

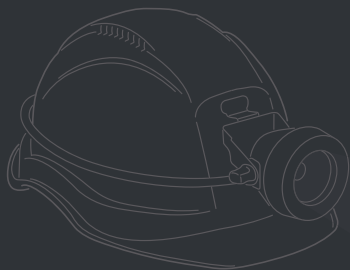
# Wallarrah 2 Coal Project

## Environmental Impact Statement

April 2013

### Appendix Z

Forestry Impact Assessment





CLIENTS | PEOPLE | PERFORMANCE

**Hansen Bailey Pty Ltd**  
Report for Wallarah 2 Coal Project  
Forestry Assessment  
August 2012



INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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- the estimation of the commercial value of current standing timber in this Forest Assessment only applies to that part of Wyong State Forest (3.2 ha) affected by the Western Ventilation Mine Shaft and ancillary works.*

*The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited to):*

- assumptions based on information provided by Hansen Bailey Pty Ltd (Appendix A), and other specialist reports associated with the Wallarah 2 Coal Project Environmental Assessment (EIS), specifically those associated with mine subsidence impacts*
- assumptions in relation to forest product yields, royalties and costs as described in Section 5.*

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# 1. Introduction

The Wyong Areas Coal Joint Venture (WACJV) is seeking Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Wallarah 2 Coal Project (the Project). This Forestry Impact Assessment forms part of the Environmental Impact Statement prepared in accordance with the Director-General's Environmental Assessment Requirements (DGRs) for the Project.

Key features of the Project include:

- The construction and operation of an underground mining operation extracting up to 5.0 Mtpa of export quality thermal coal by longwall methods at a depth of between 350 metres and 690 metres below the surface within the underground Extraction Area;
- Mining and related activities would occur 24 hours a day 7 days a week for a Project period of 28 years;
- Tooheys Road Site surface facilities on company owned and third party land (potentially leasehold land) between the Motorway Link Road and the F3 Freeway which would include (at least) a rail loop and spur, stockpiles, water and gas management facilities, workshop and offices;
- Buttonderry Site Surface Facilities on company owned land at Hue Hue Road between Sparks Road and the Wyong Shire Council's (WSC) Buttonderry Waste Management Facility. This facility would include (at least) the main personnel access to the mine, main ventilation facilities, offices and employee amenities;
- An inclined tunnel (or "drift") constructed from the coal seam beneath the Buttonderry Site to the surface at the Tooheys Road Site;
- Construction and use of various mining related infrastructure including water management structures, water treatment plant (reverse osmosis or similar), generator, second air intake ventilation shaft, boreholes, communications, water discharge point, powerlines, and connection to the WSC (after July 2013, the Central Coast Water Corporation) town water and sewerage systems;
- Capture of methane for treatment initially involving flaring as practicable for greenhouse emission management and ultimately for beneficial use of methane such as electricity generation at the Tooheys Road Site;
- Transport of coal by rail to either the Newcastle port for export or to domestic power stations;
- A workforce of approximately 300 full-time company employees (plus additional 30 full time contractors); and
- Rehabilitation and closure of the site at cessation of mining operations.

The Project Boundary lies partly beneath the Wyong State Forest (NSW State Forest No. 281) and surrounding ranges (including the Jilliby State Conservation Area (SCA)) and a section of the Dooralong Valley and the Hue Hue area.

## 2. Scope of Work & Methodology

GHD Pty Ltd (GHD) has been engaged by Hansen Bailey Pty Ltd (Hansen Bailey) to undertake a forestry impact assessment of part of the Wyong State Forest in NSW (State Forest No. 281). The assessment will be included in the Wallarah 2 Coal Project EIS to be used in support of an application for Development Consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the construction and operation of an underground coal mining operation.

The Director-General's Requirements for the Project require "*an assessment of potential impacts on forestry resources and forestry activities and consideration of appropriate compensation in relation to forestry production*".

GHD understands that this forestry assessment may be used in consideration of the financial and other impacts of the proposed Project on the commercial public forest resource, and that it may also be used to inform any considerations associated with financial compensation in relation to impacts on forest production within the Wyong State Forest. No assessment of privately owned native forest resources potentially impacted upon by the Project has been undertaken.

Table 1 describes the Director-General's Requirements specifically related to the potential impacts of the development on the publicly owned forest resources managed by Forests NSW.

**Table 1 Director-General's Requirements – Forestry related**

Issue	Where addressed in this document
<b>Subsidence</b> - a detailed quantitative and qualitative assessment of the potential conventional and non-conventional subsidence impacts of the development, including identification of natural and built features within the area that could be affected by subsidence.	Section 4.1
<b>Land resources</b> - including a detailed assessment of the potential impacts on land use including forestry, with particular reference to Wyong State Forest – including impacts on forestry resources and forestry activities and consideration of appropriate compensation in relation to forestry production.	Section 4.2 & 4.3 Section 5
<b>Consultation</b> – during the preparation of the EIS you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners including NSW Forestry.	Section 6

As detailed within Section 4 of this report, subsidence impacts and other potential general impacts on forestry resources and forestry activities have been excluded from GHD's scope of work and have not been subject to detailed investigation.

GHD has been specifically requested to assess the current 'highest possible' commercial value of the forestry resource within the 3.2 hectares of the Wyong State Forest which is proposed to be impacted upon by the Western Ventilation Shaft and ancillary works on Brothers Road.

