



# TAHMOOR SOUTH PROJECT

Preliminary Environmental Assessment

Prepared for Xstrata Coal | August 2012

## Preliminary Environmental Assessment

Tahmoor South Project

Prepared for

Xstrata Coal

Prepared by

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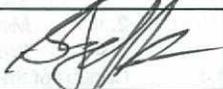
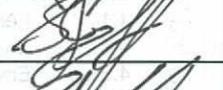
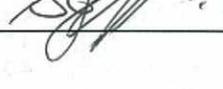
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## Abbreviations and Glossary

Abbreviation	Term/ Definition
CCL	Consolidated Coal Lease
CHPP	Coal Handling and Preparation Plant
DGRs	Director-General's requirements
DP&I	Department of Planning and Infrastructure
DTIRIS	NSW Department of Trade and Investment, Regional Infrastructure and Services
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979(NSW)</i>
EPBC Act	<i>Environment Protection and Biodiversity Act 1999 (Cth)</i>
EPL	Environment Protection Licence
Goaf	The goaf is the part of a longwall mine from which the coal has been partially or totally removed. After longwall mining is complete, typically, the roof collapses filling the void.
Inbye	Direction that is further into the mine from the longwall. Additionally, inbye can also refer to a direction that is further into the mine from a current position in the mine.
LGA	Local Government Area
Mining SEPP	<i>State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
ML	Mining Lease
Mtpa	Million tonnes per annum
Outbye	Direction that is further out from the longwall. Additionally, outbye can also refer to a direction that is further out of the mine from a current position in the mine.
PEA	Preliminary Environmental Assessment
Proposed development, the	The Tahmoor South Project
PRP	Pollution Reduction Program
REA	Rejects (refuse) emplacement area
RNE	Register of the National Estate

Abbreviation	Term/ Definition
ROM	Run of mine. The mined material that is conveyed to the Coal Handling and Preparation Plant. This material may consist of coal and rock.
SEPP	State Environmental Planning Policy
SEPP 33	<i>State Environmental Planning Policy 33 – Hazardous and Offensive Development</i>
SEPP 44	<i>State Environmental Planning Policy 44 – Koala Habitat Protection</i>
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SSTF	Shale Sandstone Transition Forest
TSC Act	<i>Threatened Species Conservation Act 1995 (NSW)</i>
Wingecarribee LEP 2010	<i>Wingecarribee Local Environmental Plan 2010</i>
WinSC	Wingecarribee Shire Council
Wollondilly LEP 2011	<i>Wollondilly Local Environmental Plan 2011</i>
WSC	Wollondilly Shire Council

## Executive Summary

Xstrata Coal has owned and operated the Tahmoor Colliery since 2007. Current mining operations are forecast to continue until 2021.

This Preliminary Environmental Assessment (PEA) has been prepared on behalf of Xstrata Coal in support of an application for the construction and operation of the Tahmoor South Project (the proposed development). The proposed development would involve underground mining of coal resources using longwall mining methods from within coal leases held by Xstrata Coal, to the south and east of the existing Tahmoor Colliery pit top. The proposed development would also include upgrade and use of the existing Tahmoor Colliery pit top facilities for the proposed 15 year operational life of the Tahmoor South Project from 2021.

The proposed development is described in this PEA in the context of environmental planning issues likely to be key to the preparation of an Environmental Impact Statement under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979*. The information contained in the PEA is intended to guide the Department of Planning and Infrastructure in issuing Director-General's requirements for the proposed development.

### The Proposed Development

The proposed development includes longwall mining operations to extract coal from the Bulli seam within Consolidated Coal Leases (CCL) 716 and 747, as well as upgrades to existing surface infrastructure at Tahmoor Colliery. Approval will be sought, under a new development application, for the:

- Construction of underground mining infrastructure to enable extraction of up to five million tonnes per annum of run of mine (ROM) coal from the Bulli seam and conveyance to Tahmoor Colliery for processing using existing infrastructure;
- Construction and operation of a mine ventilation system;
- Upgrades to the existing materials handling facilities and ancillary infrastructure;
- Staged expansion of the existing rejects emplacement area;
- Gas drainage and management;
- Coal exploration within CCL 747 and CCL 716; and
- Rail transport of product coal to Port Kembla.

The proposed development is permissible with consent under clause 7 of *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) as it is classified as "underground mining carried out on any land". The proposed development would be located within the Wollondilly and Wingecarribee Local Government Areas (LGAs) on land subject to the *Wollondilly Local Environmental Plan 2011* and *Wingecarribee Local Environmental Plan 2010*.

The proposed development is declared to be State Significant Development, for the purposes of the *Environmental Planning and Assessment Act 1979*, under clause 8 and Schedule 1 of *State Environment Planning Policy (State and Regional Development) 2011* as it constitutes development for the purposes of coal mining.

### Key Environmental Issues

Construction and operation of the proposed development would be carried out with the principal aim of avoiding environmental and social impacts where reasonable and feasible to do so. Key environmental assessment issues identified for the proposed development are:

- Mining induced subsidence effects;
- Surface water;
- Groundwater; and
- Ecological.

Other environmental issues that would be considered in the Environmental Impact Statement but are not considered as key environmental assessment issues include:

- Heritage, both Aboriginal and European;

- Land use implications;
- Air quality;
- Noise and vibration;
- Traffic and transport;
- Social and economic effects;
- Visual amenity and landscape;
- Hazard and risk;
- Greenhouse gas; and
- Waste.

Assessments would be undertaken as part of the preparation of the Environmental Impact Statement to investigate and present the potential environmental, social and cumulative impacts of the proposed development. These assessments would identify mitigation and safeguard measures to minimise potential impacts.

## 1.0 Introduction and Background

Xstrata Coal owns and operates Tahmoor Colliery, an underground coal mine south-west of Sydney in the Southern Coalfields of NSW (**Figure 1**). Xstrata Coal produces up to two (2) million tonnes per annum (Mtpa) of product coal from its existing operations at the Tahmoor Colliery.

Xstrata Coal is seeking approval for the Tahmoor South Project (the proposed development), an underground coal mine, which would be located south and east of Xstrata Coal's existing Tahmoor Colliery pit top. The proposed development would be an underground mine, accessed via the existing surface infrastructure facilities at Tahmoor Colliery.

This report provides the Preliminary Environmental Assessment (PEA) for the proposed development for the purpose of identifying Director-General's requirements (DGRs) for an Environmental Impact Statement (EIS) under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

### 1.1 Background

#### 1.1.1 History of Tahmoor Colliery

Geological exploration of coal resources at Tahmoor was undertaken in the early 1970's by Clutha Development Pty Ltd. Clutha obtained approval in 1975 for the underground coal mine, followed by a separate approval for the Coal Handling and Preparation Plant (CHPP) and Rejects Emplacement Area (REA) in 1979. The first commercial coal products were produced at the colliery in 1979.

Tahmoor Colliery initially used bord and pillar mining methods that were replaced by longwall mining methods in 1987 when a gas extraction facility and longwall mining unit were commissioned and installed.

Tahmoor Colliery was established by Clutha Development Pty Ltd, which was acquired by BP Coal in 1985. In 1989 Kembla Coal and Coke Pty Ltd acquired BP Coal's interest in Tahmoor Colliery, and in 1997, the operation was acquired by Austral Coal Limited, which was acquired by Centennial Coal Pty Ltd in 2005 and subsequently purchased by Xstrata Coal in 2007.

#### 1.1.2 Existing Operations at Tahmoor Colliery

Tahmoor Colliery is located approximately 80km south-west of Sydney between the towns of Tahmoor and Bargo in the Southern Coalfields (**Figure 1** and **Figure 2**). Coal is currently mined from within the Bulli seam, producing mostly hard coking coal for steel production. Tahmoor Colliery also produces a small amount of thermal coal which can be used for power generation. Coal products from Tahmoor Colliery are export grade.

A CHPP processes ROM coal and separates the coal into coking and thermal products. The CHPP's screening and cyclonic processes remove rock and other foreign materials from the coal. Coal washed rejects are placed in the REA and tailings are co-disposed with course rejects.

Tahmoor Colliery holds Mining Lease (ML) 1308, ML 1376, ML 1539, ML 1642, Exploration Authority 410 and Exploration Authority 206, Consolidated Coal Lease (CCL) 716 and CCL 747, which are illustrated in **Figure 3**. Subsidence Management Plans have been prepared for each 'domain' within the mining lease areas and have been approved by the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS).

Coal extraction from the Bulli seam is currently undertaken within CCL 716 and ML1376. Current mining operations are forecast to continue until 2021. The existing surface infrastructure facilities and mine drift are located within ML 1642 (**Figure 3**).

The development consents under which Tahmoor Colliery currently operates are listed in **Table 1**.

**Table 1 Development Consents for the Existing Tahmoor Colliery Operations**

Approval Year	Consent Authority	Permitted Activities
1975	Wollondilly Shire Council (WSC)	Coal mining within Special Mining Lease (later CCL 716) and transport of Run of Mine (ROM) coal to Glenlee.
1979	NSW Planning and Environment Commission	Coal preparation and washing plant and reject emplacement area.

Approval Year	Consent Authority	Permitted Activities
1985	NSW Planning and Environment Commission	Road haulage of two trial shipments of coal.
1986	Director of Environment and Planning	Upgrades to surface facilities.
1988	Director of Planning	Road haulage of up to 50,000 tonnes per annum of coal within Wollondilly Shire, or in the instance of a rail disruption.
1994	Land and Environment Court	Coal mining by longwall methods from ML1376 and emplacement of rejects on site.
1994	Director of Planning	Road haulage of coal to Corrimal and Illawarra Coke Works if West Cliff Mine is unable to supply.
1999	Minister for Urban Affairs and Planning	Longwall coal mining in ML 1539.
2006	Minister for Planning	Modifications to 1999 consent to extend the zone of subsidence into six small areas not previously proposed to be subsidised.
2007	WSC	Modification to conditions controlling heritage impact assessment.

### 1.1.3 History of Bargo Colliery

Scout drilling of the coal resource within the Bargo area was undertaken by the NSW Government in 1965, who consequently allocated the Bargo coal area to J&A Brown Pty Ltd (a subsidiary of Coal & Allied Industries Ltd) in April 1969 via exploration tenure. The company undertook a drilling program during 1970 to investigate the coal resource.

J&A Brown Pty Ltd subsequently formed the Bargo Joint Venture together with Peko Wallsend Limited and BHP Ltd. Bargo Joint Venture obtained development approvals for a new underground coal mine within coal and mining purposes leases ultimately forming CCL747 (**Figure 3**) in 1975 from Mittagong Shire Council (now part of Wingecarribee Shire Council), in 1976 from WSC and 1978 from NSW Planning & Environment Commission.

CCL 747 encompasses a total area of 4,769 hectares and is currently held by Xstrata Coal NSW. It expires in November 2025.

The Bargo Joint Venture approved development included:

- An underground mine and ventilation system;
- Construction of surface infrastructure to the east of the Bargo River and generally to the west of Hornes Creek. Surface infrastructure would have included:
  - Access to the coal seams via a personnel and materials drift;
  - Coal preparation plant;
  - Product coal stockpiles;
  - Reject emplacement areas;
  - Access roads; and
  - Bath house, offices and car parks.
- A rail loop connecting to the Main Southern Railway line.

The Bargo Joint Venture commenced the development between May 1979 and January 1981, by sinking a concrete lined six metre diameter up shaft to a total depth of 444 metres. Development of some 800 metres of roadways and headings in the Bulli and Wongawilli coal seams was undertaken in preparation for mining operations. Following the sinking of the Bargo shaft, a global economic downturn depressed the coal price thereby impacting on the feasibility of further developing the coal mine and work was put on hold.

Commercial interests in the Bargo Joint Venture were acquired by Austral Coal Limited in 1999, which was then acquired by Centennial Coal Pty Ltd in 2005. The interests were subsequently acquired by Xstrata Coal in 2007.

Xstrata Coal NSW has undertaken concept development and pre-feasibility investigations on the development of the Bargo coal resource since 2009 and in 2010 commenced an exploration programme including drilling coal quality holes and seismic surveys.

An overview of the Bargo Colliery consent history is provided in **Table 2**.

**Table 2 Development Consents for Bargo Colliery**

Approval Year	Consent Authority	Permitted Activities
1975	Mittagong Shire Council	Underground coal mine, ventilation shafts, CHPP, rail loop and rejects emplacement areas.
1976	Wollondilly Shire Council	Underground coal mine, ventilation shafts, CHPP, rail loop and rejects emplacement areas.
1978	NSW Planning and Environment Commission	Concurrent approval for an underground coal mine, ventilation shafts, CHPP, rail loop and rejects emplacement areas.
1978	Mittagong Shire Council	Final approval following concurrence from the NSW Planning and Environment Commission for an underground coal mine, ventilation shafts, CHPP, rail loop and rejects emplacement areas.

## 1.2 Pre-Feasibility Assessment

Xstrata Coal has investigated several options for development of the Bargo coal resource through a pre-feasibility assessment. The purpose of the assessment was to investigate the environmental constraints of surface infrastructure options and mine plans for the proposed development. The analysis was used to identify the surface infrastructure option likely to have the least impact on the environment, as well as to provide an initial screening of potential environmental issues arising from the mine plan options.

The surface infrastructure options investigated were:

- Use of existing Tahmoor Colliery;
- Construction of new surface infrastructure at the site approved in 1975/76 by both Wollondilly and Mittagong (now Wingecarribee) Councils approximately 5.5 km to the south-west of the existing Tahmoor Colliery between Bargo and the Bargo River.
- Construction of new surface infrastructure adjacent and to the north of the existing Tahmoor Colliery; and
- Construction of new surface infrastructure adjacent and to the south of the existing Tahmoor Colliery.

It was concluded that the preferred option for the proposed development is to use existing surface infrastructure facilities at Tahmoor Colliery, thereby minimising impacts to the environment and maximising project feasibility.

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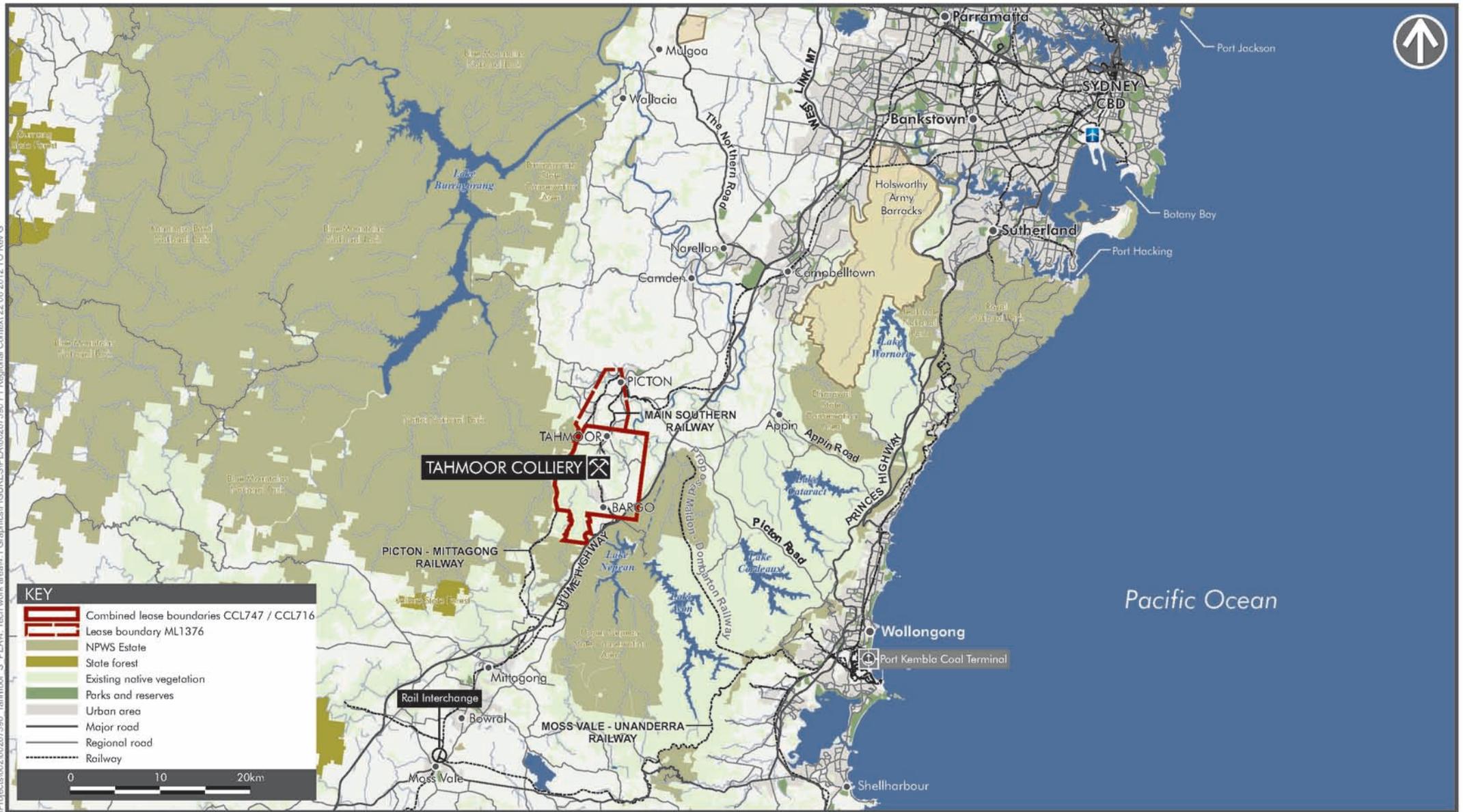
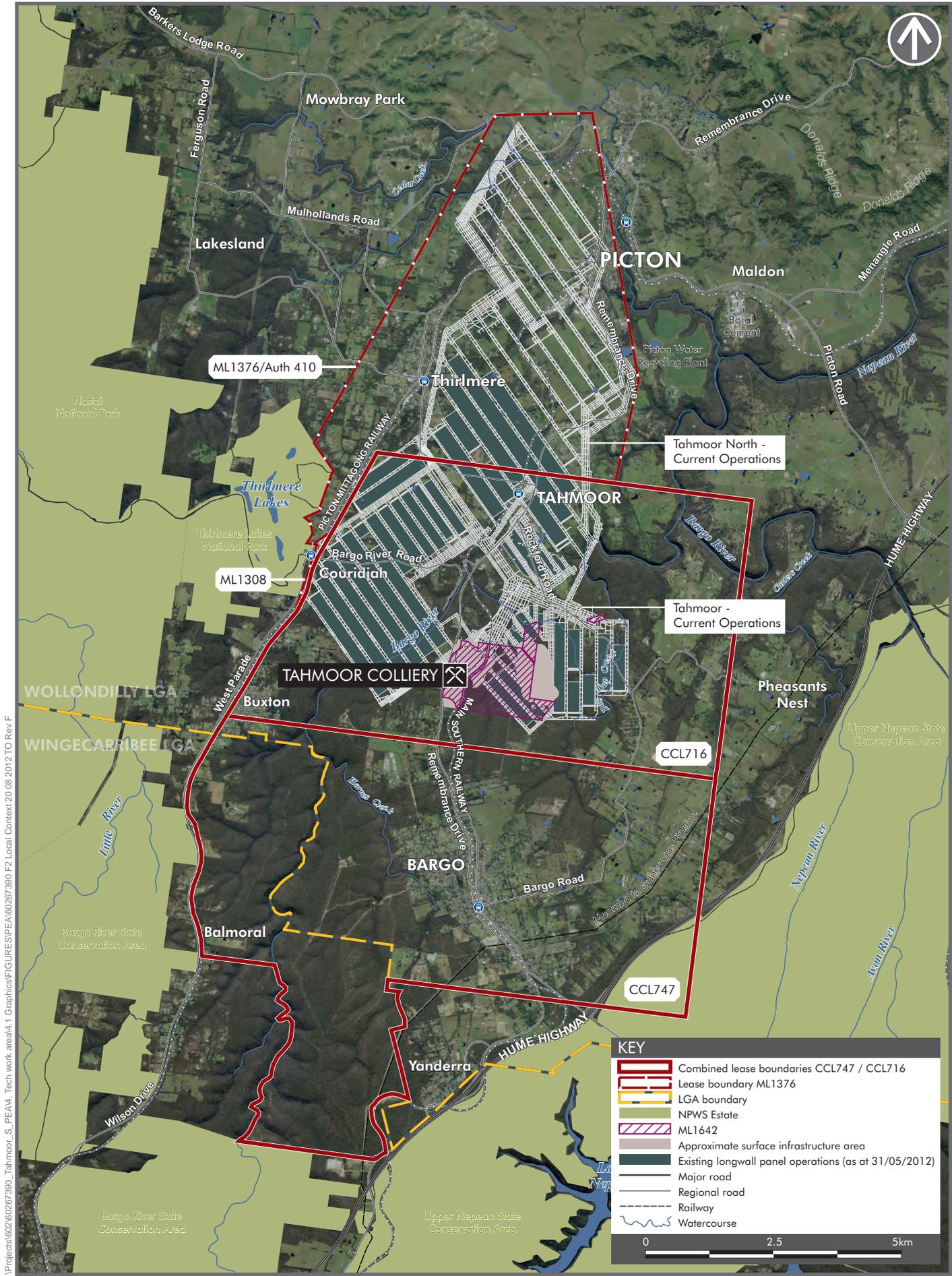


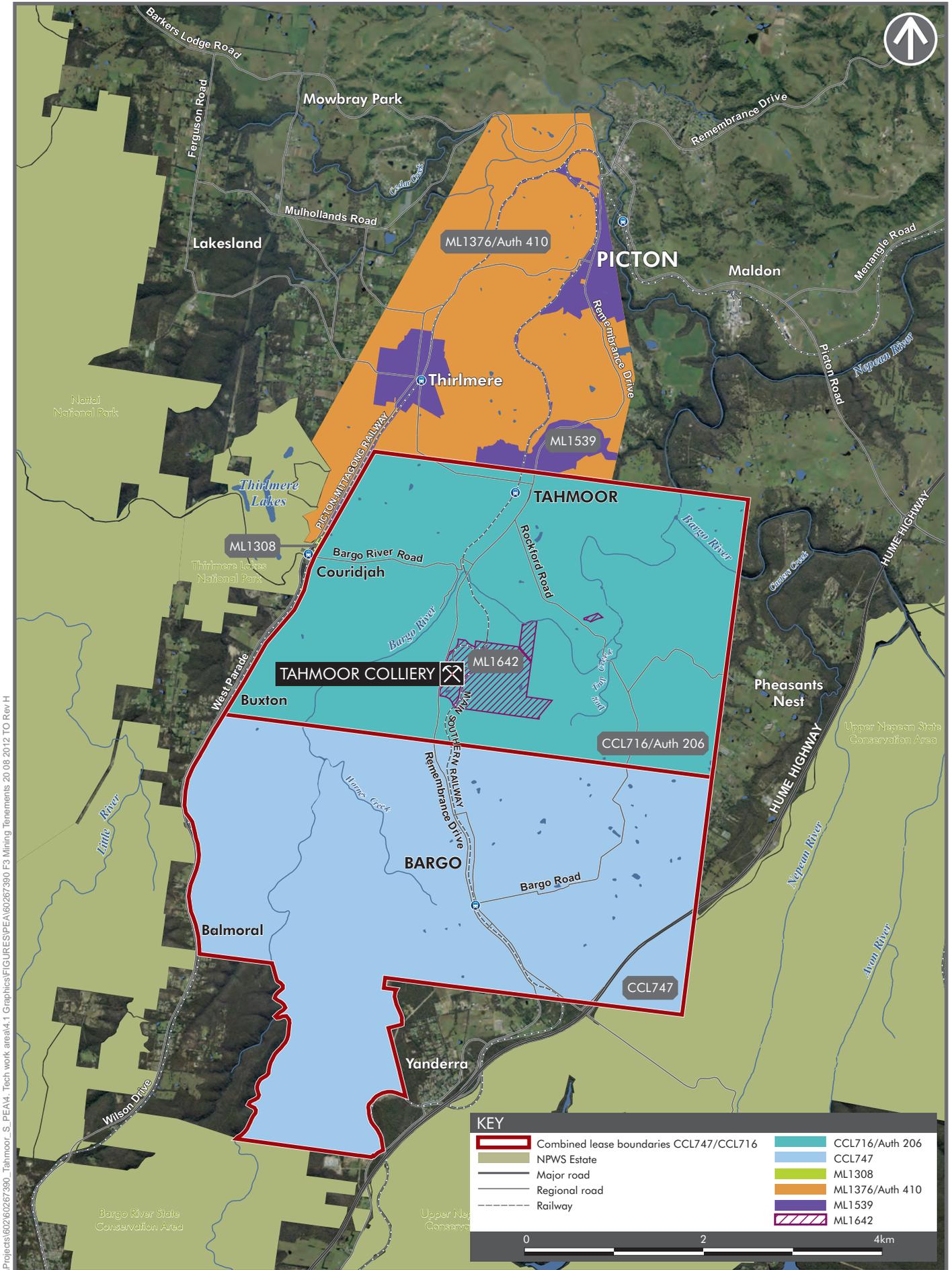
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## 2.0 The Proposed Development

### 2.1 Development Location

The proposed development would be located immediately south of the existing coal mining operations of the Tahmoor Colliery (**Figure 2**). While the underground mine is a separate project to the existing mining operations to the north of Tahmoor Colliery, the proposed development would utilise the existing mine access and coal clearance infrastructure to convey ROM coal from underground to surface facilities.

