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Caroona Coal Project

Application for Gateway Certificate Technical Overview

Contents

Contents
continued

Overview

Coal Mines Australia Pty Ltd (CMAL), a wholly owned subsidiary of BHP Billiton, is seeking a Gateway Certificate for an underground coal mining operation in the New England North West region of New South Wales (NSW), herein referred to as the Caroona Coal Project (the Project). The Project is located approximately 40 kilometres (km) south-east of Gunnedah and 14 km west of Quirindi, NSW, within the Liverpool Plains and Gunnedah Local Government Areas (LGAs).

The Southern Plains sub-region (comprising the Gunnedah and Liverpool Plains LGAs has a unique combination of volcanic soils, rainfall reliability, climate (sunshine hours, moderate temperature and protection from hot westerly weather) and availability of surface and groundwater (Department of Planning and Infrastructure, 2012).

The Project Assessment Area comprises elevated and gently sloping land characterised by agricultural enterprises, which include cattle grazing, forestry and both dryland and some limited irrigated cropping flanked by alluvial plains dominated by irrigated and dryland cropping.

This Gateway Application is for an underground coal mine underneath the Doona Ridge and Nicholas Ridge Project Assessment Area within Exploration Licence 6505. Through focusing proposed underground mining operations under these elevated and gently sloping lands, and with the implementation of other mitigation measures, the Project has been designed to minimise impacts on the alluvial plains.

Initial engagement in regard to the Gateway Application revealed reluctance on the part of some local landholders to participate in the Gateway process. Specifically, some landholders withheld access for soil test pits by McKenzie Soil Management Pty Ltd and/or agricultural interviews with La Tierra Pty Limited.

During the course of the Gateway Application studies, a pilot Working Group run by FPC Water Solutions and facilitated by the Land and Water Commissioner, Mr Jock Laurie was commissioned by the NSW Department of Trade and Regional Infrastructure and Services – Division of Resources and Energy in relation to the Gateway Application.

Following continued engagement to communicate the purpose of these assessments in informing the Gateway Application, and the Working Group, access improved to the extent that ultimately, only a small number of landholders within the Project Assessment Area declined to participate.

Notwithstanding, discussions are continuing and further soils and agricultural studies are planned to inform the Environmental Impact Statement (EIS).

Four hundred and four soil test pits were excavated to verify Biophysical Strategic Agricultural Land (BSAL) within the Project Assessment Area. In addition, some 40 interviews were conducted with local stakeholders to further characterise the agricultural enterprises in the area.

This Gateway Assessment is supported by the following assessments:

- Agricultural Impact Assessment – La Tierra Pty Limited.
- Agricultural Resource Assessment – McKenzie Soil Management Pty Ltd.
- Preliminary Groundwater Assessment – HydroSimulations.
- Subsidence Assessment – Mine Subsidence Engineering Consultants.

Approximately 2,215 hectares of Protocol Verified BSAL[1] has been identified within the Project Assessment Area by McKenzie Soil Management. It is also noted that approximately 459 hectares of Potential BSAL, as mapped by the NSW Government, is located on land within the Project Assessment Area where no access was available for ground survey. Only minor, temporary surface disturbance activities to BSAL are proposed, as major surface infrastructure components are not proposed to be located on BSAL.

BSAL within the Project Assessment Area would experience mine subsidence from the Project. Subsidence would result in some cracking on the surface; however would not affect soil fertility, effective rooting depth or soil drainage. Therefore, the Project should not result in a long-term or permanent change to the agricultural productivity of BSAL. Notwithstanding, BHP Billiton would seek to remediate any surface cracking that develops as a result of subsidence.

The groundwater assessment shows that the Project meets the 'Level 1' minimal impact considerations of the Aquifer Interference Policy for key regional 'highly productive' groundwater resources, namely the Namoi alluvium and Liverpool Ranges basalt. The Project is predicted to trigger 'Level 2' of the minimal impact considerations for the Spring Ridge water source for drawdowns of greater than 2 m at privately-owned bores. BHP Billiton has committed to 'make good' any impacts on these privately-owned bores and will continue to investigate these impacts through the conduct of a census of these bores and refinement of groundwater modelling prior to the EIS.

[1] BSAL that has been identified through ground survey in accordance with the *Strategic Regional Land Use Policy – Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government, 2013) and, where no access was available for ground survey, has been interpreted as BSAL based on continuity with adjacent BSAL dominant soil landscape units (McKenzie Soil Management, 2014).

1. Introduction

1.1 Purpose and Structure of this Document

Coal Mines Australia Pty Ltd (CMAL), a wholly owned subsidiary of BHP Billiton, is seeking consent to develop an underground coal mining operation in the New England North West region of New South Wales (NSW), herein referred to as the Caroona Coal Project (the Project) (Figure 1).

The Project is located approximately 40 kilometres (km) south-east of Gunnedah and 14 km west of Quirindi, NSW.

This document is a Technical Overview in support of an application for a Gateway Certificate pursuant to clause 17F of the NSW *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP). The Project Assessment Area is located on land designated as Biophysical Strategic Agricultural Land (BSAL).

1.2 Scope of Application

The Gateway Application will be assessed by the Mining and Petroleum Gateway Panel (the Gateway Panel) for potential impacts of the Project on strategic agricultural land and its associated water resources. The Gateway Panel undertakes its assessment in accordance with the relevant criteria outlined in clause 17H(4) of the Mining SEPP that apply specifically to BSAL.

The Gateway process applies to State Significant mining developments that require a new mining lease. The Project Assessment Area, as described in this document, is defined as the extent of underground mining and surface infrastructure areas, shown on Figure 2. Components of the Project that are outside of the proposed new mining lease (i.e. the Project Assessment Area) are not subject to the Gateway Application. These excluded Project components are identified in this document (Section 4.11).

1.3 Background

Exploration Licence (EL) 6505 was granted to BHP Billiton in 2006 and exploration activities, engineering studies and environmental baseline studies have been ongoing.

Within the 344 square kilometre (km^2) EL 6505, BHP Billiton has identified three targeted exploration areas at Doona Ridge, (Plate 1), Nicholas Ridge and Georges Island totalling 126 km^2.

Although there are significant coal deposits outside of these areas, BHP Billiton has focused exploration on the targeted areas because of the potential for longwall mining subsidence to adversely impact the alluvial plains which characterise the lands outside of the targeted areas and is often used for irrigated cropping.

This application includes proposed longwall mining within the Doona Ridge and Nicholas Ridge targeted exploration areas which total approximately 119 km^2. These areas comprise the Project Assessment Area for the Gateway Application (Figure 2). Through focusing proposed underground mining operations under these elevated and gently sloped lands, and with the implementation of other mitigation measures, the Project has been designed to minimise impacts on the alluvial plains.

This document is included within an application for a Gateway Certificate. It is anticipated that the Gateway Panel will issue a Gateway Certificate for the Project in accordance with the Mining SEPP.

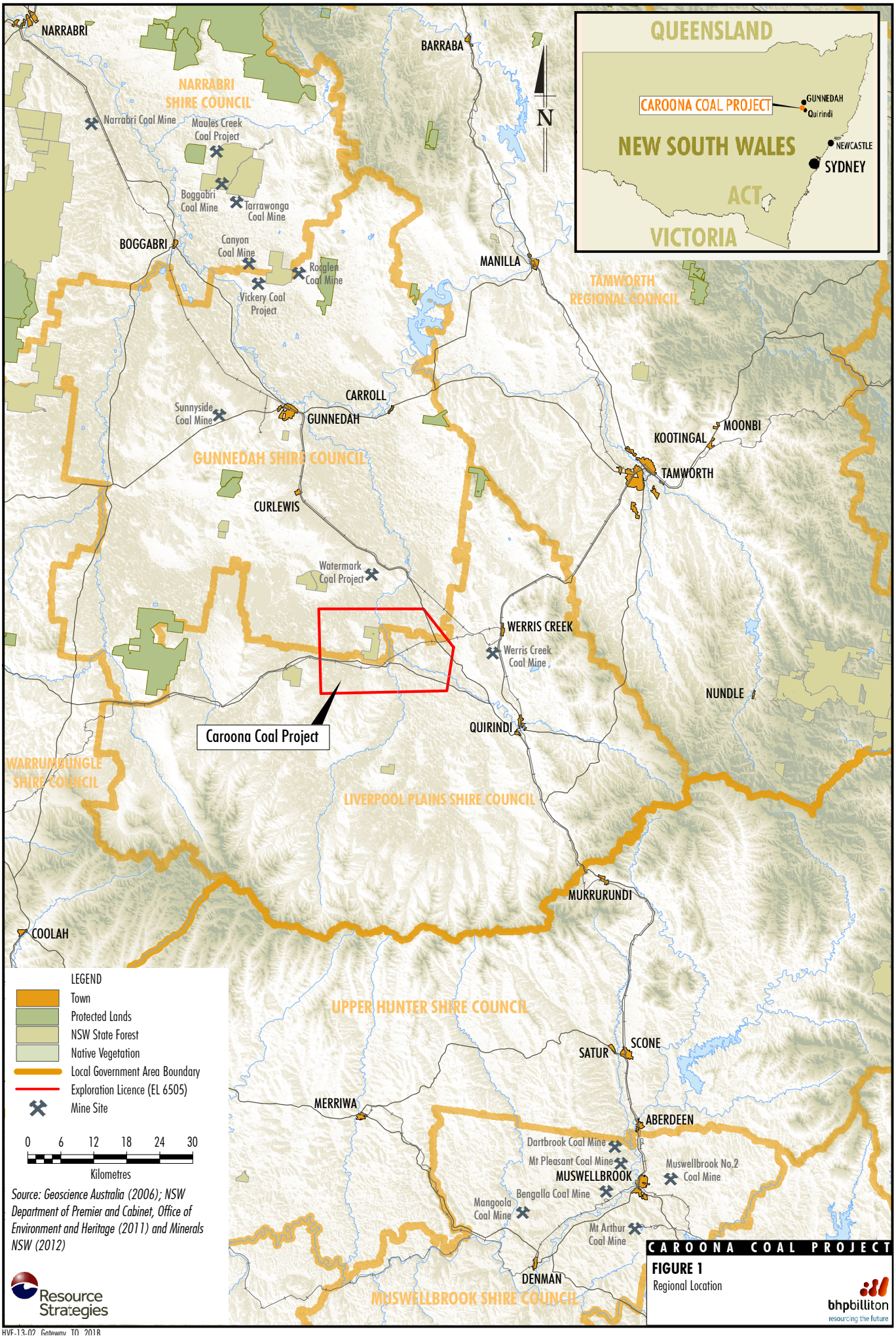
The Project will also be referred to the Commonwealth Minister for the Environment for consideration as to whether the Project is a 'Controlled Action' and requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

In parallel, BHP Billiton will seek Director-General's Requirements (DGRs) from the Director-General of the NSW Department of Planning and Infrastructure (DP&I) to inform the Environmental Impact Statement (EIS).

It is anticipated that the final DGRs will be prepared by the DP&I in consideration of:

- the Caroona Coal Project – Project Description and Preliminary Environmental Assessment;
- any key issues raised by State regulatory agencies;
- the recommendations of the Gateway Panel set out in a conditional Gateway Certificate; and
- the decision of the Commonwealth Minister for the Environment regarding the referral under the EPBC Act.