In terms of this assessment 'commercial value' is understood to be associated with timber value (rather than other potential forest products). GHD has interpreted the term 'highest possible' to imply a significant variation in value above the forest average, and in consultation with Hansen Bailey has agreed that a variation of more than 100% of the forest average is unlikely. Consequently this has been used as the meaning of 'highest possible' and is considered a conservative approach.

This report does not attempt to quantify any other impacts associated with the proposed development on any other part of the Wyong State Forest, or on any privately owned native forest which may be affected by the development.

## 2.1 Methodology

Due to the small area (3.2 hectares) predicted to be impacted, at the request of Hansen Bailey, GHD has not undertaken a site visit to independently assess or verify the values presented in this report. GHD's calculations are based on information provided by Forests NSW and a variety of other sources.

The 'highest possible value' estimate for the site has been determined using the following approach:

- ▶ Conducting initial enquiries with Forests NSW personnel to confirm that the forest in the vicinity of the Western Ventilation Shaft is currently zoned as commercial forest and available for harvest;
- ▶ Conducting enquiries with Forests NSW personnel in relation to forest management planning, harvesting activities, local and regional markets for forest products, tree species present, expected product yields, volumes and commercial values;
- ▶ A review of available and relevant Forests NSW Forest Management documentation;
- ▶ Literature reviews and discussions with third parties to verify information provided by Forests NSW;
- ▶ Estimation of the available commercial forest resource within the proposed Western Ventilation Shaft area based on the above information, site physical constraints and a series of assumptions subsequently detailed; and
- ▶ Estimation of the 'highest possible value' of the *current* standing forest resource based upon information received from Forests NSW. The estimation of financial value is based on 'average' values provided by Forests NSW and then increased by a factor of 100% to account for any site specific factors which might make the forest stand more valuable than the 'average' forest stand in Wyong State Forest, and any variability that will occur around an average.

## 2.2 Limitations & Assumptions

- ▶ GHD did not undertake a site visit to independently assess the standing forest resource or to verify the 'average' forest attributes and forest product market values provided by Forests NSW.
- ▶ Predicted impacts associated with subsidence within the forest are provided in Appendix A (MSEC, 2012). It has been assumed that any subsidence associated with underground mining will not significantly impact upon the wider forest resource or the ability of Forests NSW to undertake routine and planned commercial forest operations.

- ▶ No assessment of potential impacts on public or private forest resources outside of the Wyong State Forest has been made.
- ▶ GHD has relied upon the work of other parties (refer sections 3.3 and 4.1) associated with the production of the Environmental Assessment. This includes the assessment of the potential ecological, vegetation community and hydrological impacts associated with mining induced subsidence, and the classification of vegetation and forest types which occur within the Project Boundary. These matters were not within the scope of works for this forestry impact assessment.

## 3. Description of the Project Area

### 3.1 Location

The Project is located approximately 4.7 kilometres north-west of central Wyong and approximately 45 kilometres south-west of Newcastle within the Wyong Local Government Area (LGA). The Project boundary includes lands currently contained within the Wyong State Forest and Jilliby SCA, as well as privately owned land primarily to the east of these areas.

The area of Wyong State Forest included within the Project Boundary is presented in Figure 1.

#### 3.1.1 Proposed Western Ventilation Shaft site

The proposed Western Ventilation Shaft is to be located along Brothers Road, approximately 300 metres south of Little Jilliby Road. The site locality can be seen in Figure 2, and is illustrated in further detail in Figure 3. The Western Ventilation Shaft straddles the current alignment of Brothers Road and when developed will include a series of hardstand and paved areas as well as water storages.

The site for the Western Ventilation Shaft and ancillary works is situated approximately 45 metres above sea level (ASL).

### 3.2 Wyong State Forest (State Forest No. 281)

Wyong State Forest is located within the Lower North East Forest Management region and is included within the Lower North East Regional Forest Agreement (RFA) Region for North East NSW.