The proposed development would be located across CCL 747, CCL 716, and ML 1642 (**Figure 3**). The underground areas of the proposed development would include extraction of coal from the Bulli seam within the Central and Eastern Domains (**Figure 4**). The Bulli seam is located approximately 350m to 430m below the surface.

The extent of the mine plan for the proposed development does not cover all of CCL 747 and CCL 716. Xstrata Coal is currently conducting, and will continue to conduct, exploration activities within CCL 747 and CCL 716 (**Figure 4**).

### 2.2 Development Description

The proposed development would use longwall mining to extract coal from the Bulli seam within the bounds of CCL 716 and CCL 747. Xstrata Coal is seeking approval for the extraction of up to five (5) Mtpa of ROM coal as part of the proposed development. Once the coal has been extracted and brought to the surface, it would be processed at the existing Tahmoor Colliery CHPP and coal clearance facilities, and then transported to Port Kembla via an existing mine rail loop, the Main Southern Railway and the Moss Vale to Unanderra Railway. The proposed development would also include other underground passive operational activities within historical workings of Tahmoor Colliery. The proposed development would involve:

- 1) Gas drainage and management;
- 2) Construction of underground mining infrastructure;
- 3) Construction and operation of a mine ventilation system;
- 4) Coal extraction using longwall mining methods;
- 5) Upgrades to the existing materials handling facilities and ancillary infrastructure;
- 6) Staged expansion of the existing REA;
- 7) Coal exploration within CCL 747 and CCL 716; and
- 8) Transportation of product coal to Port Kembla.

The project description for the proposed development will continue to be refined during the detailed design phase of works. However, each component of the proposed development is described in broad terms in **Section 2.2.1** to **Section 2.2.7**.

#### 2.2.1 Gas Drainage and Management

Coal mines have to control ventilation methane gas concentration levels below safe limits in the mine so that miners are able to work in a safe and efficient environment.

To reduce the gas content in the Bulli Seam to the target range for longwall operations, the gas would be pre-drained by drilling in-seam (i.e. horizontal) boreholes in advance of mining. Experience at the existing Tahmoor Colliery operations has shown that strata relaxation caused by the retreating underground longwall face liberates volumes of gas into the mine workings from the underlying Wongawilli Seam, which is approximately 30 m below the Bulli Seam. To capture this gas, cross-measure boreholes are also drilled from the mine workings into the Wongawilli Seam. These boreholes are designed to collect the gas at its source or to intercept gas before it migrates into the mine workings.

The coal bed methane collected from the in-seam and cross-measure boreholes would be drawn by vacuum to the gas drainage plant located within the pit top facilities.

### 2.2.2 Longwall Mine

Longwall mining of the Bulli seam would occur within the Central and Eastern Domains (**Figure 4**) which are completely encompassed within CCL 747 and CCL 716. Longwall mining would be undertaken at a production rate of up to five (5) Mtpa ROM.

Longwalls in the Central Domain are orientated in a south-east/ north-west direction and are located underneath the town of Bargo and land to the north and east. Longwalls in the Eastern Domain run north/ south along the eastern boundary of CCL 747 and CCL 716.

The indicative longwall panel layout is shown on **Figure 4**. The layout and extent of longwalls will continue to be developed during the detailed design phase.

### 2.2.3 Mine Ventilation System

The proposed development would utilise ventilation shafts which are currently used for the existing operations at Tahmoor Colliery, and also involve the construction of additional ventilation shafts.

The ventilation system would include downcast ventilation shafts with no surface fans and upcast ventilation shafts with surface fans. The mine ventilation system, including the location of ventilation shafts, will continue to be refined during the detailed design phase of the proposed development and presented in the EIS.

### 2.2.4 Surface Infrastructure

Upgrades to the existing surface infrastructure facilities would be required for operation of the proposed development. Upgrades to existing surface infrastructure would be undertaken within the footprint of the existing Tahmoor Colliery.

The surface infrastructure upgrades would include upgrades to the surface material handling system and ancillary surface infrastructure, specifically:

- The surface material handling system. These upgrades would include the addition of an automated rail load out to the existing rail load out bin; and
- Ancillary infrastructure. Ancillary infrastructure would be upgraded to accommodate the proposed development including additional development and gas drainage crews as well as supplementary outbye services. In addition, the proposed development would require an upgrade and reconfiguration of administration buildings, bath houses and stores to accommodate the workforce. Additional capacity requirements would also necessitate the upgrade of service infrastructure, including electricity, water, sewage and telecommunications, as well as gas management infrastructure.

### 2.2.5 Reject Emplacement Areas

The existing Tahmoor Colliery REA would be expanded onto adjacent areas to accommodate reject material associated with the proposed development (**Figure 4**). The expansion area is anticipated to cover up to an additional 80 hectares with an additional emplacement capacity of approximately 35 million tonnes to provide for the rejects generated during the operation of the proposed development.

### 2.2.6 Transportation of Product Coal to Port Kembla

The proposed development would continue to transport up to approximately five (5) Mtpa of product coal from Tahmoor Colliery to Port Kembla via the existing mine rail loop, the Main Southern Railway and the Moss Vale to Unanderra Railway (**Figure 1**).

### 2.2.7 Exploration Activities

Exploration drilling and seismic surveys would continue to be undertaken within the boundary of CCL747 and CCL716 throughout the life of the proposed development to obtain geological structure and coal quality information. The information gained during exploration would be used to assist the detailed mine design process and further define the coal resource potential within the mining lease area, particularly across the southern areas of CCL 747. A concept exploration program would be outlined within the EIS with an overview of the environmental controls that would be used during the exploration program. An assessment of the potential environmental impacts of the exploration program would be included within the EIS.

## 2.3 Mining Tenements

Tahmoor Colliery Holding includes the mining tenements CCL 716, ML 1642, ML 1376, ML 1308 and ML 1539, while Bargo Colliery Holding includes CCL 747. Xstrata Coal is the owner of both the Tahmoor Colliery and Bargo Colliery Holdings.

The proposed development would operate within CCL 747 and CCL 716 and would utilise existing surface infrastructure facilities at the Tahmoor Colliery, located within ML 1642 (**Figure 3**). Tenements pertaining to the proposed development are listed in **Table 3**.

**Table 3 Mining Tenements Relevant to the Tahmoor South Project**

Mining Tenement	Details	Purpose
CCL 716	Company: Tahmoor Colliery Holding (owned by Xstrata Coal) Area: 4,800 ha Expiry: January 2021	<ul style="list-style-type: none"> <li>- Historical workings within the Bulli seam</li> <li>- Mining of the Bulli seam within CCL 716.</li> <li>- Ventilation shafts as required by the mine plan.</li> </ul>
CCL 747	Company: Bargo Colliery Holding (owned by Xstrata Coal) Area: 4,769 ha Expiry: November 2025	<ul style="list-style-type: none"> <li>- Mining of the Bulli seam within CCL 747.</li> <li>- Ventilation shafts as required by the mine plan.</li> </ul>
ML 1642	Company: Tahmoor Colliery Holding (owned by Xstrata Coal) Area: 206.4 ha Expiry: August 2031	<ul style="list-style-type: none"> <li>- Mining lease for surface infrastructure and the mine drift entries.</li> </ul>
Exploration Authorisation 410	Company: Tahmoor Colliery Holding (owned by Xstrata Coal) Area: 2,638 ha Expiry: renewal sought	<ul style="list-style-type: none"> <li>- Exploration drilling and seismic surveys during the proposed development.</li> </ul>
Exploration Authorisation 206	Company: Tahmoor Colliery Holding (owned by Xstrata Coal) Area: 4,080 ha Expiry: renewal sought	<ul style="list-style-type: none"> <li>- Exploration drilling and seismic surveys during the proposed development.</li> </ul>

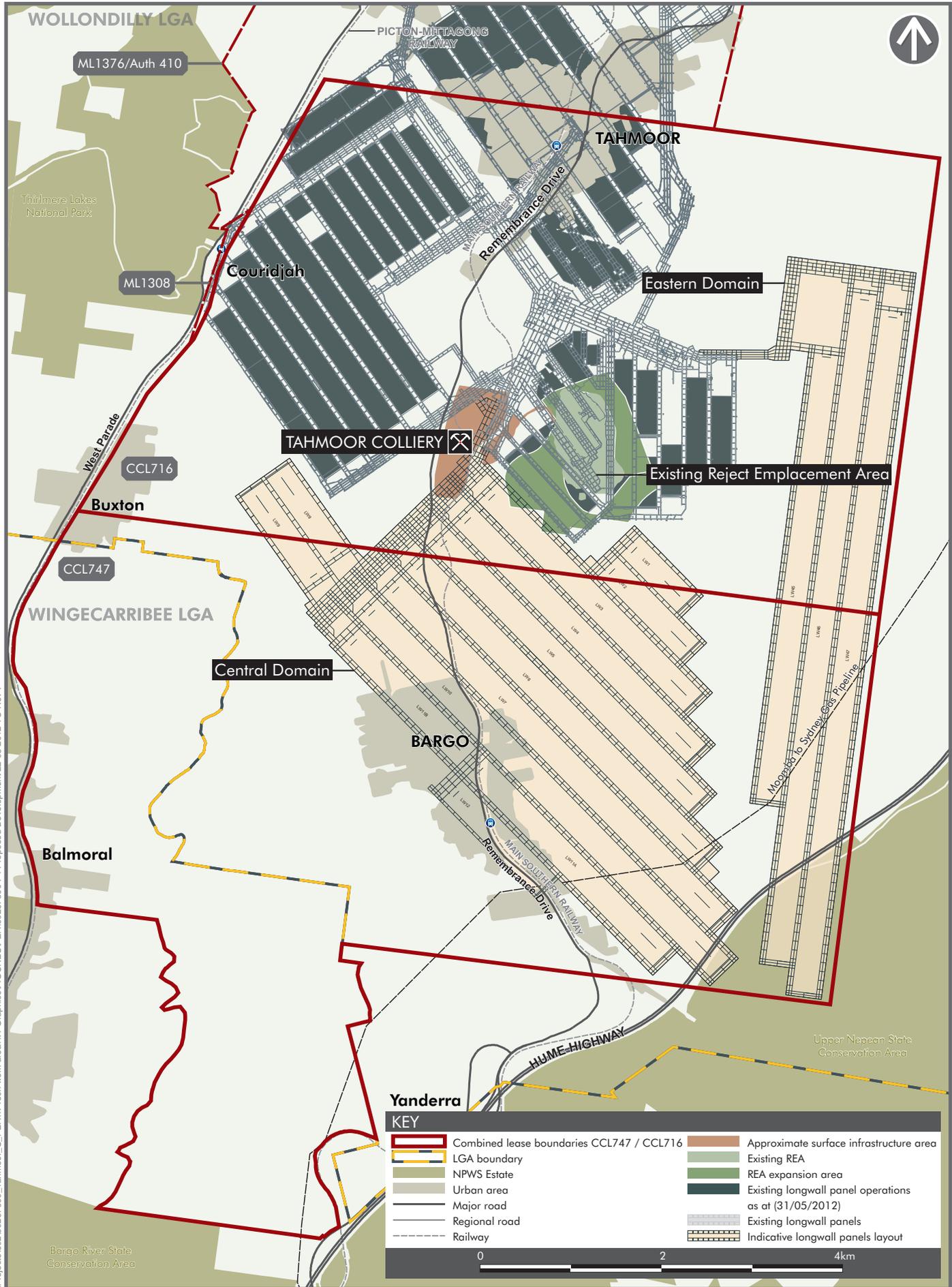
## 2.4 Project Benefits

Mining operations at Tahmoor Colliery are forecast to continue until 2021 with longwall mining to the north of the Tahmoor Colliery pit top (**Figure 2**). The proposed development, including longwall mining to the south and east of the Tahmoor Colliery pit top, would extend coal production beyond 2021, providing an additional 15 years of operations. The proposed development would benefit the local, regional and State economies through:

- Direct and indirect employment for personnel during construction and operation;
- Royalties and taxes and
- Local and regional benefits from capital investment and purchasing.

In addition, coal is a major commodity export for Australia; the proposed development would supply coking coal for export to the global market.

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## 3.0 Context of the Development within the Southern Coalfields

### 3.1 Southern Coalfields

The Southern Coalfields is one of five major coalfields located within the Sydney-Gunnedah Basin. It is located south of Sydney and to the west of Wollongong with topography that is defined by the Illawarra and Woronora Plateaux.

The Southern Coalfields is the only NSW source of premium quality hard coking coals, which are used for steel production. There are ten (10) operational underground coal mines in the Southern Coalfields, shown on **Figure 5** and detailed in **Table 4**.

**Table 4 Current Mining Operations in the Southern Coalfields**

Coal Mine	Current Owner/Operator	Source of Coal (Seam)
Appin and Appin West Colliery (formerly Tower Colliery) (labelled 1 on <b>Figure 5</b> )	Illawarra Coal Holdings Pty Ltd, a subsidiary of the BHP Billiton Group	Bulli
West Cliff Colliery (labelled 2 on <b>Figure 5</b> )	Illawarra Coal Holdings Pty Ltd, a subsidiary of the BHP Billiton Group	Bulli
North Cliff Colliery (labelled 3 on <b>Figure 5</b> )	Illawarra Coal Holdings Pty Ltd, a subsidiary of the BHP Billiton Group	Bulli
Metropolitan Colliery (labelled 4 on <b>Figure 5</b> )	Helensburgh Coal Pty Ltd, a subsidiary of Peabody Energy Australia Coal Pty Ltd	Bulli
NRE No1 Colliery (formerly known as Bellpac colliery, South Bulli Colliery and Bellambi West Colliery) (labelled 5 on <b>Figure 5</b> )	Gujarat NRE Australia Pty Ltd	Bulli
Dendrobium Colliery (labelled 6 on <b>Figure 5</b> )	Illawarra Coal Holdings Pty Ltd, a subsidiary of the BHP Billiton Group	Wongawilli
Wongawilli Colliery (formerly known as Eloura Colliery) (labelled 7 on <b>Figure 5</b> )	Gujarat NRE Australia Pty Ltd	Wongawilli
Tahmoor Colliery	Xstrata Coal Pty Ltd	Bulli
Berrima (Medway) Colliery (labelled 8 on <b>Figure 5</b> )	Boral Pty Ltd, operated by Delta Mining Pty Ltd.	Wongawilli
Hume Coal Project (labelled 9 on <b>Figure 5</b> )	Hume Coal Pty Limited, jointly owned by POSCO and Cockatoo Coal.	Currently undertaking exploration.

#### 3.1.1 The Southern Coalfields Inquiry

An independent inquiry into underground coal mining in the Southern Coalfields was established by the NSW Government on 6 December 2006. The inquiry was established in response to concerns held by the Government over past and potential future impacts of mining-induced ground movements on significant natural features in the Southern Coalfields. This action by the NSW Government followed community concerns regarding cracking and other mine-related subsidence impacts to the Cataract River that occurred as a result of the operation of the Appin West Colliery.

The purpose of the Southern Coalfields Inquiry was to:

- 1) *Undertake a strategic review of the impacts of underground mining in the Southern Coalfields on significant natural features (i.e. rivers and significant streams, swamps and cliff lines), with particular emphasis on risks to water flows, water quality and aquatic ecosystems;*
- 2) *Provide advice on best practice in regard to:*
  - a) *Assessment of subsidence impacts;*
  - b) *Avoiding and/or minimising adverse impacts on significant natural features;*

- c) *Management, monitoring and remediation of subsidence and subsidence-related impacts;*
- 3) *Report on the social and economic significance to the region and the State of the coal resources in the Southern Coalfields.*

The Southern Coalfields Inquiry made recommendations regarding best practice in relation to the assessment of subsidence impacts, minimising adverse impacts on significant natural features, and the management, monitoring and remediation of subsidence and subsidence related impacts. These recommendations have been, and will continue to be considered during the environmental assessment and approvals process for the proposed development.

### **3.1.2 Environmental Baseline Monitoring**

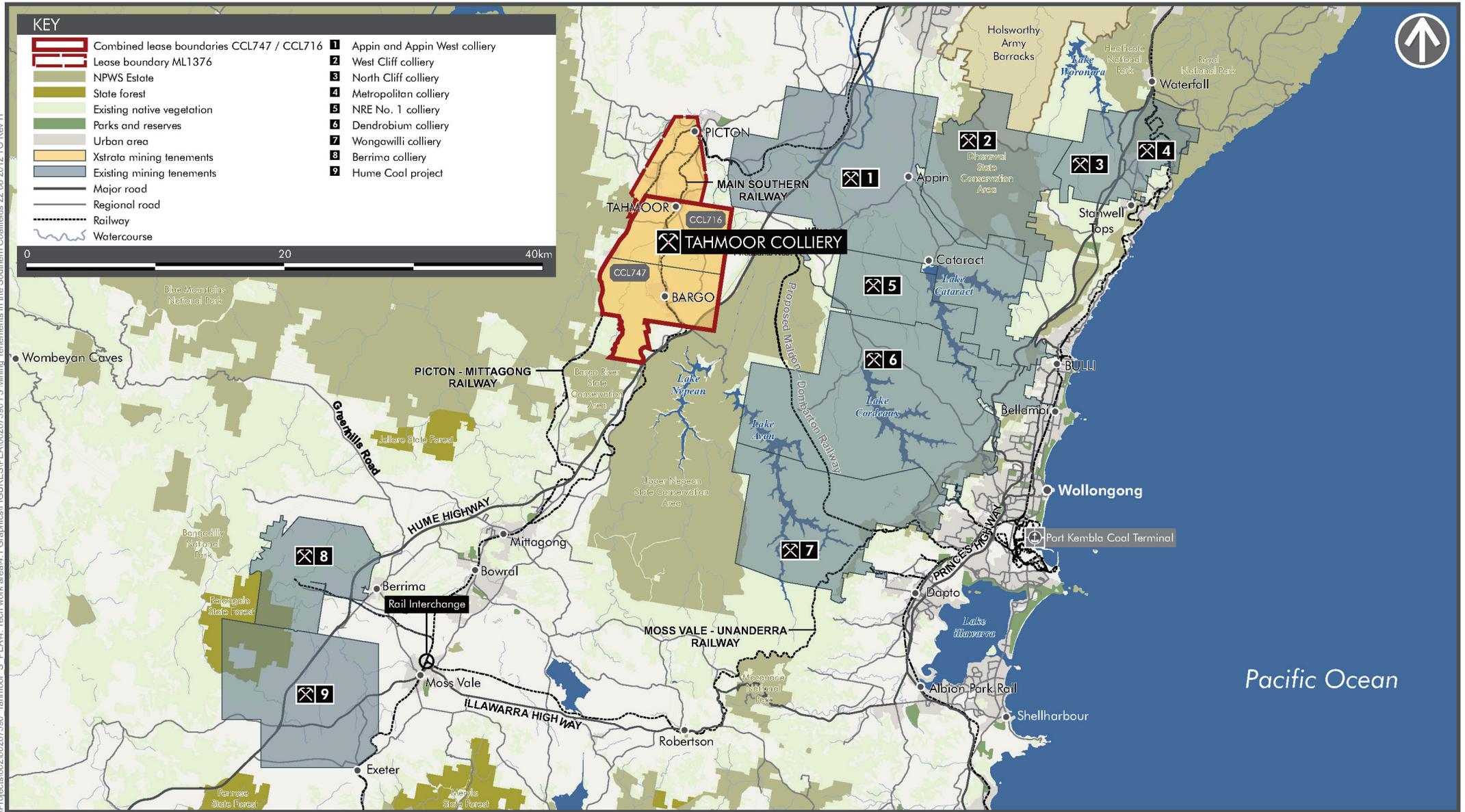
Environmental baseline monitoring is currently being undertaken to satisfy the recommendations of the Southern Coalfields Inquiry and to inform the environmental assessment process for the proposed development. The environmental baseline monitoring program includes:

- Surface water monitoring, including continuous flow monitoring and monthly water quality monitoring of selected watercourses within CCL 747 and CCL 716. Monthly monitoring of surface water commenced in March 2011 and it is anticipated that a full year of data will be available for interrogation during the preparation of the EIS. The baseline surface water monitoring program will run for two years.
- Groundwater monitoring, including installation of piezometers in exploration boreholes and a bore census of private boreholes located over the proposed longwall mine plan. The bore census is scheduled to occur prior to completion of the EIS. Piezometers have been installed for the purpose of gathering groundwater data.

Xstrata Coal also carries out monitoring for a range of other environmental matters as follows:

- Ecological monitoring of terrestrial and aquatic ecology across CCL 747 and CCL 716. Targeted ecological surveys have been undertaken for the autumn season of 2011 and spring surveys are scheduled for later in 2012.
- Air quality monitoring is undertaken using a High Volume Air Sampler, a Tapered Element Oscillating Microbalance and Dust Deposition Gauges. The air quality data will be used in the air quality impact assessment and will enable comparison between measured predevelopment and predicted post-development air quality levels.
- Noise monitoring in the vicinity of the proposed surface infrastructure and ventilation shaft locations. Two rounds of noise monitoring have been undertaken in the summer and autumn of 2012. Winter and spring monitoring is scheduled for the latter half of 2012.

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MINING TENEMENTS IN SOUTHERN COALFIELDS  
Tahmoor South Project  
Preliminary Environmental Assessment

FIGURE 5

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## 4.0 Environmental Planning Considerations

### 4.1 Permissibility

The proposed development is permissible with consent under clause 7 of the *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) as it is classified as “underground mining carried out on any land”. The proposed development would be located within Wollondilly Local Government Area (LGA) and Wingecarribee LGA on land subject to the *Wollondilly Local Environmental Plan 2011* (Wollondilly LEP 2011) and *Wingecarribee Local Environmental Plan 2010* (Wingecarribee LEP 2010).

The proposed development would constitute activities that are ordinarily permitted with consent in some land use zones, and prohibited in others under the Wollondilly LEP 2011 (refer to **Section 7.13** for land uses zones within the footprint of the proposed development). However, as the Mining SEPP prevails to the extent of an inconsistency over the Wollondilly LEP 2011, the proposed development in its entirety is considered to be permissible with consent.

### 4.2 Environmental Assessment Process

The proposed development is declared to be State Significant Development, for the purposes of the EP&A Act, under clause 8 and Schedule 1 of the *State Environment Planning Policy (State and Regional Development) 2011*.

Schedule 1 of the *State Environment Planning Policy (State and Regional Development) 2011* lists:

“ (1) Development for the purpose of mining that:

(a) is coal or mineral sands mining, or

(b) is in an environmentally sensitive area of State significance, or

(c) has a capital investment value of more than \$30 million.

(2) Extracting a bulk sample as part of resource appraisal of more than 20,000 tonnes of coal or of any mineral ore.

(3) Development for the purpose of mining related works (including primary processing plants or facilities for storage, loading or transporting any mineral, ore or waste material) that:

(a) is ancillary to or an extension of another State significant development project, or

(b) has a capital investment value of more than \$30 million.

(4) Development for the purpose of underground coal gasification.”

The proposed development would be subject to an assessment by the Minister for Planning and Infrastructure (or his delegate) under Division 4.1, Part 4 of the EP&A Act. An EIS is required to support the application for development consent.

### 4.3 Environmental Planning Instruments

The following environmental planning instruments include provisions relating to issues that would or may be relevant to the environmental impact assessment of the proposed development and relevant provisions would be considered in the EIS:

- *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*;
- *State Environment Planning Policy No 33—Hazardous and Offensive Development*;
- *State Environment Planning Policy No. 44 – Koala Habitat Protection*;
- *State Environment Planning Policy No. 55 – Remediation of Land*; and
- *Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997)*.