Plate 1. Doona Ridge



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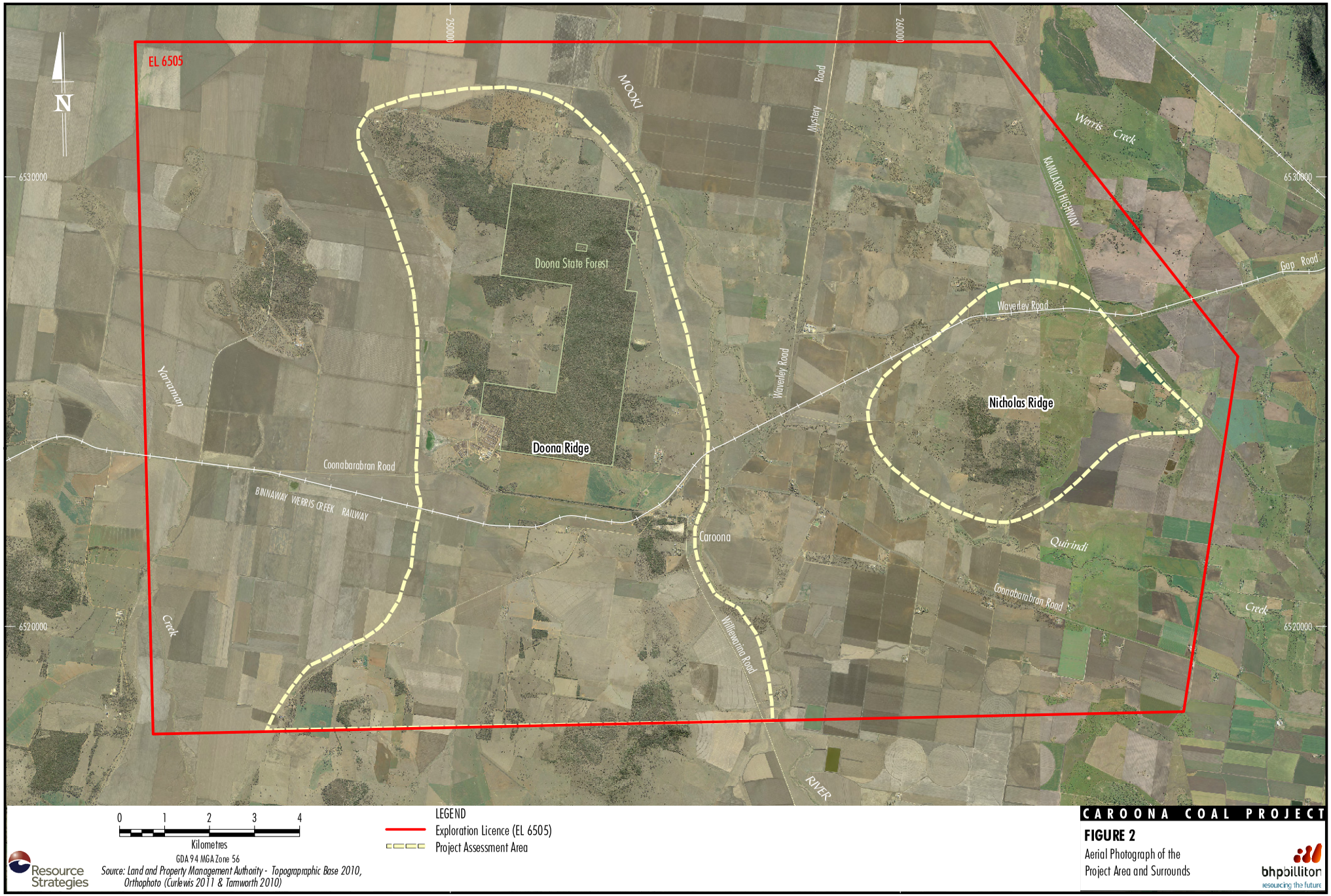
EL 6505
N
250000
260000
6530000
6520000
MOOKI
Mysleys Road
Werris Creek
KAMILAROI HIGHWAY
Gap Road
Waverley Road
Doona State Forest
Doona Ridge
Nicholas Ridge
Yarraman
Coonabarabran Road
BINNAWAY WERRIS CREEK RAILWAY
Caroona
Quirindi
Creek
Willlewarrina Road
RIVER
0 1 2 3 4
Kilometres
GDA 94 MGA Zone 56
Source: Land and Property Management Authority - Topographic Base 2010, Orthophoto (Curlewis 2011 & Tamworth 2010)
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Exploration Licence (EL 6505)
Project Assessment Area
CAROONA COAL PROJECT
FIGURE 2
Aerial Photograph of the Project Area and Surrounds
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1. Introduction
continued

1.4 Proponent

CMAL (ABN 70 062 855 270) (a wholly owned subsidiary of BHP Billiton) is the proponent for the Project. The contact details for CMAL are:

Coal Mines Australia Pty Ltd
125 Hawker Street
QUIRINDI NSW 2343

Website: http://www.bhpbilliton.com

1.5 Project Overview

The main components comprising the Project include:

- an underground mining operation within EL 6505 involving a single longwall in the Hoskissons Seam on Doona Ridge and a second longwall in the Hoskissons Seam on Nicholas Ridge;
- production of approximately 260 million tonnes (Mt) of run-of-mine (ROM) coal over the life of the mine;
- production of up to approximately 10 million tonnes per annum (Mtpa) of saleable thermal coal;
- a mine life of approximately 30 years;
- development and operation of a pit top mine infrastructure area comprising administration offices, bathhouse, workshop, store, coal stockpile areas, coal handling infrastructure, bunded hydrocarbon tanks, laydown areas, car parking, electrical substation, muster area, associated linear infrastructure and access road on Doona Ridge;
- development and operation of a separate men and materials shaft;
- construction and operation of an event coal preparation plant (CPP) (up to 1 Mtpa ROM coal capacity) on Doona Ridge for washing of occasional high-ash ROM coal;
- construction and operation of a coal unloading facility on Doona Ridge to allow transportation of Nicholas Ridge ROM coal to Doona Ridge via rail for washing;
- co-disposal of fine and coarse rejects in an emplacement on Doona Ridge, with rejects to be transported within an infrastructure corridor;
- development and operation of a separate pit top mine infrastructure area comprising coal handling infrastructure, coal stockpiles, an access road, car parking, administration offices, muster area, electrical substation and associated linear infrastructure on Nicholas Ridge;
- construction and operation of separate rail loops and spurs to connect to the Binnaway-Werris Creek Railway;
- realignment of Rossmar Park Road;
- employment of up to approximately 400 operational personnel at peak production;
- employment of an average number of construction employees of approximately 400 and up to 600 at peak construction;
- emplacement of overburden excavated during the construction of access drifts and shafts;
- progressive development of sumps, pumps, pipelines, water storages and other water management equipment and structures (including dewatering infrastructure);
- development and operation of ventilation surface infrastructure and gas drainage infrastructure;
- development and operation of water and gas pipelines to connect the infrastructure areas;
- ongoing exploration activities within EL 6505;
- ongoing surface monitoring and rehabilitation (including rehabilitation of mine related infrastructure areas that are no longer required) and remediation of subsidence effects; and
- other associated minor infrastructure, plant, equipment and activities.

Additional details of each of the main Project components are provided in Section 4.

1.6 Project Team

This Gateway Application Technical Overview was prepared by Resource Strategies Pty Ltd with specialist input provided by the following organisations:

- Caroona Coal project team (*project design, alternatives and justification, consultation*);
- La Tierra Pty Limited (La Tierra) (Mr Terry Short and Ms Tiffany Thomson) (*agricultural impact assessment*);
- McKenzie Soil Management Pty Ltd (Dr David McKenzie) (*agricultural resource assessment*);
- HydroSimulations (Dr Noel Merrick and Mr Chris Nicol) (*preliminary groundwater assessment*); and
- Mine Subsidence Engineering Consultants Pty Ltd (MSEC) (Mr James Barbato) (*subsidence assessment*).

1.7 Document Structure

The remainder of this document is structured as follows:

Section 1 Introduction – provides a background to the development of the Project and an overview of the proposed Project activities.

Section 2 Consultation – a description of the consultation undertaken in support of the application.

Section 3 Agricultural Context – describes the local and regional context of the Project Assessment Area, along with the land capability, water resources and agricultural enterprises.

Section 4 Project Description – provides a clear and concise description of the Project, indicates the types of activities that will be undertaken and summarises alternatives to the Project considered.

Section 5 Strategies to Minimise Potential Impacts on BSAL – identifies management, mitigation and remediation measures that would be implemented to minimise the potential impacts.

Section 6 Potential Impacts on BSAL – assesses whether the Project would impact on the agricultural productivity of the land.

Section 7 Conclusion – provides the key conclusions of the Gateway Application.

Section 8 References – lists the documents cited in Sections 1 to 7.

2. Consultation

2.1 Project Consultation to date

Consultation undertaken to date in relation to the Project has included:

- Ongoing consultation with local landholders regarding the Project and access for exploration and environmental baseline studies.
- Ongoing consultation with the Community Consultative Committee (CCC) since 2006. These meetings include an open invitation to the community for briefings regarding the project.
- Ongoing consultation with representatives of the NSW Department of Trade and Regional Infrastructure and Services – Division of Resources and Energy (DTRIS-DRE) regarding exploration activities in EL 6505.
- Introductory briefing with the Office of Environment and Heritage (OEH) on 7 November 2013.
- An inter-agency workshop on 5 December 2013, including representatives of NSW Office of Water (NoW), Commonwealth Department of the Environment, OEH, DTRIS-DRE and DP&I.
- Conceptual Project Development Plan meeting with representatives of the DTRIS-DRE on 9 December 2013.
- Ongoing consultation with the DP&I regarding the status of environmental baseline studies.
- Consultation with the Liverpool Plains, Gunnedah and Tamworth Regional Councils to discuss the development of the Project and environmental studies, development contributions, social impact assessment and the timing of the EIS and Gateway Application processes.
- Involvement in the Namoi Catchment Water Study with DTIRIS-DRE.

2.2 Gateway Application Consultation

BHP Billiton and the Project Team have conducted the following consultation in relation to the Gateway Application:

- All landholders within the Project Assessment Area were individually contacted in regard to access for soils sampling and the Agricultural Impact Assessment (AIA).
- CCC meetings in August and September – landholders were invited for detailed briefings from Mr Terry Short, Dr Noel Merrick and Dr David McKenzie.
- Presentation to the Caroona Coal Action Group Annual General Meeting on 8 August 2013 on the Gateway Application and the status of the associated environmental studies.
- Soil sampling field day on 19 September 2013 (Plate 2) to demonstrate the soil sampling methodology and provide the community the opportunity to discuss the methodology with the specialist consultants undertaking the AIA and the Agricultural Resource Assessment.
- Participation in a pilot Working Group run by the DTRIS-DRE and FPC Water Solutions and facilitated by the Land and Water Commissioner, Mr Jock Laurie, regarding the Gateway Application.
- Consultation with the NoW regarding the methodology of the Groundwater Assessment for the Gateway Application in November 2013.
- La Tierra conducted interviews with stakeholders with respect to agricultural productivity at nearby agricultural enterprises as part of the AIA.

