reduce the agricultural productivity of potential Biophysical Strategic Agricultural Land within the Biodiversity Offset Areas, but rather modify the land use in some areas of native vegetation.

#### **Equine Critical Industry Cluster**

A total of 700 ha of mapped Equine Critical Industry Cluster is located within the Project Disturbance Boundary (29% of the total mapped Equine Critical Industry Cluster within the Study Area) and will be directly disturbed by the Project (see Figure 18). These areas account for approximately 0.94% of Equine Critical Industry Cluster within the Upper Hunter Region. There is an additional 584 ha of mapped Equine Critical Industry Cluster within the Biodiversity Offset Areas, 69 ha of which fall within areas of cultivated land and as such will remain for agricultural activities which could include equine husbandry. Under the best practice equine land use scenario, the annual Net Value of Production potentially lost as a result of the Biodiversity Offsets Areas within areas of mapped Equine Critical Industry Cluster is \$869,804.

Accordingly, in relation to the entire Upper Hunter Equine Critical Industry Cluster the impacts have been assessed as minimal. This is due to the size of the impacted area, representing 0.94% of the mapped Equine Critical Industry Cluster within the Upper Hunter Region, and its location as an isolated pocket at the absolute extremity, approximately 1½ hours' drive from the equine centre of Scone.

## VISUAL

A Visual Impact Assessment was undertaken by JVP Visual Planning and Design. KEPCO recognises the scenic setting within which the Project is located and has given specific consideration to minimising the visual impacts of the Project on sensitive viewing locations in the mine planning and design phases of the Project. Specific mine planning decisions made in consideration of minimising visual impacts include:

- A reduction as far as is economically viable and technically feasible of the open cut mining footprint and limiting the duration of open cut mining activities;
- The siting of the Mine Infrastructure Area between existing topographic features to achieve screening from many sensitive external viewing locations, especially the main valley along the Growee River;
- Implementation of progressive Overburden Emplacement Area rehabilitation during mining operations to reduce visual effect levels of these features; and
- Retention of iconic high topographic points in the local landscape setting.

While the Bylong Village which is located to the north of the Project would have a high sensitivity to any views of the Project, tree cover and topography screen views to Project elements from this location resulting in a low visual impact. One rural residence in this area will be subject to views and will receive visual impacts prior to rehabilitation. The progressive rehabilitation of OEAs will reduce such impacts to very low as the mine progresses.

For one private rural residence, located near the eastern boundary with views to the mine operations, visual impact will be high up to four years from the commencement of open cut mining operations due to the visual effect of the pre-rehabilitated overburden emplacement area. After Year 4, progressive rehabilitation reduces the extent of high level visual effect areas. Visual integration and a further reduction in visual effect occurs as rehabilitation progresses southward behind the advancing open cut mine face. When the rehabilitated final landform is achieved, visual effects will be lowered resulting in impacts being reduced to moderate and low.

A number of rural residences are located to the south however the majority of these have been purchased by KEPCO. Localised screening by intervening topography and woodland vegetation will eliminate views of the open cut mining areas and overburden emplacement areas from the private residences.

There are privately owned residences to the west of the Project located on Bylong Valley Way. These residences are screened from views of the Project by the existing ridgeline topography.



Bylong Valley Way Looking South-West

#### Lighting

Visual impacts emanating from light sources are low for sensitive receptors primarily due to the influence of intervening topography. Mitigation measures in the form of landscape treatments and normal light management through directional lighting and hooding will further reduce diffuse light spillage from active work areas.

#### **Equine Critical Industry Cluster**

Land mapped as Equine Critical Industry Cluster within the Lee Creek and upper reaches of the Bylong River catchments is not currently utilised for equine purposes and due to the proximity to the Project Disturbance Boundary, are not anticipated to be utilised for equine related purposes for (at least) the open cut operational period. Due to the existing agricultural land uses on the mapped Equine Critical Industry Cluster, the short term nature of the open cut mining operations phase, the Project Rehabilitation Strategy and the proximity of the Project to the central area of the Equine Critical Industry Cluster, visual impact on the greater Equine Critical Industry Cluster will be negligible.

