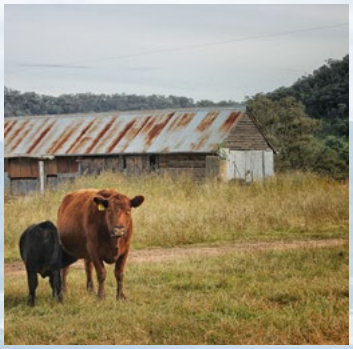
KEPCO KOREA ELECTRIC POWER CORPORATION
BYLONG AUSTRALIA

# BYLONG COAL PROJECT

## Supplementary Information

July 2018

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Main Report

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# BYLONG COAL PROJECT

# SUPPLEMENTARY INFORMATION

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# 1 INTRODUCTION

## 1.1 BACKGROUND

KEPCO Bylong Australia Pty Limited (KEPCO) owns the Bylong Coal Project (the Project) which is located within the Mid-Western Regional Council (MWRC) Local Government Area (LGA) approximately 55 kilometres (km) to the north-east of Mudgee. The Project involves the construction and operation of a coal mine utilising open cut and underground mining methods to recover up to approximately 6.5 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for a period of approximately 25 years.

KEPCO submitted an Application for State Significant Development (SSD) Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 23 July 2015 to permit the development of the Project (SSD 14_6367). The *Bylong Coal Project Environmental Impact Statement* (EIS) (Hansen Bailey, 2015) was placed on public exhibition between 23 September 2015 and 6 November 2015. KEPCO lodged the *Bylong Coal Project Response to Submissions* (RTS) (Hansen Bailey, 2016a) in March 2016 which responded to the various stakeholder submissions received during the public exhibition of the EIS. The *Bylong Coal Project Supplementary Response to Submissions* (Supplementary RTS) (Hansen Bailey, 2016b) was provided to respond to supplementary submissions received from stakeholders on the RTS. Department of Planning and Environment (DPE) subsequently finalised its Assessment Report for the Project on 31 March 2017.

On 9 January 2017, the then Minister for Planning requested the Planning Assessment Commission (PAC) (now known as the Independent Planning Commission (IPC)) to conduct a Review of the Project. The PAC Review Report was published on the 25 July 2017. The *Bylong Coal Project Response to PAC Review Report* (Response to PAC Review Report) (Hansen Bailey, 2018) was lodged with DPE on 17 January 2018 to respond to the matters raised.

The PAC Review Report stated that the impacts to Tarwyn Park and Iron Tank requires re-evaluation (Section 3.3 of the PAC Review Report) by the Heritage Council of NSW (the Heritage Council) and the Minister for Heritage. The Heritage Council was subsequently requested by DPE to provide independent comment.

The Heritage Council responded to DPE in February 2018. As a consequence of this advice (and previous comments raised within the PAC Review Report), DPE on 28 May 2018 requested further information from KEPCO in relation to the potential implications of stepping the open cut mine off Tarwyn Park. A copy of this letter is included within **Appendix A**. This document has been prepared to provide the supplementary information requested by DPE.

This document also provides responses to correspondence from NSW Department of Industry (DoI) dated 12 February 2018, the NSW Environment Protection Authority (EPA) dated 21 and 23 February 2018 and also comments on the Heritage Council's response to DPE on 25 February 2018. Further, it provides a response to a submission received by DPE from the Bylong Valley Protection Alliance (BVPA).

## 1.2 KEPCO'S RESPONSE TO DPE SUPPLEMENTARY INFORMATION REQUEST

KEPCO is concerned about the belatedness of DPE's request in the approval process and the impacts that any further mine plan refinements will have on the timing of determination for the Project. This request is also of concern given that KEPCO's previously committed conservation management regime, DPE's Recommended Development Consent conditions and the Response to PAC Review Report have all provided an appropriate basis for managing the potential impacts of the EIS Mine Plan on the assessed heritage values, including the potential impacts to the scenic landscape.

KEPCO's EIS Mine Plan has already abandoned approximately 359 Million tonnes (Mt) (or 92 percent (%)) of the identified open cut mineable insitu coal resource within Authorisations A287 and A342 (from approximately 392 Mt down to approximately 33 Mt of open cut ROM coal reserve). This has resulted in, under the EIS Mine Plan, that the people of NSW will only receive the benefits of $194 Million (M) (undiscounted) in royalty payments for the coal recovered from open cut mining as opposed to a potential $2.955 Billion (B) (undiscounted) in royalty payments for recovering all of the available open cut mineable insitu coal resource.

KEPCO is very concerned that DPE's requested further contractions to areas available for open cut mining on KEPCO owned land will result in a loss of 4.6 Mt of ROM coal recovery and the associated $12 M (present value) in royalty payments. This does not take into consideration other economic flow on benefits that the mining of this coal reserve as a result of the EIS Mine Plan would realise.

However, in light of DPE's intention to include the requested revisions "*in any recommended conditions of consent*" as stated in its letter, KEPCO has prepared a Revised Mine Plan (as described within **Section 2**) which has addressed DPE's specific requests. It should be noted that KEPCO is still seeking consent for the Mine Plan in the EIS (EIS Mine Plan). However, given that the DPE's stated intent is to impose a revised mine plan as consent conditions, KEPCO has provided this document on the basis of the Revised Mine Plan.

The Revised Mine Plan contracts the open cut mining areas off the Tarwyn Park property and has focussed on further reducing any perceived visual impacts of and maximising the integration of the associated final landform with the surrounding topography. This report provides the "*information required*" by DPE (in accordance with Attachment 1 of its letter), in the event that it decides to recommend the Revised Mine Plan for the Project to the determining authority.

## 1.3 DOCUMENT STRUCTURE

**Appendix B** provides a tabulated summary of where the information requested by DPE is provided within this Report. This Report is structured as follows:

- **Section 2** provides a brief description of the Revised Mine Plan which would be required to address DPEs proposed stepping of the open cut mine off Tarwyn Park;
- **Section 3** summarises the reduction in environmental impacts and socio-economic benefits of the Project, if the open cut mine plan was to be moved off Tarwyn Park;
- **Section 4** responds to correspondence received from DPE over the Project (and Revised Mine Plan where relevant);
- **Section 5** provides a revised management and monitoring summary to give certainty with respect to the avoidance, mitigation and management actions to be employed by KEPCO in addition to its obligations under any conditions of approval;
- **Section 6** provides a conclusion that demonstrates how the Project (even if open cut mining is moved off Tarwyn Park) remains in the public interest and should be approved; and
- **Sections 7** and **8** list all abbreviations and references relied upon for this report.

Technical specialists have provided additional specialist advice during the preparation of this report. Where applicable and as referenced, this report should be read in conjunction with the appendices and the relevant approvals documentation for the Project, which provide additional authoritative detailed technical information.

# 2 REVISED MINE PLAN

## 2.1 OVERVIEW

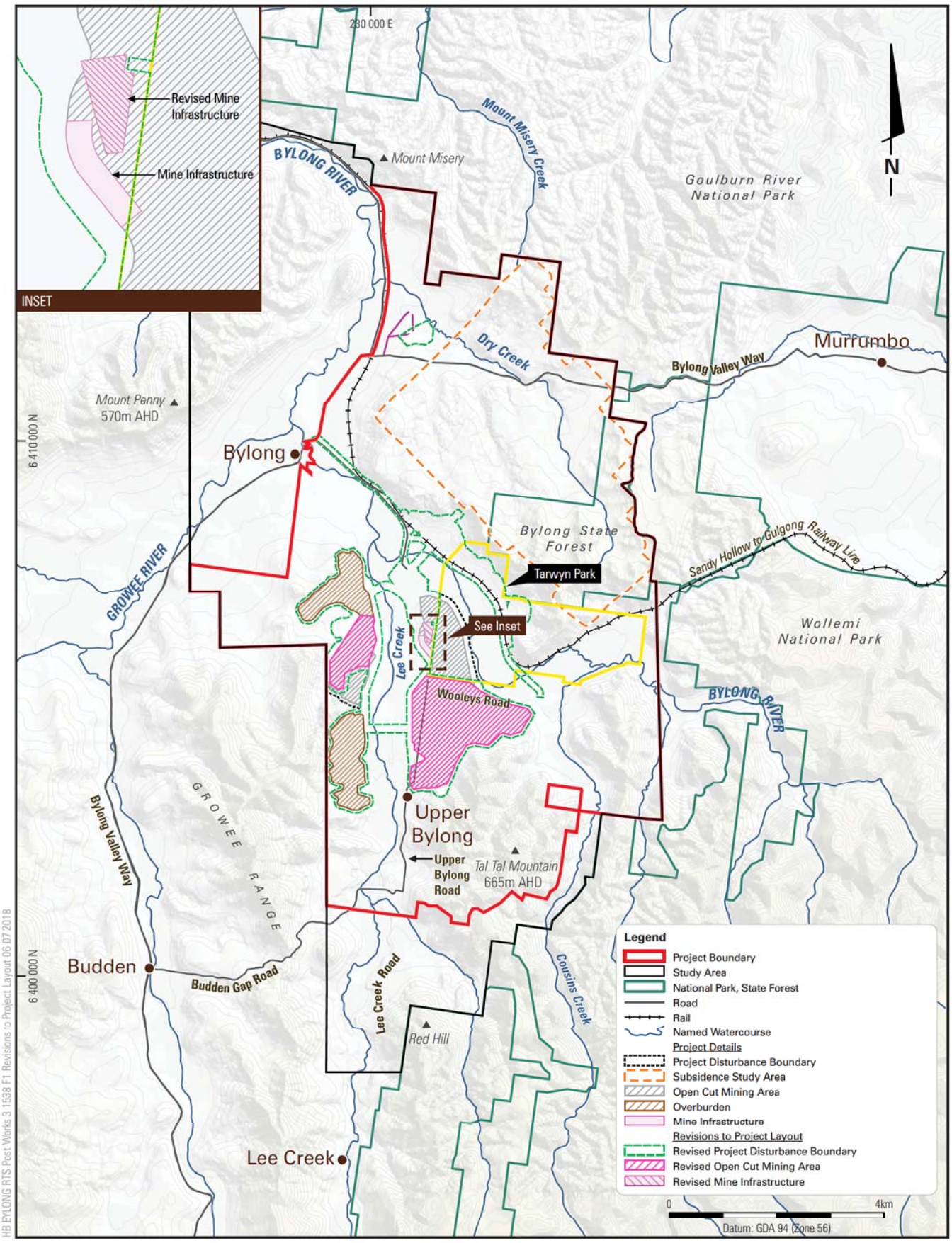
KEPCO has previously provided justification within its approvals documentation regarding the criticality of the initial, limited open cut mining operations to the Project. KEPCO has developed a Revised Mine Plan including the following refinements which are required to appropriately respond to DPE's request and its stated intention to impose this mine plan as conditions of consent:

- Reduced Eastern open cut mining area footprint and associated Overburden Emplacement Area (OEA) to remain on land outside of the Tarwyn Park Farm Complex;
- Reduced Western open cut mining area footprint and associated OEA to minimise visual impact to views of the Upper Bylong Valley from the Tarwyn Park Farm Complex; and
- Revisions to the final landform design to assist in it better blending into the surrounding natural topography so as to further minimise the potential visual impacts on the wider Bylong Landscape Conservation Area (BLCA).

**Figure 1** overlays the open cut mine plan revisions proposed by DPE on the EIS mine plan for the Project. **Figure 2** illustrates the proposed Conceptual Project Layout as per DPE's request (the Revised Mine Plan). Key features of the Revised Mine Plan include:

- The initial development of two smaller open cut mining areas with associated haul roads and OEAs, utilising a mining fleet of excavators and trucks and supporting ancillary equipment (unchanged from the EIS, other than the scale of open cut mining areas);
- The two open cut mining areas will be developed with coal extraction and related activities operating 24 hours a day, 7 days a week over an approximate 9 year period (one year less than the EIS mine plan);
- The void remaining within the Eastern open cut mining area remains consistent with the EIS mine plan and accordingly will continue to be adequate for the storage of coal processing reject materials and excess mine water from the longer-term underground mining activities;
- No changes to the maximum extraction rate of up to 6.5 Mtpa of ROM coal, however there will be a reduction of 4.6 Mt of ROM coal produced over the life of the Project;
- A workforce of up to approximately 645 (without a Workforce Accommodation Facility) during the initial construction phase and a peak of 450 full-time equivalent operations employees at full production (marginal reduction in peak employees for Revised Mine Plan); and
- No changes to the underground mining operations, related surface facilities or Coal Handling and Preparation Plant (CHPP).

**Appendix C** provides a table summary of the revisions made to the Project Description to address the request from DPE.

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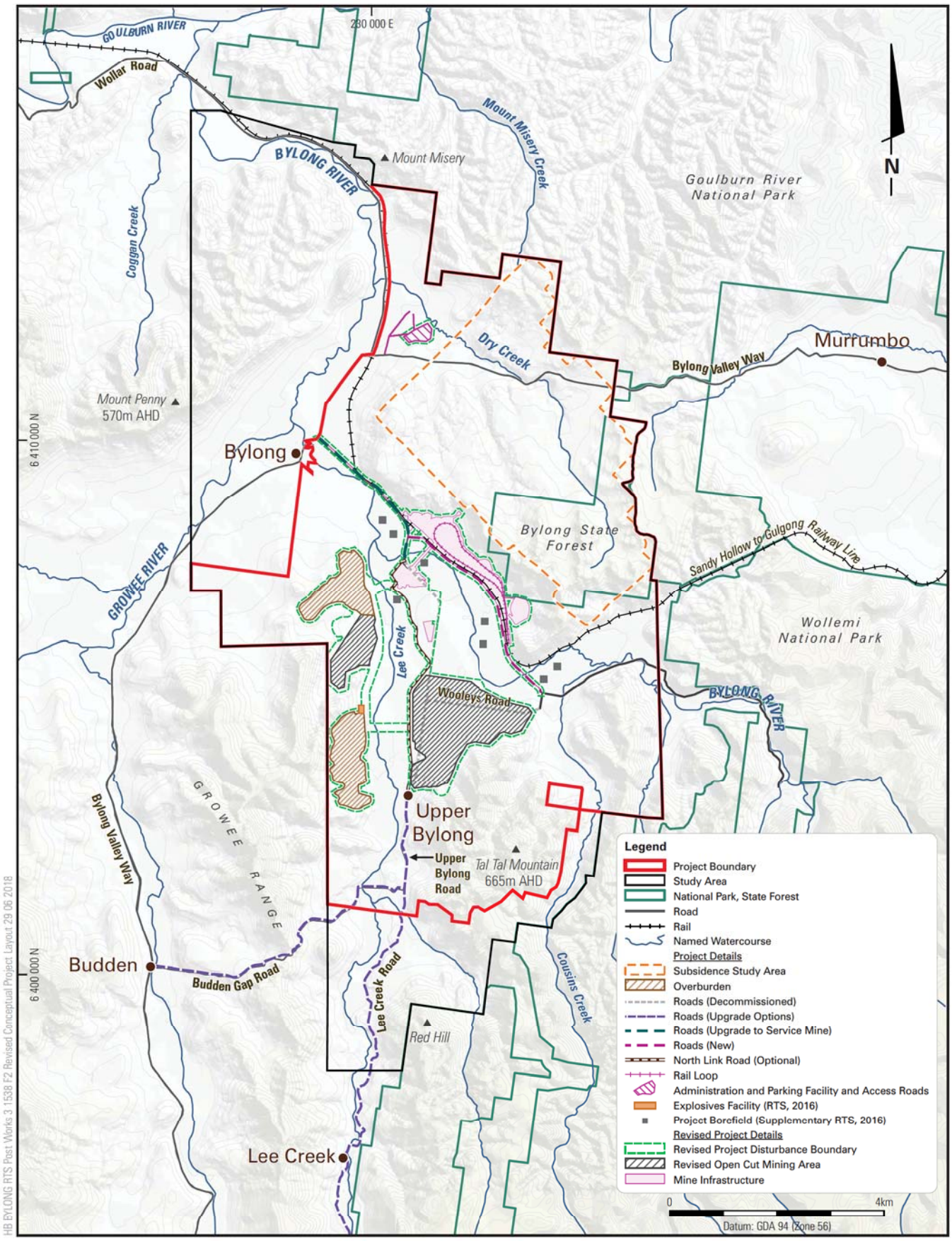
Revisions to Project Layout

**FIGURE 1**




HB BYLONG RTS Post Works 3 1538 F2 Revised Conceptual Project Layout 29 06 2018

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Revised Conceptual Project Layout

**FIGURE 2**

The Project with the Revised Mine Plan will require approximately 1,047 hectares (ha) of surface disturbance (compared to 1,160 ha assessed within the EIS as shown on **Figure 1**) which will generally be undertaken within the Revised Project Disturbance Boundary as illustrated in **Figure 2**.

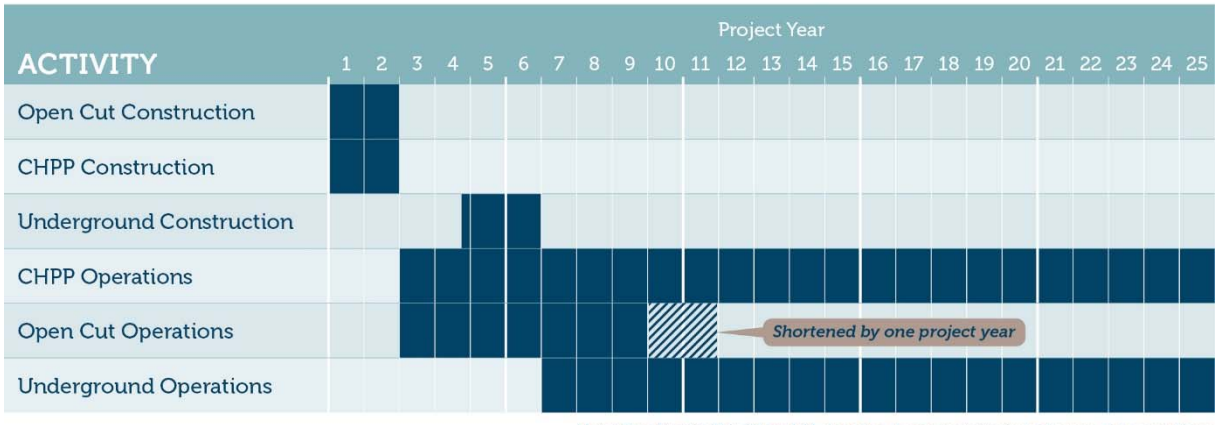
The Revised Project Disturbance Boundary comprises the areas required to accommodate the key surface components of the Revised Mine Plan for the Project with provision for minor adjustments during final design and development. The disturbance areas will be progressively rehabilitated as areas become practically available and where feasible will be reinstated to the pre-mining land use. The Subsidence Study Area (as illustrated in **Figure 2**) will not change from that assessed within the EIS.

## 2.2 IMPLICATIONS ON PROJECT SCHEDULE

A revised indicative schedule for the construction, operational and decommissioning phases of the Project is presented in **Table 1**. The Project Schedule refers to Project Years (PY), rather than calendar years, with PY 1 being the first year of construction activities. It should be noted that the indicative project schedules are subject to continual revision based on changing mining and marketing conditions and as such the forecast timing may vary.

The Project life will continue to be approximately 25 years, comprising a two year construction period and a 23 year operational period. The open cut mining phase will commence in PY 3 and continue until PY 9 (one year shorter than that described within the EIS). Underground mining operations will remain entirely consistent with that described within the EIS and indicatively commence in PY 7, following drift and main heading development between PY 4 and PY 6. Various rehabilitation and decommissioning activities will continue to be undertaken during and following the approximate 25 years of the Project. All other aspects of the Project will remain consistent with that described within Section 3 of the EIS and other associated documents.

**Table 1**
**Revised Indicative Project Schedule**




Note: Shading in PYs 10 and 11 denotes decommissioning of open cut operations

## 2.3 IMPLICATIONS TO PROJECT WORKFORCE

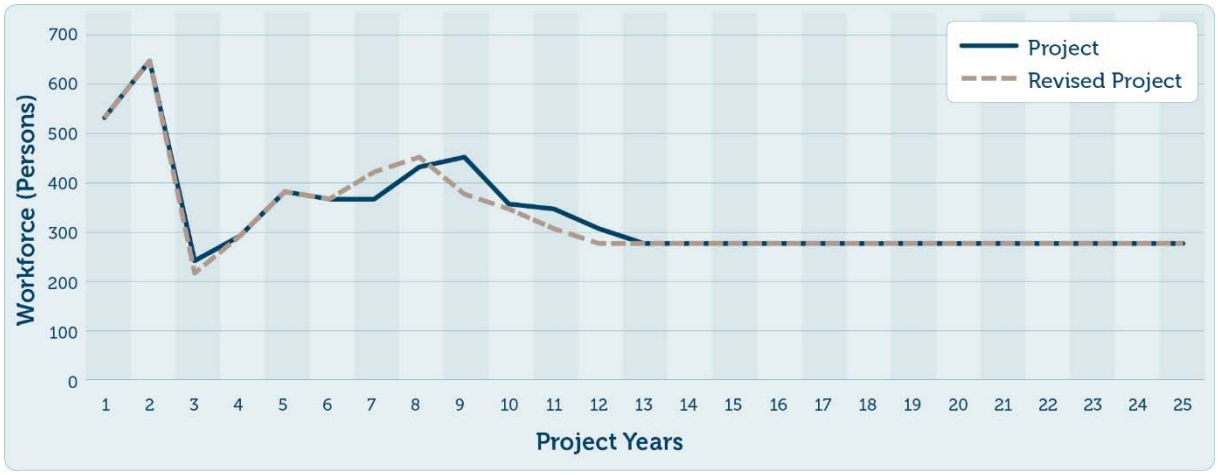
**Figure 3** illustrates the indicative full-time equivalent (FTE) workforce during the years of open cut mining operations for the revised Project versus that assessed within the EIS. The peak workforce demands during the dual operations phase for the revised Project occurs one year earlier (in PY 8) compared to the EIS and is marginally lower. This is primarily due to the peak open cut workforce occurring one year earlier and aligning with the underground development workforce, rather than longwall operations. The composition of the workforce, recruitment strategy, shift rosters and patterns will generally be consistent with the EIS and other associated documents.

## 2.4 REVISED OPEN CUT MINE PLAN

As explained within the EIS, initial conceptual plans to mine the significant coal resource from seven open cut mining areas were rejected by KEPCO to minimise environmental and social impacts (i.e. a reduction from seven open cut mining areas to the two as proposed within the EIS). DPEs requested contractions to the Project mine plan will further reduce the recovery of the State's coal resources within the Authorisations held by KEPCO.

The revised open cut mine plan will remove approximately 4.6 Mt of ROM coal from the open cut coal resource to approximately 28.3 Mt (from approximately 32.9 Mt) of ROM coal. This will reduce the Project's overall coal production to approximately 119.8 Mt of ROM coal (compared to approximately 124.4 Mt of ROM coal) within an operational period of approximately 23 years of active mining. ROM coal recovered over the mine life will be processed within the CHPP to produce approximately 87.3 Mt (compared to 90 Mt) of two key thermal product coal types (16% and 22% ash product) which will be railed to the Port of Newcastle for export.

**Figure 3**
**Comparison of Workforce Requirements**




*Note: Annual underground operations workforce data was compiled and averaged PY 9 - PY 25.*

### 2.4.1 Mine Plan Layout and Sequencing

The mining layout, sequencing and methods will continue to be generally consistent with that described within Section 3 of the EIS. **Figure 4** to **Figure 7** illustrate indicative staged mine plans for PY 3, PY 5, PY 7 and PY 9 for the revised open cut mine plan. The stage plans also illustrate the mine water management system for the revised open cut mine plan.