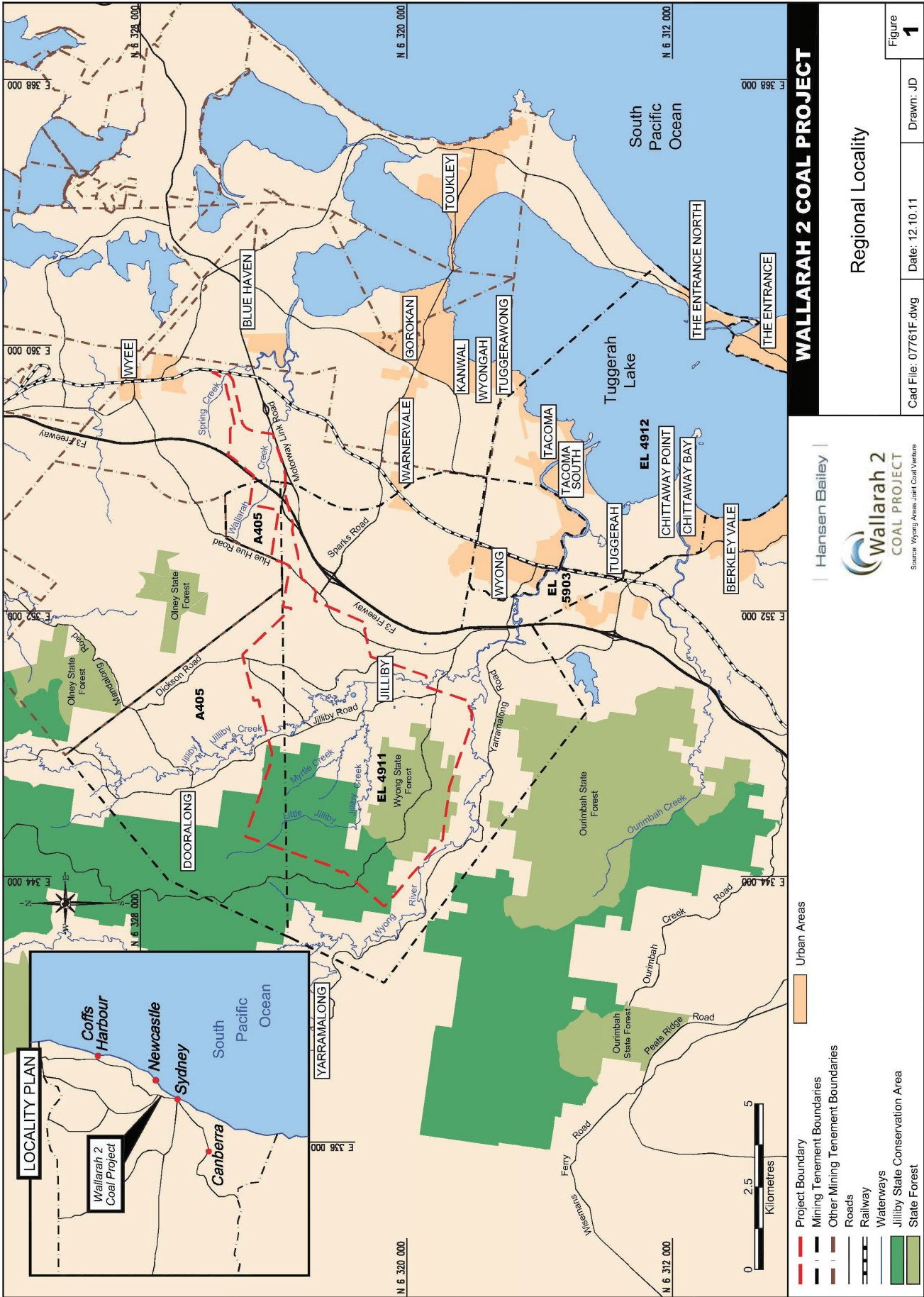
The forest is managed under the principles of Ecologically Sustainable Forest Management (ESFM) and the five-yearly ESFM Plans developed by Forests NSW set out broad strategies, performance indicators and measurable outcomes for forest management in the region (Forests NSW, 2008).

#### 3.2.1 Forest Management Zones

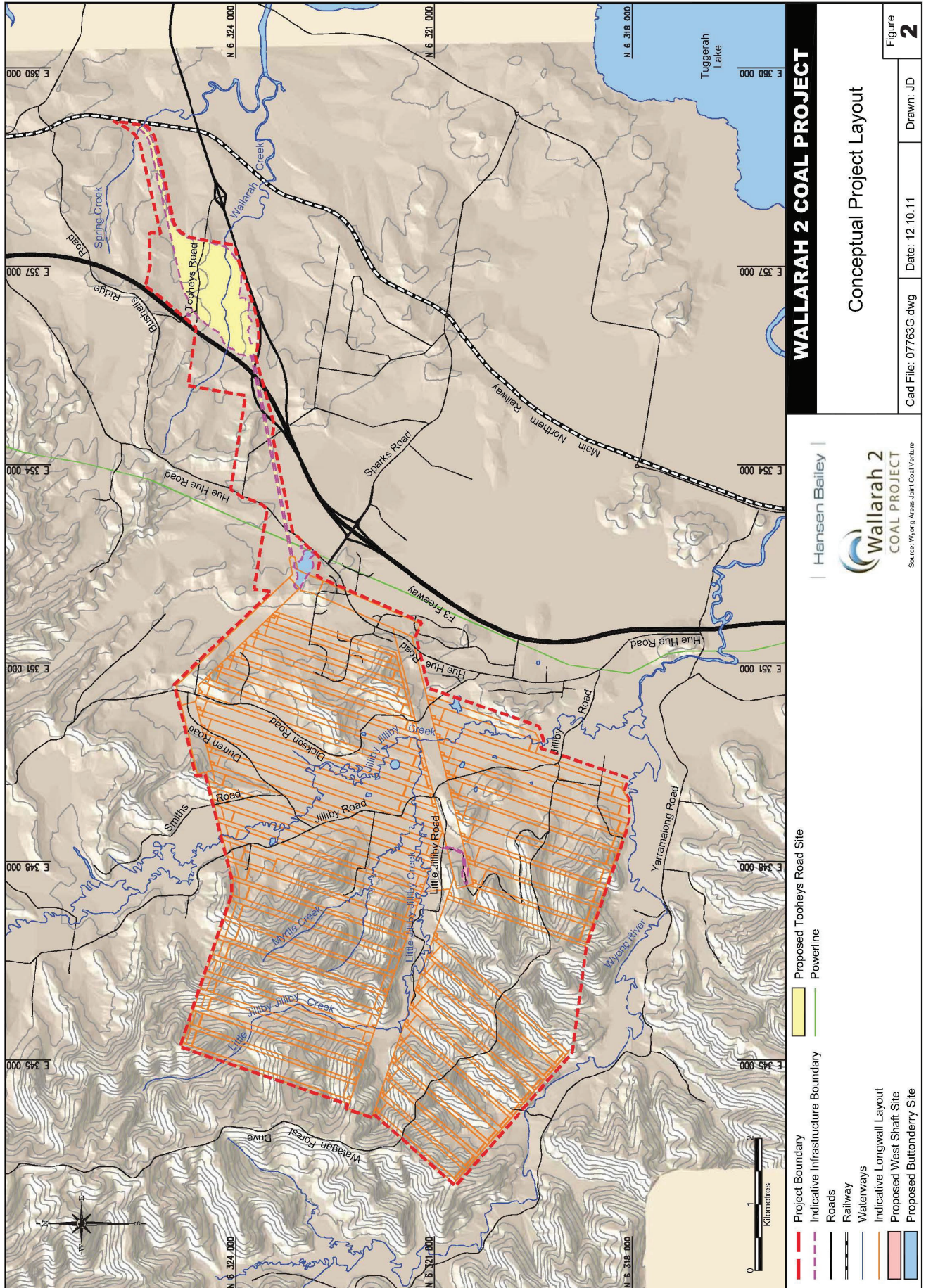
Forests NSW utilises a zoning system in order to establish the most appropriate use of the land and forest associated with it. This zoning system may exclude some areas from commercial timber harvesting.