#### 4.3.1 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)

The Mining SEPP is the principal environmental planning instrument that governs the carrying out of the proposed development. The Mining SEPP recognises the importance of mining, petroleum production, and extractive industries within the State. Clause 7 of the Mining SEPP identifies development which can be carried out only with development consent, and includes “*underground mining carried out on any land*”.

Clause 5 of the Mining SEPP addresses its relationship with other environmental planning instruments, and states that if the Mining SEPP is inconsistent with another environmental planning instrument, then the Mining SEPP prevails to the extent of the inconsistency, with the exception of *State Environmental Planning Policy 14 - Coastal Wetlands* and *State Environmental Planning Policy 26 – Littoral Rainforests*. Neither of these State Environmental Planning Policies applies to the proposed development.

The aims of the Mining SEPP are:

*“(a) To provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*

*(b) To facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*

*(c) To establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.”*

The proposed development would involve the extraction of up to five (5) Mtpa of ROM coal from the Bulli seam in the Southern Coalfields of NSW. With careful design and management, the proposed development would facilitate the orderly and economic use and development of land containing extractive material resources. Additionally, the proposed development would promote the social and economic welfare of the state by benefiting local, state and regional economies through direct and indirect employment opportunities, as well as through the payment of coal royalties, consistent with the aims of the Mining SEPP.

#### 4.3.2 State Environmental Planning Policy No 33—Hazardous and Offensive Development

*State Environmental Planning Policy No 33 – Hazardous and Offensive Development* (SEPP 33) requires a consent authority to consider whether a development may constitute a hazardous or offensive industry as defined by SEPP 33. The instrument dictates that proposed mitigation measures are to be taken into account when determining whether a development is a hazardous or offensive industry, and that the consent authority must have sufficient information to make its determination and impose conditions to minimise impacts.

While the proposed development is not strictly considered an ‘industry’ within the meaning of SEPP 33, it would nonetheless be subject to the application of a risk screening for potentially hazardous industry as defined by SEPP 33. The risk screening would be undertaken in accordance with *Applying SEPP 33* (DP&I, 2011) and would be documented in general accordance with *Guidelines for Hazard Analysis: Hazardous Industry Planning Advisory Paper No.6* (DP&I, 2011).

#### 4.3.3 State Environmental Planning Policy No. 44

*State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) requires a consent authority to consider whether land subject to a development application is classified as potential koala habitat and/ or core koala habitat. Before development consent can be granted on land defined as core koala habitat, a plan of management must be prepared for that land.

SEPP 44 applies to some vegetated areas within the Wollondilly LGA and Wingecarribee LGA. A preliminary flora and fauna assessment indicates that there is potential for core koala habitat to be present in the vicinity of the proposed development. An assessment of the potential impacts on koalas and koala habitat would be included as part of an EIS, in accordance with the provisions of SEPP 44. Core koala habitat could potentially be affected by vegetation clearing required for the proposed development.

#### 4.3.4 State Environmental Planning Policy No. 55

*State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55) requires a consent authority, when assessing and determining a development application, to consider whether the land subject to the development is contaminated and if so, whether the land requires remediation before the intended land use can proceed.

There are no known major contaminated sites in the vicinity of the proposed development and contaminated land is not expected to be a significant constraint. However, in order to meet the requirements of *State Environmental Planning Policy No. 55 – Remediation of Land*, the EIS would consider the potential for contaminated land to be encountered based on historical land use, and appropriate mitigation measures would be identified where required.

#### 4.3.5 Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997)

*Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997)* provides a framework to guide and control development in the region to protect the environment of the Hawkesbury-Nepean River system.

The *Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997)* relates to land in the greater metropolitan region including land in the Wollondilly LGA, and includes planning objectives relating to heritage, water quantity (surface flow and groundwater), water quality, and flora and fauna. The proposed development is located within the southern region of the Hawkesbury Nepean Catchment area, in the Bargo River sub-catchment, and as such the EIS for the proposed development would consider the requirements of the *Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997)*.

#### 4.3.6 State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* (Sydney Drinking Water Catchment SEPP) states that developments carried out on land in the Sydney drinking water catchment should incorporate the Sydney Catchment Authority's current recommended practices and standards.

Clause 10 of the Sydney Drinking Water Catchment SEPP states that a consent authority must not grant development consent under Part 4 of the EP&A Act on land in the Sydney drinking water catchment unless it is satisfied that the carrying out of the proposed development would have a neutral or beneficial effect (NorBE) on water quality. The EIS for the proposed development will include an assessment using the NorBE Tool to determine whether the proposed development would have a neutral or beneficial effect on water quality.

Clause 11(1) of the Sydney Drinking Water Catchment SEPP restricts a consent authority from granting consent for a development under Part 4 of the EP&A Act on land in the Sydney drinking water catchment except with the concurrence of the Chief Executive of the Sydney Catchment Authority. However, this clause does not apply if the Minister is the consent authority, as is the case for this development application.

## 4.4 Strategic Land Use Planning

The *Sydney Metropolitan Strategy for 2036* (DP&I, 2010) outlines the strategic land use planning direction for the Sydney Metropolitan Region. The Wollondilly, Camden, Campbelltown and Liverpool LGAs constitute the south-west subregion of the Regional Strategy.

The *Sydney Metropolitan Strategy for 2036* envisages that population growth will largely be associated with the release of residential land as part of the South West Growth Centre. Approximately 100,000 new dwellings are expected to be developed predominately on greenfield sites to accommodate projected population growth in the subregion.

The draft *Sydney South West Subregional Strategy* (Department of Planning, 2007) is the key planning tool for implementation of the *Sydney Metropolitan Strategy for 2036* at a regional level. The draft *Sydney South West Subregional Strategy* recognises that development in the Wollondilly LGA is largely constrained because of the number and size of sensitive water catchments in the LGA, as well as the large area of land reserved as National Parks and areas of state conservation.

The *Sydney Metropolitan Strategy for 2036* also recognises that resource based land use, including coal mining, requires protection in the south-west subregion of greater Sydney due to the regional, state and national economic value of such industries. As a result, the *Sydney Metropolitan Strategy for 2036* aims to protect resource lands from incompatible and inappropriate uses, including for the purposes of urban development. The proposed development would provide a resource-based economic contribution at a regional, State and national level in an area already recognised as resource rich.

A key priority of the *Sydney Metropolitan Strategy for 2036* is to accommodate future population growth within the existing urban area and protect the native bushland area and rural and resource lands (DP&I, 2010). About half of the south-west subregion is classified as water supply catchment areas. Protecting waterways and surrounding catchment areas is a significant management issue for the south-west subregion, and as a result, the *Sydney*

*Metropolitan Strategy for 2036* states that statutory planning decisions should be consistent with and assist in the implementation of catchment-wide and local stormwater objectives and targets.

The *Sydney-Canberra Corridor Regional Strategy 2002* applies to the Wingecarribee LGA. The primary aim of the *Sydney-Canberra Corridor Regional Strategy 2002* is to accommodate and manage growth while ensuring that the rural landscapes and environmental settings that define the Region's character are not compromised. The Regional Strategy notes that the Southern Coalfield is an important source of coking and thermal coal and that local environmental plans will provide for the protection of extractive industries and mineral resources through appropriate land use zonings and planning controls that limit the potential for land use conflicts in the buffer areas around these resources.

#### 4.5 Other NSW Environmental Approvals

Under sections 89J and 89K of the EP&A Act, other NSW environmental approvals would not be required for the proposed development (section 89J), or would be required to be issued consistent with the development consent for the proposed development (section 89K). Each of these separate approvals is considered in **Table 5**. Other environmental approvals may be required in addition to those referred to under section 89J and 89K of the EP&A Act. These would be considered and outlined where relevant to the assessment of the proposed development during preparation of the EIS.

Notwithstanding, where separate environmental approval processes have been integrated into the assessment regime under the EP&A Act, the EIS for the proposed development will be required to consider and address the same issues that would have otherwise been required to be assessed for the separate environmental approval.

**Table 5 Relevant Environmental Approvals**

Approval	Relevant to the Development?	Comment
<b>Approvals not required under section 89J</b>		
Concurrence under Part 3 of the <i>Coastal Protection Act 1979</i> .	Not relevant.	The proposed development would not be located within the coastal zone.
A permit under section 201 of the <i>Fisheries Management Act 1994</i> .	Not relevant.	The proposed development would not involve dredging or reclamation works.
A permit under section 205 of the <i>Fisheries Management Act 1994</i>	Not relevant.	The proposed development would not harm marine vegetation.
A permit under section 219 of the <i>Fisheries Management Act 1994</i>	Potentially relevant.	The proposed development is unlikely to result in the blockage of fish passage.
An approval under Part 4, or an excavation permit under section 139, of the <i>Heritage Act 1977</i> .	Potentially relevant.	The proposed development (including surface infrastructure upgrades, ventilation shaft construction and mining induced subsidence) may impact on a place, building, work, relic, moveable object, precinct, or land, that is subject to an interim heritage order or that is listed on the State Heritage Register (refer to <b>Section 7.5</b> ). The extent to which the proposed development is likely to impact a heritage item will be determined during preparation of an EIS.
An Aboriginal heritage impact permit under section 90 of the <i>National Parks and Wildlife Act 1974</i> .	Potentially relevant.	The dominant features of Aboriginal heritage in the vicinity of the proposed development comprise rock shelters, artefact scatters and axe grinding grooves associated with the Bargo River and major creek lines, and are identified as environmentally sensitive in regards to items of Aboriginal heritage significance. The proposed development would be designed and constructed to avoid impacts on Aboriginal heritage objects, places, land or persons wherever reasonable and feasible to do so. However, until more detailed survey work is undertaken within the extent of the proposed development, and the detailed design of the

Approval	Relevant to the Development?	Comment
		proposed development is progressed further, total avoidance of impacts to Aboriginal cultural heritage is not certain. The extent to which the proposed development is likely to impact on Aboriginal cultural heritage will be determined during preparation of an EIS.
An authorisation referred to in section 12 of the <i>Native Vegetation Act 2003</i> (or under any Act repealed by that Act) to clear native vegetation or State protected land.	Relevant.	The proposed development would require clearance of native vegetation for the purposes of expanding the REA and constructing ventilation shafts. The EIS will report on the extent of native vegetation clearance required to undertake the proposed development, assess the impacts of any clearing, and recommend safeguard measures.
A bushfire safety authority under section 100B of the <i>Rural Fires Act 1997</i> .	Not relevant.	Components of the proposed development may be located in bushfire prone areas. It is not anticipated that bushfire prone land would require subdivision to accommodate the installation of additional ventilation shafts, or for the expansion of the existing REA.
A water use approval (section 89), a water management work approval (section 90) or an activity approval (other than an aquifer interference approval) (section 91) of the <i>Water Management Act 2000</i> .	Relevant.	The proposed development is likely to involve water supply works and drainage works, as well as the taking of groundwater. The proposed development is also likely to involve works in, on or under waterfront land, as defined by the <i>Water Management Act 2000</i> .
<b>Approvals required to be issued consistently under section 89K</b>		
An aquaculture permit under section 144 of the <i>Fisheries Management Act 1994</i> .	Not relevant.	The proposed development would not involve aquaculture.
An approval under section 15 of the <i>Mine Subsidence Compensation Act 1961</i> .	Relevant.	The proposed development is located within a mine subsidence district.
A mining lease under the <i>Mining Act 1992</i> .	Relevant.	The proposed development involves mining.
A production lease under the <i>Petroleum (Onshore) Act 1991</i> .	Not relevant.	The proposed development would not involve petroleum production.
An EPL under Chapter 3 of the <i>Protection of the Environment Operations Act 1997</i> (for any of the purposes referred to in section 43 of that Act).	Relevant.	Mining for coal is listed as a scheduled activity under clause 28(2)(a), Schedule 1 of the <i>Protection of the Environment Operations Act 1997</i> . The proposed development would exceed the threshold for this activity being mining for coal with a capacity to produce more than 500 tonnes of coal per day. Licensing for the proposed development will therefore be sought under the <i>Protection of the Environment Operations Act 1997</i> .
Consent under section 138 of the <i>Roads Act 1993</i> .	Potentially relevant.	The proposed development may require connections of private roads to a classified road.
A licence under the <i>Pipelines Act 1967</i> .	Not relevant.	The proposed development would not involve the operation of a pipeline that would require a licence under the <i>Pipelines Act 1967</i> .

## 4.6 Commonwealth Environmental Approvals

### 4.6.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities (SEWPaC) where an action has, or would have, a significant impact on a matter of National Environmental Significance.

A search of the *EPBC Protected Matters Search Tool* has been conducted generally across the study area with a 10km buffer. The search identified potential triggers that may require Commonwealth environmental approval for the proposed development. Results of this search are presented in **Table 6** (only positive search results have been listed).

The proposed development has the potential to trigger the need for an EPBC Act referral (and potential subsequent need for approval under that Act) through:

- 1) Direct impacts, principally through vegetation clearing associated with the construction and operation of REA and to a lesser extent, ventilation shafts; and
- 2) Indirect impacts principally associated with subsidence-related changes to surface elevation, topography and drainage.

Land in and around the areas earmarked for development as REA expansion area/ ventilation shafts has been previously aerially mapped as Sydney Hinterland Transition Woodland, which shares similar characteristic and diagnostic species as Shale Sandstone Transition Forest (SSTF), an Endangered Ecological Community (EEC) under the EPBC Act.

Further, several individual threatened flora species have been previously identified in the region. Of these, there is potential for *Persoonia bargoensis* (listed as vulnerable under the EPBC Act) to occur within the footprint of the REA expansion area.

With respect to indirect impacts, two amphibian species listed by the EPBC Act, the Giant Burrowing Frog and Littlejohn's Tree Frog are known to, or suspected of, occurring in areas potentially affected by predicted subsidence impacts from the proposed development.

If it is determined that one or both of the SSTF and *Persoonia bargoensis* occur within the footprint of the REA expansion area, there would be a high probability of significant impact following clearing of vegetation, which would trigger the need for approval under the EPBC Act. Further consideration of these triggers is currently progressing to determine whether a referral is required.

**Table 6 Matters of National Environmental Significance within a 10km Buffer Area**

Matter of National Environmental Significance	Outcomes of Database Search
World Heritage Properties	The Greater Blue Mountains World Heritage Area is within the search area. However, it is not directly affected by the proposed development as it is located approximately 1km to the west of CCL 747 at its closest point.
National Heritage Places	The Greater Blue Mountains National Heritage Place is within the search area. However, it is not directly affected by the proposed development as it is located approximately 1km to the west of CCL 747 at its closest point.
Listed Threatened Species and Ecological Communities	<p>Three critically endangered ecological communities (CEEC) and one endangered ecological community (EEC) have potential to occur in the vicinity of the proposed development. These are:</p> <ul style="list-style-type: none"> <li>- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest CEEC;</li> <li>- Turpentine-Ironbark Forest of the Sydney Basin CEEC;</li> <li>- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC; and</li> <li>- Shale Sandstone Transition Forest EEC.</li> </ul> <p>Thirty-seven listed threatened species have potential to occur in the vicinity of the proposed development:</p>

Matter of National Environmental Significance	Outcomes of Database Search
	<ul style="list-style-type: none"> <li>- Regent Honeyeater (<i>Anthochaera phrygia</i>);</li> <li>- Australasian Bittern (<i>Botaurus poiciloptilus</i>);</li> <li>- Eastern Bristlebird (<i>Dasyornis brachypterus</i>);</li> <li>- Swift Parrot (<i>Lathamus discolor</i>);</li> <li>- Malleefowl (<i>Leipoa ocellata</i>);</li> <li>- Australian Painted Snipe (<i>Rostratula australis</i>);</li> <li>- Macquarie Perch (<i>Macquaria australascia</i>);</li> <li>- Giant Burrowing Frog (<i>Heleioporus australiacus</i>);</li> <li>- Green and Golden Bell Frog (<i>Litoria aurea</i>);</li> <li>- Littlejohn's Tree Frog (<i>Litoria littlejohni</i>);</li> <li>- Stuttering Frog (<i>Mixophyes balbus</i>);</li> <li>- Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>);</li> <li>- Spotted-tailed Quoll (<i>Dasyurus maculatus</i>);</li> <li>- Southern Brown Bandicoot (<i>Isodon obesulus</i>);</li> <li>- New Holland Mouse (<i>Pseudomys novaehollandiae</i>);</li> <li>- Brush-tailed Rock Wallaby (<i>Petrogale penicillata</i>);</li> <li>- Long-nosed Potoroo (<i>Potorous tridactylus</i>);</li> <li>- Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>);</li> <li>- Broad-headed Snake (<i>Hoplocephalus bungaroides</i>);</li> <li>- Bynoe's Wattle (<i>Acacia bynoeana</i>);</li> <li>- <i>Acacia flocktoniae</i>;</li> <li>- Tesselated Spider Orchid (<i>Caladenia tessellata</i>);</li> <li>- Leafless Tongue Orchid (<i>Cryptostylis hunteriana</i>);</li> <li>- White-flowered Wax Plant (<i>Cynachum elegans</i>);</li> <li>- Small-flower Grevillea (<i>Grevillea parviflora</i>);</li> <li>- Aromatic Peppergrass (<i>Lepidium hyssopifolium</i>);</li> <li>- Biconvex Paperbark (<i>Melaleuca biconvexa</i>);</li> <li>- Deane's Melaleuca (<i>Melaleuca deanei</i>);</li> <li>- Needle Geebung (<i>Persoonia acerosa</i>);</li> <li>- <i>Persoonia bargoensis</i>;</li> <li>- <i>Persoonia glaucescens</i>;</li> <li>- Hairy Geebung (<i>Persoonia hirsute</i>);</li> <li>- <i>Pomaderris brunnea</i>;</li> <li>- Sydney Plains Greenhood (<i>Pterostylis saxicola</i>);</li> <li>- Smooth Bush-pea (<i>Pultanea glabra</i>);</li> <li>- Kangaloon Sun Orchid (<i>Thelymitra kangaloon</i>); and</li> <li>- Austral Toadflax (<i>Thesium austral</i>).</li> </ul>
Listed Migratory Species	<p>Thirteen listed migratory species have potential to occur in the vicinity of the proposed development:</p> <ul style="list-style-type: none"> <li>- Fork-tailed Swift (<i>Apus pacificus</i>);</li> <li>- Great Egret (<i>Ardea alba</i>);</li> <li>- Cattle Egret (<i>Ardea ibis</i>);</li> <li>- White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>);</li> <li>- White-throated Needletail (<i>Hirundapus caudacutus</i>);</li> <li>- Malleefowl (<i>Leipoa ocellata</i>);</li> <li>- Rainbow Bee-eater (<i>Merops ornatus</i>);</li> <li>- Black-face Monarch (<i>Monarcha melanopsis</i>);</li> <li>- Satin Flycatcher (<i>Myiagra cyanoleuca</i>);</li> <li>- Rufous Fantail (<i>Rhipidura rufifrons</i>);</li> <li>- Regent Honeyeater (<i>Anthochaera phrygia</i>);</li> <li>- Latham's Snipe (<i>Gallinago hardwickii</i>); and</li> <li>- Painted Snipe (<i>Rostratula benghalensis s. lat</i>).</li> </ul>

## 4.7 Native Title Act

The *Native Title Act 1993* recognises that Aboriginal people have rights and interests to land which derives from their traditional laws and customs. Native title can be negotiated in three ways; through a Native Title Claim (applications and determinations), through an Indigenous Land Use Agreement, or future act agreements.

The Gundungurra Tribal Council Aboriginal Corporation has a Native title claim registered as Gundungurra #6 (dating 21 June 2000) extending from Katoomba to Goulburn and including the extent of the proposed development. The claim is still the subject of negotiation.

An Indigenous Land Use Agreement is an agreement between a Native title group and other parties who use or manage the land and waters. The Indigenous Land Use Agreement process allows for negotiation between indigenous groups and other parties over the use and management of land and water resources, and the ability to establish a formal agreement. An Indigenous Land Use Agreement is binding once it has been registered on the Native Title Tribunal's Register of Indigenous Land Use Agreements. The NSW State Government is negotiating an Indigenous Land Use Agreement with the Gundungurra people.

## 5.0 Consultation

Xstrata Coal recognises the importance of pursuing the proposed development in a manner that avoids and minimises potential impacts on the environment and local communities. An important input into the consideration of environmental and community impacts would come from direct and transparent consultation with potentially affected members of the community.

### 5.1 Community and Stakeholder Engagement Plan

Community and stakeholder engagement for the proposed development will be guided by the:

- *Tahmoor South Project Community Consultation Plan* (Community Consultation Plan) (Xstrata Coal, 2012a); and
- *Tahmoor South Project Stakeholder Management Plan* (Stakeholder Management Plan) (Xstrata Coal, 2012b).

The Stakeholder Management Plan was prepared for implementation during exploration activities undertaken by Xstrata Coal as part of the pre-feasibility phase through to operation of the proposed development. The Stakeholder Management Plan provides a consistent management framework to identify and consult with stakeholders that have an interest in the proposed development. It also provides guidance for appropriate monitoring and reporting of community initiated enquiries.

The Community Consultation Plan was drafted to provide a framework for community consultation activities that are to occur during the environmental planning approvals process for the proposed development.

The abovementioned plans would be implemented following the submission of this PEA to DP&I, throughout the EIS phase of the proposed development, and during the construction and operation of the proposed development. The key objectives of the Stakeholder Management Plan and Community Consultation Plan are provided in **Table 7** below.

**Table 7 Community Consultation Objectives for the Proposed Development.**

Objectives of the Stakeholder Management Plan	Objectives of the Community Consultation Plan
<ul style="list-style-type: none"> <li>- To identify key stakeholder groups relevant to the proposed development.</li> <li>- To manage and facilitate the engagement of identified stakeholders.</li> <li>- To outline procedures for communication with the identified stakeholders.</li> <li>- To define the means by which Xstrata Coal will record and respond to feedback received from identified stakeholders.</li> <li>- To guide monitoring and reporting of community initiated enquiries and contact appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>- To identify the communities and key stakeholders likely to be affected by the proposed development.</li> <li>- To identify the nature and extent of stakeholder issues and concerns, as well as relevant strategies to proactively manage these issues and concerns.</li> <li>- To define the key messages, and communication tools and techniques to be used by Xstrata Coal during the EIS phase of the proposed development and related exhibition phases to disseminate information and provide opportunity for feedback.</li> <li>- To identify the policies and procedures to be used by Xstrata Coal to record and respond to enquiries, complaints, issues and incidents.</li> <li>- To identify and allocate communication roles within Xstrata Coal and the responsibilities of these roles.</li> </ul>

The Community Consultation Plan includes a series of activities to inform identified key stakeholders and the general community, as well as to seek feedback on the proposed development. These activities are to be implemented in phases that align with the NSW environmental planning process for the proposed development and include:

- Phase 1: planning, establishment and preparation of key consultation procedures, policies, activities and materials to be used for the proposed development. This would include stakeholder mapping and identification, preparation of a community liaison plan and schedule, establishment and management of a Consultation Manager database, establishment of a webpage for the proposed development and the preparation of consultation materials to be supplied to the community to inform them about the proposed development.
- Phase 2: consultation during the preparation of the EIS for the proposed development. This would include formal notification of local councils, the local member(s) of State and Federal Parliament, as well as identified key stakeholders and communities of the proposed development. Local councils and parliamentary members would be notified by convening briefings, while the community would be made aware of the proposed development by a letter sent out by Xstrata Coal to local residents, accompanied by advertisements in local newspapers. These notification activities would be followed by a community information session, and one-on-one meetings with relevant affected government agencies and stakeholders to discuss the proposed development.
- Phase 3: on-going consultation with the community and stakeholders during the statutory public exhibition period for the proposed development, which would culminate in the preparation of a Submissions Report.
- Phase 4: Ongoing consultation with affected stakeholders and community members during detailed design work, and throughout construction and operational phases of the proposed development.

Xstrata Coal has developed seventeen sustainable development standards which guide company operations. Sustainable Development Standard 12 (Social and Community Engagement) is aimed at ensuring that the social impact of Xstrata Coal's activities, as well as associated community concerns and needs, and the social risks to current and future operational activities are identified and addressed through effective implementation of community relations strategies which uphold and promote human rights and respect cultural and heritage considerations.