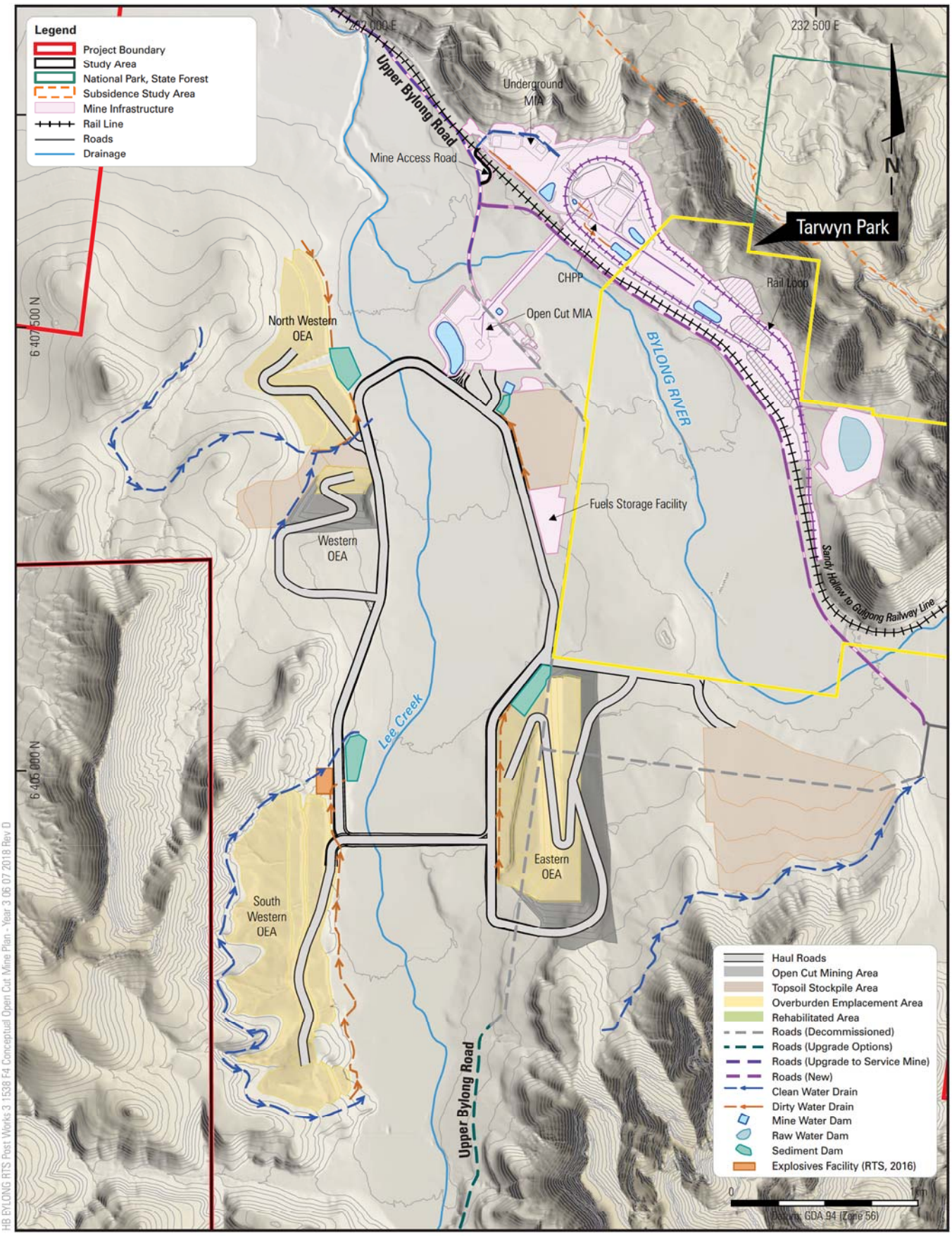
The proposed Eastern Open Cut operations commence as a box cut in the northern portion of the revised mining footprint, which is located more than 1.4 km to the south of the box cut mining operations originally proposed within the EIS. As a result of the reduced footprint, the haul road connecting the Eastern Open Cut operations with the Open Cut Mine Infrastructure Area (MIA) (utilised for ROM coal transport) has been able to be realigned to a more direct route which reduces haulage distances. This realignment to the haul road allows the realignment of the in-pit refuelling facility (as shown on **Figure 1**). Consistent with the progression of mining operations within the EIS mine plan, operations progress southwards down the western extent of the Eastern Open Cut which will then develop from west to east, with the most southern extent being mined from north to south. This indicative mining sequence is subject to change due to mine plan refinements which may be made at the time of mining. This would be considered in the Mining Operations Plan (MOP) process.

Overburden extracted from the Eastern Open Cut will initially be placed within the two OEAs external to the mining areas (North Western OEA and South Western OEA) until the mining area is suitably developed to enable progressive backfilling behind mining operations. As a result of the commencement of mining operations further to the south within this mining area, it is proposed that the southern haul road crossing of the Lee Creek floodplain will now be developed early in PY 3 to facilitate the priority emplacement of overburden from the Eastern Open Cut within the South Western OEA.

The south eastern portion of the Eastern Open Cut will continue to remain as an open void at the completion of open cut mining operations in PY 9. This void area (which is consistent in size and capacity (approximately 19 Million bank cubic metres (Mbcm)) to that proposed within the EIS) will remain open for the emplacement of coarse and fine reject materials generated during the longer-term underground mining operations.

The void will also provide a suitable storage area for surplus mine water which may be generated throughout the life of underground mining operations. The void and associated reject emplacement areas will be capped and rehabilitated at the end of the mine life, so that no final void remains at the completion of the Project. Overburden material from the southern end of the Eastern Open Cut which has been emplaced and temporarily rehabilitated during the open cut operations will be utilised to cover the reject materials and to generate the final landform.

In parallel with the commencement of mining operations in the Eastern Open Cut, mining within the Western Open Cut will commence via a box cut in the northern end of the mining area and progress consistently with that described within the EIS.




H8 BYLONG RTS Post Works 3 1538 F4 Conceptual Open Cut Mine Plan - Year 3 06 07 2018 Rev D

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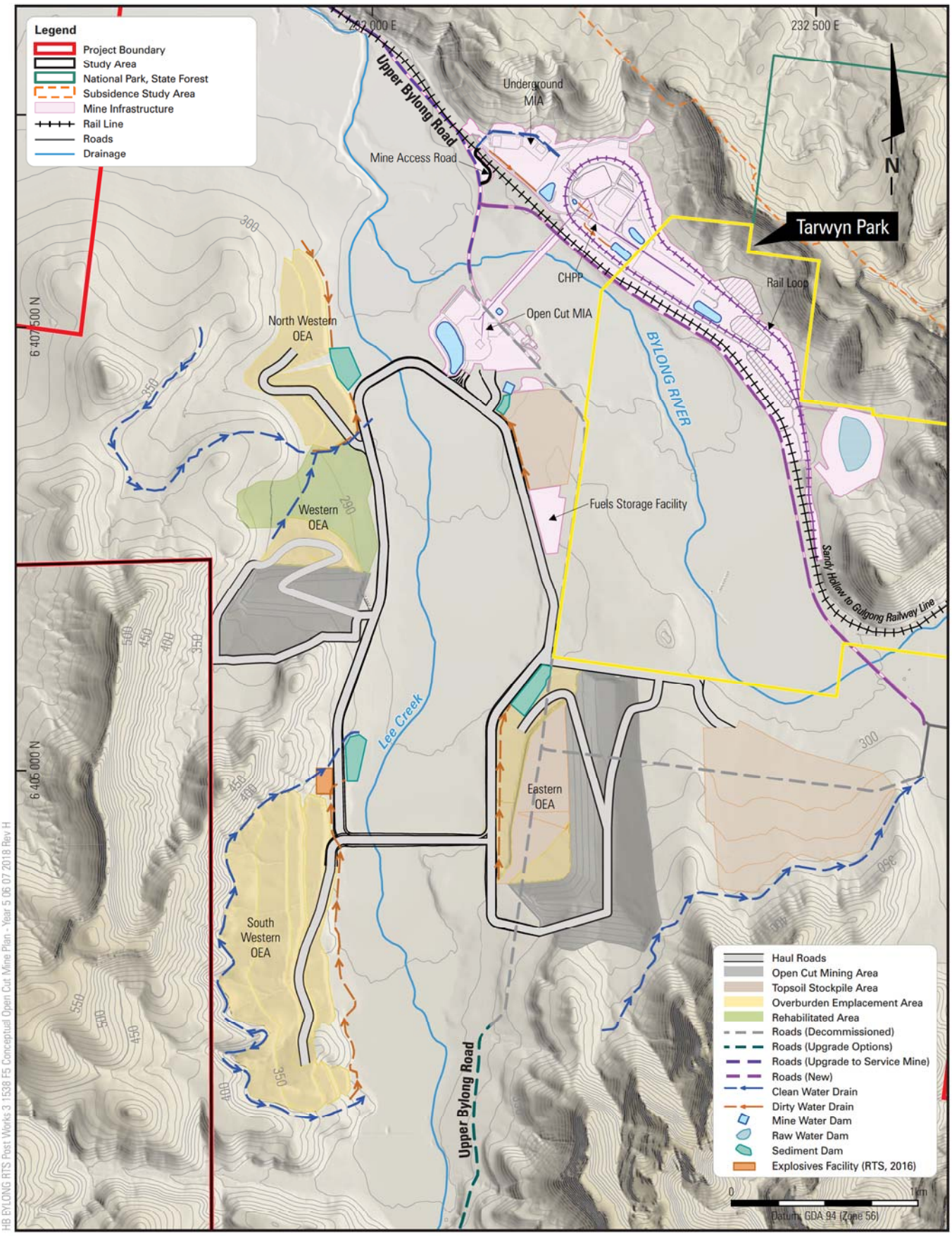
Conceptual Open Cut Mine Plan - Year 3

**FIGURE 4**




H8 BYLONG RTS Post Works 3 1538 F5 Conceptual Open Cut Mine Plan - Year 5 06 07 2018 Rev H

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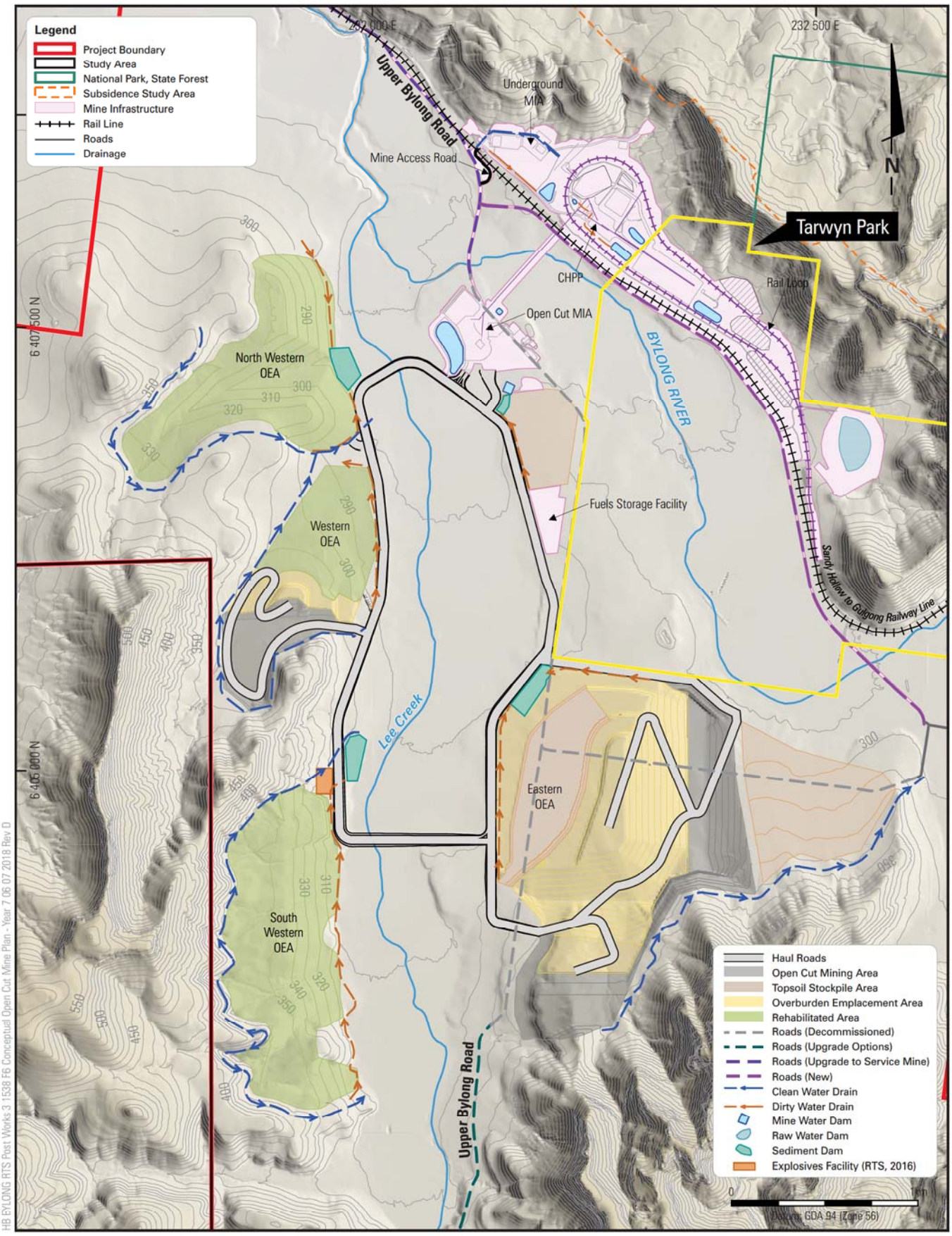
Conceptual Open Cut Mine Plan - Year 5

**FIGURE 5**




H8 BYLONG RTS Post Works 3 1538 F6 Conceptual Open Cut Mine Plan - Year 7 06 07 2018 Rev D

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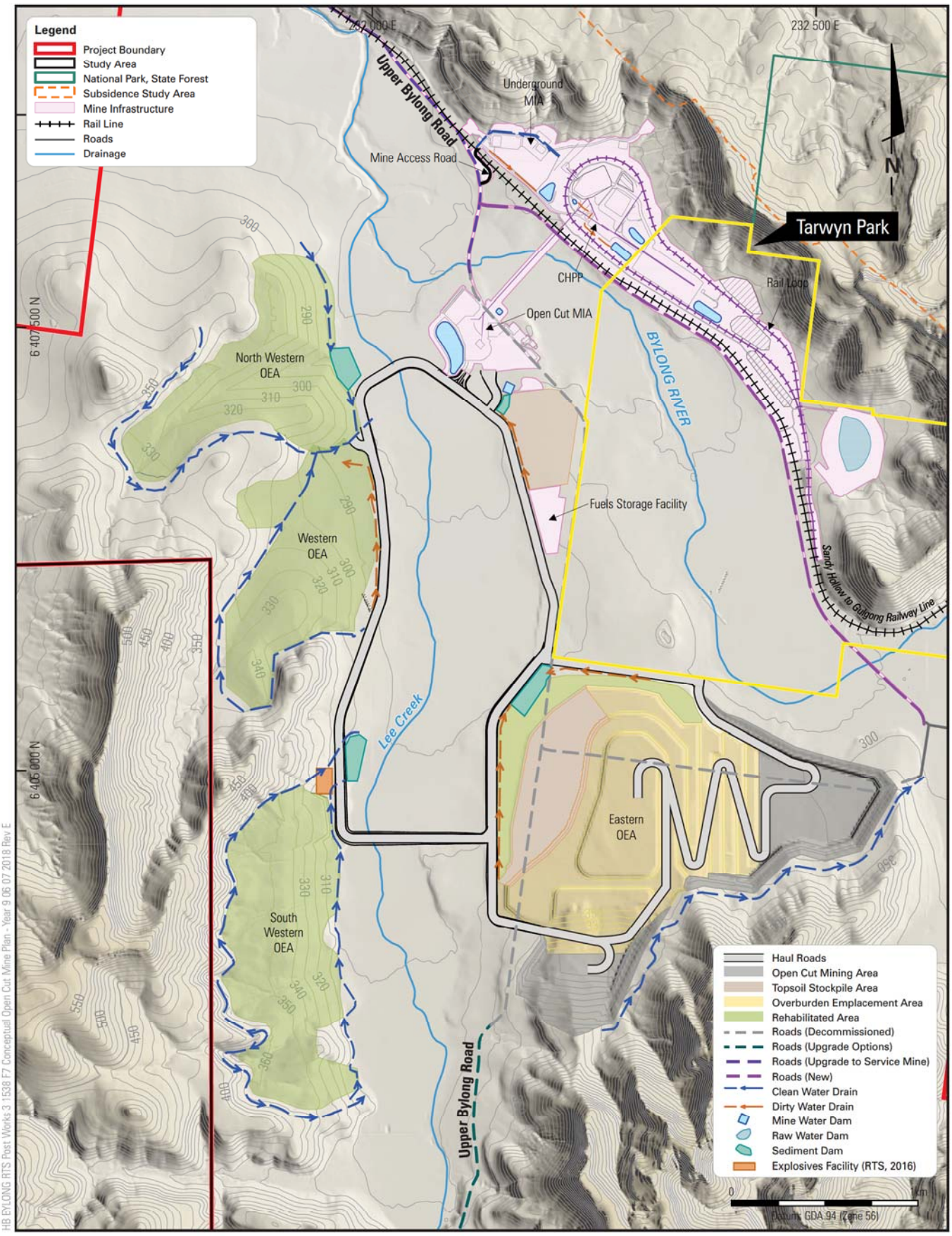
Conceptual Open Cut Mine Plan - Year 7

**FIGURE 6**




H8 BYLONG RTS Post Works 3 1538 F7 Conceptual Open Cut Mine Plan - Year 9 06 07 2018 Rev E

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Conceptual Open Cut Mine Plan - Year 9

**FIGURE 7**

The south eastern extent of the EIS Western Open Cut mining footprint will not be mined under the Revised Mine Plan to retain the existing natural wooded ridgeline/spur within this area. Overburden materials extracted from the Western Open Cut mining area will initially be placed within the North Western and South Western OEAs until the mining void is suitably developed to enable progressive backfilling. Once operations have been appropriately progressed and the OEAs have been shaped, the soil resources collected and stockpiled in advance of mining will be directly placed onto the shaped OEAs to facilitate the progressive rehabilitation process.

### 2.4.2 Revised Indicative Production Schedule

A revised indicative open cut mining production schedule for PYs 3, 5, 7 and 9 is provided in **Table 2**. It should be noted that for consistency with the EIS, the construction and operational scheduling dates remain consistent with construction commencing in 2016 being PY 1 and open cut mining operations commencing in PY 3 being 2018.

Coal production rates for the open cut mining operations for the Revised Mine Plan is forecast at approximately 3.7 Mtpa of ROM coal in PY 3, increasing to approximately 4.6 Mtpa ROM coal by PY 4. A total of approximately 28.3 Mt of ROM coal is proposed to be extracted from the open cut mine, a reduction of around 4.6 Mt of ROM coal from that assessed within the EIS. Removal of approximately 116 Mbcm of prime overburden material will be required over the approximate seven years of open cut mining operations, which is a reduction of approximately 36 Mbcm of prime overburden material when compared to the EIS mine plan.

The maximum coal extraction rates (i.e. from both open cut and underground mining operations) for the Project will continue to be up to 6.5 Mtpa of ROM coal. However as indicated in **Table 2**, ROM coal production rates via open cut mining methods will be marginally lower than the EIS mine plan.

**Table 2**
**Indicative Open Cut Mining Production Schedule Comparison**

| Project Year | Indicative Year | Overburden (Mbcm) | Revised Overburden (Mbcm) | ROM Coal (Mt) | Revised ROM Coal (Mt) | Product Coal (Mt) | Revised Product Coal (Mt) | Coarse & Fine Rejects (Mlcm) | Revised Coarse & Fine Rejects (Mlcm) |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 2018 | 17.1 | 14.4 | 4.0 | 3.7 | 2.4 | 2.6 | 0.9 | 0.6 |
| 5 | 2020 | 27.7 | 17.3 | 5.5 | 4.6 | 4.3 | 3.7 | 0.7 | 0.5 |
| 7 | 2022 | 29.7 | 20.0 | 5.0 | 4.6 | 4.5* | 4.4* | 0.6* | 0.4* |
| 9 | 2024 | 24.6 | 7.8 | 2.9 | 2.0 | 4.5* | 3.9* | 1.2* | 1.1* |
| **Total for Open Cut Years** | **2018 to 2024** | **152.0** | **115.9** | **33.0** | **28.3** | **31.0*** | **26.1*** | **6.0*** | **4.0*** |

*Mlcm – Million loose cubic metres*
** For PYs 7 and 9, both open cut and underground mining are occurring*

### 2.4.3 Revised Open Cut Mining Equipment

An indicative equipment fleet (subject to supply by a mining contractor to be engaged in the future) for revised open cut mining operations at peak production for the Project is shown in **Table 3**. Generally, there is expected to be a minor reduction in fleet required for the Revised Mine Plan as a result of the reduced mining footprints and production rates.

Other ancillary equipment will continue to be required, including (but not limited to) lighting plants, generators, water pumps, mobile cranes, delivery trucks and light vehicles.

### 2.4.4 Blasting

Blasting activities will be undertaken consistent with the methodologies presented in the EIS, however at a marginally reduced rate. Due to the contracted open cut mining footprint, blasting activities within the Eastern Open Cut will be located further south and at a greater distance to the sensitive receptors located north of the open cut operations. **Section 3.1** provides a revised assessment of blasting impacts compared to the EIS and associated approvals documentation.

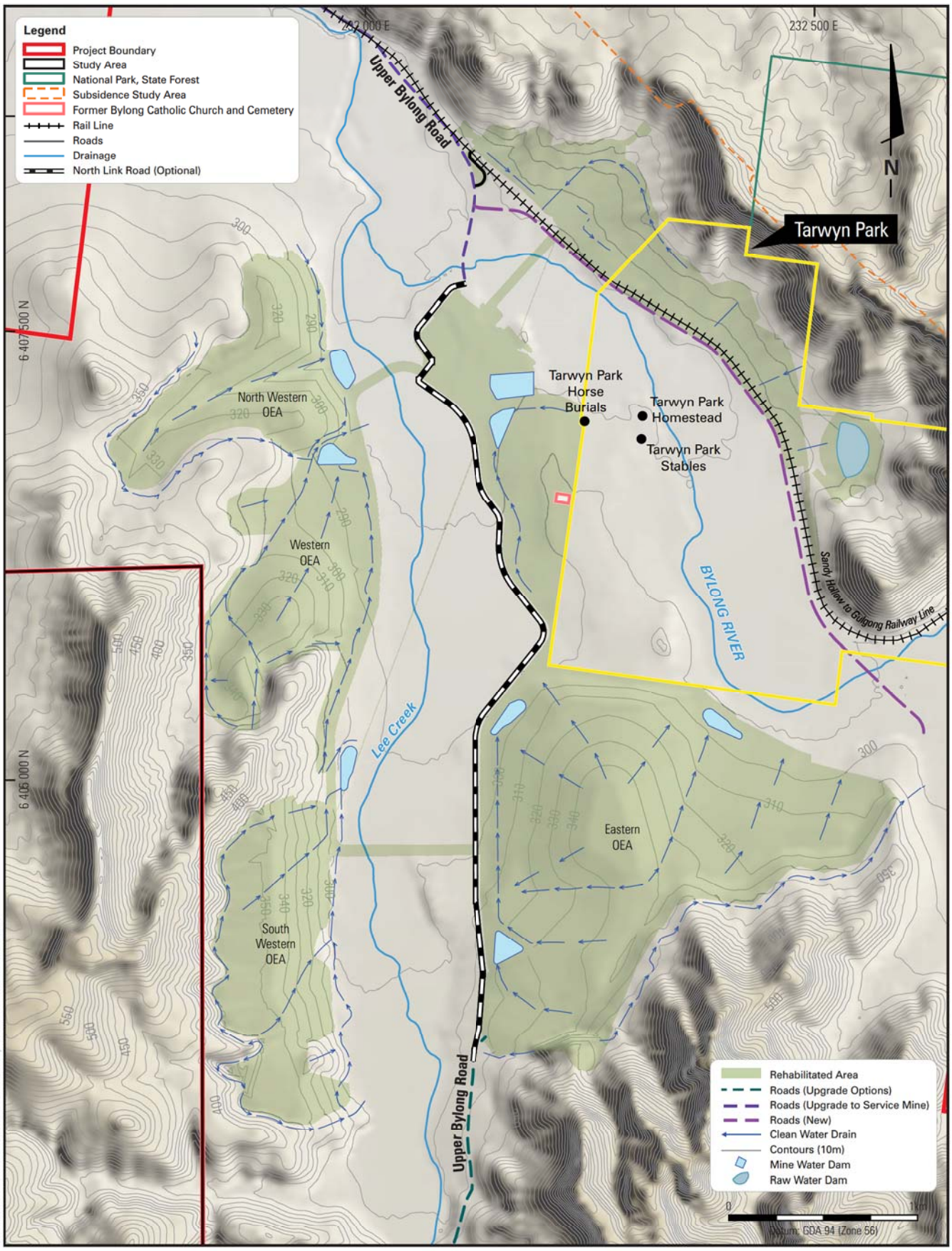
### 2.4.5 Final Landform Establishment and Rehabilitation

KEPCO's mine planning team has developed a revised Conceptual Final Landform based on the mine planning principles which were developed throughout the Project's extensive mine planning process. In this regard, the Conceptual Final Landform as illustrated within **Figure 8**, accommodates similar attributes to the EIS mine plan, albeit with reduced footprints and improved landform design elements.