The proposed Western Ventilation Shaft is situated within Forest NSW Forest Management Zone 4 (FMZ4). FMZ4 is managed as 'general management' which includes timber harvesting. Consequently the forest has the potential to be harvested for commercial purposes and is therefore considered to have a commercial forest product value.

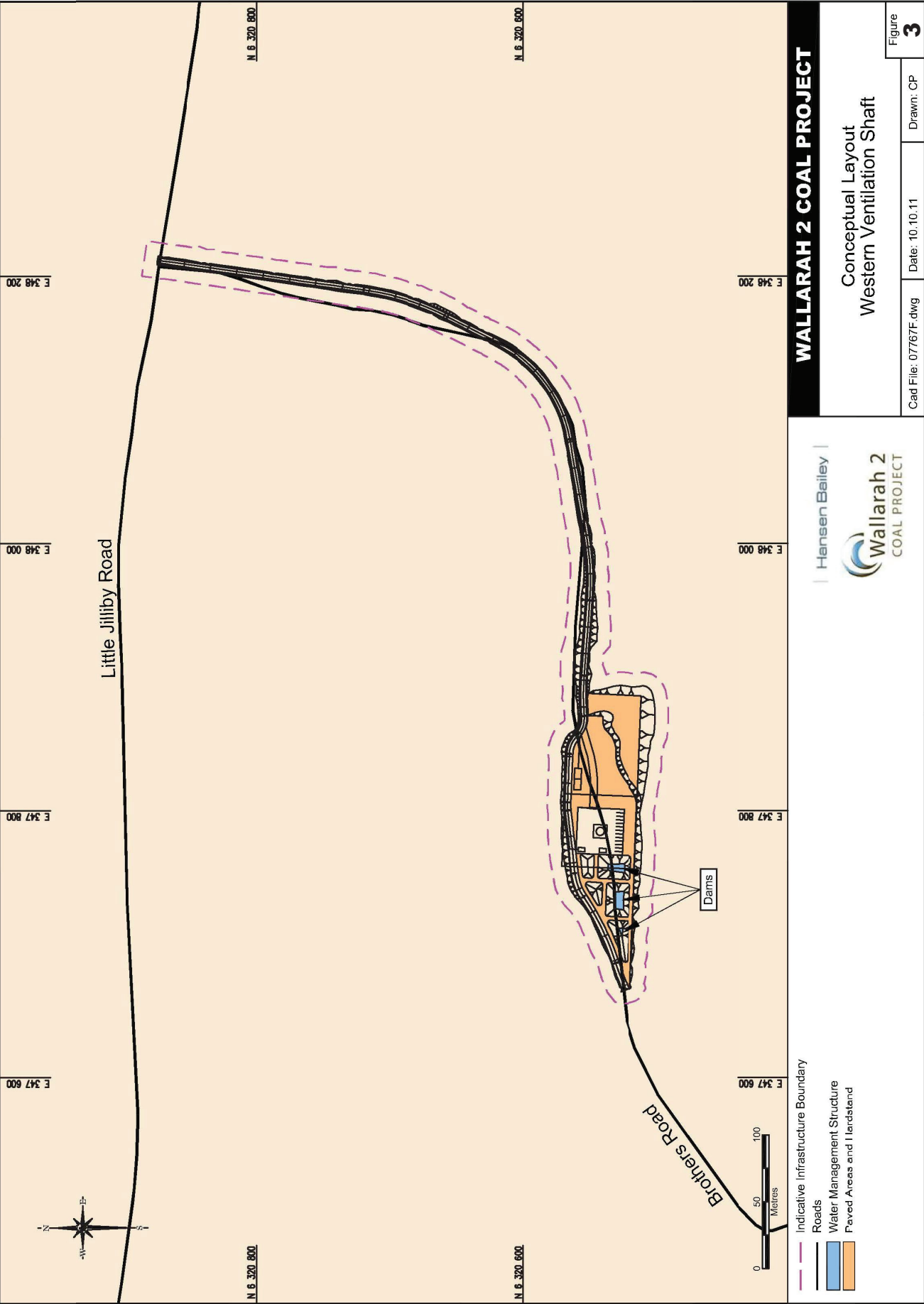












### 3.3 Vegetation Communities

The Wyong State Forest is dominated by the following vegetation communities, as identified by OzArk (2012a) and classified by Bell (2002):

- ▶ Coastal Ranges Moist Layered Forest;
- ▶ Dooralong Spotted Gum-Ironbark Forest;
- ▶ Narrabeen Warm Temperate Subtropical Rainforest; and
- ▶ Riverine Alluvial Gallery Rainforest Moist Forest.

