NSW GOVERNMENT

Tahmoor South Coal Project

Preliminary Issues Report:

State Significant Development

(SSD 8445)

June 2019

Glossary

Abbreviation	Definition
CCL	Consolidated Coal Lease
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
CIV	Capital Investment Value
Commission	Independent Planning Commission of NSW
Consent	Development Consent
Council	Wollondilly Shire Council
Department	Department of Planning and Environment
DoEE	Department of Environment and Energy
DoI	Department of Industries
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
IESC	Independent Expert Scientific Committee
LEA	Local effects analysis
LEP	Local Environmental Plan
LGA	Local Government Area
Minister	Minister for Planning
ML	Mining Lease
MNES	Matters of National Environmental Significance
NPV	Net present value
OEH	Office of Environment and Heritage
Project	Tahmoor South Coal Project
REA	Rejects Emplacement Area
RMS	Roads and Maritime Services
ROM	Run-of-mine
RTS	Response to Submissions
SA NSW	Subsidence Advisory NSW

SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIA	Social Impact Assessment
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development

Executive Summary

Tahmoor Coal Pty Ltd (Tahmoor Coal), a subsidiary of SIMEC (Australia) Mining Pty Ltd owns the Tahmoor Coal Mine, located between the towns of Tahmoor and Bargo approximately 75 kilometres south-west of Sydney and within the Wollondilly and Wingecarribee local government areas.

Tahmoor Coal Mine has several existing development consents for underground mining granted by either the local council or the Minister for Planning and has been operating in some form since the 1970s.

The approved project – known as the Tahmoor Coal Project (the Approved Project) involves extraction of coal until 2022, at a rate of up to 3 million tonnes of run-of-mine coal a year (Mtpa). Coal is approved to be transported by rail to Port Kembla Coal Terminal, or occasionally Newcastle Port Waratah, for delivery to both Australian and International markets. Tahmoor Coal Mine also has approval to transport up to 50,000 tonnes per annum of coal by road within the Wollondilly Shire or in circumstances where rail transport is unavailable.

Tahmoor Coal is now proposing to expand the Approved Project to the south with an application known as the Tahmoor South Coal Project (the Project). The Project would extract up to 4 Mtpa of run-of-mine coal and process this to produce up to 3 Mtpa of product coal. Existing mine facilities would continue to be utilised for an additional 13 years (ie until 2035). Coal would continue to be primarily transported by rail to the two coastal shipping terminals. The key change to the existing operation involves an extension to the size and height of the existing rejects emplacement area and construction of an additional two ventilation shafts.

The proposal is classified as a 'State Significant Development' under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), as it is development for the purpose of coal mining and mining-related works. The Minister for Planning and Public Spaces is the consent authority for the application. However, under the Minister's delegation dated 11 October 2017, the Executive Director, Resource Assessments and Compliance may determine the application as there were less than 25 objections to the Project, neither Council objected to the Project and Tahmoor Coal has not made reportable political donations.

The Project has a capital investment value of approximately $342.5 million (undiscounted) and would generate employment of up to 422 full time operational jobs (approximately 390 full time operational jobs would continue from the Approved Project) and up to 150 temporary construction jobs at the mine. It is also predicted to generate $700 million in (net present value) economic benefits to NSW.

Engagement

The Department of Planning and Environment (the Department) exhibited the Environmental Impact Statement for the Project from 23 January to 5 March 2019 (42 days).

The Department received 86 public submissions: 8 from special interest groups and 78 from the general public. 73 (85 %) public submissions were in support of the Project, citing mainly its employment and economic benefits. 11 (13 %) public submissions objected to the Project, with key issues including subsidence and related property damage, groundwater impacts (especially regarding Thirlmere Lakes), climate change and biodiversity impacts.

The Department also received advice from 12 government authorities. None of the Government authorities objected to the Project, although most raised issues and/or made recommendations relevant to their respective statutory responsibilities.

The Department and the Commonwealth Department of the Environment and Energy jointly requested the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Mining Development to provide advice on the Project.

The Department has also engaged Hugh Middlemis of Hydrogeologic, an independent groundwater expert, to review key groundwater aspects of the Project.

Key Issues

On 15 January 2019, the then Minister for Planning requested the Independent Planning Commission of NSW (the Commission) conduct an initial public hearing into the Project, as soon as practicable after the public exhibition period. The Minister asked that the Commission consider the EIS, submissions and any relevant expert advice and other information, and prepare a report that (amongst other things) identifies the key issues requiring detailed consideration by the Department in evaluating the merits of the Project.