**Table 3**
**Indicative Open Cut Equipment Comparison**

| Equipment | Number* | Revised Number* |
|---|---|---|
| 550 t Hydraulic Excavators | 2 | 2 |
| 250 t Hydraulic Excavators | 2 | 2 |
| Front End Loaders | 3 | 3 |
| 220 t Haul Trucks | 10 | 10 |
| 180 t Haul Trucks – Coal | 5 | 4 |
| 180 t Haul Trucks – Combi-body | 11 | 10 |
| D11 Dozers | 10 | 10 |
| Graders | 3 | 2 |
| 150 t Water Carts | 2 | 2 |
| Blast Hole Drill | 3 | 2 |
| Fuel and Lube Trucks | 2 | 2 |

**Includes coal and reject materials handling equipment fleet*




H8 BYLONG RTS Post Works 3 1538 F8 Conceptual Final Landform 02 07 2018

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Revised Conceptual Final Landform

**FIGURE 8**

The North Western OEA and South Western OEA have adopted some additional design principles from the EIS in order to address concerns in relation to the proposed landform which have recently been raised by the Heritage Council. The North Western OEA will continue to occupy the same footprint as that proposed within the EIS. However, the revised landform has incorporated the existing valley which extends from the northern portion of the Growee Ranges down to the Lee Creek floodplain on the south-eastern side of the Telstra Hill. The inclusion of this landscape feature aims to minimise the visual effects of the North Western OEA to views from Tarwyn Park and to blend the landform in with the natural topography to the maximum extent possible. Similarly, the South Western OEA has been redesigned with a reduced height to minimise the area of steeper sloping land on the western side of this landform.

The Eastern OEA generally represents a similar landform to that presented within the EIS (albeit with reduced footprint to remain off Tarwyn Park). The conceptual design for the Western OEA will also be developed generally consistent with the EIS mine plan, with exception of the contracted footprint within the south eastern extent of the Western Open Cut.

Consistent with contemporary environmental assessment requirements, this revised Conceptual Final Landform design has been developed using standard mine planning design principles. Schedule 4, Condition 63 of the Recommended Development Consent conditions prepared by DPE for the Project specifies the requirement for the final landform design to be developed to "*incorporate micro-relief and integrate with the surrounding natural landforms*" and to "*minimise the visual impact of final landforms as far as is reasonable and feasible*". These specifications follow on from KEPCO's final landform rehabilitation objectives as described within the EIS and associated approvals documentation.

As part of the Rehabilitation Management Plan (RMP) and MOP to be prepared upon the receipt of planning approval, KEPCO would be required to develop strategies to address these committed rehabilitation objectives. This will entail detailed landform modelling which will be able to accommodate real mine planning data gained through the physical mining activities as opposed to standard mine planning design assumptions which are utilised at the EIS stage.

The conceptual mine plans, schedules and final landform designs presented within this document are based on the information and knowledge available at this stage of the Project. These conceptual plans, schedules and designs will be continuously reviewed as mining progresses. Progressive rehabilitation of the site will be appropriately focused towards achieving the overall rehabilitation objectives for the Project, including the establishment of a safe and stable final landform that integrates into the neighbouring natural environment and where practical, returns the land to its pre-mining land use post-mining.

### *Conceptual Macro Relief Landform Design*

In light of the concerns raised within the PAC Review Report and subsequent Heritage Council correspondence in relation to the uniform nature of the Conceptual Final Landform design, KEPCO's mine planning team has completed some detailed landform design work to develop a revised Conceptual Final Landform design which incorporates macro relief (revised Conceptual Final Landform with Macro Relief) (see **Figure 9**). The mine planning information developed for the revised Conceptual Final Landform has been utilised as the basis of the macro relief design. It is noted that a similar detailed mine planning process will be undertaken as part of the RMP/MOP process to address the Project's rehabilitation objectives should the EIS Mine Plan be approved.

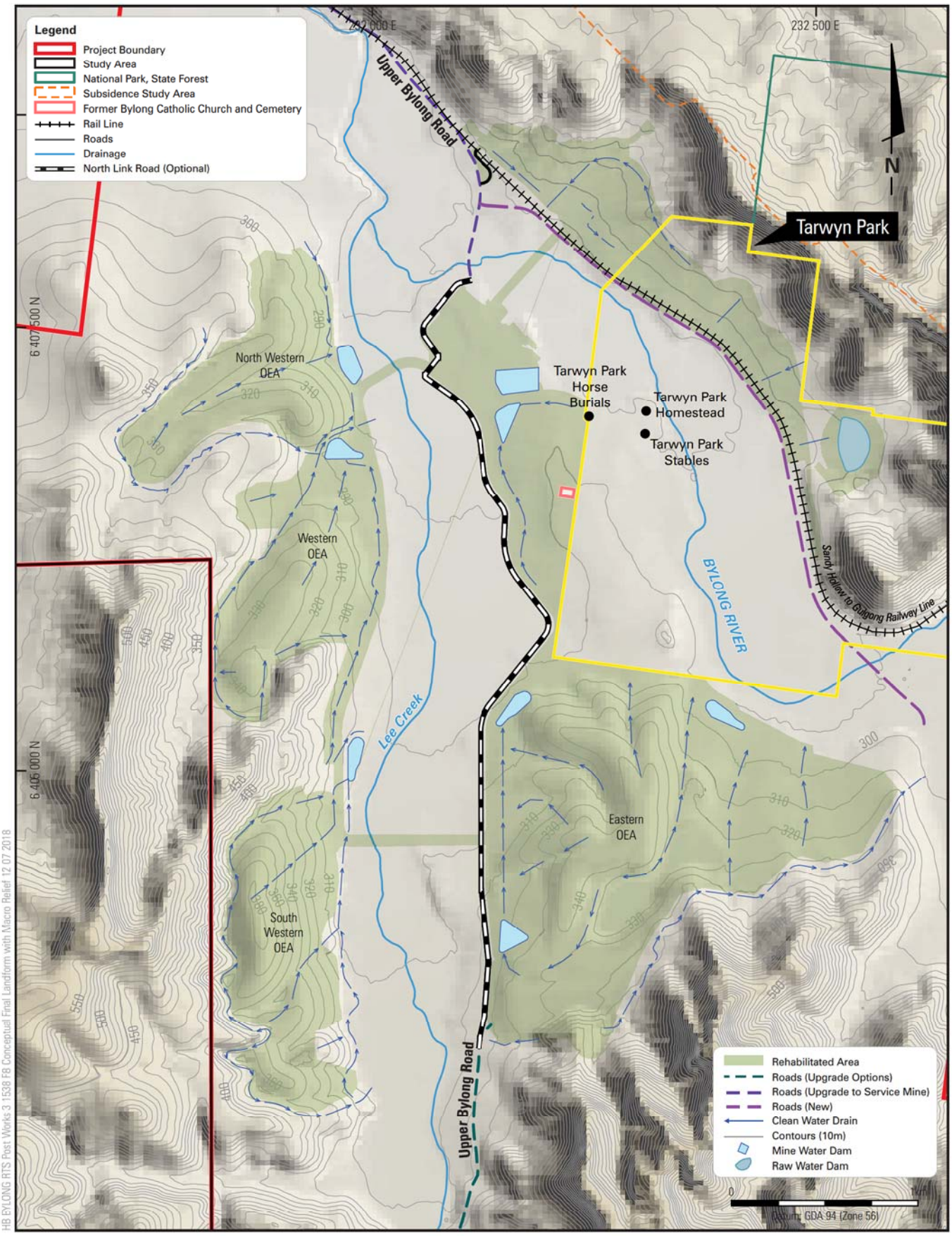
KEPCO's mine planning team conducted a detailed investigation of the surrounding natural topography and has incorporated the shape and character of natural topographic features into the final landform design for the Revised Mine Plan. The key natural topographic features identified by the mine planning team for use within the final landform design included:

- Branching ridgelines;
- Ridgelines between 50 metres (m) and 130 m wide;
- Ridgelines having gentle grades, then steeper down to the valley floor; and
- Ridge side slopes generally >20 degrees.

The revised Conceptual Final Landform with Macro Relief as illustrated in **Figure 9** incorporates the following design features:

- Branching ridgeline features;
- Various ridgeline widths between 60 m and 85 m;
- Ridge grades of between 0 to 2.5 degrees, then 2.5 to 7 degrees down to the valleys;
- Maximum landform slopes generally less than 10 degrees, with small areas between 10 to 14 degrees (to marry with existing topography); and
- Minimum 300 m vertical radius on ridge crests to ensure no sharp crests are developed where multiple slopes intersect.

In preparing the revised Conceptual Final Landform with Macro Relief, the mine planning team focussed on the planning schedule and mass centroids developed for the Revised Mine Plan. The landform design has also considered the required scheduling in order to reduce haulage distances throughout the life of mining and also the ability to retain areas suitable for the post mining land use objectives previously stated and areas for the reinstatement of Biophysical Strategic Agricultural Land (BSAL). This Conceptual Final Landform (with Macro Relief) should be considered an indicative representation of the intended outcome of the final landform for the Project. This Conceptual Final Landform (with Macro Relief) is subject to change as part of the more detailed mine planning work to occur during the initial years of mining operations for inclusion into the RMP and MOP as required. The principles used here will be utilised in the following detailed mine planning processes.

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Conceptual Final Landform with Macro Relief

**FIGURE 9**

# 3 ENVIRONMENTAL REVIEW

An environmental review of the potential environmental impacts relating to the Revised Mine Plan has been completed and is presented in this section and supporting technical appendices. The environmental review includes a comparison of the Revised Mine Plan to the assessed environmental impacts for the Project EIS Mine Plan presented in the EIS and associated documents.

A tabulated summary of the revised environmental impacts is provided within **Appendix D**.

## 3.1 NOISE & BLASTING

### 3.1.1 Background

Noise and blasting impacts for the Project have previously been assessed within Noise and Blasting Impact Assessment (NBIA) (PEL, 2015).

Environmental Resource Management (ERM) (formerly Pacific Environment Limited) was commissioned to undertake a review of the potential noise and blast impacts for the Revised Mine Plan in comparison with those previously assessed for the Project within the EIS and supporting documentation.

The assessment generally confirmed that the Revised Mine Plan would reduce noise impacts to private receivers located to the north of the Project when compared to the EIS Mine Plan. Blast impacts to Tarwyn Park Homestead and Stables were also determined to be materially lower for the Revised Mine Plan.

A copy of the ERM technical report is included within **Appendix E** with a brief overview of the assessment provided below.

### 3.1.2 Methodology

ERM has determined that PY 5 represents the worst-case operation of the open cut mining operations for which to compare the noise impacts for the Revised Mine Plan against the EIS assessments. PY 5 represents the highest year of coal and overburden production for the Revised Mine Plan in the period where operations are undertaken across the two mining areas. The PY 5 mine plan also includes activities on the North Western OEA which is generally closest to the sensitive receivers located to the north of the Project.

ERM has revised the equipment locations for the PY 5 to reflect the Revised Mine Plan and associated mine planning information. The noise modelling has utilised similar methodology and assumptions to that presented within the EIS. In this regard, the noise modelling has relied upon on the assumptions from the EIS modelling. Operational noise impacts have been modelled under each of the meteorological conditions assessed as part of the EIS to ensure a direct comparison could be made. **Appendix E** provides further information on the noise modelling methodology.

ERM has also conducted an updated blast impact assessment for the Revised Mine Plan based on the increased minimum blast distances to sensitive features. The blast impact assessment methodology and relevant criteria for the Revised Mine Plan is consistent with the NBIA. **Appendix E** provides further information on the blast impact assessment methodology.

### 3.1.3 Revision of Impacts

Since the preparation of the EIS, KEPCO has acquired and reached agreement to purchase several properties which were previously assessed to experience noise impacts as a result of the Project. **Figure 10** and **Figure 11** illustrates the status of landownership within and surrounding the Project Boundary.

**Table 4** presents a summary of the worst-case noise levels and assessment results for neighbouring private receivers which exceed the Project Specific Noise Level (PSNL) (i.e. 35 dB(A)) for the Revised Mine Plan. **Table 5** presents a revised summary of operational noise exceedances for the Revised Mine Plan. Noise impact to private receivers to the north have on average reduced by approximately 1 decibel (dB) as a result of the Revised Mine Plan. A full assessment of operational noise levels to receivers is provided in **Appendix E**.

**Table 4**
**Predicted Noise Levels for PY 5**

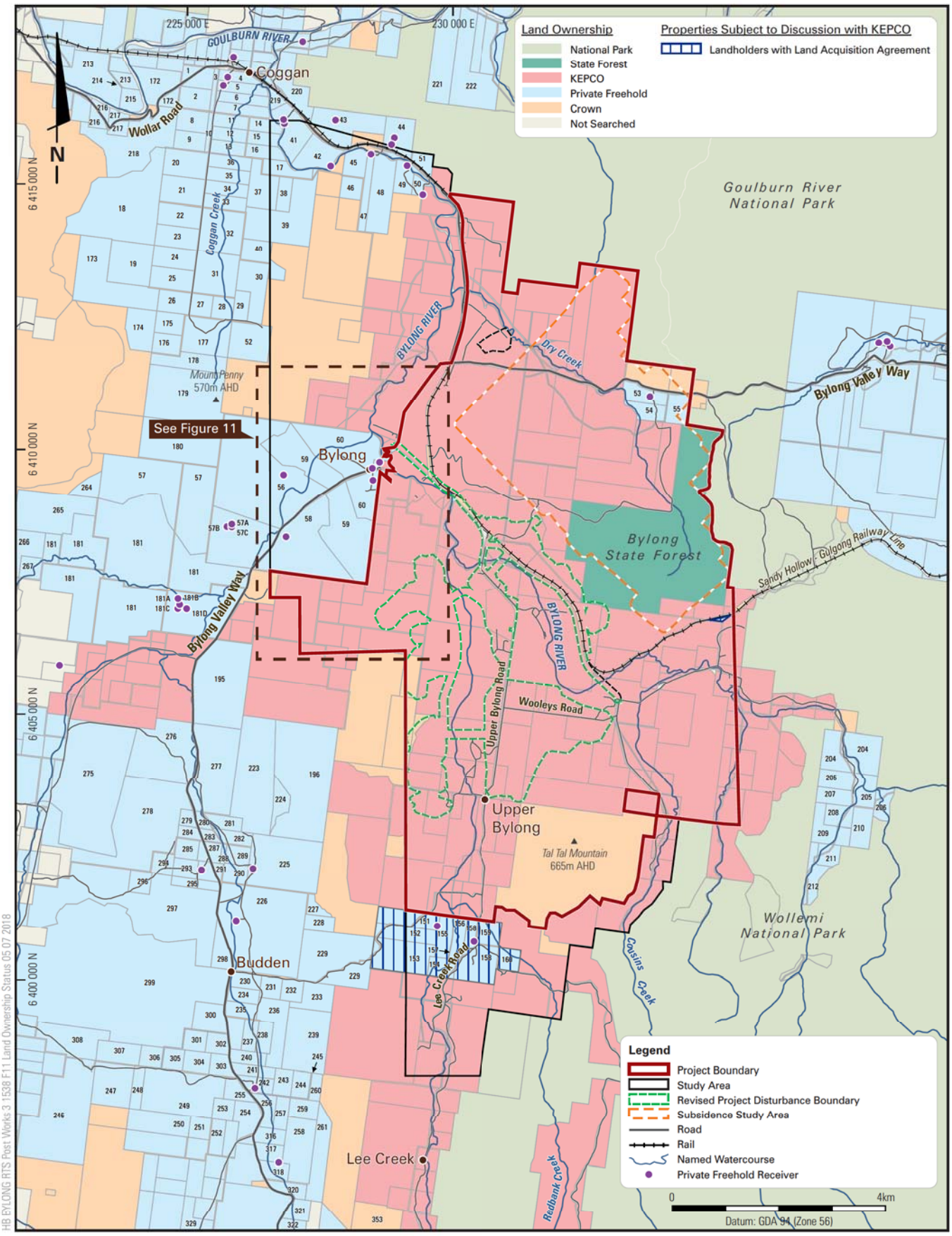
| Landowner ID | Landowner | Predicted Noise Level ($LA_{eq,\ 15\ min}$ dB(A)) | |
|---|---|---|---|
| | | Day | Evening/Night |
| 56 | Locaway Pty Ltd | - | 37 |
| 57A | Locaway Pty Ltd | - | 36 |
| 57C | Locaway Pty Ltd | - | 36 |
| 58 | I & C Tindale | 37 | 38 |
| 60 | Jarvet Pty Limited | 39 | 40 |
| 151* | PR Grieve | - | 38 |
| 158* | PR Grieve | - | 37 |

*Dashed result indicates no exceedance of PSNL predicted under that scenario*
*Green shading – Negligible operational noise impacts predicted*
*Blue shading – Moderate operational noise impacts predicted*
** KEPCO has reached the relevant agreement to purchase this property*

**Table 5**
**Revised Summary of Operational Noise Exceedances**

| Noise Exceedance | Management Approach in accordance with VLAMP | No. Affected Private Receivers | Landowner IDs |
|---|---|---|---|
| Negligible noise impacts (1-2 dB exceedance) | Noise mitigation at noise source | 4 | 56[1], 57A[1], 57C[1], 158[2]* |
| Moderate Noise Impacts (3-5 dB exceedance) | Noise mitigation, including mitigation at residence | 3 | 58, 60, 151[2]* |
| Significant Noise Impacts (>5 dB exceedance) | Acquisition | - | - |
| Additional significantly affected land (exceedance of amenity criteria on >25% of land) | Acquisition | - | - |
| Total | | 7 residences 4 landowners | |

*1. Receivers 56, 57A and 57C owned by same landowner*
*2. Receivers 151 and 158 owned by same landowner*
** KEPCO has reached the relevant agreement to purchase this property*




H8 BYLONG RTS Post Works 3 1538 F11 Land Ownership Status 05 07 2018

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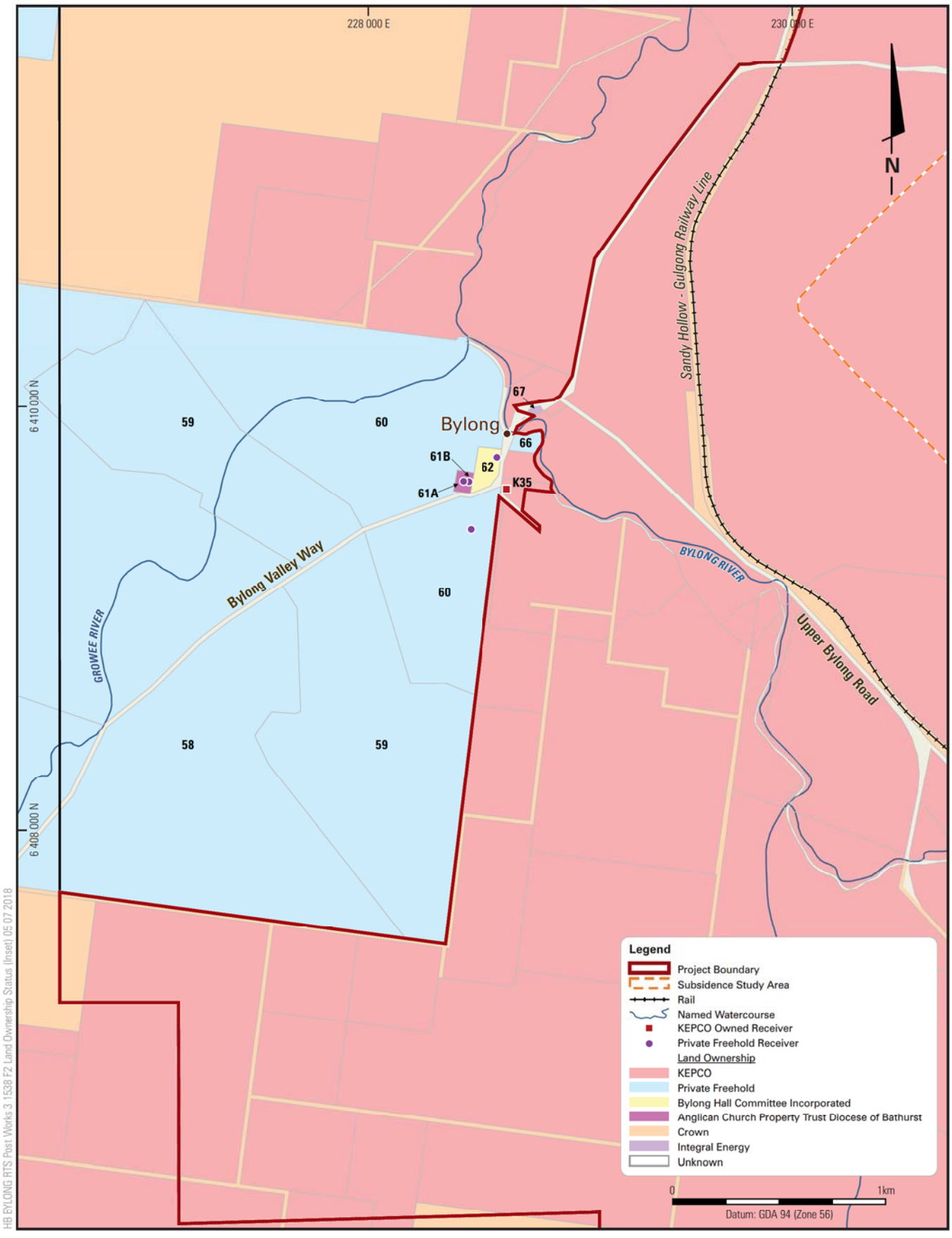
Land Ownership Status

**FIGURE 10**

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Land Ownership Status (Inset)

**FIGURE 11**

ERM has determined that one private receiver (receiver 60) previously predicted to experience significant noise impacts from the Project, has now been assessed to reduce to moderate noise impacts for the Revised Mine Plan. Receiver 58 which was previously predicted to experience moderate noise impacts as a result of the Project will continue to receive moderate noise impacts during the early years of the Project for the Revised Mine Plan. The three receivers (located on one property) will continue to experience negligible noise impacts throughout the early stages of the open cut mine life. KEPCO has reached agreement over the purchase of receivers 151 and 158 upon the granting of Development Consent for the Project. Receiver 158 has reduced from moderate noise impact to negligible noise impacts as a result of the Revised Mine Plan.