#### Cliffs

The visual impact of potential cliff instability (rock falls) to sensitive receivers has been determined to be low due to the separation distances between sensitive receivers and potentially impacted cliffs or the topographic separation.

Some cliff lines are visible when travelling along Bylong Valley Way (at a distance of more than 3 km). The visual impact to Bylong Valley Way from potential subsidence to cliffs is determined to be moderate. One receiver, located near the eastern extent of the Project Boundary, with views to the cliffs within the Underground Extraction Area approximately 1.5 km away, is likely to receive a moderate/high visual impact from potential subsidence impacts to particular cliffs. Potential subsidence related impacts to cliffs may also be visible from Wallys Road (name denoted to the most eastern section of Wooleys Road), at a distance of more than 1.5 km. If rockfall to the visible cliffs occurs within the direct line of sight to Wallys Road, the visual impact of this is likely to be moderate.

Offsite mitigation measures will be implemented for the Project, and will include the development of roadside tree screens and consultation with local landholders regarding the need for additional treatment at residences where views to the Project operations are available and would create high visual impacts.

## TRAFFIC AND TRANSPORT

A Traffic and Transport Impact Assessment was undertaken for the Project by Parsons Brinkerhoff. Given the low amount of traffic generated by the Project over a daily and peak hourly period, and the spare capacity within the road network, only minimal impacts are foreseen on the surrounding road network. Road mid-block capacities and intersection performance on Bylong Valley Way, Upper Bylong Road and Wollar Road will continue to perform well within capacity with the introduction of Project related traffic.

Although the increases in traffic are predicted to remain within the capacity of the existing network, the Project will result in increased usage of key roads and intersections. As such, road and intersection upgrades are proposed for the Workforce Accommodation Facility, Upper Bylong Road and adjoining roads and will occur during the initial construction of the Project.

Discussions with the Mid-Western Regional Council have confirmed that the 17 km section of Wollar Road between Bylong Valley Way and the Wollar Village that is currently unsealed will be upgraded and sealed. The upgrade of Wollar Road will be funded by a \$14 Million grant which has been secured under the New South Wales Resources for Regions Grants Program.

Upper Bylong Road will be widened from Bylong Valley Way to the mine infrastructure areas to accommodate the proposed mine traffic. A private access road is to be constructed over the Sandy Hollow to Gulgong Railway Line to access the underground mine infrastructure area incorporating the existing level railway crossing. This road will commence with a priority controlled T-junction with Upper Bylong Road (with dedicated left and right turn lanes on Upper Bylong Road) and will extend to a 300 m length on the southern side between the level railway crossing and Upper Bylong Road. Realignment of Upper Bylong Road will occur along the southern side of the Sandy Hollow to Gulgong Railway Line to connect with Wallys Road to the east, providing continued access for private landholders to the east of the Project.

The southern reaches of Upper Bylong Road will be decommissioned to facilitate mining operations within the eastern open cut mining area. The potential upgrade of either Lee Creek Road or Budden Gap Road is being considered to provide alternate access to private landholders. In the event that negotiated agreements are reached with relevant landholders for the resultant loss in optionality for land access and Mid-Western Regional Council is in agreement that neither of the two road upgrades is required, then neither of these upgrades will be progressed.

The proposed intermittent road closures for mine blasting purposes should not be a major inconvenience to the relatively low number of traffic users on the affected roads.

The Project will require the construction of a rail loop that connects the Project to the Sandy Hollow to Gulgong Railway Line. The Project will require an average of 2 trains per day and a peak of 10 trains per day. This assumes that standard 96 wagon (9,200 tonne payload) trains are used. There is adequate capacity of the Sandy Hollow to Gulgong Railway Line to accommodate the Project.

KEPCO will develop a Construction Traffic Management Plan for the Project, which will be prepared to ensure the traffic network can be safely and efficiently managed throughout the construction and operational phases of the Project.

Bylong Valley Way Looking South





# GEOCHEMISTRY

A Geochemical Impact Assessment was completed by RGS Environmental. The assessment was undertaken to determine the geochemical qualities of the geology being mined and to confirm any potential for acid generation which can lead to unwarranted water quality outcomes for rehabilitation activities.