The Department has undertaken a preliminary review of the development application, EIS and submissions and considered the agency and expert advice received. Key issues from this preliminary review include:

- *subsidence* – including its impacts on homes and other built features and on groundwater and surface water resources;
- *water resources* – including further clarification and details of the groundwater modelling, groundwater sensitivity assessment, exchange between surface water and groundwater, and the management of impacts to groundwater bore users;
- *amenity impacts* – including application of current noise policy and technical inputs;
- *biodiversity impacts* – including clearing of a critically endangered ecological community and other threatened species, further clarification on biodiversity offset availability and consideration of other reject emplacement methods;
- *social impacts* – including impacts on the owners of subsidence affected properties, the local Aboriginal community and people with a connection to Thirlmere Lakes; and
- *economic* – including assumptions used to calculate employment benefits and the Project's local environmental, social and transport impacts.

The Department notes that there is a range of additional concerns raised in public submissions, along with strong support for the Project from the majority of submitters, identifying the positive social, employment and economic benefits of mining to the broader regional economy.

Assessment

Following the initial public hearing by the Commission, the Department will undertake a comprehensive assessment of the merits of the Project in accordance with the requirements of the EP&A Act and relevant NSW Government policy and guidelines and the matters raised in meetings, hearings and the submissions identified above.

The Department will continue to undertake targeted consultation with landowners and key stakeholders prior to finalising its detailed assessment report.

The Department will also undertake an assessment of the Project's impacts on Matters of National Environmental Significance on behalf of the Commonwealth, in accordance with the Assessment Bilateral Agreement between the Commonwealth and NSW Governments.

The Department's groundwater expert and Government agencies will also continue to provide advice to the Department during assessment of the Project. This will include review of any additional information provided by

Tahmoor Coal on issues raised by the experts and, where relevant, advice on any findings and recommendations of the Commission following its public hearing.

NSW Government agencies have an important role in the assessment process due to their subsequent regulatory oversight roles if the Project is approved. The Environment Protection Authority (EPA) regulates noise, air emissions and water pollution through an Environment Protection Licence (EPL). The Department of Industry regulates water take through Water Sharing Plan rules and the provisions of the *Water Management Act 2000*. The NSW Resources Regulator and the Department's Division of Resources and Geoscience have roles in ensuring rehabilitation objectives are met under the provisions of the *Mining Act 1992*. Some of these are key areas of concern to the community and the Department will continue to work closely with Government agencies during assessment of the Project.

An important consideration in assessment of the Project is that the impacts of the Approved Project have already been assessed and an approval granted, with the development consents imposing conditions to manage, mitigate and offset these impacts. The Approved Project will not be reassessed, but the impacts of the extension Project will be considered in detail, including cumulative impacts. Tahmoor Coal proposes to surrender Tahmoor Coal Mine's existing development consents over time, if the Project is approved. This means that, in the long-term, the mine would be regulated under a single consolidated and contemporary development consent, if the current application is approved.

Once the Department has completed its assessment, the Project may be referred to the Commission by the Minister for Planning and Public Spaces for further public hearings prior to final determination of the development application.

Contents

1. Background

Tahmoor Coal Pty Ltd (Tahmoor Coal), a subsidiary of SIMEC (Australia) Mining Pty Ltd (SIMEC) owns the Tahmoor Coal Mine, located between the towns of Tahmoor and Bargo, approximately 75 kilometres south-west of Sydney within the Wollondilly and Wingecarribee local government areas (LGAs) (see **Figure 1**).

1.1 Ownership History

Tahmoor Coal Mine has been operating since the 1970s under various owners and operators. The mine was originally constructed by Clutha Development in 1975 with bord and pillar mining commencing in 1980 and the Tahmoor Washery being commissioned in 1981.

In 1985, BP Coal acquired the mine and commissioned a gas extraction facility in 1987. It was at this time that longwall mining commenced. BP Coal sold its interest to Conzinc Rio Tinto Australia in 1989, which owned the site until 1997 when it sold to Austral Coal Ltd, with Centennial Coal Pty Ltd then acquiring a majority share in Austral Coal Ltd in 2005.

In 2007, Xstrata Coal Pty Ltd acquired 100% shareholding in Austral Coal Ltd and with it, the ownership of Tahmoor Coal. In May 2013, Xstrata Coal Pty Ltd and Glencore Coal Pty Ltd (Glencore) merged. On 20 April 2018, SIMEC purchased Tahmoor Coal from Glencore and became the current owner and operator of Tahmoor Coal Mine.