A number of other vegetation communities (or derived communities) are present within the Project Boundary however they are not situated close to the proposed Western Ventilation Shaft.

Figure 4 presents the vegetation communities within the Project Boundary including Wyong State Forest and the area where the Western Ventilation Shaft is to be constructed.

Based on the above vegetation community classification (Wyong LGA Community, Unit 35), the Western Ventilation Shaft is understood to be occupied primarily by the Coastal Ranges Moist Layered Forest vegetation community (OzArk, 2012a).

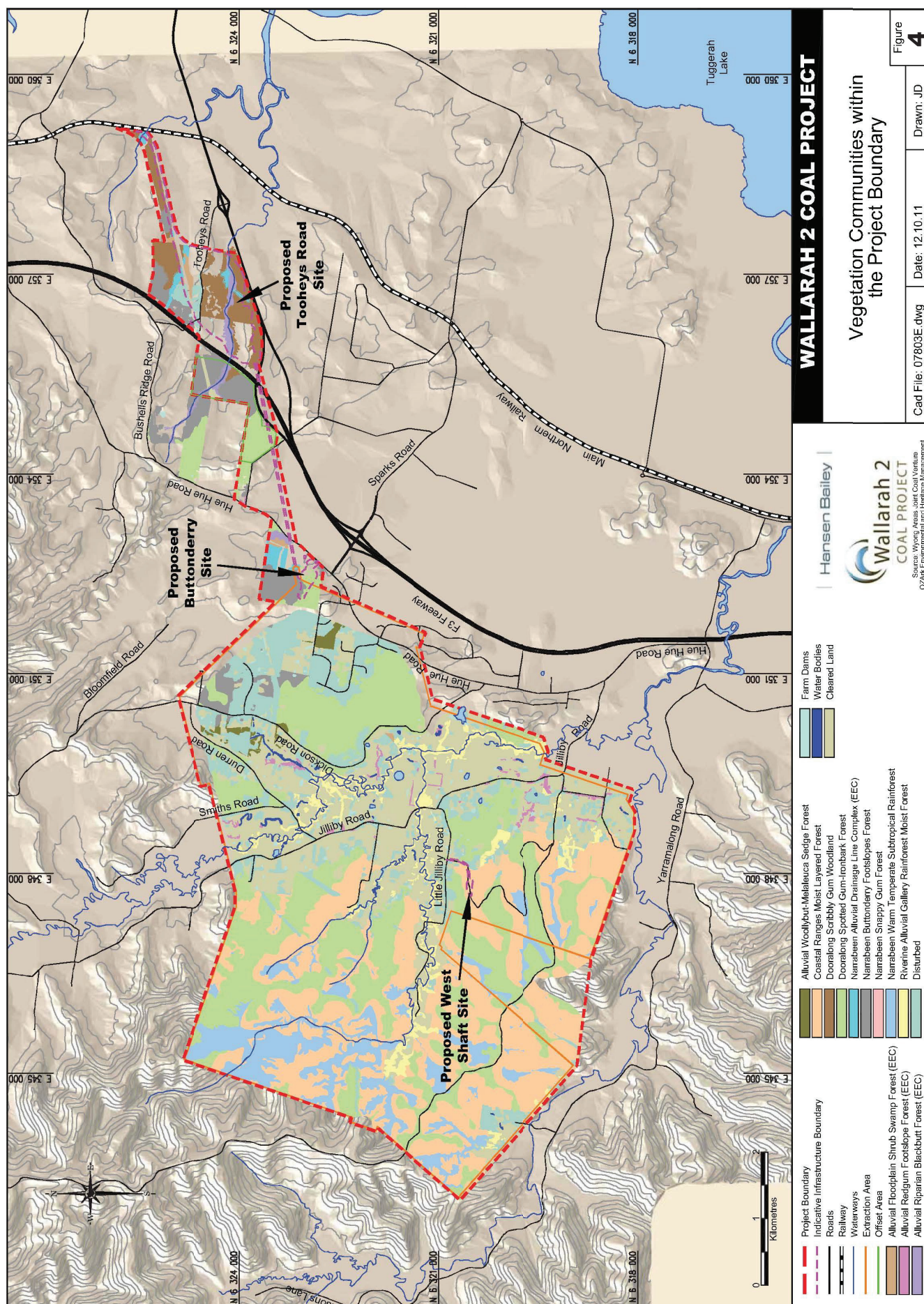
This community is characterised by tall forests with a moist understorey. Canopy species are variable, but generally consist of *Corymbia maculata*, *Eucalyptus pilularis*, *E. propinqua* and *E. umbra* on the exposed slopes and ridges, and *Syncarpia glomulifera* ssp. *glomulifera*, *Allocasuarina torulosa*, *E. acmenoides*, *E. deanei*, *E. saligna*, *E. agglomerata* and *Angophora floribunda* on the moister sites (MU35 Bell, 2002).

Common commercial tree species within this community include:

- ▶ *Corymbia maculata* (Spotted Gum);
- ▶ *Eucalyptus pilularis* (Blackbutt);
- ▶ *Eucalyptus saligna* (Sydney Blue Gum);
- ▶ *Eucalyptus acmenoides* (White Mahogany);
- ▶ *Eucalyptus propinqua* (Grey Gum); and
- ▶ *Syncarpia glomulifera* (Turpentine).

The equivalent biometric communities of the Coastal Ranges Moist Layered Forest are the Mountain Blue Gum-Turpentine moist shrubby open forest and the Spotted Gum-Grey Ironbark open forest (OzArk, 2012b).