ERM confirmed that a review of the predicted low frequency spectrum at each private receiver did not identify a low frequency noise impact (in accordance with the methodology previously accepted by EPA and methodology specified in the Noise Policy for Industry (EPA, 2017)) at any receiver.

Upon the completion of open cut mining operations (which is now one year earlier than the EIS), noise impacts to private receivers will be significantly lower for the underground mining phase (which is not affected by the Revised Mine Plan) and will remain consistent with that previously assessed for the Project.

Given that the Revised Mine Plan entails a contraction to the mining footprint (and associated blasting activities) rather than extension, blast impacts to sensitive receivers will be equal to or lower than those assessed within the EIS. Accordingly, blasting activities associated with the Revised Mine Plan are not predicted to result in blast impacts in excess of the relevant criteria for private receivers. Private receivers located to the north of the Eastern Open Cut mining area are likely to experience reduced blasting impacts for the Revised Mine Plan. **Appendix E** provides a full assessment of blast impacts to private receivers (and sensitive features) within and surrounding the Project.

Tarwyn Park Homestead and Stables will be located more than approximately 1.4 km from the nearest blasting activities associated with the Revised Mine Plan. In comparison, blasting activities were assessed within the EIS to be undertaken within 190 m and 107 m of the Homestead and Stables respectively. Due to this significant change in the distance from blasting, the overpressure and vibration impacts to these items will be considerably lower when compared to the EIS, to levels lower than the relevant guideline limits.

The reduced footprint of the Eastern Open Cut mining area for the Revised Mine Plan results in the former Catholic Church and Cemetery of Our Lady of Sacred Heart (former Upper Bylong Catholic Church and Cemetery) remaining insitu. Blasting activities under the Revised Mine Plan will be more than 1 km from the former Upper Bylong Catholic Church grounds. ERM has predicted that blasting activities will comply with the relevant guideline criteria set for the avoidance of structural damage at the former Upper Bylong Catholic Church grounds.

The Aboriginal Heritage sites to be avoided by the Revised Mine Plan (three artefact scatters and an isolated find) are not expected to be significantly impacted as a result of blasting activities.

### 3.1.4 Revised Mitigation and Management Measures

The noise and blast management and mitigation measures previously identified within the EIS and associated approvals documents continue to be relevant for the Revised Mine Plan. KEPCO will consult with the landholders where noise impacts as a result of the Revised Mine Plan have reduced to a lower impact category in accordance with the VLAMP.

Blast impacts (whilst predicted to comply with the relevant guideline criteria) associated with the former Upper Bylong Catholic Church and Cemetery (previously proposed to be removed) will be managed within the Blast Management Plan to be prepared prior to the commencement of operations.

## 3.2 AIR QUALITY & GREENHOUSE GAS

### 3.2.1 Background

A relevant Air Quality and Greenhouse Gas Assessment has been undertaken by ERM for the Revised Mine Plan to determine the likely reductions in air quality and greenhouse gas (GHG) impacts from those identified within the EIS.

The assessment confirmed that air quality and greenhouse gas emissions would reduce from those assessed within the EIS and associated approvals documents.

A copy of this technical assessment is presented in **Appendix F** with an overview of the key findings provided below.

### 3.2.2 Methodology

The EIS Air Quality and Greenhouse Gas Impact Assessment (AQGHGIA) determined that the Project would not result in any exceedances of the relevant air quality criteria and any neighbouring private receivers. As noted above, KEPCO has acquired additional properties surrounding the Project.

To demonstrate that air quality impacts will be equal to or less than those assessed within the EIS (and associated approvals documents), an emissions inventory has been prepared for the worst case operational year (PY 5) for comparison to the emissions calculated for the EIS.

Whilst there is more material moved in PY 6 and PY 8, this activity is mainly limited to the Eastern Open Cut mining area. To ensure a representative assessment of both the Eastern and Western Open Cut mining areas working simultaneously, PY 5 has been determined to contain the highest activity as well as the highest volume of topsoil removal of all mining years. PY 5 was also modelled and presented under the EIS mine plan and enables a direct comparison with the Revised Mine Plan.

The key activities from the EIS mine plan have been utilised within the revised emissions inventory. The same assumptions with respect to silt and moisture content were applied to the emission inventory as presented in the EIS. The diesel emissions have also been conservatively calculated based on all equipment being compliant with Tier 2 emission standards.

The methodology for calculating $PM_{10}$ emissions from hauling activities was consistent with the revised methodology adopted in Section 4.8.5 of the RTS (Hansen Bailey, 2016a) in response to stakeholder comments. $PM_{2.5}$ emission from diesel are assumed to remain the same, as presented in Section 2.1 of the Supplementary RTS (Appendix E) (Hansen Bailey, 2016b).

GHG emissions (expressed as carbon dioxide equivalent ($CO_2$-e)) have been revised based on the reduced mining activities associated with the Revised Mine Plan. The emissions were calculated utilising the formulas presented within the AQGHGIA. KEPCO provided the revised consumables for the Revised Mine Plan based on a prorate basis to forecast production rates (where relevant).

### 3.2.3 Revision of Impacts

The emission inventory for PY 5 of the Revised Mine Plan is provided in **Appendix F**. There is a substantial reduction in mining activity for PY 5 of the Revised Mine Plan compared to that modelled for the EIS.

Overall, the Revised Mine Plan shows a 41% reduction in total suspended particulate (TSP) emissions and 40% reduction to both $PM_{10}$ and $PM_{2.5}$ emissions when compared to the values presented in the EIS. These drastically reduced emissions for PY 5 are due to the following:

- Reduced overburden handling from approximately 22.8 Mbcm to approximately 17.3 Mbcm (a 23.9% reduction);
- Reduced open cut ROM coal production rate from approximately 5.5 Mtpa to approximately 4.6 Mtpa (a 15.9% reduction);
- Reduced wind erosion areas (mainly associated with the Eastern OEA on Tarwyn Park area) (a 28.7% reduction); and
- Marginally shorter haulage routes as they are no longer routing around the Eastern OEA, increased in pit overburden emplacement and overall less travel due to reduced amount of materials being removed.

The EIS mine plan predicted no private residences to experience ground level concentrations of $PM_{10}$ $PM_{2.5}$ or TSP above the relevant impact assessment criteria. The improved air quality results of the Revised Mine Plan in conjunction with there being less activity surrounding the closest receivers would reduce the predicted contribution of the Project compared to the EIS mine plan even further.

Scope 1 GHG emissions were estimated to drop by 3.9% for the Revised Mine Plan when compared to those assessed within the EIS. The estimated GHG emissions for the Revised Mine Plan represents only 0.02% of Australia's commitment to GHG emissions under the Paris Agreement (i.e. 431 Mt $CO_2$-e by 2030).

The Revised Mine Plan will also result in a 1.4% and 2.7% reduction in calculated scope 2 and scope 3 emissions, respectively, when compared to those assessed for the EIS.

### 3.2.4 Revised Management and Mitigation Measures

The air quality and GHG management and mitigation measures previously identified within the EIS and associated approvals documents continue to be relevant for the Revised Mine Plan.

## 3.3 GROUNDWATER

### 3.3.1 Background

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) completed a Groundwater Impact Assessment for the Revised Mine Plan.

The assessment found that the Revised Mine Plan would result in reduced groundwater inflows to the open cut mining areas as well as marginally reduced drawdown within the neighbouring alluvial aquifer compared to those previously assessed for the EIS Mine Plan. Groundwater inflows to the underground mining areas will not change from those previously assessed for the EIS Mine Plan.

An overview of this technical assessment is provided below with a full copy included within **Appendix G**.

### 3.3.2 Methodology

To ensure a direct comparison of the operational impacts between the Revised Mine Plan and the Project previously assessed, the groundwater model prepared for the Supplementary RTS was utilised. The Revised Mine Plan was adjusted within the groundwater model and run to determine the impacts to the regional groundwater regime for comparison to the impacts assessed within the Supplementary RTS.

The Supplementary RTS was also utilised to assess whether there were any changes between the post mining recoveries between the Revised Mine Plan and the EIS Mine Plan.

The predictive uncertainty assessment conducted for the Supplementary RTS was not repeated as this is influenced by the variability in model parameters and as these parameters remain unchanged there is no change expected.

### 3.3.3 Revisions to Impacts

#### *Revised Groundwater Takes*

The reduced footprint of open cut mining has resulted in a reduction of groundwater inflows to the open cut from a peak of 106 Megalitres per year (ML/year) in PY 5 reported within the Supplementary RTS groundwater modelling by AGE (2016) down to 76 ML/year in PY 7.

This represents an approximate 30% reduction in groundwater inflows to the open cut mining area. The cumulative volume of groundwater intercepted during open cut mining reduces by approximately 163 Megalitres (ML), primarily due to the reduced open cut footprints.

In light of no changes proposed to the underground mining, there is no changes to the previously predicted groundwater inflows to the underground as a result of the Revised Mine Plan for the open cut. Therefore, the predicted peak annual take of groundwater from the Permian as a result of the Project continues to remain consistent with that identified for the underground within the Supplementary RTS (i.e. 4,099 ML in PY 23).

The changes in the groundwater flows were extracted from the updated numerical model to determine how the Revised Mine Plan will influence the indirect interception of groundwater. The results showed a net increase into the alluvium from the Permian bedrock by approximately 100 ML during the initial eight years of the Project. This is expected to be the result of slightly reduced rates of depressurisation within the Permian bedrock for the Revised Mine Plan, allowing steeper hydraulic gradients to promote greater flow of Permian groundwater into the base of the alluvium.

**Table 6** provides a summary of the predicted average, maximum and cumulative (total) water takes in the alluvial and Permian (and Triassic) hard rock aquifers as a result of the Revised Mine Plan. **Appendix G** includes a detailed table of water budgets extracted from the updated numerical model for the Revised Mine Plan as well as water licencing requirements. The results indicate similar impacts to those reported within the Supplementary RTS, with slight reductions to mine inflows and Permian flow losses as a result of the reduced open cut mining footprint.

***Revised Groundwater Drawdown & Baseflow Impacts***

The Revised Mine Plan shows a reduction in the predicted maximum drawdown due to the reduced open cut mining footprint when compared to the previously predicted drawdown in the Supplementary RTS. It indicates typically between 0.1 m and 0.2 m less drawdown occurring within the alluvial aquifer. The Revised Mine Plan results show there will be no adverse impacts on the neighbouring private landholder's bores within the alluvium and therefore remains consistent with what was presented in the Supplementary RTS.

In light of the reduced drawdown within the alluvial aquifer, there is also predicted to be a reduced take of baseflow from the surface water system. That is, the alluvial groundwater which feeds the base of the creek as baseflow is reduced by up to 920 ML/year (PY 9) for the Revised Mine Plan in comparison with up to 994 ML/year (PY 9) as reported within the Supplementary RTS. These predicted baseflow losses are predominately an incidental effect of the water takes from the borefield and are generally located on land owned by KEPCO. However, the modelling demonstrates that the baseflows on KEPCO owned land never reaches zero (and therefore baseflow does not dry up at any time).

**Table 6**
**Predicted Water Take for Revised Mine Plan**

| Geological Unit | Source of Water Take | Average | Maximum | | Cumulative Take over Project Life |
|---|---|---|---|---|---|
| | | ML/Year | ML/year | Year | |
| Permian (and Triassic) hard rock | Mine Inflow | 1,445 | 4,099 | PY 23 | 36,112 |
| Alluvial | Reduced Permian flow | -5 | 55 | PY 12 | -123 |
| | Borefield pumping | 763 | 1,189 | PY 6 | 19,081 |
| | Agricultural pumping (capped) | 714 | 714 | All | 17,850 |
| Total | | 2,917 | | | 72,920 |

The creeks within the Bylong River catchment are ephemeral in nature and only flow intermittently following substantial rainfall events. Accordingly, these streams do not flow for the majority of time. However, they exist as a chain of ponds along the drainage alignment, which are windows to the alluvial water table, but with no continuous baseflow.

The baseflow losses on land not owned by KEPCO are negligible with up to 1.6 ML/year predicted during PY 9. It is important to note that within the model, the peak in baseflow losses (PY 9) coincides with the peak in borefield demand, a conservative coincidence that exacerbates the alluvial drawdown and the loss of baseflow predicted by the model. This specific scenario is considered improbable.

Notwithstanding this, an appropriate framework for which to manage the potential impacts on neighbouring water users is provided within the Draft Water Management Plan which has been prepared for the Project.

Further information in relation to the impacts of the Project on baseflows is provided within **Appendix G**.

***Revised Water Licencing***

KEPCO currently hold 3,045 units (equivalent to 3,045 ML) of groundwater allocation within the Bylong River Water Source under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (Hunter Unregulated WSP). The predicted water takes from this water source as a result of the Revised Mine Plan are significantly lower than the current licence entitlements. With water requirements remaining virtually unchanged from previous estimates presented in the Supplementary RTS, the impacts on the alluvium remain generally unchanged for the Revised Mine Plan.

The modelled peak water take of 4,099 ML/year which is predicted to occur from Permian (and Triassic) hard rock aquifers of the Sydney Basin - North Coast Water Source of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (North Coast WSP). This is entirely consistent with the peak water take from the hard rock aquifers presented in the Supplementary RTS.

KEPCO holds a water access licence (WAL) for 411 units from the North Coast WSP as a result of land acquisitions. KEPCO also lodged an application for 2,093 units of water allocation within the Permian and Triassic under the *Water Act 1912* for the Project in November 2015. DoI has previously indicated to KEPCO that this *Water Act 1912* licence application is valid and will be transferred as a licence under the North Coast WSP. Assuming these allocations are held, KEPCO will have sufficient water licences to account for the predicted water takes from the Permian and Triassic hard rock aquifers for at least the first 19 years of the Project. This provides a considerable period of time for KEPCO to obtain the remaining allocations.

In light of concerns raised by the PAC Review Report, KEPCO has engaged a water broker and is currently actively seeking to purchase water licences under the North Coast WSP to obtain water allocations for the remaining 1,596 units required to account for the peak predicted takes for the Project at PY 23.

As of 18 June 2018, the NSW Water Register indicates there are 182 WALs for groundwater within the Sydney Basin – North Coast Water Source of the North Coast WSP with a total share component of 64,673.5 units (AGE 2018). With the number of licenses within this water source and quantity available, KEPCO is confident that the additional water allocations will be obtainable prior to it being required in PY 20 and are well prepared to secure this allocation.

***Revised Post Mining Assessment***

The recovery of groundwater levels within and surrounding the Project for the Revised Mine Plan were compared to that previously assessed within the EIS Groundwater Impact Assessment (AGE, 2015). Groundwater levels were found to mound approximately 2 m higher below the Eastern OEA for the Revised Mine Plan when compared to the EIS Mine Plan. Whilst there are some minor differences in the post mining groundwater levels, the conclusion from the EIS that there will be no significant residual drawdown post mining remains valid for the Revised Mine Plan.

As previously assessed within the EIS Groundwater Impact Assessment (AGE, 2015), the groundwater system will slowly recover over a period of approximately 100 years post mining to a point where there will be no net water take from the alluvium aquifer. The updated Supplementary RTS model for the Revised Mine Plan shows no changes in these findings and therefore remains consistent with the previous predictions.

The impacts of the Revised Mine Plan on the post mining water quality is also consistent with that assessed within the EIS Groundwater Impact Assessment. The beneficial use of the alluvial groundwater will not be affected as a result of the Revised Mine Plan.

### 3.3.4 Revised Mitigation and Management Measures

The groundwater management and mitigation measures previously identified within the EIS and associated approvals documents continue to be relevant for the Revised Mine Plan. Whilst the Draft Water Management Plan which was prepared for inclusion within the Response to PAC Review Report will continue to be appropriate for the Revised Mine Plan, the finer details of this document will be reviewed and updated upon the receipt of Development Consent for the Project.

KEPCO is in ongoing discussions with DoI over the issuance of the water licence application previously lodged in November 2015. The latest correspondence from DoI is discussed in **Section 4.1**. As mentioned earlier, KEPCO has also engaged a water broker to assist in securing WALs for the North Coast WSP on the open market to meet the predicted water takes from this water source.

## 3.4 SURFACE WATER

### 3.4.1 Background

WRM Water and Environment (WRM) has prepared a Surface Water Impact Assessment for the Revised Mine Plan which is provided in **Appendix H**. The following sections provide an overview of this assessment.

The assessment has confirmed that surface water impacts for the Revised Mine Plan are generally consistent with those previously assessed for the EIS Mine Plan.

### 3.4.2 Methodology

The Surface Water Impact Assessment reviews the potential impacts of the Revised Mine Plan in comparison with the surface water impacts identified within the EIS and supporting documentation. It also provides the results of an updated mine water balance for the Revised Mine Plan.

The Bylong Operational Simulation Model (OPSIM) developed for the EIS and associated approvals documents has been updated to reflect the changes to the mine water management system and open cut mine layout for the Revised Mine Plan.

In order to develop representative results showing the changes in catchment areas, production profiles and site water demands, four representative years were selected to reflect the average conditions over the mine phases, including PY 3, PY 7, PY 9 and PY 10+ (for the underground mining phase). Consistent with the EIS, construction activities associated with the Project have not been included in the revised water balance modelling assessment. To allow for a direct comparison of impacts resulting from the Revised Mine Plan, the updated modelling results have been compared against all results and information presented in the EIS and associated approvals documents wherever appropriate.

### 3.4.3 Revision of Impacts

***Revised Mine Water Balance***

The water balance completed throughout the approvals process has demonstrated that the water management system can adequately retain all mine water onsite throughout the life of the Project. The water balance modelling for the Revised Mine Plan has demonstrated that this assessment finding continues to be the case. This is not surprising given that the void remaining at the completion of open cut mining operations is entirely consistent with that proposed for the EIS Mine Plan and there being no changes to the groundwater inflows within the underground mining area.

The water balance model confirms that during the open cut only operations, the accumulation of water is manageable and there is a low risk of significant volumes of water accumulating in the open cut mining areas. Consistent with the previous water balance modelling, once the underground operations commence, a significant increase in groundwater inflows is predicted, which increases the risk of water accumulating within the water management system. The void remaining within the Eastern open cut, along with the goaf storage available within the underground mine will sufficiently accommodate the predicted surplus mine water generated for the project for the very wet conditions 1$^{st}$ percentile scenario. The water balance contingency measures to consider in the unlikely event that further measures are required to manage surplus mine water as outlined within the Response to PAC Review report continue to be appropriate for the Revised Mine Plan.

The water balance modelling results show a slight reduction in simulated overflows from the sediment dams following rainfall events. This is the result of marginally reduced catchment areas along with the increased design capacity of the sediment dams (as requested by EPA).

The water balance modelling for the Revised Mine Plan indicates that there is a 1% probability that the annual volume requirement from the borefield water supply could equal or exceed 1,340 ML/year during the Project. This is generally consistent with the water balance modelling predictions in the Response to PAC Review Report. KEPCO's water licenses will more than account for this worst-case predicted external water supply demand.

***Revised Catchment Impacts***

The maximum undisturbed catchment that is proposed to be captured under the Revised Mine Plan has been calculated to be approximately 123 ha, which is consistent with the area calculated as part of the EIS investigations. The surface runoff collected from this undisturbed catchment has been determined to remain well within the harvestable rights for the Project.

***Revised Flooding Impacts***

The Revised Mine Plan configuration was compared to that previously assessed in the EIS and RTS to qualitatively assess the flood impacts. Given that the Revised Mine Plan involves a contraction to the mining footprints to those assessed within the EIS, the flooding impacts of the Revised Mine Plan are similar (and in some cases less than) those identified within the previous assessments. Flood impacts resulting from the Revised Mine Plan are not anticipated to encroach upon the Tarwyn Park property.

### 3.4.4 Revised Mitigation and Management Measures

The surface water management and mitigation measures previously identified within the EIS and associated approvals documents continue to be relevant for the Revised Mine Plan.

The Draft Water Management Plan which was prepared for inclusion within the Response to PAC Review Report will continue to be appropriate for the Revised Mine Plan. This document will be reviewed and updated upon the receipt of Development Consent for the Project.

## 3.5 SOILS & REHABILITATION

### 3.5.1 Background

SLR Consulting (SLR) was commissioned to undertake a Soils and Rehabilitation Assessment of the Revised Mine Plan.

The assessment confirmed that direct impacts to BSAL would reduce consistent with the Revised Project Disturbance Boundary. The available soil resources will also fulfil the Project's rehabilitation requirements.

This report is presented in **Appendix I** with a summary provided in the following sections.

### 3.5.2 Methodology

The revised areas of BSAL and various Land and Soil Capability (LSC) classes within the Revised Project Disturbance Boundary were initially calculated for comparison to those previously assessed within the EIS and associated approvals documents. This also facilitated the revision to the rehabilitation objectives for the Project and to assess how the Revised Mine Plan and associated revised Conceptual Final Landform could achieve those objectives. A revised soil resource balance was then completed to confirm whether the revised rehabilitation objectives were achievable for the Revised Mine Plan.

### 3.5.3 Revision of Impacts

***Revised BSAL & LSC Impacts***

The Revised Project Disturbance Boundary includes approximately 400.4 ha of BSAL, which represents a reduction of approximately 5.4% from the 423.1 ha of BSAL identified for the EIS mine plan for the Project.

**Figure 12** illustrates the mapped BSAL from the RTS in relation to the Revised Project Disturbance Boundary. The 22.7 ha of BSAL which now falls outside of the Revised Project Disturbance Boundary for the Project is predominantly located on the Tarwyn Park property and will be maintained for agricultural production, consistent with other KEPCO owned land not required for the Project.

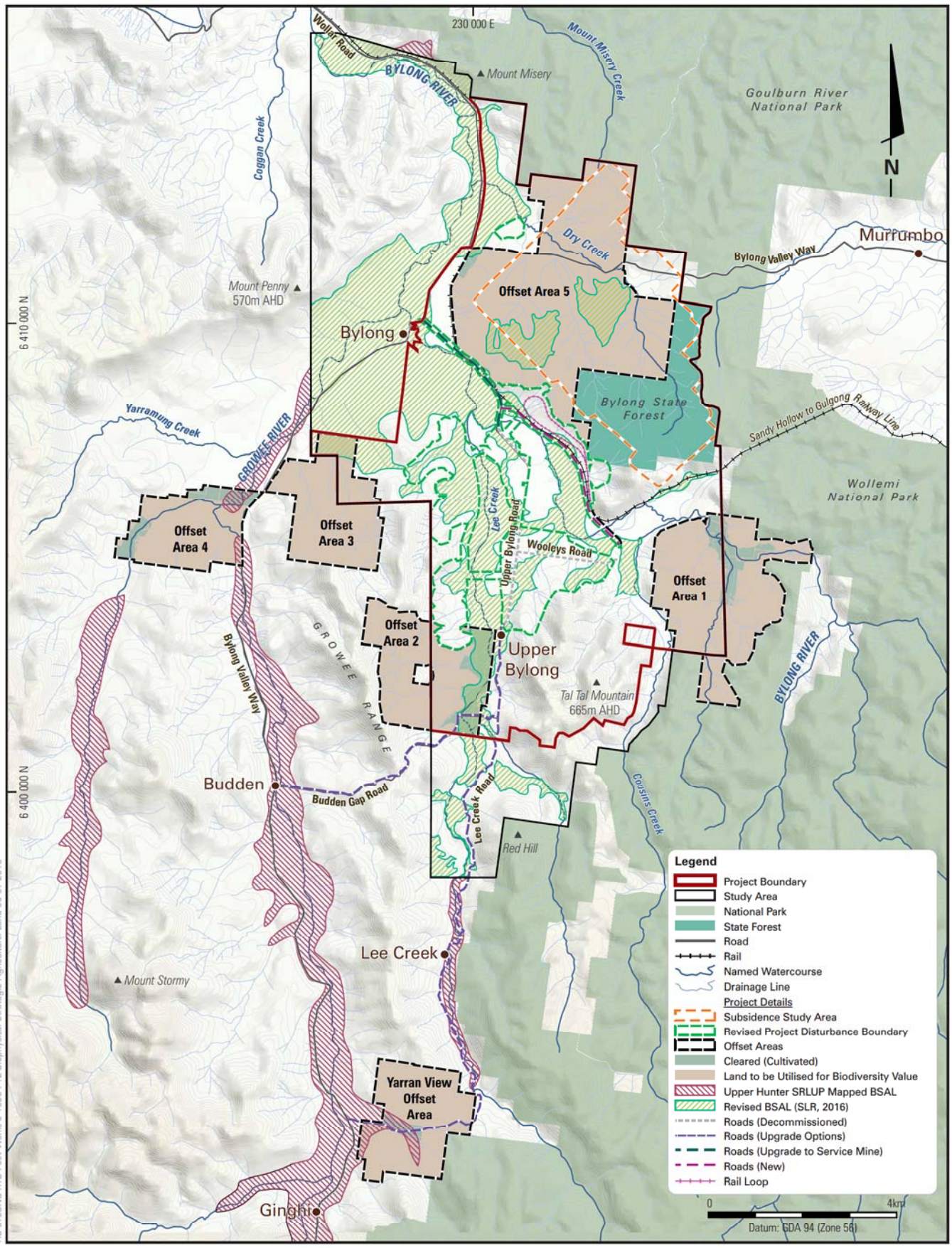
The Revised Mine Plan has resulted in reduced impacts to land of the various LSC classes. There has been reduced impacts to moderate capability land (LSC Classes 4 and 5 ~71.5% of reduced impacts), low capability land (LSC Classes 6 and 7; ~26.3% of reduced impacts) and higher capability land (LSC Class 3; ~2.2% of reduced impacts).