Samples representing overburden, interburden, coal seam and composite overburden materials (collectively termed 'overburden') were included in the Geochemical Assessment program. The results demonstrate that the majority (98.5%) of overburden materials tested is Non-Acid Forming. Total metal/metalloid concentrations in overburden materials are relatively low and sparingly soluble in leachate and are therefore unlikely to present a significant risk to rehabilitation activities and water quality. Coal reject and coal samples generated from the target Ulan and Coggan coal seams were included in the Geochemical Assessment program. The results indicate that approximately 80% of these materials are Non-Acid Forming and have a high factor of safety in respect to acid generation. Bulk coal reject materials are predicted to generate pH neutral to slightly alkaline leachate with relatively low salinity values upon contact with water.

Some limited quantities of the overburden and coal seam materials were identified to be potentially acid forming. Due to the potentially acid forming classification of some of the floor material and coal reject materials from the Coggan seam, there is some potential for parts of the underground mine workings and pit floor at the open cut operation, as well as some co-disposed coal reject materials to be a source of acidity. The implementation of appropriate mitigation and management measures will aim to adequately control or neutralise any potential acidity that may be generated by these materials.

Exploration Drilling on the Project



Most overburden, interburden and coal rejects that are associated with the Project have low sulphur content and consequently a low propensity for spontaneous combustion.

As coal reject materials for the Project will be well mixed, the amount of coal rejects with high sulphur content will be diluted to produce a composite material thereby also reducing the propensity for spontaneous combustion.

## SOCIAL

A Social Impact Assessment was prepared by Hansen Bailey for the Project. The purpose of the Social Impact Assessment was to develop a profile of the local area, which includes the regional service centre of Mudgee, the smaller settlements of Gulgong, Kandos and Rylstone and 14 villages and other localities and to identify likely future social impacts which may result from the Project.

A softening of the labour market has occurred across the Mid-Western Regional Council Local Government Area and adjoining Local Government Areas with the slow-down in the mining industry. The Project will result in the provision of new direct and indirect employment opportunities for local residents of the Mid-Western Regional Council Local Government Area. The Project will also increase the size of the labour force available for the non-mining sector through the introduction of new residents associated with Project employees. The Project is estimated to contribute approximately \$624 Million in annual direct and indirect output or business turnover in the regional economy for the next 23 years.

The Project will require up to approximately 800 people at peak construction, up to approximately 470 people during peak operations (Year 9) and approximately 275 people during underground only operations (Year 13 - Year 25).

The majority of the workforce associated with both construction and the operations phases is expected to be non-local hires. Approximately 85% of the Operations phase workforce is expected to be non-local hires. KEPCO is seeking to encourage all non-local hires associated with the Operations phase to relocate permanently to within a one hour commute of the Project Boundary. The majority (95%) of non-local hires associated with the Operations phase are anticipated to relocate to the Mid-Western Regional Council Local Government Area, with 85% of these people predicted to relocate to Mudgee township.

The Project workforce will be accommodated in a combination of:

- Short term 650 bed Workforce Accommodation Facility in Years 1 and 2 and a medium term 300 bed facility from Years 3 to 6;
- Existing KEPCO owned housing in the Bylong Valley;

- Private housing in the Local Area (i.e. within a one hour commute of the Project); and
- Short term accommodation options in the Local Area as necessary.

The Workforce Accommodation Facility will operate during the construction phases of the Project (Year 1 to approximately Year 6) providing accommodation for all non-local hires associated with the Project construction phase.

The Workforce Accommodation Facility may also provide short term accommodation for non-local hires associated with the Operations phase as an interim measure while employees secure longer term accommodation in the Local Area.

The Social Impact Assessment found some community infrastructure and services in the Mid-Western Regional Council Local Government Area are predicted to experience impacts from the Project.

Discussions with service providers in Mudgee confirms that the majority of predicted impacts on individual services including health services, children's services, and primary and secondary education services will generally be incremental and will be able to be absorbed by the 'natural' growth of those services.