Sustainable Development Standard 4 (Communication and Engagement) addresses the need for Xstrata Coal to proactively communicate and engage with external stakeholders who are concerned with, or affected by Xstrata Coal's sustainable development performance, as well as ensuring community initiated enquiries are appropriately monitored and reported.

## 5.2 Key Consultation Activities

The Tahmoor Colliery Community Consultative Committee was advised during the pre-feasibility stage of the proposed development that Xstrata Coal has been investigating a mining project. Specific details regarding the proposed development were not provided to the public through this forum as a preferred option had not been defined, nor the mine plan designed at that time. However, the indicative areas to be mined as part of the proposed development were communicated through this forum.

Government agency stakeholders have been, and will continue to be, consulted as part of the environmental approvals process for the proposed development. Xstrata Coal has made initial presentations of the proposed development to the Department of Resources and Energy (28 June 12) and DP&I (5 July 2012).

The key consultation activities and communications summarised in **Table 8** are to be undertaken during the development and assessment of the proposed development.

Table 8 Key Consultation Activities and Communications.

Activity/ Community Method	Summary
Project webpage	<a href="http://www.tahmoorcoal.com.au/EN/majorprojects">www.tahmoorcoal.com.au/EN/majorprojects</a> The Tahmoor Coal webpage would be updated regularly throughout the proposed development, including information about key milestones of the proposed development; relevant documents available for public download, frequently asked questions regarding the proposed development, as well contact details (including an enquiries email contact, to be advised).
Key Stakeholder Briefings	Ongoing meetings are to be held with key stakeholders and relevant government agencies throughout the environmental planning approvals, construction and operational phases to allow for continuity of communication. This would also establish relationships throughout the life of the proposed development, and provide opportunities for issues or concerns to be raised and addressed.
Key Stakeholder Letters	Local and State government agencies as well as sensitive receivers would be sent letters providing them with a progress update during the EIS phase. Subsequent letters would be sent during construction and operation to provide updates regarding key milestones, as well as encourage feedback and/or participation.
Newspaper Advertising	Local newspaper advertisements would be used to inform the wider community of the Project and to invite feedback on the PEA and EIS. This mechanism would also be used to raise awareness when the EIS is on public exhibition.
Fact Sheets	Fact sheets would be made available for the community and interested stakeholders during consultation events and to notify stakeholder and the community of the progress of key milestones.
EIS Community Information Sessions	Community information sessions would be held to disseminate information on the EIS and would offer key stakeholders and the community the opportunity to view information regarding the proposed development and to provide feedback to Xstrata Coal on the EIS
Planning Focus Meeting	A planning focus meeting involving key regulatory agencies would be convened by the DP&I at which Xstrata Coal would outline the proposed development and the key environmental planning issues outlined in the PEA. The planning focus meeting would inform the preparation of DGRs for the proposed development.
Consultation with Aboriginal stakeholders	Aboriginal stakeholders would be consulted through the heritage impact assessment to be undertaken ( <b>section 7.5</b> ), in accordance with the relevant guidelines issued by the Office of Environment and Heritage.

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## 6.0 Identification of Key Assessment Issues

The proposed development would play an important role in the ongoing production of coal in the Southern Coalfield and continuation of local employment (direct and indirect). The proposed development would also provide financial benefits, particularly through the generation of coal royalties.

Xstrata Coal recognises the need to carefully consider the potential impacts of the proposed development on the environment and local communities, and the need to minimise these impacts wherever reasonable and feasible to do so. In taking this approach, the benefits of the proposed development can be realised with the least net cost to the environment and the public.

### 6.1 Approach to Identification of Key Environmental Issues

An initial screening of potential issues for consideration in the EIS has been undertaken. The risk screening process has determined the likely level of assessment required to adequately and appropriately address each issue identified. The risk screening considered the significance of each potential environmental impact (through a preliminary environmental risk screening), and also the likely level of stakeholder interest in each issue. Including stakeholder perception of potential environmental impacts is an important part of determining the level of assessment that should be applied, given that key stakeholder concerns may not necessarily align with a purely technical analysis of environmental risks.

By combining the likely significance of each identified environmental issue with the expected level of stakeholder interest, an assessment has been made as to whether each issue is integral to the assessment of the proposed development, and whether a detailed specialist investigation or desktop analysis would be appropriate. Where a high level of stakeholder interest is expected, a potential environmental impact has been determined to be a key issue requiring a detailed assessment irrespective of the outcomes of environmental risk screening.

#### 6.1.1 Environmental Risk Screening

The preliminary environmental risk screening for the proposed development has been undertaken using an ordinal (comparative measurement) scale to consider the likelihood of an environmental impact occurring and the consequence of that impact should it not be mitigated. The screening levels applied to the likelihood and consequence of each relevant environmental impact are presented in **Table 9** below. The likelihood and consequence of each impact have been combined through the significance screening matrix (**Table 10**) to establish the likely significance of the issue for the environmental assessment of the proposed development.

#### 6.1.2 Review of Expected Stakeholder Interest

The expected level of stakeholder interest in each potential environmental issue identified has been considered, based on a broad review of key issues raised in submissions in relation to major coal mining projects over the past five years. Potential environmental impacts have been assigned an expected level of stakeholder interest based on the definitions presented in **Table 11**.

### 6.2 Screening of Environmental Assessment Significance

Outcomes of the preliminary risk screening process which determined the likely key issues of environmental assessment significance is presented in **Table 12**. This screening allows for general prioritisation of environmental assessment issues based on their potential significance, and does not take into account the application of mitigation measures to minimise and manage potential impacts. Reasonable and feasible mitigation measures would be applied to the proposed development to minimise potential impacts. Mitigation measures would be developed during the assessment process and presented in detail in the EIS.

Table 9 Screening Levels – Environmental Impact Likelihood and Consequence

Likelihood of Impact		Consequence of Impact	
Almost certain	<ul style="list-style-type: none"> <li>- Almost certain to occur; or</li> <li>- Could occur within months.</li> </ul>	Severe	An issue that may cause disastrous environmental impacts with long term effects requiring major remediation.
Likely	<ul style="list-style-type: none"> <li>- There is between 50% and 99% probability that an environmental effect would occur; or</li> <li>- There is the balance of probability that an environmental effect would occur; or</li> <li>- An environmental effect could occur monthly.</li> </ul>	Major	An issue that may cause serious environmental impacts with medium term effects requiring significant remediation.
Possible	<ul style="list-style-type: none"> <li>- There is between 20% and 50% probability that an environmental effect would occur; or</li> <li>- An environmental effect may occur shortly but there is a distinct probability that it will not; or</li> <li>- An environmental effect could occur within 2 to 5 years.</li> </ul>	Moderate	An issue that may cause moderate and reversible environmental impacts with a short term effect requiring moderate remediation.
Unlikely	<ul style="list-style-type: none"> <li>- There is between 1% and 20% probability that an environmental effect would occur; or</li> <li>- An environmental effect may occur but is not anticipated; or</li> <li>- An environmental effect could occur within 5 to 20 years.</li> </ul>	Minor	An issue that may cause minor and reversible environmental impacts requiring minor remediation.
Very unlikely	<ul style="list-style-type: none"> <li>- There is less than 1% probability that an environmental effect would occur; or</li> <li>- An environmental effect may occur under exceptional circumstances; or</li> <li>- An environmental effect is exceptionally unlikely, even in the long term future; or</li> <li>- An environmental effect could occur once every 20 years.</li> </ul>	Insignificant	An issue that may cause negligible and reversible environmental impacts requiring very minor or no remediation.

Table 10 Significance Screening Matrix

Likelihood of Effect	Consequence of Effect				
	Severe	Major	Moderate	Minor	Insignificant
Almost Certain	Very High Significance	Very High Significance	High Significance	Medium Significance	Medium Significance
Likely	Very High Significance	High Significance	High Significance	Medium Significance	Medium Significance
Possible	High Significance	High Significance	Medium Significance	Medium Significance	Low Significance
Unlikely	Medium Significance	Medium Significance	Medium Significance	Low Significance	Very Low Significance
Very Unlikely	Medium Significance	Medium Significance	Low Significance	Very Low Significance	Very Low Significance

Table 11 Screening Levels – Expected Stakeholder Interest

Level of Interest	Definition
High level of interest	Issues raised in feedback from most stakeholders or in most submissions made on the development.
Medium level of interest	Issues raised in feedback from some stakeholders or in some submissions made on the development.
Low level of interest	Issues not raised, or rarely raised, in feedback from stakeholders or in submissions made on the development.

Table 12 Outcomes of Screening of Environmental Assessment Significance

Issue	Unmitigated Environmental Risk Screening			Stakeholder Level of Interest	Environmental Assessment Significance
	Likelihood	Consequence	Significance		
<b>Subsidence and Geology</b>					
Structures – subsidence related impacts to infrastructure and private property.	Likely	Moderate	High	High	High
Natural features – subsidence related impacts to waterways, caves, escarpments, overhangs, aquifers and other local environmental features.	Likely	Moderate	High	High	High
<b>Ecology</b>					
Vegetation clearance and habitat loss.	Likely	Moderate	High	Medium	High
Landscape and drainage change.	Likely	Moderate	High	High	High
Changes to aquatic ecology as a consequence of discharge and subsidence.	Possible	Moderate	Medium	High	High
Impacts to groundwater dependent ecosystems.	Possible	Moderate	Medium	Medium	Medium
<b>Groundwater</b>					
Changes to volume and quality of inflows.	Possible	Moderate	Medium	High	High
Impacts to local bore users.	Possible	Moderate	Medium	High	High
<b>Surface Water</b>					
Erosion and sedimentation issues during construction.	Possible	Minor	Medium	Low	Medium
Operational discharge into the environment.	Likely	Moderate	High	Medium	High
Site water balance impacts (surplus/ deficit).	Likely	Insignificant	Medium	Low	Medium
Impacts from drainage from non-operational areas.	Unlikely	Moderate	Medium	Low	Medium
Impacts associated with changes to catchment areas.	Possible	Minor	Medium	High	High
<b>Noise and Vibration</b>					
Construction noise.	Likely	Minor	Medium	Low	Medium
Operational noise.	Likely	Moderate	High	Medium	High
Noise generated by the operation of ventilation shafts.	Likely	Moderate	High	Medium	High
Increased rail movements associated with the proposed development.	Unlikely	Minor	Low	Medium	Medium

Issue	Unmitigated Environmental Risk Screening			Stakeholder Level of Interest	Environmental Assessment Significance
	Likelihood	Consequence	Significance		
<b>Traffic and Transport</b>					
Increase in vehicle movements as a consequence of construction.	Likely	Minor	Medium	Medium	Medium
Additional operational traffic movements.	Possible	Minor	Medium	Low	Medium
Extension of operational traffic movements as a result of an increase in the duration of local mine operations.	Likely	Minor	Medium	Low	Medium
Increased rail movements associated with the proposed development.	Unlikely	Minor	Low	Low	Low
<b>Heritage</b>					
Impacts to items of Aboriginal heritage.	Possible	Moderate	Medium	Medium	Medium
Impacts to items of European heritage.	Possible	Moderate	Medium	Medium	Medium
<b>Visual/Landscape</b>					
Impacts from an increase in the size of the REA.	Likely	Minor	Medium	Medium	Medium
Visible alterations to surface infrastructure.	Likely	Minor	Medium	Low	Medium
Installation of additional ventilation shafts.	Likely	Minor	Medium	Low	Medium
Subsidence-induced visual impacts.	Possible	Insignificant	Low	Medium	Medium
<b>Air Quality</b>					
Air quality impacts associated with the operation of additional ventilation shafts.	Possible	Moderate	Medium	Medium	Medium
Construction dust.	Likely	Minor	Medium	Low	Medium
Operational dust.	Likely	Minor	Medium	Medium	Medium
Pit top and REA-induced impacts to air quality.	Possible	Moderate	Medium	Medium	Medium
<b>Land Use</b>					
Increase in land-take as a result of the expansion of the REA and installation of additional ventilation shafts.	Likely	Minor	Medium	Low	Medium
<b>Social and Economic</b>					
Increase in demand for local services.	Likely	Minor	Medium	Low	Medium
Creation of employment opportunities.	Likely	Minor	Medium	Low	Medium

Issue	Unmitigated Environmental Risk Screening			Stakeholder Level of Interest	Environmental Assessment Significance
	Likelihood	Consequence	Significance		
<b>Waste</b>					
Construction waste.	Likely	Minor	Medium	Low	Medium
Operational waste.	Likely	Minor	Medium	Low	Medium
Waste associated with a coal washery and the REA.	Likely	Moderate	Medium	Low	Medium
<b>Hazard and Risk</b>					
Impacts associated with a bushfire event.	Possible	Major	High	Low	High
Spontaneous combustion in underground workings.	Unlikely	Moderate	Medium	Low	Medium
Hazardous event associated with the on-site storage of dangerous goods.	Unlikely	Major	Medium	Low	Medium
<b>Greenhouse Gases</b>					
Carbon consumption during construction.	Likely	Minor	Medium	Low	Medium
Carbon consumption during operation.	Likely	Minor	Medium	Medium	Medium
Downstream end use of coal products from the proposed development.	Likely	Moderate	High	High	High

### 6.3 Identification of Key Environmental Assessment Issues

Based on the risk screening presented in **Table 12**, key issues of consideration for the environmental impact assessment of the proposed development have been identified and are summarised in **Table 13**. These issues are discussed in further detail in **Section 7.0** of this PEA.

For each of the issues considered in **Table 13**, an assessment of significance was made based on the dominant environmental assessment significance ranking. For example, in the case of subsidence and geology, surface water, groundwater and ecology, the majority of environmental significance rankings for potential impacts were rated as high. As a consequence, these issues have been determined key issues for the environmental planning assessment of the development. A similar approach was taken to identify heritage, air quality, noise and vibration, traffic and transport, hazard and risk, greenhouse gas and visual amenity and landscape to be of medium significance to the environmental planning assessment process, based on the information available and the desktop investigations undertaken to date. The rankings of environmental assessment significance would be reviewed and updated accordingly as more detailed environmental investigations are undertaken to inform the preparation of the EIS for the proposed development.

**Table 13 Identification of Key and Other Environmental Assessment Issues**

Issue	Environmental Assessment Significance	Key Issues/Other Issue
Subsidence and Geology	High	Key issue ( <b>Section 7.1</b> )
Surface Water	High	Key issue ( <b>Section 7.2</b> )
Groundwater	High	Key issue ( <b>Section 7.3</b> )
Ecology	High	Key issue ( <b>Section 7.4</b> )
Heritage	Medium	Other issue ( <b>Section 7.5</b> )
Air Quality	Medium	Other issue ( <b>Section 7.6</b> )
Noise and Vibration	Medium	Other issue ( <b>Section 7.7</b> )
Traffic and Transport	Medium	Other issue ( <b>Section 7.8</b> )
Social and economic	Medium	Other issue ( <b>Section 7.9</b> )
Visual/Landscape	Medium	Other issue ( <b>Section 7.10</b> )
Hazard and Risk	Medium	Other issue ( <b>Section 7.11</b> )
Greenhouse Gases	Medium	Other issue ( <b>Section 7.12</b> )
Land Use	Low	Other issue ( <b>Section 7.13</b> )
Waste	Low	Other issue ( <b>Section 7.14</b> )

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## 7.0 Preliminary Environmental Assessment

This section considers the environmental assessment issues for the proposed development. During the pre-feasibility assessment and this PEA, the key focus has been for the avoidance of impacts wherever feasible. This focus will continue through the detailed design phase and preparation of the EIS, with residual implications for the environment and local communities managed to minimise impacts where reasonable and practical.

### 7.1 Subsidence and Geology

#### 7.1.1 Existing Environment

The geological series map of the Wollongong – Port Hacking (1:100 000 Sheet 9029-9129, Stroud et.al. 1985), shows that the majority of the proposed development is underlain by medium to coarse-grained Hawkesbury Sandstone. A smaller portion of the proposed development is underlain by shales associated with the Wianamatta Group (Stroud et.al 1985). Additional detail regarding the regional geology of the proposed development area is provided in **Table 14** below.

The main coal bearing sequence is the Late Permian Illawarra Coal Measures. The Illawarra Coal Measures consist of interbedded shales, mudstones, lithic sandstones and coals. Stratigraphic units include the Bulli seam, Loddon Sandstone, Lawrence Sandstone, Eckersley Formation, Wongawilli Coal and Kembla Sandstone. The Bulli and Wongawilli units contain commercial quantities of coal.

There are several regional scale fault zones in the vicinity of the proposed development, which indicate a general north-south trend for the “Bargo/Nepean” fault complex in the east of CCL 716 and CCL 747, along with unnamed north-west/south-east trending fault zones in the central and western regions. There are also several smaller-scale seam level faults and fault/dyke zones in the vicinity of the existing Tahmoor Colliery.

The proposed development lies mostly within the residual Blacktown and Lucas Heights soil landscapes, which are intersected by the erosional Gynea and colluvial Hawkesbury landscapes associated with local watercourses, as shown on the Soil Landscapes of the Wollongong 1:100 000 map sheet (Hazelton and Tille, 1990). There is also a small portion of land classified as disturbed terrain, which is associated with the existing Tahmoor Colliery surface infrastructure facilities and REA.

The topography of the proposed development area can generally be described as comprising a gently undulating landscape with low relief and small slopes. However, topography becomes steeper nearer the valleys of the Bargo and Nepean rivers which lie adjacent to the proposed development area. Here, the topography is characterised by narrow crests, ridges and incised valleys, steep side slopes and narrow benches with a high local relief of up to 200m (Hazelton and Tille, 1990). These sections of the landscape are limited by the steepness of the slopes, the presence of rock outcrops, extreme soil erosion hazards, mass movement hazards; namely rock falls, and shallow, stony, highly permeable soils with very low fertility, associated with the Hawkesbury and Gynea landscapes.

The depth of cover to the Bulli seam varies from approximately 350m in the south-western section of CCL 747 to approximately 430 m in the north-eastern section of CCL 716. The thickness of the Bulli seam varies from approximately 1.8 m to approximately 3.3m across the lease area.

The Bulli seam has been mined, and continues to be mined at Tahmoor Colliery as part of the existing and historical operations (**Figure 2**). Past and current operations have caused the land under a range of man-made and natural features to subside to the north of the proposed development. As a result of past and current mining, subsidence levels generally in the order of 1.2m have been experienced.

The surface land areas of the proposed development are located within the Bargo Mine Subsidence District (NSW Mine Subsidence Board, 2012). Key landscape features and infrastructure in the area that may be affected by subsidence include tributaries and catchments of the Bargo and Nepean Rivers, as well as the Hume Highway, Moomba to Sydney gas pipeline and the Main Southern Railway.

Table 14 Regional Geology in the Vicinity of the Development

Stratigraphic unit	Geological Time Period	Description
Upland Swamps and Stream Alluvium	Quaternary	<ul style="list-style-type: none"> <li>- Narrow clayey/silty/sandy alluvium with no significant aquifers along upland streams.</li> <li>- Minor alluvial sediment within the upper reaches of the Bargo River channel. Downstream of Picton Weir, the Bargo River transgresses to areas of interspersed exposed sandstone, boulder fields and minor sandy alluvium.</li> <li>- No upland swamps are located in the proposed development area.</li> </ul>
Wianamatta Group	Triassic	<ul style="list-style-type: none"> <li>- Ashfield Shale (basal unit): dark grey to black fossiliferous siltstone, grading to a laminite towards the top of the unit.</li> <li>- Minchinbury Sandstone: thin, persistent quartz lithic sandstone horizon separating the Ashfield Shale from overlying shale strata.</li> <li>- Bringelly Shale (overlying unit): minor carbonaceous claystone at the base, and predominately comprised of claystone, siltstone, laminite and sandstone.</li> </ul>
Hawkesbury Sandstone	Triassic	<ul style="list-style-type: none"> <li>- Characteristic of sedimentary deposition and erosion of a braided stream system, with individual facies representative of local sedimentary processes that generally don't persist across the unit.</li> <li>- Low hydraulic conductivity with low yielding aquifers.</li> </ul>
Narrabeen Group	Permo-Triassic	<ul style="list-style-type: none"> <li>- Newport and Garie Formations: interbedded grey shales and sandstones of variable thicknesses. The Garie foundation contains cream to brown, massive, characteristically oolitic claystone with a constant thickness.</li> <li>- Bald Hill Claystone: brown-red marker horizon with a constant thickness. This unit is a key marker bed in the Narrabeen formation beneath the Hawkesbury Sandstone and has low permeability. It is typically a massive chocolate brown to red-brown kaolinitic claystone with silty and sandy grey, and mottled grey-brown zones. It also contains minor laminated and thinly bedded siltstones and sandstones varying up to 3m in thickness.</li> <li>- Bulgo Sandstone: medium to course-grained, thickly bedded lithic sandstone with occasional conglomerate and shale.</li> <li>- Stanwell Park Claystone: greenish-grey mudstone and sandstone.</li> <li>- Scarborough Sandstone: thickly bedded sandstone with shale and sandy shale lenses up to several metres thick.</li> <li>- Wombarra Claystone: similar lithology to Scarborough Sandstone.</li> <li>- Coalcliff Sandstone: shales and sandstones contiguous with the underlying Bulli Seam and varies from a quartzose sandstone to a shale/mudstone units.</li> </ul>
Illawarra Coal Measures	Permian	<ul style="list-style-type: none"> <li>- Bulli seam.</li> <li>- Loddon Sandstone: shale, mudstone, siltstone and sandstone with a sharp conglomerate base.</li> <li>- Balgownie Coal Seam.</li> <li>- Lawrence Sandstone: mudstone and siltstone, progressing to sandstone at the base.</li> <li>- Cape Horn Coal Seam.</li> <li>- Eckersley Formation and Hargraves Coal Member: mudstone, claystone, siltstone and shales with intercalated, very thin uncommercial Hargraves Coal Seam.</li> <li>- Wongawilli Coal Seam.</li> </ul>

### 7.1.2 Issues for Consideration

Environmental issues relating to subsidence were identified during the pre-feasibility assessment. Throughout the pre-feasibility phase of the proposed development, the underground mine concept planning was developed with the aim of striking a balance between economic coal extraction, and the environmental and social impacts of subsidence. As a result of the pre-feasibility assessment, reasonable endeavours to minimise the potential for subsidence impacts, particularly on sensitive landscape features have been undertaken.

Notwithstanding efforts to avoid and minimise impacts, there would be permanent alterations to the local and regional geology as a result of the proposed development, including:

- Removal of panels of coal from the Bulli seam via longwall mining;
- Tunnelling for the purposes of mine access;
- Collapse of the goaf following coal removal; and
- Subsidence of the overlying strata into the goaf.

Potential subsidence movements include vertical subsidence, tilt, curvature and strain. Subsidence movements from the proposed development would potentially impact road, rail and pipeline infrastructure as well as private property. Within the vicinity of the proposed development, the following items have the potential to be impacted:

- The Hume Highway, Remembrance Drive and the Main Southern Railway (**Figure 2**);
- Secondary and minor roads that would be undermined by the proposed development;
- Moomba to Sydney Gas Pipeline;
- Private residences in the town of Bargo and surrounds; and
- Listed items of historic and Aboriginal heritage (**Section 7.5**).

Subsidence movements from the proposed development could potentially also impact natural features including groundwater aquifers (refer to **Section 7.3**), waterways (refer to **Section 7.2**), caves, escarpments and overhangs.

### 7.1.3 Method of Assessment

Potential impacts of the proposed development on the local and regional geology would be assessed mainly with respect to the collapse of the goaf and resulting subsidence of the overlying strata.

A subsidence impact assessment would be undertaken to support the EIS for the proposed development. To determine the extent and impacts of subsidence, the following would be undertaken:

- Further investigation of sensitive natural features and surface infrastructure in the zone of influence of the proposed development; including:
  - Built infrastructure, including roads, railways and building structures; and
  - Natural features; including steep slopes and cliffs, bedrock creeks and rivers with rock bars and standing pools.
- Subsidence modelling of mining of the Bulli seam to predict the extent of subsidence. The subsidence modelling would also take into account the latest observations from the current longwall mining at Tahmoor Colliery.
- Subsidence impact assessments for significant natural features, heritage items and items of surface built and service infrastructure which may be potentially impacted by the proposed development. The impact assessment would also include predictions of the nature and extent of sub-surface strata cracking (height of continuous and discontinuous cracking above the mine workings), which would be used to assess the impact of subsidence on hydrological features as part of the surface water and groundwater impact assessments.