## 4. Potential Impacts on Wyong State Forest

### 4.1 Subsidence impacts on forest resources or activities

Investigations undertaken for the project by other parties (MSEC (2012), OzArk (2012a), Geoff Herman and Associates (2012), and Mackie Environmental Research (2012)), indicate that the impacts associated with underground mining operations and subsequent mine subsidence are unlikely to significantly impact upon the factors affecting the health, tree species composition and by extension the commercial viability of the forest.

A maximum of 2.6 metres of vertical subsidence has been predicted to occur across areas of the Wyong State Forest. The depths of cover are between 350 and 690 metres and the natural grades are typically less than 1 in 1 (Appendix A).

With appropriate management and remedial measures in place, it has been assumed that any subsidence which does occur will not be significant enough to impact upon forestry resources or forestry activity. As such, detailed investigations of subsidence issues were excluded from GHD's scope of work for this forestry impact assessment.

GHD raised the issue of subsidence in its Project discussions with Forests NSW personnel and was advised by those personnel that subsidence issues were not currently a significant consideration for native forest management. It was indicated that on some occasions it is necessary to be considerate of potential subsidence or to exercise care with machinery or road related activities, but on the whole subsidence issues were not identified as a significant forest management issue.

### 4.2 General impacts on forest resources or activities

The construction and / or operation of the mine and ancillary infrastructure has the potential to impact on forest resources and activities in a number of ways including:

- ▶ Altered or restricted road access for forest maintenance, harvesting or fire protection activities;
- ▶ Reduced ability to control grazing or the access of third parties through impacts on fencing and gates;
- ▶ Loss or alienation of vegetation and commercial forest due to infrastructure such as new roads, pipelines or powerlines; and
- ▶ Increased road construction and maintenance costs due to increased use of certain forest roads or impacts on local drainage.

GHD understands that these potential impacts are not expected to be significant on Wyong State Forest due primarily to the underground nature of the mining activity. However some localised 'general' impacts will occur in the area of the Western Ventilation Shaft.

#### **4.3 Direct impacts on forest resources or activities associated with the Western Ventilation Shaft**

The construction and operation of the Western Ventilation Shaft will result in a number of direct impacts on the existing forest.

The direct impacts associated with the removal of the existing commercial forest resource from 3.2 hectares of Wyong State Forest are evaluated in more detail in Section 5.

The removal of an area of commercial forest on a semi-permanent or permanent basis also requires consideration in terms of future income and resource for Forests NSW.

A number of localised impacts associated with the construction and operation of the Western Ventilation Shaft (for example disruption to access as a result of construction, or the requirement to construct an alternative road alignment past the Shaft and associated infrastructure) may also occur.

Forests NSW have advised that the management of the loss of future income and any localised impacts, together with the definition of management responsibilities, obligations and financial compensation associated with these impacts could to a large extent be dealt with via the development of an Occupation Permit granted under Section 31 of the *Forestry Act* (1916).



## 5. Western Ventilation Shaft

An assessment has been made of the current commercial value of the forestry resource occurring on the 3.2 hectares of the Wyong State Forest where the proposed Western Ventilation Shaft and ancillary infrastructure (Brothers Road) is to be located.

Information to inform this assessment has primarily been supplied from Forests NSW. GHD did not carry out a site visit to inventory or verify standing timber volumes, species or the likely products used in the estimates. Assumptions are therefore based on the information provided by Forests NSW and from various other relevant sources.

In the absence of direct site measurement, a 'highest possible value' of the standing commercial timber resource on the site has been estimated by incorporating a 100% increase in the estimated values to account for potential site specific 'upside' associated with species, yields, products or markets.

The indicative infrastructure boundary associated with the ventilation shaft (and the area of direct impact on the Wyong State Forest) can be seen in detail in Figure 3.

### 5.1 Products, yields and standing timber value

Timber harvesting is undertaken on a rotational basis within Forest Management Zone 4 of the Wyong State Forest. Rotation lengths or harvesting intervals will vary according to site quality, species, forest products and markets, and would typically range between 30 and 80 years.

Forests NSW currently utilises silvicultural practices involving selective removal of trees. The typical timber volume yields for selective harvesting within the Wyong State Forest are understood to approximate 50 m<sup>3</sup> per hectare. This figure (50 m<sup>3</sup> per hectare) equates to the removal of 50% of the current standing volume of the forest in any single harvesting operation.

Removal of the entire volume of the current standing material (100% removal) in order to facilitate the Western Ventilation Shaft and ancillary infrastructure works has been assumed to yield 100 m<sup>3</sup> per hectare.

Forests NSW are paid a 'royalty' or stumpage for log products removed from the forest. In order to avoid any confusion with mining 'royalty' the term 'stumpage' has been used in this document instead of 'royalty'. Stumpages are essentially market based and reflect the wholesale value paid by industry to allow it to harvest and subsequently process the timber. Higher quality, larger or more marketable logs typically attract a higher stumpage. The volume of log material available (m<sup>3</sup>/ha) and its stumpage (\$/m<sup>3</sup>) allow the standing timber value (\$/ha) to be estimated for each product or site.

The typical products sold from the Wyong State Forest, the proportion that these products represent of the currently available standing timber volume, the volume typically allocated to each product (m<sup>3</sup> per hectare), and the average value for each product (\$ per m<sup>3</sup>) is presented in Table 2. The average standing timber value per hectare has been calculated for the proposed removal of 100% of the standing volume. Yield, product and stumpage value information has been provided by Forests NSW.

