The estimated rainfall recharge to the alluvial aquifer within the Bylong River Water Source is estimated at 2,580 ML/year. At the commencement of the Hunter Unregulated and Alluvial WSP in 2009, there were the following licence allocations under the "*Bylong River Water Source*" which makes up 20% of the total Goulburn Extraction Management Unit:

- Total surface water entitlement: 65 ML/year (100% used for irrigation purposes);
- 2 surface water licences for Peak Daily Demand = 1.4 ML/day; and

Total groundwater entitlement over 23 licences: 5,843 ML/year (100% used for irrigation purposes).

KEPCO currently holds six WALs with a total allocation of 1,959 ML/year. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. Further water allocations are likely to be secured by KEPCO into the future as the Project progresses through the planning approvals process.

Groundwater Dependent Ecosystems

A desktop analysis has been completed to identify whether any Groundwater Dependent Ecosystems (GDEs) have been mapped on a regional basis within the Project Boundary. The Hunter Unregulated and Alluvial WSP does not map any GDEs within the Project Boundary.

A review of the National GDE Atlas (BOM, 2013) for the land within the Project Boundary confirmed that there are no mapped GDE in the Bylong River and Lee Creek catchments. The Growee River in the western portion of the Project Boundary is mapped as low to moderate potential for GDE supported by surface expressions of groundwater.

The Hunter Unregulated and Alluvial WSP and the National GDE Atlas only presents a guide to potential GDEs within the area. Accordingly, further field investigations are being undertaken to determine if GDEs are present during the preparation of the EIS. An early survey on the hills on Tal Tal Mountain and Mt Penny identified some patches of swampy land dominated by *Backhousia myrtifolia* (Grey Myrtle). However, these patches of swampy land appear to be more rainfall dependent rather than groundwater dependent.

3.5 SURFACE WATER

3.5.1 Catchments

The Project is located within the catchment of the Bylong River, a tributary of the Goulburn River, which in turn is a tributary of the Hunter River. The Bylong River drains generally northwards, from the south-east, through the Project Boundary. A number of tributaries (see **Figure 3**) feed into the Bylong River throughout the Project Boundary, including: Reedy Creek, Wattle Creek, Cousins Creek, Lee Creek, Growee River, Dry Creek and Coggan Creek.

The drainage network in the Bylong Valley varies from steep headwater gullies to wide, flat, alluvial floodplains. These systems are generally ephemeral in nature and flow towards the north to the Goulburn River.

3.5.2 Water Quality

Through the implementation of its WMP, KEPCO has monitored surface water flows and water quality on a monthly basis within the regional surface water systems since February 2012. **Figure 15** shows monitoring locations.

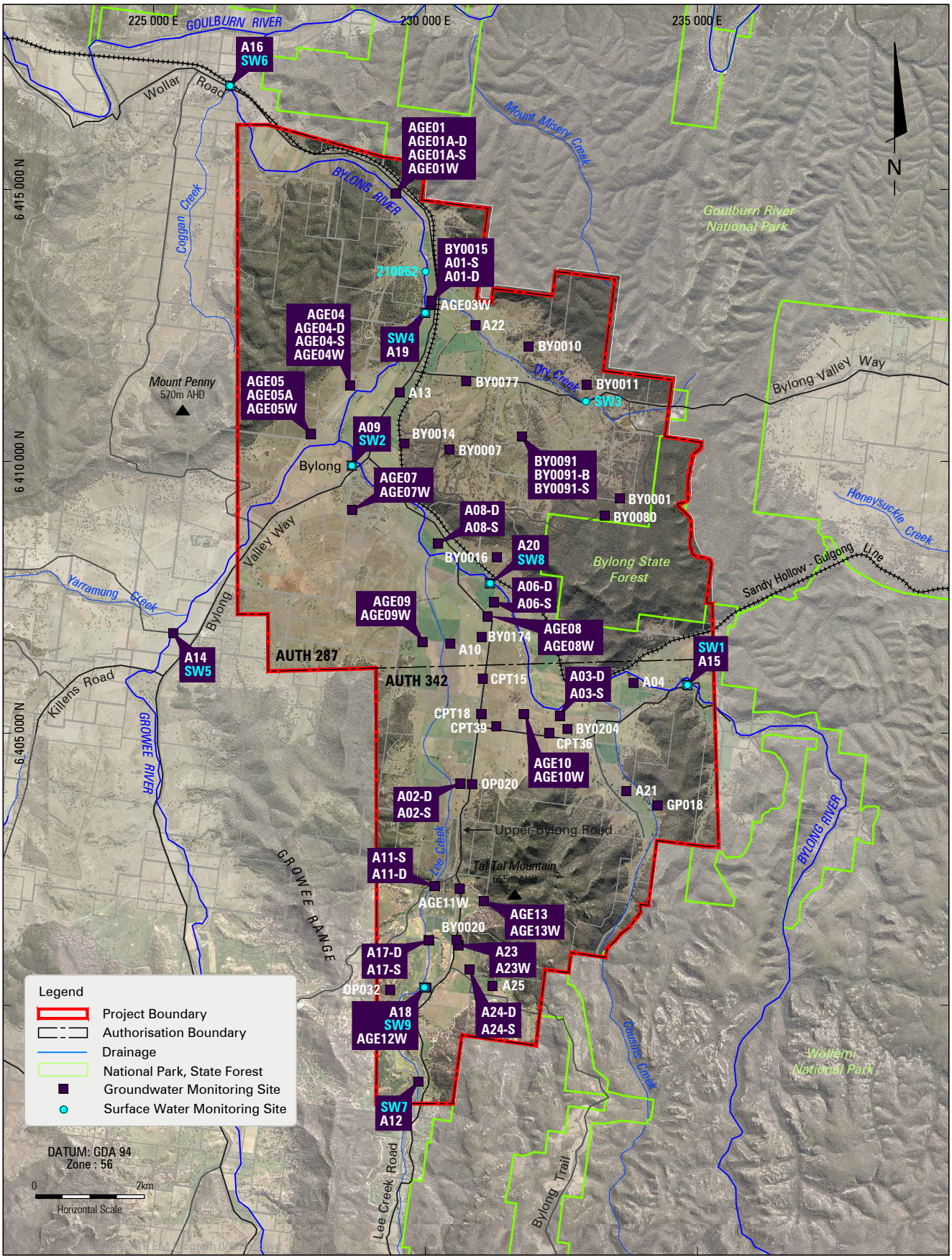
Monitoring has shown the surface water within the catchment has an average EC ranging from 224 µS/cm to 1,790 µS/cm with six of the monitoring sites exhibiting an EC below 1,000 µS/cm. The salinity of surface water suggests a significant groundwater baseflow component to the surface water regime.

3.5.3 Bank Stability

The lower reaches of Bylong River and Lee Creek consist of a wide, flat floodplain, with a small, poorly defined low-flow channel. Extensive clearing of the floodplain has been undertaken as part of farming activities, with complete removal of riparian vegetation along substantial reaches. Significant bank erosion is evident in the mid-reaches of both Bylong River and Lee Creek.

3.5.4 Water Users

As discussed in **Section 3.4.2**, there are two surface water entitlements that have been granted within the Bylong River Water Source allocating 65 ML/year for irrigation purposes. These two licences are located in the northern part of the Project Boundary (on privately owned land) and have a peak daily demand of 1.4 ML/day.



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Environmental Monitoring Program - Water

FIGURE 15

4 ASSESSMENT APPROACH

This section outlines the approach taken to this assessment including consideration of the regulatory framework under which a Gateway Certificate Application should be prepared, including the Environmental Planning & Assessment Regulation 2000 and *Mining SEPP. It provides a relevant discussion in the methodologies applied to the determination and assessment of BSAL, CIC and the AIP in relation to the Project.*

4.1 INTRODUCTION

Figure 16 conceptually illustrates the legislative requirements applicable to the Project and demonstrates the relationship between the requirements under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) Referral, NSW EP&A Act Development Consent, Mining SEPP Gateway Certificate and stakeholder engagement processes.

4.2 REGULATORY FRAMEWORK

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. The EPBC Act is administered by the Department of the Environment (DoE) (formerly Sustainability, Environment, Water, Populations and Communities (SEWPaC)) and provides protection for listed Matters of National Environmental Significance (MNES). The MNES of potential relevance to the Project include listed threatened species, ecological communities, migratory species and water resources.

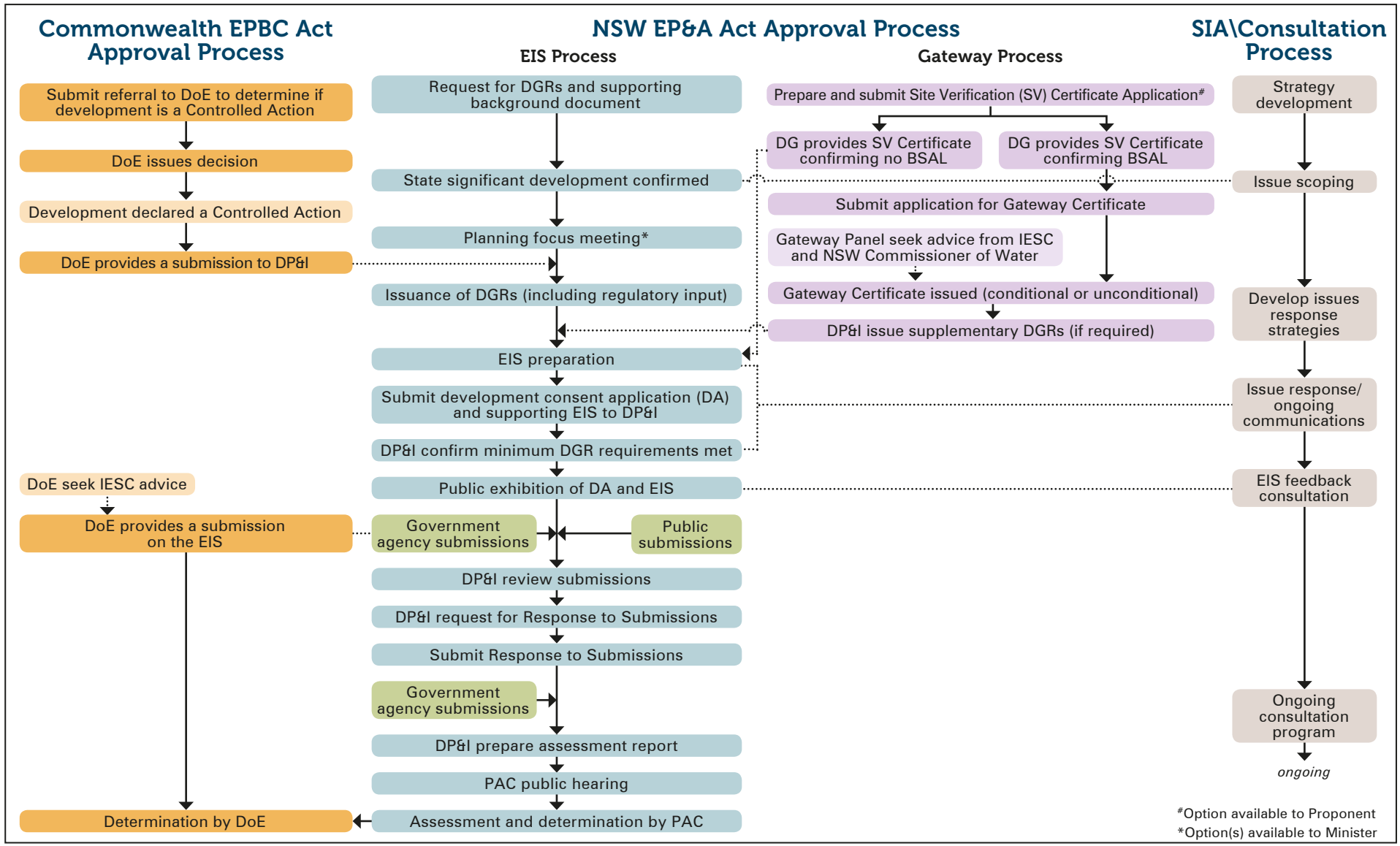
A Referral including a supporting assessment of significance for each threatened species and community and the potential impact upon water resources will be made to DoE to obtain confirmation of whether or not a Project constitutes a Controlled Action. The submission of the relevant Referral will be undertaken following the submission of this document and Gateway Certificate Application.

4.2.2 Environmental Planning and Assessment Regulation 2000

Applicable Land

As noted in Division 2 of Mining SEPP, Clause 50A of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation) requires that:

> *"a development application for consent to mining or petroleum development on certain identified land (including land shown on the Strategic Agricultural Land Map) must be accompanied by either:*
>
> (a) *A Gateway Certificate; or*
>
> (b) *A Site Verification Certificate that certifies that the land on which the proposed development is to be carried out is not biophysical strategic agricultural land."*



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NSW Planning Approvals and Consultation Process

FIGURE 16

KEPCO intends to apply to the Minister for Planning & Infrastructure to seek Director-General's Requirements (DGRs) in accordance with Schedule 2, Clause 3 of the EP&A Regulation to address in an EIS to be submitted in support of an application for Development Consent. The Project meets the definition of mining as stipulated in the Mining SEPP.

KEPCO is required to hold a Gateway Certificate or a Site Verification Certificate (verifying there is no BSAL within Project Boundary) prior to making the Application for Development Consent. The Project Boundary contains areas of BSAL that are likely to be impacted by the Project. Accordingly, KEPCO has elected to apply for a Gateway Certificate for the Project.

This document supports KEPCO's Gateway Certificate Application.

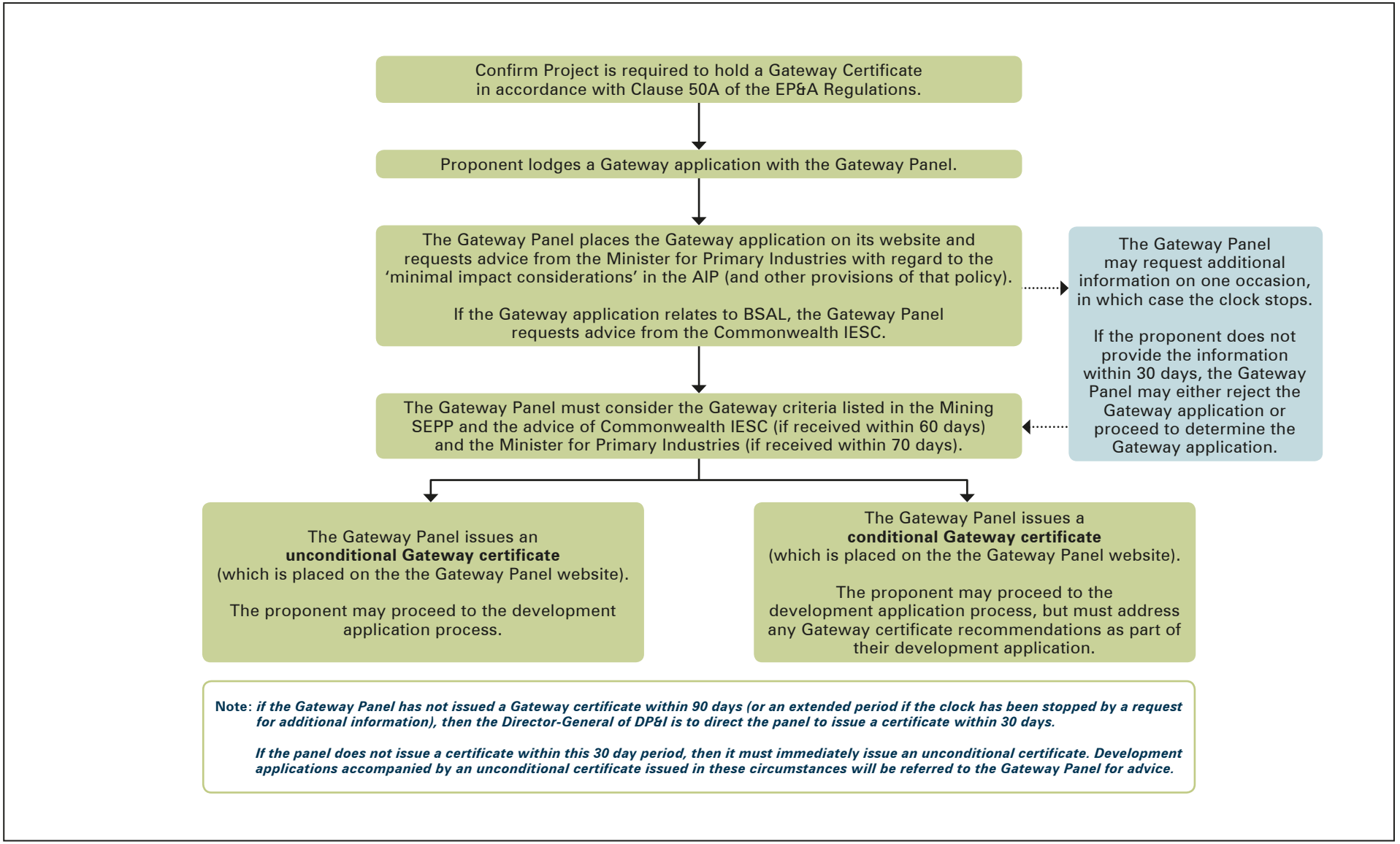
Figure 16 and **Figure 19** generally show each of the general Gateway Process and Site Verification Process, respectively.

Environmental Assessment Requirements

Clause 17B(1)(b) of the Mining SEPP requires that before determining an application for development consent by the consent authority, the consent authority must consider the written advice from the Gateway Panel that was received during the consultation required under Clause 3 (4A)(b) of Schedule 2 of the EP&A Regulation as follows:

> *"(4) In preparing the environmental assessment requirements with respect to an application for State significant development, the Director-General must consult relevant public authorities and have regard to the need for the requirements to assess any key issues raised by those public authorities.*
>
> *(4A) Without limiting subclause (4): …*
>
> *(b) if a Gateway certificate has been issued by operation of clause 17I (3) of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 in relation to the State significant development to which an application for environmental assessment requirements relates, the Director-General, in preparing the requirements, must consult with the Gateway Panel and have regard to the need for the requirements to assess any key issues raised by that Panel.*
>
> *(4B) If a Gateway certificate in respect of proposed State significant development is issued after environmental assessment requirements for that proposed development have been notified under this clause, the Director-General:*
>
> *(a) must have regard to any recommendations of the Gateway Panel set out in the Gateway certificate, and*
>
> *(b) may modify the requirements in accordance with subclause (5)."*

The Minister for Planning and Infrastructure will be required to consult with the Gateway Panel when KEPCO applies for DGRs if a Gateway Certificate has not been issued at that time. KEPCO intends to apply for DGRs early in 2014.



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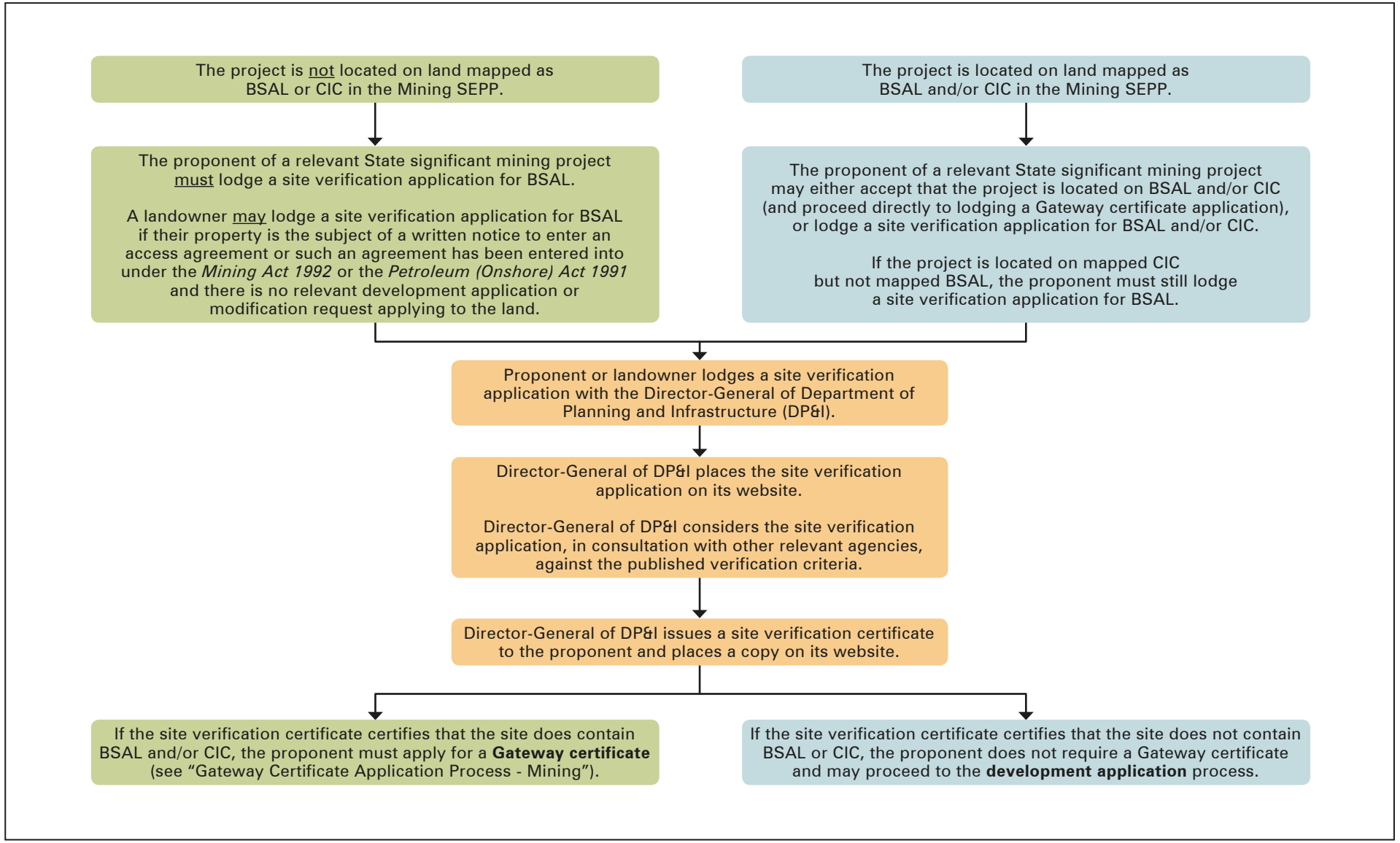
Gateway Certificate Application Process - Mining

FIGURE 17



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Site Verification Certificate Application Process - Mining

FIGURE 18

4.2.3 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

This document has been prepared to support a Gateway Certificate Application and will be determined in accordance with the Mining SEPP as generally described below.

Development Application Assessment

In accordance with Clause 17B(1) of the Mining SEPP, before determining any application for Development Consent, the consent authority must:

- Refer the application to the Minister for Primary Industries for advice regarding the impact of the Project on water resources; and
- Consider:
  - Certificate recommendations; and
  - Written advice from the Minister for Primary Industries;
  - Any written advice of the Gateway Panel in relation to consultations undertaken by the Director-General in accordance with Clause 3(4A)(b) of Schedule 2 of the EP&A Regulation (see **Section 4.2.1**);
  - Written advice of the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) provided to the Gateway Panel as per clause 17G(1); and
  - Any cost benefit analysis for the Project.

Clause 17B(2) and (3) requires the determining authority to further consider whether the recommendations set out in the Gateway Certificate have been addressed; and advice from the Minister for Primary Industries in relation to the *'Minimal Impact Considerations'* of the AIP and other provisions of that policy (see **Section 4.4**).

The Minister for Planning & Infrastructure (or delegate) will consider the above criteria in determining any application from KEPCO for Development Consent.

Applicability

Section 17A(1)(a) of the Mining SEPP defines "*mining*" for the purposes of the application as:

> *"development specified in Clause 5 (Mining) of Schedule 1 State Environmental Planning Policy (State and Regional Development) 2011, but only if: …*
>
> *(B) there is no current mining lease in relation to the proposed development …".*

The Project will require a mining lease under the *Mining Act 1992* prior to commencement of operations and as such meets this definition.

4.2.4 Gateway Certificate

Application

Clause 17F of the Mining SEPP requires that an application for a Gateway Certificate in respect of proposed mining or petroleum development on SAL, including BSAL and CICs, is to be made to the Gateway Panel and may only be made by the person who proposed to carry out the development.

Clause 17F(3) of the Mining SEPP notes that the application may only be made if written notification is given to the owner of the land before the application is made. As shown and described in **Section 3.1**, KEPCO owns or has agreements in place to acquire a majority of land in the Project Boundary and land where direct disturbance is proposed to occur.

For all privately owned properties within the Project Boundary, notification was provided to these landholders via a letter on 30 November and 2 December 2013, respectively. KEPCO also held follow up face to face briefings with these landholders during December 2013.

Further, a newspaper advertisement was placed in the 'Mudgee Guardian' on Monday, 9 December 2013 and 'The Land' newspaper on Thursday, 12 December 2013 with the first occurring at least 30 days prior to lodgement of this document in accordance with Clause 17F(3) of the Mining SEPP. A copy of each notification is provided in **Appendix B**.

Clause 17F(4) of the Mining SEPP stipulates the inclusions of an application which are reproduced in **Table 7**, which also indicates where each is addressed in this document.

Table 7
Gateway Certificate Application Requirements

Requirement	Where Addressed
Applicant Name and Address	**Section 1.3**
Address and Particulars of title of the subject land	**Appendix B**
A description of the proposed development	**Section 2**
Whether the land is BSAL or CIC land, or both	**Sections 4.3** & **4.3.4**
Be in the form (if any) approved by the Gateway Panel	N/A

Referral

Clause 17(G) of the Mining SEPP provides direction to the Gateway Panel in relation to matters which must be considered when determining an application for a Gateway Certificate, including referral of the Gateway Certificate Application to the IESC and Minister for Primary Industries for advice in relation to impacts on water resources.

The Gateway Panel must consider any written advice received from the IESC within 60 days and the Minister for Primary Industries within 70 days of the referral concerned.

The Minister for Primary Industries must have regard to the *"Minimal Impact Considerations"* of the AIP and other provisions of that policy.

4.3 BIOPHYSICAL STRATEGIC AGRICULTURAL LAND

4.3.1 Verification Process

The *Strategic Regional Land Use Plan – Upper Hunter Region* (SRLUP) (DP&I, 2012a) provided mapping of BSAL at a regional scale. Given the Project occurs at a local scale, the mapping provided in the SRLUP and other lands within the Project Boundary required review to determine a more accurate mapping of BSAL. This subsequently informs the assessment of likely impacts of the Project on this resource.

The extent of BSAL situated outside of the Project Boundary (as mapped by the SRLUP) has been assumed as being accurate on a regional scale. In this regard, no further review of this land has been completed for this document and is not required at this stage.

Extensive soils and land capability field work was completed within the Project Boundary in accordance with the '*Interim Protocol for Site Verification of Biophysical Strategic Agricultural Land'* (Interim Protocol) (OAS&FS and OEH, 2013) to validate and refine the regional mapping of BSAL that was included within the SRLUP. The Interim Protocol provides a procedure for determining if the soil resources and the availability of water within the Project Boundary embody the broader characteristics of BSAL (as defined by criteria in the SRLUP).

In order for land to be classified as BSAL, access to a reliable water supply is required. Criterion defining a reliable water supply is provided in the Interim Protocol. The Bylong Valley is located within an area with an annual average rainfall of greater than 350 millimetre (mm) and the Bylong River and Growee River alluvial groundwater are considered to be highly productive groundwater sources. Accordingly, the verification of BSAL required the consideration of the soil and water resources within the Project Boundary.

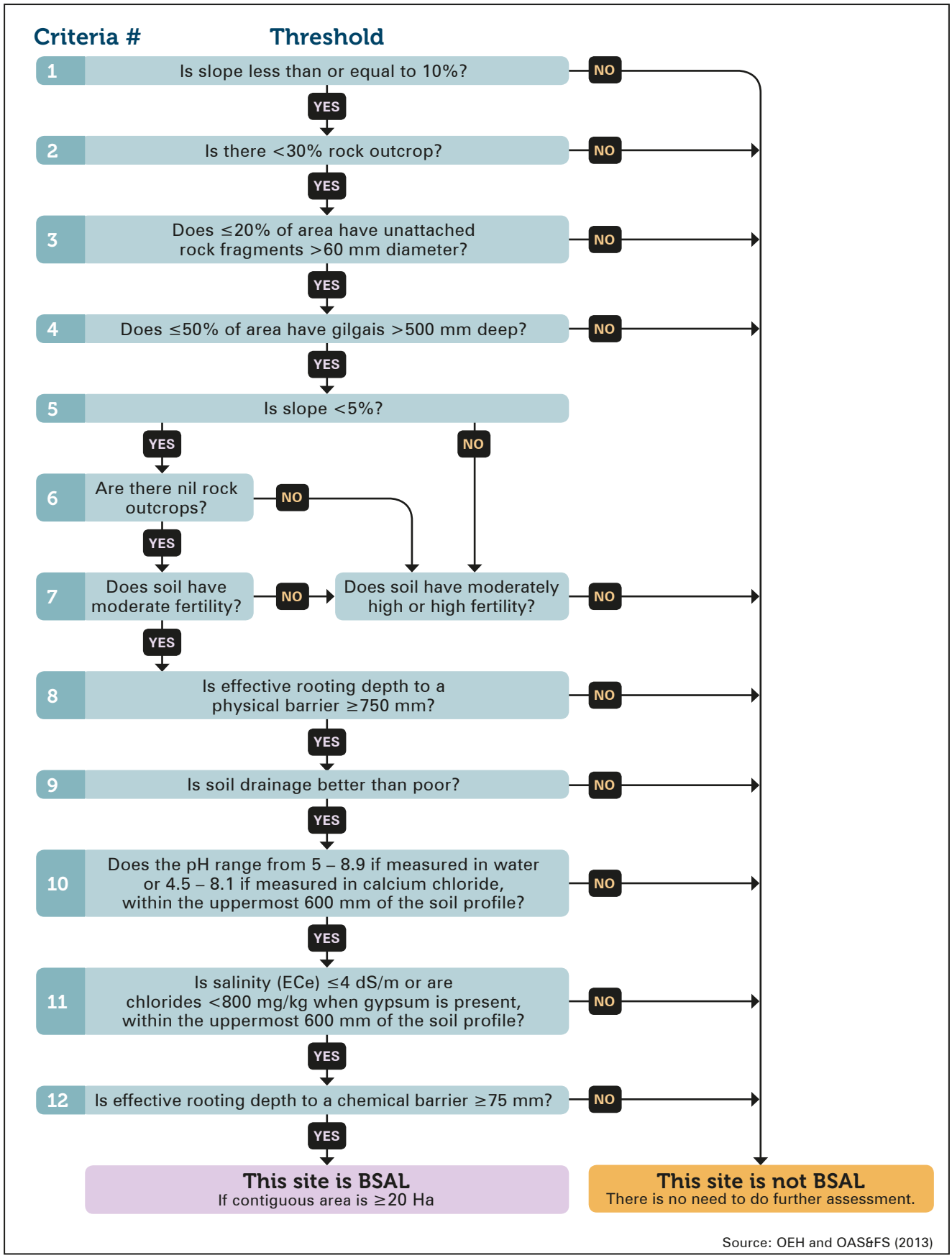
The Interim Protocol stipulates Soils and Landscape Verification Criteria, provided as a 12-step process, for determining if the applicable soil resource represents BSAL (as reproduced in **Figure 19**).