The Southern Coalfields Inquiry recommended that predictions of subsidence impacts should consider major geological disturbances or discontinuities which may lead to non-conventional subsidence effects, and work to accurately predict the resultant 'anomalous' subsidence impacts. In addition, the inquiry recommended an increased focus on the prediction of valley closure in addition to local upsidence when assessing impacts on valleys and watercourses. The subsidence impact assessment would be undertaken in line with the

recommendations of the Southern Coalfields Inquiry and would be informed by data collected during the environmental baseline monitoring program for the proposed development.

The mine plan for the proposed development would continue to be refined in light of the outcomes of specialist environmental investigations undertaken to inform the preparation of the EIS and as more detailed engineering designs are developed. As part of this process, particular consideration would be given to the following issues in an endeavour to strike an appropriate balance between the commercial and operational requirements of the proposed development, and the need to minimise potential environmental and local amenity impacts:

- Geotechnical and/or geological limitations that may be identified during ongoing mining and exploration drilling;
- Evaluation of potential subsidence impacts on significant natural features, heritage items and items of surface built and service infrastructure; and
- Likely remediation costs of various layout/design options.

The extraction panel evaluation process and the adopted extraction panel design would be described in the EIS.

## 7.2 Surface Water

### 7.2.1 Existing Environment

#### Natural Surface Water Features

The Bargo River, a tributary of the Nepean River is the principal watercourse within the lease areas (**Figure 6**). It flows from south to north, on the western edge of CCL 747 and CCL 716, and is comprised of steeply incised sandstone embankments and escarpments. The lease areas are also traversed by a number of smaller tributaries of the Bargo and Nepean Rivers (**Figure 6**). The Bargo River converges with the Nepean River in the north-east of CCL 716. From this location, the Nepean River continues to flow northwards, where it flows into the Hawkesbury River and eventually into the Pacific Ocean.

Eight named watercourses lie within the vicinity of the proposed development, as well as numerous other unnamed tributaries. The watercourses range from first order to fifth order streams using the Strahler Stream order system (1952). Watercourses and their stream order within the vicinity of the proposed development are listed in **Table 15** below.

In addition to the Bargo and Nepean Rivers, other surface water features in the region include Thirlmere Lakes. Thirlmere Lakes form part of the Thirlmere Lakes National Park and are located approximately 600m west of the boundary of CCL 716 and approximately 2.5km north-west from the north westerly extent of the proposed development (**Figure 6**).

**Table 15 Watercourses within CCL 747 and CCL 716**

Creek	Stream Order According to Strahler (1952)
Bargo River	4th/5th
Hornes Creek	3rd/4th
Dogtrap Creek	1st/2nd/3rd
Eliza Creek	1st/2nd/3rd
Teatree Hollow	1st/2nd/3rd
Cow Creek	2nd
Dry Creek	1st/2nd
Carters Creek	1st/2nd

#### Current Water Management Systems

Stormwater and surface water runoff from surface infrastructure of the existing Tahmoor Colliery passes through oil containment devices before entering treatment dams. Mine water from dewatering operations is also transferred to these treatment dams (Xstrata Coal, 2011).

Treated water is then discharged via one of the licensed discharge points into Tea Tree Hollow under EPL 1389. Tahmoor Colliery undertakes monthly monitoring of the water being discharged to natural waterways as required by EPL1389. The results of the monthly monitoring are reported in the Annual Environmental Monitoring Reports prepared by Xstrata Coal and submitted to the Office of Environment and Heritage.

### 7.2.2 Issues for Consideration

The following issues would be considered in assessing the environmental impact of the proposed development:

- Subsidence induced impacts to watercourses undermined by the proposed development;
- Catchment and drainage modifications associated with the expansion of the REA;
- Site water balance, including water use, the treatment of mine water, potential operational discharge to the environment and the likelihood of uncontrolled surface run-off to adjacent watercourses from site drainage; and
- Erosion, sedimentation or contamination resulting from construction and operation of the surface facility.

#### Subsidence

The proposed development would undermine several watercourses, including Tea Tree Hollow, Dogtrap Creek, Eliza Creek, Cow Creek, Dry Creek, Carters Creek and several other unnamed creeks (refer to **Figure 6**). Mining induced subsidence can potentially result in alterations to surface water flow and water quality. The extent to which the proposed development would impact watercourses will be assessed as part of a surface water impact assessment to be included in the EIS. The surface water, groundwater and subsidence impact assessments will be interrelated and undertaken simultaneously to allow for a holistic view of local and regional hydrology.

#### Catchment and Drainage Change

Expansion of the REA would result in landform alterations that would change the catchment area for several small watercourses. Surface water run-off from the REA would be captured, treated and discharged and as a result, the expansion of the REA could potentially affect the volume of flow in adjacent waterways.

#### Site Water Balance

The proposed development would require water supply for its underground and surface operations. Water supply for the proposed development may be an issue depending on the quantities required and the source of supply.

Mine dewatering would be a necessary component of the proposed development. Management of mine water would include extraction, treatment and disposal.

Water balance issues relating to the surface operations include management of surface water run-off volumes, the potential for localised flooding and requirements for operational discharge to the environment under an EPL.

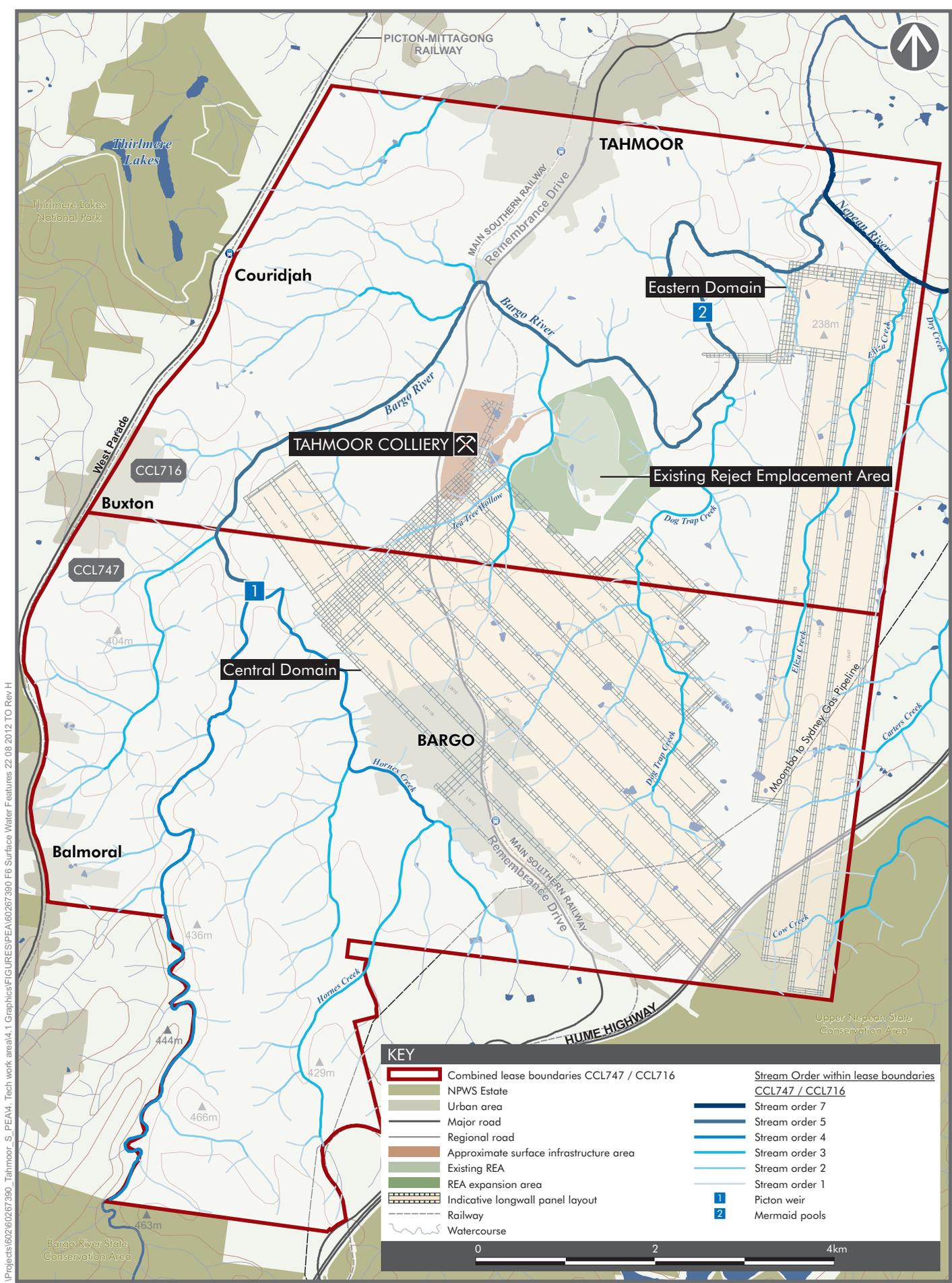
Flooding is not expected to be a key issue for the proposed development as the existing Tahmoor Colliery is not located within an active floodplain or flood prone area.

#### Erosion and Sedimentation

Watercourses are susceptible to environmental degradation through erosive action, weed infestation and changes to water quality. Construction and operation of the surface facilities may potentially impact local surface water through erosive action and sedimentation during construction and as a result of uncontrolled surface run-off. Specifically, potential erosion, sedimentation and contamination issues would relate to the:

- Contamination of soils due to accidental spillages of chemicals/ fuel by plant and equipment at Tahmoor Colliery;
- Erosion and sedimentation during construction and operation of surface infrastructure and the REA; and
- Erosion and sedimentation resulting from construction of ventilation shafts.

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### 7.2.3 Method of Assessment

A surface water impact assessment would be completed as part of the EIS and will include:

- A watercourse and catchment assessment;
- A water balance assessment, including a high level flooding assessment for the surface infrastructure; and
- An assessment of potential erosion and sedimentation impacts.

Initially, a review of available information and an evaluation of the existing surface water environment would be undertaken. The review would build on data gathered during the environmental baseline monitoring program, including information about major water features such as catchment boundaries, catchment areas, flow paths, stream flow volumes, water quality, as well as evaporation and rainfall data. It would also provide a comparison of baseline water quality data with water quality guidelines.

A watercourse and catchment assessment would be undertaken, involving the identification and ranking of watercourses potentially at risk from leakage and cracking. This would incorporate the findings of the subsidence impact assessment with the groundwater and surface water modelling in a combined water modelling package. Hydrology modelling of the watercourses in the lease area would be undertaken using the baseline monitoring data for verification, and the models developed would be adjusted to assess the impact of the proposed development on stream flows. The results of the modelling would be used to develop risk maps of potential impacts, which would assist in the development of mitigation measures tailored to the type and likelihood of risk presented.

A water and salt balance assessment would be prepared for the proposed development. This would identify site water demands (deficit/ surplus), water disposal volumes and frequency (controlled releases and overflow), dam sizes, water salinity and water discharge volumes. A water balance model would highlight whether the proposed development is in deficit or surplus over the life of the mine and how this would be managed or sourced. The likelihood and extent of localised flooding would be confirmed through the preparation of a high level flooding assessment as part of the water balance assessment.

There is potential for erosion and sedimentation to occur as a result of construction phase activities, and as part of ongoing site operations. The EIS for the proposed development would consider the potential impacts to soils, such as erosion and sedimentation, spills and leaks, and construction site run-off. In addition, a suite of effective and practical mitigation measures to be applied to construction works to manage these potential impacts within acceptable environmental limits would be outlined. The objectives of the control measures would be to:

- Provide a practical program for ongoing erosion and sediment control measures for the REA;
- Control the disturbance of soil and stockpiles at Tahmoor Colliery; and
- Limit the area of disturbance to the locations necessary for the construction of ventilation shafts.

The control measures would address the potential environmental impacts on soils in consideration of the above objectives.

## 7.3 Groundwater

### 7.3.1 Existing Environment

The existing environment for groundwater in the vicinity of the proposed development is characterised below in terms of:

- Aquifer systems;
- Stream and regional groundwater recharge; and
- Existing bore water use.

#### Aquifer Systems

Within the region of the proposed development, there are three main aquifer systems, namely:

- Thin, unconsolidated, perched, ephemeral, alluvial aquifers associated with stream valleys. The proposed development would not be located within close vicinity of notable groundwater bearing stream based alluvium due to the steep topography associated with local watercourses. The closest aquifer system of this

nature is associated with the Thirlmere Lakes System to the west of the proposed development, approximately 600m from the boundary of CCL 716 and 2.5 km from the extent of the proposed development at its closest point;

- Perched, ephemeral aquifers within the dual matrix porosity (where water is contained in both the primary porosity between sediment grains and secondary porosity in faults and bedding planes), tortuous (where the groundwater does not flow in a purely horizontal or vertical direction, but as a combination of the two) and unpredictable flow paths within limited joint/fracture/bedding plane or dyke related groundwater flow systems of the Shallow Hawkesbury Sandstone; and
- Dual matrix porosity, tortuous and unpredictable flow paths within limited joint/fracture/bedding plane or dyke related groundwater flow systems within the deeper basement Hawkesbury Sandstone and underlying lithologies in a variable sequence of aquicludes and aquitards. These systems comprise mainly mudstones and shales, and low yielding aquifers in sandstones and coal seams.

### **Stream and Regional Groundwater Recharge**

The Bargo River is classified as a 'gaining' system. Groundwater flows from the Illawarra Plateau under a regional hydraulic gradient to the Bargo River. The groundwater flow is predominantly horizontal within confined flows along discrete layers which are underlain by fine grained or relatively impermeable strata.

Regional groundwater in the vicinity of the proposed development fluctuates in response to the long term variable rate of rainfall recharge, as well as a result of the variable stream run-off and lateral groundwater flow. There are localised variations in groundwater recharge as a result of localised groundwater extraction and/or seepage to streams.

### **Groundwater Bores**

Within the vicinity of the proposed development, there are 72 private bores licensed by the NSW Office of Water; 24 of which are located directly over the proposed longwalls and headings, and 48 within the broader boundaries of CCL 747 and CCL 716 (**Figure 7**).

Bores within these areas are predominantly used for stock and domestic purposes, along with poultry, irrigation, waste disposal and monitoring. The deepest bore is 162m and bores are within Hawkesbury Sandstone stratigraphy, have standing water levels between 10m and 54m below the surface and have yields of up to 6.6L per second. Salinities of the bore holes within the lease areas range from 993mg per litre in shallower intersections down to a minimum 30mg per litre.

#### **7.3.2 Issues for Consideration**

Groundwater issues associated with the proposed development would largely relate to potential impacts on local bore users and subsidence related effects which would potentially alter groundwater flow and quality, including:

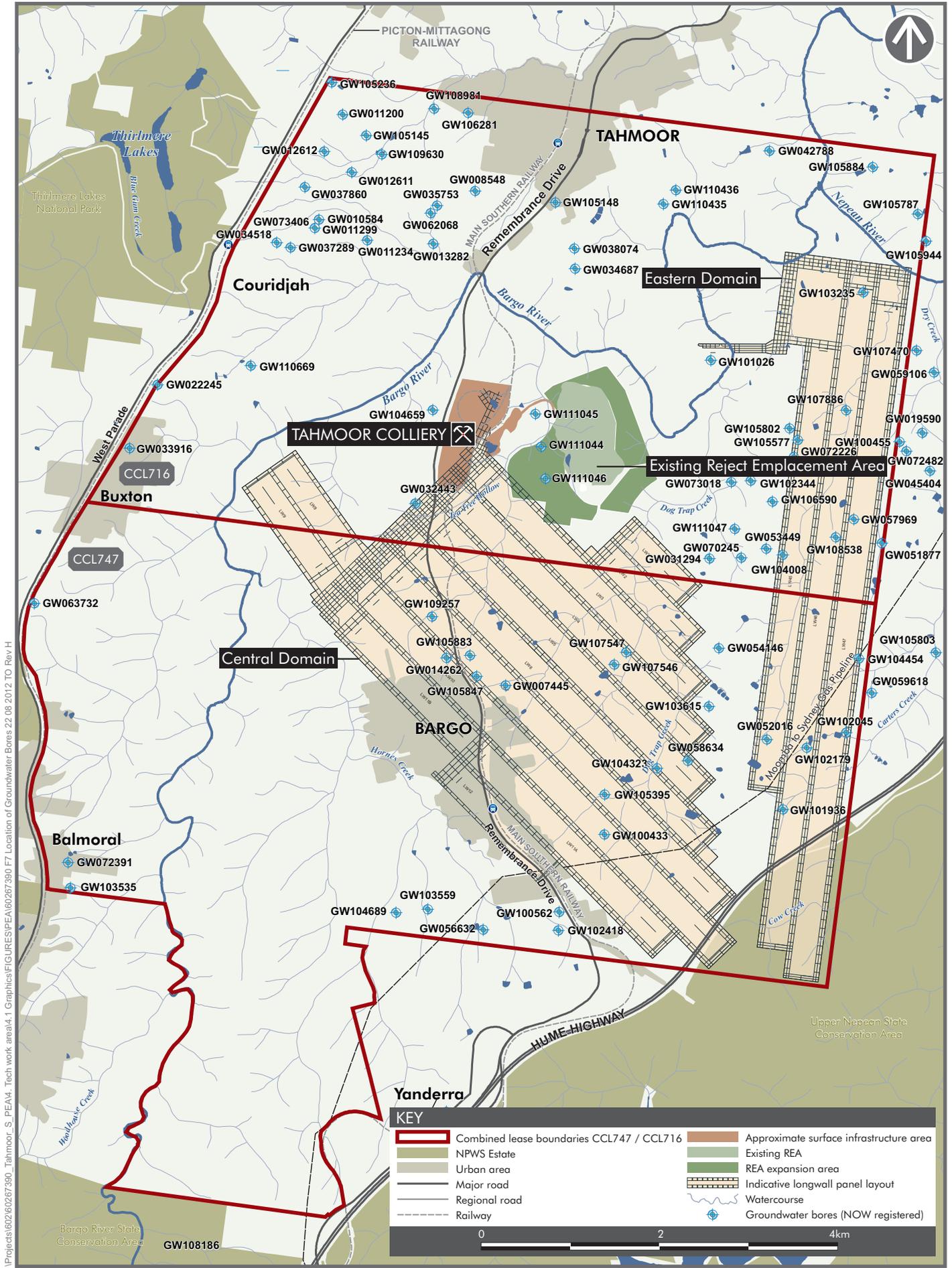
- Subsidence induced impacts such as cracking and/or changes in sub-surface hydrology of perched groundwater lenses and saturated zones;
- Potential requirement for an aquifer interference licence;
- Groundwater pressure effects; and
- Lowering of the water table.

Bore monitoring has been undertaken following the extraction of coal from some of the longwalls which are part of the existing Tahmoor Colliery operations. Several local private boreholes experienced a reduction in bore yields during the monitoring period and required re-drilling. Effects on local bore users as a result of the proposed development would be considered as part of the EIS.

In addition, groundwater inflows into the underground mine would require consideration and management.

#### **7.3.3 Method of Assessment**

A detailed assessment of mining induced subsidence impacts on groundwater as a result of the proposed development would be undertaken. This would include an overall assessment of the effects of subsidence on local watercourses, in the form of a stream constraints assessment as discussed in **Section 7.2**, and would determine whether the proposed development would impact regional groundwater levels. Following the groundwater assessment, a suite of mitigation measures would be presented to manage potential impacts within acceptable environmental limits.



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## 7.4 Ecology

### 7.4.1 Existing Environment

Impacts to areas of high ecological value identified during the pre-feasibility assessment for the proposed development have been largely avoided by using the existing surface facilities at Tahmoor Colliery, rather than creating a new and separate footprint. For some components of the proposed development, it would not be possible to entirely avoid clearing potentially significant vegetation due to other constraints such as land use/ownership conflicts. In these cases, the detailed design would consider opportunities to further reduce impacts on significant vegetation where reasonable and feasible with regard to cost/engineering practicalities as well as a balanced assessment of other environmental planning factors.

Notwithstanding the aim to avoid impacts from the proposed development on ecology, it is likely that some impacts to flora and fauna would be unavoidable. The existing ecological environment is described below with regards to vegetation communities, flora, fauna and threatened species.

#### Vegetation Communities

Eight vegetation communities have been mapped within the vicinity of the proposed development, classified as part of the native vegetation of south-east NSW (Tozer *et al* 2006) (**Figure 8**). Some of these vegetation communities are known as having the potential to constitute EECs. These are:

- Cumberland Shale Sandstone Transition Forest which may constitute SSTF listed under the *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act;
- Cumberland River Flat Forest which may constitute River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions which is listed as an EEC under the TSC Act;
- Southern Highlands Shale Woodland may constitute Southern Highlands Shale Woodlands in the Sydney Basin Bioregion, listed under the TSC Act; and
- Sydney Hinterland Transition Woodland, which comprises characteristics similar to SSTF.

The Tozer *et al* (2006) classification and mapping is somewhat consistent with the EPBC Protected Matters database which listed the following EECs as potentially occurring in the proposed development area:

- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest;
- Turpentine-Ironbark Forest of the Sydney Basin;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland; and
- Shale Sandstone Transition Forest.

The discrepancies between Tozer *et al* (2006) and the EPBC Act database are due to different classification and naming conventions. Ecological surveys, undertaken as part of the EIS, would groundtruth the Tozer *et al* (2006) and EPBC Act database mapping to determine the extent of vegetation communities in the vicinity of the proposed development, including that of EECs.

Previous surveys, undertaken as part of the pre-feasibility assessment and baseline monitoring phases of work, have mapped SSTF along Dog Trap and Eliza Creeks, as well as being scattered throughout private properties and National Parks estate further south of the proposed development. SSTF may potentially occur along creek lines within the vicinity of the proposed development, but restrictions on access to private land have limited the extent of survey possible to date.

SSTF has also been identified within the footprint of the REA expansion area. The REA expansion would be into areas of land which have been previously remotely mapped as Sydney Hinterland Transition Woodland, which shares similar characteristic and diagnostic species to the SSTF (**Figure 8**). There is a high probability that SSTF occurs within the footprint of the proposed REA expansion area, based on the distribution of this community and species in surrounding areas.

Southern Highlands Shale Woodland has been mapped as occurring in the proposed development area in a number of fragmented patches in close proximity to creek and ridge top environments on private property in the central portion of the study area (Niche, 2012).

### Threatened Flora

Searches of the *EPBC Protected Matters Search Tool* and the *NSW Atlas of Wildlife* identified 24 flora species listed as previously being recorded, or having potential habitat within a 10km radius of the proposed development (**Appendix A**). Of particular note is *Persoonia bargoensis*, listed as a vulnerable species under the EPBC Act, and as an endangered species under the TSC Act. There is a high probability that *Persoonia bargoensis* is present within the footprint of the REA expansion area.

### Fauna Habitat

Fauna habitats within the vicinity of the proposed development have been classified into six broad categories based on the vegetation type and general features present. These habitats include:

- Wildlife corridors;
- Woodland and forest;
- Riparian corridors;
- Perennial and ephemeral watercourses;
- Cleared habitat; and
- Microhabitat features.

Wildlife corridors provide for enhanced flora and fauna diversity and habitat, and are likely to be less impacted by adjoining land uses and associated edge effects than other vegetated areas. The key wildlife corridor in the vicinity of the proposed development is associated with the Bargo River. This wildlife corridor is connected to the Bargo River State Conservation Area to the south, and allows fauna movements to parts of Sydney Catchment land to the south, and to Nattai National Park.

The wildlife corridor reaches over 3.5km in width in some sections to the west of the proposed development. North of the proposed development, the wildlife corridor narrows and consists mostly of riparian land along the Bargo River. To the east and some sections to the west, the wildlife corridor narrows and is fragmented by access tracks. The wildlife corridor also covers sections of land which would be underlain by the underground operations of the proposed development in the vicinity of Tea Tree Hollow and Dog Trap Creek.