1.2 Approvals History

Tahmoor Coal Mine consists of two Colliery Holdings under the *Mining Act 1992* (Mining Act), including the Tahmoor Colliery Holding (Consolidated Coal Lease (CCL) 716 and Mining Leases (MLs) 1308, 1376, 1539 and 1642; and the Bargo Colliery Holding (CCL 747). The Department notes that limited development was undertaken at Bargo Colliery between 1979 and 1981 before being discontinued in June 1981.

Tahmoor Coal Mine is divided into three distinct mining areas, including:

- Tahmoor Central – Longwalls 1 – 21;
- Tahmoor North – Longwalls 22 – 37; and
- Tahmoor South – the proposed Tahmoor South Coal Project (the Project).

The Tahmoor Coal Mine currently operates under several development consents, the earliest of which dates back to 1975, with the key consents shown in **Table 1** below.

Table 1 | Tahmoor Coal Mine development consents

Consent	Consent Authority	Permits
DA 1975	Wollondilly Shire Council in 1975	Allows underground mining in the central area of the Tahmoor Coal Mine
DA 57/93	Land and Environment Court in 1994	Allows underground mining in the Tahmoor North area, excluding certain areas below urban land and rail infrastructure where mining was, at that time, prohibited under the applicable environmental planning instruments
DA 67/98, as modified	Minister for Planning in 1999	Allows underground mining in parts of the areas excluded under DA 57/98. Mining in these areas had become permissible by this time, and the application sought to subside those parts of the excluded areas where subsidence was predicted in the mine plan