A detailed Soils and Site Verification Assessment was undertaken by SLR Consulting Australia (SLR) and is provided in **Appendix D**. This assessment determined the extent of BSAL within the Project Boundary in accordance with the requirements of the Interim Protocol. The methods adopted for this assessment are described further below.

As per the Interim Protocol, BSAL verification should include the entire Project Boundary and at least a 100 m buffer to take into account minor changes in the conceptual design. The Project Disturbance Boundary is wholly within the Project Boundary. A buffer greater than 100 m between the closest point of the Project Disturbance Boundary and the Project Boundary has been accounted for in relation to the assessment area.

Desktop Assessment

A desktop assessment was undertaken to gain an initial understanding of the soil resource within the Project Boundary. This assessment involved a review of applicable aerial photography, topographic, cadastral and soil maps and previous physiographic, geological, vegetation and water resources studies.



Source: OEH and OAS&FS (2013)

BYLONG COAL PROJECT

Site Assessment BSAL Verification Process

FIGURE 19

A conceptual soil *"reference map"* was then developed for the land within the Project Boundary based on the available information. This reference map was then used, in conjunction with a risk assessment, to inform the sample density and locations for the field assessment and the broader BSAL verification process (as described below).

Risk Assessment

To determine the likelihood for the Project to impact on soil resources (in particular BSAL) within the Project Boundary and the associated consequences of such impact, a risk assessment was undertaken in accordance with the risk ranking matrix outlined in Appendix 3 of the Interim Protocol (reproduced in **Table 8**).

The risk ranking matrix was applied to the levels and duration of disturbance for each type of activity or infrastructure (Project components) proposed to be undertaken within the Project Disturbance Boundary (2,667 ha). These Project-related activities comprise seven major components, including: open cut mining areas, OEAs, mine infrastructure, rail loop, roads (internal and haul roads), water storages (raw water storage and mine water dam) and Underground Extraction Area.

Table 8
Agricultural Impacts Risk Ranking Matrix

Probability / **Consequence**	**A** Almost Certain	**B** Likely	**C** Possible	**D** Unlikely	**E** Rare
1. Severe and/or permanent damage. Irreversible impacts.	**A1** High	**B1** High	**C1** High	**D1** High	**E1** Medium
2. Significant and /or long term damage. Long term management implications. Impacts difficult or impractical to reverse.	**A2** High	**B2** High	**C2** High	**D2** Medium	**E2** Medium
3. Moderate damage and/or medium-term impact to agricultural resources or industries. Some ongoing management implications which may be expensive to implement. Minor damage or impacts over the long term.	**A3** High	**B3** High	**C3** Medium	**D3** Medium	**E3** Medium
4. Minor damage and/or short-term impact to agricultural resources or industries. Can be managed as part of routine operations.	**A4** Medium	**B4** Medium	**C4** Low	**D4** Low	**E4** Low
5. Very minor damage and minor impact to agricultural resources or industries. Can be effectively managed as part of normal.	**A5** Low	**B5** Low	**C5** Low	**D5** Low	**E5** Low

Table 9 provides the area in hectares and percentage of land within the Project Disturbance Boundary to be impacted by each of the Project components. Of note, it describes each in terms of the Project: indirect and temporary impacts; direct and temporary impacts; and direct and permanent impacts (see **Section 5.1** for an outline of these impact categories).

The risk of the Project on BSAL soil resources varied from low to high based on the Project component under investigation and the level and duration of disturbance (see **Table 10**). Consistent with the Interim Protocol, sampling density is to be undertaken at a scale of 1:25,000 unless it can be demonstrated that the land will be subject to a low risk of impact. **Table 10** provides the predicted level of risk associated with each Project component having regard to the impacted soil resource. For the majority of Project components identified as having a high risk of impacting soil resources, the associated land was subject to a sampling density scale of 1:25,000. For the remaining Project components identified as having a high to low risk of impacting soil resources, the associated land was subject to a sampling density scale of 1:50,000 to 1:100,000.

The proposed survey effort was discussed and agreed in concept during a meeting with personnel from Office of Environment and Heritage (OEH) and Department of Primary Industries Office of Agricultural Sustainability and Food Security (OAS&FS) on 21 January 2013. Further justifications for the variations to the sampling density scale of 1:25,000 are provided in the explanatory notes in **Table 10**. The sampling density scales (from the risk assessment) subsequently informed the field assessment and the broader BSAL verification process.

Table 9
Project Impacts within the Project Disturbance Boundary

Project Component	Area (ha)	Percentage of Disturbance Boundary (%)
Indirect and Temporary Impact		
Underground extraction area	1,717	64
Subtotal	*1,717*	*64*
Direct and Temporary Impact		
Rail loop	50	2
Water storages (raw water storage and mine water dam)	12	<1
Roads (internal and haul roads)	53	2
Mine infrastructure	38	1
Subtotal	*153*	*6*
Direct and Permanent Impact		
Open cut mining areas	439	16
OEA	358	13
Subtotal	*797*	*30*
TOTAL	**2,667**	**100**

Table 10
Risk Assessment for Potential BSAL Impacts by Project Component

Project Component	Risk Rating		Sample Density
Open cut mining areas	A1-A3	High	1:25,000
OEAs	A1-A3	High	
Water storage (raw water)	A3	High[1]	
Rail loop	A3	High[1]	
Water storage (mine water dam)	A3	High[2]	1:50,000
Mine infrastructure and roads	A4	Medium	
Underground extraction area on non-SRLUP mapped BSAL	B5	Low	1:100,000
Underground extraction area on SRLUP mapped BSAL (non-alluvial influenced BSAL)	C4	Low[3]	
Nil disturbance	-	Nil[4]	1:100,000 to 1:250,000

[1] Project components will be left in place for future use; [2] Area of land is small and impact on agricultural industries is minimal, however, as topsoil and subsoil will be significantly disturbed it has been assigned a high rating; [3] BSAL is on elevated land and is not predicted to be significantly impacted by subsidence related effects; and [4] No survey required for BSAL verification. Survey scale nominated to satisfy typical DGRs.

Field Assessment

An extensive field assessment was undertaken to accurately characterise the soil resource within the Project Boundary. The field assessment commenced in November 2011 and continued regularly to August 2012, as land access progressively became available. This initial assessment adopted the methods outlined in '*Guidelines for Surveying Soil and Land Resources'* (NCST, 2009).

Following the introduction of the SRLUP in September 2012, further works were undertaken between February and April 2013 in accordance the '*Draft Interim Protocol for Verification of Biophysical Strategic Agricultural Land - Version 7*' (Draft Interim BSAL Protocol) (DPI, 2012). The purpose of this additional assessment was to supplement previous field work and satisfy the requirements of the SRLUP and the draft Interim BSAL Protocol. The Interim Protocol was released in April 2013, which was generally at the back end of the field works completed. The works undertaken in line with the draft Interim BSAL Protocol also satisfy the requirements of the Interim Protocol.

A total of 355 samples (comprising of 257 detailed profile description assessments and 98 laboratory profile assessments) were collected with 302 surface observations recorded by means of a random grid survey within the Project Boundary. Identified soil landscapes and its individual units were categorised in accordance with the ASC system.

4.3.2 Recommended Amendments to the Interim Protocol

The NSW Government is currently completing a review of the Interim Protocol to ensure the document provides a robust assessment methodology for verifying BSAL.

During the BSAL verification process undertaken as a component of the Soils and Site Verification Assessment for the Project (see **Appendix D**), an inconsistency associated with criterion 7 from the Interim Protocol was detected in relation to the inherent fertility of certain soil units. This inconsistency is evident with the application of the Interim Protocol to the soil unit G05, a red chromosol of the Growee soil landscape, identified within the Project Boundary.

The Interim Protocol provides the first approximation of the relative fertility of Australian soil using the ASC. Soil fertility for each ASC class has been derived from the known relationship of the *Great Soil Group* system (Stace et al., 1968). The Interim Protocol places most red chromosols in the moderately high soil fertility group, which is inconsistent with the referenced literature that ranks these soils as having moderate fertility. Due to the inconsistency, the fertility ranking for the red chromosols that are not considered ideally suited to arable purposes can be classified as BSAL using the Interim Protocol.

Further, soil unit G05 was also assessed against the recently released '*Land and Soil Capability*' (LSC) classification system (OEH, 2012). Based on the field assessment, this soil unit has been classified Class 5 land and soil capability, which is moderate to low capability land that has high limitations for high impact land uses.

When adopting the Interim Protocol criteria, it has been identified that moderate to low capability land may be designated as BSAL. This is in direct contrast to the SRLUP, which requires BSAL to be land highly suitable for agricultural practices (generally Class 1 to 3). As such, it has been recommended to the NSW Government that the LSC capability classification be considered as part of the BSAL verification process.

In consideration of the aforementioned, red chromosols derived from a sedimentary origin (e.g. soil unit G05) are unlikely to have an inherent fertility higher than moderate.

On 27 November 2013, KEPCO provided a submission to the NSW Government highlighting the inconsistency associated with criterion 7 of the Interim Protocol and recommending amendments for the consideration of including reference to the LSC classification system.

If the Interim Protocol is amended as suggested in KEPCO's submission, the total quantum of verified BSAL within the Project Disturbance Boundary and broader Project Boundary will be substantially reduced. The soil fertility classification would result in the total quantum of BSAL within the Project Disturbance Boundary (401 ha (or 367 ha excluding BSAL outside Subsidence Impact Limit)) to be reduced to 358 ha (or 324 ha excluding BSAL outside the Subsidence Impact Limit).

Adoption of the land and soil capability classification in the verification process would result in the total quantum of BSAL within the Project Disturbance Boundary to be reduced to 295 ha (or 261 ha excluding BSAL outside the Subsidence Impact Limit). In this regard, the impact assessment (as provided in **Section 5.1**) will change relative to the reduction of BSAL predicted in the Project Disturbance Boundary.

4.3.3 Impact Assessments

The potential impacts of the Project on BSAL have been assessed in accordance with the requirements of the Gateway Process as set out in Clause 17H(4)(a) of the Mining SEPP (see **Table 1**) and the Guideline for Gateway Applicants.

The assessment is informed by a number of technical specialist studies, including:

- A Groundwater Impact Assessment undertaken by Australasian Groundwater and Environmental Consultants which assesses the impacts of clause 17H(4)(a) (iv) on BSAL (see **Appendix E**);
- A Preliminary Surface Water Balance undertaken by WRM Water and the Environment which assists in the assessment of impacts of clause 17H(4)(a) (iv) on BSAL (see **Appendix F**);
- An Agricultural Impact Statement (AIS) undertaken by Scott Barnett and Associates which assesses the impacts of clause 17H(4)(a) (in its entirety) on the agricultural productivity of BSAL generally in accordance with the '*Agricultural Impact Statement Technical Notes – A Companion to the Agricultural Impact Statement Guideline'* (DPI, 2013) (see **Appendix G**);
- A preliminary Subsidence Predictions and Impact Assessment completed by Mine Subsidence Engineering Consultants (MSEC), which assesses the impacts of clause 17H(4)(a)(i) on BSAL (see **Appendix I**);
- A Preliminary Biophysical Strategic Agricultural Land Rehabilitation Strategy (Preliminary BSAL Rehabilitation Strategy) undertaken by SLR which assesses the impacts of clause 17H(4)(a) (i) to (iii) and (vi) on BSAL (see **Appendix J**).

4.3.4 BSAL Verification Results

Background

Mine planning and the development of the preferred mine plan for the Project has evolved as Government requirements and expectations have changed since the election in March 2011.

Initial discussions with the NSW Government officers over what was to constitute agricultural land resulted in some field work being completed to verify the land capability within the Project Boundary, according to the requirements of the former Department of Land and Water Conservation *Land Capability* (1989) and Cunningham et al., 1988. This work verified areas of Class II and Class III land within the Project Boundary, which were considered to be constraints to avoid in the development of the mine plan. This Land Capability mapping was superseded following the release of the new LSC Classification System (OEH, 2012) which has resulted in a material difference in the mapping. The new LSC Classification System mapped land capabilities within the Project Boundary as being Class 3 and higher (i.e. Class 4 to 8).

The '*Draft Strategic Regional Land Use Policy and Strategic Regional Land Use Plan for Upper Hunter Region*' (Draft SRLUP) was released in March 2012 for public review and comment. Initial mapping of BSAL within the Draft SRLUP consisted of a small area in the south-western portion of A287 which was located outside of the current Project Disturbance Boundary.

In September 2012, the NSW Government released the final "*Strategic Regional Land Use Policy*" (the Policy) and the SRLUP). The SRLUP provided mapping on a regional basis and generally follows the regional geological mapping for the alluvial soils associated with the Lee Creek, Bylong River and Growee River within the Project Boundary.

In December 2012, the initial draft guidelines for the verification of BSAL were released for public review and comment. There have been a number of variations to these guidelines since this time. In April 2013, the Interim Protocol was released which provides a procedure to be taken for the verification of BSAL. The following section provides a description of the BSAL that has been verified within the Project Boundary.

Verified BSAL Mapping

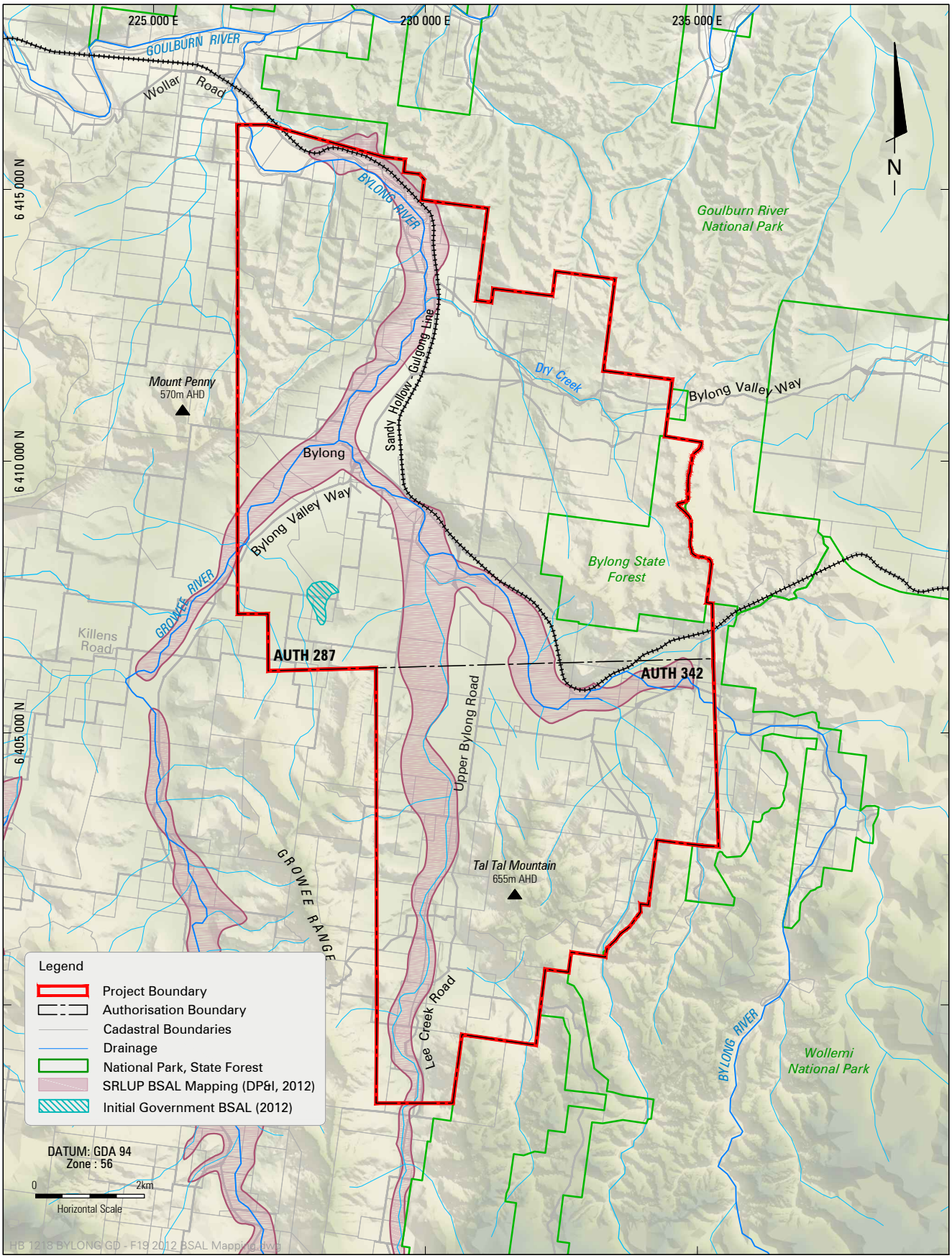
As mapped by the SRLUP, approximately 1,610 ha of potential BSAL is situated within the Project Boundary (see **Figure 20**). Verification of the land within the Project Boundary was undertaken in accordance with the criteria prescribed by the Interim Protocol (see **Section 4.3.1**) and is provided in the Soils Assessment and Site Verification (see **Appendix D**).

The verification process determined that 2,366 ha or 23% of the land within the Project Boundary represents BSAL (see **Figure 21**). This process identified additional areas of BSAL (756 ha) at a local, Project-specific scale beyond that mapped at a regional scale by the SRLUP (1,610 ha). **Figure 21** illustrates the extent and distribution of verified BSAL within the Project Boundary.

Verified BSAL that was mapped according to the Interim Protocol can be grouped into three main categories, including:

- Alluvial-influenced, deep, non-saline black dermosol soil unit within the Bylong soil landscape on very gently inclined land;
- Basaltic-influenced red dermosol soil unit within the Bald Hill soil landscape on gently inclined land; and
- Sedimentary-derived, deep red chromosols within the Growee soil landscape.

The remaining land (7,951 ha or 77%) within the Project Boundary does not meet all relevant criteria under the Interim Protocol to be classified as BSAL. Limitations to these areas include a range of chemical and physical limitations, in particular unfavourable slopes. **Table 11** and **Figure 22** illustrate the land that does not conform to BSAL within the Project Boundary, having regard to each of the key limitations provided in the Interim Protocol.



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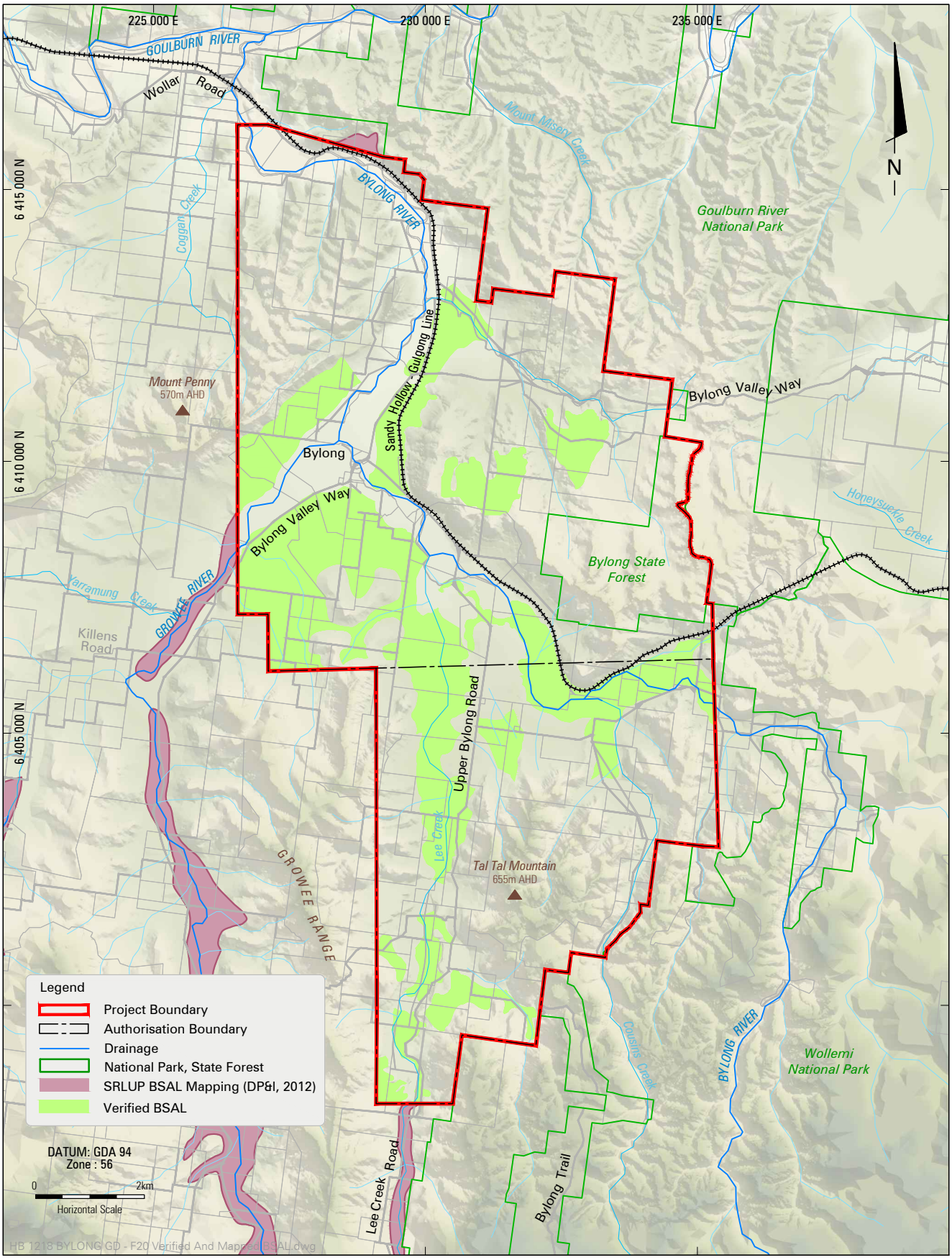
SRLUP BSAL Mapping

FIGURE 20



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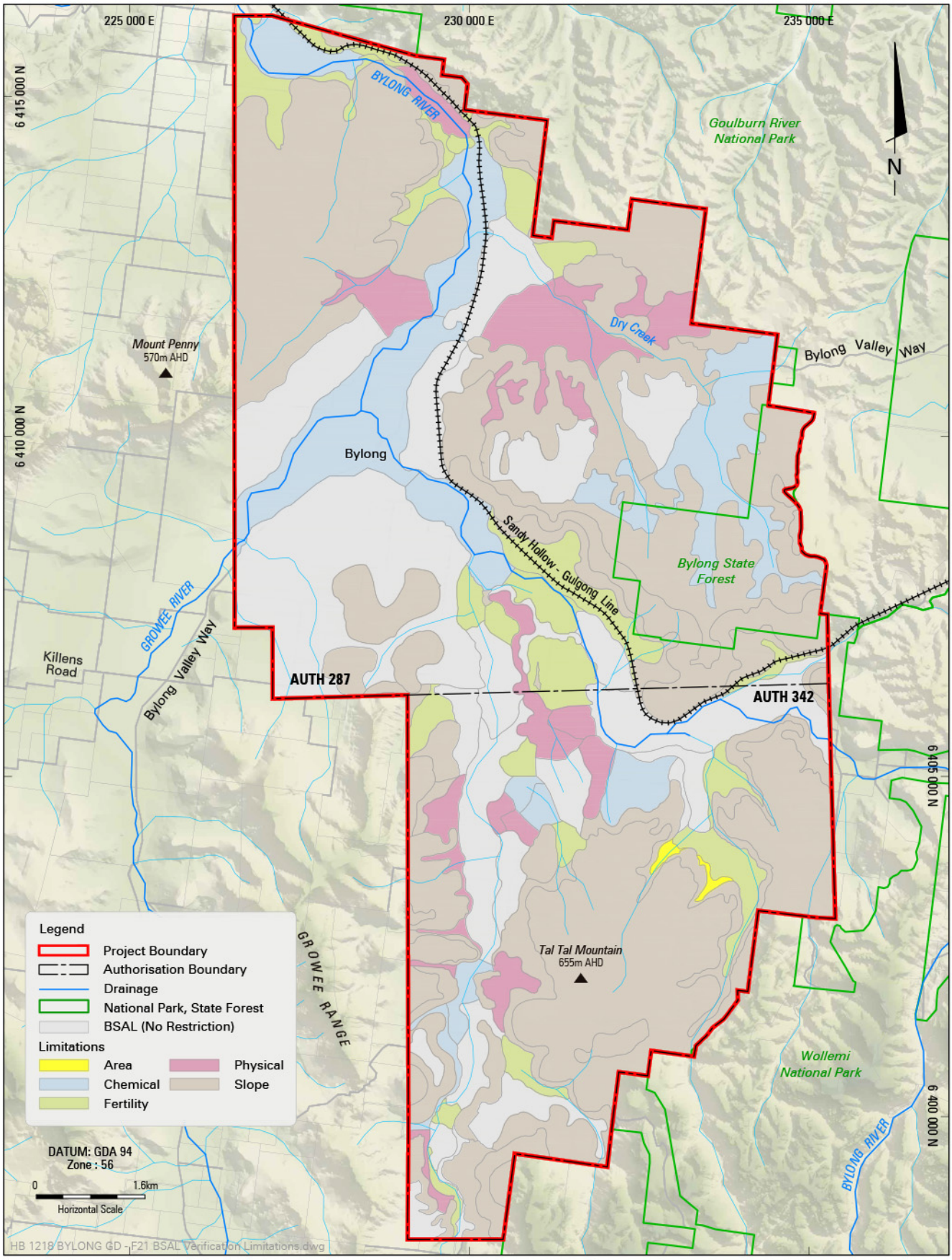
Verified BSAL within Project and Mapped BSAL within Locality

FIGURE 21



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BSAL Verification Limitations
(Interim Protocol)

FIGURE 22

Table 11
BSAL Limitations

Limitation	Area	
	(ha)	(%)
Land not Representative of BSAL		
Land Area	17	<1
Chemical	1,255	12
Fertility	814	8
Physical	684	7
Slope	5,181	50
Subtotal	**7,951**	**77**
Land Verified as BSAL		
None	2,366	23
Subtotal	**2,366**	**23**
Grand Total	**10,317**	**100**

4.4 AQUIFER INTERFERENCE POLICY

4.4.1 Introduction

Clause 17H (4)(a)(iv) of the Mining SEPP requires the Gateway Panel to have regard to "*any impacts on highly productive groundwater (within the meaning of the Aquifer Interference Policy)"*.

Accordingly, Clause 17G(1)(a) of the Mining SEPP requires the Gateway Panel to refer the application to the IESC and the Minister for Primary Industries for advice regarding the impacts of the development on water resources.

Further, Clause 17G(2) of the Mining SEPP states:

> "*The Minister for Primary Industries, when providing advice under this clause on the impact of the proposed development on water resources, must have regard to:*
>
> *(a) the minimal impact considerations set out in the Aquifer Interference Policy, and*
>
> *(b) the other provisions of that Policy.*"

IESC Guidelines

Table 12 summarises the requirements included within the IESC Information Guidelines for proposals relating to the development of Coal Seam Gas and Large Coal Mines where there is a potential for significant impact on water resources.

Table 12 indicates where each requirement is addressed within this document.

Table 12
IESC Guideline Checklist

Project Information	Description	Where Addressed
1. Summary Details		
Project Title	Project name	**Section 1**
Date of Request	Date	January 2014
Requesting Organisation	Name of the requesting organisation (the Regulator)	Department of Planning and Infrastructure (Gateway Panel)
EPBC Act Referral	Reference (referral number, type - if EPBC referral)	Not available
Advice Stage	Stage of EIS process at which request has been made	Gateway Process
Request Details	Background to the referral and advice that is sought from the Committee	Not available
Proponent Details	Proponent name	**Section 1.3**
Website Links	Links to web sites, including proponent website and documents	**Section 1.3**
Public Submissions	Summary of public submissions	Not applicable
2. Project Description		
Project Location	Overview of project location including geographical, geologic, river basin/catchment, hydro-geological basin	**Sections 1.1** and **3**
Project Description	Brief project description	**Section 2**
Project Type	Type of project that is being proposed (e.g. new project or extension) and type of operation (CSG, large coal mine)	**Section 2**
Resource	Geologic/ hydro-carbon resource that will be targeted	**Sections 2.1** and **2.2**
Operation Area	Information to define the extent of the operation	**Section 2**
Establishment Activities	Relevant activities required to establish the proposed project	**Section 2**
Operation Details	How the project operations will be undertaken operationally	**Section 2.2**
Lifetime	Lifetime of the project	**Section 2**
Residual Site Condition	Expected site condition after decommissioning and proposed monitoring regime	**Sections 2.2** and **7**
Site Rehabilitation	Outline of planned site rehabilitation works	**Sections 7.2** and **7.3**

Project Information	Description	Where Addressed
3. Regional Water Balance Model		
Regional Overview	Proponent's regional and site water balance model	**Section 5.4.2** and **Appendix F**
Regional Groundwater	Regional groundwater description	**Section 3.4**
Regional Surface Water	Regional surface water description	**Section 3.5**
Data Uncertainties / Data Integrity Issues	Level of certainty/uncertainty with respect to the information provided	**Appendix E** and **F**
4. Local Water Balance Model incorporating the Site		
Site Overview	Pre-development baseline water resources	**Sections 3.4** and **3.5**
Local and Site Groundwater Overview	Local groundwater description	**Section 3.4**
Local and Site Surface Water Overview	Local surface water description	**Section 3.5**
Data Uncertainties / Data Integrity Issues	Level of certainty/uncertainty with respect to the information provided	**Appendix E** and **F**
5. Impacts of Development		
Groundwater Impacts from Project Activities	Impacts to regional, local and site groundwater	**Section 5.4**
Surface Water Impacts from Project Activities	Impacts to surface water	**Section 5.4**
Landform and Land-use Change Impacts from Project Activities	Changes and impacts to landform, geomorphology and land-use	**Section 5**
Water Related Assets of National Environmental Significance	Relevant impacts to water related Matters of National Environmental Significance for surface and groundwater	**Section 5.4**
Impacts on Other Water Related Assets	Assessment of direct and indirect impacts on other water related assets	**Sections 5.4** and **6.2**
Data Uncertainties / Data Integrity Issues	Level of certainty/uncertainty with respect to the information provided	**Appendix E** and **F**
6. Water Related Risk Assessment		
Risk Assessment Overview	Overview of Risk Assessment method that has been used	**Appendix E** and **F**
Risk Assessment	Assessment of the overall level of risk to water balance and water related assets	**Appendix E** and **F**
Mitigation Measures	Proposed mitigation measures to address potential risks and/or impacts	**Section 7, Appendix E** and **F**

Project Information	Description	Where Addressed
Residual Risks	Mitigation measures that have been provided for residual risk (including monitoring and reporting)	**Section 7, Appendix E** and **F**
7. Cumulative Impacts		
Regional Overview	Summary of CSG and large coal mine developments within the region. Catchment and regional scale information provided through the bioregional assessments or other relevant assessments	**Section 3.2** and **Appendix E**
Cumulative Risk Assessment	Cumulative risk assessment of the proposal, considering all relevant developments. Assessment of the overall cumulative level of risk to water related assets	**Appendix G**

Aquifer Interference Policy

The AIP was released in September 2012 to outline the role and requirements of the Minister who administers the WM Act.