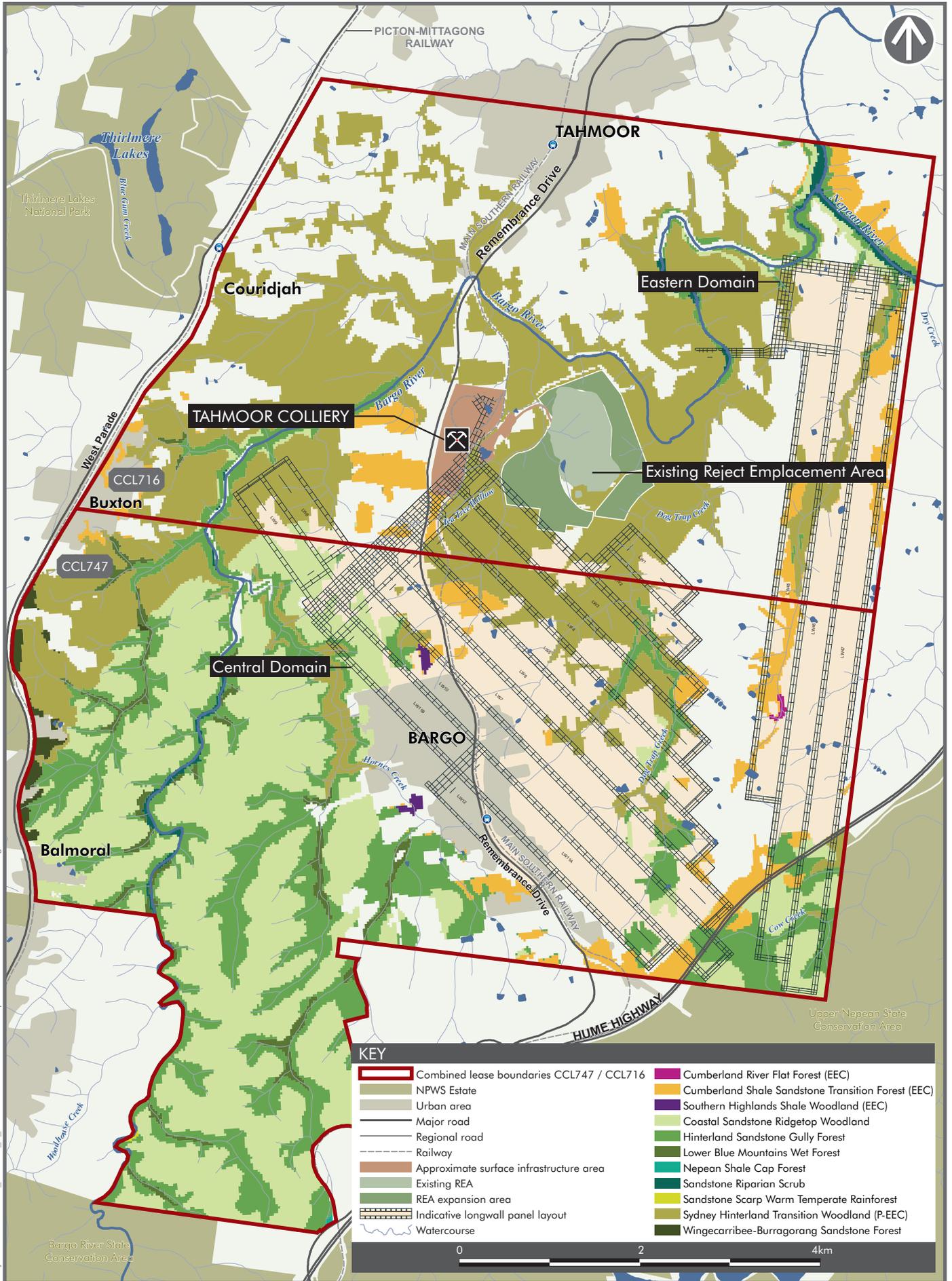
Several woodland and forest communities occur in the vicinity of the proposed development. The condition of woodland and forest habitat near the existing Tahmoor Colliery is likely to be in low to moderate condition as a result of edge effects, previous clearing, vegetation modification and weed invasion. Areas of woodland and forest communities would need to be cleared as a result of the proposed development, mostly due to the expansion of the existing REA.

Riparian corridors act as an interface between terrestrial and aquatic ecosystems and play an important role in the maintenance of stream stability, as well as providing fauna habitat for fauna and facilitating fauna movement. Within the vicinity of the proposed development, there are riparian corridors present along the length of the Bargo River, Tea Tree Hollow, Dogtrap Creek, Eliza Creek and other minor tributaries.

The degree to which perennial and ephemeral watercourses provide habitat is related to the extent of submerged and emergent vegetation, water quality, rate of flow, geomorphology (physical habitats created by the channel and bedform) and extent of debris. The majority of these parameters are influenced by catchment conditions and the extent of riparian vegetation. Therefore, it is expected that in areas of the broader lease that have been subject to clearing and agriculture, watercourses will exhibit lower habitat values than those watercourses in heavily forested catchments. The proposed development has the potential to impact on watercourse habitat through subsidence and vegetation clearing.

Cleared habitat occurs predominately to the east of the township of Bargo. The cleared land provides minimal habitat opportunities for fauna other than common native species, introduced avian species, and introduced mammals.

Microhabitat features that are likely to exist in the vicinity of the proposed development are hollow bearing trees, mature trees, woody debris, leaf debris and exfoliating bark. The main impact to these features as a result of the proposed development would be through vegetation clearing associated with the REA expansion.



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## Threatened Fauna

Searches of the *EPBC Protected Matters Search Tool* and the *NSW Atlas of Wildlife* identified 56 species listed under the EPBC Act and/or TSC Act as previously being recorded, or having potential habitat within a 10km radius of the proposed development (refer to **Appendix A**).

Vegetation/ habitat clearance would be the principal potential impact of the proposed development for the majority of fauna species listed. However, with respect to listed amphibians, there is potential for the Giant Burrowing Frog and Littlejohn's Tree Frog to be impacted by subsidence (indirectly through changes to hydrology), as they are known to or suspected of occurring in, areas that would be undermined by the proposed development.

Also, seven aquatic fauna species were identified that have the potential to occur, or that have been previously recorded in aquatic environments within a 10km radius of the proposed development. None of the identified species are listed as threatened or endangered under the TSC Act, but are listed under the EPBC Act and/or the *Fisheries Management Act 1994*. The results of these searches are detailed in **Appendix A**. However, it should be noted that of the seven listed aquatic fauna species, only three are likely to occur in the vicinity of the proposed development, due to habitat availability. These species are the Sydney Hawk Dragonfly (*Austrocordulia leonardi*), Adam's Emerald Dragonfly (*Archaeophya adamsi*), and the Macquarie Perch (*Macquaria australasica*).

## Conservation Areas

Conservation areas in close proximity to the proposed development are managed by the Office of Environment and Heritage and have been deemed important habitat for a number of threatened flora and fauna species within a section of the Upper Bargo River Catchment area. The south-eastern section of the proposed development extends into land that is part of the Upper Nepean State Conservation Area (refer to **Figure 4**), and several creeks and rivers within the boundary of CCL 716 and CCL 747 flow from the Bargo River State Conservation Area.

The Bargo State Conservation Area is located along the western boundary of CCL 747, Bargo River State Conservation Area to the south, and the Upper Nepean State Conservation Area is directly adjacent to the south-east (refer to **Figure 2**). Thirlmere Lakes and Nattai National Parks are also located to the west of the boundaries of CCL 716 and CCL 747.

## SEPP 44 Koala Habitat Protection

SEPP 44 aims to encourage the conservation and management of areas of natural vegetation that provide potential Koala habitat (**Section 4.3.3**). Vegetation mapping that was undertaken as part of the pre-feasibility phase of the proposed development identified large areas of land that contained preferred feed trees for the Koala. Additionally, Koalas have been recorded to the west of the proposed development near the Bargo River. Based on the amount and type of vegetation present in the area, the likelihood of feed trees, and the large wildlife corridor, it is likely that the area in the vicinity of the proposed development provides habitat for the Koala.

### 7.4.2 Issues for Consideration

The pre-feasibility assessment and project design was completed with the aim of avoiding or minimising impacts to ecology. Notwithstanding, the proposed development could have the potential to impact on the local and regional ecology through vegetation clearance, mining-related subsidence effects and habitat degradation.

Vegetation clearance would be required to accommodate the REA expansion required for the proposed development and for the installation of additional ventilation shafts.

The proposed REA expansion would result in a combined clearance of up to approximately 66 ha of vegetation. This vegetation clearance has the potential to impact on local habitat availability for common flora and fauna species, and those species listed as vulnerable, threatened or endangered under the TSC Act and EPBC Act.

Mining induced subsidence from the proposed development has the potential to affect both the local and regional aquatic and terrestrial ecology. Subsidence can affect aquatic ecology by altering the local watercourses and associated drainage, and by altering water quality, particularly in regards to metal concentrations. Groundwater dependent ecosystems could also be affected by subsidence.

There is also the potential for the surface operations of the proposed development to impact aquatic habitats and ecological communities. This would arise in the event of unmitigated erosion and sedimentation processes and from uncontrolled discharge of water to the environment.

### 7.4.3 Method of Assessment

An ecological assessment would address the impacts of the development on the local and regional terrestrial and aquatic ecology. The ecological assessment would identify potential impacts on ecological communities, flora and fauna, and potential habitat for species and communities identified as vulnerable, threatened or endangered under the TSC Act and EPBC Act. The impacts of the proposed development on groundwater dependent ecosystems would also be considered as part of the ecological assessment.

The subsidence related effects of the proposed development on local and regional aquatic and terrestrial ecology within the vicinity of the proposed development would be assessed as part of a mining subsidence assessment discussed in **Section 7.1**. The effects of subsidence on the interconnectedness of groundwater and surface water systems and potential impacts on local aquatic ecology would be assessed in the groundwater and surface water assessments (**Section 7.2** and **Section 7.3**).

## 7.5 Heritage

### 7.5.1 Existing Environment

Searches of the relevant heritage inventories were undertaken to identify heritage items within CCL 747 and CCL 716 (summarised in **Table 16** and illustrated in **Figure 9** and **Figure 10**).

**Table 16 Heritage Items in the Study Area**

Heritage Inventory	Number of Heritage Items Identified
Register of the National Estate (RNE) *	3
National Heritage List (NHL)	0
Commonwealth Heritage List (CHL)	0
NSW State Heritage Register (SHR)	6
National Trust of Australia	0
Wollondilly LEP 2011	30
Aboriginal Heritage Information Management System (AHIMS)	38

\*As of 19 February 2012, items listed on the RNE were removed from the EPBC Act as these parts have been superseded by stronger ongoing heritage protection provisions under national environment law.

#### Register of the National Estate

Three items were listed on the RNE as occurring within CCL 747 or CCL 716: Bargo Railway Station, Bargo River Gorge and Mermaids Pool. Of these, the Bargo Railway Station toilet block would be undermined by the proposed development.

As of 19 February 2012, the RNE ceased to be a statutory list of heritage items. The RNE now exists as an information source only and RNE listed items are no longer an obligatory issue for consideration by the Minister for Planning and Infrastructure if a matter is referred, unless it is explicitly identified in an alternate statutory heritage list.

#### NSW State Heritage Register

Four items of State heritage significance listed on the NSW State Heritage Register are located within CCL 747 and CCL 716. These items, their location and whether they are likely to be impacted by the proposed development are presented in **Table 17** and illustrated in **Figure 9**.

#### Wingecarribee Local Environmental Plan 2010

There are no heritage items listed in the Wingecarribee LEP 2010 that are located within CCL 747 and CCL 716.

#### Wollondilly Local Environmental Plan 2011

Under the Wollondilly LEP 2011, twenty-seven sites of either local or state significance were identified as occurring within CCL 747 and CCL 716. These items, their significance and whether they would be undermined or otherwise impacted by the proposed development are presented are detailed in **Table 18** below and illustrated in **Figure 9**.

Table 17 NSW State Heritage Register Items

Item	Location	Potential to be Impacted by the Proposed Development
Tahmoor Railway Station	George Street, Tahmoor LGA: Wollondilly	Low, the proposed development would not undermine the Tahmoor Railway Station.
Bargo Railway Viaduct	Main Southern Railway, Bargo LGA: Wollondilly	Low, the proposed development would not undermine the Bargo Railway Viaduct.
Bargo Hotel	Great Southern Road, Bargo LGA: Wollondilly	Potential to be impacted as the proposed development would mine under the Bargo Hotel.
Bargo (Picton) Weir	Bargo River between Buxton and Bargo LGA: Wollondilly	Low, the proposed development would not undermine the Bargo River or the weir.

Table 18 Wollondilly LEP Heritage Items in the vicinity of the Tahmoor South Project

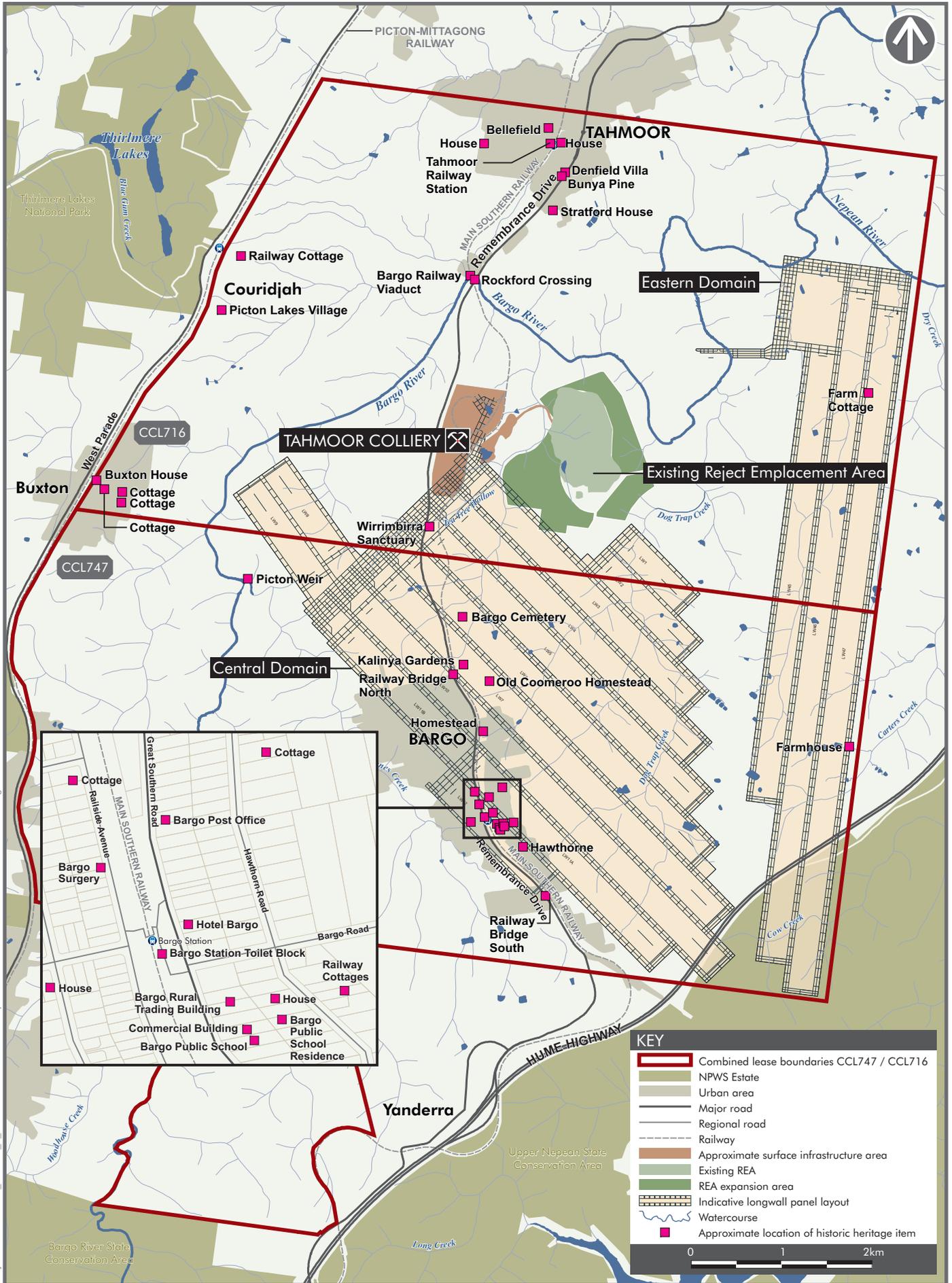
Name	Significance	Potential to be Impacted by the Proposed Development
Bargo Cemetery	Local	Yes
Bargo Railway Viaduct	State	Low potential, the proposed development would not undermine the Bargo Railway Viaduct.
Kalinya Gardens and Landscape	Local	Yes
Old Coomeroo Homestead	Local	Yes
Homestead (170 Great Southern Road)	Local	Yes
Bargo Post Office	Local	Yes
Hotel Bargo	Local	Yes
Bargo Rural Trading Building	Local	Yes
Commercial Building	Local	Yes
Bargo Public School	Local	Yes
Cottage (91 Hawthorne Road)	Local	Yes
House (118 Hawthorne Road)	Local	Yes
Hawthorne	Local	Yes
House (8 Noongah Street)	Local	Yes
Bargo Railway Station Toilet Block	Local	Yes
Bargo Surgery	Local	Yes
Cottage (121 Rainside Avenue)	Local	Yes
Wirrimbirra Sanctuary	State	Yes
Bargo Railway Bridge (South)	Local	Yes

Name	Significance	Potential to be Impacted by the Proposed Development
Bargo Railway Bridge (North)	Local	Yes
Bargo (Picton) Weir	Local	Low potential, the proposed development would not undermine the Bargo (Picton) Weir.
House (13 Larkin Street)	Local	Low potential, the proposed development would not undermine 13 Larkin Street.
Bellefield	Local	Low potential, the proposed development would not undermine Bellefield
Rockford Crossing	Local	Low potential, the proposed development would not undermine Rockford Crossing.
Denfield Villa	Local	Low potential, the proposed development would not undermine Denfield Villa.
Bunya Pine	Local	Low potential, the proposed development would not undermine Bunya Pine.
Stratford House	Local	Low potential, the proposed development would not undermine Stratford House.
Railway cottage (305 Bargo River Road)	Local	Low potential, the proposed development would not undermine the Railway cottage.
Picton Lakes Village	Local	Low potential, the proposed development would not undermine the Picton Lakes Village.
Buxton House (57–59 East Parade)	Local	Low potential, the proposed development would not undermine Buxton House.
Farmhouse (160 Dwyers Road)	Local	Yes
Cottage (25–27 Eurelia Road)	Local	Low potential, the proposed development would not undermine the Cottage (25–27 Eurelia Road).
Cottage 7–9 (Eurelia Road)	Local	Low potential, the proposed development would not undermine the Cottage 7–9 (Eurelia Road).
Cottage 7–9 (Erith Road)	Local	Low potential, the proposed development would not undermine the Cottage 7–9 (Erith Road).
Farm Cottage (45 Lawson Road)	Local	Yes

#### Aboriginal Heritage Information Management System

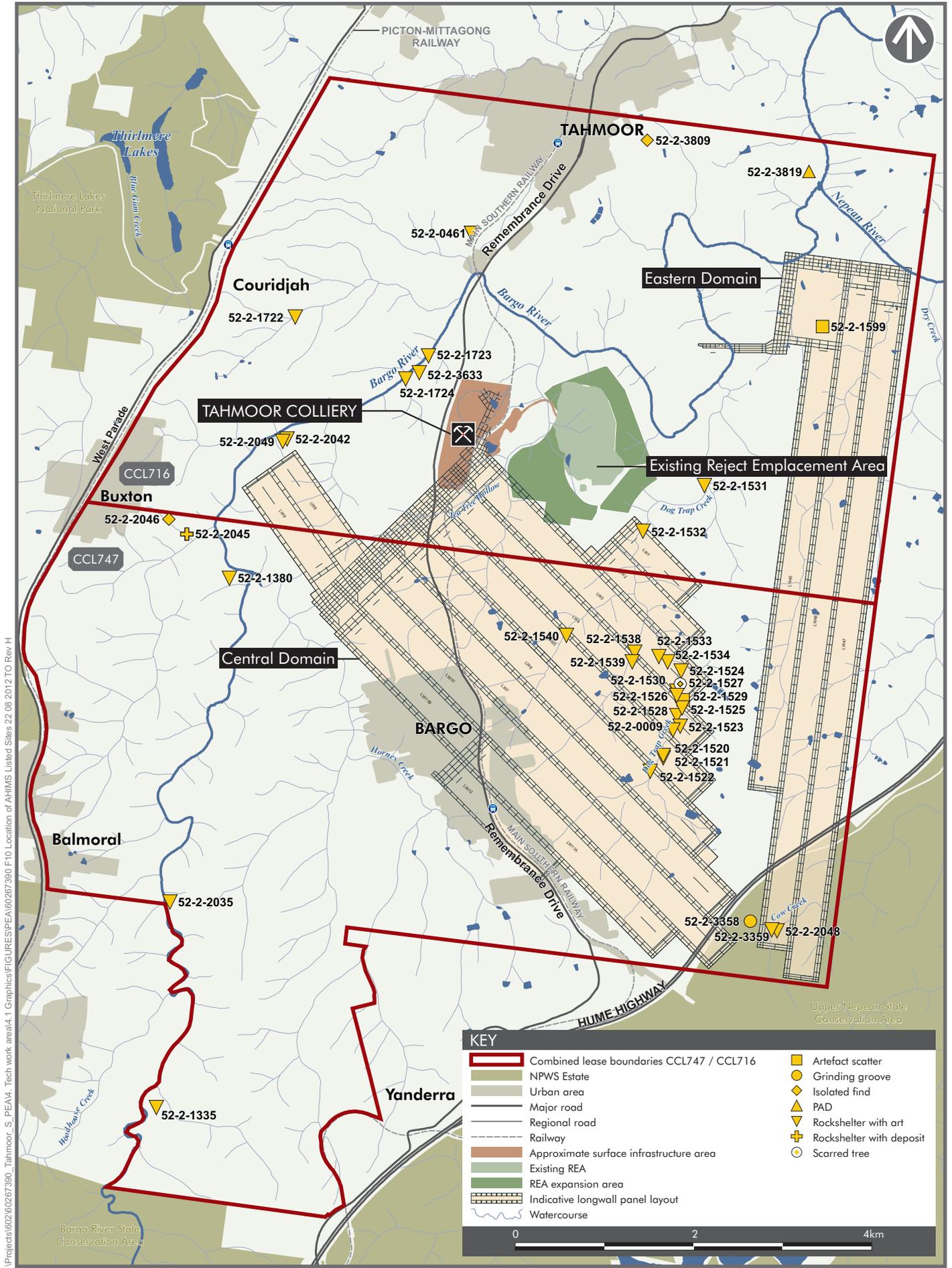
The nature and distribution of items of Aboriginal heritage significance within the vicinity of the proposed development can be predicted by considering the environmental, archaeological and ethno-historical context of the area. Items of Aboriginal heritage significance in the vicinity of the proposed development are likely to include:

- Open artefact scatters and isolated finds;
- Rock shelters;
- Scarred trees;
- Axe grinding grooves; and
- Archaeological deposits.



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Of the above, rock shelters would be the most common site type within the vicinity of the proposed development, and most of these would be associated with the Bargo River and other major creek lines, which are identified as environmentally sensitive. Additionally, artefact scatters and grinding grooves are also likely to be present, and are likely to be associated with rivers and creeks in the vicinity of the proposed development.

A search of the Aboriginal Heritage Information Management System, managed by the Office of Environment and Heritage, was conducted as part of the pre-feasibility assessment on 14 July 2011. Thirty eight registered Aboriginal sites were identified within CCL 747 and CCL 716, which are detailed in **Table 19**. The locations of these sites are also illustrated in **Figure 10**.

**Table 19 AHIMS Sited within the Vicinity of the Tahmoor South Project**

Site Type	Number of Sites	Number of Sites Likely to be Impacted by the Proposed Development
Rock shelter with art	30	19
Rock shelter with deposit	1	0
Artefact scatter	2	2
Grinding grooves	1	0
Isolated find	2	0
PAD	1	0
Scarred Tree	1	1
<b>Total</b>	<b>38</b>	<b>22</b>

### 7.5.2 Issues for Consideration

Items of heritage significance may be directly impacted by the upgrade to existing surface infrastructure facilities at Tahmoor Colliery, the expansion of the REA, and the installation of ventilation shafts for the proposed development. Items of heritage significance may be indirectly impacted as a result of mining induced subsidence.

Direct impacts to heritage items may be potentially minimised by designing the infrastructure to avoid known or potential items and areas of significance. Impacts of the proposed development on items of heritage significance within the development footprint of surface infrastructure would be considered further during the detailed design and the EIS phases of the proposed development.

The majority of identified items of European heritage significance in the vicinity of the proposed development are located in close proximity to the Bargo and Tahmoor townships (refer to **Figure 9**). Many of these items would be underlain by the underground mining operations associated with the proposed development and would potentially be subject to mining induced subsidence impacts.