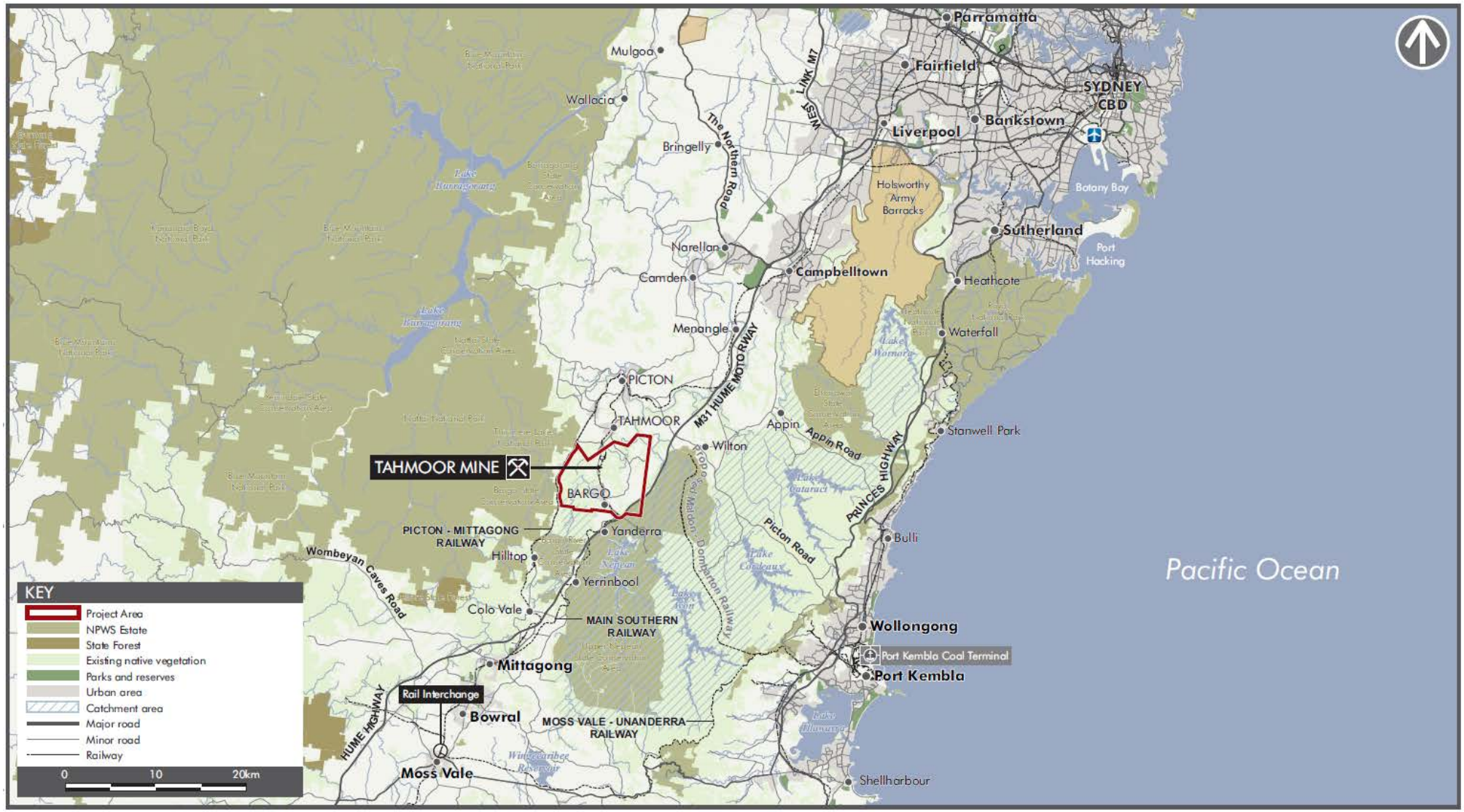

Figure 1 | Regional Context

1.3 Current Operations

Tahmoor Coal Mine targets the Bulli Coal Seam, although several lower coal-bearing units occur in the area, including the Balgownie Coal Seam and Wongawilli Coal Seam.

These other seams are major sources of carbon dioxide and methane in the existing mine. Consequently, these seams are drilled and degassed for safety reasons. Some of the methane produced via this mine gas drainage is used for electricity generation by Energy Developments Ltd, with the remainder being flared.

On-site facilities and infrastructure at Tahmoor Coal Mine includes a Coal Handling and Preparation Plant (CHPP) which can process up to 650 tonnes of coal per hour, ventilation shafts, gas drainage and a rail load-out facility and rail loop.

Product coal is approved to be transported by rail to Port Kembla Coal Terminal, or occasionally Newcastle Port Waratah, for delivery to both Australian and International markets. Tahmoor Coal Mine also has approval to transport up to 50,000 tonnes per annum (tpa) of coal by road within the Wollondilly Shire or in circumstances where rail transport is unavailable. Tahmoor Coal currently employs up to 390 ongoing permanent and contract staff. The approved operational areas at Tahmoor Coal Mine are shown in **Figure 2**.

1.4 SIMEC

SIMEC is a subsidiary of GFG Alliance, an international group of businesses founded and owned by the British Gupta family. GFG Alliance's main operating businesses include:

- Liberty House Group, which has five main divisions, comprising commodities, recycling, steel (including primary steel at Whyalla), aluminium and engineering; and
- SIMEC Group, which also has five main divisions, comprising shipping, infrastructure, mining, energy and commodities.

Tahmoor Coal is an operating business within the SIMEC Mining division of the GFG Alliance. Approximately 25% of metallurgical coal produced at Tahmoor Coal Mine is sold to domestic steelmakers (ie GFG Whyalla and Bluescope Port Kembla). If the Project is approved, it is expected that the proportion of product coal sold to GFG Whyalla would increase to approximately 40% domestic sales.

2. Project Details

Tahmoor Coal is proposing an extension of the mining and ancillary activities associated with its existing mine. The key elements of the Project are:

- extracting and processing an additional 48 million tonnes (Mt) of run-of-mine (ROM) coal by extending the footprint of the underground mine to the south of the approved footprint towards and beneath the town of Bargo;
- increasing the maximum extraction rate of ROM coal from 3 Mt per annum (Mtpa) to 4 Mtpa;
- extending the life of the mine by approximately 13 years until 2035;
- constructing and operating two additional mine ventilation shafts;
- horizontal and vertical expansion of the existing coal rejects emplacement area (REA); and
- upgrades to the mine's existing surface facilities, amenities, equipment and infrastructure, including the car park.