Aquifer interference activities are defined under the WM Act as activities which involve any of the following:

- "*The penetration of an aquifer;*
- *The interference with water in an aquifer;*
- *The obstruction of the flow of water in an aquifer;*
- *The taking of water from an aquifer in the course of carrying out mining or other activity prescribed by the regulations; and*
- *The disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations*" (NOW, 2012).

The AIP states that "*all water taken by aquifer interference activities, regardless of quality, needs to be accounted for within the extraction limits defined by the water sharing plans. A water licence is required under the WM Act (unless an exemption applies or water is being taken under a basic landholder right) where any act by a person carrying out an aquifer interference activity causes the:*

- *Removal of water from a water source; or*
- *Movement of water from one part of an aquifer to another part of an aquifer; or*
- *Movement of water from one water source to another water source, such as from:*
    - *An aquifer to an adjacent aquifer; or*
    - *An aquifer to a river/lake; or*
    - *A river/lake to an aquifer. "*

AIP Water Licensing

The AIP states that a water licence is required for the aquifer interference activity regardless of whether water is taken directly for consumptive use or incidentally. Activities may induce flow from adjacent groundwater sources or connected surface water. Flows induced from other water sources also constitute take of water. In all cases, separate access licences are required to account for the take from all individual water sources.

In addition to the volumetric water licensing considerations, the AIP requires details of the following potential impacts:

- Water level, quality or pressure drawdown impacts on nearby water users who are exercising their right to take water under a basic landholder right;
- Water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources;
- Water level, quality or pressure drawdown impacts on groundwater dependent ecosystems;
- Increased saline or contaminated water inflows to aquifers and highly connected river systems;
- To cause or enhance hydraulic connection between aquifers; and
- For river bank instability, or high wall instability or failure to occur.

AIP Minimal Impact Considerations

In particular, the AIP describes "*minimal impact considerations*" for aquifer interference activities based upon whether the water source is highly productive or less productive and whether the water source is alluvial or porous / fractured rock in nature. In general, the AIP applies a predicted 2 m drawdown maximum limit at existing groundwater users.

A detailed assessment against the *"minimal impact considerations"* is provided in **Section 5.4.3**.

In order to assess the impacts of the Project upon the surrounding water resources and to address the "*minimal impact considerations"* and other items within the AIP, a Groundwater Impact Assessment has been completed by Australasian Groundwater and Environmental Consultants and is provided in full in **Appendix E**. A detailed summary is provided in **Section 5.4**.

Mine Water Balance

Further to the incidental take of water from the groundwater regime associated with the mining activities, the mine water balance is anticipated to require an external water supply to ensure sufficient water is available for dust suppression and coal processing related activities. The most suitable water source has been identified to be from the productive alluvial aquifers within the Project Boundary. Accordingly, a Preliminary Surface Water Balance has been completed by WRM Water and the Environment to confirm the likely water supplies and demands for the various stages of the Project under average rainfall conditions and to determine the amount of water required from the external water source. A detailed summary of the preliminary water balance for the Project is provided in **Section 5.4.2**.

The Preliminary Water Balance is provided in full in **Appendix F**.

The following sections provide a summary of the methodology of the preliminary groundwater and surface water work that has been completed by the relevant technical consultants.

4.4.2 Methodology

Field Investigation Program

Douglas Partners was engaged by Cockatoo Coal (as managers of the Project) in December 2011 to commence hydrogeological field investigations within the Project Boundary to assist in gathering detailed baseline data and assisting in an understanding of the regional hydrological regime.

Douglas Partners has prepared a WMP (Douglas Partners, 2013) to satisfy conditions of the A287 and A342. The WMP outlines the groundwater and surface water monitoring program that has been undertaken since November 2011 and throughout the exploration phase and provides a conceptualisation of the groundwater regime within the Project Boundary. The WMP was prepared in close consultation with NOW and has been continually updated in consultation with NOW since its initial development in 2011.

A report prepared by Douglas Partners is attached to **Appendix E** outlining a summary of the extensive monitoring effort that has been completed to date within the Project Boundary and includes the following:

- Mapping of alluvial extents based examination of stereo-pair photos and light detection and ranging survey data;
- Testing rock strata permeability with packers within coal exploration bores;
- Installing standpipe piezometers in exploration bores;
- Drilling, soil logging and installing twin nested standpipe piezometers in alluvium;
- Cone Penetration Testing to confirm the extent and depth of alluvium at selected locations;
- Rising head hydraulic testing within installed standpipe piezometers;
- Automated logging of piezometric head and EC in selected locations;
- Monitoring of piezometric levels;
- Multi-level pore water pressure measurements (piezometric levels) through seven vibrating wire piezometer (VWP) installations;
- Surface water and groundwater sampling and chemical analyses at selected locations (see **Figure 15**); and
- Automated logging of surface water flow velocity at three locations.

Groundwater Modelling Methodology

The Guideline for Gateway Applicants indicates that the information that is presented within the Gateway Application to address a Project's likely impacts upon water resources "*should be based on a simple model that uses best available baseline data collected at an appropriate frequency and scale and that is determined to be fit-for-purpose to the satisfaction of the Minister for Primary Industries. Proponents should also provide a strategy for moving to modelling using more detailed site specific data that will be used at the development application stage to better assess potential impacts.*"

As discussed previously, KEPCO has developed a robust WMP within the Project Boundary that has been developed in close consultation with NOW and other relevant regulators. With the development and implementation of the WMP initially commencing in November 2011, a good set of baseline data has been collected which provides the groundwater technical consultants with a good knowledge of the groundwater regime.

The primary objective of the groundwater modelling was to develop a model that could quantify the impact of the proposed mining on the groundwater regime, allowing the preliminary impacts to be compared with the AIP, particularly groundwater resources used for agricultural activities. The design, construction and calibration of the model were tailored to this objective, while also providing a framework for future iterations of the model following the addition of new data during the preparation of the EIS. The model was calibrated so that it broadly replicated groundwater flow directions, gradients and system dynamics. Following calibration, the model simulated the impact of the Project on the groundwater regime.

Given the requirement for a simple numerical model, it was decided to calibrate to steady state (i.e. long term average) water levels from the monitoring bore network. The steady state model was calibrated by adjusting aquifer parameters and stresses to produce the best match between the observed and simulated water levels. A more detailed transient calibration to time series water level measurements is not necessary at this stage to meet the standard of a simple numerical model. Instead, a transient model run verified the model closely reproduced the transient water level fluctuations measured in the monitoring bore network installed for the Project.

The numerical model was developed using the finite difference method and utilising recent hydrology, hydrogeology and geological structure data. The model grid was 33 km wide (E-W) and 39 km long (N-S). The model grid aligned to the principal groundwater flow direction from south to north in the alluvial aquifer. The boundaries were set distant at 10 km to 11 km from the proposed mining areas, to minimise the effect of boundaries on the predictions.

The three-dimensional model (MODFLOW SURFACT) was used to simulate the impact of the Project (and other possible mining activities adjacent to the Project Boundary) on the groundwater regime over time. The modelling has utilised conservative parameters and values based on the investigation work completed as part of the environmental monitoring program. Therefore the model has been developed to represent a worst case scenario for the potential groundwater impacts of the future proposed mining activities.

Barnett *et al* (2012) developed a system to classify the confidence-level for groundwater models. Models are classified as either Class 1, Class 2 or Class 3 in order of increasing confidence (i.e. Class 3 has the highest level of confidence). Several factors are considered in determining the model confidence level:

- Available data;
- Calibration procedures;
- Consistency between calibration and predictive analysis; and
- Level of stresses.

The groundwater model for the Project is currently considered a Class 1 model as follows:

- A transient calibration has not been undertaken;
- Transient predictions are made when calibration is in steady state only; and
- The model has not been reviewed.

As outlined above, the purpose of the Class 1 model developed for the Project is to assess the Gateway application requirement for a "*simple model"* and to serve as a template that can be refined and improved to higher classes as additional data is gathered from monitoring.

Section 5.4.1 provides a summary of the results of the preliminary groundwater modelling.

Surface Water Balance Modelling Methodology

A static annual water balance with annual average rainfall was undertaken for the Open Cut Mine Plan stages for Year 3, Year 5, Year 7 and Year 10 of the Project and then a scenario for the underground mining for remaining years of the Project that reflects the changing physical layout of the Project and management of water within the management system. This annual water balance allows for a comparison of inflows and outflows between the different mine plan stages and to determine whether the overall balance is at surplus or deficit.

In order to develop the preliminary water balance model, a list of the assumptions and calculation methods were required to be implemented. These are described in detail within **Appendix F** and are summarised below:

- Runoff volume reporting to the site storages was calculated by multiplying the site catchments by the relevant long term conservative volumetric runoff coefficients and the adopted average annual rainfall;
- The volume of rain falling direct on storages was estimated based on:
  - The adopted average annual rainfall; and
  - A combined surface area for the Raw Water Dam and mine water dams of 11 ha (estimated from the preliminary mine plans) was adopted; and
- The total surface area of the sediment dams was estimated based on an assumed depth of 3 m and a total volume based on the total catchment area reporting to the sediment dams during each stage, a 90th percentile 5-day rainfall depth of 36 mm and a volumetric runoff coefficient of 0.68;
- The volume of evaporation from storages was estimated based on the combined maximum Raw Water Dam and mine water dams surface area (11 ha) multiplied by a factor of 0.6 to account for the variations in surface area with changing dam volume;
- The sediment dams and other minor mine water storages were assumed to be pumped out immediately to the primary Mine Water Dam, hence no evaporation from the sediment dams was accounted for;
- Groundwater inflows were adopted as identified within the Groundwater Impact Assessment;
- Operational water demands are described in **Appendix F**; and
- For the post-open cut mining water balance (Years 10-29), it was assumed that the open cut mine was completely rehabilitated and only underground operations were occurring.

Section 5.4.2 provides a summary of the results of the preliminary groundwater modelling.

4.4.3 Impact Assessments

The potential impacts of the Project on the water resources within the vicinity of the Project Boundary have been assessed in accordance with the requirements of the Gateway Process, criteria stipulated in clause 17H(4)(a)(iv) of the Mining SEPP (see **Table 2**) and supporting documentation, including the Guideline for Gateway Applicants.

The assessment is informed by the Groundwater Impact Statement undertaken by AGE Consultants (see **Section 5.4.1** and **Appendix E**) in conjunction with the Surface Water Balance which was completed by WRM (see **Section 5.4.2** and **Appendix F**).

4.5 EQUINE CRITICAL INDUSTRY CLUSTER

4.5.1 Verification Process

Similar to BSAL, the SRLUP maps the potential equine CIC at a regional scale. Given the Project occurs at a local scale, the mapping provided in the SRLUP and other lands within the Project Boundary require verification to accurately determine the extent of the equine CIC. This subsequently is intended to inform the assessment of likely impacts of the Project on collective equine enterprises.

Land within the Project Boundary and broader locality (2 km radius) was verified for inclusion in the equine CIC in accordance with the '*Draft Guideline for Site Verification of Critical Industry Clusters'* (Draft CIC Guideline) (DP&I, 2012b). The Draft CIC Guideline provides processes to determine if the equine enterprise and associated property within the Project Boundary and broader locality embody the broader characteristics of the Equine CIC, as defined by criteria in the SRLUP.

According to the Draft CIC Guideline, in order for land to be classified as part of the equine CIC, the project site must be:

- *"Wholly or partially within the area mapped as Equine CIC in the map accompanying State Environmental Planning Policy (Mining, Extractive Industries and Petroleum Production) 2007; and*
- *Located on or within 2 km of a property that is also within the area mapped as Equine CIC and which is primarily used for horse breeding, horse husbandry, horse sales, or forage sales directly to registered horse breeders."*

Section 4.5.4 describes in detail the assessment verification of the extent of the equine CIC within the Project Boundary and locality (2 km radius of the Project Boundary) in accordance with the requirements of the Draft CIC Guideline. An AIS which assesses the impacts upon agriculture has been undertaken by Scott Barnett and Associates is provided in **Appendix G**.

4.5.2 Recommended Amendments to the Revised Draft Equine CIC Mapping

Further to the mapping of 2012 Equine CIC Mapping, the NSW Government released revised Draft mapping of Equine CIC within the Upper Hunter region on 4 October 2013 for public review and comment. Submissions from the public and the mining industry were invited to be provided by 8 November 2013 to assist in the finalisation of the Draft Equine CIC Maps.

KEPCO lodged a submission with the NSW Government to provide local scale details of the current land use on properties mapped as equine CIC within and immediately surrounding the Project Boundary. It was shown that the land within the Project Boundary is predominantly utilised for cattle grazing with some fodder production activities also occurring. KEPCO's submission provided detail of the equine related infrastructure that is located on the properties within the Project Boundary that are no longer being predominantly utilised for equine related activities.

Further, Section 4.3.1 of the KEPCO submission noted that two landholders whose properties had been included within the Revised Draft Equine CIC Mapping were of the opinion that their properties do not form part of the Equine CIC within the region and that equine related activities are no longer a dominant land use within the Bylong Valley (see **Appendix G**).

Should the Revised Draft Equine CIC Mapping be amended according to KEPCO's submission, the verification and assessment completed in this document would no longer be required for consideration by the Gateway Panel.

4.5.3 Impact Assessments

Agriculture

The potential impacts of the Project on the equine CIC have been assessed in accordance with the requirements of the Gateway Process criteria stipulated in clause 17H(4)(b) of the Mining SEPP (see **Table 2**) and supporting documentation, including the Guideline for Gateway Applicants.

Section 4.3.4 provides a detailed assessment in this regard. The assessment is informed by an AIS undertaken by Scott Barnett and Associates (see **Appendix G**), which assesses the impacts of clause 17H(4)(b) in relation to the equine CIC.

Visual

The assessment includes a Visual Impact Assessment undertaken by JVP Visual Planning and Design which assesses the impacts of the Project in relation to clause 17H(4)(b)(v) of the Mining SEPP.

The Visual Impact Assessment considers the potential impacts of the Project on the existing landscape and visual values of the surrounding areas in relation to impacts on the scenic and landscape values within the areas of Equine CIC as mapped within the Project Boundary.

Further, it considers visual impacts from the Project on Bylong Valley Way which is a designated tourist route consistent with the Guidelines for Gateway Applicants which requires:

> *"Views of the project site from CIC properties or RMS-signposted Tourist Routes must be assessed in the application. The application should use visual aids such as photomontages to explain the potential impacts. Any mitigation measures such as visual bunds or plantings should also be shown in images."*

Further discussion is provided in **Section 6.5** with the Visual Impact Assessment technical assessment presented in full in **Appendix H**.

Water Resources

The assessment includes: a Groundwater Impact Assessment undertaken by AGE Consultants and a Preliminary Surface Water Balance completed by WRM Water and the Environment to assesses the impacts of the Project in relation to clause 17H(4)(b)(ii) of the Mining SEPP.

The Groundwater Impact Assessment includes the results of some preliminary groundwater modelling completed for the Project which provides predictions of the water take from the neighbouring groundwater resources. The Preliminary Surface Water Balance was completed to assess the likely additional water requirements for the Project in consideration of the water demands and supplies. These two assessments have been utilised to determine any possible impacts to the water resources that may have been utilised by the Equine CIC.

Further discussion is provided in **Section 6.2**, the Groundwater Impact Assessment and Preliminary Surface Water Balance, which is presented in full in **Appendix E** and **Appendix F**, respectively.

4.5.4 Equine CIC Verification Results

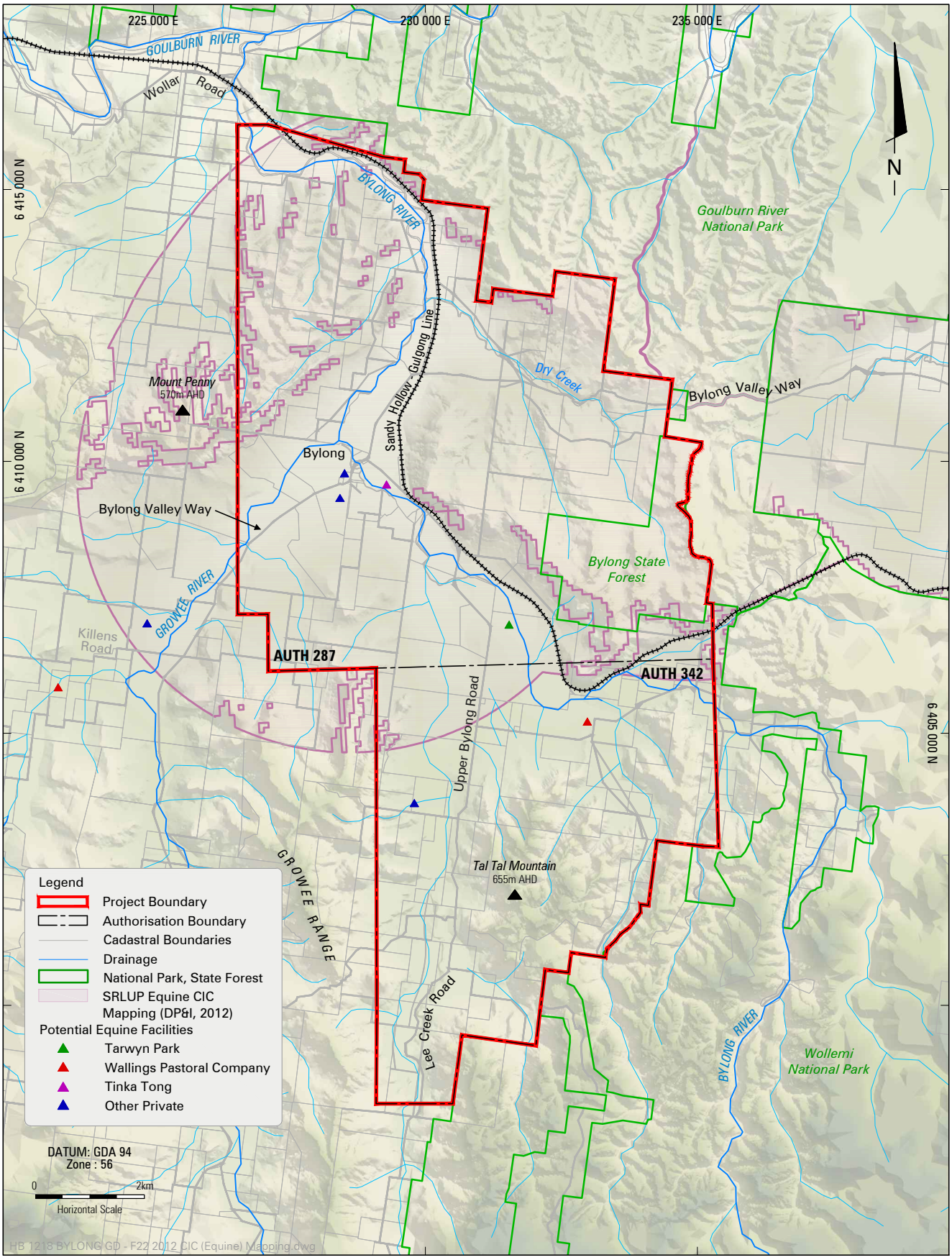
SRLUP 2012 CIC (Equine) Mapping

Approximately 6,617 ha of the potential equine CIC was mapped by the SRLUP (2012 Equine CIC Mapping) within the Project Boundary (see **Figure 23**). A number of equine related enterprises were initially within this 2012 Equine CIC Mapping, including Tarwyn Park, Bylong Park, Tinka Tong, and two properties (Helvetia and Wingarra) owned by ACN 000 690 648 Pty Ltd (hereafter referred to as Wallings Pastoral Company). All other equine enterprises situated within the Project Boundary and in the locality, including Wallings Pastoral Company properties (Torrie Lodge and Sunnyside) and Byleigh Ridge were not included within the 2012 Equine CIC Mapping.

Revised Draft Equine CIC Mapping 2013

As discussed in **Section 4.5.2**, the NSW Government released Revised Draft Equine CIC Mapping in October 2013 for review and comment as illustrated in **Figure 24**. **Figure 25** illustrates the three private landholdings that exist within the Revised Draft Equine CIC Mapping, including: Wallings Pastoral Company (part of) (under agreement for acquisition with KEPCO), Tarwyn Park (under agreement for acquisition with KEPCO) and Tinka Tong.

The Murrumbo area is a separately mapped area more than 2 km to the north-east of the Project Boundary (more than 2 km from the underground mining operations and more than 5 km from active open cut mining operations) and is separated from the Project Boundary by the Bylong State Forest and intervening vegetation (see **Figure 24**). The landform between the Murrumbo area (which contains elevated areas up to 390 mAHD but generally is between 200 to 390 mAHD) and the proposed open cut mining areas (up to 320 mAHD) is elevated within the State Forest (ridge lines up to 520 mAHD) and is densely tree covered which will screen all views towards the Project. Due to the significant intervening topography, vegetation and distance to the surface disturbance associated with the Project, there is no potential for this area to have any exposure to the Project and as such is not further considered in this assessment.



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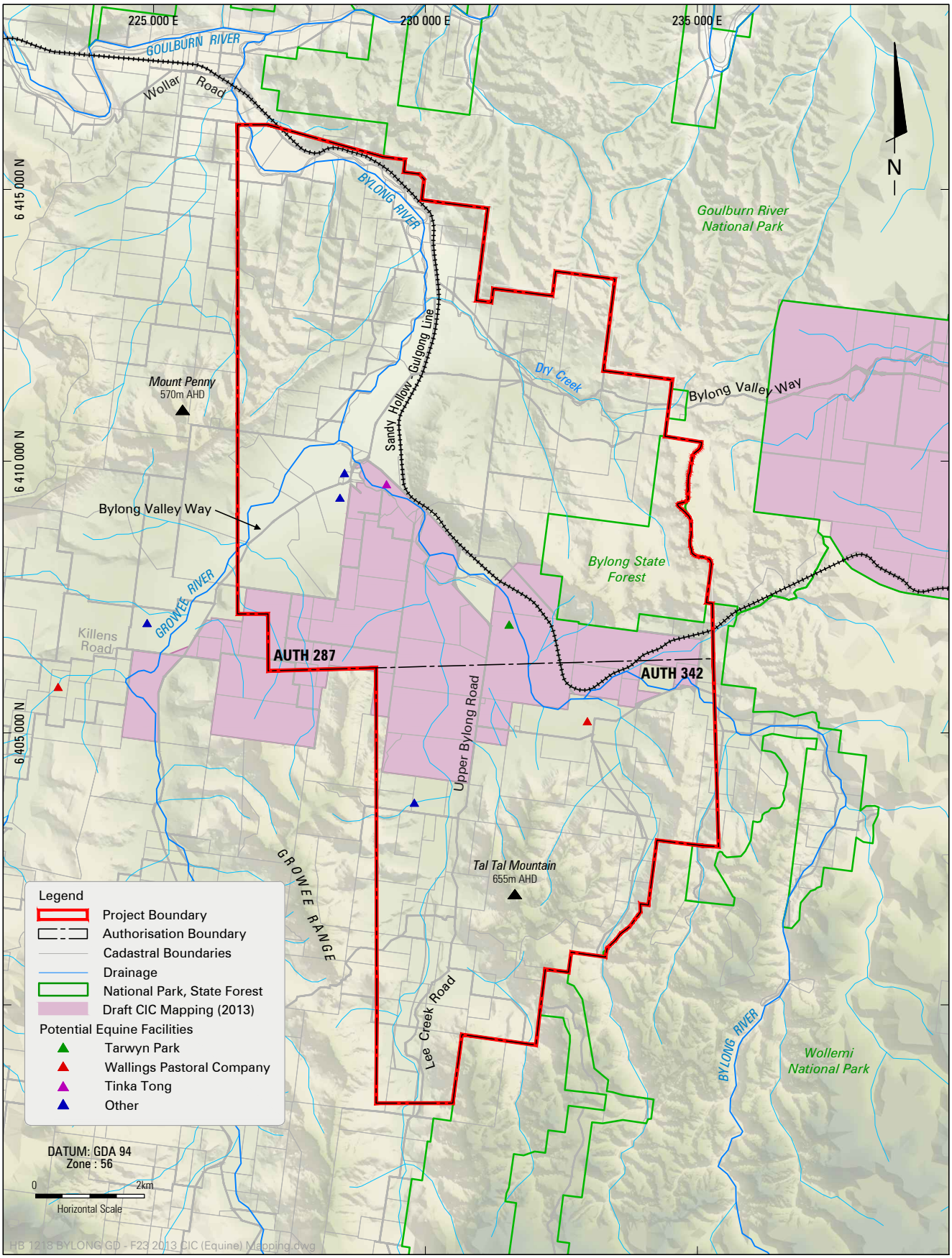
2012 Critical Industry Cluster (Equine) Mapping

FIGURE 23



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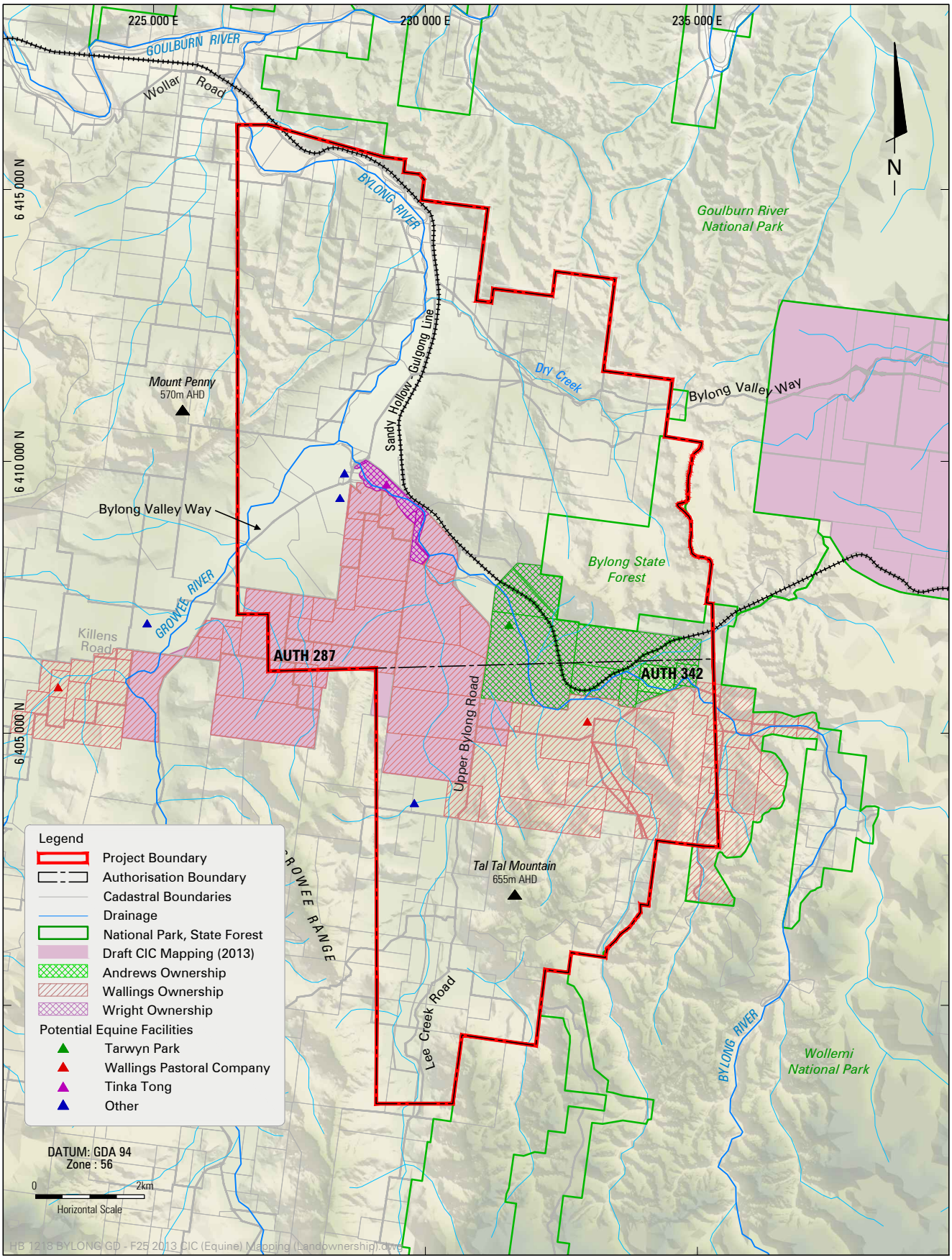
Revised Draft Critical Industry Cluster (Equine) Mapping

FIGURE 24



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Revised Draft Critical Industry Cluster (Equine) Mapping - Land Ownership

FIGURE 25

The Revised Draft Equine CIC Mapping shows 1,933 ha of the equine CIC within the Project Boundary (see **Figure 24** and **Figure 25**) which has been confirmed at property scale. Verification of the land within the Project Boundary was undertaken in accordance with the following:

- The equine CIC mapping criteria outlined in the Appendix of the SRLUP, which states that *"The equine cluster is spatially defined as land (excluding National Park and State Forest) having a slope of equal to or less than 18 degrees and falling within…the Mid Western Regional, Muswellbrook and Upper Hunter LGAs – within 5 km of the Bylong Valley Way…"* (see **Figure 26**)
- The site verification criteria prescribed by the Draft CIC Guideline (see **Section 4.5.1**).

Review of SRLUP Mapping Criteria

A total of 6,346 ha within the Project Boundary has been confirmed to meet the mapping criteria outlined in the Appendix of the SRLUP.

Site Verification

Based on the site verification criteria, 1,933 ha of land within the Project Boundary is situated within an area of mapped equine CIC (as per the Revised Draft Equine CIC Mapping). Of this area, approximately 1,683 ha meets the mapping criteria as described above.

Further, a portion of the land within the Project Boundary is located on two equine enterprises and their respective properties, namely Tarwyn Park and Tinka Tong, which are within the area mapped as equine CIC. These areas also meet the mapping criteria as described above.