***Revised Rehabilitation Objectives***

The aim of the rehabilitation program for the Project as described within the EIS and associated approvals documents is to preserve or re-establish the equivalent area of BSAL quality of land, and the better LSC classes which is to be disturbed. Accordingly, at least 400.4 ha of rehabilitation is proposed to be reinstated to BSAL. Further, at least 176.5 ha is also proposed to be returned to LSC Class 3 land (which will also meet BSAL criteria).

In order for rehabilitated mine land to be considered appropriate for re-establishing BSAL (and LSC Class 3 land), it requires a landform slope of less than or equal to 10%. Further, this area also needs to be part of a contiguous area of at least 20 ha to meet the BSAL criteria. The revised Conceptual Final Landform with Macro Relief provides approximately 436.23 ha of land that meets these criteria. The revised Conceptual Final Landform developed on standard mine planning principles provides considerably more land which will conform to the relevant BSAL criteria. Accordingly, the revised Conceptual Final Landform is able to be developed to allow for adequate areas of BSAL and LSC Class 3 land to be reinstated progressively throughout the life of the Project. Furthermore, there are areas of pre-mining land which is non BSAL and will be suitable to re-establish BSAL quality land by utilising soil resources recovered from the OEA's and open cut mining footprints.

There are a number of examples where mine sites within the Hunter Valley and throughout Australia have undertaken mine rehabilitation to a targeted agricultural land use or capability class. This includes a recent comparative example at Bengalla Mine within the Hunter Valley of NSW where a rehabilitated area has been verified to be BSAL in accordance with the relevant criteria. Further information on examples of successful mine rehabilitation can be found within **Appendix I**. Through these case studies, it can be shown that KEPCO's commitment to reinstating BSAL into the final landform is a reasonable and achievable outcome which has now been demonstrated elsewhere.




H8 BYLONG RTS Post Works 3 1538 F12 Biophysical Strategic Agricultural Land 09 07 2018

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Biophysical Strategic Agricultural Land

**FIGURE 12**

***Revised Soil Balance***

With soil stripping depths assessed and calculated during the EIS process and refined for the RTS, SLR has calculated the soil resources available for recovery from the revised Project Disturbance Boundary. This identified that 7.42 Million cubic metres (Mcm) of soil resources is available within the revised Project Disturbance Boundary.

To achieve the revised final landform rehabilitation objectives identified above, the total volume of material required for rehabilitation is approximately 6.91 Mcm. Therefore, a surplus of approximately 0.51 Mcm (or 7.4%) of soil materials are available for recovery.

### 3.5.4 Revised Management and Mitigation Measures

Apart from some minor revisions to the areas of BSAL and LSC Class 3 rehabilitation, the rehabilitation objectives and associated management strategies have not changed for the Revised Mine Plan from that presented in the EIS and associated approvals documents.

The overall results of the assessment indicate the Revised Project Disturbance Boundary will reduce the impact on BSAL and all classes of LSC land. The soil resources available remain adequate to fulfil the rehabilitation requirements of the impacted BSAL and better quality LSC classes of land. The final landform design, with the inclusion of macro relief demonstrates there are adequate areas for the reinstatement of BSAL.

## 3.6 HISTORIC HERITAGE

### 3.6.1 Background

AECOM Australia Pty Limited (AECOM) was commissioned to complete a review of the potential impacts to historic heritage items and to conduct an updated visual and landscape analysis of the Revised Mine Plan.

The review confirmed that the two items with assessed local heritage value would not experience direct impacts as a result of the Revised Mine Plan. These include the former Upper Bylong Catholic Church and Cemetery and the Tarwyn Park Horse Burials. The review also confirmed that there would be materially reduced impacts to the Tarwyn Park property (as a result of stepping open cut mining off the property) as well as the BLCA.

The Historic Heritage and Visual Impact Assessment (HHVIA) report is presented in **Appendix J** with a brief summary of the findings of the historic heritage assessment provided below. The visual and landscape assessment completed by AECOM is discussed further in **Section 3.7**.

### 3.6.2 Methodology

The objective of the HHVIA was to review the potential historic heritage and the visual and landscape impacts in relation to the Revised Project Disturbance Boundary and associated contraction to the mine plan. The heritage assessment focussed on the indirect impacts and proposed management of the heritage items which will no longer be directly impacted as a result of the Revised Mine Plan.

### 3.6.3 Revision of Impacts

***Direct Impacts***

**Table 7** illustrates the heritage items which will experience reduced impacts in comparison with the previous assessments. **Figure 13** illustrates the revised impact analysis of historic heritage sites within the study area due to the Revised Mine Plan.

Two heritage items previously assessed within the EIS to be wholly impacted by the Project will be retained as a result of the Revised Mine Plan. The former Upper Bylong Catholic Church and Cemetery will be retained in situ and will not need to be relocated as was previously the case. The horse burials and some elements of the Natural Sequence Farming (NSF) areas located on Tarwyn Park within the previously proposed open cut mining area will also remain undisturbed.

The assessment also found that the Revised Mine Plan would result in reduced landscape impacts to the wider BLCA. This is generally due to the contracted open cut mining footprints and improvements to the final landform design as well as the retention of additional heritage items.

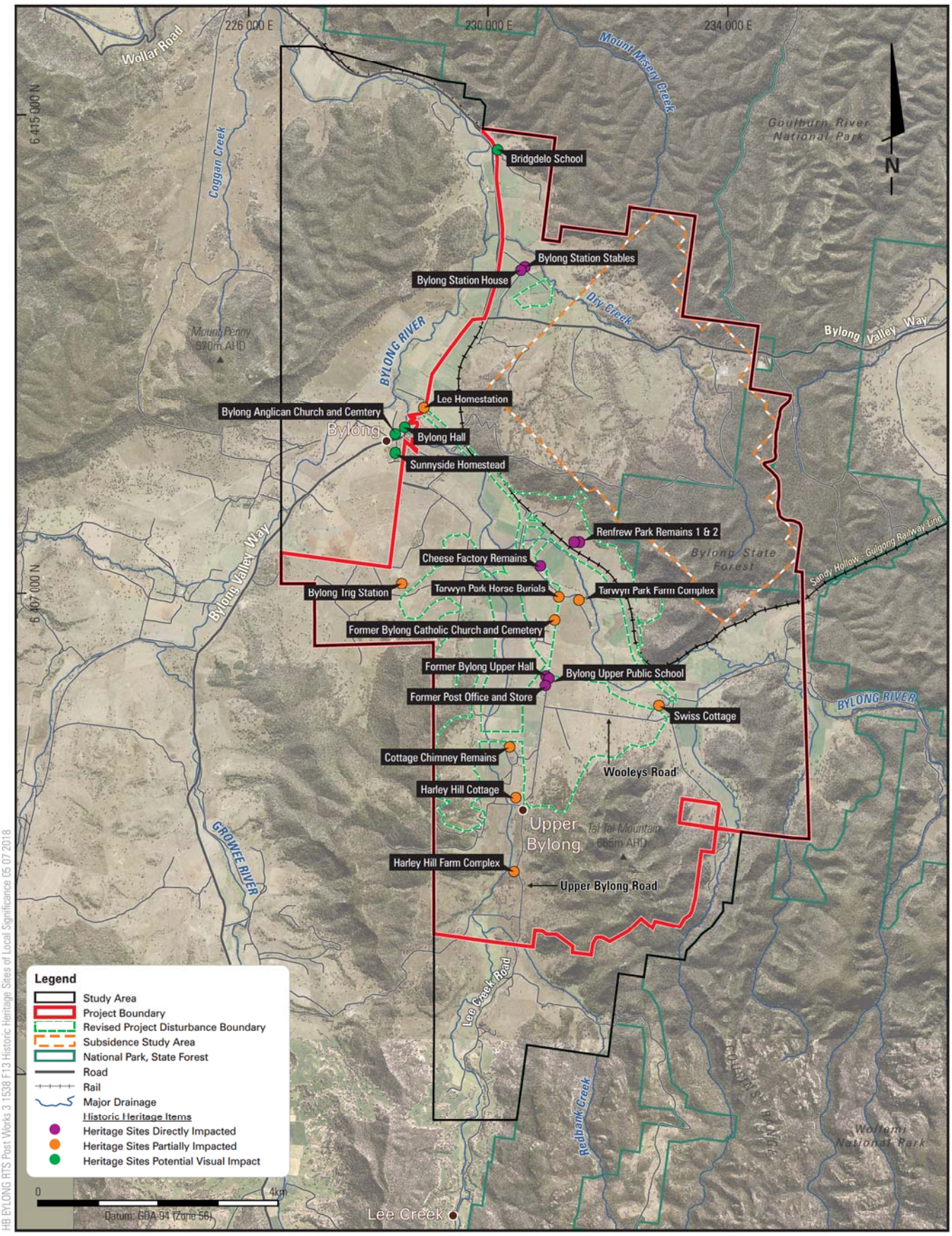
***Indirect Impacts***

As discussed in Section 3.1, a revised blasting assessment was completed by ERM for the Revised Mine Plan. Blasting activities associated with the Revised Mine Plan will now be located more than 1.4 km from Tarwyn Park Homestead and Stables and more than 1 km from the former Upper Bylong Catholic Church and Cemetery. Accordingly, blast impacts will be well below the guideline criteria specified within the EIS for sensitive features at these heritage items.

The Revised Mine Plan will also reduce the potential visual and landscape impacts on heritage items within the study area for the Project, particularly those previously identified from the Tarwyn Park property. This is further discussed in **Section 3.7**.

**Table 7**
**Summary of Revised Impacts to Historic Heritage Sites**

| Historic Heritage Sites | HHIA Impacts (Direct/Partial) | Revised HHIA Impacts |
|---|---|---|
| Former Upper Bylong Catholic Church and Cemetery | Direct | Partial (Possible visual and vibration) |
| Tarwyn Park Farm Complex horse burial location & NSF farmland and features within open cut mining area | Direct | Partial (Possible visual and vibration) |
| BLCA | Partial (removal of heritage items and landscape impacts) | Partial (removal of heritage items and reduced impacts on landscape impacts) |




H8 BYLONG RTS Post Works 3 1538 F13 Historic Heritage Sites of Local Significance 05 07 2018

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Impacts to Historic Heritage Sites

**FIGURE 13**

### 3.6.4 Revised Management and Mitigation Measures

The impacts of the Revised Mine Plan to a number of heritage items previously assessed have either reduced or would be removed. Accordingly, the historic heritage management and mitigation measures previously identified within the EIS and associated approvals documents continue to be appropriate for the Revised Mine Plan.

The following additional mitigation and management measures are proposed in relation to the Revised Mine Plan:

- A Conservation Management Strategy (or similar) for the former Upper Bylong Catholic Church and Cemetery will be prepared to manage the indirect impacts of the Project;
- A vibration strategy will be developed for the former Upper Bylong Catholic Church and Cemetery to document any relevant site specific mitigation and management measures;
- The *draft Tarwyn Park and Iron Tank: Conservation Management Plan* which was prepared for the Response to PAC Review report will be revised to include management measures for the horse burials to remain and to amend the visual mitigation and management measures for the Revised Mine Plan;
- Subject to consultation with MWRC and agreement over the need for it at the time, KEPCO will construct, if it is required, an unsealed gravel road between the Upper Bylong Road and Lee Creek Road at mine closure. This road would aim to re-establish the connection between the Upper Bylong Road and with the local road network to the south of the Project. The Upper Bylong Road Realignment (East Link Road), which is proposed as part of the Project, would provide an appropriate connection to the local road network to the east of the Project; and
- The draft Historic Heritage Management Plan (HHMP) prepared for the Response to PAC Review Report will be reviewed and updated to reflect the Revised Mine Plan.

## 3.7 VISUAL AND LANDSCAPE

### 3.7.1 Background

The updated visual and landscape analysis has confirmed that the Revised Mine Plan represents a material improvement in visual and landscape impacts when viewed from land surrounding the Project, the majority of which is generally owned by KEPCO. The detailed mine planning work completed to provide the revised Conceptual Final Landform with Macro Relief as an indication of the intended outcome has demonstrated that the landform can be designed to conform with the Project's rehabilitation objectives, including to integrate with the surrounding natural landform.

The following sections provide an overview of the revised visual and landscape impacts of the Revised Mine Plan.

### 3.7.2 Methodology

The analysis of the revised visual and landscape impacts for the HHVIA was supported by photomontages and cross sections prepared by Hansen Bailey. The photomontages and cross sections are included within **Appendix K**. AECOM provided an outline of the proposed changes to the conceptual final landform design associated with the Revised Mine Plan and analysed the improved landscape character and visual amenity outcomes arising from the revised Conceptual Final Landform.

AECOM then developed a conceptual landscape design to assist in mitigating the impacts of the Project to the key heritage views of Tarwyn Park Homestead and reviewed the likely residual impacts and recommended any additional mitigation and management measures to be applied during the development of the final landform.

### 3.7.3 Revision of Impacts

***Visual***

The Visual Impact Assessment (VIA) within the EIS identified two properties requiring additional visual mitigation and management measures as a result of the Project. Both of these properties have since been purchased by KEPCO. Other private receivers surrounding the Project were predicted to experience minimal visual impacts, particularly upon the completion of rehabilitation activities.

It should be highlighted that KEPCO now owns and manages the majority of land within the Upper Bylong Valley from which the proposed open cut mining activities for the Project will be openly visible. The Revised Mine Plan proposes reduced open cut mining footprints and will subsequently result in reduced visual impacts when compared to the mine plan previously assessed within the EIS.

The Revised Project Disturbance Boundary is generally surrounded by KEPCO owned agricultural properties which will continue to be utilised for agricultural uses throughout the life of the Project. The use of this surrounding land for agricultural uses throughout the life of the Project will assist in maintaining the existing rural character of the Upper Bylong Valley.

***Landscape Analysis***

From the initial mine planning phase of the Project, KEPCO has recognised the scenic rural setting within which the Project is proposed. With this in mind, the open cut mine plan for the Project was developed with specific consideration to minimising the potential visual and landscape impacts to sensitive viewing locations. The mine plans were strategically designed to be shielded by the natural topography and intervening topography. For example, the North Western OEA was specifically designed to the south of and at an elevation below the ridgeline which extends down to the Bylong River floodplain from Telstra Hill to ensure that these mining activities were not openly visible to sensitive viewing locations to the north of the Project.

The contractions to the open cut mine plan that have now been requested by DPE will further minimise the impacts to the scenic landscape. **Section 2.4** outlines the revisions made to the Project mine plan to address DPEs request.

These revisions for the Revised Mine Plan include:

- Reduced footprint of the Eastern Open Cut mining areas and associated OEA to remain off the Tarwyn Park property. This results in reduced impacts to the existing views of the ranges within the upper Lee Creek valley (including Bald Hill) and lower slopes of the Growee Ranges from Tarwyn Park, which have been identified of importance by the Heritage Council. The former Upper Bylong Catholic Church and Cemetery will also be retained and visible from Tarwyn Park. This will assist in maintaining the current landscape character and setting of Tarwyn Park Homestead. Photomontages and cross sections illustrating these improvements as a result of the Revised Mine Plan are included in **Appendix K**.
- Reduced footprint of the Western Open Cut to maintain a wooded ridgeline/spur within this area which would potentially represent a material landscape change to the view from Tarwyn Park Homestead if this were removed. **Appendix K** provides photomontages and cross sections which illustrate this ridgeline which will be maintained (previously shielded by the Eastern OEA).
- The North Western OEA has incorporated the existing valley which extends from the northern portion of the Growee Ranges down to Lee Creek floodplain on the south-eastern side of the Telstra Hill which aims to minimise the visual effects of this landform to views from Tarwyn Park and to assist in blending the landform in with the natural topography. The photomontages provided within **Appendix K** illustrate the improved visual effects of the North Western OEA for the Revised Mine Plan.
- The South Western OEA has been designed with reduced landform heights which assists in reducing the area of steeper sloping land previously proposed on the western side within the EIS landform. This landform design was previously identified by the Heritage Council's consultant as an area of concern.

AECOM has determined that the landscape character and visual amenity outcomes have significantly improved as a result of the above revisions made by the Revised Mine Plan.

The revised Conceptual Final Landform with Macro Relief (which has been demonstrated as an example of how the Project will comply with the rehabilitation objectives specified within the Recommended Development Consent) provides an appropriate indicative representation of the intended outcome of the final landform for the Project.

### 3.7.4 Revised Management and Mitigation Measures

The impacts of the Revised Mine Plan to the visual and landscape values previously assessed within the EIS and associated approvals documents have materially reduced. Accordingly, the visual and landscape management and mitigation measures previously identified within the EIS and associated approvals documents continue to be appropriate for the Revised Mine Plan.

The RMP/MOP to be prepared for the initial open cut mining operations will provide further information on the final landform design criteria in accordance with the rehabilitation objectives provided within the Recommended Development Consent conditions.

Consistent with the rehabilitation objectives provided within the Recommended Development Consent, the detailed design process will include detailed consideration of:

- Incorporating more detailed micro relief into the final landform design to integrate with surrounding natural landforms; and
- Reducing the visual impacts of the final landform design as far as is reasonable and feasible.

## 3.8 ECONOMICS

### 3.8.1 Background

Gillespie Economics was commissioned to complete a review and update of the economic impact assessment for the Revised Mine Plan.

The Revised Mine Plan results in a reduction in net production benefits of $13 M (present value) or 4% when compared to the EIS Mine Plan. This is mainly the result of reduced royalties from not mining the 4.6 Mt of ROM coal which would otherwise be recovered under the EIS Mine Plan. The Revised Mine Plan also results in reduced environmental, social and cultural impacts when compared to the EIS Mine Plan. These reduced impacts are important at a local scale but are immaterial from an aggregate CBA perspective. The net social benefits of $301 M (present value) to NSW confirms that the Project (even when considering the contracted open cut footprint within the Revised Mine Plan) continues to be desirable and justified from an economic efficiency perspective. The Revised Mine Plan will also provide significant economic activity to the regional economy, as well as more broadly across NSW.

A copy of the updated economic report is included in **Appendix L** with a summary provided in the following sections.

### 3.8.2 Methodology

The revised Economic Impact Assessment has been prepared utilising the same primary methods referred to in the Economic Impact Assessment provided for the EIS and subsequent approvals documents.

The revised assessment has provided an updated Cost Benefit Analysis (CBA), Input-Output (IO) Analysis and Computable General Equilibrium (CGE) Analysis, based on the financial and technical advice provided by KEPCO and technical consultants for the Revised Mine Plan.

### 3.8.3 Revision of Impacts

The Revised Mine Plan will result in a reduction in the open cut production rates in the early years of mining. This will subsequently result in reduced operating costs and revenues for these initial years of mining operations. The overall results of the CBA indicate a reduced net production benefit from the Project of $13 M (present value). This reduction is generally comprised of the loss in NSW government royalties from not recovering the 4.6 Mt of ROM coal from the open cut mining area.

The Revised Mine Plan will also result in a reduction in the environmental, social and cultural impacts of the Project. Whilst these have been identified to be important from a local perspective, their values (generally less than $1 M) are immaterial from an aggregate CBA perspective.

Consequently, the Revised Mine Plan will result in a minor reduction in the net social benefits of the Project to NSW, from $314 M ($395 M including revised company tax estimates) to $301 M ($380 M including revised company tax estimates). The aggregate benefits of the Revised Mine Plan to NSW exceed the aggregate costs to NSW and hence continues to be desirable and justified from an economic efficiency perspective.

The Revised Project will also continue to contribute to economic activity within the regional and NSW economies, during both the construction and operational phases. These impacts have been estimated using two methods, the IO analysis and the CGE analysis. These methods have been undertaken to understand these contributions, although the methods differ in their underlying assumptions. Whichever approach is used, it is obvious that the Revised Mine Plan for the Project will continue to provide significant economic activity (output, value-added, regional income, and employment) to the regional economy, as well as more broadly across NSW.

The CGE analysis estimates that the revised Project would increase gross regional income (preferred measure of economic welfare i.e. whether the region as a whole is better off or worse off) to the regional economy by around $4.9 B (present value) and between $6.4 B and $6.8 B (present value) to the NSW economy.

### 3.8.4 Revision of Mitigation and Management Measures

Revised mitigation and management measures for specific environmental issues are addressed within the relevant sections of this report.