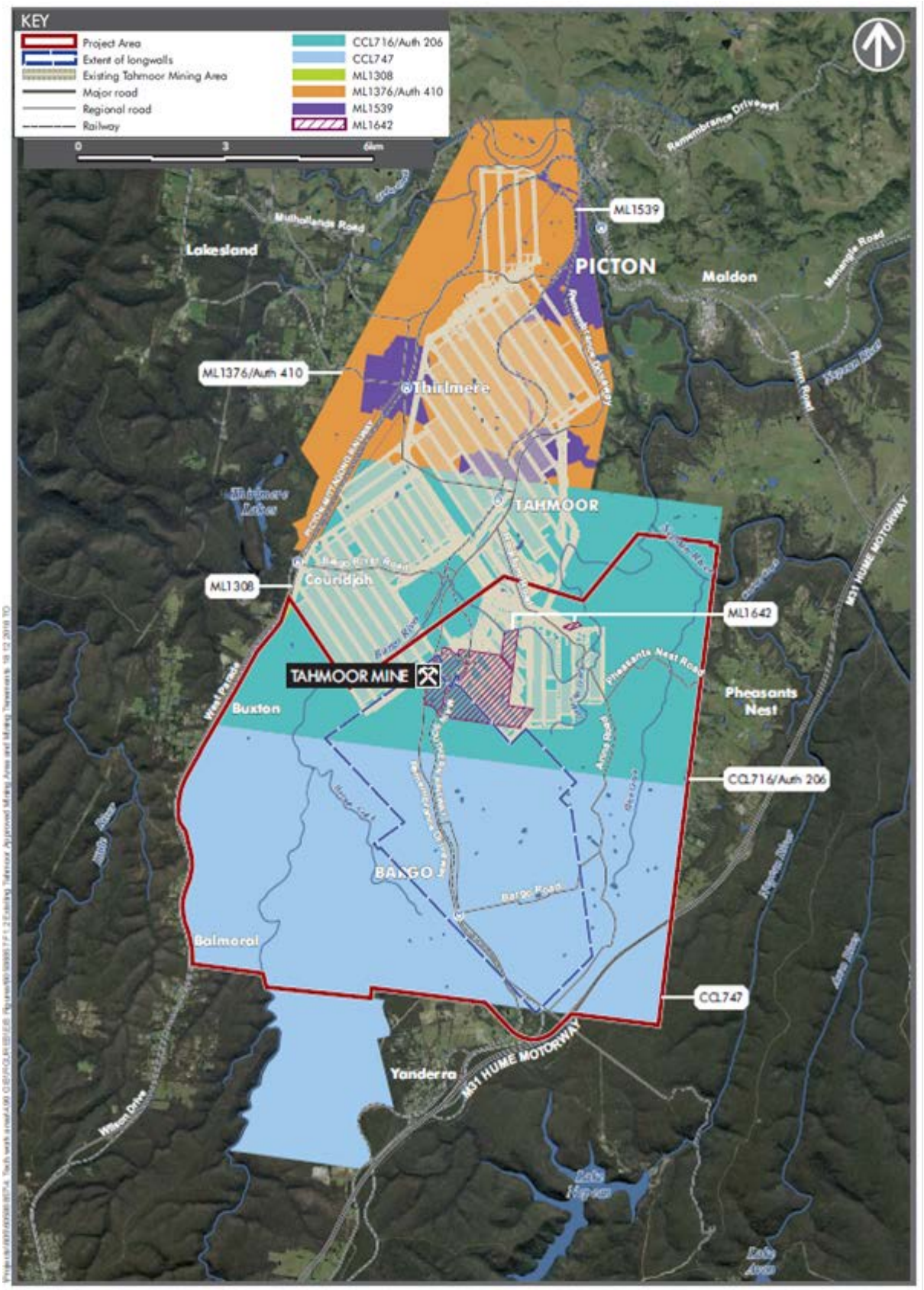

Figure 2 | Project Area and the Tahmoor Central and Tahmoor North Mining Areas

The proposed Project is detailed further in **Table 2** and depicted in **Figure 3**, with the expanded REA shown in **Figure 4**. Approved activities are also included for comparison purposes. The proposal is described in detail in the Environmental Impact Statement (EIS) for the Project (see **Appendix A**).

Table 2 | Main components of the Project

Project Component	Existing Tahmoor Mine	Tahmoor South Coal Project
ROM Coal Production Rate	• Up to 3 Mtpa	• Peak production rate of up to 4 Mtpa
Project Life	• Anticipated to be completed by 2022	• Additional 13 years life, until approximately 2035
Mining and Reserves	• To date, the mine has extracted approximately 51 Mt of ROM coal from Longwalls 1 to 31 in the Bulli Seam, providing around 38 Mt of product coal • Approximately 12 Mt of ROM coal is yet to be extracted, which is expected to provide around 9 Mt of product coal	• Longwall extraction of approximately 47.4 million tonnes of ROM coal from the Bulli Seam, providing around 38 Mt of product coal
Processing	• On-site stockpiling and processing of 3 Mtpa of ROM coal from the mine • Production of up to 2 Mtpa of product coal from the CHPP	• On-site stockpiling and processing of 4 Mtpa of ROM coal from the mine • Production of up to 3 Mtpa of product coal from the CHPP
Coal Transport	• Up to 2 Mtpa of product coal is transported by rail to Port Kembla or occasionally to Newcastle • Up to 50,000 tonnes of product coal transported by road within Wollondilly LGA • Road transport of product coal allowed when rail transport is unavailable • Up to 50,000 tonnes of reject material to be transported by road	• Up to 3 Mtpa of product coal to be transported by rail to Port Kembla or occasionally to Newcastle • The Project would also utilise the road network to transport and/or receive product coal and reject material where rail transport is unavailable or imported coal is needed for special blends, or where a market opportunity for beneficial use of rejects exists. • Road transport would be restricted to a maximum of 200,000 tpa and a maximum of 3,000 tonnes per day • Road transport campaign periods generate a maximum of eight truck movements per hour during the period between 6 am to 7 pm
Rejects Management	• The existing REA covers approximately 89 hectares (ha) and has a capacity of approximately 13 Mt (approximately 4 Mt capacity remaining) • The maximum height of the REA is 13 metres (m) above ground level	• Production of approximately 9.5 Mt of rejects • REA would increase by approximately 43 ha and capacity would increase by 12 Mt to 25 Mt • The maximum height of the REA would increase by 5 m to 18 m above ground level in its southern section
Roadworks	• Not applicable	• Construction of an upgraded intersection at Remembrance Driveway / Tahmoor Mine Access Road
Employment	• Up to 390 ongoing permanent and contract staff	• Up to 175 construction workers • Up to 440 operational workers
Capital Value	• Various depending on which development consent is taken into account	• Approximately an additional $342 million