The Project will result in significant economic benefits for the Mid-Western Regional Council Local Government Area and New South Wales. In addition to the economic benefits, KEPCO is currently finalising the terms with the Mid-Western Regional Council in relation to the preparation of a Voluntary Planning Agreement for the Project. The Voluntary Planning Agreement is the primary mechanism for managing socio-economic impacts associated with the Project and enhancing positive benefits and opportunities for the local area. KEPCO has provided an offer for the Voluntary Planning Agreement for the Mid-Western Regional Council's consideration and includes:

- \$2.75 Million contribution consisting of an initial payment of \$1.5 Million upon granting of Development Consent and KEPCO's approval to proceed, and a further \$1.25 Million (to be adjusted for consumer price index following 1 July 2017) at the commencement of the open cut mining operation; and
- Payment of \$0.05 (to be adjusted for consumer price index following 1 July 2017) per railed tonne of coal for the life of the Project, toward a Community Investment Fund.

KEPCO will develop a Social Impact Management Plan which will document the full suite of mitigation strategies proposed for the Project including mitigation strategies to be potentially funded via the Community Investment Fund. This will include content and a process with Mid-Western Regional Council for the management arrangements of the Community Investment Fund as allocated in the Voluntary Planning Agreement. The Social Impact Management Plan will also include a strategy for monitoring social impacts and the success of management strategies.

# ECONOMICS

An Economic Impact Assessment was undertaken by Gillespie Economics which has determined both the economic efficiency and economic impacts of the Project.

A comprehensive Benefit Cost Analysis, which has included conservative sensitivity modelling, confirms that when production costs (acquisition costs for affected land, opportunity cost of land, operating costs, decommissioning costs, etc.) and production benefits (revenues from production, residual values of land, etc.) are considered, the Project will have total net production benefits of \$596 Million to Australia. Based on this outcome, the Project is considered to be justified from an economic efficiency perspective. This net production benefit is distributed amongst a range of stakeholders including the local community, KEPCO and the Commonwealth and New South Wales governments.

In summary, the Project is estimated to make up to the following direct and indirect average annual contribution to the New South Wales economy for 23 years:

- \$855 Million in annual direct and indirect regional output or business turnover;
- \$492 Million in annual direct and indirect regional value added;
- \$135 Million in annual direct and indirect household income; and
- 1,496 direct and indirect jobs.

The Project is estimated to result in the following average annual contribution to the regional economy for approximately 23 years:

- \$624 Million in annual direct and indirect regional output or business turnover;
- \$378 Million in annual direct and indirect regional value added;
- \$72 Million in annual direct and indirect household income; and
- 830 direct and indirect jobs.

The capital investment associated with the Project is estimated to be in the order of \$1.3 Billion. The Project will result in total royalties of \$763 Million (or \$290 Million present value at 7% discount rate).

While the main environmental, cultural and social impacts have been quantified and included in the Benefit Cost Analysis, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between \$592 Million and \$757 Million for the Project to be questionable from an Australian economic efficiency perspective.

An economics specialist was engaged to peer review the Economics Assessment Report. Mr Drew Collins found that the Economic Assessment is a "generally sound report" that adequately addresses the Secretary's Environmental Assessment Requirements and relevant New South Wales Government guidelines in relation to economic analysis. The assessment "appropriately concludes that firstly, the project offers net economic benefits to the region, State and more broadly to Australia, and is therefore desirable from an economic efficiency perspective; and secondly, that the region and governments will be significant beneficiaries through the levels of regional employment and activity, and royalty and taxation collections respective!"

## MANAGEMENT AND MONITORING SUMMARY

In addition to the conditions that may be attached to any Development Consent granted for the Project, KEPCO has identified and commits to the operational controls summarised in the Management and Monitoring Summary in this Environmental Impact Statement for the activities associated with the Project.

The aim of the Management and Monitoring Summary is to ensure that any potential environmental impacts resulting from the Project as identified in this Environmental Impact Statement are minimised and managed by implementing relevant environmental monitoring, management and mitigation strategies.