Plate 2. Soil Sampling Field Day

- Stage 1 of the Bore Census was undertaken in November 2013, including participation of all interested landowners. Stage 2 of the Bore Census is currently underway with the results to be incorporated into the EIS.
- Key findings of this Gateway Application were presented to the CCC in March 2014.

Initial engagement in regard to the Gateway Application revealed reluctance on the part of some local landholders to participate in the Gateway process. Specifically, some landholders withheld access for soil test pits by McKenzie Soil Management and/or agricultural interviews with La Tierra.

Following continued engagement in regard to the purpose of these assessments in informing the Gateway Application and the Gateway Working Group, access improved to the extent that ultimately, only a small number of landholders within the Project Assessment Area declined to participate.

Notwithstanding, discussions are continuing and further soils and agricultural studies are planned to inform the EIS.

2.3 Ongoing Consultation

A stakeholder engagement programme has been developed for the Project. Key objectives of this programme are to:

- inform government and public stakeholders about the progress and nature of the Project;
- recognise and respond to local interest or concerns regarding the Project; and
- continue the ongoing dialogue between local landholders and BHP Billiton.

The issues raised and outcomes of the stakeholder engagement programme will be reported in the EIS.

The EIS consultation programme will include the use of a variety of consultation mechanisms which in summary include current and future actions such as:

- public availability of key documents (e.g. the request for DGRs and the EIS);
- provision of Project information on the BHP Billiton website (www.bhpbilliton.com) and Caroona CCC website (www.caroonacoalccc.com.au);
- ongoing consultation with the local community and landowners, including the CCC;
- meetings with the general community including Aboriginal groups and directly affected landowners;
- meetings with relevant government agencies; and
- community information brochures and community information sessions.

3. Agricultural Context

3.1 Regional Context

The Southern Plains sub-region (comprising the Gunnedah and Liverpool Plains Local Government Areas (LGAs) (Figure 1) has the highest agricultural productivity in NSW, with a combination of volcanic soils, rainfall reliability, climate (sunshine hours, moderate temperature and protection from hot westerly weather) and availability of surface and groundwater (DP&I, 2012).

The sub-region accounts for around $282 million of agricultural production, more than half of which occurs in the Liverpool Plains LGA (La Tierra, 2014).

The alluvial plains of the region are characterised by soils derived from alluvial deposits of volcanic origin. These are deep, alluvial Vertosol soils (La Tierra, 2014). Surrounding the floodplains are low hills, ridges and gently graded country comprising lighter soils of volcanic and sedimentary origins. These can include Vertosols, but also Sodosols, Podosols, Ferrosols and other soil types (La Tierra, 2014).

Groundwater beneath the Liverpool Plains has been subject to extensive use by agriculture. Essentially, there are three groundwater bearing geological units of varying quality, yield and hence agricultural utility: alluvial, porous rock and fractured rock aquifers.

Alluvial aquifers occur as palaeochannels, with the most productive of these being associated with high-energy erosional deposition of coarse aggregates. These are known to be the most productive in the region (La Tierra, 2014).

Porous rock units of the Jurassic to Permian sedimentary and volcanic formations contain poorer quality water with lower yields, compared to alluvial aquifers.

The fractured rock (basalt) aquifer of the Liverpool Range Bed is used for agriculture, but its extent is limited to the southern end of the Liverpool Plains.

3.2 Local Context

The types of agricultural industries within the surrounding locality include beef cattle and a mix of dryland and irrigated cropping (La Tierra, 2014). No equine or viticulture enterprises are located in the surrounding locality. An aerial photograph of the Project Assessment Area and surrounds is provided as Figure 2.

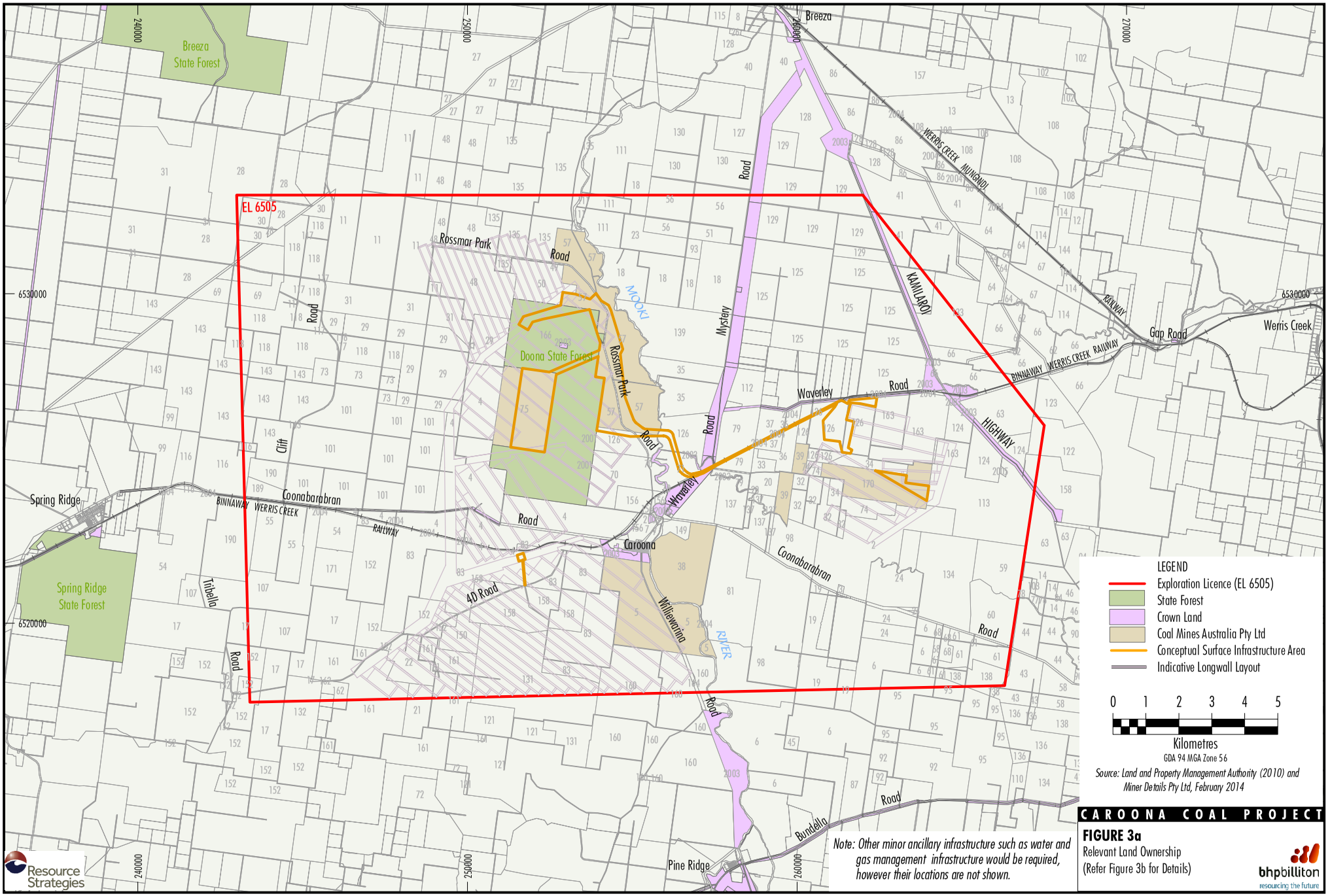
The land within the Project Assessment Area is primarily used for agricultural and rural residential purposes. Agricultural enterprises include cattle grazing and both dryland and some limited irrigated cropping. The Caroona Feedlot owned by JBS Australia, located to the south – west of the Doona State Forest within the Project Assessment Area, is a 23,500 head capacity, 1,390 hectare (ha) feedlot which includes a number of holding yards, sheds, mills, silos and other associated infrastructure. Figures 3a and 3b show local land ownership, including the Caroona Feedlot owned by JBS Australia.

The most common enterprises within the Project Assessment Area are producing cattle (weaners/vealers) on natural pastures and dryland cropping (La Tierra, 2014).

There are a number of dryland and irrigated cropping enterprises within the Project Assessment Area, predominantly located in the southern portion of the Doona Ridge, and the eastern portion of the Nicholas Ridge underground mining area. Parts of the Project Assessment Area are comprised of denser woodland vegetation (generally on the steeper slopes), including the Doona State Forest, which are occasionally used to graze cattle.

The Doona State Forest is used by Forests NSW for timber production, generally White Cypress Pine. The Forest is managed as under Zone 4 of the *Brigalow and Nandewar Community Conservation Area Act 2005* for forestry, recreation and mineral extraction.

Surrounding the Project Assessment Area are alluvial plains which are often used for irrigated and dryland cropping.