Project Component	Existing Tahmoor Mine	Tahmoor South Coal Project
Hours of Operation	• Mining operations, train loading and rail transport 24 hours a day, seven days a week • REA operates 24 hours a day, Monday to Friday	• Mining operations, train loading and rail transport 24 hours a day, seven days a week • REA proposed to operate 7am to 10pm, 7 days a week • Road transport of product coal or rejects is proposed to only occur between 6 am and 7 pm, on up to seven days a week • Construction to be undertaken 6 am to 7 pm, seven days a week, with the exception of ventilation shaft construction, which would occur 24 hours a day, 7 days a week
Rehabilitation	• Progressive rehabilitation of REA and surface disturbance areas, predominantly to native bushland • A total of 50 ha has been rehabilitated to date	• Progressive rehabilitation of REA and surface disturbance areas, predominantly to native bushland
Disturbance Area, Vegetation Clearing and Biodiversity Offsets	• The REA has an area of 89 ha: – 35 ha are disturbed and operational; – 4 ha are internal dams; and – 50 ha have been rehabilitated • No biodiversity offsets are required for the existing REA	• Clearance of an additional 49.2 ha of native woodland to allow for expanded REA, construction of two ventilation shafts and extension of car park • Offset the following biodiversity impacts, in accordance with the *Framework for Biodiversity Assessment*: – clearance of 43.4 ha of Shale Sandstone Transition Forest Critically Endangered Ecological Community (CEEC); – clearance of 5.7 ha of Upper Georges River Sandstone Woodland; – removal of 2,324 *Grevillea parviflora subsp. parviflora* plants; – removal of 100 *Persoonia bargoensis* plants; – removal of 7.4 ha of potential habitat for Large-footed Myotis; – removal of 43.5 ha of potential habitat for Koala.

The Department notes that the Project comprises a single mining domain referred to as the Central Domain. Two additional domains, the Eastern and Southern Domains, were previously identified by Glencore as mineable however are not included as part of SIMEC's Project due to the presence of geological features (eg major faults) and a greater number of risk management zones and sensitive features.

The coal resource to be targeted is of high quality and would be processed to produce both coking coal for use in the steel making industry, and thermal coal for use in power generation. Approximately 91 per cent of the saleable product coal would be coking coal, and 9 per cent would be thermal coal.

If development consent for the Project is granted, existing consents would be surrendered (in some cases, after mining is completed in 2022) and elements of the existing consents (eg activities related to surface facilities) would be governed only by the new development consent. Surrendering existing consents would enable a smooth transition to a single consent to govern activities, final closure and rehabilitation at Tahmoor Coal Mine as a whole.