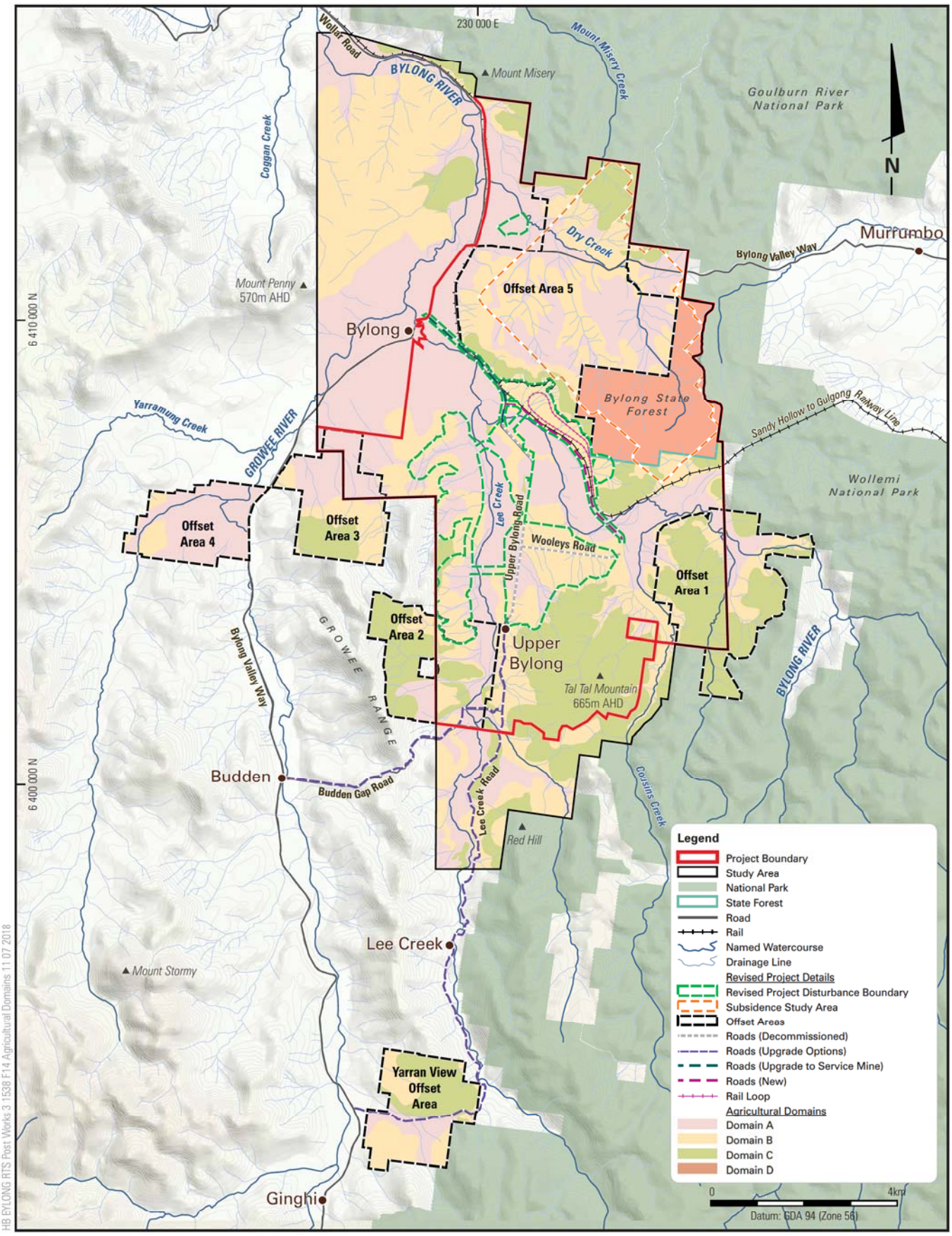
## 3.9 OTHER ENVIRONMENTAL CONSIDERATIONS

### 3.9.1 Agriculture

The Revised Project Disturbance Boundary reduces the direct disturbance to agricultural land including BSAL and land mapped as Equine Critical Industry Cluster (CIC) in comparison to that assessed within the EIS. **Figure 14** illustrates the impacts to land classified under the various agricultural domains (consistent with those identified in the EIS) within the Revised Project Disturbance Boundary. The reduced footprint within the Eastern Open Cut will avoid impacts to approximately 54.7 ha of arable land (Domain A) and 36.2 ha of extensive grazing land (Domain B). The reduced footprint within the Western Open Cut will avoid impacts to approximately 18.8 ha of extensive grazing land (Domain B) and around 1 ha of arable land (Domain A). It will also avoid impacts to approximately 2.6 ha of heavily timbered land (Domain C) associated with the ridgeline to be retained.

As discussed in **Section 3.5.3**, the Revised Project Disturbance Boundary reduced direct impacts on BSAL from 421.1 ha to 400.4 ha. Similarly, the Revised Project Disturbance Boundary also avoids direct impacts to land mapped as Equine CIC from 700 ha to approximately 587.2 ha. **Figure 15** illustrates the Revised Project Disturbance Boundary in relation to the land mapped as Equine CIC.

KEPCO's landholdings that are not specifically required for the Project or Biodiversity Offset Strategy (BOS) and suitable for agricultural uses will continue to be retained for agricultural land uses. **Table 7** summarises the land which is available for agriculture on KEPCO's landholdings as illustrated on Figure 16. The Revised Mine Plan will retain approximately 3,258 ha of land for agricultural production throughout the life of the Project. This was previously proposed within the Project Disturbance Boundary and accordingly was to be temporarily removed from agriculture until mine rehabilitation is completed and returned for agricultural uses.




HB BYLONG RTS Post Works 3 1538 F14 Agricultural Domains 11 07 2018

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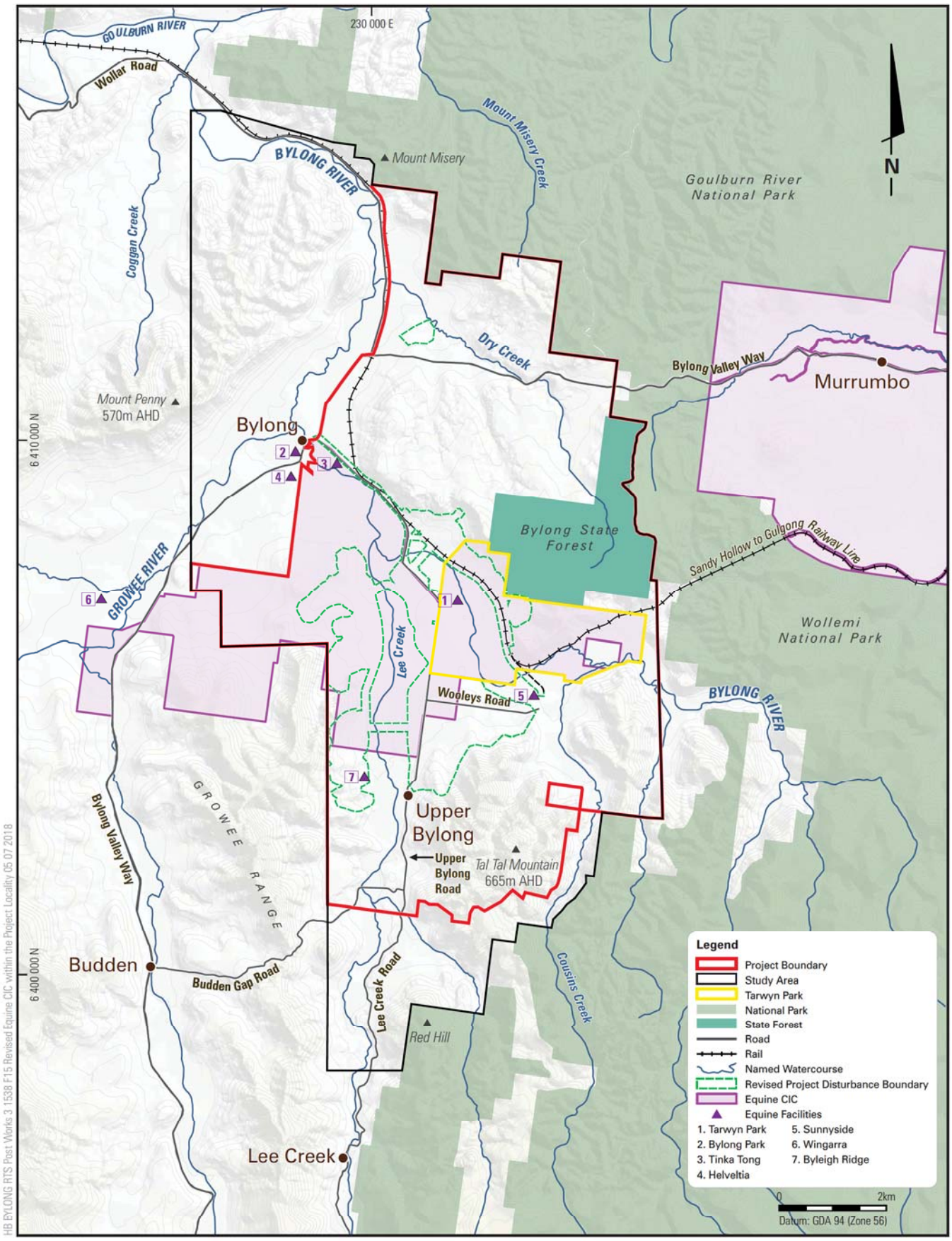
Agricultural Domains

**FIGURE 14**




HB BYLONG RTS Post Works 3 1538 F15 Revised Equine CIC within the Project Locality 05 07 2018

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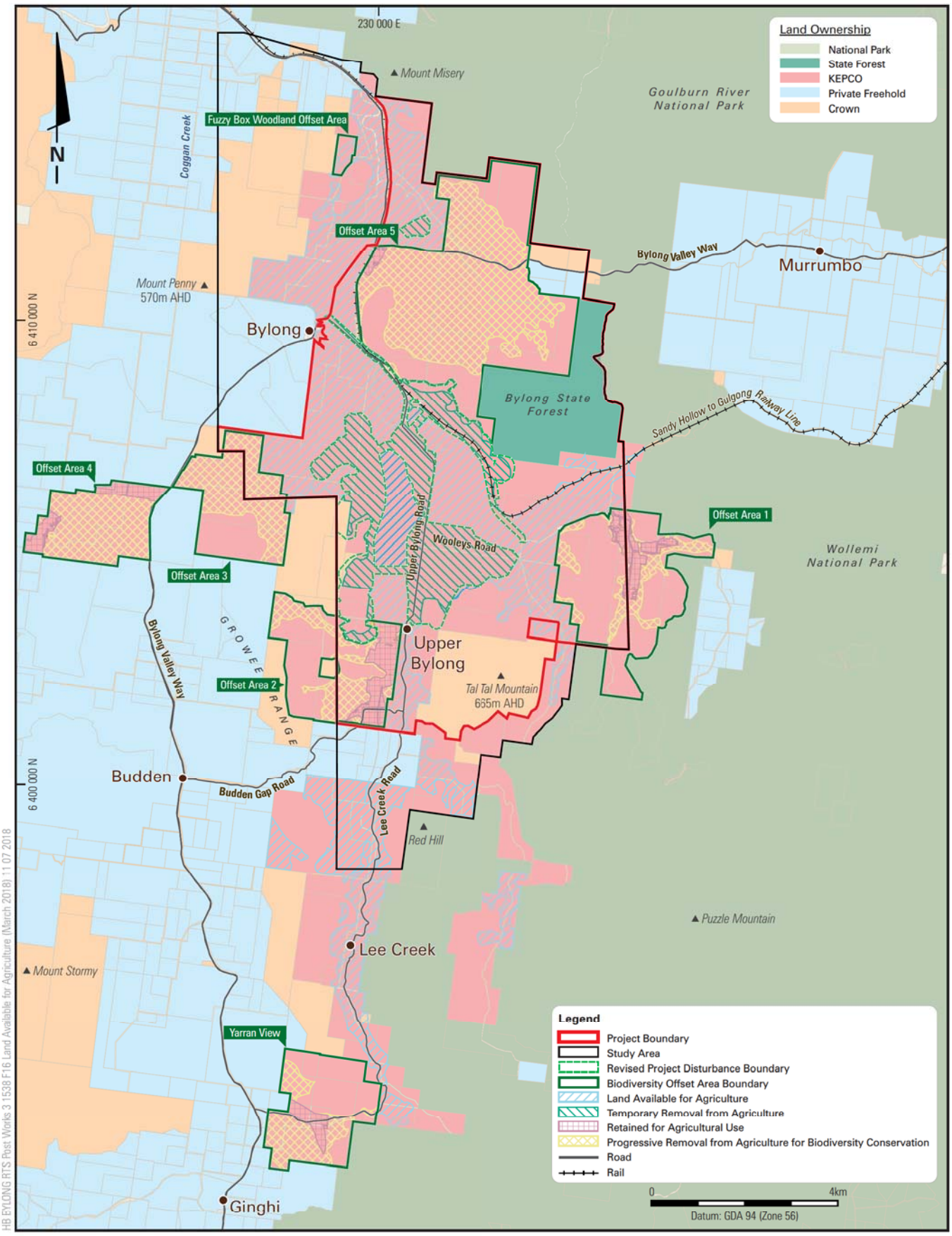
Equine CIC within the Project Locality

**FIGURE 15**

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Land Available for Agriculture (June 2018)

**FIGURE 16**

**Table 7**
**Land Available for Agriculture (June 2018)**

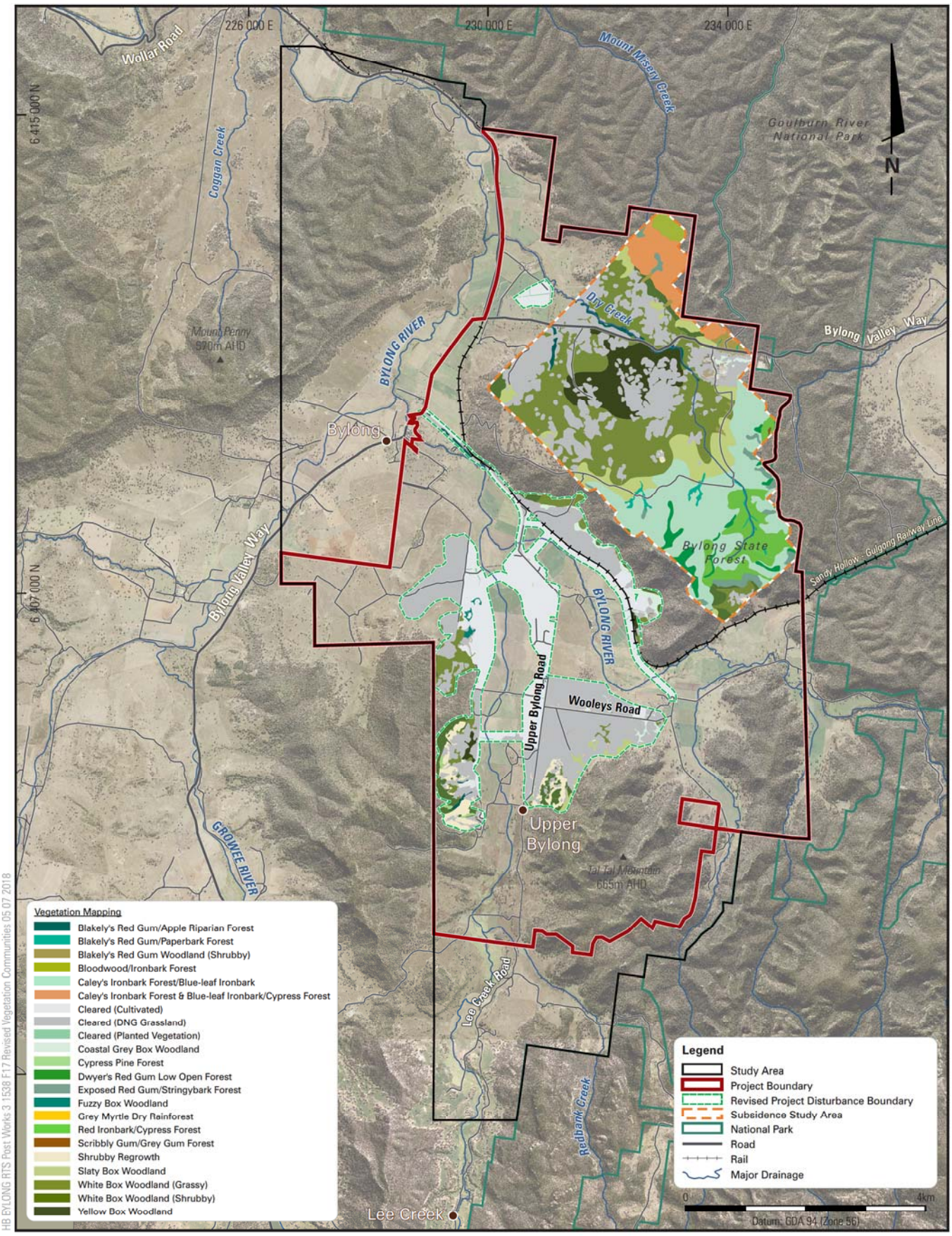
| Historic Heritage Sites | Project (ha) | Revised Project (ha) |
|---|---|---|
| Land Available for Agriculture | 3,166 | 3,258 |
| Temporary Removal from Agriculture | 974 | 882 |
| BOS – Retained for Agricultural Use | 295 | 295 |
| BOS – Progressive Removal from Agriculture for Biodiversity Conservation | 2,104 | 2,104 |
| KEPCO Land Suitable for Agriculture | 6,539 | 6,539 |
| KEPCO Land Not Suitable for Agriculture | 3,561 | 3,561 |
| KEPCO Landholdings | 10,100 | 10,100 |

### 3.9.2 Ecology

**Figure 17** and **Table 8** below illustrate the reduced disturbance to vegetation community for the Revised Mine Plan compared with that previously assessed for the Project.

The Revised Project Disturbance Boundary reduces disturbance to approximately 62.4 ha (or 8.3%) of native vegetation, which includes approximately 24.8 ha (10.7%) of woodland vegetation, which retains habitat suitable for a number for threatened bird and bat species known to occur within the area. The Revised Mine Plan results in approximately 4.4 ha (or 1.8%) of reduced disturbance to woodland and grassland vegetation conforming to White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland) vegetation community. Box Gum Woodland is listed as a Critically Endangered Ecological Community (CEEC) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and an Endangered Ecological Community (EEC) under the former *Threatened Species Conservation Act 1995* (TSC Act) (now repealed by *Biodiversity Conservation Act 2016*).

Despite these material reductions in impacts to biodiversity values as a result of the Revised Mine Plan, KEPCO does not propose any amendments to the BOS for the Project. Therefore, there will be a net reduction to the long term ecological impacts compared to those previously assessed within the EIS and associated approvals documents.

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Vegetation Communities

**FIGURE 17**

**Table 8**
**Revised Disturbance to Vegetation Communities**

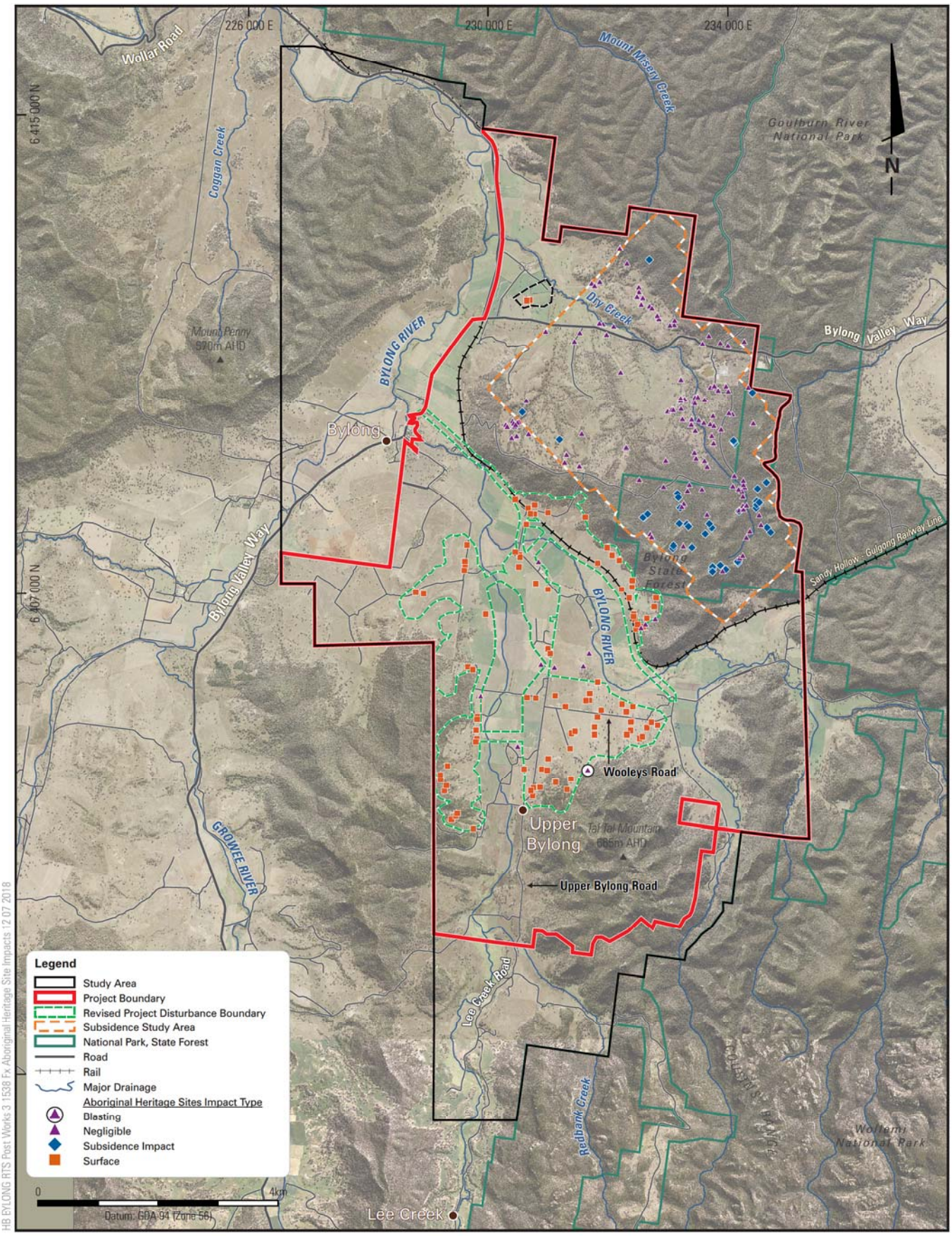
| Vegetation Community | Project Disturbance Boundary (ha) | Revised Project Disturbance Boundary (ha) | Reduced Disturbance (ha) |
|---|---|---|---|
| Slaty Box Woodland[1] | 13.0 | 12.6 | 0.4 |
| Yellow Box Woodland[3] | 8.3 | 8.3 | No change |
| White Box Woodland (Grassy)[3] | 57.3 | 54.9 | 2.4 |
| White Box Woodland (Shrubby) | 70.5 | 53.5 | 17.0 |
| Coastal Grey Box Woodland | 29.0 | 24.3 | 4.7 |
| Fuzzy Box Woodland | 4.8 | 4.5 | 0.3 |
| Blakely's Red Gum / Apple Riparian Forest | 5.9 | 5.9 | No change |
| Shrubby Regrowth | 39.7 | 39.7 | No change |
| Cypress Pine Forest | 3.7 | 3.7 | No change |
| River Oak / Redgum Riparian Woodland Derived Native Grassland[2] | 10.5 | 10.0 | 0.5 |
| Blakely's Redgum / Apple Riparian Forest Derived Native Grassland[3] | | | |
| Yellow Box Woodland Derived Native Grassland[3] | 14.5 | 14.5 | No change |
| White Box Woodland Derived Native Grassland[3] | 171.0 | 169.0 | 2.0 |
| Slaty Box Woodland Derived Native Grassland | 29.4 | 29.4 | No change |
| Coastal Grey Box Woodland Derived Native Grassland | 243.1 | 214.9 | 28.2 |
| Fuzzy Box Woodland Derived Native Grassland | 52.8 | 45.9 | 6.9 |
| Cultivated Lands | 385.7 | 336.1 | 49.6 |
| Other (cleared, planted vegetation) | 21.0 | 19.7 | 1.3 |
| **TOTAL** | **1,160** | **1,047** | **113.3** |
| **Total Native Vegetation** | **753** | **691.1** | **62.4** |
| **Total Woodland** | **232** | **207.1** | **24.8** |

*Notes: Discrepancies may be present in totals due to rounding*
*[1]Hunter Valley Footslopes Slaty Gum Woodland*
*[2]Hunter Floodplain Red Gum Woodland*
*[3]Box Gum Woodland and Derived Native Grassland*

### 3.9.3 Aboriginal Heritage

**Figure 18** illustrates the Aboriginal Heritage sites identified within the vicinity of the Project in relation to the Revised Project Disturbance Boundary. The Revised Mine Plan will avoid the direct disturbance of four archaeological sites located on the Tarwyn Park property, including three artefact scatters and one isolated find.

These revised impacts will be managed in accordance with the Aboriginal Heritage Management Plan to be developed for the Project.

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Aboriginal Heritage Sites Impacts

**FIGURE 18**

### 3.9.4 Social

The Revised Mine Plan will require a slightly smaller workforce during the years of open cut mining operations for the Project. The open cut mining workforce will also reduce by one year from that previously assessed within the EIS and associated documents. No changes to the underground mining workforce are required for the Revised Mine Plan.

The revised social impacts in relation to no longer proposing the use a Workforce Accommodation Facility to accommodate the construction workforce for the Project (as confirmed within the Response to PAC Review Report) has previously been assessed within the RTS.