Breeza State Forest
EL 6505
Rossmar Park
Road
MOOKI
Doona State Forest
Rossmar Park
Mystery
Road
KAMILAROI
RAILWAY
Gap Road
Werris Creek
WERRIS CREEK MUNGINDI
BINNAWAY WERRIS CREEK RAILWAY
Waverley
Road
HIGHWAY
Cliff
Spring Ridge
BINNAWAY WERRIS CREEK RAILWAY
Coonabarabran
Road
Caroona
Waverley
Coonabarabran
Road
Spring Ridge State Forest
Tibella
4D Road
Willewarina
RIVER
Road
Road
Bundella
Pine Ridge
240000
250000
260000
270000
6530000
6520000
LEGEND
Exploration Licence (EL 6505)
State Forest
Crown Land
Coal Mines Australia Pty Ltd
Conceptual Surface Infrastructure Area
Indicative Longwall Layout
0 1 2 3 4 5
Kilometres
GDA 94 MGA Zone 56
Source: Land and Property Management Authority (2010) and Miner Details Pty Ltd, February 2014
Note: Other minor ancillary infrastructure such as water and gas management infrastructure would be required, however their locations are not shown.
CAROONA COAL PROJECT
FIGURE 3a
Relevant Land Ownership
(Refer Figure 3b for Details)
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Ref. No	Land Holder
1	AMPS Agribusiness Pty Limited
2	Alcorn LJ & MA
3	Alcorn ML
4	JBS Australia Pty Ltd
5	Coal Mines Australia Pty Ltd
6	Bailey TN
7	Cohen GJ & DF
8	Baker RE & BM
9	Shenhua Watermark Coal Pty Ltd
10	Shenhua Watermark Coal Pty Ltd
11	Birrawa Pastoral Company Pty Ltd
12	Bolger EP (Junior)
13	Bonner MLD
14	Boorer CJ
15	Shenhua Watermark Coal Pty Ltd
16	Shenhua Watermark Coal Pty Ltd
17	Brown GW & SL
18	Burt MC, WP & WA
19	Charters CR
20	Charters CR & SJ
21	Charters HF
22	Charters HF
23	Pursehouse Properties Pty Ltd
24	Clarmonds Pty Ltd
25	Shenhua Watermark Coal Pty Ltd
26	Clift DT
27	Clift G
28	Clift M
29	Clift M & KA
30	Clift RS
31	Clift RS & A
32	Cohen RG & TM
33	Cohen GJ
34	Cohen GJ & DF
35	Cohen GJ & DF
36	Cohen GJ & DF
37	Cohen GJ & DF
38	Coal Mines Australia Pty Ltd
39	Coal Mines Australia Pty Ltd
40	Craig ST, JW & NL
41	Craig WTA & P
42	Cudmore RH & SA
43	Dalton R
44	Dalton R & RT
45	Dangar WJ, FH, HC & AA
46	Doolan BV
48	CJ & PA Duddy Pty Ltd
49	Duddy C J
50	Duddy CJ
51	Burt MC & WA
52	Ranken JWL
53	Eleveld KF & GK
54	Elsley FE
55	Elsley FE & DE
56	Burt MC & WA
57	Coal Mines Australia Pty Ltd
58	Eykamp CD
59	Eykamp CW
60	Eykamp LA
61	Eykamp LA & JL
62	Fisher ME, GC & HR
63	Fisher GC
64	Fisher HR
65	Fisher ME & GC
66	Fisher ME, GC & HR
67	Fisher RC
68	Fletcher BI & VR
69	Frofour Pty Ltd
70	Fuller JW & RM
71	Fullers Transport Pty Ltd
72	G.S.S.H Pty Ltd
73	Carbon Minerals NL
74	Glencohen Pty Ltd
75	Coal Mines Australia Pty Ltd
76	SCMB Pty Ltd and BGI Pty Ltd
77	Green T
78	Green TD
79	Hamlin CR & VJ
80	Hamblin NJ
81	Hamblin RJ, FJ, PG & NJ
82	Graham JW, Smith MEL
83	Hanuta Pty Ltd
84	Hickman JM
85	Hickman SSM & Ross-Hickman DS
86	Holifall Pty Ltd
87	Hurley JK
88	Ingall IG,Lyttle KN,Cohen RJF,Squires JA,Bruce JHP,Hosking J
89	Church - Croaker, AMA; Croaker, GDH; and James, MJ Trustees
90	Jarret H & M
91	Shenhua Watermark Coal Pty Ltd
92	Karapiti Holdings Pty Ltd
93	Pursehouse Properties Pty Ltd
94	Lawlor MW & Gorsch JB
95	Lindenow Pastoral Company Pty Limited
96	Hollis M & V
97	Lingard TL
98	Bailey TN
99	Malden J
100	Maraig Pty Ltd
101	Maylan Pty Ltd
102	McBeth W & PE, & AJ
103	McIlrick TW & JA
104	Bradfield NG & MJ
105	Shenhua Watermark Coal Pty Ltd
106	Shenhua Watermark Coal Pty Ltd
107	Mills RA Estate:Perpetual Lease
108	Moore GN & JC
109	Munro NM
110	Murphy PJ & KN
111	Pursehouse Properties Pty Ltd
112	N.R.L.F Pty Ltd
113	AR Grant Estate Perpetual Lease
114	Newcombe IR
115	Nicholson RP
116	Nilwon Pastoral Co Pty Ltd
117	Norman CF
118	Norman GS
119	NSW Grain Corporation Ltd
120	Penick RE
121	Permaid Pty Ltd
122	Pike CT
123	Pike CT & VL
124	Pike MG & CT
125	Piper SL & MJ
126	Priestley JC & CL
127	Pursehouse AL
128	Pursehouse AL & CI
129	Pursehouse Investments Pty Ltd
130	Pursehouse Properties Pty Ltd
131	Rado Ranch Pty Limited
132	Ranken DCL,HRL & JWL
133	Rex Fisher Pty Ltd
134	RG & HD Thompson Pty Ltd
135	Rossmar Park Pastoral Co Pty Ltd
136	Rutter EO & SA
137	Rutter PR
138	Rutter RA & DA
139	Ryan WH & EC
140	Frankham DR & DW
141	Seymour MG & CL
142	Seymour MG & Lingard CL
143	Single Tree Pty Ltd
144	Small HR
145	Shenhua Watermark Coal Pty Ltd
146	Stackman BA & Lingard KL
147	Tandim Investments Pty Ltd
148	Taylor MG Estate
149	Todman, Anthony Reginald & Jennifer Ruth
150	Thyrek Pty Ltd
151	Shenhua Watermark Coal Pty Ltd
152	Tribella Pty Ltd
153	Trustees Of The Roman Catholic Church, Diocese of Armidale
154	Shenhua Watermark Coal Pty Ltd
155	Wadwell KG & SN
156	Walhallow Local Aboriginal Land Council
157	Walhallow Murri Enterprise Aboriginal Corporation
158	Wallalla Holdings Pty Limited
159	Warren CS
160	Williewarina Pty Ltd
161	Willis SNB & RNB
162	Willis SN & MJ
163	Wilson BM & E
164	The Peel-Cuningham County Council
166	Doona State Forest
170	Coal Mines Australia Pty Ltd
171	Elsley FE & DE
172	Willis
180	Shenhua Watermark Coal Pty Ltd
189	TS&CR 32492
190	Penunga Pty Ltd
2001	Doona State Forest
2003	State of NSW
2004	State Rail Authority
2005	The Council of The Shire of Tarmang
2006	The Minister for Public Roads

Source: Miner Details Pty Ltd (2014)

CAROONA COAL PROJECT

FIGURE 3b

Relevant Land Ownership List
(as at 10 February 2014)

Resource Strategies

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4. Project Description

The Project is a proposed underground coal mining operation with an operational life of approximately 30 years.

The Project underground mining area would be located entirely within EL 6505. The Project would also involve the development and use of infrastructure required for the handling, washing, and transportation of coal.

Table 1 provides an overview of the activities associated with the Project. The Project general arrangement is shown on Figure 4.

4.1 Exploration Activities, Geological Features and Coal Resource

EL 6505 was granted to BHP Billiton in 2006 as part of a competitive tender process for a period of 5 years. EL 6505 was renewed for a further term until 22 February 2016 by Minister for Resources and Energy on 19 March 2014.

Since the grant of the EL in 2006, BHP Billiton has conducted various exploration activities, which are described in several documents, namely:

- *Exploration Environmental Management Plan for the Caroona Project – EL 6505* (July 2006) (BHP Billiton, 2006a);
- *Review of Environmental Factors for Exploration Borehole C44 – Caroona Exploration Area* (BHP Billiton, 2006b);
- *Review of Environmental Factors for Caroona Exploration Program Reconnaissance Drilling and Associated Activities 2007 to 2011* (September 2007) (BHP Billiton, 2007);
- *Review of Environmental Factors for Caroona Exploration Program Exploration Drilling and Associated Activities 2009 to 2011* (March 2009) (BHP Billiton, 2009);
- *Review of Environmental Factors for Caroona Exploration Program – EL6505 3D Seismic Survey 2010* (October 2010) (BHP Billiton, 2010a);
- *Review of Environmental Factors for Caroona Exploration Program – EL6505 3D Seismic Survey 2010 Addendum* (December 2010) (BHP Billiton, 2010b);
- *Review of Environmental Factors for Caroona Exploration Program - Large Diameter Boreholes 2011* (April 2011) (BHP Billiton, 2011a); and
- *Caroona Exploration Program – REF for Large Diameter Boreholes 2011* (June 2011) – Classification of Issues. Addendum to the original REF dated April 2011 (BHP Billiton, 2011b).

BHP Billiton's exploration program was undertaken from 2006 to 2012. Exploration activities included:

- drilling of 346 boreholes;
- airborne magnetometer survey;
- 2-Dimensional and 3-Dimensional seismic surveys; and
- ground magnetic surveys.

During the life of the Project, geological exploration activities would continue to be undertaken in areas ahead of the underground mining operations to investigate geological structure and coal quality. This would include in-seam and surface-to-seam drilling, magnetic, electromagnetic, gravimetric and seismic investigations. The findings from these activities would provide input into the detailed mine planning and engineering studies.

Targeted Exploration Areas

In 2008, BHP Billiton identified three targeted exploration areas. The targeted exploration areas on Doona Ridge and Nicholas Ridge are shown on Figure 2. A third targeted exploration area on Georges Island is not part of the proposed Development Application.

Geological Features and Coal Resource

The Project is located within the Gunnedah Basin, which forms the central part of the Sydney-Gunnedah-Bowen Basin system (DTIRS-DRE, 2014).

The formations expressed at the surface within EL 6505 include: Quaternary Alluvial Deposits; Jurassic Formations Pilliga Sandstone, Purlawaugh and Garrawilla Volcanics; Middle Triassic Napperby Formation; Early Triassic Digby Formation; and late Permian Coogal and Nea Sub Groups. The Hoskissons Seam is located within the Coogal Sub Group of the Black Jack Group and is the target seam for the Project.

Thirteen coal seams can be identified within EL 6505 within the Permian Black Jack Group, however only the Hoskissons Seam is presently considered to be economically recoverable. These minor coal seams include the Caroona, Howes Hill, Breeza, Clift, Springfields and Mooki Seams (MSEC, 2014).

Within the Project underground mining area, the Hoskissons Seam is 8 to 16 metres (m) in thickness and has a depth of cover between 130 and 710 m (MSEC, 2014). Once mined and processed, the Hoskissons Seam is expected to produce mainly energy (thermal) coal.

The target recoverable coal within the target seam in the underground mining area is approximately 260 Mt of ROM coal.

4.2 Project General Arrangement

The indicative mining layout and surface infrastructure is shown on Figure 4. The main activities associated with the Project are provided in Table 1.

4.3 Development Activities

The Project would consist of two distinct construction phases, one initial phase commencing in Year 1 of the Project focused on Doona Ridge and taking approximately 3 years and a second phase in approximately Year 15 of the Project focused on Nicholas Ridge, with a duration of approximately 18 months.

The following is a general description of the construction activities that would be common to each phase.

Underground Mine Development

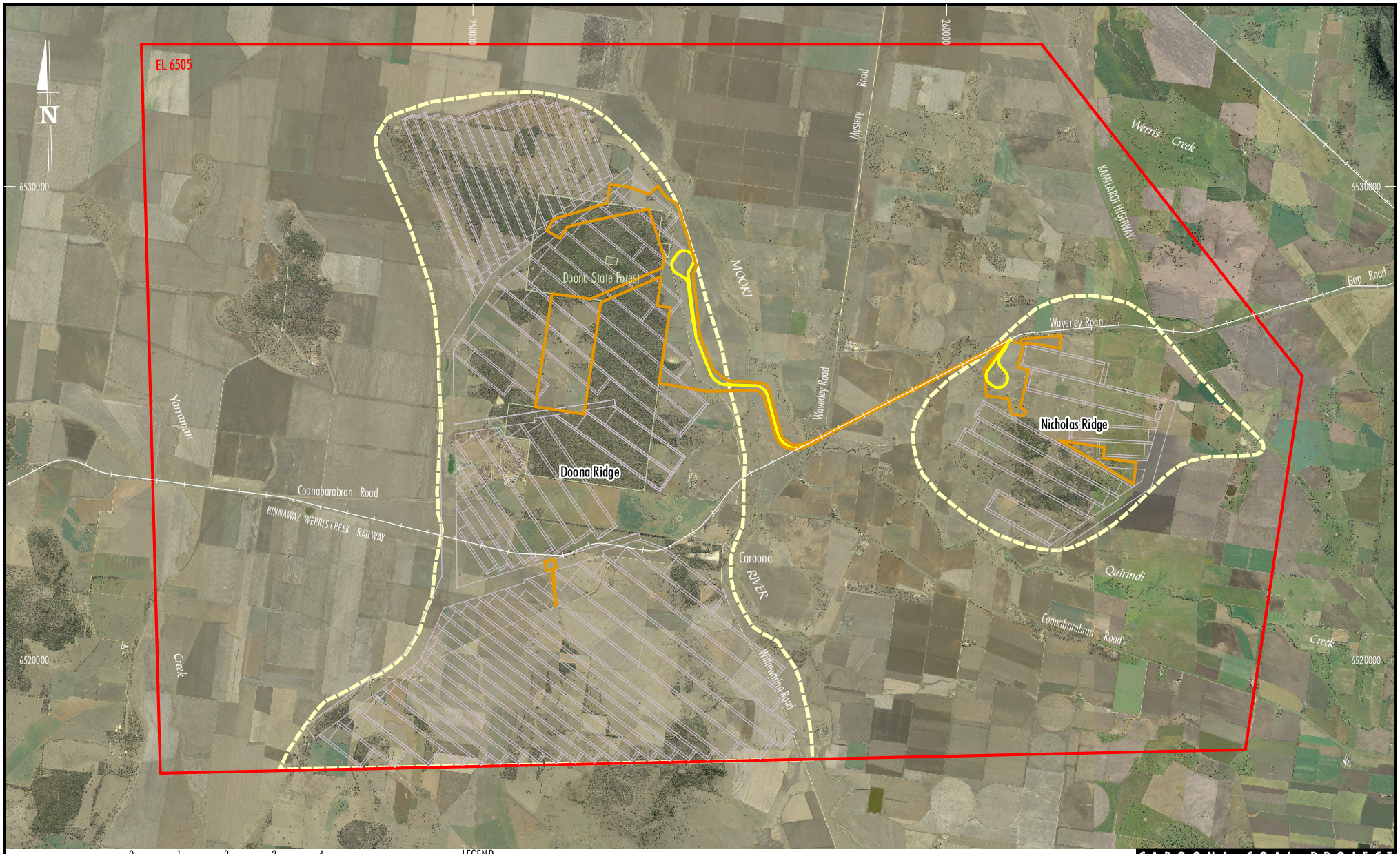
Specific underground mine development activities would include:

- initial underground access and portal development to enable the commencement of the men and material and conveyor drifts;
- construction of men and material and ventilation shafts;
- use of overburden associated with excavations for construction fill and emplacement of excess overburden;
- development of underground main roadways and gate roads for longwall panels;
- delivery and assembly of mining equipment; and
- installation of underground conveyors.

4. Project Description
continued

Table 1. Overview of the Caroona Coal Project

Project Feature	Project
Mine Life	Operational life of approximately 30 years.
Mining Method and ROM Coal Production	Longwall mining in the Hoskissons Seam. Production of approximately 260 Mt of ROM coal over the life of the mine. Production of up to approximately 10 Mtpa of ROM thermal coal.
Mining Areas	Doona Ridge and Nicholas Ridge areas.
Mine Infrastructure Areas and Mine Access	Development and operation of a mine infrastructure area comprising administration offices, bathhouse, workshop, store, coal stockpile areas, bunded hydrocarbon tanks, laydown areas, car parking, electrical substation and associated linear infrastructure and access road on Doona Ridge. Development and operation of a men and materials shaft on southern Doona Ridge with access off 4D Road. Development and operation of a mine infrastructure area comprising coal stockpiles, bathhouse, car parking, administration offices, linear infrastructure and an access road on Nicholas Ridge. Road access to Doona Ridge off Rossmar Park Road and Nicholas Ridge off Waverley Road. Construction and operation of train load-out facilities including a rail spur and loop at Doona Ridge and Nicholas Ridge.
CPP and Transport Infrastructure	Construction and operation of coal handling infrastructure on Doona Ridge for sizing and handling of coal, incorporating an event CPP (1 Mtpa ROM coal capacity) for washing of occasional high-ash ROM coal. Construction and operation of coal handling infrastructure on Nicholas Ridge for sizing and handling of coal. Development and operation of a rail spur and loop and coal loading infrastructure on both Doona Ridge and Nicholas Ridge to allow access to the Binnaway-Werris Creek Railway. Construction and operation of a coal unloading facility on Doona Ridge to allow the transportation of high-ash ROM coal from Nicholas Ridge to Doona Ridge for washing at the CPP. Co-disposal of fine and coarse rejects in an emplacement on Doona Ridge, with rejects to be transported within an infrastructure corridor.
Ventilation and Gas Drainage	Development of ventilation shafts and gas drainage infrastructure. Construction and operation of a connecting gas pipeline between infrastructure areas.
Water Management	Development of a water management system comprising of water storages, sumps, pumps, pipelines, sediment control, mine dewatering and sewage treatment. Development of a water management strategy based on a detailed site water balance which may include reuse of water on-site, storage of water on-site, licensed water extraction for water supply and/or treatment and beneficial use or controlled licensed release of excess water. Construction and operation of a connecting water pipeline between infrastructure areas.
Hours of Operation	24 hours per day, seven days per week, including drift construction and development.
Operational Workforce	Up to approximately 400 personnel at peak production.
Power Supply	Construction and use of internal power reticulation infrastructure (substations and internal transmission lines) as required. Construction and operation of a 132 kilovolt (kV) electricity transmission line from the Werris Creek substation to the Caroona Coal Project (subject to separate approvals).
Exploration	Ongoing exploration activities within EL 6505.
Monitoring of Subsidence Impacts	Monitoring of subsidence and subsidence impacts over the proposed underground mining and mine development areas.
Remediation and Rehabilitation Works	Progressive rehabilitation of surface disturbance areas (e.g. exploration drill pads). Ongoing remediation of subsidence effects. Rehabilitation of mine related infrastructure areas at the end of the Project life.
Construction Workforce	Average number of construction employees approximately 400 with up to 600 at peak construction.



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4. Project Description
continued

Coal Handling Infrastructure
- surface conveyors;
- CPP;
- train load-out facility including rail spur and loop; and
- ROM and product coal stockpiles.

Site Access and Services
- on-site power substation and reticulation infrastructure;
- access road from Rossmar Park Road (Doona Ridge) and Waverley Road (Nicholas Ridge);
- partial relocation of Rossmar Park Road;
- development of administration offices, bathhouse, workshop compound, store buildings, bunded fuel tank, laydown areas and car parking;
- construction of water management and mine dewatering infrastructure, including sumps, pumps, pipelines, water storages and other water management equipment and structures; and
- installation of ancillary infrastructure (e.g. internal roads, electrical infrastructure, potable water supply, sewage treatment, visual screens/bunds and site security).

Construction Activities Specific to Doona Ridge
Doona Ridge would be the initial and main mine infrastructure area for the Project and, therefore, several construction activities would be specific to this area, namely:
- construction of a 1 Mtpa event CPP for the washing of occasional high-ash coal;
- development of emplacements for the co-disposal of CPP rejects;
- establishment of an infrastructure corridor for the CPP to the rejects emplacement;
- construction of a rail unloading facility for occasional unloading of Nicholas Ridge coal at Doona Ridge; and
- construction of a separate men and materials shaft off 4D Road.

Ongoing Construction Activities
Ventilation and gas drainage infrastructure on the surface would be required for the Project. Preliminary engineering studies have indicated that gas management can be achieved through a combination of surface and underground (in-seam) gas drainage techniques.

The requirement for surface gas drainage infrastructure would be determined through further detailed coal seam gas content analysis and mine planning.

The final location of the ventilation and (if required) gas drainage infrastructure would be determined through detailed mine planning, environmental assessment outcomes and consideration of alternatives.

Ventilation and gas drainage infrastructure would progressively be constructed over the life of the Project as required.

Waste Rock Management
Waste rock would be excavated during the construction of access drifts and shafts for the Project. Waste rock would be preferentially used as a source of construction for infrastructure items such as hardstand areas, dam embankments and road embankments.

As part of the Project mine planning and environmental assessment process, BHP Billiton would determine the volume of excess waste rock and location of emplacement areas.

4.4 Underground Mining Operations

Underground Mining Area
The Project would involve mining from a single coal seam (Hoskissons) on Doona Ridge and Nicholas Ridge using longwall mining methods for a period of approximately 30 years. The proposed underground mining layout is shown on Figure 4.

Longwall mining involves extraction of rectangular panels of coal defined by underground roadways constructed around each longwall. The longwall mining machine travels back and forth across the width of the coal face progressively removing coal in slices from the panel.

Once each slice of coal is removed from the longwall face, the hydraulic roof supports are moved forward, allowing the roof and a section of the overlying strata to fall behind the longwall machine (referred to as forming the 'goaf').

Extraction of coal by longwall mining methods results in the vertical and horizontal movement of the land surface. The land surface movements are referred to as subsidence effects.

The layout and design of longwall panels is continually being refined and developed through an iterative process as part of the subsidence assessment, environmental assessment and BHP Billiton's mine planning process.

Replacement underground mining equipment would be required over the life of the Project in order to maintain production capacity.

Pre-mining gas extraction would generally be facilitated by either vertical wells directly from the surface to the coal seam or via underground cross panel drilling and drainage of the gas through an underground collection system to infrastructure on the surface.

Post-mining gas extraction would be undertaken by either vertical wells directly into the goaf to the surface or via underground drilling methods into the goaf. Underground techniques include the use of a goaf gas sewer system whereby a large diameter drill hole is angle drilled from the surface to approximately 10 m above the coal seam and connected to gas infrastructure on the surface. Gas would generally be flared via flaring facilities located on the surface; however, BHP Billiton may investigate other options to manage gas.

Other associated infrastructure and activities would include:
- personnel and materials access via transport drifts from the mine infrastructure areas at both Doona Ridge and Nicholas Ridge;
- personnel access via a separate men and materials shaft;
- materials handling and transport systems to convey coal from the longwall machine to the surface;
- underground equipment (e.g. longwall mining machine, continuous miners, conveyors, bins) and mobile fleet (e.g. load haul dump vehicles, drill rigs, shuttle cars, personnel carriers);
- ventilation systems for air intake and to exhaust air from the mining area;

4. Project Description
continued

- a gas pipeline to allow the transfer of gas between infrastructure areas;
- gas management systems to monitor and control the concentrations of gases in the underground mining area;
- underground goaf gas drainage via large diameter drill holes above the longwall panels and gas extraction via a gas 'sewer' system to gas infrastructure on the surface;
- gas drainage infrastructure in areas owned by BHP Billiton or with the consent of private landholders;
- flaring facilities on the surface; and
- water management systems to transfer groundwater that accumulates in underground workings to the surface.

The location of surface infrastructure (where required) would be agreed through detailed mine planning, environmental assessment outcomes and consideration of alternatives, and would be documented in the EIS.

4.5 Product Coal Stockpiling, Handling and Transport

Doona Ridge and Nicholas Ridge would have separate facilities for handling ROM coal. ROM coal would be stockpiled prior to being sized and conveyed to the product coal stockpile.

Washing (or beneficiation) of all of the ROM coal is not required for the Project given it is generally of a high enough quality to be exported. Notwithstanding, an event CPP with a production rate of up to 1 Mtpa is proposed at Doona Ridge which would be operated during occasional periods where high-ash coal is produced. Sized ROM coal processed in the CPP would be conveyed to the Doona Ridge product coal stockpile.

Product coal would be reclaimed from the product coal stockpile and conveyed to product coal bins located at both of the rail loops (i.e. at Doona Ridge and Nicholas Ridge).

Product coal would then be loaded onto trains for transportation to market.