The forest is considered to be of sufficient size to allow a commercial salvage harvesting operation to take place, particularly given that all commercial timber products will be removed. The site is also located within commercial haulage distances for potential timber processors.

Table 2 Products, yields and standing timber value

Product	HQLS	HQSS	Poles	Girders	Pile	Salvage	Ex. pulp	Dom. pulp	Residue	Fencing	Total
<b>Average Wyong SF Product yield (%)</b>	21.9%	9.5%	4.7%	0.8%	0.5%	24.5%	20.7%	5.3%	8.5%	3.5%	100%
<b>Average Wyong SF stumpage (\$/m<sup>3</sup>)</b>	\$80.00	\$30.00	\$150.00	\$200.00	\$200.00	\$12.00	\$8.00	\$8.00	\$8.00	\$12.00	
<b>Volume available for harvest (m<sup>3</sup>/ha) (100% harvest)</b>	21.9	9.5	4.7	0.8	0.5	24.5	20.7	5.3	8.5	3.5	100
<b>Average standing timber value of products (\$/ha) (100% harvest)<sup>++</sup></b>	\$1,752	\$285	\$705	\$160	\$100	\$294	\$166	\$42	\$68	\$42	\$3,614

HQLS: High Quality Large Sawlog

HQSS: High Quality Small Sawlog

Ex. Pulp: Export pulpwood

Dom. Pulp: Domestic Pulpwood

<sup>++</sup> assumes that all standing timber is available for harvest and is harvested in a single harvesting event

From Table 2 it may be seen that the current standing timber value of Wyong State Forest, (the value of the current standing timber based upon the “one-off” removal and sale of 100% of the harvestable timber) is in the order of \$3,600 per hectare.

Therefore for the 3.2 hectare site, the current value of the standing timber can be estimated as being worth approximately \$11,520 (3.2 ha x \$3,600 / ha) to Forests NSW. This is based on the typical products, yields and values for the whole of Wyong State Forest and assumes a single harvesting event.

The estimation of the current standing timber value which has been provided is based on the average current market values and stumpage received by Forests NSW for each product. These values are subject to change over time.

The above values represent the results associated with a single “one-off” harvesting event.

## 5.2 General costs associated with harvest/haulage

Forests NSW would normally incur costs associated with road and log landing construction, harvesting supervision and rehabilitation of tracks and log landings post-harvest. For the purposes of this assessment these costs have been assumed to be zero for the reasons outlined below.

The Brothers Road (which passes through the area to be cleared) has been assumed to be of a suitable standard to facilitate the harvesting which will be required on the adjacent land.

Rehabilitation costs may also be minimal given that the site will be subject to further disturbance and modification, and no subsequent establishment of native forest will be undertaken.

It has been assumed that harvesting and haulage costs are borne by the harvesting contractor.

## 5.3 Estimated ‘highest possible value’

The commercial values estimated above are based on the typical products, yields and values for the whole of Wyong State Forest (per hectare) and have not been verified in the field. It is possible that the site contains higher quality timber and therefore a higher proportion of high value products, or alternately, a greater volume of merchantable timber.

In order to account for the potential ‘upside’ which may exist at the Western Ventilation Shaft and to determine the ‘highest possible value’, the Wyong State Forest ‘average’ has been increased by a maximum expected variation factor of 100%. This equates to an estimated highest possible value of \$7,200 per hectare or a total value of the current standing timber over the 3.2 hectare area equivalent to approximately \$23,000. This valuation approach is considered conservative.

## 5.4 Permit requirements

This report focusses on the valuation of the current standing timber volume of the site. It does not consider the value of the future commercial forest product yields which will be foregone due to the removal of 3.2 hectares from the forest estate. Discussions with Forests NSW have indicated that the loss of future income will be most easily addressed via an annual fee associated with an Occupation Permit granted under Section 31 of the *Forestry Act* (1916). GHD understands that this would be the subject of negotiation between the Project proponent and Forests NSW.



## **5.5 Salvage and re-establishment**

Regardless of the nature of any compensation entered into for the project, it will be possible to commercially harvest and salvage the standing timber present on the 3.2 ha site. It may also be possible to re-establish much of the area once mining activities have been completed.

## 6. Consultation with Forests NSW

Relevant consultation with Forests NSW regarding this assessment report is presented in Table 3. It should be noted that this information does not represent all of the discussions or consultation undertaken by GHD or the Project proponent as part of the development of the EIS.

**Table 3 Summary of consultation with Forests NSW**

Date	Key Issue	Topic of consultation
22 May 2012	Confirmation that commercial forest activities occur within Project Boundary	<p>A discussion was held with the Forests NSW Harvest Planner based in the Forests NSW Maitland office to confirm the Forest Management Zone associated with the area to be impacted upon by the proposed development within Wyong State Forest.</p> <p>It was confirmed that the proposed Western Ventilation Shaft site is situated within Forests NSW Forest Management Zone 4 (FMZ4).</p> <p>FMZ4 is managed as 'general management' which includes timber harvesting. Consequently the forest has the potential to be harvested for commercial purposes and has a financial value.</p>
4 July 2012	<p>Confirmation of basis for establishing forest commercial values</p> <p>Identification of potential impacts on forest resources and forest management activities</p>	<p>A discussion was held with the Forests NSW Harvest Planner (Maitland Office) to discuss potential forest products, yields and values that would be associated with the area potentially impacted by the proposed development.</p> <p>Potential issues associated with mine subsidence and other forest operations and management issues were discussed.</p>
11 July 2012	Confirmation of forest products and their commercial value	<p>A discussion was held with the Land Administration Officer-Central Region in Wauchope to confirm expected products, yields and estimates of financial value from the existing Wyong State Forest.</p> <p>The preferred approach to the loss of ongoing revenue from the affected land, and proponent access arrangements was discussed, together with subsidence and access issues.</p>

## 7. Conclusions

The potential impacts of the Project on forestry resources and forestry activities on Wyong State Forest (State Forest No. 281) have been assessed. The 'highest possible' commercial value of the current standing timber resource on a 3.2 hectare area of forest which will be cleared to facilitate the construction and operation of the Western Ventilation Shaft has been estimated. In terms of this assessment, 'commercial value' is understood to be associated with timber value (rather than other potential forest products).