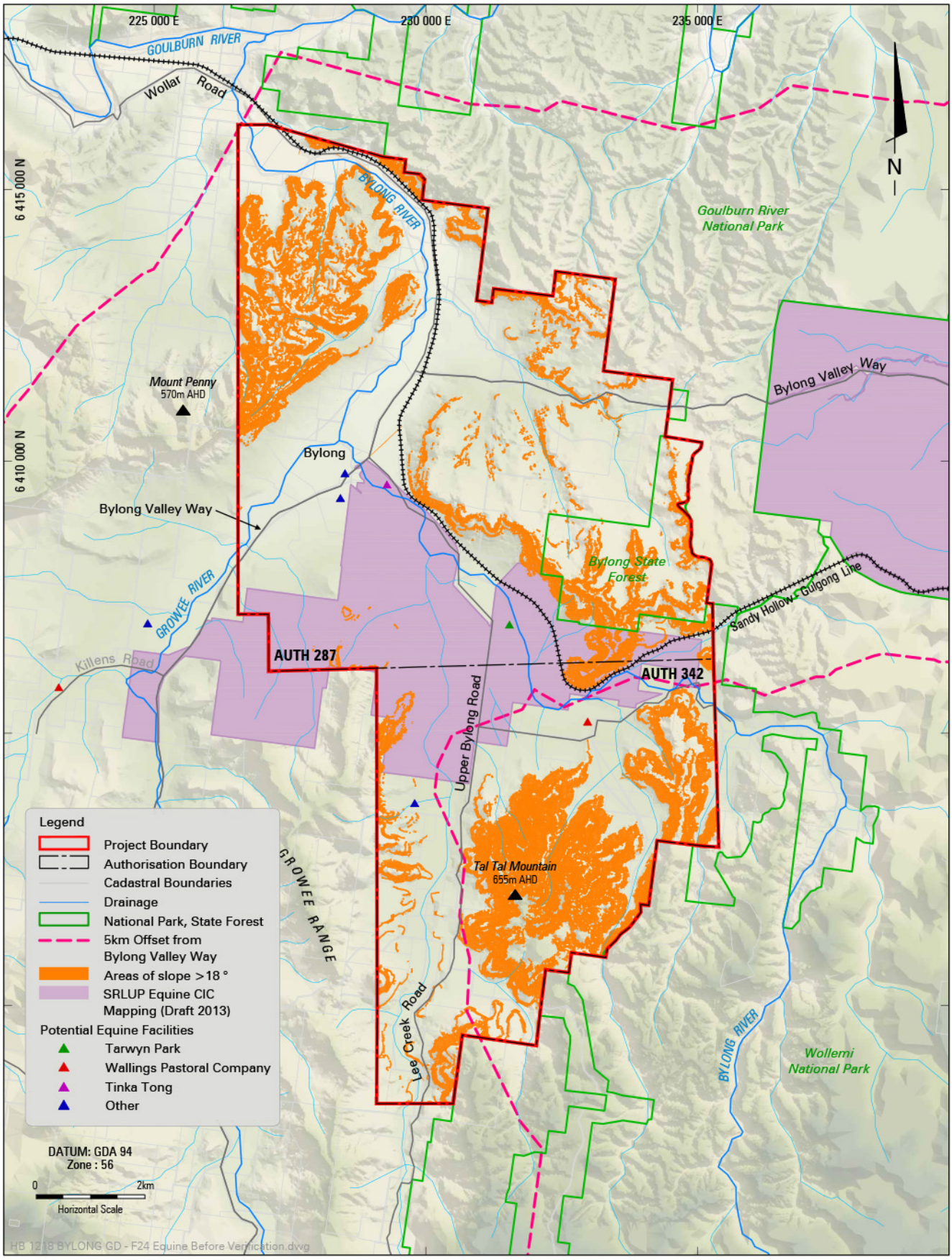
Sunnyside is part of the Wallings Pastoral Company and is not directly situated on land mapped as equine CIC; however, it is associated with a property that is partially mapped. Only a portion of this property is located within the Project Boundary.

The operations for each of the equine enterprises are described and verified in accordance with the Draft CIC Guideline below.

Equine Enterprises

Tarwyn Park

Tarwyn Park covers approximately 610 ha and is the origin for the concept of "*Natural Sequence Farming*"; a method of land management still used today. The property was used as a horse breeding, spelling and training establishment for many years, being most famous as the home of *"Heroic"* from 1927 to 1939 and the 1968 and 1969 Melbourne Cup winner "*Rain Lover"* returned to stud in 1970. Tarwyn Park retains a complex comprising of 30 stables and associated facilities (16 of which are in fair to poor condition), covered round yard and steel, post and rail fencing which provides a disused 2,000 m training track.



BYLONG COAL PROJECT

Equine CIC Mapping Criteria

FIGURE 26

Tarwyn Park is no longer used for horse breeding, spelling or training. The Property does not have any horses registered with the Australian Stock Horse Association or the Federation of Bloodstock Agents Australia Limited nor has it produced forage for sale or had sales/commercial agreements with registered horse breeders in the previous 12 months. Furthermore, the property is not subject to any development consent or application with the MWRC for horse breeding, husbandry or sales.

The current land use across Tarwyn Park is cattle breeding supplemented by fodder cropping. In support of this, an article from *Racing and Sport* (2011) in relation to the awarding of an Order of Australian Medal to Peter Andrews (then owner) states that "*The property (Tarwyn Park) is now used as a cattle raising farm operated by the Andrew's family*".

As such, Tarwyn Park has been found to not primarily be used for horse breeding, horse husbandry, horse sales or forage sales directly to registered horse breeders and consequently does not meet a key criterion of the equine CIC site verification process.

As discussed in **Section 3.1**, KEPCO has an Agreement in place with this landholder to acquire this property.

Tinka Tong

Tinka Tong is the home of a small Australian Stock Horse stud situated on approximately 56 ha and is operated in conjunction with a beef cattle enterprise. Tinka Tong has limited but adequate horse infrastructure to support a small scale equine enterprise. Tinka Tong is located 1.4 km from the North-Western OEA and over 2.4 km from open cut mining operations.

The Australian Stock Horse Association records showed that as of 28 October 2013, Tinka Tong had 13 registered horses. The Australian Stock Horse Association notes that the register may include animals that have died or have been sold.

In consideration of the aforementioned, Tinka Tong is primarily used for Stock Horse breeding and horse husbandry. Consequently, Tinka Tong meets the equine CIC site verification criterion as an individual property.

Wallings Pastoral Company (Sunnyside)

The Wallings Pastoral Company's (Sunnyside Property) is situated on a large aggregation of land comprised of over nine previous independent properties (covering an area of approximately 3,358 ha). Sunnyside retains a complex of 12 stables and associated facilities.

Sunnyside does not have any horses registered with the Australian Stock Horse Association or the Federation of Bloodstock Agents Australia Limited. In addition, Sunnyside has not produced forage for sale or had sales/commercial agreements with registered horse breeders in the previous 12 months. Furthermore, Sunnyside is not subject to any development consent or application with the MWRC for horse breeding, husbandry or sales. The current land use across the total landholding is beef cattle, fodder cropping and conservation (Lucerne and oats) and opportune winter cereal cropping.

The owner of this property supports the proposition that Sunnyside and the broader land holdings do not meet the criteria to be included in the equine CIC (see **Appendix G**).

In consideration of the aforementioned, Sunnyside is not primarily used for horse breeding, horse husbandry, horse sales or forage sales directly to registered horse breeders and consequently does not meet a key criterion of the equine CIC site verification process.

As discussed in **Section 3.1**, KEPCO has an Agreement in place with this landholder to acquire this property.

Definition of a Critical Industry Cluster

The SRLUP defines a CIC as "*a localised concentration of interrelated productive industries based on an agricultural product that provides significant employment opportunities and contributes to the local identity of the region. The CIC also needs to have potential to be substantially impacted by coal seam gas of mining proposals*." It further provides criteria for what constitutes a CIC:

- "*There is a concentration of enterprises that provides clear development and marketing advantages and is based on an agricultural product,*
- *The productive industries are interrelated,*
- *It consists of an unique combination of factors such as location, infrastructure, heritage and natural resources,*
- *It is of national and/or international importance,*
- *It is iconic industry that contributes to the region's identity, and*
- *It is potentially substantially impacted by coal seam gas or mining proposals.*"

As noted previously, Tinka Tong is the only equine enterprise that has been verified as meeting all criteria to be classed as part of the equine CIC. In consideration of the above definition of a CIC and its associated criteria:

- The majority of the equine facilities within or in the locality of the Project Boundary do not meet the site verification criteria to be classed as an enterprise of the equine CIC;
- Tinka Tong (as a single enterprise) does not represent a concentration of enterprises that provide clear development and marketing advantages based only on the breeding and husbandry of Australian Stock Horses (not Thoroughbreds);
- Tinka Tong is not interrelated with other agricultural enterprises within or in the locality of the Project Boundary and is predominantly associated with cattle breeding and some minor cropping. Furthermore it is not interrelated with other equine facilities within or in the locality of the Project Boundary (which do not meet the criteria of the equine CIC);
- Tinka Tong does not represent an unique combination of factors such as location, infrastructure, heritage and natural resources;
- Tinka Tong is a small scale Australian Stock Horse stud and is not of national and/or international importance;
- The equine industry, which is represented solely by Tinka Tong (as per the Verification Process) does not contribute the Bylong Valley's regional identity; and

- Tinka Tong will not be substantially impacted by the Project as it is situated outside of the direct Project Disturbance Boundary. There may be some indirect impacts associated with potential noise and air quality management that will require assessment and further consideration within the EIS.

Based on the aforementioned, Tinka Tong does not embody the definition or criteria of a CIC.

Conclusion

The verification process determined that the vast majority of the equine enterprises and their associated properties within or in the locality (2 km radius) of the Project Boundary do not meet the criteria to be classed in the equine CIC.

Only one equine enterprise (Tinka Tong) met all the relevant criteria. This single enterprise does not embody the definition or criteria of a CIC as outlined in the SRLUP. As such, it has been concluded that the land within the Project Boundary does not represent part of the equine CIC. Further details are provided in the AIS (see **Appendix G**).

4.6 VITICULTURE CRITICAL INDUSTRY CLUSTER

The SRLUP does not indicate any mapped viticulture CIC within or in the locality of the Project Boundary and is not considered to be a land use within the area. Further the draft mapping released by NSW Government in October 2013 has not illustrated Viticulture CIC within this area.

As such, viticulture CIC is not considered to be in this area and has not been assessed further in this document.

5 BIOPHYSICAL STRATEGIC AGRICULTURAL LAND

This section considers any predicted impacts from the Project against the criteria in clause 17H(4)(a) of the Mining SEPP in relation to the BSAL as shown on Figure 21 and described in Section 4.3.4. This section is supported by detailed technical specialist's impact assessments in Appendix D to J. The impacts of the Project on the agricultural productivity of BSAL have been assessed in consideration of the relevant criteria listed in Table 1. Avoidance, mitigation, offset and/or rehabilitation measures for predicted impacts are described in Section 7.

5.1 SURFACE AREA DISTURBANCE AND SUBSIDENCE

5.1.1 Surface Area Disturbance

The Project will directly impact approximately 950 ha of land through surface disturbance. Of the area to be impacted, approximately 215 ha has been verified as BSAL, which is approximately 9.1% of the total verified BSAL resource within the Project Boundary (2,366 ha).

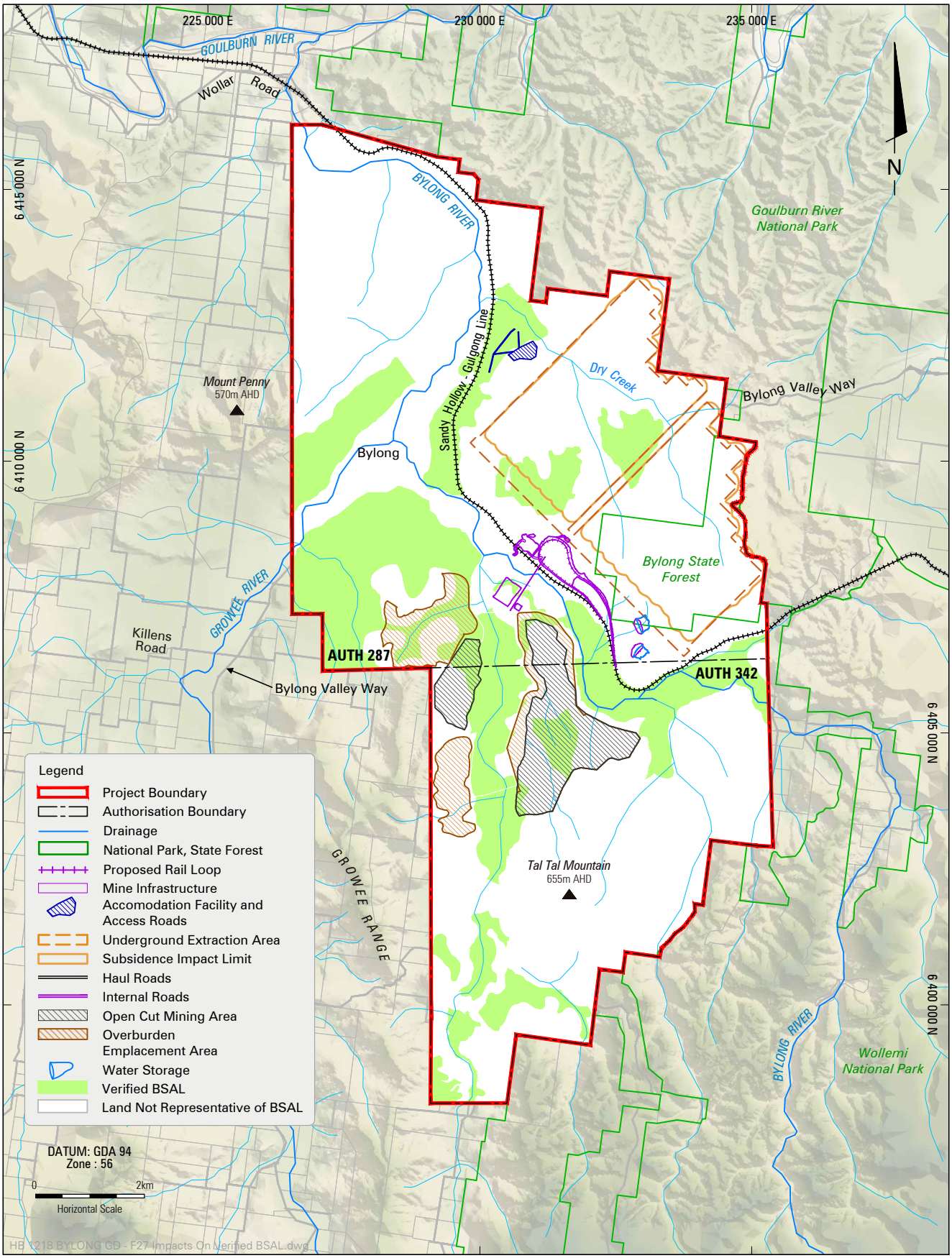
This represents a 0.1% impact to the total Biophysical Strategic Agricultural Land mapped within the SRLUP.

Direct and Temporary Impacts

The Project will directly and temporarily impact approximately 153 ha of land through surface disturbance to facilitate the necessary mine infrastructure (including roads). Of this area, approximately 21 ha represents land that has been verified as BSAL, which is approximately 0.9% of the total verified BSAL resource within the Project Boundary (2,366 ha) (see **Figure 27**). This land is assessed as:

- 4 ha of land and soil capability Class 3 with moderately high relative soil fertility and it forms part of the basaltic-influenced red dermosol soil unit within the Bald Hill soil landscape;
- 10 ha of land and soil capability Class 3 with moderately high relative soil fertility and it forms part of the alluvial-influenced, deep, non-saline black dermosol soil unit within the Bylong soil landscape; and
- 7 ha of land and soil capability Class 5 with moderately high relative soil fertility and it forms part of the sedimentary-derived, deep red chromosols within the Growee soil landscape.

Major mine infrastructure (e.g. CHPP and main haul roads) will be constructed and remain operational for the life of the Project to facilitate coal recovery and processing. Other minor infrastructure (e.g. internal roads) will be established and decommissioned in line with the scheduling of the mine plan and remain relatively dynamic. Agricultural productivity of BSAL will cease within these areas within the period for which mine infrastructure will be operational. Upon decommissioning, infrastructure will be removed and the land reshaped and reinstated to its pre-mining condition.



BYLONG COAL PROJECT

Impacts on Verified BSAL

FIGURE 27

This will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and '*The Land and Soil Capability Assessment Scheme: Second Approximation – A General Rural Land Evaluation System for NSW'* (LSC Scheme) (OEH, 2012).

Section 7 provides further details regarding each of the measures outlined above.

In consideration of the aforementioned, the agricultural productivity of approximately 21 ha of BSAL is not anticipated to be significantly impacted in the long-term as a result of surface disturbance. Once the soils have been reinstated to the reshaped profile, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

Direct and Permanent Impacts

The Project will directly and permanently impact approximately 797 ha of land through surface disturbance to facilitate the open cut mining areas and OEAs. Of this area, approximately 194 ha represents land that has been verified as BSAL, which is approximately 8.2% of the total verified BSAL resource within the Project Boundary (2,366 ha) (see **Figure 27**). This has been assessed as:

- 95 ha of land and soil capability Class 3 with moderately high relative soil fertility and it forms part of the basaltic-influenced red dermosol soil unit within the Bald Hill soil landscape;
- 1 ha of land and soil capability Class 3 with moderately high relative soil fertility and it forms part of the alluvial-influenced, deep, non-saline black dermosol soil unit within the Bylong soil landscape; and
- 99 ha of land and soil capability Class 5 with moderately high relative soil fertility and it forms part of the sedimentary-derived, deep red chromosols within the Growee soil landscape.

The Project has been designed to avoid direct and permanent impacts on verified BSAL, as far as practical, without causing significant harm to other environmental aspects (see **Section 2.7** for further discussion on this Project aspect).

Agricultural productivity of BSAL will cease progressively as mining advances. Establishment and rehabilitation of the final landform will be undertaken in parallel with the scheduling of such operations to achieve a post mining land and soil capability of Class 4. As mining activities are completed, re-establishment of agricultural activities will occur on rehabilitated land as soon as practical.

In order to compensate for the direct and permanent impact of the Project, KEPCO has committed to progressively stripping and reinstating the soils from the 194 ha of affected BSAL (in line with the mining schedule) external to the Project Disturbance Boundary. This approach will afford the best outcome for stakeholders and maintain the integrity of the BSAL soil resources.

The reinstatement of BSAL will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme.

Section 7 provides further details regarding each of the measures outlined above.

As such, the agricultural productivity of approximately 194 ha of BSAL is not anticipated to be significantly impacted in the long-term as a result of surface disturbance. Rather there will be a change in the spatial distribution of BSAL from the pre-mining landscape. Once the soil resources have been reinstated on land external to the Project Disturbance Boundary, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

5.1.2 Subsidence

MSEC has completed a 'Subsidence Predictions and Impact Assessment for Natural and Built Features in Support of the Gateway Application' (see **Appendix I**) for the Project.

The Project will indirectly and temporarily impact 1,717 ha by operations in the Underground Extraction Area. Preliminary subsidence modelling has indicated a Subsidence Impact Limit, whereby predicted subsidence is expected to be less than 20 mm. This Subsidence Impact Limit has identified to potential impact to 1,627 ha of land, partially within and outside of the Underground Extraction Area.

Of the land overlying the Underground Extraction Area, 186 ha represents land that has been verified as BSAL, which is approximately 7.9% of the total verified BSAL resource within the Project Boundary (2,366 ha) (see **Figure 27**).

Of the land that is predicted to be affected by subsidence effects within the Subsidence Impact Limit, 152 ha represents land that has been verified as BSAL, which is approximately 6.4% of the total verified BSAL resource within the Project Boundary (2,366 ha) (see **Figure 27**).

The BSAL to be indirectly and temporarily impacted by subsidence effects is assessed as land and soil capability Class 3 with moderately high relative soil fertility and forms part of the basaltic-influenced red dermosol soil unit within the Bald Hill soil landscape.

The maximum predicted subsidence parameters, resulting from the extraction from the Underground Extraction Area are as follows:

- Vertical subsidence of 3,400 mm, which represents approximately 65% of the total extraction height;

- Tilt of 66 mm/m (i.e. 6.6 %, or 1 in 15);
- Hogging curvature of 3.6 km-1 (i.e. minimum radius of curvature of 275 metres);
- Sagging curvature of 3.3 km-1 (i.e. minimum radius of curvature of 300 metres); and
- Strains typically between 10 mm/m and 20 mm/m, with some isolated strains greater than 20 mm/m.

Surface cracking is likely to be experienced above the Underground Extraction Area as a result of subsidence. In the flatter areas above the Underground Extraction Area, surface cracking is expected to be typically between 25 mm and 50 mm, with some isolated cracking around 100 mm or greater.

The surface cracking along the steeper slopes are expected to be typically in the order of 50 mm to 100 mm, with isolated cracking around 200 mm or greater. As a result of the Underground Extraction Area, minor surface cracking (generally less than 100 mm) may also occur in the soil beds of the drainage lines on flat to gently inclined land with the potential for localised cracking of up to 200 mm associated with steeper slopes. Given that the BSAL to be impacted upon by subsidence is located on gently inclined land (3-10%) surface cracking is expected to be minor. Further investigations in relation to the potential for surface cracking will be undertaken in a detailed Subsidence Impact Assessment to be developed for the EIS with any relevant mitigation identified as required.

Subsidence may also result in ponding along the ephemeral drainage lines drainage that occur above the Underground Extraction Area. There is a higher potential for ponding to develop along the lower reaches of Dry Creek, which are estimated to be less than around 1 m deep and 50 m to 100 m long, after the completion of mining.

It is expected that localised areas of ponding will develop along other drainage lines, particularly in the areas with shallow grades. Further investigations in relation to the potential for ponding will be undertaken in a detailed Subsidence Impact Assessment to be developed for the EIS with any relevant mitigation identified as required.

The current agricultural land utilisation above the proposed longwalls includes cattle grazing. The potential impacts on these features include surface cracking and changes in surface water drainage.

In consideration of the above, the vertical component associated with the predicted subsidence is unlikely to change the soil profile to the extent that the 152 ha of BSAL within the Subsidence Impact Limit and its associated agricultural productivity are significantly impacted. Upon progressive settlement (approximately two years following each subsided longwall panel), it is expected that BSAL will be able to retain its pre-mining land capability characteristics and be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

5.2 SOIL AND LANDSCAPE CHARACTERISTICS

As outlined in **Section 4.3.1**, the impact on soil resources will vary based on the Project component and the timing that the land will be out of agricultural production.

The following section assesses the impact of each Project component on the agricultural productivity of BSAL soil and landscape characteristics holistically, including consideration of slope, surface rockiness/outcrops, land surface micro-relief, soil fertility, effective soil rooting depth, soil drainage, soil pH and soil salinity.

Direct and Temporary Impacts

The Project will result in direct, temporary impacts (associated with mine infrastructure including haul roads and MIAs) on approximately 153 ha of soil resources within the Project Disturbance Boundary, including 21 ha of verified BSAL (see **Section 5.1.1**). The Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) determined that the existing soil and landscape characteristics of BSAL to be impacted is predicted to change temporarily from its pre-mining condition due to the removal of soil resources, including topsoil and subsoil stripping, to facilitate the construction of mine infrastructure.

Agricultural productivity of BSAL will cease relative to the period for which mine infrastructure will be operational. Upon decommissioning, infrastructure will be removed and the land reinstated to its pre-mining soil and landscape characteristics. This will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme.

Section 7 provides further details regarding each of the measures outlined above.

In consideration of the aforementioned, agricultural productivity of approximately 21 ha of BSAL will not be significantly impacted in the long-term as a result of the Project's operations on soil and landscape characteristics. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

Direct and Permanent Impacts

The Project will result in direct and permanent impacts (associated with the open cut mining areas and OEAs) on approximately 797 ha of soil resources within the Project Disturbance Boundary, including approximately 194 ha of verified BSAL (see **Section 5.1.1**). The Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) determined that the existing soil and landscape characteristics of BSAL to be impacted is predicted to change from its pre-mining condition due to the removal of soil resources, including topsoil and subsoil stripping, to facilitate overburden removal and coal recovery.

Agricultural productivity of BSAL will cease progressively as mining advances. Establishment and rehabilitation of the final landform will be undertaken in parallel with the scheduling of such operations to achieve land and soil capability Class 4. As such, the post-mining soil and landscape characteristics will subsequently resemble this classification from its pre-mining condition as provided in **Table 13**. **Section 7.3.2** provides further details regarding how land and soil capability Class 4 will be achieved.

Table 13
Pre and Post-Mining Soil and Landscape Characteristics

Soil and Landscape Characteristics	Pre-mining	Post-mining
Chemical		
pH	5.9 (moderately acidic) to 9.0 (strongly alkaline)	Greater than 4.7 (moderately acidic to neutral or alkaline) with moderate or high surface soil buffering capacity or between 5.5 and 8.0 with low surface soil buffering capacity
Salinity	ECe 3 (non-saline)	ECe less than 6.0 (moderately saline)
Physical		
Slope	Less than 1% to 5%	Less than 20%
Drainage	Well drained	Imperfectly drained (waterlogging 8 to 12 weeks duration)
Effective rooting depth	Greater than or equal to 750 mm	Greater than 500 mm
Land surface micro-relief	Less than 500 mm	Greater than 500 mm
Rock outcrop and surface rockiness	Less than 30% rock outcrop and less than or equal to 20% of area has unattached rock fragments greater than 60 mm diameter	Between 30 and 50% rock outcrop and/or surface rockiness

In order to compensate for the direct and permanent impact of the Project, KEPCO has committed to progressively stripping and reinstating the 194 ha of affected BSAL (in line with the mining schedule) external to the Project Disturbance Boundary. This approach will afford the best outcome for stakeholders and maintain the integrity of the BSAL resource.

The reinstatement of BSAL will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme.

Section 7 provides further details regarding each of the measures outlined above.

In consideration of the aforementioned, agricultural productivity of approximately 194 ha of BSAL will not be significantly impacted in the long-term as a result of the Project's operations on soil and landscape characteristics. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

Indirect and Temporary Impacts

The Project will indirectly and temporarily impact 1,717 ha by operations in the Underground Extraction Area. The Subsidence Impact Limit may result in potential impacts to 1,627 ha of land. The Subsidence Impact Limit includes approximately 152 ha of verified BSAL, which is approximately 6.4% of the total verified BSAL within the Project Boundary.

Underground mining will not result in surface disturbance nor will predicted subsidence change the chemical or physical composition of the soil profile to the extent that BSAL and its associated agricultural productivity are significantly impacted from its pre-mining condition (see **Section 5.1.2**). Where potential issues, such as localised ponding and cracking, may occur surface remediation will be investigated to ensure BSAL and its associated agricultural productivity is not significantly impacted (see **Sections 5.1.2** and **7**). In this regard, the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) determined the Underground Extraction Area is unlikely to impact the existing soil and landscape characteristics of the overlying BSAL.

Upon progressive settlement (approximately two years following each subsided longwall panel), it is expected that BSAL will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

5.3 LAND AND SOIL CAPABILITY

Verification Process

As outlined in **Section 4.3.2**, land and soil capability classifications should be considered in the verification process to better assess the presence of BSAL.

Currently, a number of soil units classified as BSAL (B02, BH01, BH02 and G05) have a land and soil capability Class 4 (moderate to severe limitations for some land uses that need to be consciously managed to prevent soil and land degradation) or 5 (severe limitations for high impact land management uses with only few management practices available to overcome these limitations) as per the LSC Scheme. This is contrary to the SRLUP, which requires BSAL land to be highly suitable for agricultural practices (generally Class 1 to 3).

Acceptance of the amendments to the soil fertility classification would result in the total quantum of BSAL within the Project Disturbance Boundary (401 ha (or 367 ha excluding BSAL outside Subsidence Impact Limit)) to be reduced to 358 ha. Adoption of the land and soil capability classification in the verification process would result in the total quantum of BSAL within the Project Disturbance Boundary to be reduced to 295 ha.

Direct and Temporary

The Project will result in direct, temporary impacts (associated with mine infrastructure including haul roads and MIAs) on approximately 153 ha of soil resources within the Project Disturbance Boundary, including 21 ha of verified BSAL (see **Section 5.1.1**). This is represented by 14 ha of land and soil capability Class 3 (associated with the Bald Hill and Bylong soil landscapes) and 7 ha of Class 5 (associated with the Growee soil landscape).

The Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) determined that the existing land and soil capability of BSAL to be impacted is predicted to reduce temporarily from its pre-mining condition (Class 3 and 5) due to the removal of soil resources (including topsoil and subsoil stripping) to facilitate the construction of mine infrastructure.

Upon decommissioning, it is most likely that infrastructure will be removed and the land reinstated to its pre-mining land and soil capability characteristics. This will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme.

Section 7 provides further details regarding each of the measures outlined above.

The land and soil capability of approximately 21 ha of BSAL will not be significantly impacted in the long-term as a result of the Project. Once reinstated, the land and soil capability will resemble pre-mining conditions.

Direct and Permanent

The Project will result in direct and permanent impacts (associated with the open cut mining areas and OEAs) on approximately 797 ha of soil resources within the Project Disturbance Boundary. This includes approximately 194 ha of verified BSAL, which is approximately 8.2% of the total verified BSAL within the Project Boundary (see **Section 5.1.1**). This is represented by approximately 95 ha of land and soil capability Class 3 (associated with the Bald Hill and Bylong soil landscapes) and approximately 99 ha of Class 5 (associated with the Growee soil landscape).

The Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) determined that the existing land and soil capability of BSAL to be impacted is predicted to reduce permanently from its pre-mining condition (Class 3 and 5) due to the removal of soil resources (including topsoil and subsoil stripping) to facilitate overburden removal and coal recovery.

Establishment and rehabilitation of the final landform will be undertaken progressively with the scheduling of such operations to achieve land and soil capability Class 4, which will be suitable for moderate impact land uses such as grazing with some cultivation (i.e. current land use practice). As a result there will be a marginal increase in the quantum of Class 3 land by approximately 1% (99 ha) and marginal decrease in the quantum of Class 5 land by 1% (99 ha).

In order to compensate for the direct and permanent impact of the Project, KEPCO has committed to progressively stripping 194 ha of affected BSAL (in line with the mining schedule) and reinstating it external to the Project Disturbance Boundary. This approach will afford the best outcome for stakeholders and maintain the integrity of the BSAL resource.

The predicted permanent increase in Class 4 land within the Project Disturbance Boundary is numerically cancelled out as Class 4 land will be targeted for improvement to Class 3 during BSAL reinstatements works (see **Section 7**).

Indirect and Temporary

The Project will indirectly and temporarily impact 1,717 ha by operations in the Underground Extraction Area, which contains 186 ha of BSAL. Approximately 152 ha of BSAL within the Subsidence Impact Limit (1,627 ha) will be indirectly and temporarily affected by subsidence that is predicted to occur within this area, which is approximately 6.4% of the total verified BSAL within the Project Boundary. This BSAL is represented by land and soil capability Class 3 (associated with the Bald Hill soil landscape).