Some high-ash ROM coal mined at Nicholas Ridge would also be processed at the Doona Ridge CPP. This would be facilitated by transportation of high-ash ROM coal from Nicholas Ridge via train to a coal unloader at Doona Ridge, where this coal would be conveyed to the CPP for processing.

Operation of the CPP would produce some coarse and fine rejects. These rejects may be co-disposed in an emplacement on the western side of Doona Ridge (in the property known as 'Doona Vale'). Any rejects would be transported to the emplacement via an infrastructure corridor.

4.6 Water Management Infrastructure and Services

A site water balance will be developed for the Project. The Project water management strategy would be developed as part of the site water balance and would be based on the following:

- separation of undisturbed area runoff from disturbed area runoff;
- collection and reuse of surface runoff from disturbed areas;
- capture of groundwater inflows and reuse;
- storage of water on-site;
- licensed water extraction to supplement water supply;
- consideration of flood impacts on surface infrastructure; and
- treatment and beneficial use or licensed controlled release of excess water.

Water management infrastructure such as sumps, pumps, pipelines and water storages would be developed or upgraded/replaced as required over the Project life. In addition, a pipeline would be constructed for the transfer of water between the infrastructure areas.

4.7 Power Supply

A 132 kV electricity transmission line would be constructed from the Werris Creek substation to the Project. Discussions with the relevant power authority (Essential Energy) and engineering studies are ongoing to determine the physical alignment of the electricity transmission line.

The electricity transmission line would be subject to a separate approval under Part 5 of the *Environmental Planning and Assessment Act, 1979*.

Construction and use of substations and power supply infrastructure for internal power reticulation would be required for the Project and approval for this infrastructure would be sought as part of the Project.

4.8 Workforce

The average number of construction employees would be approximately 400 with up to 600 employees at peak construction.

During operations, a peak workforce of approximately 400 employees would be required.

4.9 Rehabilitation Activities, Remediation Works and Offsets

Other activities that would be conducted as a component of the Project include exploration, monitoring, remediation of subsidence impacts (Plates 3 and 4), rehabilitation of surface disturbance, establishment and management of biodiversity offsets and development of other associated minor infrastructure, plant, equipment and activities.

Plate 3. Example of Subsidence Remediation

4. Project Description
continued

4.10 Summary of Project Disturbance Area

Approximately 2,215 ha of Protocol Verified BSAL[1] has been identified within the Project Assessment Area by McKenzie Soil Management (2014). Approximately 2,103 ha of Protocol Verified BSAL within the Project Assessment Area is predicted to experience subsidence impacts.

Approximately 459 ha of Potential BSAL, as mapped by the NSW Government, is located on land within the Project Assessment Area where no access was available for ground survey. Of this, approximately 56 ha is expected to experience subsidence within the Project Assessment Area. Project surface disturbance would involve only minor surface disturbance to BSAL associated with temporary gas drainage and water management infrastructure.

4.11 Activities unrelated to the Gateway Application

The following activities would be required for the Project however would not require a mining lease and therefore do not fall within the definition of "mining or petroleum development" under clause 17A of the Mining SEPP:

- Rail loops and spurs at Doona Ridge and Nicholas Ridge.
- Connecting water and gas pipelines between Doona Ridge and Nicholas Ridge.

Accordingly, these activities would not require a Gateway Certificate and have been excluded from this Gateway Application where they are located outside the Project Assessment Area. These activities would be described and assessed in the EIS.

The 132 kV electricity transmission line constructed from the Werris Creek substation to the Project would be subject to a separate approval and is not included in this Gateway Application.

4.12 Consideration of alternatives and Project Justification Overview

Project Alternatives

As discussed in Section 1.3, the Project underground mining area has been positioned underneath Doona Ridge and Nicholas Ridge Project Assessment Area to minimise impacts on the alluvial plains within EL 6505. Alternatives to the proposed location, scale and mining methods have been considered by BHP Billiton in the development of the Project description. An overview of the alternatives considered is provided below:

- **Project Location –** the location of the Project is determined by the presence of coal seams able to be economically mined in the Doona Ridge and Nicholas Ridge Project Assessment Area. The Project mine plan is positioned beneath the Doona and Nicholas Ridge areas to minimise impacts on the surrounding agricultural practices. A third ridge, Georges Island, has been considered for mining; however does not form part of the proposed Development Application.
- **Surface Facilities –** The proposed pit top locations were determined based on distance and depth to the Hoskissons Seam (i.e. to reduce costs associated with the personnel and conveyor drifts). The proposed construction of a men and materials shaft on Doona Ridge was determined on the basis of providing alternate underground access, and therefore more efficient commuting of employees to the southern portion of the longwall panels on Doona Ridge. The location of the men and materials shaft on Doona Ridge was also sited to minimise impacts on BSAL.
- **Scale –** the Project coal yield is estimated at approximately 260 Mt of ROM coal within the Hoskissons Seam. Resource definition and exploration drilling conducted by BHP Billiton indicates that this is the optimum scale of the Project.
- **Mining Method –** BHP Billiton has considered alternate methods of mining, however the depth of cover means that the coal resource is amenable to underground mining methods and open cut mining is not proposed. Longwall extraction has been determined to be the most efficient method of mining the coal resource relative to other underground mining methods (e.g. bord and pillar mining), and has reduced impacts relative to open cut mining methods.

Further consideration of alternatives to location, scale, methods and management would be undertaken as a component of comprehensive assessment undertaken for the EIS.

Project Justification

The Project would facilitate the creation of employment opportunities for up to approximately 400 employees during the operational phase at peak production. Employment of up to approximately 600 personnel would be required for the construction of the Project. The construction phase would take approximately 3 years.

The Project is expected to invest significant capital over 30 years, to be defined in the EIS. The Project would also result in the payment of substantial royalties to the State, in addition to other Federal Government contributions, such as the Mineral Resources Rent Tax and other payments.

Further analysis of the justification for the Project on social, environmental and economic grounds will be included in the EIS.

Plate 4. Fencing of Subsidence Cracks Prior to Remediation

[1] BSAL that has been identified through ground survey in accordance with the *Strategic Regional Land Use Policy – Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government, 2013) and, where no access was available for ground survey, has been interpreted as BSAL based on continuity with adjacent BSAL dominant soil landscape units (McKenzie Soil Management, 2014).

5. Strategies to Minimise Potential Impacts on Strategic Agricultural Land

5.1 Mine Planning and Design

The Project underground mining area has been positioned underneath the Doona Ridge and Nicholas Ridge Project Assessment Area to minimise impacts on the alluvial plains within EL 6505.

The mine infrastructure area and coal handling and preparation plan reject emplacement areas have been located to avoid impacts on BSAL.

Further iterative mine planning and design would be undertaken in consideration of environmental impact assessment outcomes that emerge from EIS studies.

5.2 Subsidence Management

The preliminary subsidence assessment includes the adoption of subsidence control measures in both the northern and south-western portions of the Doona Ridge mine plan. In these areas, the extraction height will be decreased and/or the panel width reduced to achieve the same level of subsidence control obtained elsewhere across the mine plan. These Subsidence Control Zones have been included in the subsidence assessment (MSEC, 2014) and will be further reviewed and revised and documented in the EIS.

The subsidence assessment for the Gateway Assessment has focused on those aspects of the physical and built environment that are relevant to agricultural production. Other aspects of the built environment will be addressed in the EIS.

Prior to causing any subsidence, the Project would be required to prepare and submit a Subsidence Management Plan (SMP) for approval by the DTRIS-DRE. This is an approval required by standard conditions of mining leases for underground coal mines in NSW.

In addition, it is likely that any Development Consent would include a requirement for an Extraction Plan that would be prepared to the satisfaction of DP&I.

SMPs and/or Extraction Plans would be required to include a Property Subsidence Management Plan (PSMP) for each individual property that may be affected by subsidence.

A PSMP would be provided to the landholder/ occupier prior to mining in the area and would include:

- a plan of the property in relation to the final mining layout;
- details of predicted subsidence impacts and associated probabilities of these impacts occurring;
- the expected timeframe of mine subsidence;
- a specific subsidence monitoring plan to monitor subsidence impacts during and following mining, including visual inspections and structure surveys;
- implementation of appropriate pre-mining mitigation measures to minimise impacts, where appropriate;
- development of appropriate remedial measures for any subsidence impacts; and
- a process to mitigate, repair, replace or compensate any impacts in a timely manner.

Potential mitigation and management strategies are provided in Table 2.

5.3 Management of Water Resources

Management of water resources would include:

- management of potential impacts on groundwater users;
- holding appropriate water licences under the *Water Management Act, 2000* for any water taken directly or incidentally for the Project; and
- ongoing groundwater monitoring and validation of the groundwater model throughout the Project life.

These aspects are described further below.

Management of Potential Impacts on Groundwater Users

As part of the Gateway Assessment, over 100 bores were inspected to confirm their location, hydrogeological characteristics and usage (i.e. a bore census).

BHP Billiton has commenced a second stage of the bore census in consultation with relevant landholders to confirm the status, location and details of the bores not yet inspected in order to inform further impact assessment work planned for the EIS.

Consistent with the Namoi Catchment Water Study (Schlumberger Water Services, 2012) and the Aquifer Interference Policy (AIP), BHP Billiton has committed to "make good" provisions for any groundwater users adversely affected by mine operations and associated impacts.

This includes provision of alternative water supply or remedial works. Such measures would be documented in a Groundwater Management Plan prior to the commencement of longwall mining operations and would include:

- A Trigger Action Response Plan for identifying groundwater triggers and appropriate actions that would be invoked.
- Identifying mitigation measures including consideration of deepening of existing wells or bores, relocation of the bore and/or provision of an alternate water supply.

Water Licensing

Under the *Water Management Act, 2000*, all water taken by aquifer interference activities is required to be accounted for within the extraction limits set by any relevant Water Sharing Plans. The Water Sharing Plans relevant to the Project include:

- *Upper and Lower Namoi Groundwater Sources 2003*;
- *NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*;
- *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Spring Ridge]); and
- *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Other]).

The predicted annual groundwater volumes required to be licensed over the life of the Project are summarised in Table 3.

BHP Billiton holds several Water Access Licences that are available for the Project:

- WAL12931 (422 units – Upper and Lower Namoi Groundwater Sources 2003 Zone 8).
- WAL14550 (215 units – Upper and Lower Namoi Groundwater Sources 2003 Zone 8).[1]
- WAL 36496 (1,000 units *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Other]).

[1] Supplementary water access licences valid to 1 July 2015.