Mine subsidence has the potential to affect forest health and operational activities in a number of ways. Some of these impacts may have financial implications (for example on forest growth, access for operations or impacts on forest assets). Based upon information provided by a number of sources, GHD understands (and has assumed) that the forest impacts associated with mine subsidence are unlikely to be significant (Appendix A). As such, the investigation of subsidence issues in detail and their potential impact upon the forest resource or activities within Wyong State Forest has not been undertaken.

The Project has the potential to directly impact upon the forest resource and forest activities through the construction of the Western Ventilation Shaft and ancillary works on Brothers Road. This will affect an area of approximately 3.2 hectares of the Wyong State Forest. GHD has assessed the current 'highest possible' commercial value of the current standing forest resource within this area. GHD did not carry out site investigations to support the commercial forest product assessment and has relied upon information supplied from Forests NSW and a number of other assumptions.

The typical "average" standing timber value of Wyong State Forest, assuming the removal of 100% of the harvestable timber has been estimated as \$3,600.00 per hectare. This is based on the typical products, yields and values for the whole of Wyong State Forest. It is possible that the site contains higher quality timber, a higher proportion of high value products, and/or a higher volume of merchantable timber than the typical average across the entire forest. In order to account for this possibility the 'highest possible value' for the forest has been estimated by increasing the Wyong State Forest average by a maximum expected variation factor of 100%. This equates to \$7,200 per hectare or a total standing timber value of over the affected 3.2 hectares equivalent to \$23,000. This valuation approach is considered conservative.

Regardless of the nature of any compensation entered into for the project, it will be possible to commercially harvest and salvage the standing timber present on the 3.2 ha site. It may also be possible to re-establish much of the area once mining activities have been completed.

It has been assumed that compensation for the future income forgone by Forests NSW associated with the permanent or semi-permanent removal of the current 3.2 ha forest resource from the forest estate will be achieved via commercial negotiations between Forests NSW and the WACJV. These negotiations, which are likely to include an annual fee, are expected to form the basis of an Occupation Permit under Section 31 of the *Forestry Act* (1916).

## 8. References

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## Appendix A

# Subsidence impact on Wyong State Forest advice from MSEC

Statement from MSEC regarding subsidence issues in Wyong  
State Forest

There will be a maximum predicted total conventional subsidence of 2,600 mm in the western forested hill zones where the seam extraction height and panel widths are greater than those proposed in the floodplain and Hue Hue areas. Similarly, in parts of the western forested areas the maximum predicted total conventional tilt will be 15 mm/m, the maximum predicted total conventional hogging curvature of 0.28 km<sup>-1</sup> and the maximum predicted total conventional sagging curvature of 0.37 km<sup>-1</sup>. Possible minor impacts could be associated with steeply sloping areas where cracking can occur as has been seen in the Southern Coalfield at similar deep cover depths and could be associated with minor changes to water drainage as detailed below.

The extraction of longwalls beneath steep slopes can result in downslope movements of the surface soils, which can result in tension cracks appearing at the tops and along the sides of the steep slopes and compression ridges forming at the bottoms of the steep slopes. Whilst cracking due to downslope movements of the surface soils is more likely at shallower depths of cover, some minor cracking can be anticipated in the Forest Areas, it is unlikely that any large scale soil instabilities (i.e. slip circle failures) would occur as a result of mining, particularly since none have been previously observed along steep slopes in the Hunter, Newcastle and Southern Coalfields.

If tension cracks were to develop on the tops of steep slopes, as a result of the extraction of the proposed longwalls, it is possible that soil erosion could occur if these cracks were left untreated. It is possible, therefore, that some remediation might be required, including infilling of surface cracks with soil or other suitable materials, or by locally regrading and re-compacting the surface.

With the appropriate management and remedial measures in place, it is unlikely that the potential impacts associated with steep slopes within the Forest Areas would provide a constraint on the Project. Impacts on trees resulting from longwall mining have only been previously observed in the NSW Coalfields where the depths of cover were extremely shallow, say less than 100 metres, or on very steeply sloping terrain, say greater than 1 in 1. It is unlikely, therefore, that any trees within the Forest Areas would be adversely impacted by the proposed mining, as the depths of cover are between 400 and 700 metres and the natural grades are typically less than 1 in 1.

As the flora and vegetation within the Forest Areas could be affected by changes in the surface water and groundwater regimes, resulting from the extraction of the proposed longwalls, detailed studies on the potential impacts and consequences of subsidence have been undertaken and the results are presented in the reports by Geoff Herman and Associates (2012) and Mackie Environmental Research (2012), respectively.

- Geoff Herman and Associates (2012) Wallarah 2 Coal Project Flood Impact Assessment
- Mackie Environmental Research (2012) Wallarah 2 Coal Project Groundwater Impact Assessment





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