Underground mining will result in neither significant surface disturbance nor will the vertical component associated with the predicted subsidence change the land and soil capability to the extent that BSAL is significantly impacted from its pre-mining condition (see **Section 5.1.2**). Where issues have a potential to occur (such as localised ponding and cracking), surface remediation will be investigated to ensure BSAL is not significantly impacted (see **Section 5.1.2** and **Section 7**).

In this regard, the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) has determined the Underground Extraction Area is unlikely to impact the existing land and soil capability classification of the overlying BSAL.

5.4 AQUIFER INTERFERENCE POLICY

The Project will comprise open cut and underground mining operations which are classified aquifer interference activities under the AIP. In order to assess the Project against the relevant criteria within the AIP, a groundwater model was developed as discussed in **Section 4.4.2**.

The associated assessment of the Project against the relevant criteria within the AIP is provided in **Appendix E** and summarised below.

5.4.1 Groundwater Impact Assessment

Groundwater Depressurisation

The groundwater modelling exercise simulated the existing conditions of the groundwater regime and provided preliminary predictions of the potential impacts of future mining operations. The potential future mining operations included the Project, and the possible mining operations associated with the Mount Penny Project. Seepage of groundwater from the aquifers intersected during mining will reduce groundwater pressures in the coal seams and overburden / interburden aquifers around the open cut and underground mining areas. This will lower the water table of an unconfined aquifer or depressurise a confined aquifer, lowering the potentiometric surface. Depressurisation of the coal formations is greatest at the working coalface and gradually reduces with distance from the mine.

The numerical model calculated the extent of the zone of depressurisation within the Permian and alluvial groundwater systems due to mining by comparing water levels with and without the proposed mine operating. Two scenarios were simulated, firstly with all proposed mining active, and secondly with no mining at Bylong. The zone of depressurisation due to Project was determined as the difference in the potentiometric surface between these two model runs.

The modelling indicates the proposed mining induces drawdown in the alluvium in the first 10 years of the Project life when open cut mining is active. When the open cut mine void is backfilled, the zone of influence begins to retract and groundwater levels in the alluvium start to recover. At the end of the Project life, the drawdown within the alluvium only affects the fringes of the floodplain areas.

Open cut and underground mining depressurises the water in the coal seam in a zone that extends between 1 km and 2 km from the proposed mining areas. Beyond this zone, the drawdown is predicted to be less than 1 m and will likely to be undetectable and within natural variations. **Figure 28** illustrates the predicted maximum drawdown for the Project. Drawdown within the alluvium peaks at around 5 m in the alluvium adjacent the Eastern Open Cut. In contrast, the longwall mining influences water levels only on the very fringes of the alluvial aquifers and highlights that most significant impacts occur in the first 10 years.

Groundwater Inflows

Figure 29 shows the predicted inflows of water into the proposed mining areas throughout the life of the Project. It is important to note that these results illustrate the actual take of water from the groundwater system and do not account for the evaporative and other losses that will be experienced prior to this water being collected within the water management system.

As illustrated in **Figure 29**, the predicted mine seepage rates vary throughout the life of the Project. The variability in inflows is due to the proposed mining depths, strata being mined over time and the hydraulic gradients induced by the depressurisation.

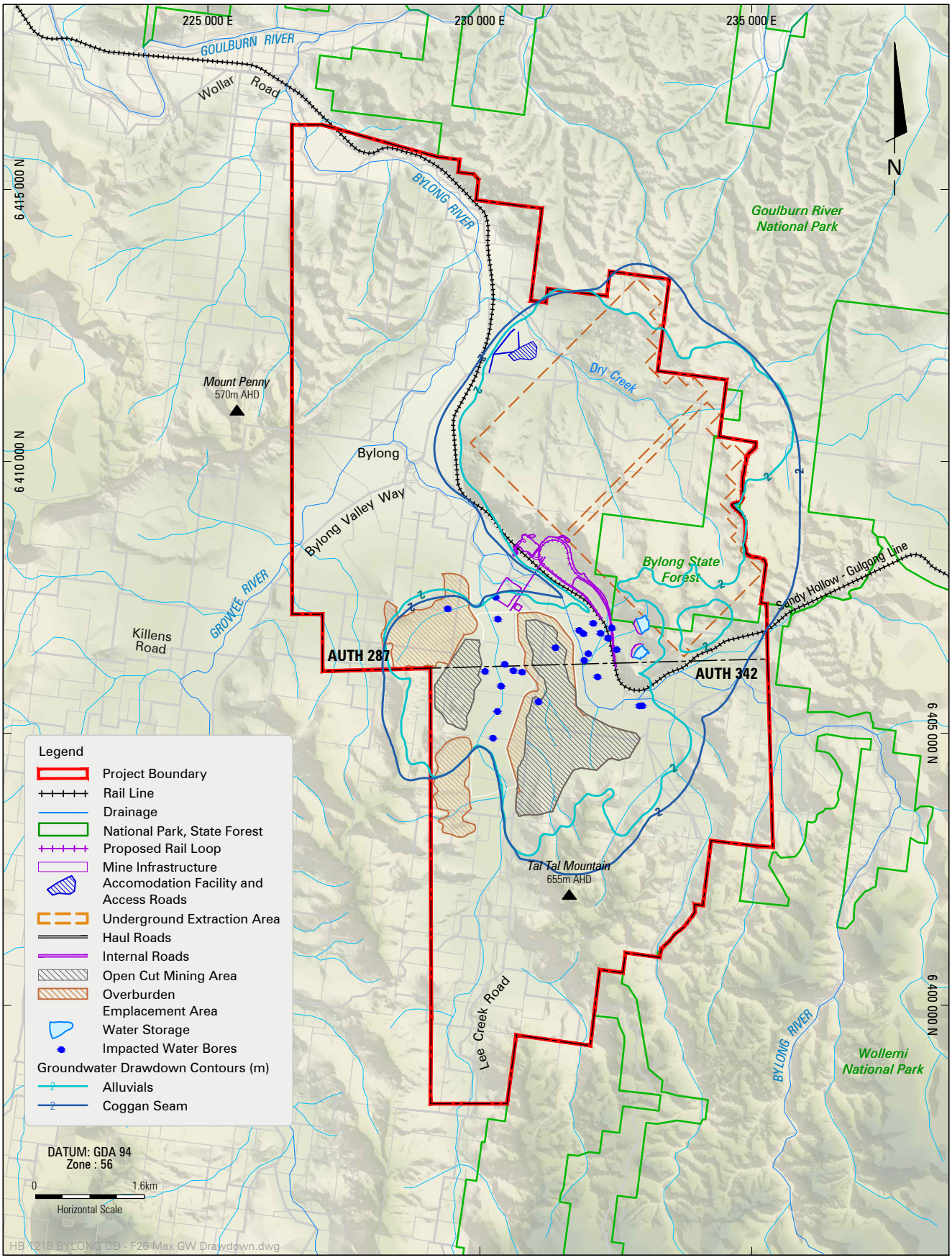
The model predicts seepage rates to the open cut mining areas of less than 1.8 ML/day (657 ML/year). Groundwater inflows to Western Open Cut decrease to zero at year 7, as mining advances up-dip, above the saturated groundwater levels.

Groundwater inflow to the longwall panels and main road is lower than the open cut mining areas due to the offset distance from the alluvium. The peaks in the predicted underground inflows is due to the progress of the longwall mining, which remains active in the model until switched off when the panel is completed.

Alluvial Losses

In the absence of the Project, the model predicts there is a net upward flow entering the alluvium aquifer from the underlying Permian formation of 7.7 ML/day across the whole model domain. This is comprised of 8.4 ML/day upward flow and 0.7 ML/day downward flow. This is effectively recharge to the alluvium and is part of the alluvial system water budget.

The model predicts that once mining commences, depressurisation of the Permian strata occurs. Within the zone of influence, the rate of upward flow from the Permian to the alluvium reduces. This is due to changes in hydraulic gradients between the alluvium and Permian that reduce upward flow, and reverse the flow to downward flow in some areas adjacent to the proposed open cut mining areas.



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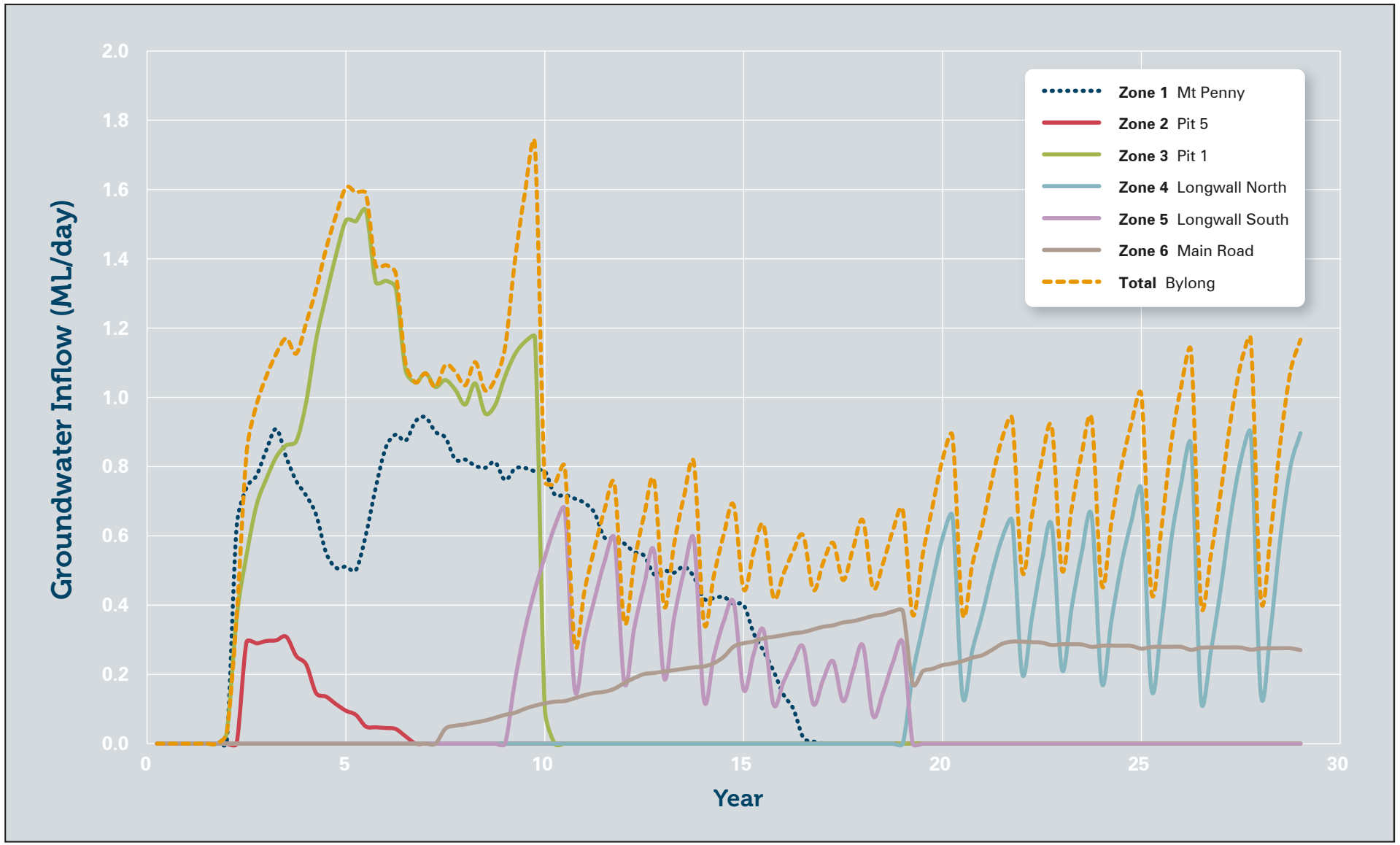
Preliminary Maximum Groundwater Drawdown - Alluvium and Permian

FIGURE 28



BYLONG COAL PROJECT

Cockatoo Coal Limited

KEPCO Korea Electric Power Corporation BYLONG AUSTRALIA | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Predicted Seepage to Open Cut and Underground Mining Areas

FIGURE 29

The water take from the alluvium due to mining peaks at 469 ML/year in Year 10, then gradually reduces to 285 ML/year at the end of the Project life. This water take from the alluvials will occur from the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP.

KEPCO has secured 1,959 units of water allocation from the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP, which is more than sufficient to licence the predicted take of water from the alluvium. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. Further allocations are likely to be secured by KEPCO into the future.

Permian Losses

Mining activities will experience a water take from the Permian coal seam aquifers which is not part of a WSP and as such are regulated under the *Water Act 1912*. The model predicts that groundwater take from the Permian coal seams will peak at approximately 536 ML/year in Year 10, averaging around 300 ML/year over the Project life.

KEPCO will secure a water licence under Part 5 of the *Water Act 1912* for the maximum water take from the Permian coal seam aquifer. There are presently no embargoes applied to this region for seeking this relevant approval.

Baseflow Losses

The modelling for the Project has shown that once mining commences, the Permian strata become depressurised, and within the zone of influence, upward flow from the Permian to the alluvium reduces. The resultant lowering of groundwater levels in the alluvium, although very small, reduces the hydraulic gradient between the bed of the river and the underlying aquifer. This reduction in hydraulic gradient results in a reduction in baseflow to the surface water system.

Modelling has indicated that mining reduces the baseflows within Lee Creek (35 ML/year at peak impact) and the Bylong River (180 ML/year at peak impact), which are both immediately adjacent to the Open Cut Mining Areas. The model has identified that there is not anticipated to be any impacts to the baseflows to the Growee River. The Goulburn River to the north of the Project Boundary was also identified to be not likely to be impacted by the Project within the preliminary modelling.

The surface water within Bylong River and Lee Creek is regulated under the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP. Accordingly, surface water licence allocations for 205 ML/year are required to account for the losses to baseflow to Lee Creek and the Bylong River.

KEPCO has secured 1,959 units of water allocation from the Bylong Water Source under the Hunter Unregulated and Alluvial Water Sharing Plan. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. The current allocations are groundwater allocations, however given the highly connected alluvial aquifer with the surface water system; it is likely that groundwater allocations may be transferred to account for surface water takes. Further allocations are likely to be secured into the future and will be sufficient to license the estimated water take.

Impact on Groundwater Users

Table 14 presents privately owned or government licensed bores with predicted groundwater drawdown impacts of greater than 2 m. These bores are all in the alluvium (except GW044352, which is constructed within the Permian strata). The majority of the bores are currently located on private land. KEPCO has reached agreement with key landholders for the purchase of the properties with 22 bores that are predicted to be impacted. KEPCO will continue to consult with all other affected stakeholders regarding the predicted impact on their bores (2) and possible mitigation measures. Privately owned bores are highlighted grey in **Table 14**.

Table 14
Licensed Bores within Predicted Impacts

Bore ID	Strata	Easting (m)	Northing (m)	Owner	Maximum Predicted Drawdown (m)
GW044352	Hardrock	231390	6406570	Private*	28.47
GW034172	Alluvium	230775	6406122	Private*	7.79
GW034173	Alluvium	230457	6406268	Private*	6.89
GW044346	Alluvium	232163	6406036	Private*	6.25
GW044345	Alluvium	231919	6406338	Private*	5.13
GW027890	Alluvium	230330	6407097	Private*	4.91
GW042936	Alluvium	232935	6405502	Private*	4.73
GW042935	Alluvium	232987	6405503	Private*	4.18
GW044351	Alluvium	232515	6406539	Private*	4.14
GW018266	Alluvium	229410	6407288	Private*	3.99
GW044349	Alluvium	232426	6406937	Private*	3.87
GW034171	Alluvium	230324	6405401	Private*	3.82
GW044350	Alluvium	232353	6406750	Private*	3.56
GW044347	Alluvium	231906	6406831	Private*	3.49
GW044348	Alluvium	232084	6407021	Private*	3.09
GW018271	Alluvium	230294	6407497	Private*	2.49
GW078252	Alluvium	230095	6406135	Private*	12.82
GW078253	Alluvium	230617	6406149	Private*	7.19
GW078254	Alluvium	230390	6405865	Private*	6.05
GW078247	Alluvium	231994	6406463	Private*	4.52
GW078245	Alluvium	231826	6406890	Private*	3.44
GW078246	Alluvium	232220	6406839	Private*	3.4
GW030543	Alluvium	231077	6405575	Other Government	18.46
GW271037	Alluvium	230241	6404910	NOW	2.65

** Property under Agreement with KEPCO for purchase*

Groundwater Dependent Ecosystems

As explained in **Section 3.4.2**, there are no GDEs currently mapped within the Project Boundary on a regional scale based on searches of information in the public arena. Furthermore, there are no high priority GDEs listed under schedule 4 of the Hunter Unregulated and Alluvial WSP in the Project Boundary or immediate surrounds. Accordingly this assessment does not anticipate any impacts upon GDEs.

Further work will be completed during the preparation of the EIS to confirm the presence of GDEs within the Project Boundary at a local scale. Should GDEs be identified within the Project Boundary, the Groundwater Impact Assessment will complete the relevant assessment of the impacts upon these ecosystems and recommend appropriate monitoring, management and mitigation measures to be implemented to minimise the impacts of the Project, as required.

Culturally Significant Sites

There are no culturally significant sites listed under the Hunter Unregulated and Alluvial WSP in the Project Boundary or immediate surrounds. Accordingly this assessment does not anticipate impacts upon culturally significant sites as a result of the take of groundwater.

Post Mining Groundwater Recovery

Post mining impacts were investigated with a recovery model, commencing from the end of mining and run for 1,000 years. The model used the final end of mining groundwater levels as the starting heads, and removed all drain cells simulating the proposed mining areas to allow groundwater levels to equilibrate. At the end of mining, it was assumed that the last longwall panel was converted to goafed material, and the main road drain cells removed.

The recovery model simulated illustrates that the mining will lead to a permanent change in shape of the water table surface, with water levels mounding and falling within the spoil areas due to the change in hydraulic properties and recharge rates.

It is proposed to co-dispose partially dried fine and coarse reject materials into the Western and Eastern Open Cuts during the years of open cut mining operations. Additionally, fine and coarse reject materials generated during the longer term underground mining operations are proposed to be disposed into the remaining Eastern Open Cut void for the remainder of the Project life following open cut mining operations.

In order to understand the potential for the leachate from the fine and coarse reject material to impact on surrounding water quality, it is important to understand geochemistry and the rate of groundwater flow through these and spoil materials. Geochemical studies are being undertaken to characterise the quality of water that flows through these materials for inclusion within the EIS for the Project. The model provides an indication of the fluxes of water from the spoil and fine and coarse reject materials into the surrounding environment.

A review of the groundwater levels and flow directions within the groundwater at 1,000 years post mining indicates that groundwater flow is through the proposed coarse and fine reject materials, into the spoil and then into the adjacent alluvium. The flow of groundwater from Eastern Open Cut to the surrounding strata stabilises at about 0.27 ML/day. The model indicates the flow from the remaining Eastern Open Cut Void and the proposed disposal of coarse and fine reject material stabilises at about 0.06 ML/day. The coarse and fine reject materials water flows into the spoil, and then out into the surrounding alluvium.

Approximately 0.8 ML/day is predicted to flow from the Permian to the alluvial system post mining. After equilibrium conditions are reached post mining, the rate of flow from the Permian to the alluvium increases to 1.0 ML/day, indicating an increase of 0.2 ML/day entering the alluvium from the post mining situation.

The flow through the coarse and fine reject materials accounts for about 6% of groundwater flowing from the Permian into the alluvium. As stated previously, the potential for this water to impact on the water quality in the alluvium and the connected streams depends on the geochemistry of the spoil and coarse fine reject material. There is no current data available for the likely geochemistry of the material within the Project Boundary. Testing by Environmental Geochemistry International Pty Ltd (2006) at the Moolarben Project analysed the chemical composition of water extracts of overburden and floor samples, which is mining in the same geological units. The testing indicated a relatively low EC of water extracts from the overburden/ interburden lithological units averaging 119 µS/cm. If the salinity of the spoil and coarse and fine reject materials is similar to this for the Project, no significant impacts on aquifer or stream water quality are considered likely to occur.

Further work will be completed during the preparation of the EIS to confirm that the impacts to the surrounding aquifers post-mining will be within acceptable limits.

5.4.2 Surface Water Balance

A static water balance was completed for the Project to determine the additional water requirements during average rainfall conditions.

Catchment runoff was identified to provide the greatest water input to the water management system during the operation of the open cut mining areas (i.e. during Years 3, 5, 7 and 10 of the Project). At the completion of open cut mining, rehabilitation will be completed and it was assumed that sediment dams will be able to be decommissioned, resulting in these catchments no longer contributing to the water management system. The largest inflow to the water management system following year 10 was identified to be groundwater inflows into the Open Cut Void and the underground mining areas. The greatest demands identified within the water management system include water required for underground operations and CHPP make up water.

The preliminary water balance provides an indication of whether there will be a deficit (a negative value) or a surplus (positive value) of water under the proposed operational rules and layout for each given staged mine plan. For a water deficit, off-site supplies will be required to meet the operational demands, and for a water surplus, sufficient storage capacity will be required on site to contain excess mine affected water.

For the Year 5 mine plan, the water balance indicates a water surplus of approximately 90 ML/year will be experienced within the water management system under the adopted operating rules and layout for that stage. Additionally, a surplus of 46 ML/year was identified to occur for the Year 7 staged mine plan under average rainfall conditions.

The preliminary water balance identified that in Year 3, Year 10 and post-open cut mining, there will be a deficit of water of 387 ML/year, 321 ML/year and 732 ML/year, respectively under average rainfall conditions. For the years when the water management system is in deficit, the existing groundwater bore licences held by KEPCO will be sufficient to supply the additional water requirements. KEPCO is likely to secure further water entitlements throughout the planning approvals process.

The preliminary water balance has identified that there will be areas of the existing catchment that would otherwise flow towards the main drainage lines in the Project Boundary that will be captured. In Year 5 when open cut disturbance is at its maximum, 696 ML/year of rainfall runoff and 101 ML/year of direct rainfall will be captured within the mining areas and sediment dams under average rainfall conditions.

Clause 18(1) of the *Water Management (General) Regulation 2011* (WM Regulation) states that a Water Access Licence (WAL) is not required for any of the purposes listed under Part 1 of Schedule 5 of the WM Regulation. "*Excluded works*" are listed under Part 1 of Schedule 5 as a purpose that does not require a WAL.

"*Excluded works"* are defined in Schedule 1 of the WM Regulation and include:

> *"Dams solely for the capture, containment and recirculation of drainage and / or effluent, consistent with best management practice or required by a public authority (…) to prevent the contamination of a water source, provided such dams are located on a minor stream."*

Therefore, a WAL does not need to be obtained for water captured in sediment dams. Additional to this, harvestable use rights will be investigated for use as part of the EIS for any additional water takes from the catchment.

5.4.3 Aquifer Impact Assessment

Groundwater Source Categories

Groundwater sources are divided as highly productive and less productive under the AIP. Highly productive groundwater are those groundwater sources where the total dissolved solids is less than 1,500 mg/L and contains a water supply works that can yield more than 5 litres/second.

Within the Project Boundary, the alluvial groundwater has been assessed as a highly productive groundwater source where total dissolved solids are less than 1,500 mg/L. The Permian coal measures are considered to be less productive groundwater aquifers since yields >5L/sec are considered unlikely and salinity <1,500 mg/L is not common.

Minimal Impact Considerations

There are two levels of minimal impact considerations specified in the AIP. If the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable. Where the predicted impacts are greater than the Level 1 minimal impact considerations then the AIP requires additional studies to fully assess these predicted impacts to determine if they are acceptable. If this assessment shows that the predicted impacts do not prevent the long-term viability of the relevant water-dependent asset, then the impacts will be considered to be acceptable.

The modelling indicates potential for drawdown in a number of private bores to exceed the Level 1 minimal impact considerations. Further studies will be undertaken during the EIS phase of the Project to improve the accuracy of the model predictions.

Alluvial Aquifer

Table 15 provides an assessment against the "*Minimal Impact Considerations"* for the alluvial aquifer. The land on which the groundwater depressurisation impacts are greater than 2 m is located on land that will be directly impacted as a result of the open cut mining operation and infrastructure components.

KEPCO has reached Agreements to purchase the two private properties where the predicted impacts are anticipated to occur. Following acquisition, these impacts will occur on KEPCO owned land. KEPCO will continue to consult with the NSW Government in relation to the predicted impact on its two bores.

Table 15
Minimal Impact Considerations for Alluvium

Aquifer	**Alluvial Aquifer – Bylong River and Lee Creek Alluvium**
Category	**Highly Productive**
Level 1 Minimal Impact Consideration	**Assessment**
Water Table Less than or equal to a 10% cumulative variation in water table allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) High priority groundwater dependent ecosystem; or (b) High priority culturally significant site; Listed in the schedule of the relevant water sharing plan. OR A maximum of a 2 m water table decline cumulatively at any water supply work.	As explained in **Section 5.4.1**, there are no High Priority GDEs or Culturally Significant Sites listed within the Hunter Unregulated and Alluvial WSP. As outlined in **Section 5.4.1**, there are 23 bores that will be impacted by a decline in water table (alluvial aquifer) greater than 2 m. KEPCO has reached Agreements to Purchase these properties and as such, following acquisition, these impacts will occur on KEPCO owned land KEPCO will continue to consult with all other affected stakeholders regarding the predicted impact on their bores within the alluvial aquifer (2) and possible mitigation measures.

Aquifer	**Alluvial Aquifer – Bylong River and Lee Creek Alluvium**
Category	**Highly Productive**
Level 1 Minimal Impact Consideration	**Assessment**
Water Pressure A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the base case of the water source to a maximum of a 2 m decline, at any water supply work.	As outlined in **Section 5.4.1**, there are 23 bores that will be impacted by a decline in water table (alluvial aquifer) greater than 2 m. KEPCO has reached Agreements to Purchase these properties and as such, following acquisition, these impacts will occur on KEPCO owned land. KEPCO will continue to consult with all other affected stakeholders regarding the predicted impact on their bores within the alluvial aquifer (2) and possible mitigation measures.
Water Quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. No increase of more than 1% per activity in the long-term average salinity in a highly connected surface water source at the nearest point to the activity. No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply". Not more than 10% cumulatively of the three dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200m laterally from the top of the high bank and 100m vertically beneath a highly connected surface water source that is defined as a "reliable water supply".	There is not anticipated to be any change in groundwater quality that will lower the beneficial use category of the neighbouring alluvial aquifer.

Permian Coal Seam Aquifer

Table 16 provides an assessment against the "*Minimal Impact Considerations"* for the Permian coal seam aquifer. The land on which the groundwater depressurisation impacts are predicted to be greater than 2 m is that which will be directly impacted as a result of the open cut mining operation and infrastructure components. KEPCO has reached Agreements to Purchase these properties and as such, following acquisition, these impacts will occur on KEPCO owned land.

Table 16
Minimal Impact Considerations for Permian Coal Seam

Aquifer	**Permian Coal Seam**
Category	**Less Productive**
Level 1 Minimal Impact Consideration	**Assessment**
Water Table Less than or equal to a 10% cumulative variation in water table allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) High priority groundwater dependent ecosystem; or (b) High priority culturally significant site; Listed in the schedule of the relevant water sharing plan. A maximum of a 2 m water table decline cumulatively at any water supply work.	As explained in **Section 5.4.1**, there are no High Priority GDEs or Culturally Significant Sites listed within the Hunter Unregulated and Alluvial WSP. There is one bore within the Permian coal seam aquifer that will be impacted by a decline in water table greater than 2 m. KEPCO has reached Agreements to Purchase these properties and as such, following acquisition, these impacts will occur on KEPCO owned land.
Water Pressure A cumulative pressure head decline of not more than a 2 m decline, at any water supply work.	There is one bore within the Permian coal seam aquifer that will be impacted by a decline in water table greater than 2 m. KEPCO has reached Agreements to Purchase these properties and as such, following acquisition, these impacts will occur on KEPCO owned land.
Water Quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.	There is not anticipated to be any change in groundwater quality that will lower the beneficial use category of the Permian coal seam aquifer.

AIP - Other Requirements

Table 17 to **Table 19** compares the preliminary groundwater impact predictions for the Project against the requirements under the NSW AIP (NOW, 2012).

Table 17
Accounting for or Preventing the Take of Water

AIP Requirement		Proponent Response
1	Described the water source (s) the activity will take water from?	Based on the AIP, the groundwater system impacted by the Project can be separated into two systems, as follows: • Porous and/or fractured consolidated sedimentary rock of the Permian coal measures; and • Groundwater within alluvium associated with the Bylong River and Lee Creek alluvium. Water quality and yields for the coal measures and Permian coal measures is considered a less productive aquifer according to the AIP because yields >5L/sec are considered unlikely and salinity <1,500 mg/L is not common, while the Bylong River and Lee Creek alluvium is considered a highly productive aquifer as yields >5L/sec are considered achievable and salinity <1,500 mg/L occurs in some areas.
2	Predicted the total amount of water that will be taken from each connected groundwater or surface water source on an annual basis as a result of the activity?	Predicted take based on this preliminary modelling for the Project include: • Permian coal measures: 536 ML/year at peak – 300 ML/year average • Quaternary alluvium: 469 ML/year at peak 320 ML/year at average • Bylong River baseflow – 180 ML/year peak, 54 ML/year average • Lee Creek baseflow – 35 ML/year peak, 21 ML/year average
3	Predicted the total amount of water that will be taken from each connected groundwater or surface water source after the closure of the activity?	The post-mining take of water will be no greater than the peak levels predicted during mining operations (see item 2 above). A licence/s for the peak annual take will be held by KEPCO during mining operations and will be applicable and account for any lesser post-mining take until levels recover to pre-mining conditions.

AIP Requirement		Proponent Response
4	Made these predictions in accordance with Section 3.2.3 of the AIP? (page 27)	Modelling has been completed based on a simple model to estimate the potential impact upon the groundwater regime. The modelling has been developed based on the extensive environmental monitoring that has been completed since November 2011 within the Project Boundary. This provides a firm understanding of the groundwater system.
5	Described how and in what proportions this take will be assigned to the affected aquifers and connected surface water sources?	Predicted takes based on the preliminary modelling for the Project include: • Permian coal measures – 536 ML/year at peak, 300 ML/year average • Quaternary alluvium – 469 ML/year at peak, 320 ML/year at average • Bylong River baseflow – 180 ML/year peak, 54 ML/year average • Lee Creek baseflow – 35 ML/year peak, 21 ML/year average
6	Described how any licence exemptions might apply?	Not applicable.
7	Described the characteristics of the water requirements?	Initial estimates: • Mine Industrial Areas – 90 ML/year • Open cut – 500 ML/year • Underground – 500 ML/year • CHPP – 400 ML/year • Accommodation Facility – 50 ML/year
8	Determined if there are sufficient water entitlements and water allocations that are able to be obtained for the activity?	KEPCO has secured 1,959 units of water allocation from the Bylong Water Source under the Hunter Unregulated and Alluvial WSP. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. Further allocations are likely to be secured into the future.
9	Considered the rules of the relevant water sharing plan and if it can meet these rules?	Hold the relevant WAL/s to account for the take of water associated with the Project. KEPCO has secured 1,959 units of water allocation from the Bylong Water Source under the Hunter Unregulated and Alluvial WSP. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. Further allocations are likely to be secured into the future. KEPCO will adhere to the dealings rules under the Hunter Unregulated and Alluvial WSP, where required.