5. Strategies to Minimise Potential Impacts on Strategic Agricultural Land
continued

Table 2. Potential Subsidence Mitigation and Management Strategies

Surface Cracks and Deformations	Drainage Lines, Ponding and Water Infrastructure	Cropping Areas (Irrigated and Dryland)	Grazing Areas
• Visual monitoring of the surface in the active subsidence zone, to identify larger surface cracking and deformations that could affect safety, access, or increase erosion. • Establish methods for surface remediation, which could include: – infilling of surface cracks with soil or other suitable materials; or – by locally regrading and recompacting the surface. • Establishment of erosion protection measures may be needed, such as the planting of vegetation in order to stabilise the steeper slopes in the longer term. • Refinement of the proposed Subsidence Control Zones as part of an adaptive management approach. • Develop PSMPs incorporating the agreed methods to manage surface cracking and deformations with each of the property owners.	• Visual monitoring of the surface in the active subsidence zone, to identify larger surface cracking and deformations which could result in increased potential for erosion. • Establish methods to regrade the drainage lines or contour banks in the locations where adverse impacts occur. • Establish methods of remediation of the surface cracking, which could include infilling with soil or other suitable materials, or by locally regrading and recompacting the surface. On steeper slopes, erosion protection measures may be needed, such as providing rip-rap.	• Visual monitoring during active subsidence. • Establish methods to adjust the fences and irrigation systems. • Use of alternative crops to reduce potential for erosion. • Establish methods to remediate larger surface cracks which could adversely impact on the crops or associated infrastructure. • Develop a PSMP incorporating the agreed methods to manage surface cracking and deformations with the property owner.	• Visual monitoring of the surface in the active subsidence zone, to identify any surface cracking and deformations which could potentially injure stock or people. • Consider the installation of temporary fencing and/or the temporary relocation of stock to areas outside the active subsidence zone. • Establish methods of remediation, which could include infilling of surface cracks with soil or other suitable materials, or by locally regrading and recompacting the surface. • Develop PSMPs incorporating the agreed methods to manage surface cracking and deformations with the property owners.

Table 3. Project Groundwater Licensing Summary

Water Sharing Plan	Management Zone/ Water Source	Predicted Interim Annual Water Takes requiring Licensing (ML/year)	
		During Mine Operation	Post-Mine Operation
Upper and Lower Namoi Groundwater Sources 2003	Zones 1, 3, 6, 7, 8 and 10	Avg. 363 Max. 458	Avg. 167 Max. 487
NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011	Liverpool Ranges Basalt MDB	Avg. 9 Max. 10	Avg. 4 Max. 9
NSW Murray Darling Basin Porous Rock Groundwater Sources 2011	Gunnedah–Oxley Basin MDB (Spring Ridge)	Avg. 2 Max. 6	Avg. 6 Max. 11
NSW Murray Darling Basin Porous Rock Groundwater Sources 2011	Gunnedah–Oxley Basin MDB (Other)	Avg. 1,033 Max. 2,301	Avg. 88 Max. 254

Source: HydroSimulations (2014).

BHP Billiton has or will obtain appropriate licences under the *Water Management Act, 2000*.

BHP Billiton will continue to investigate opportunities to obtain licences in the *NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* (Liverpool Ranges Basalt) and *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Spring Ridge]); as well as additional licences in the *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Other]). BHP Billiton would also trade or transfer its existing allocation under WAL12931 to different Upper and Lower Namoi Groundwater Sources 2003 Zones, as necessary.

5.4 Rehabilitation

Minor Project surface disturbance areas that would be progressively rehabilitated include those associated with surface exploration activities, surface gas drainage works, service boreholes, access tracks, environmental monitoring and management activities (e.g. installation of monitoring equipment) and mine subsidence surface impacts. These areas would be rehabilitated to their previous land use (e.g. agricultural use or native vegetation).

Other surface disturbance areas, including the mine infrastructure area, would be rehabilitated at the cessation of the Project.

5. Strategies to minimise potential impacts on strategic agricultural land
continued

The final land use of the mine infrastructure area would include areas for agricultural land uses and would be determined through the EIS process, as it requires detailed consultation with relevant stakeholders.

Soil resource management practices would involve the stripping and stockpiling of soil resources prior to any mine-related disturbance.

The objectives of soil resource management for the Project would be to:

- Identify and quantify potential soil resources for rehabilitation.
- Optimise the recovery of useable topsoil and subsoil during stripping operations.
- Manage topsoil and subsoil reserves so as not to degrade whilst stockpiled.
- Establish effective soil amelioration procedures to maximise the availability of soil for future rehabilitation.
- Take into account the need to provide soil conditions that minimise the risk of soil loss via wind and water erosion during and after rehabilitation.

McKenzie Soil Management has developed soil resource management measures that would be considered in the preparation of the EIS and Rehabilitation Management Plan for the Project.

Plate 5. Soil Investigation

6. Consideration of Gateway Criteria for Biophysical Strategic Agricultural Land

6.1 Assessment of Biophysical Strategic Agricultural Land

An assessment of BSAL within the Project Assessment Area was conducted by McKenzie Soil Management (2014). Verification included 404 soil test pits across the Project Assessment Area and surrounds, in accordance with the *Strategic Regional Land Use Policy – Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government, 2013) (Plate 5). The above protocol outlines 12 steps that must be satisfied to meet BSAL characteristics (Figure 5).

BSAL mapping for the Project is shown on Figure 6. The majority of soil test pits did not meet the criteria for BSAL, with subsoil salinity being the main limiting factor (McKenzie Soil Management, 2014).

6.2 Consideration of Gateway Criteria

The AIA prepared by La Tierra (2014) includes an assessment of the potential impacts of the Project on BSAL, including consideration of the relevant criteria in the Mining SEPP. A summary of this assessment is provided in Table 4. The assessment indicates that the Project would not significantly reduce the agricultural productivity of any BSAL.

The majority of Project infrastructure which is the subject of this Gateway Application would not be located on verified BSAL. However, the Project would also involve minimal temporary disturbance to BSAL associated with ventilation and gas drainage infrastructure, service boreholes, exploration activities and remediation activities.

La Tierra (2014) notes that for the mining of any coal resource, the underground longwall mining method has lower-order potential impacts on agriculture than open cut mining.

Potential Subsidence Impacts

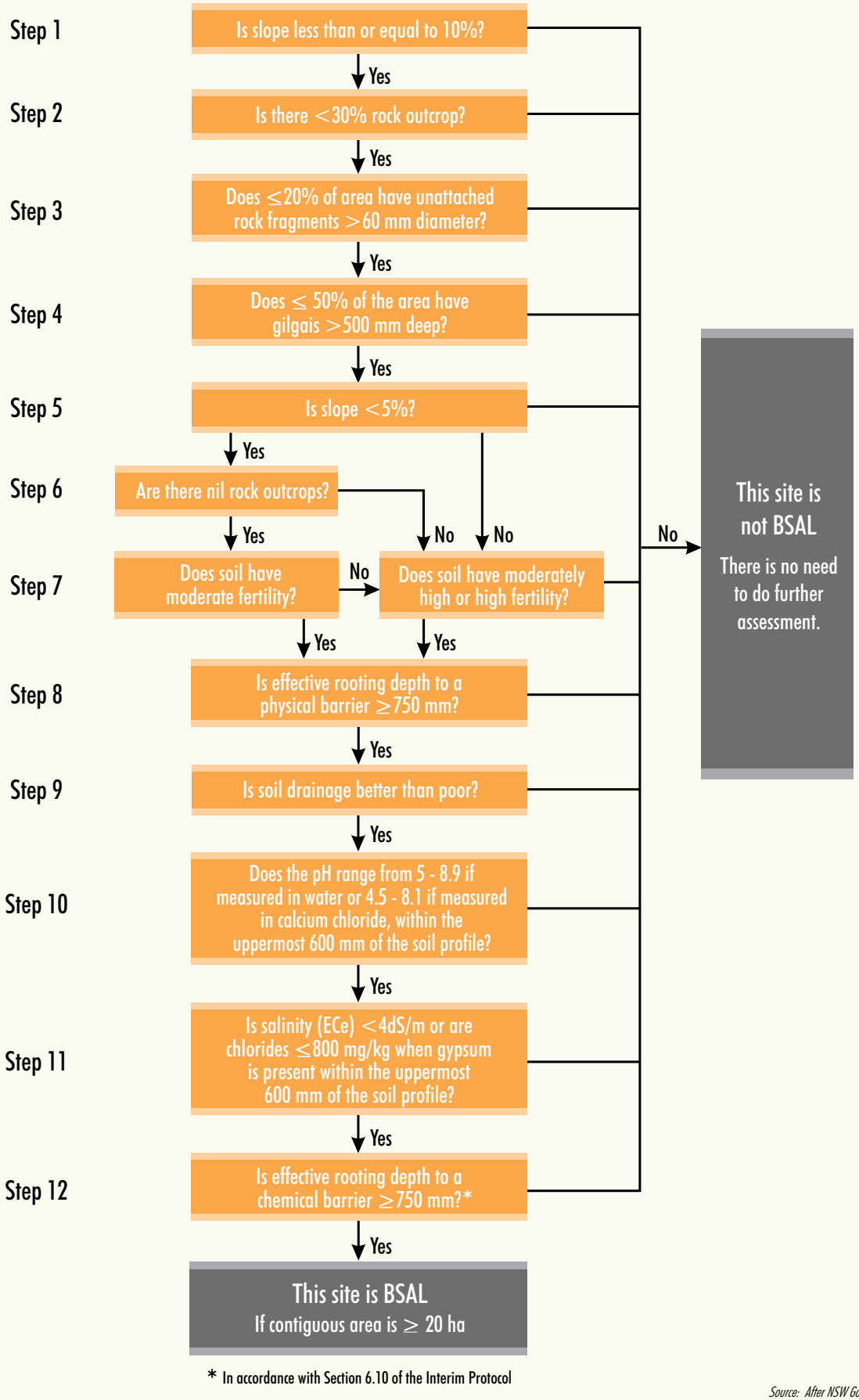
La Tierra has assessed the potential impacts of subsidence on BSAL supported by a Subsidence Assessment prepared by MSEC.

Mine subsidence may cause surface cracking and landform changes, changes to water drainage, changes to surface water resources, changes to groundwater resources and impacts to built features. Subsidence may also result in changes in gradient of surface drainage features, both natural and manmade (such as contour banks). This may lead to ponding above longwall panels in some cases (MSEC, 2014).

BHP Billiton and MSEC have investigated Subsidence Control Zones for the Project to achieve consistent subsidence control across the mine plan. These Subsidence Control Zones would be reviewed and revised for the EIS.

The predicted total maximum subsidence varies due to depth of cover and extraction height (i.e. extraction height is reduced in the Subsidence Control Zones) and is predicted to be between 1.6 and 3.1 m.

The predicted strains vary across the Project underground mining area depending on the local depth of cover. A summary of predicted crack widths is provided in Table 5.