### 3.9.5 Traffic and Transport

In addition to the reduced workforce requirements (see **Section 3.9.4**), there will also be reduced open cut mining operations and associated consumables to be delivered to the site. Accordingly, there will be marginally lower traffic movements compared with those assessed within in the EIS and associated approvals documents. Over the life of the Project, there will also be a slight decrease in rail usage as a result the reduced transport of approximately 2.5 Mt of product coal (equivalent of approximately 284 train movements over open cut mining phase). However, there will be no change in the peak of up to 10 return trips per day.

The Revised Project Disturbance Boundary borders the western side of the Tarwyn Park property boundary and accordingly includes this section of Upper Bylong Road (which is proposed to be formally closed). However, the soil stockpiles and the fuel storage facility will be constructed within this area (which previously formed part of the Eastern Open Cut) to minimise impacts to the existing formation of the Upper Bylong Road in this area. This section of Upper Bylong Road will be retained to maintain an internal access (via the Mine Infrastructure Area) to the Tarwyn Park Homestead and former Upper Bylong Catholic Church and Cemetery. As outlined within **Section 3.6.4**, at mine closure KEPCO will consult with MWRC to confirm whether the connection between Upper Bylong Road and Lee Creek Road is required at the time. If it is agreed that this is required, KEPCO will re-establish this connection.

It is important to note that the upgrades to the Wollar Road by MWRC (in accordance with Resources for Regions funding) is now well advanced and will be completed in time to support the Project.

As described within the Response to PAC Review Report, KEPCO has agreed to contribute $3,635,802 of funding to MWRC for road upgrades. This funding for the Project will facilitate the upgrade to sections of Wollar Road travelling through the Munghorn Gap Nature Reserve and some pertinent sections of the Bylong Valley Way, including an upgrade to the intersection between Bylong Valley Way and Wollar Road.

These contributions align with Condition 54 under Schedule 4 of the Recommended Development Consent for the Project. It is noted that a further $3 M of Resources for Regions funding to MWRC has been announced in June 2018 to further assist with the upgrades through the Munghorn Nature Reserve and other road related matters.

KEPCO has also held further discussions with the Muswellbrook Shire Council (MSC) in relation to increasing the previous offer of a one off payment from $40,000 to $267,700 (CPI indexed from 2016 to 2018), upon the commencement of the Project. This additional funding is proposed to assist in remediating high risk road safety issues which have previously been identified by MSC on the relevant section of Bylong Valley Way.

Despite the significantly less impacts on the road and rail network, KEPCO is not proposing any reduction in committed funding to road upgrades and maintenance contributions.

# 4 RESPONSE TO COMMENTS

*This section responds to any additional submissions received from regulatory authorities and other stakeholders following the Response to PAC Review Report. A response to each matter raised is provided below.*

## 4.1 NSW DEPARTMENT OF INDUSTRY

DoI provided comments on the Response to PAC Review Report within correspondence dated 12 February 2018. The comments have come from Crown Lands and Water (DoI-Water) in relation to water and from the Department of Primary Industries (DPI) in relation to agricultural resources and rehabilitation. The following sections respond to the comments raised in DoI's correspondence.

### 4.1.1 Water Management

***Alluvial Water Take***

> *DoI Water is satisfied that the maximum predicted loss of base flow in the Bylong River Water Source has been appropriately accounted for and can be licensed through existing entitlement. The proponent has also acknowledged that if water takes were to exceed their entitlements, contingency measures will need to be implemented including the purchasing of water allocations on the open water market, redundancy of the proponent's agricultural activities or the progressive reduction in the mining activities that consume water.*
>
> *As previously outlined and committed to by the proponent, the Water Management Plan should outline monitoring and ongoing assessment of the impact of alluvial aquifer depressurisation on base flow in the Bylong River, including appropriate monitoring of the ecological impacts and impacts on basic landholder rights and licensed extraction. It is noted that the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 makes provision for introduction of a cease to take by year 10 of the plan based on studies to determine appropriate groundwater levels and trigger points. Given that losses in base flow due to alluvial aquifer depressurisation cannot be switched off during low flow events, the impact of the reduced base flow during these low flows will need to be monitored and assessed. Any active extraction from the alluvial borefield would be subject to any cease to pump rules implemented within the Water Sharing Plan.*

Noted.

The groundwater modelling for the Revised Mine Plan and associated accounting for the predicted loss of baseflow has been prepared utilising a consistent methodology to that completed for the Supplementary RTS for the EIS Mine Plan.

As described within **Section 3.3.3**, it is important to note that the predicted baseflow losses are almost entirely located on land owned by KEPCO. Further, baseflow losses have marginally reduced as a result of the Revised Mine Plan.

Section 7.3.6 of the draft Water Management Plan which was prepared for the Response to PAC Review Report describes the proposed monitoring program to determine the effects of the Project on baseflows. Section 7.3.7 of the draft Water Management Plan refers to the monitoring of groundwater dependent ecosystems to be undertaken in accordance with the Biodiversity Management Plan to be prepared for the Project.

***Compensatory Water Supply***

> *The proponent has provided further information on the potential for the project to result in impacts on neighbouring private landholder bores and commitment to establish compensatory water supply agreements. Condition 27 of the Department of Planning and Environment's (DPE's) recommended conditions of consent requires that the proponent provide a compensatory water supply to the owner of any privately-owned land whose surface water and/or groundwater supply is adversely and directly impacted (other than a negligible impact) as a result of the development. DoI Water is satisfied that the proposed consent conditions, commitments by the proponent and further details to be outlined within the proposed Water Management Plan will ensure adequate compensatory measures for any impacts on private water users. The proponent has also stated that the Water Management Plan will outline a program to investigate potential alternative water supplies should these be required.*

Noted.

KEPCO has commenced discussions with surrounding landholders in relation to entering into a Compensatory Water Supply Agreement. Discussions with landholders are ongoing.

The draft Water Management Plan to be reviewed and updated prior to the commencement of the Project will outline a program to investigate alternative water supplies in the unlikely event that this be required.

***Permian Water Take***

> *The proponent currently holds a licence for 411 units and DoI Water received a valid application for a water licence for 2,093 units submitted under the Water Act 1912 (Water Act) to extract groundwater from the Permian strata for the Project from the Sydney Basin – North Coast Groundwater Source (North Coast groundwater source) under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016 (North Coast WSP).*

*Predicted maximum groundwater inflows are 4,099 ML in year 23 of the project. The application submitted for 2,093 units under the Water Act will be assessed and determined on its merits should the project proposal be approved by DPE. Should this application be approved, the proponent will need to obtain the remaining 1,596 shares from the water market to account for the predicted maximum take. If a licence for 2,093 shares is not issued upon project approval, the full 3,689 ML would need to be obtained from the market.*

*DoI Water notes that whilst the proponent has outlined that as at 1 July 2016, there were 3,453 ML/year of unassigned water allocation entitlements and that the water required for the project may therefore be available through a Controlled Allocation Order, the department's Strategy for the controlled allocation of groundwater (DoI Water, May 2017) outlines that the amount of water made available in any controlled allocation order is intended to keep total water requirements below 80 % of the appropriate extraction limit in any water source. Whilst water was made available in the North Coast Fractured and Porous Rock Groundwater Source in the 2017 Controlled Allocation Order, this did not include the Sydney Basin – North Coast Groundwater Source. Controlled Allocations for this water source may not be available in the future to account for the Permian water required for the project.*

KEPCO notes DoI-Water's comment that the water licence application lodged in December 2015 remains a 'valid' application and will be assessed on its merits should the Project be approved.

In light of the concerns raised within the PAC Review Report, KEPCO is also actively seeking water allocations within the Sydney Basin – North Coast Groundwater Source on the open market. KEPCO has engaged a Water Broker in this regard. As explained within **Section 3.3.3**, KEPCO remains confident that sufficient water licences will be secured to account for the predicted water takes for the underground mine.

### 4.1.2 Agricultural Resources and Rehabilitation

***Final Landform***

*A detailed erosion stability assessment, not just geotechnical studies, should be conducted to determine the erodibility of the OEA, particularly on any areas greater than 10 degrees. In relation to design of the final landform, DPI Agriculture does not endorse the use of the GeoFluv approach alone as empirical measurements from surrounding stable landforms in the area of interest is not an accurate measure compared to varying unconsolidated materials of the overburden. DPI recommends partnering the GeoFluv approach with sound erosion stability and landform assessment modelling such as SIBERIA or Water Erosion Prediction Project (WEPP).*

Noted.

The Conceptual Final Landform for the Project has previously been designed to minimise the areas where landform slope exceeds 10 degrees. The Macro-Relief example provided within this Report for the Revised Mine Plan has also been based on the need to minimise slopes of greater than 10 degrees (in line with the proposed agricultural final land uses).

The draft Rehabilitation Management Plan which was prepared for inclusion within the Response to PAC Review Report will be reviewed and updated prior to the commencement of mining operations. This will be undertaken in close consultation with DPI and other regulatory stakeholders. KEPCO will ensure that the revised Rehabilitation Management Plan includes specific strategies and methodologies to address the rehabilitation objectives currently specified within the Recommended Development Consent conditions, including "*final landforms maximise **geotechnical performance**, stability and hydrological function*".

***BSAL Rehabilitation***

> *Table 2 of the Rehabilitation Management Plan identifies restoration of 423.1 ha of BSAL, while section 4.4.3.1 (and other parts of the Plan) identifies reinstatement of only 319.5 ha of BSAL. Given previous commitments it is assumed that the 423.1 ha is to be rehabilitated to BSAL like conditions, however this should be confirmed.*
>
> *Water Holding Capacity measurements should be included as completion criteria in Table 16 Summary of BSAL and LSC Class 3 Completion Criteria, with measurements to be conducted pre and post rehabilitation.*

KEPCO is committed to reinstating or re-establishing BSAL which is directly disturbed as a result of the Project. As noted within the response to DPI in August 2016 (Appendix K of the Supplementary RTS), there was assessed to be 319.5 ha of BSAL to be directly and permanently disturbed and a further 103.6 ha to be directly and temporarily disturbed as a result of the Project (which totals 423.1 ha within the Project Disturbance Boundary).

The reinstatement of 319.5 ha refers to BSAL to be established on the mined landform as opposed to the 103.6 ha to be replaced in areas temporarily utilised for mine infrastructure.

As discussed in Section 3.5, KEPCO is committing to reinstate approximately 400.4 ha of BSAL on mine rehabilitation within the Revised Project Disturbance Boundary for the Revised Mine Plan. This equates to the total area of BSAL to be directly disturbed as a result of the Revised Mine Plan.

***Erosion Assessment***

> *Section 7.3.2.2 identifies that erosion data is to be collected from a 50m cross-section along the centre of each Landscape Function Analysis (LFA) transect conducted as part of the final landform monitoring procedure. It is recommended that aerial imagery is used to identify erosion as LFA transects alone often miss key erosion hazards.*

Noted.

***Research Trials***

> *Research trials are proposed to be undertaken over the life of the mine. DPI Agriculture recommends that these trials start at the onset of approval of the mine to ensure any outcomes from the research can be incorporated into rehabilitation planning for the life of the mine.*

Noted.

***Consultation***

> *As noted DPI Agriculture are to consulted with for all aspects relating to the reinstatement of land to be used as agriculture purposes post mining.*

Noted.

The Recommended Development Consent conditions specify that DPI is to be consulted over the preparation of the Rehabilitation Management Plan.

## 4.2 ENVIRONMENT PROTECTION AUTHORITY

The NSW EPA provided comment on the Response to PAC Review Report within correspondence dated 21 and 23 February 2018. This section has been prepared in response to EPA's comments for DPE's consideration.

### 4.2.1 Low Frequency Noise

KEPCO notes that the EPA has reaffirmed its acceptance of the assessment of low frequency noise utilising the modified DEFRA approach as reported within the DPE's Preliminary Assessment Report. EPA noted that the assessment found that the Project can comply with the low frequency noise criteria and that a low frequency noise modifying factor is not applicable.

As identified by the EPA, KEPCO supports the requirement that the noise monitoring program for the Project will need to entail the monitoring of compliance against this assessment finding. KEPCO further supports the fact that trigger action response plans will need to be developed for implementation in the event that a low frequency noise modifying factor is deemed necessary in the future. If it is identified that a low frequency noise modifying factor is applicable during the monitoring program, KEPCO will modify its mining operations to ensure that the noise generated from the operations continues to comply with the criteria specified within any Development Consent for the Project.

KEPCO is supportive of the *Noise Policy for Industry* (EPA, 2017) being utilised within any Development Consent conditions as the most contemporary noise policy which has effectively replaced the former *Industrial Noise Policy* (EPA, 2000).

### 4.2.2 Water

The EPA has commented that whilst a number of possible contingency measures have been described within the Response to PAC Review Report to manage mine water within the '*highly unlikely*' groundwater modelling scenarios, there is no firm commitment to act upon them.

As described within the Response to PAC Review Report, there is a considerable amount of time available (i.e. to Project Year 20) to confirm whether further contingency measures are required. In the '*highly unlikely*' event that further measures are required to manage the mine water onsite, this would be triggered as part of the Water Management Plan (that will contain the relevant trigger action response plans) which will be reviewed and updated throughout the life of the Project.

Section 5.6 of the current draft Water Management Plan (Appendix F of the Response to PAC Review Report) discusses the requirement to validate the site water balance. This regular site validation review of the water balance will assist in determining the likelihood of the '*highly unlikely*' scenarios ever occurring. Further to this, the trigger action response plan for mine water storage within the draft Water Management Plan provides another layer of assessment which would identify the need for additional contingency measures at the time. Given the extensive time available to further review and validate the water models for the Project with operational data, it is not reasonable to expect detailed contingency measures for these '*highly unlikely*' scenarios to be accurately determined and committed to at this time. However, there are numerous contemporary mechanisms described within the Response to PAC Review report that have been successfully demonstrated to be able to manage excess mine water, if indeed this is required in 20 years' time. Nevertheless, in the 'highly unlikely' event that there is surplus mine water to manage in PY 20, there will be further refined and new technologies available to add value to and maximise the use of this water.

The EPA has also suggested that DPE recommend a condition of consent which requires the Project to be a nil-discharge mine. Schedule 4, Condition 28 of the Recommended Development Consent condition currently states:

> "*The Applicant must not discharge any water from the site or irrigate any waste water onsite except as may be expressly provided by an EPL, or in accordance with Section 120 of the POEO Act.*"

This condition is considered appropriate for ensuring mine water is not discharged from the mine. The detailed water balance modelling undertaken over the Project and the draft Water Management Plan prepared will ensure this condition is complied with.

The EPA's support for the revised sediment basin design criteria within the Response to PAC Review Report is noted.

### 4.2.3 Air Quality- Diesel Emissions

The EPA has recommended the following Development Consent conditions in order for KEPCO to manage diesel emissions from the operations throughout the life of the Project.

1. "*The applicant must implement all reasonable and feasible best practice measures to prevent and/or minimise the emission of odour, blast fume, diesel exhaust, spontaneous combustion and dust emissions of the development.*
2. *Best practice non-road diesel emissions standards, unless otherwise approved in writing by the EPA.*

2.1 *The applicant must ensure that any item of non-road mobile diesel equipment commissioned into service and operating at the premises after 30 June 2020:*

- i. *Complies with the US EPA Tier 4 final or equivalent exhaust emission standard; or*
- ii. *Is otherwise approved, in writing, by the NSW EPA for use on the premises.*

Note 1 *For the purpose of condition 2.1 'commissioned into service' is defined as the act of using an item of non-road mobile diesel equipment for commercial or industrial activities for the first time in Australia.*

Note 2 *US EPA Tier 4 final is defined by USEPA (2016), Non-road Compression-Ignition Engines: Exhaust Emission Standards, EPA-420-B-16-022, March 2016, U.S. Environmental Protection Agency, Office of Transportation and Air Quality (6401A), 1200 Pennsylvania Avenue, NW, Washington, DC 20460, United States. https://www.epa.gov/emission-standards-reference-guide/nonroad-engines-and-vehicles-emission-standards Acceptable equivalent standards include EU stage V and any other international non-road emission standard with emission limits equal to or lower than the applicable US EPA Tier 4 standard.*

Note 3 *– For the purpose of this condition, non-road mobile diesel equipment means:*

- i. *Equipment fitted with a diesel (compression ignition) engine, that is either self-propelled or portable and transportable as indicated by the presence of wheels, skids, lifting handles/points, dolly, trailer or platform mounted; and*
- ii. *Which is primarily designed for off-road use; and*
- iii. *Is not an eligible vehicle under the NSW Road Transport (Vehicle Registration) Regulation 2007, but may be conditionally registered for the purpose of moving from one off-road work site to another; but does not include*
  - a. *Equipment primarily designed to be operated on public roads for the transportation of freight or passengers; and*
  - b. *Diesel locomotives.*
  - c. *Diesel generators.*"

KEPCO has previously responded to the EPA's comments in relation to the control of diesel emissions from the open cut operational fleet and made the following key points:

- The Project is located within a rural area with few nearby residential receivers;
- Air quality modelling (conservatively undertaken based on US EPA Tier 2 standards) has predicted that there would be no $PM_{2.5}$ impacts greater than the relevant criteria, even when considering background concentrations;
- The primary diesel emissions from the Project are likely to be from the equipment fleet required as part of the relatively short term eight year open cut mining operations (or seven years for the Revised Mine Plan);
- US EPA Tier 4 mining equipment was (in 2016) in short supply, with only industrial diesel engines in Australia conforming to this emission standard; and
- The relatively short term open cut operations are likely to be undertaken by contractors whom may utilise existing equipment available to them which meets the relevant NSW and Federal government regulatory requirements at the time.

During KEPCO's meeting with EPA representatives on 26 October 2017 in Bathurst, the air quality expert was understood to have been comfortable with KEPCO's approach to ensuring that any equipment either contracted or purchased to work at the mine site will comply with all contemporary NSW and Federal emissions standards at the time. It is understood that since this time, there has been a substantial uptake of the supply of US Tier 4 mining equipment within Australia and it is likely to be available, should KEPCO (or its mining contractor) decide to procure a new mining fleet for its open cut mining operations.

Point 1 of EPA's recommended condition of approval is appropriately addressed by Schedule 4, Condition 21 (a) of the Recommended Development Consent conditions which states:

> ***"Operating Conditions***
>
> *21. The Applicant must:*
>
> *(a) implement all reasonable and feasible measures to minimise the off-site odour, fume, diesel particulate, spontaneous combustion and dust emissions of the development;*"

This Recommended Development Consent condition also appropriately addresses point 2 in the EPA's recommended conditions of approval. In light of the time passed since EPA initially raised this matter and KEPCO's latest investigations confirming that US EPA Tier 4 mining equipment will be available for purchase within Australia at the time it may be required, KEPCO has gained confidence that Point 2.1 of the EPA's recommended conditions of approval will be achievable and as such supports it being added to any Development Consent granted over the Project.

### 4.3 HERITAGE COUNCIL OF NSW

In light of concerns over heritage issues enunciated within the PAC Review Report, DPE requested the Heritage Council's independent advice over the following matters:

- The heritage values of the Tarwyn Park Homestead complex;
- The significance of NSF practices deployed on the property by Peter Andrews;
- The overall scenic values of the Tarwyn Park property within the Bylong Valley confines including clarification over the National Trust NSW classification of the Bylong Valley Scenic Landscape; and
- The implications of KEPCO's proposed mitigation and management measures from a heritage and cultural landscape perspective.

The Heritage Council subsequently provided their response in correspondence dated 23 February 2018 which included some recommendations for the Project to minimise the impacts on the identified heritage values. This section has been prepared to respond to the recommended mitigation measures provided by the Heritage Council.

KEPCO has previously provided a detailed response from its heritage and landscape technical specialists (AECOM) over the external reports prepared on behalf of the Heritage Council by Hector Abrahams Architects Pty Ltd (HAA). While HAA's work was clearly utilised as the basis for the Heritage Council's advice to DPE, it has since been recognised that HAA's work contains some factual errors. Despite this, some observations raised within the HAA reports have been utilised to guide the revisions to the Project mine plan and/or relevant responses to the Heritage Council recommendations below.

### 4.3.1 Recommended Mitigation Measures

The Heritage Council provided the following recommendations:

1. *"In relation to the NSF values, the Council strongly urges measures to be introduced (should KEPCO's application be favourably considered) to mitigate loss of the research potential which is across a broader landscape than the physical constructions of NSF on Tarwyn Park and the 'readability' of NSF practices.*

2. *The Council has significant concerns, aligned to HAA's findings, that the proposed post-mining modified landscape will not adequately respect the current varied, complex and undulating character of the terrain. The Council is concerned that the proposed remediation will create a landscape that alters the existing reading of the valley system and is made up of landforms that are too uniform and symmetrical, the whole being too potentially altered to be able to 'read' the pre-disturbance condition. The Council urges DPE to further evaluate the proposed post-mining landscape form to better reproduce the current character of the terrain. This should include a more in-depth study of the patterns of the landscape so that measures are put in place to effectively respect the visual and functional aspects of the former landscape. This should also consider the current layering of European built elements such as roads, buildings, and rural structures in their current context.*"

Each of these is responded to within the following sections.

***Mitigate Impacts to NSF Practices***

As explained in Section 9.4.1 of the EIS and within the subsequent approvals documents, KEPCO is committed to avoiding open cut mining of land on the alluvial floodplain, which is known to be the primary focus for NSF techniques. Subsequently, the EIS and associated approvals documents proposed the Eastern and Western Open Cut mining areas within the more elevated land outside of the alluvial floodplain.

In recognition of the NSF land management techniques which have been conducted, Section 7.15.3 of the EIS commits to establish a trial area on rehabilitated land to investigate the benefits of soil hydrology techniques in the post mining landform.

Further, consistent with KEPCOs responses to comments received from stakeholders during the public exhibition period, Schedule 4, Condition 68 of the Recommended Development Consent conditions states:

> *"The Applicant shall use its best endeavours to maintain or enhance the soil hydrology farming techniques on the Tarwyn Park property and make reasonable access to the property available for external study by applicable scientific organisations (such as CSIRO, universities and government authorities) upon request."*

KEPCO supports and is well advanced in its planning to fully comply with this proposed development consent condition. It should be noted that since KEPCO acquired the property (in February 2014), a number of baseline assessments, monitoring and research projects have already been completed on the Tarwyn Park property to investigate the scientific values of this land use. This has included:

- *"Tarwyn Park" Agricultural Productivity Audit* (SLR, 2014), which was prepared following KEPCO's purchase of the property in February 2014 to document the baseline agricultural productivity of the property;
- *"Tarwyn Park" Agricultural Assessment and Land Management Plan* (SLR, 2016), which was prepared to complete a comparative analysis of the agricultural condition upon taking occupation of the property on 1 August 2016;
- *Comparative Agricultural Productivity Assessment of Properties Subject to Varying Land Management Techniques* (CAPA) (SLR, 2017) which was prepared for provision to the IPC (formerly the PAC) during its review process for the Project; and
- Various baseline monitoring, assessment and research projects completed in collaboration with the University of New England to assist in the understanding of any benefits of soil hydrology techniques and to assist with preliminary planning in relation to developing the trial on mine rehabilitation (as per the commitment within the EIS).

KEPCO's Response to PAC Review Report also committed to the investigation of using the Tarwyn Park Homestead and associated lands as the '*Tarwyn Park Collaborative Research and Education Centre*'. Since this time, KEPCO has held preliminary discussions with a number of universities and research institutions over this opportunity and is progressing positive discussions with at least one academic institution.

Whilst the previously committed mitigation measures mentioned above are considered to be appropriate, the contractions to the open cut mine plan requested by DPE (i.e. the Revised Mine Plan), if conditioned by DPE, will further avoid/mitigate any impacts to Tarwyn Park and NSF.