AIP Requirement		Proponent Response
10	Determined how it will obtain the required water?	Via seepage to the mine face – a portion will likely evaporate or be removed as moisture in coal and will not enter the site water circuit. Potential need for a supplementary bore field to source deficits within the mine site water balance.
11	Considered the effect that activation of existing entitlement may have on future available water determinations?	Current groundwater entitlement for Bylong River is 5,843 ML/year – predicted impacts based on the preliminary modelling are considered negligible against existing entitlements.
12	Considered actions required both during and post-closure to minimise the risk of inflows to a mine void as a result of flooding?	Open cut mine plans have been designed to be located outside of the flood limits of Bylong River and Lee Creek. Further modelling and assessment will be completed within the EIS to confirm that the mine plans are located outside of this floodplain. Further, the Open Cut Mining Void is proposed to be backfilled. Therefore there will not be a post-mining final void.
13	Developed a strategy to account for any water taken beyond the life of the operation of the project?	Allocate existing and future water entitlements to the Project to licence take of water as necessary.
	Will uncertainty in the predicted inflows have a significant impact on the environment or other authorised water users? *Items 14-16 must be addressed if so.*	Yes, modelling indicates supply of adjacent private bores could be affected during and immediately after open cut mining is active for a period of approximately 9 years. While modelling did not indicate significant impact due to underground mining, the sensitivity analysis indicated increasing the hydraulic conductivity of the aquifer units could increase the number of private bores affected by mining.
14	Considered any potential for causing or enhancing hydraulic connections, and quantified the risk?	Mine plan has been designed to remain outside of the 150 m boundary from the edge of the neighbouring alluvium to ensure that impacts to the alluvial system are minimised as far as possible. Underground mine will fracture overlying strata, but this will not result in any direct connection to the alluvial aquifer. Designs have incorporated angle of draw to stay outside 40 m stand off from alluvials.
15	Quantified any other uncertainties in the groundwater or surface water impact modelling conducted for the activity?	Yes – work plan to reduce uncertainty of modelling provided. Completed a sensitivity analysis of the modelling to identify parameters that demonstrate most substantial changes in the predictions. These parameters will be further investigated during the preparation of the EIS.

AIP Requirement		Proponent Response
16	Considered strategies for monitoring actual and reassessing any predicted take of water throughout the life of the project, and how these requirements will be accounted for?	Ongoing monitoring and verification of modelling.

Table 18
AIP – Determining Water Predictions

AIP Requirement		Proponent Response
1	Addressed the minimum requirements found on page 27 of the AIP for the estimation of water quantities both during and following cessation of the proposed activity?	Modelling has been completed based on a simple model to estimate the potential impact upon the groundwater regime. The modelling has been developed based on the extensive environmental monitoring that has been completed since November 2011 within the Project Boundary. This modelling provides a firm understanding of the groundwater system.

Table 19
AIP – Other Requirements

AIP Requirement		Proponent Response
1	Establishment of baseline groundwater conditions?	Section 3.4.1 provides a summary of the baseline groundwater conditions.
2	A strategy for complying with any water access rules?	KEPCO currently holds 1,959 ML/year of water allocations within the Bylong River Water Source. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. KEPCO will utilise these water allocation (along with other water allocations that may be secured within the future) to account for predicted water takes from the alluvial and surface water sources. KEPCO will apply to NSW Office of Water for a water licence that accounts for predicted water takes from the Permian coal seam aquifer in accordance with the requirements under the *Water Act 1912*.

AIP Requirement		Proponent Response
3	Potential water level, quality or pressure drawdown impacts on nearby basic landholder rights water users?	Yes, there are predicted impacts upon existing bores currently located on privately owned land – KEPCO has reached agreement to acquire these properties upon request from the landowner.
4	Potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources?	Yes, there are predicted impacts upon existing bores currently located on privately owned land – KEPCO has reached agreement to acquire these properties upon request from the landowner.
5	Potential water level, quality or pressure drawdown impacts on groundwater dependent ecosystems?	No GDEs have been identified from the desktop searches of the WSP and the National GDE Atlas. Further assessment will be completed during the preparation of the EIS.
6	Potential for increased saline or contaminated water inflows to aquifers and highly connected river systems?	Yes, there is a potential for increased saline or contaminated water to flow into the aquifers as a result of mining operations. Preliminary assessment has identified that there is unlikely to be any significant water quality impacts to surrounding aquifers, however this will be assessed further during the preparation of the EIS.
7	Potential to cause or enhance hydraulic connection between aquifers?	No. The mine plan has been designed in consideration of the potential for enhanced hydraulic connection between the aquifers. The underground mine is predicted to fracture overlying strata, however this will not result in any direct connection to the alluvial aquifer as a result of the mine plan design.
8	Potential for river bank instability, or high wall instability or failure to occur?	No. The open cut and underground mine plans have been developed in consideration of its proximity to the neighbouring rivers and streams. It is unlikely that the Project will directly impact upon the stability of the river banks within the Project Boundary. Further, the mine plan will be designed in consideration of the strata that is being mined, which will manage any potential for highwall instability to occur.
9	Details of the method for disposing of extracted activities (for CSG activities)?	N/A

5.5 AGRICULTURAL LAND USE FRAGMENTATION

The current spatial distribution of BSAL within the Project Boundary is substantially fragmented by land with a range of chemical and physical limitations, in particular unfavourable slopes (i.e. greater than 10%) (see **Figure 22**). The Project has been designed to minimise the amount of BSAL annexed from surrounding agricultural land use practices.

All land held by KEPCO within the Project Boundary and immediate vicinity not required for mining or mining related activities has been and will continue to be, managed and utilised for agricultural purposes.

As outlined in **Section 4.3.1**, the impact on soil resources will vary based on the Project component. The following section assesses the impact of each Project component on the agricultural productivity of BSAL in consideration of existing and predicted fragmentation.

Direct and Temporary Impacts

The Project will result in direct, temporary impacts (associated with the construction of mine infrastructure including roads) on approximately 153 ha of soil resources within the Project Disturbance Boundary, including 21 ha of verified BSAL (see **Section 5.1.1**).

The Soils Assessment and Site Verification (see **Appendix D**) determined that the existing 21 ha of BSAL is significantly fragmented by land that is limited by its physical and chemical characteristics (and overarching soil fertility).

The agricultural productivity of BSAL will cease relative to the period for which mine infrastructure will be operational. Upon decommissioning, infrastructure will be removed and the land reinstated to its pre-mining characteristics.

Given that the land is significantly fragmented and the impact of mine infrastructure is temporary in nature, agricultural productivity of approximately 21 ha of BSAL will not be significantly impacted in the long-term as a result of the Project. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

Direct and Permanent Impacts

The Project will result in direct and permanent impacts (associated with the open cut mining areas and OEAs) on approximately 797 ha of soil resources within the Project Disturbance Boundary, including approximately 194 ha of verified BSAL (see **Section 5.1.1**).

The Soils Assessment and Site Verification (see **Appendix D**) determined that the existing 194 ha of BSAL is substantially fragmented by land that is limited by its physical characteristics, in particular slopes greater than 10%.

Agricultural productivity of BSAL will cease progressively as mining advances. Progressive rehabilitation of the final landform will be undertaken in parallel thereby reducing disconnect to surrounding agricultural land at a relatively proportionate rate. However, this rehabilitated land will not be representative of BSAL.

In order to compensate for the direct and permanent impact of the Project, KEPCO has committed to progressively stripping and reinstating the 194 ha of affected BSAL (in line with the mining schedule) external to the Project Disturbance Boundary. Upon reinstatement, KEPCO will aim to adjoin or create connectivity with larger areas of in situ BSAL. This approach will afford the best outcome for stakeholders and maintain the integrity of the BSAL resource.

In consideration of the aforementioned, agricultural productivity of approximately 194 ha of affected BSAL will not be significantly impacted in the long-term as a result of the Project. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

Indirect and Temporary Impacts

The land overlying the proposed Underground Extraction Area (1,717 ha) contains 186 ha of BSAL. Within this area, approximately 152 ha of BSAL occurs within the Subsidence Impact Limit (total of 1,627 ha) and will be indirectly and temporarily affected by subsidence that is predicted to occur. This is approximately 6.4% of the total verified BSAL within the Project Boundary.

The Soils Assessment and Site Verification (see **Appendix D**) determined that the existing 186 ha of BSAL within the Underground Extraction Area (152 ha of which is within the Subsidence Impact Limit) is substantially fragmented by land that is limited by its chemical and physical characteristics, in particular slope.

Underground mining will not result in surface disturbance nor will it fragment overlying BSAL. In this regard, agricultural productivity of approximately 186 ha of BSAL within the Underground Extraction Area (152 ha within the Subsidence Impact Limit) will not be significantly impacted in the long-term as a result of the Project.

Upon progressive settlement (approximately two years following each subsided longwall panel), it is expected that BSAL will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed.

5.6 REDUCTION IN VERIFIED BIOPHYSICAL STRATEGIC AGRICULTURAL LAND

The Project will potentially impact approximately 367 ha of BSAL, which is approximately 15.5% of the total verified BSAL within the Project Boundary. To compensate for direct and permanent impacts associated with the open cut mining areas and OEAs on BSAL (approximately 194 ha), KEPCO has committed to reinstating BSAL on less capable land external to the Project Disturbance Boundary proportionate to the predicted impact (see **Section 7**).

For other minor areas of BSAL (approximately 21 ha) that will be directly impacted for a temporary period, land will be rehabilitated to pre-mining conditions following conclusion of mining (see **Section 7**).

Underground mining is not anticipated to result in significant levels of surface disturbance nor is the vertical component associated with the predicted subsidence expected to change the chemical or physical composition of the soil profile to the extent that BSAL and its associated agricultural productivity are significantly impacted (see **Section 5.1.2**). Where potential issues, such as localised ponding and cracking, may occur surface remediation will be investigated to ensure BSAL and its associated agricultural productivity is not significantly impacted (see **Section 7**).

In consideration of the aforementioned, the direct and indirect impacts on BSAL will be temporary in the short to medium term. Ultimately there will be a negligible reduction in the availability of BSAL in the long-term once BSAL is reinstated and other minor areas are rehabilitated. The spatial distribution of the reinstated BSAL will, however, vary from the pre-mining landscape. As such, the agricultural productivity of BSAL will not be significantly impacted as a result of a reduction in the area of verified BSAL.

6 EQUINE CRITICAL INDUSTRY CLUSTER

This section considers any predicted impacts from the Project against the criteria in clause 17H(4)(b) of the Mining SEPP in relation to the equine CIC as described in Section 4.5.4. This section is supported by detailed technical specialist's impact assessments in Appendix D to Appendix J.

The impacts of the Project on the equine CIC have been assessed in consideration of the relevant criteria listed in Table 2. Avoidance, mitigation, offset and/or rehabilitation measures for predicted impacts are described in Section 7.

6.1 SURFACE AREA DISTURBANCE AND SUBSIDENCE

Within the Project Boundary, three potential equine related enterprises are identified in the Revised Draft Equine CIC Mapping, including: Wallings Pastoral Company (under Agreement with KEPCO for acquisition), Tarwyn Park (under Agreement with KEPCO for acquisition) and Tinka Tong (see **Figure 25**).

Tinka Tong is located outside the both the area of direct surface area disturbance and subsidence from the Project.

The Project will directly impact 604 ha of the Wallings Pastoral Company property. Direct disturbance comprises 388 ha of open cut mining area, 11 ha infrastructure and 205 ha of OEA. This property is under Agreement with KEPCO for acquisition.

The Project will directly impact 109 ha of the Tarwyn Park property and indirectly through 24 ha of subsidence. Direct disturbance comprises 60 ha of open cut mining area, and 25 ha infrastructure. This property is under Agreement with KEPCO for acquisition.

A very small area defined as CIC (but utilised for cattle grazing) is also predicted to experience minor surface impacts from subsidence, however the standard mitigation measures will be applied to manage the impacts (see **Appendix I**).

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality (2 km radius around the Project Boundary) does not represent part of the equine CIC. In this regard, the Project will not impact the equine CIC through surface area disturbance or subsidence.

6.2 WATER AND AGRICULTURAL RESOURCES

6.2.1 Water Resources

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. In this regard, the Project will not impact the equine CIC in the immediate vicinity through reduced access or availability to water resources. Whilst no impacts are predicted within the immediate vicinity of the Project, there may be potential impacts on equine CIC enterprises located downstream within the wider Goulburn River and Hunter River catchments.

The Groundwater Impact Assessment (see **Appendix E**) predicted a maximum groundwater take of 469 ML from the alluvium of the Bylong River Water Source and 536 ML from the Permian coal measures at Year 10 of mining.

KEPCO has secured 1,959 water allocation units from the Bylong Water Source under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. This will sufficiently license the predicted take of water from the alluvium. Further allocations are likely to be secured into the future in association with the acquisition of land within the Project Boundary.

As the Project is within the framework of the WSP, it accounts for the impact (take of water) on all groundwater users within the water source. In this regard, the Project will not impact the equine CIC downstream through reduced access or availability to alluvial water resources.

Given the poorer quality of water within the Permian coal measures, extraction of water from this aquifer for agricultural purposes is unlikely. Nevertheless, KEPCO will also seek relevant water licences to account for any take of water from the Permian coal measures. Currently no water sharing plan exists for the Permian coal measure water source. In this regard, the Project is unlikely to impact the equine CIC downstream through reduced access or availability to Permian coal measure water resources.

6.2.2 Agricultural Resources

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. Furthermore, the Project Disturbance Boundary is not directly situated on land (a key agricultural resource) utilised for the operations of verified equine CIC enterprises. In this regard, the Project will not impact the equine CIC through reduced access to agricultural resources.

6.3 SUPPORT SERVICES AND INFRASTRUCTURE

There are currently no equine-related supporting services (e.g. horse breakers, horse trainers, farriers, veterinarians, commercial Lucerne hay producers) within the Project Boundary or the broader locality in Bylong Valley.

A number of properties situated within the Project Disturbance Boundary and Project Boundary retain limited equine-related infrastructure (e.g. stables, fenced yards and small training track) associated with current or historical equine-related activities. However, the existing dominant land use for these properties is primarily beef cattle grazing with the major enterprise being beef cattle breeding supported by fodder cropping.

To facilitate beef cattle operations, minor infrastructure such as fencing, cattle yards, machinery sheds, reticulated stock water and internal farm access roads are utilised on site. Agricultural output from the land contributes to the local supporting services, such as sale yards and abattoirs. The cattle breeding enterprise and its supporting services and infrastructure are not interrelated with existing equine enterprises within or in the locality of the Project Boundary.

Furthermore, as verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. In this regard, the Project will not impact the equine CIC through reduced access to support services and infrastructure.

6.4 TRANSPORT ROUTES

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. In this regard, the Project will not impact the equine CIC through reduced access to road transport routes. Whilst no impacts are predicted within the immediate vicinity of the Project, there may be potential impacts on equine CIC enterprises located within the broader locality that use this road network.

The key transport route utilised by existing agricultural enterprises within or in the locality of the Project Boundary is Bylong Valley Way. Other minor routes include Upper Bylong Road, Lee Creek Road, Woolley's Road, Wally's Road and Wollar Road.

The Project will result in the closure of part of the Upper Bylong Road, which will result in restricting access to Lee Creek Road (to the south) and Woolley's Road (to the east). Suitable access to the Lee Creek Road shall be maintained by either the upgrade to Lee Creek Road to the south or an upgrade to Buddens Gap Road, which also connects to Bylong Valley Way south-west of the Bylong Village. Access will be maintained to the remaining areas of Woolley's Road and to the east of the Project by the construction of a realigned portion of road following the existing rail corridor and connecting to Woolley's Road and Wally's Road to the east of the Eastern Open Cut.

These alternations to the local road network will ensure that existing agricultural enterprises are not fragmented from the rest of the Bylong Valley and efficient and economic agricultural production can continue. In this regard, the Project will not impact the equine CIC within the broader locality through reduced access to road transport routes.

The Sandy Hollow to Gulgong Railway Line runs to the north of the Project Boundary and is proposed to be used for the transport of coal from the Project to the Port of Newcastle. This rail line is not used for the transport of agricultural products or inputs. In this regard, the Project will not impact the equine CIC through reduced access to rail transport routes.

6.5 SCENIC AND LANDSCAPE VALUES

6.5.1 Introduction

The Visual Impact Assessment primarily considered individual equine related enterprises identified in the Revised Draft Equine CIC Mapping, including the three enterprises identified within the Project Boundary, including: Wallings Pastoral Company (under Agreement with KEPCO), Tarwyn Park (under Agreement with KEPCO) and Tinka Tong. The views from the Bylong Valley Way as it is a dedicated tourist route as described in **Section 6.5.2** were also considered in relation to potential visual impacts from the Project. A discussion follows on the predicted visual and scenic impacts of the Project on the Equine CIC mapping in relation to each.

There are a range of potentially sensitive viewing locations within the Revised Draft Equine CIC Mapping including rural residences, roads, rail lines and agricultural activities. **Section 4.5.4** and **Figure 30** provides further detail on the location of the residences within these properties and a further description of these enterprises.

Figure 30 illustrates various significant site parameters relevant to the Visual Impact Assessment including: Revised Draft Equine CIC Mapping boundary, key project components, significant ridgelines, private and mine-owned residences in the locality and the primary visual catchment applicable to the area.

Specific mitigation measures in relation to the impacts determined below are described in detail in **Section 7**.

6.5.2 Bylong Valley Way

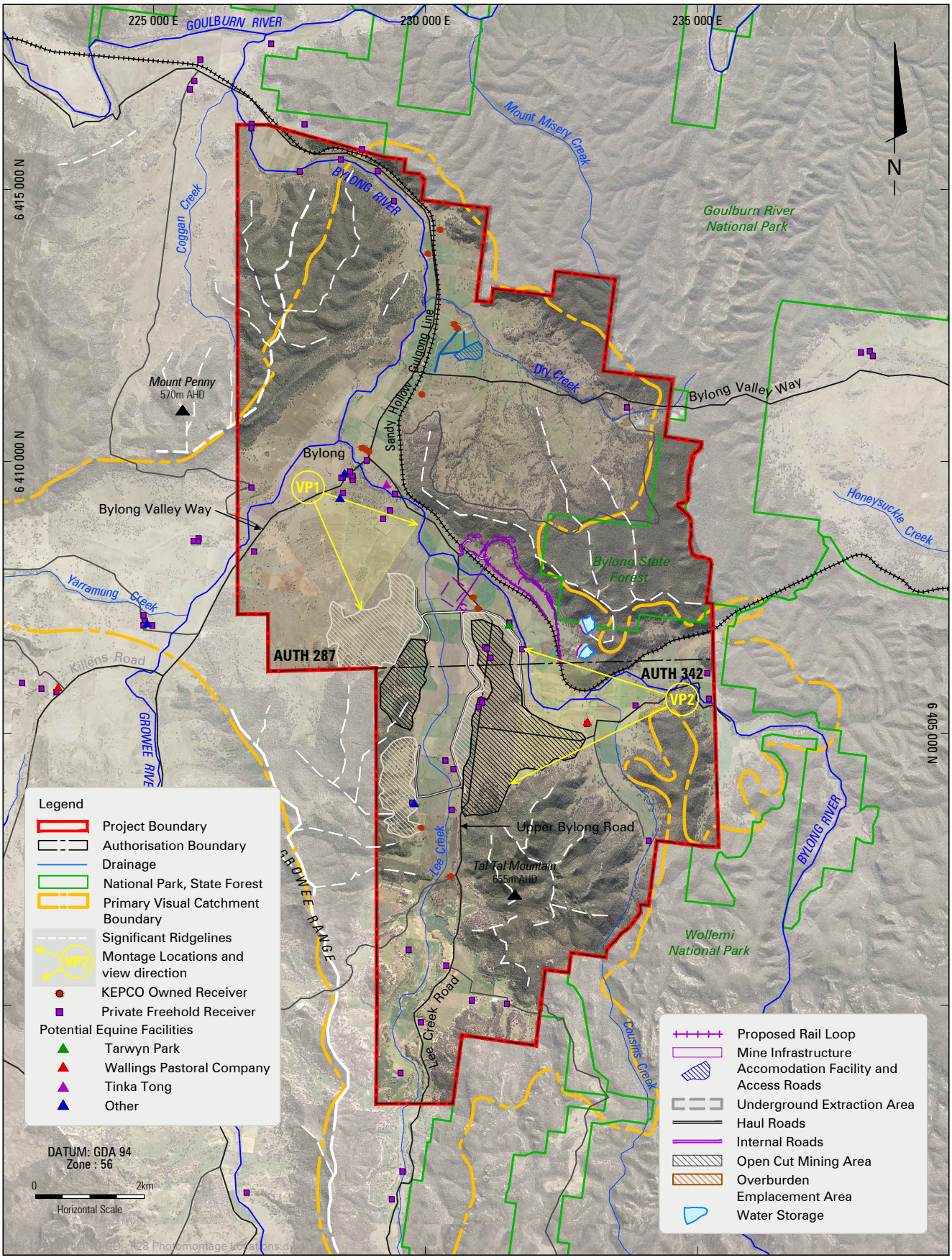
The Bylong Valley Way is a picturesque, fully sealed link between the Golden Highway and the Castlereagh Highway and is part of the Greater Blue Mountains Touring Route. As a designated tourist route, it has a moderate sensitivity being between 2.5 and 7.5 km from visible components of the Project. It is anticipated that the open cut mining areas will be partially screened by intervening topography and roadside vegetation.

Figure 31 shows the location of Photomontage Location 1 on Bylong Valley Way. **Figure 31** illustrates views to the south-east from Bylong Valley Way from the edge of the CIC towards the North-Western OEA, Underground mining areas to the north and northern extent of Eastern Open Cut (see **Figure 3** for mine plan). In Year 3 of mining operations, there is no visible alteration to the existing vegetation or topography landscape character. In Year 7 of mining, the North-Western OEA is visible between vegetation in the middle distance and foreground.

Intervening topography also limits the area of visible OEA. Progressive rehabilitation of the OEA will reduce the visual contrast in colour and texture, thereby minimising the visual effect. By Year 10 of mining, no further changes will be visible at the North-Western OEA. Project components to the east and north of this OEA are not anticipated to be visible.

Sections of the Bylong Valley Way will have a high sensitivity where a short stretch of the route is within 2.5 km from the North-Western OEA, moderate sensitivity within 7.5 km and low sensitivity beyond these distances.

Visual impacts will be moderate to high where roadside vegetation is absent and driving orientation is towards the project up to Year 5, when progressive rehabilitation on the northern of the OEA will reduce visual impact to moderate to low, relative to the increasing distance from the OEA.



BYLONG COAL PROJECT

CIC (Equine) and Tourist Route
- Visual Assessment Locations

FIGURE 30

BYLONG COAL PROJECT

Photomontage - Location VP01 Bylong Valley Way (Existing to Year 3 and Year 7 to Year 10)

FIGURE 31

6.5.3 Wallings Pastoral Company

Wallings Pastoral Company has broad landholdings within the Project Boundary (under Agreement with KEPCO), which also extend further to the east and west. There are 12 residences across the broader landholdings with 10 residences located within the Project Boundary.

Of those residences within the Project Boundary, two are located in the north of the landholdings near Bylong village and are accessed from Bylong Valley Way. Each is situated on open pastoral lands with limited intervening vegetation between houses. Both residences are within 2.5 km of the Project and as such will have a high sensitivity to changes in the visual landscape.

There are five residences located on Upper Bylong Road. With the current Project layout these residences are situated within the Project Disturbance Boundary. Given that these residences are within 0.5 km of the Project they will have a high sensitivity to changes in the visual landscape. There are also three residences to the east of the Eastern Open Cut. Views to two residences are largely screened by intervening topography and vegetation. The third residence located on Woolley's Road and closest to the Project is situated on flat to undulating grazing land with limited vegetation or tree cover. This residence is within 2.5 km of the Project and as such will have a high sensitivity to changes in the visual landscape.

Figure 32 shows the location of Photomontage Location 2 on the Wallings Pastoral Company property, immediately south of a residence. **Figure 33** illustrates views north-eastwards from Woolley's Road and indicative of an Equine CIC residence towards the Eastern Open Cut and more distant North-Western OEA. The Underground MIA will also be within this view shed. The existing view from this location is one of flat to undulating grazing land with scattered trees with tree covered ridgelands and hills in the mid distance. The rural road rises over a slow rise in the existing topography in the mid view with good visual amenity values. From Year 3 of Mining, project infrastructure will be visible in the mid-ground to the right of the view. The MIA build elements appear low and flat in the landscape, with the CHPP and stockpile areas providing a more solid, visible form. Moderate colour contrast will also be experienced, however will occupy a small area of the primary view form this location. Vegetation provides some filtering of views across the pastoral land towards the Project components.

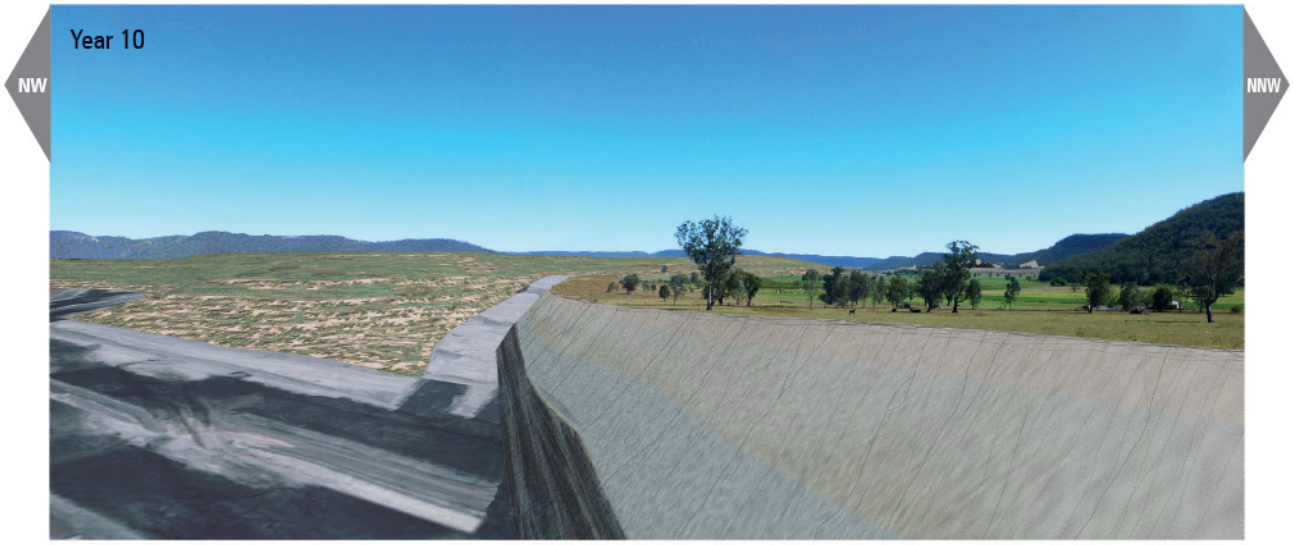
From Year 7 of mining, the MIA Rom is no longer visible in the view; however the CHPP and stockpile areas will remain visible and unchanged from Year 3. The North-Western OEA is largely rehabilitated and integrating well into the surrounding rural landscape. The Eastern Open Cut mine face has developed and advanced towards the Location 2. The exposed face of the mining area occupies a larger proportion of the view, increasing the level of visual impact. Additionally, vegetation cover reduces and landscape charter will be largely altered.

By Year 10, this location has been subsumed by the Eastern Open Cut. A rerouted access road to eastern properties will experience a high level of visual effect as the open cut develops to its furthest extent. The open cut face will be visible at distances less than 2.5 km which shall result in a high level of visual impact by users of the road, altering the character of the existing pastoral lands. Underground MIA components will also remain visible but with less visual effect than the open cut area.

BYLONG COAL PROJECT

Photomontage - Location VP02 East Wooleys Road (Existing and Year 3)

FIGURE 32



BYLONG COAL PROJECT

Photomontage - Location VP02 East Wooleys Road (Year 7 and Year 10)

FIGURE 33

6.5.4 Tarwyn Park

Tarwyn Park (under Agreement with KEPCO) spans flat pastoral lands extending into the ridgeline to its north. A residential homestead and working buildings also exist at the property, with the Bylong River and rail line passing though the property also.

Tarwyn Park's close proximity to the Project identifies it as a sensitive receptor. Three residences on this property are likely to be directly disturbed by the Project, following which no visual impact will be experienced. One residence is within 2.5 km of the Project and as such will have a high sensitivity to changes in the visual landscape.

Views from residences in this Eastern View Sector (see **Figure 30**) will be of the northern and eastern aspects of the Eastern Open Cut and OEA with some views to the MIAs and CHPP and associated activities.

High visual effects will be experienced until Year 7 due to operations at the Eastern Open Cut, after which effect will reduce to moderate or low when OEAs are progressively rehabilitated and trees establish. The movement of mine fleet may also be visible.

All residences in this sector will have high visual impacts up to Year 10 of mining operations, being within 2.5 km of active operations, dependent on visual screening effects of gardens, roadside landscapes and view orientation. Progressive rehabilitation after Year 5 will reduce from moderate to low until final landform is achieved.

6.5.5 Tinka Tong

The Tinka Tong stockhorse stud exhibits mature remnant native tree plantings within the grazing paddocks near roadside landscapes and property boundaries. Mature native trees along the driveway reinforce the rectilinear established pattern of the horse stud landscapes and differentiate it from other pastoral areas and contrast with the more random patter of the native remnant trees on the adjacent hills.

Tinka Tong is 1.6 km from the North-Western OEA and over 2.5 km from open cut mining operations. The property has one residence centrally located on the property, approximately 100 m from the Upper Bylong Road. Roadside trees partially screen views to the road and in the direction of Project Underground MIA and to the south-east in the direction of the open cut MIA.

It is unlikely to experience significant views of the Project components due to vegetation surrounding the property. Following rehabilitation of the OEAs the visual effect will be reduced.

The residence will experience high visual impact being less than 2.5 km from nearest seen mine areas depending on visual screening impacts of garden and roadside landscapes and view orientation. High impacts will reduce when rehabilitation of OEAs occur.