* In accordance with Section 6.10 of the Interim Protocol

Source: After NSW Government (2013)

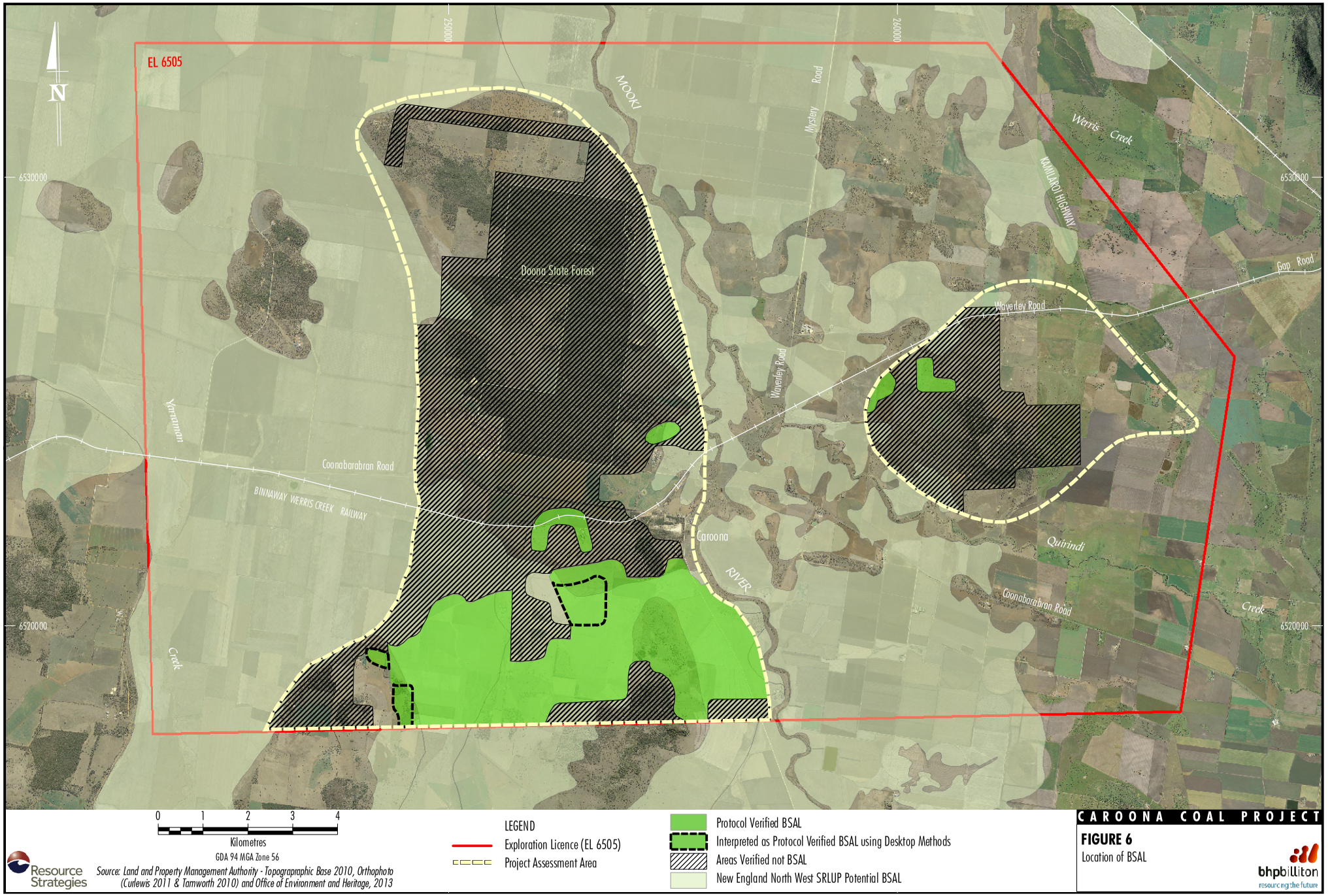
CAROONA COAL PROJECT

FIGURE 5
Flow Chart for Site Vertication of Biophysical Strategic Agricultural Land

Resource Strategies

bhpbilliton

HVE-13_02 _Gateway_TO_004C



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6. Consideration of Gateway Criteria for Biophysical Strategic Agricultural Land
continued

Table 4. Consideration of Relevant Criteria for Biophysical Strategic Agricultural Land

Criteria[1]	Assessment
(i) any impacts on the land through surface area disturbance and subsidence,	Disturbance to BSAL would be associated with subsidence and some areas of minor temporary disturbance associated with gas drainage and water management infrastructure. Approximately 2,215 ha of Protocol Verified BSAL has been identified within the Project Assessment Area. Approximately 459 ha of Potential BSAL, as mapped by the NSW Government, is located on land within the Project Assessment Area where no access was available for ground survey. Subsidence would occur as a result of longwall mining within the Project Assessment Area. Impacts on farming operations are expected to be managed such that BSAL characteristics are preserved and agricultural land uses reinstated.
(ii) any impacts on soil fertility, rooting depth or soil drainage,	The Project would not cause any long-term or permanent impacts on soil fertility, effective rooting depth or soil drainage with respect to BSAL.
(iii) increases in land surface micro-relief or soil salinity, rock outcrop, slope and surface rockiness or significant changes to pH,	The Project would cause changes to land surface micro-relief of BSAL as a result of subsidence. The Project would not cause any effects on soil salinity, rock outcrop, slope or surface rockiness or soil pH.
(iv) impacts on highly productive groundwater (within the meaning of the AIP),	The Project meets the Level 1 minimal impact considerations for highly productive groundwater outlined in the AIP for alluvial groundwater. The Project triggers the Level 2 minimal impact considerations of the AIP for the highly productive Gunnedah-Oxley Basin MDB (Spring Ridge) Water Source. BHP Billiton has committed to "make good" provisions for any groundwater users adversely affected by mine operations and associated impacts.
(v) any fragmentation of agricultural land uses,	The Project would not cause any long-term or permanent fragmentation of BSAL.
(vi) Any reduction in the area of biophysical strategic agricultural land.	The Project would not cause any reduction in the area of BSAL.

Source: After La Tierra (2014).
[1] Clause 17H(4)(a) of the Mining SEPP.

Table 5. Predicted Crack Width

Mining Area	Depth of Cover (m)	Typical Crack Widths
Doona Ridge (North)	135 – 420	25 to 100 mm
Doona Ridge (South)	395 – 710	10 to 25 mm
Nicholas Ridge	130 – 360	50 to 100 mm

Potential Impacts on Highly Productive Groundwater

HydroSimulations (2014) assesses impacts on highly productive groundwater within the framework of the AIP. The AIP framework has been developed by the NSW Government to assist with the assessment and management of activities with potential to affect groundwater resources. The AIP framework has been developed by NoW which identifies two levels of minimal impact considerations, as described below:

- Level 1 impact, which is considered acceptable.
- Level 2 impact, which requires further studies to assess whether a project will prevent the long-term viability of a dependent ecosystem or significant site, or needs other arrangements to mitigate the impacts.

Based on the findings of HydroSimulations (2014), the Project meets the Level 1 Minimal Impact Considerations of the AIP for 'highly productive' groundwater associated with the Upper and Lower Namoi Groundwater Sources, and associated with the NSW Murray Darling Basin Fractured Rock Groundwater Sources (Liverpool Ranges Basalt Murray Darling Basin).

The Project triggers the Level 2 Minimal Impact Considerations of the AIP for the 'highly productive' *NSW Murray Darling Basin Porous Rock Groundwater Sources 2011* (Gunnedah-Oxley Basin MDB [Spring Ridge]) water source. This is due to a prediction of more than 2 m predicted cumulative drawdown at some 27 water supply works.

In accordance with the AIP, this means "*that further studies to assess whether a project will prevent the long-term viability of a dependent ecosystem or significant site, or needs other arrangements to mitigate the impacts*".

Consistent with the Namoi Catchment Water Study (Schlumberger Water Services, 2012) and the AIP, BHP Billiton has committed to "make good" provisions for any groundwater users adversely affected by mine operations and associated impacts. This includes provision of alternative water supply or remedial works. Such measures would be documented in a Groundwater Management Plan prior to the commencement of longwall mining operations and would include:

- A Trigger Action Response Plan for identifying groundwater triggers and appropriate actions that would be invoked.
- Identifying mitigation measures including consideration of deepening of existing wells or bores, relocation of the bore to another aquifer and/or provision of an alternate water supply.

7. Conclusion

The Southern Plains sub-region (comprising the Gunnedah and Liverpool Plains LGA (Figure 1) has the highest agricultural productivity in NSW, with a unique combination of volcanic soils, rainfall reliability, climate (sunshine hours, moderate temperature and protection from hot westerly weather) and availability of surface and groundwater (DP&I, 2012).

The Project Assessment Area comprises elevated and gently sloping land characterised by agricultural enterprises, which include cattle grazing, forestry and both dryland and some limited irrigated cropping flanked by alluvial plains dominated by irrigated and dryland cropping.

This Gateway Application is for an underground coal mine underneath the Doona Ridge and Nicholas Ridge Project Assessment Area within EL6505. Through focusing proposed underground mining operations under these elevated and gently sloping lands, and with the implementation of other mitigation measures, the Project has been designed to minimise impacts on the alluvial plains.

Initial engagement in regard to the Gateway Application revealed reluctance on the part of some local landholders to participate in the Gateway process. Specifically, some landholders withheld access for soil test pits by McKenzie Soil Management and/or agricultural interviews with La Tierra.

Following continued engagement to communicate the purpose of these assessments in informing the Gateway Application, and the Gateway Working Group, access improved to the extent that ultimately, only a small number of landholders within the Project Assessment Area declined to participate. Notwithstanding, discussions are continuing and further soils and agricultural studies are planned to inform the EIS.

Four hundred and four soil test pits were excavated to verify BSAL within the Project Assessment Area. In addition, some 40 interviews were conducted with local stakeholders to further characterise the agricultural enterprises in the area. This Gateway Assessment is supported by the following assessments:

- AIA – La Tierra.
- Agricultural Resource Assessment – McKenzie Soil Management.
- Preliminary Groundwater Assessment – HydroSimulations.
- Subsidence Assessment – MSEC.

Up to 2,215 ha of BSAL has been verified or interpreted within the Project Assessment Area by McKenzie Soil Management. Surface infrastructure has been designed to avoid BSAL. Only minor, temporary surface disturbance activities to BSAL are proposed.

It is also noted that approximately 459 ha of Potential BSAL, as mapped by the NSW Government, is located on properties where no access was available for ground survey as part of this assessment. Most of this Potential BSAL is within the Alluvial soil landscape unit which has been found to have subsoil limitations that generally exceed the relevant BSAL criteria (McKenzie Soil Management, 2014).

BSAL within the Project Assessment Area would experience mine subsidence from the Project. Subsidence would result in some cracking on the surface; however would not affect soil fertility, effective rooting depth or soil drainage. Therefore, the Project should not result in a long-term or permanent change to the agricultural productivity of BSAL. Notwithstanding, BHP Billiton would seek to remediate any surface cracking that develops as a result of subsidence.

The groundwater assessment shows that the Project meets the 'Level 1' minimal impact considerations of the AIP for key regional 'highly productive' groundwater resources, namely the Namoi alluvium and Liverpool Ranges basalt. The Project is predicted to trigger 'Level 2' of the minimal impact considerations for the Spring Ridge water source for drawdowns of greater than 2 m at privately-owned bores. BHP Billiton has committed to 'make good' any impacts on these privately-owned bores and will continue to investigate these impacts through the conduct of a census of these bores and refinement of groundwater modelling prior to the EIS.

8. References

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BHP Billiton (2007) *Review of Environmental Factors for Caroona Exploration Program Reconnaissance Drilling and Associated Activities 2007 to 2011* (September 2007).

BHP Billiton (2009) *Review of Environmental Factors for Caroona Exploration Program Exploration Drilling and Associated Activities 2009 to 2011* (March 2009).

BHP Billiton (2010a) *Review of Environmental Factors for Caroona Exploration Program – EL6505 3D Seismic Survey 2010* (October 2010).

BHP Billiton (2010b) *Review of Environmental Factors for Caroona Exploration Program – EL6505 3D Seismic Survey 2010 Addendum* (December 2010).

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Mine Subsidence Engineering Consultants (2014) *Caroona Coal Project Gateway Application – Subsidence Assessment*.

New South Wales Government (2013) *Strategic Regional Land Use Policy - Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land (BSAL)*.

Schlumberger Water Services (2012) *Namoi Catchment Water Study.*