***Mitigate Potential Landscape Impacts***

As explained within **Section 3.7.3**, KEPCO's mine planning team specifically designed the open cut mine plan for the Project with specific consideration to minimising the potential visual and landscape impacts to sensitive publicly available viewing locations. The mine plans for the Project were strategically designed to be shielded from open public views by the intervening natural topography and wooded vegetation. In this regard, the majority of open views of the Project are from within the Upper Bylong Valley, which is predominantly owned by KEPCO (with some crown land) (refer to **Figure 10**).

Whilst the Conceptual Final Landform design will result in elevated landforms being extended to the north when compared to the natural landform, it is noted that the proposed landforms do generally follow the shape of the terrain which divides the Lee Creek floodplain from the Bylong River floodplain.

The photomontages from the new Upper Bylong Road view location (see **Appendix K**) demonstrate the visual and landscape effects of the EIS Conceptual Final Landform design compared to the Revised Conceptual Final Landform (Macro Relief) design. This new location represents an important view of the Upper Bylong Valley which is experienced when first entering the upper valley from the north. The EIS Conceptual Final Landform design when viewed from this location results in some landform modifications and the rehabilitated landform contrasts against the existing landscape. However, it does not significantly affect the reading of the valley system from this location. This finding is in contrast to the views from the Tarwyn Park Homestead and surrounds which are immediately adjacent to and looking across the Eastern OEA, which understandably (given its immediate proximity) removes some views towards distant landforms. It is these close up, localised views (on KEPCO owned land) that have influenced the Heritage Council's recommendations over the EIS Conceptual Final Landform design.

The Revised Conceptual Final Landform (Macro Relief) design associated with DPE's request provides some material improvements to the final landscape impacts when compared to the EIS landform from the Upper Bylong Road viewing location. These improvements generally relate to the reduced mining footprints, increased open woodland planting (to reduce contrasts against the upper wooded slopes) and retention of existing forested ridgelines which are seen from this location. The photomontages for the Tarwyn Park view locations illustrate a material improvement in landscape impacts for the Revised Conceptual Final Landform design when compared to the EIS Conceptual Final Landform design. This is primarily due to the OEA landform being moved off the Tarwyn Park property and further away from the viewing locations. The Revised Conceptual Final Landform design retains the existing views towards the Upper Lee Creek valley (including Bald Hill) and upper slopes of the Growee Ranges which have been identified by the Heritage Council (and its expert consultant) as an important view to retain for the Tarwyn Park Homestead.

The Heritage Council has considered the Conceptual Final Landform design to be too uniform and symmetrical in shape and recommended that the visual and functional aspects of the surrounding natural landform be incorporated into the final landform design.

The Conceptual Final Landform presented within the EIS and associated approvals documents is conceptual and has been developed based on standard mine planning design principles. This is typical of mine plan designs prepared at the environmental approvals stage of a mining project. Of course, the Conceptual Final Landform design is also supported by rehabilitation objectives which are to be specifically addressed when undertaking the detailed design of the final landform.

The RMP/MOP process provides the basis for detailed mine plan designs to be prepared in accordance with the rehabilitation objectives for the site. The rehabilitation objectives for the Project are outlined in Schedule 4, Condition 63 of the Recommended Development Consent conditions. Rehabilitation objectives which specifically relate to the Heritage Council concerns include:

- "*Final landforms designed to incorporate micro-relief and integrate with surrounding natural landforms*" and
- "*Minimise visual impact of final landforms as far as is reasonable and feasible*".

Accordingly, the final landform to be developed throughout the life of the Project will be generally consistent with the Conceptual Final Landform design, however will also be required to address the specific rehabilitation objectives. In this regard, the Heritage Council recommendations have already largely been addressed within the Recommended Development Consent conditions.

In order to provide further information for the Revised Mine Plan in light of the Heritage Council's comments, KEPCO's mine planning team has completed detailed landform design work to provide a final landform design which incorporates macro relief.

**Figure 9** illustrates the revised Conceptual Final Landform (Macro Relief) design as an indicative representation of the intended outcome of the final landform for the Revised Mine Plan. This is subject to refinement as part of the RMP/MOP process.

The reinstatement of the impacted heritage items on the post mining landform is addressed within **Section 3.6** and **Appendix J**. The re-establishment of the connection between Upper Bylong Road and Lee Creek Road at mine closure will be undertaken subject to consultation and agreement with MWRC over the need for this connection at the time. The heritage items to be affected by the Project are not proposed to be reinstated into the final landform at mine closure, which is consistent with sound conservation practice.

## 4.4 IEEFA SUBMISSION

DPE forwarded a submission prepared by the Institute for Energy Economics and Financial Analysis (IEEFA) on behalf of the BVPA to KEPCO on 18 June 2018. Gillespie Economics was commissioned by KEPCO to prepare a response to this submission. This is included within **Appendix M**.

A brief summary of this response is provided within the following sections which are structured according to the key matters raised within the IEEFA submission.

### 4.4.1 Global Coal Supply and Demand

The IEEFA makes a number of statements to infer that the global demand for coal fired electricity generation will considerably reduce and therefore the need for a new coal mining project is unjustified. This assertion is inconsistent with the current policy direction of both the Australian and Republic of Korea Governments.

The IEEFA submission selectively utilises information contained within the International Energy Agency's (IEA) World Energy Outlook report for 2017 (IEA, 2017) to support its assertions rather than providing a balanced summation of the information contained within this report. In this regard, it is important to recognise the IEA's function and objectives and thus the context surrounding the information which is presented in its World Energy Outlook report.

> *The International Energy Agency (IEA) is an autonomous agency established in November 1974. Its primary mandate is twofold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:*
>
> - *Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.*
> - ***Promote sustainable energy policies that spur economic growth and environmental protection in a global context – particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.***

- *Improve transparency of international markets through collection and analysis of energy data.*
- ***Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.***
- *Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.*

*Source IEA - Emphasis added*

The World Energy Outlook report considers world energy demand and supply under three policy settings:

1. Current Policy Scenario (CPS) that considers only those policies and measures enacted into legislation by mid-2017 i.e. those currently in place.
2. New Policy Scenario (NPS) that considers existing policies as well as announced policy intentions, including aspirational policies and targets. These are not enacted into legislation and may not be implemented.
3. Sustainable Development Scenario (SDS) that is a new scenario which examines what it would take to achieve the main energy-related components of the "*2030 Agenda for Sustainable Development*" adopted in 2015 by member states of the United Nations.

The World Energy Outlook does not provide a preference between scenarios but rather provides an analysis of demand for different energy sources under each policy setting scenario. Only the CPS represents the current state of play with the other scenarios subject to the vagaries of domestic and international politics. The SDS scenario has no basis in current or aspirational policy announcements of either the Australian or Republic of Korea Government or the IEA's other 27 member countries. The IEEFA submission makes statements based on the highly speculative SDS (and selectively the more speculative NPS) which are inconsistent with the key directions outlined within the World Energy Outlook report for the current state of play, namely:

- A forecast **increase** in the quantity of coal demanded in the world to 2040 under both the CPS and the more speculative NPS;
- A forecast **increase** in the quantity of thermal coal traded in the world to 2040 under the CPS, and a very slight decline under the more speculative NPS;
- A forecast **increase** in the quantity of coal demanded in the world to 2040 for power generation under both the CPS and NPS; and
- Coal remains the second largest source of energy demanded in 2040 under the CPS (behind oil), and the third largest source of energy demanded in 2040 under the NPS (behind oil and gas).

The Australian Chief Economist has identified 286 advanced technology coal fired power stations planned or under construction around the world. This demonstrates substantial investment in coal fired power technology which will be utilised for some time into the future.

The demand for a new export thermal export coal mine in NSW (the Bylong Coal Project) is demonstrated by KEPCO's willingness to spend in excess of $700 M to progress and obtain an approval to mine this NSW State owned coal resource.

KEPCO's parent company has provided a letter of continued support for the Project, which was included as Appendix C of the Response to PAC Review Report. KEPCO's parent company, being 51% owned by the Republic of Korea Government and being responsible for the generation of 80% of electricity utilised within South Korea is well placed to confirm the necessity for the Bylong Coal Project to the Republic of Korea.

### 4.4.2 Strategic Importance and New Energy Priorities

The IEEFA has questioned the strategic importance of the Project to South Korea given the supposed policy announcements of the Korean Government and the KEPCO CEO in relation to the new energy priorities, including the focus on renewable energy generation.

Coal will continue to be critical to the energy mix in South Korea. While some coal-fired power plants will be retired in coming years, other high efficiency low emissions technology clean coal-fired power stations are proposed to replace them.

The Republic of Korea Government has pledged to abandon nuclear power. While the Korean Government did try to boost solar and wind power generation, it is not yet able to provide a steady volume of affordable energy from renewable resources. According to the Republic of Korea Government plan (the 8th Basic Plan for Long-term Electricity Supply and Demand dated 29th December 2017), the total capacity of coal-fired power plants will grow from 36.8 Gigawatts (GW) in 2017 to 39.9GW in 2030. South Korea and KEPCO (which is 51% Government owned and is currently responsible for supplying 80% of power to the people of South Korea) see strategic advantages in being able to control its own supply of coal i.e. to increase the vertical integration of KEPCO.

KEPCO has also recognised the coal to be produced from the Project will have a low sulphur content (i.e. less than 0.4% on average over the life of the Project) that meets South Korea's new regulations for coal utilised in electricity generation. Even under a highly conservative NPS, South Korea's demand for coal in 2040 will be over 10 times the average annual production from the Project.

Accordingly, the Republic of Korea Government and KEPCO continue to support the need (and strategic importance) of the Project to the people of South Korea.

### 4.4.3 Coal Price Forecasts and Coal Quality

The IEEFA raised concerns that the coal prices used within the Economic Impact Assessment were out of date and do not reflect the coal quality to be recovered from the Project.

The Economic Impact Assessment over the Project was prepared in 2015 for inclusion within the EIS. The coal price forecasts were based on a detailed Wood Mackenzie marketing study which specifically considered the coal quality from the Project.

It should be noted that the current coal price is substantially higher than the coal price forecast by Wood Mackenzie in its marketing study for the Project. A sensitivity analysis of the CBA of +/- 20% of AUD coal price was included within the EIS with the RTS providing additional sensitivity analysis of +/-30% AUD coal price. This demonstrated that the Project would continue to provide considerable economic benefits even under a 30% decline in the coal price.

The Economic Impact Assessment has been independently Peer Reviewed which confirmed that the implied coal price used in the CBA is reasonable. This was further supported by the additional sensitivity analysis completed as part of the RTS.

Whilst it is recognised that coal price forecasts will vary month to month and year to year, whatever the coal price is during the operation of the Project, it is clear that the royalties to be paid to the NSW Government as a result of recovering the coal resource will be in the hundreds of millions of dollars (present value) in addition to the several billion dollars of economic stimulus to the Mid-Western Region and even more to NSW as a whole, as forecast by the CGE Modelling undertaken as requested by the IPC (formerly PAC) over the Project. This significant benefit to NSW, along with the various other benefits from the Project will continue to substantially outweigh any residual economic costs of the Project.

### 4.4.4 Corporate Tax Benefits

The IEEFA has commented that there are significant doubts over the corporate tax benefits of the Project as it considers that there will inevitably be a high level of Project and corporate debt used to fund the Project.

The Economic Impact Assessment actually significantly understated company tax benefits to NSW at approximately $21 M (present value) as it used a company tax rate of 28.5%, which was a proposed Australian Government policy at this time and attributed only 7% of this to NSW. The NSW Government (2015) *Guidelines for Economic Assessment of Mining and Coal Seam Gas Proposals* which was released shortly after the finalisation of the Economic Impact Assessment for the Project provided a revised approach for apportioning company tax to NSW. Accordingly, the RTS reassessed the company tax benefits of the Project to NSW (based on the new guidelines) were projected at $102 M (present value).

The Project is 100% owned by KEPCO, which is 51% owned by the Republic of Korea Government, and which has the capacity to fully fund the Project. However, in response to the IEEFA concerns, a hypothetical analysis of company tax has been undertaken utilising the maximum allowable debt financing to 60% in accordance with the thin capitalisation rules in Australian tax law.

The revised estimate of company tax benefits of the Project accruing to NSW (i.e. $102 M), would reduce to approximately $68 M under this maximum debt funding scenario. Lower levels of debt financing would increase the level of tax benefits from the Project to NSW. This company tax forecast continues to be considerably higher than the $21M estimated within the EIS.

It is also noted that since the Project Economic Impact Assessment was undertaken, mining costs across the industry, and particularly in Australia, have reduced. By way of example only, a 15% reduction in costs since 2015 would completely offset the predicted company tax reductions from the maximum allowable debt funding scenario.

# 5 ADDITIONAL MANAGEMENT AND MONITORING SUMMARY

**Appendix N** provides a consolidated summary of the additional environmental management and monitoring measures proposed, in the event that Development Consent is granted for the Revised Mine Plan for the Project.

# 6 CONCLUSION

This document definitively responds to DPE's request for information over a mine plan which steps open cut mining areas off the Tarwyn Park property (the Revised Mine Plan). DPE has suggested this revision to the EIS Mine Plan to further avoid and minimise the potential impacts to the heritage values of Tarwyn Park and the surrounding landscape. This report also provides responses to issues raised by other regulatory bodies and a submission received by DPE from the BVPA. This document comprehensively considers all of the additional matters raised and addresses each with certainty.

KEPCO is concerned over the lateness of DPE's request to revise the EIS Mine Plan and the implications this may have on the timing of the approvals process. KEPCO is also not convinced that further revisions to the EIS Mine Plan are required given that detailed information has previously been provided to respond to the PAC's (now IPC's) concerns over the potential impacts to items of heritage value as part of the *Response to PAC Review Report*. Further, the Heritage Councils' comments have been based on an independent technical report which contains material errors and does not consider the comprehensive conservation management regime addressed within DPE's earlier Recommended Development Consent conditions. Notwithstanding the above, KEPCO has prepared this report on the basis that DPE intends to include these revisions to the open cut mine plan in any recommended conditions of consent for the Project.

In careful consideration of DPE's request, the Revised Mine Plan would entail the following changes when compared to the EIS Mine Plan:

- Reduced Eastern open cut mining area and associated OEA to remain on land outside of the Tarwyn Park property;
- Reduced Western open cut mining area and associated OEA to minimise visual impact to views of parts of the Upper Bylong Valley from the Tarwyn Park Homestead; and
- Revisions to the conceptual final landform design to assist in it better blending into the surrounding natural topography so as to further minimise the perceived visual impacts on the wider BLCA.

The Revised Mine Plan will leave behind approximately 4.6 Mt (or approximately 14%) of ROM coal which is recoverable by open cut mining methods under the EIS Mine Plan. The Revised Mine Plan will also result in open cut mining operations being shortened by approximately one year when compared to the EIS Mine Plan. The life of the Project for the Revised Mine Plan will remain at 25 years, with no changes to the timing of the underground mine.

KEPCO has commissioned various technical specialist reviews of environmental impacts associated with the Revised Mine Plan to respond with certainty to DPE's list of requested information. As envisaged, these reviews have definitively confirmed that the environmental impacts as a result of the Revised Mine Plan will be generally equal to or less than those previously assessed for the EIS Mine Plan.

The Revised Mine Plan has been developed at DPE's request primarily to further avoid and minimise any potential impacts on the heritage values of Tarwyn Park and the surrounding landscape. Accordingly, the Revised Mine Plan further avoids direct impacts to land which may have been used for NSF practices and the horse burials at the Tarwyn Park entry. It also avoids impacts to the former Upper Bylong Catholic Church and Cemetery, which is visible from the Tarwyn Park Homestead.

The Revised Mine Plan will minimise the indirect impacts (blasting and visual) to the Tarwyn Park Homestead and Stables. Blasting activities will be more than 1.4 km from the Homestead and Stables for the Revised Mine Plan and will be managed below the relevant blast criteria. The OEA associated with the Eastern Open Cut will also be located further to the south of and more distant from the assessed viewing locations at the Tarwyn Park Homestead and Stables, retaining views towards the upper Lee Creek valley. The Heritage Council has advised DPE that these views from KEPCO land are important to facilitate the reading of the valley system.

KEPCO's mine planning team has completed further mine planning work to develop a revised Conceptual Final Landform design which incorporates landform design features from the surrounding natural topography to assist in minimising the visual impacts and blend the final landform with the surrounding natural topography. Further, photomontages and cross sections have been prepared for the Revised Mine Plan to illustrate the Conceptual Final Landform design.

It should be highlighted that KEPCO now owns and manages the majority of land within the Upper Bylong Valley from which the majority of the proposed open cut mining activities from the Project will be openly visible. The Revised Mine Plan results in reduced open cut mining footprints and will subsequently result in reduced visual impacts when compared to the EIS Mine Plan. Available views of the Revised Mine Plan from publicly available locations will be limited and all but indiscernible.

The Revised Mine Plan results in a reduced $13 M (present value) net production benefits when compared to the EIS Mine Plan. This reduced net benefit is predominantly the result of less NSW government royalties from not mining the 4.6 Mt of open cut mineable ROM coal which was to be recovered by the EIS Mine Plan. Whilst there are reduced environmental social and cultural impacts from the Revised Mine Plan, their economic values are immaterial from an aggregate CBA perspective.

Notwithstanding the above, the Revised Mine Plan for the Project continues to be desirable and justified from an economic efficiency perspective and accordingly remains within the public interest.

Despite the reduced recovery of ROM coal for the Revised Mine Plan, the Project will continue to provide significant economic activity to the regional economy, as well as more broadly across NSW. The CGE analysis estimates the Revised Mine Plan will still increase gross regional income to the regional economy by around $4.9 B (present value) and between $6.4 B and $6.8 B (present value) to the NSW economy.

In conclusion, this report has been prepared to provide the information required by DPE on a Revised Mine Plan. The Revised Mine Plan results in a further reduction in the recovery of the State's coal resources which are known to exist within the Authorisations held by KEPCO. The Revised Mine Plan will generally result in reduced environmental, social and cultural impacts when compared to the EIS Mine Plan. However, it is important that the reduced environmental, social and cultural impacts of the Revised Mine Plan (which have previously been assessed and a comprehensive mitigation and management regime developed) are carefully weighed against the 4.6 Mt of ROM coal recoverable by adopting the EIS Mine Plan.

* * *

for
**HANSEN BAILEY**

Nathan Cooper
*Principal*

James Bailey
*Director*

# 7 ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| % | Percentage |
| AECOM | AECOM Australia Pty Limited |
| AGE | Australasian Groundwater and Environmental Consultants Pty Ltd |
| AQGHGIA | Air Quality Greenhouse Gas Impact Assessment |
| AUD | Australian Dollar |
| BLCA | Bylong Landscape Conservation Area |
| BOS | Biodiversity Offset Strategy |
| BSAL | Biophysical Strategic Agricultural Land |
| BVPA | Bylong Valley Protection Alliance |
| CBA | Cost Benefit Analysis |
| CEEC | Critically Endangered Ecological Community |
| CGE | Computable General Equilibrium |
| CHPP | Coal Handling and Preparation Plant |
| CIC | Critical Industry Cluster |
| $CO_2$-e | Carbon Dioxide Equivalent |
| CPS | Current Policy Scenario |
| dB | Decibels |
| dBA | The peak sound pressure level, expressed as decibels (dB) and scaled on the 'A-weighted' scale, which attempts to closely approximate the frequency response of the human ear |
| DoI | Department of Industry |
| DoI-Water | Department of Industry - Crown Lands and Water Division |
| DPE | Department of Planning and Environment |
| DPI | Department of Primary Industries |
| EEC | Endangered Ecological Community |
| EIS | Environmental Impact Statement |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EPA | Environment Protection Authority |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)* |
| ERM | Environmental Resource Management Pty Ltd |
| FTE | Full Time Equivalent |
| GW | Gigawatts |
| Ha | Hectare |
| Hansen Bailey | Hansen Bailey Environmental Consultants |
| Heritage Council | The Heritage Council of NSW |
| HHMP | Historic Heritage Management Plan |
| HHVIA | Historic Heritage and Visual Impact Assessment |

| Abbreviation | Description |
|---|---|
| Hunter Unregulated WSP | *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* |
| IEA | International Energy Agency |
| IEEFA | Institute for Energy Economics and Financial Analysis |
| IO | Input-Output |
| IPC | Independent Planning Commission (formerly Planning Assessment Commission (PAC)) |
| KEPCO | KEPCO Bylong Australia Pty Limited |
| km | Kilometres |
| LGA | Local Government Area |
| LSC | Land and Soil Capability |
| m | Metres |
| M | Million |
| Mbcm | Million bank cubic metres |
| Mcm | Million cubic metres |
| MIA | Mine Infrastructure Area |
| ML | Megalitres |
| ML/Year | Megalitres per year |
| Mlcm | Million loose cubic metres |
| MOP | Mining Operations Plan |
| MSC | Muswellbrook Shire Council |
| Mt | Million Tonnes |
| Mtpa | Million tonnes per annum |
| MWRC | Mid-Western Regional Council |
| NBIA | Noise and Blasting Impact Assessment |
| North Coast Groundwater Source | *Sydney Basin - North Coast Groundwater Source* under the North Coast WSP |
| North Coast WSP | *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Source 2017* |
| NPS | New Policy Scenario |
| NSF | Natural Sequence Farming |
| NSW | New South Wales |
| OEA | Overburden Emplacement Area |
| OPSIM | Operational Simulation Model |
| PAC | Planning Assessment Commission (now known as the IPC) |
| PAC Review Report | Planning Assessment Commission Review Report (July 2017) |
| $PM_{2.5}$ | Particulate matter with a diameter less than 2.5 µm |

| Abbreviation | Description |
|---|---|
| $PM_{10}$ | Particulate matter with a diameter less than 10 µm |
| PSNL | Project Specific Noise Level |
| PY | Project Years |
| RMP | Rehabilitation Management Plan |
| ROM | Run of Mine |
| RTS | Response to Submissions (Hansen Bailey, 2016a) |
| SDS | Sustainable Development Scenario |
| SLR | SLR Consulting |
| SSD | State Significant Development |
| Supplementary RTS | Supplementary Response to Submissions (Hansen Bailey, 2016b) |
| the Project | Bylong Coal Project |
| TSC Act | *Threatened Species Conservation Act 1995* (repealed by *Biodiversity Conservation Act 2016*) |
| TSP | Total Suspended Particulates |
| VIA | Visual Impact Assessment |
| WAF | Workforce Accommodation Facility |
| WAL | Water Access License |
| WRM | WRM Water and Environment |

# 8 REFERENCES


- Australasian Groundwater and Environmental Consultants Pty Ltd (2015). *Bylong Coal Project Groundwater Impact Assessment.*
- Australasian Groundwater and Environmental Consultants Pty Ltd (2016b). *Bylong Coal Project – Response to Submissions.*
- Australasian Groundwater and Environmental Consultants Pty Ltd (2018). *Bylong Coal Project-Supplementary Information.*
- Hansen Bailey (2015). *Bylong Coal Project Environmental Impact Statement.*
- Hansen Bailey (2016a). *Bylong Coal Project Response to Submissions.*
- Hansen Bailey (2016b). *Bylong Coal Project Supplementary Response to Submissions.*
- Hansen Bailey (2018). *Bylong Coal Project Response to PAC Review Report*
- International Energy Agency (2017). *World Energy Outlook for 2017*.
- NSW Environment Protection Authority (2017). *Noise Policy for Industry.*
- NSW Government (2015) *Guidelines for Economic Assessment of Mining and Coal Seam Gas Proposals*.
- Pacific Environment Limited (2015). *Bylong Coal Project Noise and Blasting Impact Assessment.*
- SLR (2014). *"Tarwyn Park" Agricultural Productivity Audit*.
- SLR (2016). "Tarwyn Park" Agricultural Assessment and Land Management Plan.
- SLR (2017). *Comparative Agricultural Productivity Assessment of Properties Subject to Varying Land Management Techniques (CAPA).*

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