6.5.6 Discussion

The Visual Impact Assessment has considered individual equine related enterprises identified in the Revised Draft Equine CIC Mapping, including the three enterprises identified within the Project Boundary, including: Wallings Pastoral Company (under Agreement with KEPCO), Tarwyn Park (under Agreement with KEPCO) and Tinka Tong. The Visual Impact Assessment also considered the views from the Bylong Valley Way as a dedicated tourist route.

In relation to CIC, the Project will not have a significant impact on the relevant CIC based on a consideration of *"the loss of scenic and landscape values"* as follows.

The Visual Impact Assessment has identified that potentially sensitive receptors at the Wallings Pastoral Company and Tarwyn Park may experience moderate to high visual impacts from the Project, however both properties have in place an Agreement for purchase with KEPCO (and as such, will be mine owned in the near future). Neither comprise individual CICs (or collectively) as verified in **Section 4.5.4**.

Tinka Tong is a stockhorse stud and as verified in **Section 4.5.4**, neither individually nor collectively conforms to the definition of a CIC. High visual impacts may be experienced at this private residence. However, woodland would appear to partially screen it from views to operational areas.

Limited sections of Bylong Valley Way will have a high impact where driving orientation is directly towards the Project and adjacent roadside vegetation is absent.

6.5.7 Conclusion

The Visual Impact Assessment has assessed the Bylong Valley Way as it is a designated tourist route. The assessment determined that although the majority of the Project will not be visible to users of the Bylong Valley Way, some limited and intermittent views of the Project may occur. In this regard, appropriate mitigation and management measures have been identified and are presented in **Section 7**.

The Visual Impact Assessment has considered the potential visual and landscape impacts of the Project on the three individual equine enterprises identified in the Revised Draft Equine CIC Mapping, at potentially sensitive viewing locations including rural residences, roads, rail lines and within agricultural activity areas. However, as verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent an Equine CIC. In this regard, the Project does not significantly compromise the scenic and landscape settings of any Equine CIC area.

As such, the Project will not have a significant impact on the relevant critical industry based on a consideration of the loss of scenic or landscape values.

Preliminary mitigation and management measures are described in **Section 7** for any privately owned residences (inclusive of privately owned residences within the Revised Draft Equine CIC Mapping) which may be predicted in the EIS (yet to be developed) to have a high visual impact from the Project.

7 PRELIMINARY MITIGATION AND MANAGEMENT

*This section describes the preliminary measures that will be implemented to mitigate and manage the Project's impacts on BSAL and the equine CIC as assessed in **Section 5** and **6**, respectively.*

7.1 AVOIDANCE

7.1.1 Equine Critical Industry Cluster

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. Consequently, the Project will not impact the equine CIC, effectively avoiding it entirely.

However, further to **Section 6.5** the Visual Impact Assessment (see **Appendix H**) identifies preliminary visual mitigation measures both onsite and at sensitive receivers where high impacts from the Project are predicted including (but not limited to): onsite and offsite vegetative screening, landscaping treatments and adjustments to the mine plan scheduling. This will be confirmed following detailed Project visual assessment and stakeholder consultation as part of the EIS.

As part of the EIS, KEPCO will commit to the development of a Landscape Management Plan for the Bylong Valley Way and other longer term impact areas. This plan will be developed following assessment in the EIS and consultation with the relevant stakeholders. This plan will include tree planting and screens along the rerouted Mine Access Road, Upper Bylong and Lee Creek Roads to provide screening of mine elements, as required.

7.1.2 Biophysical Strategic Agricultural Land

The conceptual Project design was developed in consideration of the soil resources and verified BSAL within the Project Boundary and other safety, environmental and socio-economic issues. A number of alternatives were investigated and the Project (as proposed) provides an economic mine plan that minimises potential environmental and social impacts whilst maximising coal recovery. This adopted design minimises the extent of impacts on soil resources and avoids 1,965 ha or 83% of the total verified BSAL resource (2,366 ha) within the Project Boundary.

Furthermore, KEPCO has committed to reinstating BSAL external to the Project Disturbance Boundary to compensate for any direct, permanent impacts on BSAL in accordance with a Preliminary BSAL Rehabilitation Strategy. These commitments are discussed in further detail in **Section 7.3.2**.

7.2 MITIGATION

7.2.1 Equine Critical Industry Cluster

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. Consequently, the Project will not impact the equine CIC. In this regard, no mitigation measures are proposed.

7.2.2 Biophysical Strategic Agricultural Land

As outlined in **Section 5**, the Project will result in:

- Direct and permanent impacts (associated with the open cut mining areas and OEAs) on approximately 797 ha of soil resources within the Project Disturbance Boundary, including approximately 194 ha of verified BSAL;
- Direct and temporary impacts (associated with internal roads, haul roads and mine infrastructure) on approximately 153 ha of soil resources within the Project Disturbance Boundary, including approximately 21 ha of BSAL; and
- Indirect and temporary impacts (associated with the Underground Extraction Area) on approximately 1,717 ha of soil resources within the Project Disturbance Boundary, including approximately 186 ha of BSAL.

To mitigate the direct impacts of the Project, KEPCO will implement a strategy designed to reinstate the characteristics of BSAL and broader soil landscapes (identified within the Project Boundary) disturbed by mining to a state acceptable to stakeholders. This is provided in the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**) and in **Section 7.3.2**.

The reinstatement of BSAL will be achieved by:

- Understanding the balance of available BSAL (and broader soil resource) for rehabilitation;
- Implementing the proposed methods for stripping, handling and reinstatement;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land;
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme; and
- Developing and implementing suitable management plans to minimise the impact on BSAL (e.g. Rehabilitation Plan, Sediment and Erosion Management Plan, Water Management Plan).

Further, KEPCO has significantly reduced the impact on BSAL (as far as practical) in the immediate vicinity of the Project Disturbance Boundary through the mine plan design (see **Section 7.3.2**). The Project as proposed minimises the annexure of pockets of land, in particular BSAL, from surrounding agricultural land use practices.

Where potential issues, such as localised ponding and cracking, may occur above the Underground Extraction Area, surface remediation will be investigated and implemented as required. The management of any potential impacts to this land will be considered and specific management measures will be implemented during the Property Subsidence Management Plans and Extraction Plan processes which are required as a condition of any Mining lease and Development Consent respectively, required for longwall mining operations. A consideration to the taken in the development of these mitigation and management measures will in relation to maintaining the long-term agricultural use of these agricultural resources.

All land held by KEPCO within the Project Boundary and immediate vicinity not required for mining or mining related activities has been and will continue to be managed and utilised for agricultural purposes.

KEPCO has secured 1,959 units of water allocation from the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP, which is more than sufficient to licence the predicted take of water from the alluvium. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two WALs totalling 576 units. Further allocations are likely to be secured by KEPCO into the future in association with the acquisition of land within the Project Boundary.

KEPCO will secure a water licence under Part 5 of the *Water Act 1912* for the maximum water take from the Permian coal seam aquifer. There are presently no embargoes applied to this region for seeking this relevant approval.

In adopting the above measures, BSAL within and surrounding the Project Disturbance Boundary will be capable of sustaining agricultural enterprises and production rates currently observed in the long-term.

7.3 REHABILITATION

7.3.1 Equine Critical Industry Cluster

As verified in **Section 4.5.4**, the land within the Project Boundary and broader locality does not represent part of the equine CIC. Consequently, the Project will not impact the equine CIC. In this regard, no rehabilitation measures with regard to CIC are proposed.

7.3.2 Biophysical Strategic Agricultural Land

Background

As outlined in **Section 5** and **7.2.2**, the Project will result in direct (temporary and permanent) and indirect impacts on soil resources, including BSAL within the Project Disturbance Boundary.

Applicable components of the Project will be rehabilitated to the post-mining land characteristics as discussed in **Section 5.2**. Specifically, BSAL that will be directly and temporarily impacted by the Project will be rehabilitated to its pre-mining conditions.

To compensate for direct, permanent impacts of the Project, KEPCO has committed to reinstating the 194 ha of affected BSAL (in line with the mining schedule) external to the Project Disturbance Boundary. Where potential issues (such as localised ponding and cracking, may occur above the Underground Extraction Area) surface remediation will be investigated.

Management and mitigation measures may include:

- Visual monitoring of the surface in the active subsidence zone, to identify the larger surface cracking and deformations would could affect safety, access, or increase erosion;
- Establish methods for surface remediation, which could include infilling of surface cracks with soil or other suitable materials, or by locally re-grading and compacting the surface. In some cases, erosion protection measures may be needed, such as the planting of vegetation in order to stabilise the steeper slopes in the longer term; and

- Develop Property Subsidence Management Plans (PSMPs) with privately owned property owners and any infrastructure owners incorporating the agreed methods to manage surface cracking and deformations.

Preliminary BSAL Rehabilitation Strategy

KEPCO proposes to achieve the target landscape BSAL characteristics within the Project Disturbance Boundary and broader Project Boundary in accordance with the measures provided in the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**). This Strategy will be enhanced and amended as required for inclusion within the EIS.

Objectives

The overarching rehabilitation objectives for the Project (having a particular focus on BSAL) are to:

- Develop rehabilitation areas which are safe, stable, non-polluting and sustainable;
- Appropriately recover, store and rehandle suitable soil resources for future rehabilitation;
- Undertake progressive rehabilitation as soon as areas become available;
- Establish healthy and self-sustaining soil profiles and vegetation cover for future land use (e.g. agriculture) on both re-contoured (rehabilitated) and undisturbed lands (i.e. area dedicated for reinstatement of BSAL);
- Implement assisted natural regeneration methods on undisturbed areas to increase the integrity of land dedicated for reinstatement of BSAL;
- Create a post-mining landform which enhances agricultural land uses and other environmental aspects;
- Develop a landscape that reduces the requirement for long term monitoring and management;
- Conduct maintenance (e.g. weed control, follow-up fertiliser, reseeding, erosion repair etc.) until rehabilitation is sustainable; and
- Monitor and manage rehabilitation areas to facilitate the process of achieving sign-off on success criteria.

Program of Works

In order to manage and achieve successful rehabilitation of BSAL, a preliminary program of works has been developed for the Project and generally comprises the following sequential aspects:

- Pre-disturbance planning and soil resource recovery (stripping);
- Soil resource storage (stockpiles) and management;
- Recovery and placement of soil resources in rehabilitation; and
- Maintenance and monitoring.

Further details pertaining to each aspect are provided in the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**). This will inform the broader Rehabilitation Plan for the Project, which will be prepared upon grant of approval and in consultation with relevant stakeholders.

Success Criteria

Key performance outcomes that form the preliminary BSAL rehabilitation success criteria for the Project are adapted from the '*Strategic Framework for Mine Closure'* (ANZMEC, 2000) and include:

- Clearing and/or vegetation disturbance and rehabilitation progress consistent with an approved Mining Operations Plan (MOP) or equivalent;
- Successful establishment of vegetation on the final landform consistent with the approved MOP or equivalent;
- Progressive achievement of landform and land use objectives;
- Achievement of the committed objectives with respect to flora and fauna, soil resources, land and soil capability, erosion and sediment control and air quality;
- Verification of achievements through monitoring;
- A legally binding arrangement to secure the long-term security of the BSAL offsets; and
- Performance reporting in an Annual Review.

Specifically, preliminary rehabilitation success criteria for the reinstatement of BSAL on less capable land will initially be based on the criteria of the Interim Protocol (see **Figure 19**) followed by consideration of the land and soil capability Class 3 hazard criteria in the LSC Guideline (see **Table 20**).

Preliminary rehabilitation success criteria for the establishment of Class 4 land within the Project Disturbance Boundary will be based on the characteristics provided in **Table 13**. These are a different mix of soil and landscape characteristics to the pre-mining landform. The rehabilitated landform will be suitable for grazing with some cultivation and is expected to have no significant micro-relief, moderate soil fertility, a minimum effective rooting of 0.5 m, better than poor internal soil drainage and suitable pH and salinity characteristics.

Table 20
BSAL Success Criteria (Land and Soil Capability)

Characteristic	Class 3 Criteria
Water Erosion	Slope < 10% or < 3% if slope is > 500 m in length
Wind Erosion	Not applicable^
Soil Structure Decline	Surface soil texture with <60% silt and very fine sand and <5% ESP
Soil Acidification#	Moderate or higher surface soil buffering capacity and pH >5.5 or low surface soil buffering capacity and pH 6.7-8.0
Salinity**	ECe <4.0 (low salt store)
Waterlogging	Imperfectly drained soil (waterlogging is 1-8 weeks duration)
Soil Depth (rock outcrop)	Rock outcrop is <30% and soil depth is >75 cm
Mass Movement	No mass movement

^ Based on low wind erosive power and low exposure to wind, all wind erodibility classes will be classified as Class 3.

 # Based on mean annual rainfall of 550-700 mm.

*** Based on low recharge potential and low discharge potential.*

Further details pertaining to the preliminary rehabilitation success criteria are provided in the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**). This will be used to develop the broader Rehabilitation Plan for the Project, which will be prepared upon grant of approval and in consultation with relevant stakeholders.

Examples of Successful Agricultural Rehabilitation

KEPCO proposes to reinstate soils to its pre-mining condition or to BSAL (with Class 3 characteristics) on less capable land external to the Project Disturbance Boundary. A number of recent examples of mine rehabilitation (as described below) demonstrate that this proposal is achievable given that better quality rehabilitation has previously been achieved.

Alluvial Lands Project – Hunter Valley Operations

The Alluvial Lands Project (Nelson and Stewart, 2007) provided evidence that rehabilitation of mined land to land capability Class 1 and 2 land is achievable which can facilitate agricultural production and in this particular case, a Lucerne hay productivity yield of "*at least equivalent to the average crop productivity yields for the Upper Hunter Region for three consecutive years*".

The Alluvial Lands Project achieved the conditioned target land capability class characteristics for agricultural production and was endorsed by the NSW Government at the time.

The Alluvial Lands Project is considered to be a good example of mine rehabilitation, particularly in comparison to that proposed for the Project (i.e. rehabilitating back to Class 4 land).

Bengalla Mine

The most recent example of successful rehabilitation of high value agricultural land has been demonstrated at Bengalla Mine. Bengalla Mine has recently established an area of approximately 5.7 ha of an existing OEA to Class 3 land capability where slopes are less than 3% and black vertosol soils have been applied to a depth of at least 200 mm (BMC, 2013). This area was seeded with pasture vegetation in late 2012 and will be monitored as part of the annual rehabilitation audit with results presented in an Annual Review.

International Examples

In the Midwestern United States, similar suggestions were made that prime agricultural farmland should not be mined due to unproven reclamation techniques. To help allay these concerns, a reclamation research program was initiated at the Universities of Illinois and Kentucky to investigate the best reclamation strategies. Darmody et al. (2002) compiled research which has shown that surface mining can be a short term land use which can be followed by productive higher agricultural uses, if rehabilitation is undertaken correctly. Achieving a higher mine land productivity is possible if rehabilitation plans are designed to minimise compaction, if good quality soil materials are used, and if high management levels (herbicides, fertility, adapted crop varieties) and practices are followed.

Conclusion

Given the relatively gentle topography and landscape characteristics, the available topsoil and subsoil resource and recent evidence afforded by other parties, KEPCO is confident that land external to the Project Disturbance Boundary can be successfully returned to a high value agricultural resource or BSAL.

Furthermore, as KEPCO proposes to reinstate the majority of BSAL outside the Project Disturbance Boundary on undisturbed land (versus mined land as per the examples provided); there is even a greater likelihood of rehabilitation success.

7.4 OFFSET

7.4.1 Equine Critical Industry Cluster

As verified in **Section 4.5.4**, the land within the Project Boundary does not represent part of the equine CIC. Consequently, the Project will not impact the equine CIC. In this regard, no offsets are proposed.

7.4.2 Biophysical Strategic Agricultural Land

No offsets for impacts to BSAL are proposed for the Project. However, to compensate for direct, permanent impacts of the Project, KEPCO has committed to progressively reinstating the 194 ha of affected BSAL (in line with the mining schedule) external to the Project Disturbance Boundary. Further details regarding the program of works required to reinstate this resource is provided in **Section 7.3.2** and the Preliminary BSAL Rehabilitation Strategy (see **Appendix J**).

8 CONCLUSION

8.1 INTRODUCTION

This Gateway Certificate Application Supporting Document has been prepared by Hansen Bailey on behalf of Cockatoo Coal, as the managers of the Bylong Coal Project for KEPCO. This document supports KEPCO's Gateway Certificate Application for assessment under the NSW Government's recently introduced Gateway Process for mining on Strategic Agricultural Land.

A Gateway Certificate for the Project is required to support the Development Application that KEPCO intends to lodge under Division 4.1 of Part 4 of the EP&A Act to seek Development Consent for the construction and operation of the Bylong Coal Mine.

This document provides information and results from the preliminary environmental assessments that have been completed to allow the Gateway Panel to assess whether the Project will *"significantly"* impact SAL in accordance with the criteria listed under Clause 17H(4) of the Mining SEPP. Further work will be completed during the preparation of the EIS in order to further assess and manage the impacts of the Project upon Strategic Agricultural Land.

The following sections provide a summary of the key findings and conclusions as presented throughout this document. To enable the Gateway Panel to form an opinion in accordance with Clause 17H(5) of the Mining SEPP, this document provides the relevant detail in relation to the duration of any impact and the proposed avoidance, mitigation, offset and rehabilitation measures in respect of such impact.

8.2 BACKGROUND

KEPCO acquired A287 and A342 in December 2010 from Anglo American, with the intention to develop a coal mine to recover the extensive coal resources that were known to occur within this area. Cockatoo Coal was appointed by KEPCO as the managers of exploring the opportunities for developing the Bylong Coal Project.

The Project team has undertaken further exploration which has focused on refining the potential coal resources within the authorisations and to supplement the work undertaken by the former owners of the Project. In light of the varying topography and geology within the authorisations, exploration work has identified that a majority of the coal resources are most suited to being recovered utilising underground mining methods. Exploration has also identified additional coal resources that are too shallow to be recovered by underground mining methods and as such have been identified to be most suitable for extraction utilising open cut mining methods.

Throughout the exploration and mine planning phases, the Project team has investigated numerous mine planning scenarios to maximise the recovery of the coal resource within the authorisations. Each mine planning option was considered in relation to its economic viability. As a vital consideration in refining each mine planning option for economic evaluation, the Project team reflected on the key environmental constraints (predominantly reducing impacts to SAL) in relation to the various mine planning options. This resulted in some material concessions being made to the mine plans and infrastructure layouts (e.g. reduction of the initial seven open cut mining areas to the Project's two), to avoid impacts or where impacts are unable to be avoided, to minimise impacts without compromising the viability of the Project.

8.3 MINE PLANNING ENVIRONMENTAL CONSIDERATIONS

From the commencement of mine planning works, there has been a thorough understanding of and consideration given to the key environmental constraints that are likely to be experienced by the Project. The key environmental constraints that have been considered during the preliminary mine planning stage included (but were not limited to):

- Location of proposed mining areas to neighbouring receivers in terms of anticipated amenity impacts (noise, air quality and visual impacts);
- Impacts to agricultural land, particularly Class II Land Capability Land (according to former guidelines (Emery, 1986));
- Setback distance of open cut mining from alluvial soils from Government guidelines;
- Flooding impacts along Bylong River and Back Creek; and
- Sensitive surface features in relation to underground mining areas.

Regulator and stakeholder expectations in relation to impacts to agricultural land have varied since the commencement of mine planning. Initial efforts were made to ensure that the open cut extraction areas were greater than the 150 m from the alluvial soils of Bylong River and Lee Creek according to the '*Guidelines for the Management of Stream/Aquifer Systems in Coal Mining Developments'* (DIPNR, 2006) and outside of areas of potential flooding impacts. The purpose of the buffer between the alluvial soils and mining areas is to ensure that a sufficient barrier is in place to impede the flow of alluvial groundwater into mining areas.

With the newly elected NSW Government in March 2011, commitments were made to introduce a new Gateway Process to ensure that the impacts of all coal mining and coal seam gas projects on agricultural assets were assessed upfront in the planning approvals process. Draft Strategic Regional Land Use Plans were released in March 2012 for public review and comment which provided an indication of the agricultural land that was intended for protection.

Land capability mapping of the Project Boundary was completed in early 2012 in accordance with Emery (1986) (the relevant guidelines at the time) to identify land classified as Class I and Class II, which were to be afforded protection under the Draft Strategic Regional Land Use Plans. The mine plan was refined in order to avoid areas of Class I and Class II land (primarily Class II land), with only haul roads and other minor infrastructure to impact on these areas.

In September 2012, the NSW Government released the final Policy which applies state-wide in areas where there is high value agricultural land and increasing activity in the coal mining and coal seam gas industries. Land was mapped as SAL in the Upper Hunter and New England North West SRLUPs which were also finalised in September 2012.

The Upper Hunter SRLUP is relevant to the Bylong Coal Project and mapped BSAL and Equine CIC within the Bylong authorisation areas on a regional basis. No viticulture CIC is mapped within the Project Boundary or in the vicinity. The Upper Hunter SRLUP also referred to BSAL being land that was classified as Class I, II or III when utilising the LSC assessment scheme (OEH, 2012) which was released in October 2012. This new guideline resulted in the former land capability mapping to be superseded and further work was required to determine the land capability within the Project Boundary according to the mapping criteria.

Further to this, the NSW Government released draft guidelines for the verification of BSAL for stakeholder review and comment. The Interim Protocol was finalised in April 2013. The extensive soils field work that was undertaken for the Project between 2011 to April 2013 was analysed and refined in order to meet the requirements of the Interim Protocol.

Verified Mapping of BSAL in accordance with the Interim Protocol was finalised in July 2013. This verified mapping has identified areas of BSAL within the open cut mining areas, including in areas where the OEAs are proposed which was not previously identified within the work completed to former requirements.

It is understood that the NSW Government is currently amending the Interim Protocol in order to finalise this document. KEPCO has lodged a submission in relation to an inconsistency identified within the Interim Protocol that when amended will have a material reduction in the quantity of BSAL that will be impacted by the Project.

Mine planning and assessment of the potential environmental impacts will continue to be undertaken throughout the planning approvals process and into the development of the Project to address changing expectations of stakeholders. In light of potential changes that may be required to the mine plan in the future, it is important to consider the economic importance of the coal resource to the State of NSW and the viability of the Project in relation to the significant concessions to the mine plan that have already been made. The EIS will ensure that the appropriate balance between environmental and social impacts and the economic viability and benefits of the Project are portrayed in the context of the principles of ESD as required under the EP&A Act.

8.4 MINE PLAN JUSTIFICATION

The coal resource within A287 and A342 is largely suitable for recovery utilising underground mining methods, particularly in the elevated areas around the southern, eastern and northern areas. The geology within the less elevated areas adjacent to the alluvial land is shallower and accordingly the coal resource in this area would be most safely and efficiently recovered utilising open cut mining methods.

A mine planning option considering mining the coal resource utilising underground mining methods only was investigated. This investigation identified issues related to the management of fine and coarse reject materials that will be generated from the processing of the coal resource to meet market requirements. The management of these materials was identified to potentially result in additional unfavourable environmental impacts associated with the water management risks of fine and coarse reject storage. This investigation also determined that this option would not be economically viable and that KEPCO would not be prepared to invest in the significant capital required to develop this option.

In light of the investigation of mining the resource utilising underground methods only being considered unviable, a number of mine plan options and scales were investigated that utilised both open cut and underground mining operations. Initial plans identified seven small open cut mining areas that are separated by the neighbouring drainage lines and associated alluvial soils. Due to various identified environmental issues, the Project now proposes only two open cut mining areas which shall result in no final void at the end of mining operations.

These two proposed mining areas are located more than 2 km from the Bylong Village and there will be limited views of these areas from Bylong Valley Way. The development of open cut mining areas will also facilitate the most appropriate method (i.e. no surface fine and coarse reject materials dam) for the disposal of fine and coarse reject materials for the predominant underground mining operation.

The initial development of the open cut mining areas will require the development of two OEAs external to the mining areas. There is limited area within the authorisations that would be suitable for accommodating the OEAs, which have been located outside of the floodplain and alluvial areas and do not sterilise coal resources. The Project proposes the development of the North-Western OEA and South-Western OEA which generally satisfy these criteria.

The North-Western OEA results in disturbance to 92.5 ha of verified BSAL within the Project Boundary. This BSAL is mostly beyond the alluvial soils (with only 1 ha within) associated with Lee Creek which was previously understood to be the only BSAL within the Project Boundary. Various other options for the emplacement of overburden that would minimise the impacts to BSAL have been investigated and determined to be unviable from mine planning practicality and economic viability perspectives. Other options considered are likely to result in additional amenity impacts as a result of longer haulages. Further the practicality of rehabilitating the alternative OEAs may be problematic with the need to blend the landform in with the surrounding topography. Accordingly, the OEAs as proposed for the Project present the most appropriate alternative to accommodate overburden to enable the mining of the coal resource within the Project Boundary.

The two proposed Open Cut Mining Areas include 101.9 ha of BSAL as verified utilising the current version of the Interim Protocol. Designing an open cut mine plan that entirely avoids BSAL in these areas would sterilise further coal resources (additional to the coal already sterilised within the Project mine plan) and would result in the Project being unviable from an operational and economic perspective.

The land overlying the proposed Underground Extraction Area contains 186 ha of BSAL. Approximately 152 ha of BSAL within the Subsidence Impact Limit (approximately 6.4% of the total verified BSAL within the Project Boundary) will be indirectly affected by subsidence that would be experienced within this area. The Extraction Area has been defined based on the timing for extraction (~23 years) and has been constrained to minimise impacts to sensitive surface features (such as significant cliff lines) and the alluvial groundwater. Appropriate management measures will be implemented at the time of subsidence effects to ensure that the limited impacts predicted to this BSAL as a result of land subsidence to not result in a loss of agricultural production capability of this land.

Various options were considered for the proposed infrastructure for the Project, including MIAs, CHPP, rail loop, and decline drifts. An option for the rail loop, CHPP, Underground MIA and other associated infrastructure was originally proposed to occur at the northern end of the Eastern Open Cut. This alternative required the development of a decline drift from the Eastern Open Cut, beneath the Bylong River and associated alluvial to the proposed Extraction Area. This option was predicted to result in additional impacts to the alluvial aquifers that are no longer anticipated for the Project.

Additional disturbance to BSAL would also have occurred if this option were adopted as a result of the construction of the Rail Loop and CHPP. Further the rail loop would have resulted in flooding impacts as a result of constructing this infrastructure on the floodplain.

The Project proposes the construction of the Underground MIA, Rail Loop and CHPP on the northern side of the Sandy Hollow to Gulgong Railway Line which minimises the predicted impacts on the alluvial aquifer whilst also avoiding additional impacts to BSAL and the flood regime for the Bylong River and Lee Creek.

The Project as proposed presents the only viable option for the construction and operation of a coal mine within the authorisation. Mining the coal resource within A286 and A342 utilising underground mining methods only is not economically viable and also presents further environmental constraints in relation to the disposal of fine and coarse reject materials. Further reducing the areas of open cut mining or readjusting the OEAs to avoid areas of verified BSAL would result in the Project being economically unviable, whilst also potentially resulting in other environmental impacts. The location of Project infrastructure also provides the most appropriate layout in terms of minimising environmental impacts, whilst also avoiding areas of BSAL.

8.5 BSAL ASSESSMENT

Further to the regional mapping within the Upper Hunter Region SRLUP, KEPCO has completed extensive soil surveys to verify BSAL within the authorisations, generally in accordance with the requirements of the Interim Protocol (OEH and OAS&FS, 2013).

8.5.1 Surface Area Disturbance & Subsidence

The Project is estimated to disturb approximately 367 ha of the 2,366 ha of verified BSAL, representing approximately 15.5% of BSAL within the Project Boundary. The BSAL within the Project Boundary comprises of three soil units derived from varying parent material which provides differing fertility of the BSAL soils, including:

- Approximately 11 ha of alluvial influenced materials comprising which will be impacted on non-saline Black Dermosol soil units on very gently inclined land. These alluvial influenced soils are considered to have the highest productivity, relative to other soil types assessed as BSAL, due to high inherent fertility and availability of water resources within alluvial groundwater;
- Basalt influenced materials which comprise approximately 250 ha of BSAL to be impacted from the Bald Hill Soil Landscape Unit that generally exist as Red Dermosol soils. These igneous soils are considered to be the second most productive category of soil assessed as BSAL within the Project Boundary due to moderately high inherent fertility and good soil profile characteristics; and
- Sedimentary derived soils comprising approximately 106 ha of BSAL influenced by sedimentary material that forms part of the Growee Soil Landscape unit. The sedimentary derived soils are considered to be the least productive of the soil units assessed as BSAL. Inherent fertility for one particular soil unit (G05) is considered to be borderline BSAL due to low cation exchange capacity. In fact, it is argued that approximately 43 ha of this soil unit should not be classified as BSAL as per our submission to the NSW Government on 27 November 2013.

To define the actual impacts to BSAL from the Project, it is critical to note the physical extent and duration of impacts to these soil resources:

- Indirect and Temporary Impacts – including approximately 152 ha of BSAL soils (all basalt derived soils) within the Subsidence Impact Limit that will be indirectly affected through the potential subsidence effects of underground mining operations. Post-mining, some minor remediation works may be required to these soils to either repair surface cracking that may occur as a result of subsidence effects. It is also expected that BSAL will be able to retain its pre-mining land capability characteristics and be capable of sustaining agricultural enterprises and production rates comparable to those currently observed (cattle grazing activities and limited fodder production);
- Direct and Temporary Impacts – including approximately 21 ha of BSAL soils (10 ha of alluvial derived, 4 ha of basalt derived and 7 ha of sedimentary derived) where topsoils and suitable soil resources will be removed and emplaced to accommodate the construction and use of haul roads, MIAs and other infrastructure that will be removed at the end of use (approximately 8 years) and the land is able to be rehabilitated to pre-mining landform and land use; and
- Direct and Permanent Impacts – including approximately 194 ha of BSAL (1 ha of alluvial derived, 94 ha of basalt derived and 99 ha of sedimentary derived) soils that are located within the proposed open cut mining areas and OEAs that will be permanently impacted by the Project. The soil resources that are recovered from this area will be used to re-establish areas of BSAL external to the Project Disturbance Boundary.

8.5.2 Soil and Landscape Characteristics

For the areas to be directly impacted on a temporary basis, the agricultural productivity of BSAL will cease relative to the period for which mine infrastructure will be operational. Upon decommissioning, infrastructure will be removed and the land reinstated to its pre-mining soil and landscape characteristics. This will be achieved by means of:

- Proposed methods for the stripping, handling and reinstatement of BSAL;
- Understanding the key learnings from recent examples of mine rehabilitation to productive agricultural land; and
- Preliminary success criteria for the reinstatement of BSAL consistent with the criteria of the Interim Protocol and the LSC Scheme.