The predominant and most significant heritage impact would relate to potential heritage landscape implications. The dominant features of Aboriginal heritage in the vicinity of the proposed development are rock shelters, artefact scatters and axe grinding grooves associated with the Bargo River and major creek lines. These areas are identified as environmentally sensitive with regard to items of Aboriginal heritage significance.

### 7.5.3 Method of Assessment

Mining induced subsidence effects on surface infrastructure and on known and potential Aboriginal heritage landscapes would be included in a subsidence impact assessment to be prepared for inclusion in the EIS. For additional detail regarding impacts of the proposed development as a result of subsidence, refer to **Section 7.1**.

A detailed heritage impact assessment would be included in the EIS. The assessment would include a detailed survey of areas where surface infrastructure would require excavation or disturbance of the ground surface. The survey would also include environmentally sensitive areas, particularly along major rivers and creek lines, where there is the greatest potential for items of Aboriginal heritage significance to exist, and a visual inspection of previously identified Aboriginal and European heritage sites (refer to **Section 7.5.1**). Aboriginal stakeholders would be identified prior to the survey and invited to register their interest in the proposed development. Identified stakeholders would then be invited to participate in the site heritage surveys.

The heritage impact assessment would be undertaken in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (Department of Environment and Climate Change, 2010) and the *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996). A central component of the assessment would be the development of a detailed risk-based landscape assessment to identify landscape features likely to be associated with items of heritage significance.

The subsidence related effects of the proposed development on items of Aboriginal and European heritage significance would be assessed as part of a mining subsidence assessment to be included in the EIS. For additional details regarding the effects of subsidence, refer to **Section 7.1**.

## **7.6 Air Quality**

### **7.6.1 Existing Environment**

Weather monitoring at Tahmoor Colliery indicates the dominant wind patterns are from a south and south-west direction. The mixing height (the height above ground level through which relatively vigorous vertical mixing occurs) for the area ranges from less than 1000m during the night and early hours of the morning, to around 3000m in the early afternoon. Rainfall is more prevalent between January and March, whilst the lowest mean rainfall is between July and September.

As part of its Annual Environmental Management Report, Tahmoor Colliery monitors air quality via dust-monitoring gauges which indicated that the monitored locations have, for the past four reporting periods, met the Environment Protection Authority's annual average assessment criteria. However, it is noted in the Annual Environmental Management Report that complaints have been made with regard to dust created by vehicles driving over dirt roads and odour emissions from ventilation shafts. Dust and odour issues continue to be addressed through additional dust management measures and the redesign of the existing ventilation shaft number two located on Rockford Road. These dust and odour issues are also regulated by the addition of several conditions in the existing Tahmoor Colliery's EPL 1389.

### **7.6.2 Issues for Consideration**

The proposed development has the potential to emit air pollutants during construction and operation which may impact the local air shed as well as local sensitive receivers. The potential sources of air pollution from the proposed development are:

- Dust emissions as a result of earthworks including earthmoving and materials handling operations (including those at the REA) as well as other sources of 'fugitive' dust. Coal dust emissions may also occur when the moisture content of the coal falls below approximately 4.7% during handling and storage as well as during loading and unloading stages;
- Vehicle exhaust emissions during construction and operation of the proposed development. In particular, emissions of carbon monoxide, nitrogen dioxide, and sulfur dioxide particulate matter; and
- Odour and dust emissions from the operation of ventilation shafts and gas management process.

In addition, there is the potential for a limited period of cumulative air quality impacts resulting from the operation of the proposed development in tandem with the existing operations at Tahmoor Colliery.

### **7.6.3 Method of Assessment**

Impacts of the proposed development on local air quality conditions would be assessed in an air quality impact assessment to be included in the EIS. Air quality impacts would be identified by air dispersion modelling of the local atmospheric envelope, which would include odour, pollutants and nitrogen oxide. This modelling would determine what area, if any, would be affected by emissions that exceed relevant air quality criteria or regulatory requirements for the proposed development.

The dispersion modelling would incorporate likely sources of emissions, which are expected to include:

- Construction and operation of mine ventilation shafts;
- Construction and operation of the REA expansion area; and
- Cumulative impacts associated with the operation of surface facilities, including:
  - ROM Stockpiles;

- Conveyors and transfer points;
- Product coal stockpiles; and
- Materials handling emissions e.g. bulldozers, truck loading, on-site coal haulage and site maintenance.

The air quality impact assessment would determine the nature and extent of the impacts that the proposed development would have on air quality in a stand-alone scenario, while also determining what cumulative impact the proposed development may have on the surrounding environment and sensitive receivers. Additionally, the assessment would identify design or management options the proposed development may need to consider during the detailed design phase to meet relevant air quality criteria and requirements.

## **7.7 Noise and Vibration**

### **7.7.1 Existing Environment**

Tahmoor Colliery is currently a 24 hour operation, with noise emissions of underground activities and surface infrastructure facilities regulated by conditions of the 1975 and 1994 development consents (refer to **Table 1**), and the regulatory requirements of EPL 1389. Existing sources of noise and vibration include operations at the existing Tahmoor Colliery, namely train movements within the mine rail loop, the ROM stockpile dozer, low frequency operations such as washery screens, the CHPP, transfer screens, motor/gearbox/conveyors, product impact (chutes/transfer), gas vacuum pumps and cogeneration plant, rejects haul trucks and mine ventilation shafts.

Current noise impacts are influenced by meteorological conditions, including the dominant south and south-west winds. Sensitive receivers within the vicinity of the proposed development include rural and rural residential land and properties as well as Wollondilly Anglican College.

Noise complaints have been made regarding operations at the existing Tahmoor Colliery, which is subject to a Pollution Reduction Plan (PRP). The majority of complaints received throughout the 2010-2011 annual monitoring period were concerned with night-time operations of the Tahmoor Colliery. During the 2010-2011 annual reporting period, the existing Tahmoor Colliery's EPL was modified to include five (5) additional PRPs; three of which (PRPs 16-18) were directed towards undertaking a review of previous modifications to infrastructure that have been installed and activated to address exceedences of noise criteria surrounding the pit top area and the number two ventilation shaft.

Blasting activities as part of Tahmoor Colliery's existing operations are only carried out underground during initial longwall workings to create cavities for the installation of machinery, or in areas of unusual geological circumstances, and have a negligible effect on the surface. No complaints were received during the 2010-2011 annual reporting period that related to blasting related vibration (Xstrata Coal, 2011). No explosives are used on the surface, and when first workings are being undertaken, notification letters are sent out to landholders whose properties may potentially experience surface vibrations as a result of the works.

Other sources of noise in the vicinity of the proposed development include road and rail traffic noise as well as domestic/rural activities.

### **7.7.2 Issues for Consideration**

Key issues to be considered regarding noise and vibration impacts of the proposed development relate to noise associated with the installation and operation of ventilation shafts and gas management facilities. Also, the construction and operation of the existing Tahmoor Colliery's surface infrastructure facilities for the duration of the proposed development are likely to emit noise. These include the CHPP, REA and stockpiles.

Traffic and transport impacts on noise and vibration in the local area and along transport routes would be considered, including on-site train movements, rail loading activities, rail noise and vibration, and the transport of coal rejects material to the REA.

In addition, there is the potential for a limited period of cumulative noise impacts resulting from the operation of the proposed development in tandem with the existing operations at Tahmoor Colliery.

### **7.7.3 Method of Assessment**

Impacts of the proposed development on the surrounding environment would be assessed in a noise and vibration assessment that would be included in the EIS. The assessment would be undertaken in line with regulatory requirements for operational noise modelling and assessment, including:

- *NSW Industrial Noise Policy* (EPA, 2000);
- *Road Noise Policy* (RTA, 2011); and
- *Interim Construction Noise Guidelines* (DECCW, 2009).

Impacts of the proposed development would be identified and modelled against background noise data collected during the environmental baseline monitoring program (**Section 3.1.2**), which would establish noise assessment criteria. The assessment would also include impacts associated with the operation of the surface infrastructure facilities, as well as identified impacts that result from road and rail movements.

## **7.8 Traffic and Transport**

### **7.8.1 Existing Environment**

Entrance to the current underground workings of Tahmoor Colliery and associated surface infrastructure facilities, including staff parking and amenities, is located on Remembrance Drive between Tahmoor and Bargo (**Figure 4**). Remembrance Drive serves as a regional connection between Picton, Tahmoor and Bargo and intersects the Hume Highway south-east of the proposed development. The road provides for two way traffic with one lane of traffic in each direction and the majority of intersections between Bargo and Picton containing priority controls.

The posted speed limit adjacent to town centres is 60km per hour and 40km per hour in school zones. Outside of town centres, the speed limit increase to between 80km per hour and 100km per hour. A survey of the existing traffic conditions was undertaken as part of the pre-feasibility assessment between Friday 22 July 2011 and Friday 29 July 2011. The results of the survey showed a combined north and south-bound average daily traffic volume of 8,206 vehicles. When compared with historical data published by the Roads and Traffic Authority (now Roads and Maritime Services) for daily traffic in the area between 1994 and 2006, the results suggest that the growth in average traffic volumes along Remembrance Drive is approximately 0.93 per cent per annum.

Transportation of coal from the Tahmoor Colliery to Port Kembla is via an on-site mine rail loop that connects to the Main Southern Railway, and the Moss Vale to Unanderra Railway. The Main Southern Railway is also used for passenger and freight routes between Sydney and Canberra. The Moss Vale to Unanderra Railway provides an alternative route to the Main Southern Railway for passenger and freight trains travelling to and from Wollongong and Port Kembla.

### **7.8.2 Issues for Consideration**

The proposed development would potentially result in an increase in light vehicle traffic on local roads and intersections, with additional construction and operational personnel commuting to the site. This would increase traffic volumes at the intersection of the Tahmoor Colliery main entrance with Remembrance Drive, as well as other key local intersections. Road traffic could also be impacted by an increase in heavy vehicle movements during the construction phase of the proposed development.

Operational traffic (namely coal haulage) would not be an issue for the proposed development as coal would be transported via the existing rail infrastructure to Port Kembla. The proposed development is not expected to alter the number of rail movements along the Main Southern Railway.

An increase in personnel on site will increase the demand for parking within the surface facilities. Tahmoor Colliery is currently investigating options for additional car parking areas to manage an existing shortage. Construction of new car parking areas would be undertaken prior to the commencement of the proposed development under a separate approvals process. The additional car parking areas are expected to have sufficient capacity to service the proposed development.

### **7.8.3 Method of Assessment**

Potential impacts of the proposed development on local traffic conditions and the transport route of coal products from Tahmoor Colliery to Port Kembla would be assessed in a traffic and transport impact assessment that would be included in the EIS.

The impact assessment would include an intersection analysis of the Tahmoor Colliery entrance from Remembrance Drive, including the monitoring of morning and evening peak traffic conditions, as well as information regarding intersection capacity and previous vehicle accident statistics. This would determine what effects additional construction and operational traffic may potentially have on the performance of this intersection

in comparison to existing conditions. The assessment would also address the impacts of additional traffic on the wider local and regional road networks, and would consider impacts to road safety and general traffic conditions.

There is the potential for the structural integrity of local roads to be compromised from mine subsidence associated with the proposed development. Potential impacts to transport infrastructure as a result of mine subsidence would be assessed in the subsidence impact assessment, as outlined in **Section 7.1**.

## **7.9 Social and Economic**

### **7.9.1 Existing Environment**

Tahmoor Colliery and the proposed development are located within the Wollondilly LGA and the Wollondilly statistical area. The Wollondilly statistical area covers 2,557km<sup>2</sup> (Australian Bureau of Statistics, 2010), and spans the entire Wollondilly LGA from north of Lake Burragorang, to the border of the Kowmung River in the west, to the south of Bargo and to the east of Appin.

As at 2006, the Wollondilly statistical area had a total population of 40,344 persons with a split of approximately 50 per cent male and 50 per cent female residents. Of this total population, over three quarters (approximately 76 per cent) were aged 15 and over and approximately nine per cent were aged 65 and over. The population of the Wollondilly LGA is projected to grow to up to 60,000 by the mid-2030s (WSC, 2010)

The total labour force in 2006 for the Wollondilly statistical area was 20,295, of which 878 (approximately four per cent) were unemployed. The main sources of employment for people living in the Wollondilly statistical area include manufacturing (14 per cent), construction (11 per cent), retail (11 per cent), health (nine per cent), education and training (eight per cent), and transport (seven per cent). The percentage of the labour force living in the Wollondilly statistical area and employed in mining was two per cent.

In the 2006 Census there were 8,961 jobs recorded within the Wollondilly statistical area, of which Wollondilly Shire residents held 63.9 per cent. Of the remaining jobs, the majority were held by residents of adjoining LGAs. The industries that provide the most jobs in the Wollondilly statistical area, regardless of where the employees reside, are manufacturing, mining, retail and construction (WSC, 2010). Therefore, despite the low percentage of Wollondilly residents employed in mining, the mining industry in the Wollondilly statistical area is a key provider of employment for the labour force of surrounding statistical areas.

Tahmoor Colliery has been operating within the Southern Coalfield for approximately 30 years and currently employs approximately 440 personnel across its operations, including in the mining, administration and maintenance sectors. Existing operations at Tahmoor Colliery are economically beneficial at a local, regional and State level through the generation of coal royalties, employment, contributing to the operation of local businesses, and involvement with the local community.

### **7.9.2 Issues for Consideration**

Potential social impacts of the proposed development would primarily relate to local increases in demand for health and educational services, accommodation, childcare and early childhood services as a result of an inflow of construction and operational personnel into the local area.

Construction of the proposed development would generate numerous locally sourced employment opportunities, as services in excavation, earthmoving, general and specialist construction works, and transport would be required. Employment opportunities would be provided for residents of south-western Sydney, but also for residents of the Illawarra Region, which is currently subject to a restructuring of its manufacturing base. It is therefore anticipated that the proposed development would have a beneficial effect on local and regional economies.

Direct economic impacts of the proposed development would be from an increase in employment of personnel and the use of services and materials onsite during construction. Indirect economic effects may include the impact of the proposed development on associated industries and services in the region, and from flow on effects through the local economy. Direct and indirect impacts of the proposed development would be considered as part of the social and economic impact assessment component of the EIS.

### **7.9.3 Method of Assessment**

The proposed scope for the social and economic assessment would include a:

- Cost-benefit analysis (threshold value analysis);

- Regional economic impact assessment;
- Employment, population and community infrastructure assessment; and
- Development of measures to avoid or mitigate potential social and economic impacts (e.g. at mine closure).

Social, economic and community impacts of the proposed development would be determined based on the generation of a profile of the surrounding community. Identified impacts would be assessed and evaluated against the likely direct, indirect and cumulative impacts of other developments in the surrounding area.

Preparation of the social and economic impact assessment would consider the guidelines outlined in the *Draft Economic Evaluation in Environmental Impact Assessment* (Department of Planning) and *Techniques for Effective Social Impact Assessment: A Practical Guide* (Office of Social Policy, NSW Government Social Policy Directorate).

## **7.10 Visual Amenity and Landscape**

### **7.10.1 Existing Environment**

The topography of the proposed development area is generally of low relief and consists of a gently undulating landscape. Built elements within the existing Tahmoor Colliery that can be readily seen from Remembrance Drive include:

- A bund wall with tree plantings which stands 4-5 metres high at the north western corner of the site and 5-6 metres at the south-western corner of the site which is designed to screen the existing colliery infrastructure from the road;
- Taller elements of the colliery infrastructure such as conveyors, the REA and ventilation shafts; and
- Lighting associated with conveyors and buildings.

There are no public lookouts or viewing points within the vicinity of the proposed development.

### **7.10.2 Issues for Consideration**

As the proposed development would use existing surface infrastructure, the visual landscape is unlikely to be greatly affected. The installation of ventilation shafts for the operation of the proposed development may potentially impact upon the visual amenity of residential dwellings adjacent to this infrastructure.

The existing REA would be expanded on land that is mostly vegetated, including canopy trees which are several storeys in height. Clearance of this vegetation may result in the REA being more visible from surrounding rural residential dwellings and cleared areas. In addition, as a result of the proposed development, the height of the REA may be increased.

### **7.10.3 Method of Assessment**

The visual impact of the proposed development would be assessed through inspections of the surrounding area, topographic map interpretation and photographs of the existing environment to understand the nature and extent of various elements including vegetation cover, with particular regard to vegetation suitable for screening or landscape remediation. The design of the proposed development, including structure and mound heights would be assessed having regard to a range of observer locations, including surrounding residential and rural residential development, as well as from surrounding roads from which the colliery is visible.

## **7.11 Hazard and Risk**

### **7.11.1 Existing Environment**

There are several potential hazards and risks associated with existing operations at Tahmoor Colliery. These include storage of hazardous goods and the potential for underground fire/ explosion (spontaneous combustion or outburst). Tahmoor Colliery is also located close to extensive stands of vegetation which could pose a bushfire risk.

#### **Storage of Hazardous Goods**

In line with the *Explosives Act 2003*, *Explosives Regulation 2005*, *OHS Amendment (Dangerous Goods) Act 2003* and the *OHS Amendment (Dangerous Goods) Regulation 2005*, the existing Tahmoor Colliery has developed and submitted a site security plan and has also notified WorkCover NSW of the dangerous goods kept onsite, detailed

in **Table 20** below. Operation of the proposed development is unlikely to result in greater volumes of these materials being stored at Tahmoor Colliery.

**Table 20 Summary of Dangerous Goods Stored on the Premises of the Existing Tahmoor Colliery**

Depot	Class	Type of Storage	Product Name	Quantity
1	3	Underground tank	Ethyl Hexanol	11,000L
1	C1	Underground tank	Diesel Fuel	11,000L
2	C1	Above ground tank	Diesel Fuel	27,500L
3	1.1D	Above ground magazine	Explosive: Blasting Type E	900kg
4	1.4B	Above ground magazine	Detonators: Electric for blasting	2,000

### Underground Fire/ Explosion

Under favourable conditions, coal has the potential to spontaneously combust. The exothermic (release of heat) reaction of coal naturally oxidising when it is exposed to oxygen can lead to heating followed by open ignition of coal if exposure and heating is not controlled. The tendency for the initial oxidation of coal, and the subsequent rate of a reaction occurring is influenced by several factors, including rank<sup>1</sup>, petrographic composition and physical properties of the coal, as well as the presence of pyrite.

The rank, petrographic composition and scarcity of pyrite of the Bulli seam indicates that it has a low tendency to spontaneously combust. Mining of the Bulli seam has been undertaken for over 120 years, during which there has been no reports of spontaneous combustion events. The risk of a spontaneous combustion event occurring at Tahmoor Colliery is regarded as remote. However, Tahmoor Colliery has a spontaneous combustion management plan which includes specific provisions for managing surface stockpile spontaneous combustion risks.

Outbursts are ejections of gas and coal from the working coal face. The potential for outbursts is managed primarily via gas drainage of the coal seam prior to mining to lower the gas content of the seam. The potential for outbursts as a result of the proposed development would be assessed during preparation of an EIS which would include details of gas management.

### Bushfire

The potential hazard that a bushfire poses arises from a combination of local topographic features and the type and amount of vegetation present in a defined area. The landscape of the proposed development area is a basin dominated by undulating to very steep hills along the westerly aspect, with an effective south to north oriented ridgeline within the local topography. The topography in the central region of the proposed development broadens out to flatter and more gently undulating lands, with generally south west to north east ridge-like features.

Areas of land under the control of the existing Tahmoor Colliery are periodically inspected, and controlled burning is applied if recommended by the local bush fire brigade. The existing Tahmoor Colliery works closely with the local Rural Fire Service and the NSW Land and Property Management Authority officers to maintain appropriate communication between the groups, and to provide an open communication network that is emergency-ready should the need arise. Fire fighting equipment caches are situated at various strategic locations around the existing Tahmoor Colliery, including a fire hydrant network that forms part of the mine safety system. Problematic bushfires associated with land surrounding the existing Tahmoor Colliery have not previously been reported. However, Xstrata Coal is alert to the dangers and risks associated with bushfires in this location (Xstrata Coal, 2011).

#### 7.11.2 Issues for Consideration

The issues for consideration are similar for the storage of hazardous goods and the potential for underground fire/ explosion, namely:

- Risk to employees on site;
- Risk to adjacent residents and communities;

<sup>1</sup> Lower rank coal has higher moisture content and lower energy content than higher rank coal. Also, lower rank coal contains volatile compounds that make the coal easier to ignite or combust.

- Risk of a dangerous goods spill causing contamination;
- Risk of an ignition that may potentially initiate a bushfire;
- Damage to surface infrastructure; and
- Effects on underground mining infrastructure.

### 7.11.3 Method of Assessment

The risk posed by bushfire during the construction, operation and decommissioning phases of the proposed development would be assessed with reference to applicable guidelines, standards and policy, including:

- *Rural Fires Act 1997*;
- *Planning for Bushfire Protection: A guide for Councils, Planners, Fire Authorities and Developers* (Rural Fire Service, 2006);
- *Wollondilly Bush Fire Risk Management Plan* (Rural Fire Service, 2011); and
- *AS3953-2009 Construction of buildings in bushfire prone areas*.

The assessment would identify the presence and extent of bushfire hazards in the vicinity of the proposed development, including known bushfire behaviour.

The proposed development would be subject to the application of a risk screening for potentially hazardous development as defined by SEPP 33. Application of a risk screening would be undertaken in accordance with *Applying SEPP 33* (DP&I, 2011). In the event that screening thresholds are exceeded an appropriate level of risk assessment would be conducted in accordance with *Multi-Level Risk Assessment* (DP&I, 2011) and *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis* (DP&I, 2011).

An assessment of the likelihood for spontaneous combustion and other underground explosion events to occur as a result of the proposed development would be considered as part of the EIS. A supplementary spontaneous combustion management plan would be prepared to complement the plan which is in place for the existing Tahmoor Colliery, or alternatively the existing plan would be amended to include the proposed development.

## 7.12 Greenhouse Gas

### 7.12.1 Existing Environment

Greenhouse gas emission sources listed in the Australian Government reporting legislation include:

- Carbon dioxide (CO<sub>2</sub>);
- Sulphur hexafluoride (SF<sub>6</sub>);
- Methane (CH<sub>4</sub>);
- Nitrous oxide (N<sub>2</sub>O);
- Hydrofluorocarbons (HFCs); and
- Perfluorocarbons (PFCs).

Emissions of these greenhouse gases are categorised into three different scopes (1, 2 or 3) in accordance with the World Business Council for Sustainable Development and World Resources Institute Greenhouse Gas Protocol (2004), and the Australian Government greenhouse gas accounting and reporting systems. The definitions of each of these scopes are as follows:

- Scope 1 emissions: also referred to as “direct emissions”, are emissions which are generated directly by the proposed development, e.g. emissions generated by the use of diesel fuel by construction plant/equipment.
- Scope 2 emissions: also referred to as “indirect emissions”, are emissions which are generated outside of the proposed development’s boundaries to provide energy to the proposed development, e.g. the use of purchased electricity from the grid.
- Scope 3 emissions: also referred to as “indirect upstream emissions”, due to third party supply chains that are in direct relation to the proposed development (e.g. extraction, production and transport of purchased materials and waste disposal offsite).

### 7.12.2 Issues for Consideration

The greenhouse gas inventory for the proposed development would assess construction and operational impacts of the proposed development. Potential emission sources from the proposed development could include:

- Operation of the CHPP and coal clearance facilities;
- Fugitive emissions from fuel burning (onsite and offsite);
- Vegetation clearance;
- Embodied energy of carbon in construction materials;
- Gas management; and
- End-use of coal mined at the facility.

The potential for incorporating energy efficiencies into the construction and operation of the proposed development will be assessed during the EIS and detailed design phases. For example, potential energy expenditure of surface emplacement of coal wash rejects versus underground co-disposal of rejects will be investigated.

### 7.12.3 Method of Assessment

A greenhouse gas assessment would be conducted for the proposed development in accordance with the standards outlined in the following documents:

- *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*, World Resources Institute and World Business Council for Sustainable Business Development (2004);
- *The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard*, World Resources Institute and World Business Council for Sustainable Business Development (2011);
- *National Greenhouse Accounts (NGA) Factors*, Commonwealth Department of Climate Change (2012)
- *National Carbon Accounting Toolbox (FullCAM Carbon Accounting Model 3.10)*, Australian Department of Climate Change and Energy Efficiency;
- *National Greenhouse and Energy Reporting System, Technical Guidelines* (2012);
- *Life Cycle Assessment (LCA) Australian and New Zealand Standards (AS/NZS ISO 14040 series)*; and
- *Greenhouse Gas Part 1: Specification with guidance at the organisational level for quantification and reporting of greenhouse gas emissions and removals, Australian Standard (AS ISO 14064.1 – 2006)*.