Upper Bylong Road Looking to North-East

# **Project Justification**

This Environmental Impact Statement has identified and assessed the potential impacts of the Project in accordance with the Secretary's Environmental Assessment Requirements, the Gateway Certificate Recommendations, all relevant regulatory requirements and the findings from the extensive consultation program undertaken over the Project.

KEPCO acquired Authorisations 287 and 342 in December 2010, with the intention to develop a coal mine to recover some of the extensive coal resources that are known to occur within this area. KEPCO's acquisition of the Authorisations and proposed development of the Project is strategically important to assist in meeting KEPCO Korea's overarching objective of securing critical energy coal resources for the people of South Korea.

The Project team investigated numerous mine planning scenarios to maximise the recovery of the coal resource within Authorisations 287 and 342. During this process, a vital consideration in refining each mine planning option was an assessment of the key environmental constraints. This process has resulted in some material concessions being made to the mine plans and infrastructure layouts including reducing the number of open cut mining areas from seven to two, to avoid impacts or where impacts are unable to be avoided, to minimise impacts whilst maintaining the viability of the Project.

The open cut mining areas to be developed in the initial eight years of mining operations are essential for ensuring the economic viability of the Project whilst also providing the most robust solution for the emplacement of coarse and fine reject materials which are generated from the longer term underground mining operations. Without the resultant void space generated by the open cut mining areas, extensive emplacement areas (or dams) would need to be constructed to accommodate the coal processing waste which will be generated throughout the 23 operations years of the Project.

The Project will optimise the social and economic benefits from the extraction of this New South Wales government owned coal resource including the employment of up to approximately 470 people throughout operations. Exports of product coal generated by the Project will also provide net social benefits to Australia of between approximately \$592 Million and approximately \$757 Million. Royalties for the New South Wales Government are expected to total approximately \$290 Million (present value).



The Project has been assessed conservatively on an 'appropriate worst case' environmental impact basis, assuming it will operate at a maximum coal production rate of 6.5 Mtpa, with all feasible and reasonable management and mitigation measures being applied. The environmental assessment of the Project has adopted the following general methodology:

- Considering the objects of the *Environmental Planning and* Assessment Act 1979, including the principles of Ecologically Sustainable Development and leading practice environmental and social standards;
- Ongoing consultation with stakeholders to identify any additional issues to be addressed in this Environmental Impact Statement;
- Undertaking detailed technical assessments (including peer reviews by pre-eminent independent specialists) to quantify potential environmental impacts with certainty; and
- Developing environmental management and mitigation measures as required.

These commitments provide certainty that the impacts of the Project will remain within the predictions presented within this Environmental Impact Statement.

KEPCO has made an offer to enter into a Voluntary Planning Agreement with Mid-Western Regional Council to provide material public benefit(s) to the Local Government Area. This offer comprises an upfront capital contribution and ongoing payments based on coal production.

The Project will maximise the economic and social value from the extraction of the coal resource by utilising a mine plan that will appropriately address the identified environmental and socio-economic constraints and the objects of the *Environmental Planning and Assessment Act 1979*, including the principles of Ecologically Sustainable Development. The Project will provide net production benefits to Australia of approximately \$596 Million (approximately \$315 Million to New South Wales) and will:

- Maximise the recovery of a thermal coal resource, within the environmental constraints identified, for which there is an increasing global demand;
- Create approximately 830 direct and indirect jobs on a regional basis (Mid-Western Regional Council Local Government Area);
- Create approximately 1,496 direct and indirect jobs in New South Wales;
- Continue and extend financial support to the region, New South Wales and Australia with taxation and royalty benefits of approximately \$592 Million over the life of the Project; and
- Achieve the most efficient economic use of the land.

In conclusion, the Project will serve the essential purpose of providing thermal coal for current and future generations predominantly in South Korea and will generate significant economic benefits to the Mid-Western Regional Council Local Government Area, New South Wales and the wider Australian economy in the process.

The social and environmental impacts of the Project will be avoided or minimised as far as practicable by implementing all reasonable and feasible management and mitigation measures. As a consequence, the socio-economic benefits of the Project will far outweigh its social and environmental impacts. Therefore, there is a strong argument that the Project should be found to be in the public interest.

Looking South-West from Land Proposed for CHPP



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