The agricultural productivity of approximately 21 ha of BSAL that will be temporarily impacted will not be significantly impacted in the long-term as a result of the Project's operations on soil and landscape characteristics. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed (cattle grazing activities and limited fodder production).

Agricultural productivity of BSAL that is permanently impacted will cease progressively as mining advances. Establishment and rehabilitation of the final landform will be undertaken in parallel with the scheduling of such operations to achieve an overall land and soil capability Class 4 on the final landform. As such, the post-mining soil and landscape characteristics will subsequently resemble this classification from its pre-mining condition.

In order to compensate for the direct and permanent impact of the Project, KEPCO has committed to progressively stripping and reinstating the 194 ha of affected BSAL (in line with the mining schedule). This approach will afford the best outcome for stakeholders and maintain the integrity of the BSAL resource.

Agricultural productivity of approximately 194 ha of BSAL will not be significantly impacted in the long-term as a result of the Project's operations on soil and landscape characteristics. Once reinstated, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed (cattle grazing activities).

All land held by KEPCO within the Project Boundary and immediate vicinity not required for mining or mining related activities has been and will continue to be managed and utilised for agricultural purposes.

Underground mining is not anticipated to result in substantial surface disturbance. Further it is not anticipated that underground mining operations will result in changes to the chemical or physical composition of the soil profile to the extent that the BSAL and its associated agricultural productivity are significantly impacted from its pre-mining condition. Where potential issues, such as localised ponding and cracking, may occur surface remediation will be investigated to ensure BSAL and its associated agricultural productivity is not significantly impacted. In this regard, the Preliminary Biophysical Strategic Agricultural Land Rehabilitation Strategy determined the Underground Extraction Area is unlikely to impact the existing soil and landscape characteristics of the overlying BSAL.

Upon progressive settlement (approximately two years following each subsided longwall panel), it is expected that BSAL will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed (cattle grazing practices).

8.5.3 Water Resources

The preliminary groundwater modelling completed for the Project determined that the proposed mining induces drawdown within the alluvium in the first 10 years of the Project life when open cut mining is active. When the open cut mine void is backfilled, the zone of influence is predicted to retract and groundwater levels in the alluvium start to recover. At the end of the Project life, the drawdown within the alluvium only affects the fringes of the floodplain areas.

Open cut and underground mining depressurises the water in the coal seam in a zone that extends between 1 km and 2 km from the proposed mining areas. Beyond this zone, the drawdown is predicted to be less than 1 m and will likely to be undetectable and within natural variations. Drawdown within the alluvium is predicted to peak at around 5 m in areas immediately alluvium adjacent the Eastern Open Cut. In contrast, the longwall mining influences water levels only on the very fringes of the alluvial aquifers and highlights that most significant impacts occur in the first 10 years.

Groundwater inflows to the open cut mining areas were predicted to be approximately 1.8 ML/day (657 ML/year), reducing to less than 1 ML/day (365 ML/year) of inflow into the underground mining areas during the years of underground mining operations.

The water take from the alluvium due to mining peaks at approximately 469 ML/year in Year 10, then gradually reduces to approximately 285 ML/year at the end of the Project life. This water take from the alluvials will occur from the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP. KEPCO hold sufficient allocations under the Bylong River Water Source to account for this water take.

The model predicts that groundwater take from the Permian coal seams will peak at approximately 536 ML/year in Year 10, averaging around 300 ML/year over the Project life. This groundwater aquifer is managed under the *Water Act 1912* and accordingly KEPCO will apply for a water licence under Part 5 to account for this take of water.

The groundwater model predicted the losses to baseflows to the waterways within the Project Boundary. Modelling has indicated that mining reduces the baseflows within Lee Creek (35 ML/year at peak impact) and the Bylong River (180 ML/year at peak impact), which are both immediately adjacent to the Open Cut Mining Areas. These peak impacts are only predicted to occur during the years of open cut mining operations and are anticipated to recede once these operations are completed in around Year 10 of the Project. The model has identified that there is not anticipated to be any impacts to the baseflows to the Growee River. The Goulburn River to the north of the Project Boundary was also identified to be not likely to be impacted by the Project.

The surface water within Bylong River and Lee Creek is regulated under the Bylong River Water Source under the Hunter Unregulated and Alluvial WSP. KEPCO currently holds sufficient allocations under the Bylong River Water Source to account for this take of water.

Additional to the water takes induced by groundwater depressurisation as a result of mining, the preliminary surface water balance indicated that the Project is also likely to require the use of a bore field within the alluvial aquifer to supplement water supplies within the water management system. These water takes will be undertaken in accordance with allocations held by KEPCO under the Bylong River Water Source.

A review of available literature has indicated that there are no GDEs currently mapped within the Project Boundary on a regional scale based on searches of information in the public arena. Accordingly this assessment does not anticipate any impacts upon GDEs.

The groundwater recovery model simulated for post mining conditions illustrates that the mining will lead to a permanent change in shape of the water table surface, with water levels mounding and falling within the spoil areas due to the change in hydraulic properties and recharge rates.

The risk of impact to the water quality within the alluvial aquifers was assessed in terms of the emplacement of fine and coarse reject materials within the Open Cut Mining areas. Based on the limited data available on the geochemistry of the proposed rejects materials at this time, this assessment determined that if the salinity of the spoil and fine reject materials is similar to other mining operations within the region, no significant impacts on aquifer or stream water quality are considered likely to occur.

An assessment was completed against the requirements of the AIP, including the minimal impact considerations. The groundwater drawdown within the alluvial aquifer is predicted to be greater than the 2 m criterion under the minimal impact considerations at 24 of privately owned bores.

KEPCO is currently in discussions with the landholders in relation to the acquisition of these properties. It is the intention of KEPCO that any of its landholdings that are not directly required for mine related purposes or ecological offsetting will continue to be utilised for agricultural production. In the unlikely event that existing relied upon water resources are disrupted, KEPCO will supplement such supplies from its own extensive water allocations.

8.5.4 Fragmentation of Agricultural Resources

The 21 ha of BSAL that will be directly and temporarily impacted will be initially significantly fragmented by land that is limited by its physical and chemical characteristics (and overarching soil fertility). The agricultural productivity of this BSAL will cease relative to the period for which mine infrastructure will be operational. Upon decommissioning, infrastructure will be removed and the land reinstated to its pre-mining characteristics.

Given that the land is currently significantly fragmented and the impact of mine infrastructure is temporary in nature, agricultural productivity of approximately 21 ha of BSAL will not be significantly impacted in the long-term as a result of the Project.

The 194 ha of BSAL that will be directly and permanently impacted by the Project is currently substantially fragmented by land that is limited by its physical characteristics, in particular slopes greater than 10%. This is particularly the case with the BSAL underlying the proposed North-Western OEA which contains small fingers of BSAL surrounded by areas of land greater than 10% in slope. The BSAL in this area is currently unlikely to be able to be utilised for productive cropping land and is presently utilised for cattle grazing land.

The agricultural productivity of the directly and permanently impacted BSAL will cease progressively as mining advances. Progressive rehabilitation of the final landform will be undertaken in parallel thereby reducing disconnect to surrounding agricultural land at a relatively proportionate rate. However, this rehabilitated land will not be representative of BSAL. Agricultural activities will continue on KEPCO owned land that is not required for mining or mining related activities; and following an appropriate time directly on established rehabilitation.

In order to compensate for the direct and permanent impact of the Project, KEPCO will progressively strip and reinstate 194 ha of affected BSAL (in line with the mining schedule). Upon reinstatement, KEPCO will aim to adjoin or create connectivity with larger areas of in-situ BSAL. Once reinstated at an alternate location, the land will be capable of sustaining agricultural enterprises and production rates comparable to those currently observed (cattle grazing activities). This approach will afford the best outcome for stakeholders and the maintenance of the integrity of the BSAL resource.

Underground mining will not result in surface disturbance nor will it fragment overlying BSAL. In this regard, agricultural productivity of approximately 152 ha of BSAL within the Subsidence Impact Limit will not be significantly impacted in the long-term as a result of the Project.

8.5.5 Reduction in Verified BSAL

The direct and indirect impacts on BSAL associated with the Project will only be for the short to medium term. Ultimately, in the longer term, it is anticipated that there will be no reduction in the quantum of BSAL within the locality once the same amount of BSAL that is impacted is reinstated. However, the spatial distribution of the reinstated BSAL will vary from the pre-mining landscape and will be undertaken in such a way as to minimise any impacts in the agricultural productivity of BSAL in the locality.

8.6 CIC ASSESSMENT

The Upper Hunter Region SRLUP mapped Equine CIC within the vicinity of the Project Boundary according to regional mapping criteria as follows:

- Land (excluding National Parks and State Forests) with a slope of equal to or less than 18 degrees; and
- In the MWRC LGA within 5 km of the Bylong Valley Way.

This broad scale mapping included approximately 6,617 ha of Equine CIC within the Project Boundary. This broad scale mapping includes Crown Land and land that is currently owned by KEPCO that is not utilised for equine related activities. It also included properties such as Tarwyn Park and some of the landholdings owned by Wallings Pastoral Company (both of which are under Agreement with KEPCO to acquire upon request by the landholder) and the privately owned stockhorse property, Tinka Tong.

The NSW Government exhibited Revised Draft Equine CIC Mapping in October 2013 for public review and comment. The Revised Draft Equine CIC Mapping was refined down to a property scale and specifically excluded Crown Land and land owned by KEPCO. The Revised Draft Equine CIC Mapping was refined down to 1,933 ha of Equine CIC within the Project Boundary.

An assessment was undertaken for the land within the Project Boundary utilising the site verification criteria described within the NSW Government's Draft CIC Guideline to verify the land that has been mapped as Equine CIC under both versions of the mapping. The verification assessment was completed on three equine related properties (Wallings Pastoral Company, Tarwyn Park and Tinka Tong) that are located within or partially within the Project Boundary that also meet the mapping criteria.

The Project Boundary is located more than 80 km to the south-west of Scone which is the primary centre of the equine industry in NSW. Further the Equine CIC cluster in the vicinity of Jerrys Plains is approximately 65 km to the east of the Project Boundary. These equine centres are distant from the Project Boundary with enterprises unlikely to be symbiotically interrelated.

The verification process determined that the vast majority of the equine enterprises and their associated properties within or in the locality (2 km radius) of the Project Boundary do not meet the criteria to be classed in the equine CIC. Only one equine enterprise, a stock horse property (Tinka Tong) met all the relevant criteria. This single enterprise does not embody the definition or criteria of a CIC as outlined in the SRLUP. As such, it has been concluded that the land within the Project Boundary does not represent part of the Equine CIC.

8.6.1 Surface Area Disturbance and Subsidence

The verification process determined that there is not any land within the Project Boundary that would represent Equine CIC. Tinka Tong was the only equine related facility that met the relevant criteria for the Equine CIC and will not be directly disturbed by the Project. However as a single enterprise it does not meet the definition of a CIC. The land which may be subsided is not within the verified Equine CIC and is owned by KEPCO.

In this regard, the Project will not impact the Equine CIC through surface area disturbance or subsidence.

8.6.2 Water Resources and Agricultural Resources

As the Project is within the framework of the WSP, it accounts for the impact (take of water) on all groundwater users within the water source. In this regard, the Project will not significantly impact on the ability of the equine industry downstream through reduced access or availability to water resources.

The Project is not located on land (a key agricultural resource) utilised for the operations of verified equine CIC enterprises. In this regard, the Project will not impact the equine CIC through reduced access to agricultural resources.

8.6.3 Support Services and Infrastructure

There are currently no equine-related supporting services (e.g. horse breakers, horse trainers, farriers, veterinarians, commercial Lucerne hay producers) within the Project Boundary or the broader locality in Bylong Valley.

A number of properties situated within the Project Boundary retain aged and limited equine-related infrastructure (e.g. stables, fenced yards and small training track). However, the existing dominant land use for these properties is primarily beef cattle grazing with the major enterprise being beef cattle breeding supported by fodder cropping. The cattle breeding enterprise and its supporting services and infrastructure are not interrelated with existing equine enterprises within or in the locality of the Project Boundary. Two private landholders whose land was included within the Revised Draft CIC Mapping have confirmed that equine related activities are not a prime focus on this land or within the wider Bylong Valley and should not be included as part of the equine CIC.

As verified, the land within the Project Boundary and broader locality does not represent part of the equine CIC. In this regard, the Project will not impact the preliminary mapped equine CIC through reduced access to support services and infrastructure.

8.6.4 Transport Routes

The key transport route utilised by existing agricultural enterprises within or in the locality of the Project Boundary is Bylong Valley Way. Other minor routes include Upper Bylong Road, Lee Creek Road, Woolleys Road, Wallys Road and Wollar Road.

The Project will close a portion of Upper Bylong Road and Woolleys Road to facilitate the development of the Eastern Open Cut. The Project will construct an alternate access road for any private properties that remain to the east of the Project Disturbance Boundary.

Additionally, properties to the south of the Disturbance Boundary may have utilised Upper Bylong Road to travel to the Bylong Village. KEPCO is investigating two options for the upgrade of either Lee Creek Road or Buddens Gap Road to Bylong Valley Way, which will provide ongoing access for these properties. The alignments will be subject to stakeholder consultation prior to finalisation.

8.6.5 Scenic and Landscape Values

A visual assessment was completed for users along the Bylong Valley Way as a tourist route that travels through the Project Boundary. The assessment determined that although existing vegetation and topography screens most views towards the components of the Project for users of the Bylong Valley Way, some limited and intermittent views of the Project may occur.

The visual assessment was also completed in relation to visual and landscape impacts as a result of the Project on the three individual properties which was identified within the Revised Draft Equine CIC Mapping. The assessment was completed at potentially sensitive viewing locations including rural residences, roads, rail lines and within agricultural activity areas. However since the land within the Project Boundary and broader locality does not represent an Equine CIC the Project does not significantly compromise the scenic and landscape settings of any Equine CIC area.

8.7 PRELIMINARY MITIGATION AND MANAGEMENT

Throughout the completion of technical studies and the preparation of this document, the Project team has identified a number of mitigation and management measures that will be implemented to avoid, minimise and manage potential impacts on SAL.

The Project effectively avoids direct impacts to Equine CIC, since the site verification process has confirmed that no CIC occurs within the Project Boundary. Further the Project has been designed to avoid impacts on BSAL where possible, with more than 1,965 ha of BSAL within the Project Boundary that will not be impacted by the Project.

The preliminary visual assessment provided recommendations for the mitigation of the potential visual impacts of the Project on sensitive receptors. This has included a recommendation to make a commitment within the EIS to prepare a Landscape Management Plan to detail mitigation and management measures in relation to visual amenity impacts. These measures may include the illustration of various tree screens and other onsite and offsite treatments.

Any impacts to areas of BSAL within the Project Boundary are proposed to be managed in a way that ensures the agricultural productivity of these areas is not significantly affected into the long term.

A preliminary rehabilitation strategy has been outlined for the Project. The preliminary strategy considers the works required to recover and maintain the valuable soil resources, the success criteria that needs to be achieved and reference to other examples where land of greater agricultural productivity (when compared to land in Project Boundary) has been successfully mined and rehabilitated to achieve comparable rates of agricultural production post mining.

8.8 FURTHER WORK

The technical assessments that have been completed to assist in addressing the relevant Gateway Criteria (solely impacts to agriculture) within this document are preliminary in nature and are based on the information that is currently available for the Project. In this regard, the technical assessments to be prepared for the EIS will be required to complete additional work to refine modelling assumptions and to develop a more broad assessment of the impacts of the Project, rather than being focussed on just agricultural aspects.

The following provides a summary of some of the key items that have been identified by the Project team during the preparation of this document that will be required to be completed during the preparation of the EIS:

- Refinement of the Project Disturbance Boundary to ensure that it includes all components that will be required for the Project and to complete the relevant assessment of impacts on this land;
- AIS to be prepared for all agricultural enterprises within the Project Boundary as opposed to being focussed on equine related facilities and will involve landholder interviews and discussions with other agricultural related support services that may be affected by the Project;
- Ongoing research and literature reviews in order to supplement existing case studies and to develop further clarity and certainty over the reestablishment of BSAL;
- Subsidence impact assessment to be completed to confirm appropriate subsidence predictions for the Project and to assess the impacts to any other sensitive surface features;
- Investigate the potential for perched water systems to be present in the basalt capping and Permian overburden overlying the proposed longwall mining areas;
- Complete analysis to determine the physical and chemical properties of the spoil and coarse and fine reject materials;
- Investigate the temporal diffuse recharge to the alluvium and recharge from the creek systems within the Project Boundary;
- Complete a private bore / landholder bore survey to identify the usage of water from these bores;
- Complete ecological surveys with a primary focus on identifying the presence of any springs or GDEs and the relevant impact assessment on these;
- Identify the location of the groundwater bore field that will be required to supplement the water supplies for the water management system;
- Further work will be undertaken to improve the calibration and predictive capability of the groundwater model, including:
    - Calibrating the model to transient water level records collected from the monitoring bores and VWP network;
    - Representing the measured stage heights in the creek systems in the model;
    - Updating the geological surfaces with any updated exploration data;
    - Representing pumping from private bores in the model;
    - Simulating progressive backfilling of coarse and fine reject materials during mining;

  - Analysing the sensitivity of the predictions to model parameters;
  - Increasing the model confidence class from Level 1 to Level 2 as described in the Australian Groundwater Modelling Guidelines; and
  - Having the model peer reviewed.
- Update the water balance modelling to a daily time-step model based on the long-term climatic conditions and refine key demands and supplies within the water management system;
- This updated water balance modelling will assist in refining the sizes of the water management dams to be included as part of the water management system to ensure that all mine water is able to be contained onsite; and
- Development and updates to the proposed management and mitigation measures proposed to be utilised to manage impacts on SAL, including the refinements and updates to the Preliminary BSAL Rehabilitation Strategy and the development of a Land Use Management Plan to manage and maintain the co-existence of mining and agricultural activities within the vicinity of the Project.

8.9 CONTEXT FOR DETERMINATION

This document provides a relevant assessment of the potential impacts of the Project upon SAL within the vicinity of the Project Boundary as required by Clause 17F of the Mining SEPP.

In accordance with Clause 17F(3) of the Mining SEPP, KEPCO notified (by letter and follow up face to face briefings) the current private landholders within the Project Boundary of its intention to lodge a Gateway Certificate application in late November to early December 2013. Notices were also placed in the Mudgee Guardian and The Land newspapers on 9 and 12 December, respectively providing notice to the wider public of the intention to lodge the Gateway Certificate application.

In addition, Community Information Sessions were held at the Bylong Community Hall on 18 and 19 December 2013 to brief any interested local community members on the Project mine plan and to provide an update on the planning approvals process. These Community Information Sessions were well attended, with 22 landholders visiting over the two days to ask any questions that they had on the Project.

KEPCO has also been in ongoing discussions with the MWRC since it acquired the Project, including most recent discussions over particular details of the Project and the intention to lodge this Gateway Application.

This document has been prepared following direction provided during discussions with personnel within DP&I, NOW, and OAS&FS and the Executive Officer of the Gateway Panel and over the proposed content and structure of this document. This application has been lodged as the Project Boundary contains areas of Verified BSAL and mapped Equine CIC (verified in this document as not being Equine CIC). In consideration of the requirement for the Gateway Panel to refer the application to the IESC and the Minister for Primary Industries seeking advice over the Project's potential impacts on water resources, this document provides the necessary preliminary information to address the AIP requirements (including minimal harm considerations) and information for the IESC in relation to their requirements.

This document provides a thorough description of the extensive mine planning work that has been completed for the Project over the past three years to identify the only practical and economically viable mine plan to recover the coal resources within the Project Boundary that appropriately considers environmental sensitivities and agricultural productivity. In particular, all efforts have been made throughout the mine planning process to avoid impacts to SAL.

A majority of the proposed impacts to BSAL (~95%) are located on land that is beyond the alluvial soils of the Bylong River and Lee Creek, which portrays KEPCO's efforts to minimise impacts to these valuable agricultural resources consistent with the previous direction on which resources should be afforded protection. Various alternative mine plan layouts have been considered in order to further reduce impacts to verified BSAL. All alternatives investigated either result in greater environmental impacts or deem the Project to be economically unviable. In this regard, there are no other feasible options available to KEPCO that would enable the development of a coal mine within the existing mining authorities to recover the valuable coal resources for the State of NSW.

As outlined above, there is ongoing work that is proposed to occur during the preparation of the EIS as further baseline information becomes available and as various modelling assumptions are able to be refined. This ongoing work will assist in providing the detail required to complete a robust environmental impact assessment for the Project. The EIS will include an assessment on all environmental and social aspects of the Project and make an informed conclusion over the consistency of the Project against the Objects of the EP&A Act for consideration by the DP&I and the Planning Assessment Commission prior to making a determination under Division 4.1 of Part 4 of the EP&A Act.

Open Cut mining activities are proposed to take place for eight of the initial 10 years of the Project life, being approximately 29 years. Infrastructure that is required for the open cut mining operations which is anticipated to temporarily impact on BSAL will be able to be decommissioned and rehabilitated to restore the land to its pre-mining land capability. Further those soil resources from BSAL that will be directly and permanently impacted by the OEAs and the open cut mining areas will be used to establish areas of BSAL elsewhere within the locality. These commitments by KEPCO will ensure that the agricultural productivity of the impacts to BSAL as a result of the Project will not be significant.

The balanced mine plan and associated infrastructure design, along with the comprehensive studies presented in this Supporting Document, clearly demonstrate that all relevant Gateway Certificate considerations have been thoroughly assessed.

In consideration of the short-term duration of impacts, proposed avoidance, mitigation and rehabilitation measures as described in this Supporting Document, it is available for the Gateway Panel to form an opinion under Clause 17H(5) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* that the Project will not significantly reduce the agricultural productivity of Strategic Agricultural Land within the Upper Hunter Region.

9 STUDY TEAM

Section	Role/Document Section	Team Member and Company	
KEPCO and Cockatoo Coal			
	Technical General Manager	William (Bill) Vatovec	KEPCO Bylong Australia
	Senior Manager	Kay (Kyung iL) Na	KEPCO Bylong Australia
	Senior Manager	Sunjung Yoon	KEPCO Bylong Australia
	Technical Manager	Scott Lee	KEPCO Bylong Australia
	General Manager – NSW Project Development	Stuart Hides	Cockatoo Coal
	Mine Planning Superintendent	Trephon Stambolie	Cockatoo Coal
	Senior Environmental Planner	Shaun Smith	Cockatoo Coal
Gateway Application Management			
	Project Director	James Bailey	Hansen Bailey
	Project Manager	Nathan Cooper	
	Project Coordinator	Renee Attard	
	Peer Review	Dianne Munro	
Gateway Application Sections			
	Executive Summary	Dianne Munro	Hansen Bailey
1	Introduction	Nathan Cooper	
2	Conceptual Project Description	Nathan Cooper & Trephon Stambolie	
3	Existing Environment	Renee Attard	
4	Assessment Approach	Dianne Munro Chelsea Kavanagh	
5	Biophysical Strategic Agricultural Land	Nathan Cooper Chelsea Kavanagh	
6	Equine Critical Industry Cluster	Dianne Munro Chelsea Kavanagh	
7	Preliminary Mitigation and Management	Dianne Munro Nathan Cooper Chelsea Kavanagh Renee Attard	
8	Conclusion	Nathan Cooper	
9	Study Team		
10	Abbreviations		
11	References		

Section	Role/Document Section	Team Member and Company	
Appendices			
Appendix A	Address and Particulars of Title with the Project Boundary	Paul Callaghan Renee Attard	Carteform Hansen Bailey
Appendix B	Public Notifications under Clause 17F(3) of the Mining SEPP	Renee Attard	Hansen Bailey
Appendix C	Mine Plan Justification	Trephon Stambolie	Cockatoo Coal
Appendix D	Soils Assessment and Site Verification	Adele Calandra	SLR Consulting Australia
Appendix E	Groundwater Impact Assessment	James Tomlin	Australasian Groundwater and Environmental Consultants
Appendix F	Agricultural Impact Statement	Scott Barnett	Scott Barnett and Associates
Appendix G	Preliminary Water Balance	David Newton	WRM Water and Environment
Appendix H	Visual Impact Assessment	Annette Allen & John Van Pelt	JVP Visual Planning and Design
Appendix I	Subsidence Predictions and Impact Assessments for Natural and Built Features in Support of the Gateway Application	Daryl Kay	MSEC
Appendix J	Preliminary BSAL Rehabilitation Strategy	Adele Calandra	SLR Consulting Australia
Legal advice provided by: Minter Ellison Drafting and graphics design by: Hansen Bailey, Carteform and Greenpond TSG			

10 ABBREVIATIONS

Abbreviation	Description
A	Authorisation
AIP	*Aquifer Interference Policy* (NOW, 2012)
ASC	Australian Soil Classification
BSAL	Biophysical Strategic Agricultural Land
CHPP	Coal Handling and Preparation Plant
CIC	Critical Industry Cluster
Cockatoo Coal	Cockatoo Coal Limited
DGRs	Director-General's Requirements
DP&I	NSW Department of Planning and Infrastructure
Draft CIC Guideline	*Draft Guideline for Site Verification of Critical Industry Clusters* (DP&I, 2012b)
Draft Interim Protocol	*Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land – V7* (OAS&FS and OEH, 2013)
DRE	Division of Resources and Energy
EC	Electrical conductivity
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environment Protection Biodiversity Conservation Act 1999*
ESD	Ecologically Sustainable Development
GDEs	Groundwater Dependant Ecosystems
Guideline for Gateway Applicants	*Strategic Regional Land Use Policy Guideline for Gateway Applicants* (DP&I, 2013)
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
Interim Protocol	*Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OAS&FS and OEH, 2013)
KEPCO	KEPCO Bylong Australia Pty Ltd
km	Kilometre
kV	Kilovolt
LGA	Local Government Area

Abbreviation	Description
LSC Scheme	*The Land and Soil Capability Assessment Scheme: Second Approximation – A General Rural Land Evaluation System for NSW* (OEH, 2012)
m	Metre
MIA	Mine Infrastructure Area
Mining SEPP	*State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*
ML	Megalitres
mm	Millimetre
Mt	Million tonnes
Mtpa	Million tonnes per annum
MWRC	Mid-Western Regional Council
MOP	Mine Operations Plan
NOW	NSW Office of Water
NSW	New South Wales
OEA	Overburden Emplacement Area
Project Boundary	Project Application Boundary
ROM	Run of Mine
SAL	Strategic Agricultural Land
SRLUP	*Strategic Regional Land Use Plan – Upper Hunter* (DP&I, 2012a)
t	Tonnes
The Project	Bylong Coal Project
This document	*Bylong Coal Project Gateway Application Supporting Document*
tph	Tonnes per hour
Underground Extraction Area	The proposed Underground Extraction Area for the Bylong Coal Project
VWP	Vibrating Wire Piezometer
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WM Regulation	*Water Management (General) Regulation 2011*
WMP	*Preliminary Hydrogeological Assessment and Water Monitoring Plan*
WSP	Water Sharing Plan

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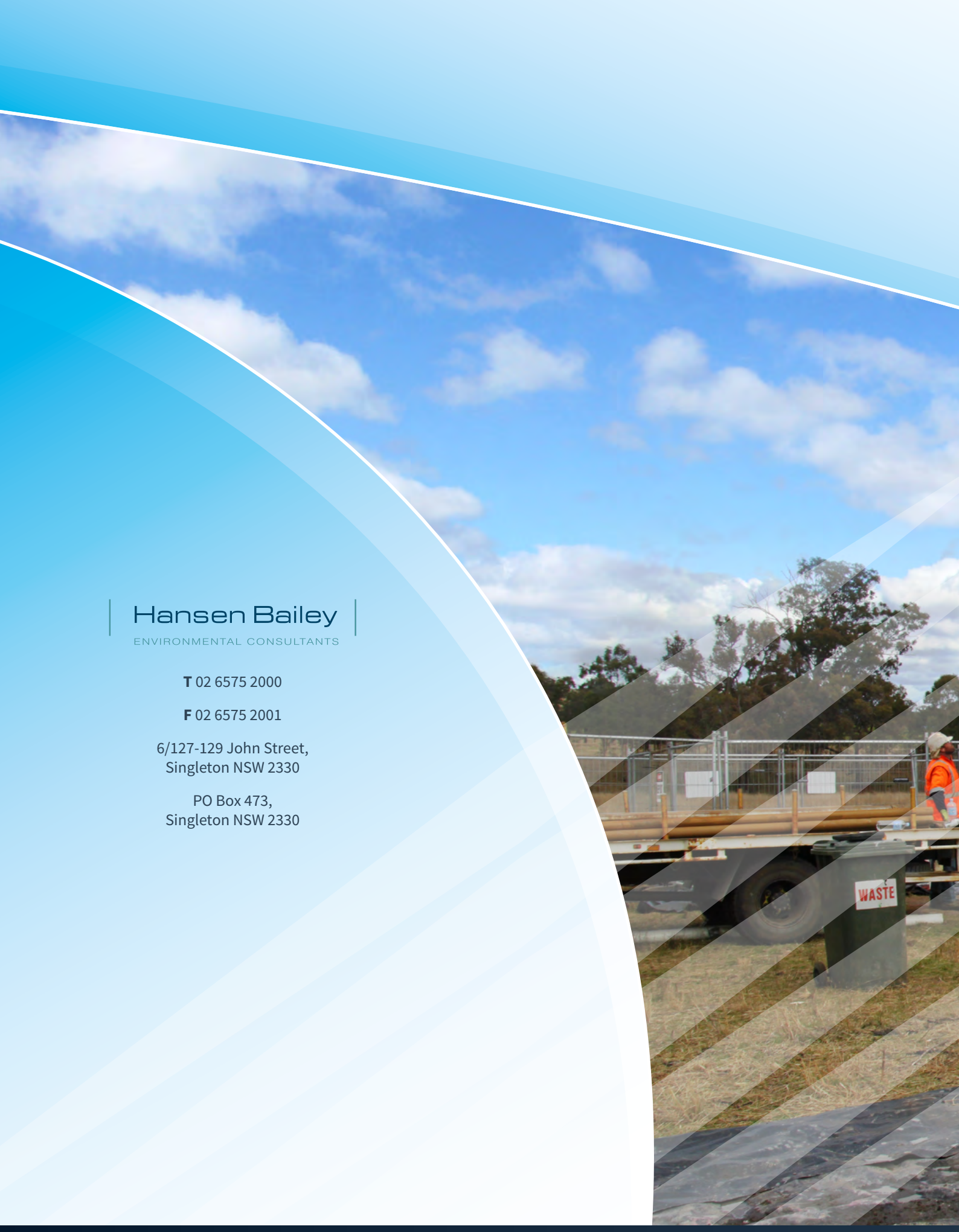

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

T 02 6575 2000

F 02 6575 2001

6/127-129 John Street,
Singleton NSW 2330

PO Box 473,
Singleton NSW 2330