Following identification of emission sources from the proposed development, the assessment would estimate equivalent total carbon dioxide emissions from these emission sources. The assessment would also recommend mitigation measures appropriate for the proposed development, which would lower emissions where possible.

## 7.13 Land Use

### 7.13.1 Existing Environment

In areas of flat and low gradient slopes in the vicinity of the proposed development, historical land use can be largely classified as agricultural. These activities, in addition to urban development and mining have resulted in moderate landscape disturbances to these areas, mostly due to large-scale vegetation clearance.

There are also several transport routes and other general service infrastructure located within the vicinity of the proposed development. These include the Hume Highway, Remembrance Drive, Bargo River Road, Rockford Road, the Main Southern Railway, the Picton-Mittagong Railway, and the mine rail loop within Tahmoor Colliery (**Figure 2**). General service infrastructure within the vicinity of the proposed development includes the Moomba to Sydney Gas Pipeline and various transmission line easements.

Land use is characterised in the region by a series of small towns and villages comprising residential and commercial land uses, namely the townships of Bargo, Tahmoor, Balmoral and Buxton. These townships are separated by semi-rural and partly forested landscapes. The remainder of land surrounding the proposed development comprises a mix of rural and environmental land uses. Within CCL 747 and CCL 716, land use is

governed by the Wollondilly LEP 2011 and the Wingecarribee LEP 2010. The extent of the proposed development is located only within areas of land to which the Wollondilly and Wingecarribee LEPs apply.

Land adjacent to major watercourses has remained relatively intact, with little to no vegetation clearance and disturbance to the ground surface. This can be attributed to the lack of suitable agricultural land due to steep slopes, particularly incised gullies associated with the region's watercourses. There are some flat areas of land which are relatively undisturbed, mostly around the existing Tahmoor Colliery, which retain some standing vegetation, though this is likely to be regrowth.

Approximately one third of land within the boundaries of CCL 747 and CCL 716 is forested and most of it is designated as Crown Land. The majority of forested land is located in the south-west of CCL747, surrounding the Bargo River, and in the central to south-eastern section of CCL 716 surrounding the existing REA (**Figure 2**). Under the Wollondilly and Wingecarribee LEPs, this forested land is generally classified as E2 – Environmental Conservation.

The proposed development would undermine several of the land use zones outlined in the Wollondilly LEP 2011, listed and described in **Table 21**. Expansion of the existing REA would be on land classified as RU2 – Rural Landscape and E2 – Environmental Conservation under the Wollondilly LEP 2011. Ventilation shafts to be installed for the proposed development would be located across a number of land use zones. The locations of these ventilation shafts have yet to be determined. The mine ventilation system, including shaft locations, would continue to be refined during the detailed design for the proposed development.

Land uses within CCL 747 and CCL 716, as zoned by the Wingecarribee LEP 2010 and Wollondilly LEP 2011 are listed in **Table 21**.

There are five National Parks and State Conservation Areas in the vicinity of the proposed development:

- Nattai National Park to the north;
- Thirlmere Lakes National Park to the west;
- Bargo River State Conservation Area to the south;
- Bargo State Conservation Area to the west and south-west; and
- Upper Nepean State Conservation Area to the east.

### 7.13.2 Issues for Consideration

Land uses undermined by the proposed development would largely be unchanged. However, there is potential for mine subsidence to impact structures and dwellings, which would require management under a mine subsidence management plan. Additionally, residents impacted by mine subsidence may be eligible for compensation by the Mine Subsidence Board.

The longwall panels for the proposed development extend into the Upper Nepean State Conservation Area which may result in subsidence impacts within the conservation area.

The proposed development would involve the staged expansion of the existing REA into currently vegetated areas, which would require vegetation clearing of up to 66 ha. However, impacts to land use from the expansion of the REA are likely to be temporary as these areas would be rehabilitated progressively to, as far as practicable, resemble vegetative conditions present prior to the operation of the proposed development.

The installation of ventilation shafts would temporarily impact the land on which they are located. This could potentially impact on the use of the land for the duration of operations. Once operation of the ventilation shafts is no longer required, these sites would be rehabilitated as far as practicable to resemble their condition prior to the operation of the proposed development.

**Table 21 Land Use Zones within CCL 747 and CCL 716**

Land Use Zone	Description	Potential to be Impacted by Underground Workings and Ventilation Shafts	Potential to be Impacted by Surface Infrastructure.
Wollondilly LEP 2011			

Land Use Zone	Description	Potential to be Impacted by Underground Workings and Ventilation Shafts	Potential to be Impacted by Surface Infrastructure.
B2	Local Centre	Yes	No
E2	Environmental Conservation	Yes	No
E4	Environmental Living	Yes	No
IN2	Light Industrial	Yes	No
RE1	Public Recreation	Yes	No
RE2	Private Recreation	Yes	No
R2	Low Density Residential	Yes	No
R3	Medium Density Residential	Yes	No
R5	Large Lot Residential	Yes	No
RU2	Rural Landscape	Yes	Yes
RU4	Rural Small Holdings	Yes	No
SP2	Infrastructure – Railways	Yes	No
SP2	Infrastructure – Sewerage System	Yes	No
Wingecarribee LEP 2010			
RU4	Rural Small Holdings	No	No
E2	Environmental Conservation	No	No
E3	Environmental Management	No	No

### 7.13.3 Method of Assessment

The assessment of the effects of the proposed development on land use would address matters such as:

- Land sterilisation;
- Vegetation clearance and the potential for rehabilitation; and
- Short and long term impacts to land uses in surrounding areas.

## 7.14 Waste

### 7.14.1 Existing Environment

The primary waste management facility in the Wollondilly Shire is the Bargo Waste Management Centre. It is operated by Wollondilly Shire Council, and can accept waste that is free of food and putrescible material. The waste management centre also hosts a recycling facility.

Coal rejects material is the most significant waste material arising from operation of the existing Tahmoor Colliery. This material is stored in the existing REA, which is located off Charles Point Road (**Figure 4**)

### 7.14.2 Issues for Consideration

Waste generated by the proposed development during construction and operation would be classified in accordance with the categories defined in the *Waste Classification Guidelines* (DECC, 2008).

### Construction Waste

During construction of the proposed development, the primary waste streams would be associated with:

- Steel scraps/ offcuts;
- Excess concrete;
- Potential excess spoil;
- Domestic waste; and
- Vegetation waste from surface works.

Waste would be collected and transported off-site where necessary to appropriately licensed waste facilities. Vegetation waste would be mulched and re-used on Xstrata Coal land where possible. Where it is unable to be reused or recycled, vegetation waste would be transported to a green waste facility.

### Operational Waste

Operational waste would likely consist of:

- Coal wash rejects;
- Special waste (tyres);
- Liquid waste (wastewater, liquid hydrocarbons, waste oil);
- Hazardous waste (coolant pods, batteries and containers with hazardous liquid residue);
- General solid non-putrescible waste (steel, timber pallets, pipeline, aluminium, paper, cardboard, glass, wood, concrete, conveyor belts);
- General solid putrescible waste (food waste); and
- Vegetation waste (minor amount during maintenance of surface landscaping).

Underground mining operations of the proposed development are unlikely to produce new waste streams, in addition to those already produced by current operations. However, the proposed development would increase the amount of coal rejects material, necessitating the expansion of the existing REA.

Annual volumes of operational waste produced currently by Tahmoor Colliery are unlikely to change as a result of the proposed development. Waste would be handled in accordance with the Waste Management Plan currently in place as part of Tahmoor Colliery's Environmental Management System, which would be amended to include operational requirements of the proposed development. Where appropriate and possible, operational waste would be transported offsite for recycling or to a licensed waste facility. However, the management of waste would be prioritised according to the waste control hierarchy currently employed on site, following this preferred order:

- Elimination;
- Reduction;
- Re-use or recycling; and
- Treatment and disposal.

#### 7.14.3 Method of Assessment

A waste impact assessment to be included in the EIS would identify waste streams likely to be produced during construction and operation of the proposed development. Categories would be determined based on the Waste Classification Guidelines (DECC, 2008), and approximate volumes would be identified. Local facilities that are appropriately licensed to accept waste streams associated with the proposed development would be identified and referenced for inclusion in future construction and operational environmental management plans.

## 8.0 Conclusion

This PEA has been prepared to inform the preparation of DGRs for the proposed development. Following the receipt of DGRs for the proposed development, Xstrata Coal would undertake an EIS to be submitted for formal approval of the proposed development by the DP&I. Key environmental assessment issues identified for the proposed development, which would be assessed in greater detail during the preparation of the EIS are:

- Mining induced subsidence effects. Particularly with regards to the implications that subsidence impacts may have on the local and regional geology, surface water and groundwater systems, public infrastructure (services and transport), local residents, dwellings, buildings and other structures, as well as the local and regional ecology.
- Surface water impacts. In particular, changes to local drainage and catchment systems, possible impacts from erosion, sedimentation and/or contamination during construction and operation; subsidence induced impacts to watercourses undermined by the proposed development and issues surrounding the site water balance.
- Groundwater impacts, namely the effects on local aquifers and bore users.
- Ecological impacts, specifically those resulting from vegetation clearances for the expansion of the REA and from mining induced subsidence.

Other relevant environmental issues would also be considered in the EIS.

As part of the preparation of the EIS, assessments would be carried out to refine the potential environmental impacts of the proposed development. The key focus of these assessments would be the avoidance and minimisation of impacts on the environment and local communities, while also taking into account engineering constraints and cost implications.

The assessment would also identify mitigation and management measures to minimise impacts on the environment. Consultation with affected property owners, stakeholders and the local community would continue throughout the assessment of the proposed development, as well as during the detailed design, construction and operational phases.

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## 9.0 References

- Australian Bureau of Agricultural Resources and Economics and Sciences (ABARES) (2011), *Energy Update 2011*, Andrew Schultz and Rebecca Petchey, Canberra, ACT
- Australian Bureau of Statistics (2010), *National Regional Profile - Wollondilly Statistical Local Area*, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/105308400Main%20Features12004-2008?OpenDocument&tabname=Summary&prodno=105308400&issue=2004-2008&num=&view=&>, accessed: June 2012
- Australian Department of Climate Change and Energy Efficiency, *National Carbon Accounting Toolbox (FullCAM Carbon Accounting Model 3.10)*
- Commonwealth Department of Climate Change (2012), *National Greenhouse Accounts (NGA) Factors*
- Department of Environment and Climate Change (2008), *Waste Classification Guidelines*, <http://www.environment.nsw.gov.au/resources/waste/08202classifyingwaste.pdf>, accessed: June 2012
- Department of Environment, Climate Change and Water (2009), *Interim Construction Noise Guideline*, Sydney, NSW
- Department of Environment, Climate Change and Water (2010), *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, <http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf>, accessed June 2012.
- Department of Environment, Climate Change and Water (2011), *Road Noise Policy*, Sydney, NSW
- Department of Planning (2008), *Applying SEPP 33: Consultation Draft, July 2008*, 23-33 Bridge Street, Sydney NSW
- Department of Planning (2007), *Southwest Subregion: Draft Subregional Strategy*, Sydney, NSW
- Department of Planning and Infrastructure (DP&I) (2011), *Applying SEPP 33: Hazardous and Offensive Development Application Guidelines*, Sydney, NSW
- Department of Planning and Infrastructure (DP&I) (2011), *Guidelines for Hazard Analysis: Hazardous Industry Planning Advisory Paper No.6*, Sydney, NSW.
- Department of Planning and Infrastructure (2010) *Sydney Metropolitan Strategy for 2036*, Sydney, NSW
- Environment Protection Authority (2000), *Industrial Noise Policy*, Office of Environment and Heritage, Sydney, NSW
- Hazelton P.A. and Tille P.J., (1990), *Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet* map and report, Soil Conservation Service of NSW, Sydney
- Niche Environment and Heritage (2012), *Tahmoor South Project Terrestrial and Aquatic Ecology Pilot Study*
- NSW Heritage Office and department of Urban Affairs & Planning (1996), *NSW Heritage Manual*, Sydney, NSW
- NSW Mine Subsidence Board (2012), *Bargo Mine Subsidence District*, <http://www.minesub.nsw.gov.au/SiteFiles/minesubnswgovau/Bargo%20Map.pdf>, accessed: May, 2012
- Rural Fire Service (2006), *Planning for Bushfire Protection: A guide for Councils, Planners, Fire Authorities and Developers*, [http://www.rfs.nsw.gov.au/file\\_system/attachments/State08/Attachment\\_20070301\\_0A17F845.pdf](http://www.rfs.nsw.gov.au/file_system/attachments/State08/Attachment_20070301_0A17F845.pdf), accessed: June 2012
- Rural Fire Service (2011), *Wollondilly Bush Fire Risk Management Plan*, [http://www.rfs.nsw.gov.au/file\\_system/attachments/State08/Attachment\\_20110218\\_2772167F.pdf](http://www.rfs.nsw.gov.au/file_system/attachments/State08/Attachment_20110218_2772167F.pdf), Accessed: June 2012
- Strahler, A. N. (1952) "Hypsometric (area-altitude) analysis of erosional topology", *Geological Society of America Bulletin* 63 (11): 1117-1142.
- Stroud W.J., Sherwin L., Roy H.N. and Baker C.J., (1985), *Wollongong - Port Hacking 1:100 000 Geological Sheet 9029-9129*, 1st edition. Geological Survey of New South Wales, Sydney.

Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., Tindall, D., Pennay, C. (2006) *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands, Version 1.0*, NSW Department of Environment and Conservation and Department of Natural Resources, Hurstville.

Wollondilly Shire Council (2010), *Wollondilly Shire Council, Draft Growth Management Strategy 2010*

World Resources Institute (2004), *Greenhouse Gas Protocol*, <http://www.ghgprotocol.org/>, accessed: June 2012

World Resources Institute and World Business Council for Sustainable Business Development (2004), *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*

World Resources Institute and World Business Council for Sustainable Business Development (2011), *The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard*

Xstrata Coal (2011), Tahmoor Colliery Annual Environmental Management Report May 2010 – April 2011, <http://www.tahmoorcoal.com.au/EN/Publications/Pages/AnnualEnvironmentalManagementReports.aspx>  
Accessed: June 2012

Xstrata Coal (2012a), *Tahmoor South Project Community Consultation Plan*

Xstrata Coal (2012b), *Tahmoor South Project Stakeholder Management Plan*

Appendix A

# Threatened Flora and Fauna Species Lists

## Appendix A Threatened Flora and Fauna Species Tables

### Threatened Flora listed under the TSC Act and/or EPBC Act within 10km of the Proposed Development

Threatened Flora	NSW Conservation Status (under the TSC Act)	Commonwealth Conservation Status (under the EPBC Act)	Likelihood of Occurrence
<i>Acacia bynoeana</i> Bynoe's Wattle	Vulnerable	Vulnerable	High
<i>Acacia flocktoniae</i>	Vulnerable	Vulnerable	High
<i>Caladenia tessellata</i> Tesselated Spider Orchid	Endangered	Vulnerable	Moderate
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchis	Vulnerable	Vulnerable	Moderate
<i>Cynachum elegans</i> White-flowered Wax Plant	Endangered	Endangered	Low
<i>Darwinia peduncularis</i>	Vulnerable	-	High
<i>Epacris purpurascens</i> var <i>purpurascens</i>	Vulnerable	-	High – large amount of records for this species
<i>Genoplesium baurei</i>	Vulnerable	-	Moderate
<i>Grevillea parviflora</i> Small-flower Grevillea	Vulnerable	Vulnerable	High – previously recorded in the area
<i>Lepidium hyssopifolium</i> Aromatic Peppercress	Endangered	Endangered	Low
<i>Leucopogon exolasius</i> Woronora Beard-heath	Vulnerable	Vulnerable	High
<i>Melaleuca biconvexa</i> Biconvex Paperbark	Vulnerable	Vulnerable	High
<i>Melaleuca deanei</i> Dean's Melaleuca	Vulnerable	Vulnerable	Low
<i>Persicaria elatior</i> Tall Knotweed	Vulnerable	Vulnerable	Moderate – High
<i>Persoonia acerosa</i> Needle Geebung	Vulnerable	Vulnerable	High
<i>Persoonia bargoensis</i>	Endangered	High	High – previously recorded in the area
<i>Persoonia glaucescens</i>	Endangered	Vulnerable	High
<i>Persoonia hirsuta</i> Hairy Geebung	Endangered	Endangered	High – previously recorded in the area
<i>Pomaderris brunnea</i>	Vulnerable	Vulnerable	Moderate
<i>Pterostylis saxicola</i> Sydney Plains Greenhood	Endangered	Endangered	Moderate – High
<i>Pultenaea glabra</i> Smooth Bush-pea	Vulnerable	Vulnerable	Low
<i>Rulingia prostrate</i>	Endangered	Endangered	Low
<i>Thelymitra Kangaloon</i> Kangaloon Sun Orchid	-	Critically Endangered	Low
<i>Thesium australe</i> Austral Toadflax	Vulnerable	Vulnerable	Moderate – High

**Threatened Terrestrial Fauna Listed under the TSC Act and/or EPBC Act within 10km of the Proposed Development**

Threatened Fauna	NSW Conservation Status (under the TSC Act)	Commonwealth Conservation Status (under the EPBC Act)	Likelihood of Occurrence
<b>Birds</b>			
<i>Apus pacificus</i> Fork-tailed Swift	-	Migratory	Low
<i>Ardea alba</i> Great Egret	-	Migratory	Low
<i>Ardea ibis</i>	-	Migratory	Low
<i>Burhinus grallarius</i> Bush Stone-curlew	Vulnerable	-	Moderate
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	Vulnerable	-	High
<i>Calyptorhynchus lathami</i> Glossy Black Cockatoo	Vulnerable	Endangered in South Australia only	High
<i>Climacteris picumnus victoriae</i> Brown Treecreeper	Vulnerable	-	High – previously recorded in the study area
<i>Daphoenositta chrysoptera</i> Varied Sittella	Vulnerable	Vulnerable	High – previously recorded in the study area
<i>Gallinago hardwickii</i> Latham's Snipe	-	Migratory	Low – Moderate
<i>Glossopsitta pusilla</i> Little Lorikeet	Vulnerable	-	High
<i>Haliaeetus leucogaster</i> White-bellied Sea-eagle	-	Migratory	Moderate
<i>Hieraetus morphnoides</i> Little Eagle	-	Migratory	Moderate
<i>Hirundapus caudacutus</i> White-throated Needletail	-	Migratory	Moderate
<i>Lathamus discolor</i> Swift parrot	Endangered	Endangered	High
<i>Melanodryas cucullata cucullata</i> Hooded Robin	Vulnerable	-	High
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater	Vulnerable	-	High – previously recorded in the study area
<i>Merops omatus</i> Rainbow Bee-eater	-	Migratory	High
<i>Monarcha melanopsis</i> Black-faced Monarch	-	Migratory	High
<i>Myiagra cyanoleuca</i> Satin Flycatcher	-	Migratory	High
<i>Neophema pulchella</i> Turquoise Parrot	Vulnerable	-	High

Threatened Fauna	NSW Conservation Status (under the TSC Act)	Commonwealth Conservation Status (under the EPBC Act)	Likelihood of Occurrence
<i>Ninox connivens</i> Barking Owl	Vulnerable	-	High
<i>Ninox strenua</i> Powerful Owl	Vulnerable	-	High – previously recorded in the study area
<i>Petroica boodang</i> Scarlet Robin	Vulnerable	-	High – previously recorded in the study area
<i>Pyrrholaemus saggitatus</i> Speckled Warbler	Vulnerable	-	High
<i>Rhipidura rufifrons</i> Rufous Fantail	-	Migratory	Moderate
<i>Rostratula australis</i> Australian Painted Snipe	Endangered	Vulnerable	Moderate
<i>Stagonopleura guttata</i> Diamond Firetail	Vulnerable	-	High – previously recorded in the study area
<i>Sterna fuscata</i> Sooty Tern	Vulnerable	-	Low – previously recorded in an isolated incident
<i>Tyto novaehollandiae</i> Masked Owl	Vulnerable	-	High
<i>Tyto tenebricosa</i> Sooty Owl	Vulnerable	-	Moderate
<i>Xanthomyza phrygia</i> Regent Honeyeater	Endangered	Endangered, Migratory	High
<b>Amphibians</b>			
<i>Heleioporus australiacus</i> Giant Burrowing Frog	Vulnerable	Vulnerable	High – recorded during assessments
<i>Litoria aurea</i> Green and Golden Bell Frog	Endangered	Vulnerable	Moderate
<i>Litoria littlejohni</i> Littlejohn's Tree Frog	Vulnerable	Vulnerable	High
<i>Mixophyes balbus</i> Stuttering Frog	Endangered	Vulnerable	Low – habitat is moderate, but species is almost regionally extinct
<i>Pseudophryne australis</i> Red-crowned Toadlet	Vulnerable	-	High – recorded during assessments
<b>Reptiles</b>			
<i>Hoplocephalus bungaroides</i> Broad-headed Snake	Endangered	Vulnerable	High
<i>Varanus rosenbergi</i> Rosenburg's Goanna	Vulnerable	-	High
<b>Invertebrates</b>			
<i>Meridolum comeovirens</i> Cumberland Plain Land Snail	Endangered	-	High
<b>Mammals</b>			
<i>Cercartetus nanus</i>	Vulnerable	-	High

Threatened Fauna	NSW Conservation Status (under the TSC Act)	Commonwealth Conservation Status (under the EPBC Act)	Likelihood of Occurrence
Eastern Pygmy-possum			
<i>Chalinolobus dwyer</i> Large-eared Pied Bat	Vulnerable	Vulnerable	High
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	Vulnerable	Endangered	High
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	Vulnerable	-	High – previously recorded in the study area
<i>Isodon obesulus</i> Southern Brown Bandicoot	Endangered	Endangered	Moderate – High
<i>Miniopterus schreibersii oceanensis</i> Eastern bent-wing Bat	Vulnerable	-	High – previously recorded in the study area
<i>Miniopterus australis</i> Little Bent-wing Bat	Vulnerable	-	Low – species at the very edge of possible range
<i>Mormopterus norfolkensis</i> Eastern Freetail Bat	Vulnerable	-	High – previously recorded in the study area
<i>Myotis macropus</i> Large-footed Myotis	Vulnerable	-	High
<i>Pseudomys novaehollandiae</i> New Holland Mouse	-	Vulnerable	High
<i>Petaurus australis</i> Yellow-bellied Glider	Vulnerable	-	Moderate
<i>Petaurus norfolcensis</i> Squirrel Glider	Vulnerable	-	High
<i>Petrogale penicillata</i> Brush-tailed Rock Wallaby	Endangered	Vulnerable	Moderate – populations severely reduced
<i>Phascolarctos cinerus</i> Koala	Vulnerable	-	High – previously recorded in the area
<i>Potorous tridactylus</i> Long-nosed Potoroo	Vulnerable	Vulnerable	Moderate
<i>Pteropus poliocephalus</i> Grey-headed Flying Fox	Vulnerable	Vulnerable	High
<i>Scoteanax rueppelli</i> Greater Broad-nosed Bat	Vulnerable	-	High – previously recorded in the study area

#### Threatened Aquatic Fauna listed under the EPBC Act and/or the FM Act within 10km of the Proposed Development

Threatened Fauna	EPBC Conservation Status	FM Act Conservation Status	Potential for habitat to occur within 10km of the study area
<i>Carcharius taurus</i> Grey Nurse Shark	-	Critically Endangered	No
<i>Pristis zijsron</i> Green Sawfish	Presumed extinct	Presumed extinct	No
<i>Austrocordulia leonardi</i>	-	Endangered	Yes

Threatened Fauna	EPBC Conservation Status	FM Act Conservation Status	Potential for habitat to occur within 10km of the study area
Sydney Hawk Dragonfly			
<i>Archaeophya adamsi</i> Adam's Emerald Dragonfly	-	Endangered	Yes
<i>Carcharodon carcharias</i> Great White Shark	Vulnerable	Vulnerable	No
<i>Epinephelus daemeli</i> Black cod	-	Vulnerable	No
<i>Macquaria australasica</i> Macquarie Perch	Endangered	Endangered	Yes

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