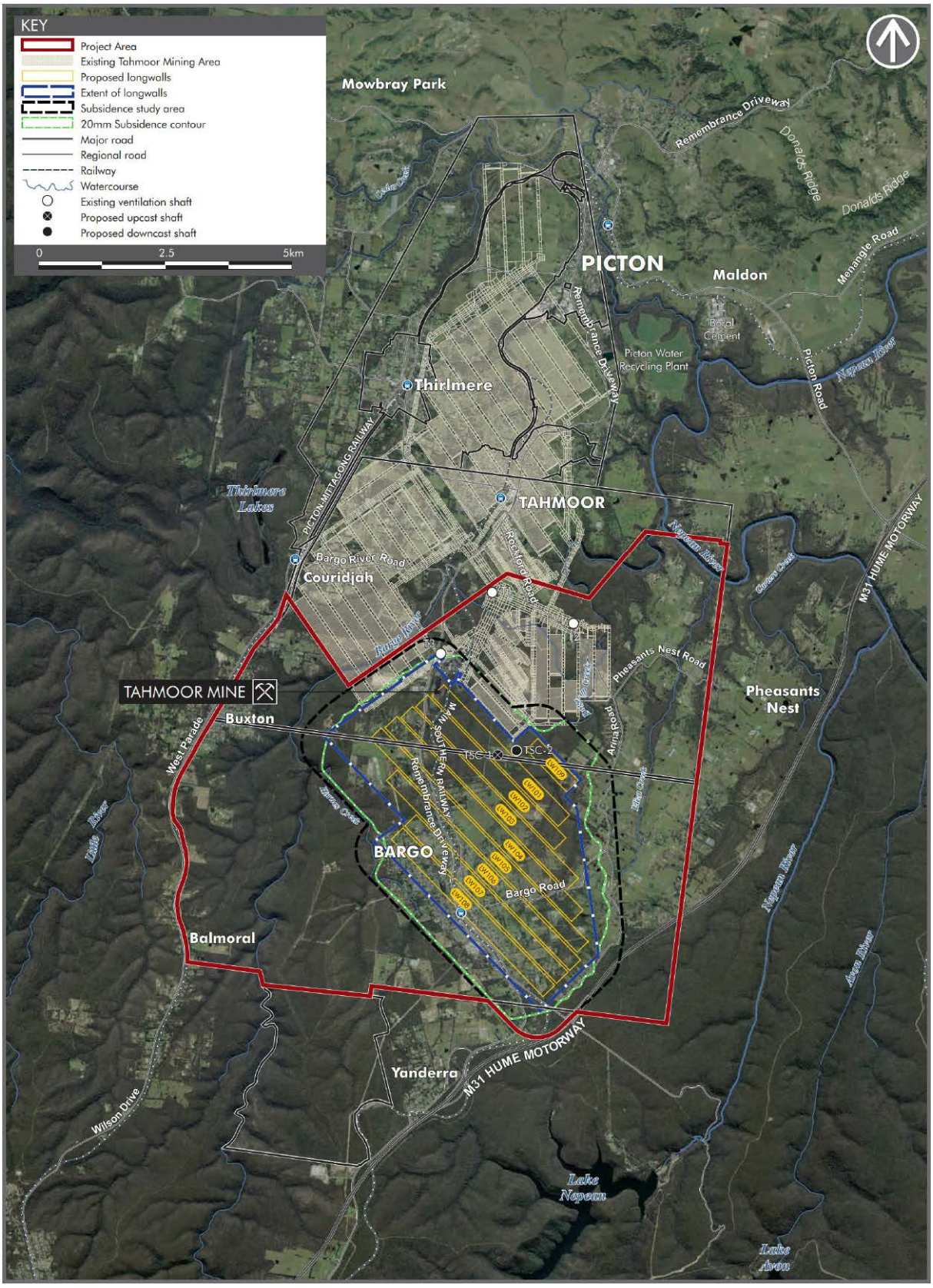

Figure 3 | Proposed Tahmoor South Project Area

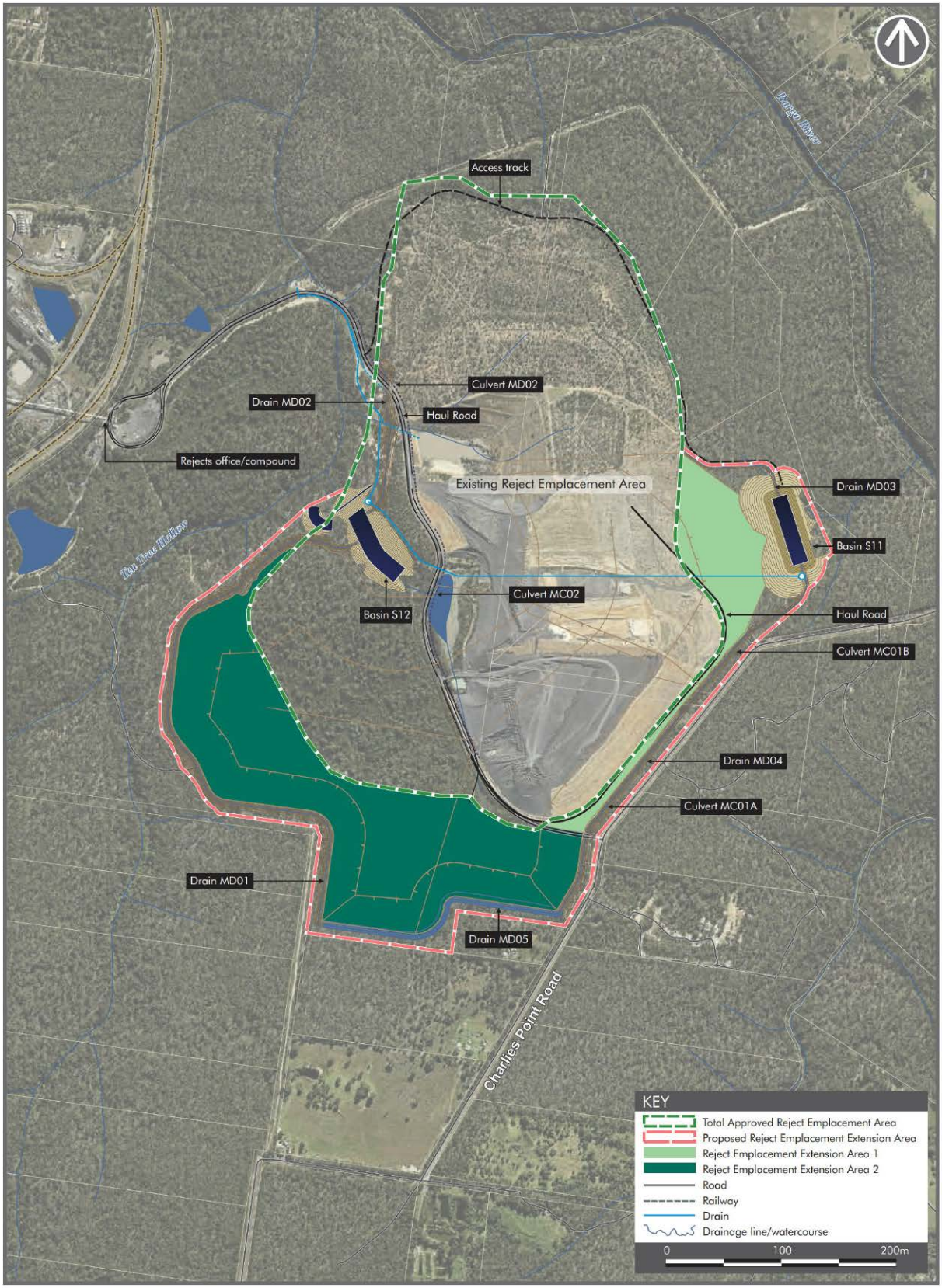

Figure 4 | Proposed Reject Emplacement Extension Area

3. Strategic Context

3.1 Southern Coalfield

The Southern Coalfield is renowned for its premium quality, hard coking coals, used predominantly for steel manufacture. This coalfield is the principal source of hard coking coal within the State and supports both the Port Kembla and Whyalla Steelworks and provides significant coking coal exports.

All mining in the Southern Coalfield is undertaken using underground methods, principally longwall mining. Longwall mining is the most economic method of underground mining and has the greatest recovery of coal. However, it inevitably results in subsidence of surface features.

The Southern Coalfield is unique in NSW, in that much of it is located beneath high-value native vegetation and streams primarily used as water catchment. The water catchment is divided between the Special Areas (close to dams and stored waters) and the outer catchment (other areas within the broader catchment). The Special Areas allow careful management by WaterNSW of the catchments of the Avon, Cordeaux, Cataract, Woronora and Nepean Dams, which supply water to the greater Wollongong area and (in the case of Woronora) to southern Sydney.

There are only two active mines in the Special Areas – Dendrobium Coal Mine and Metropolitan Coal Mine. There are four other active mines in the broader catchment (Springvale Colliery, Clarence Colliery, Bulli Seam Operations (including Appin, Appin West and Westcliff Collieries) and Tahmoor Coal Mine). Springvale Colliery and Clarence Colliery are not within the Southern Coalfield.

Other Southern Coalfield mines include Russell Vale Colliery, Wongawilli Colliery and Berrima Colliery, all of which are currently under care and maintenance. The closest nearby mine to Tahmoor Coal Mine is Bulli Seam Operations, located approximately 20 km to the east of the Project.

Most coal produced in the Southern Coalfield is exported or else shipped to Whyalla from the Port Kembla Coal Terminal. Coal is transported to the Port Kembla Coal Terminal predominantly by rail (60 per cent), either along the Illawarra South Coast rail line or via the Moss Vale to Unanderra Line.

The Main Southern Railway is a passenger and freight service connecting Sydney with Melbourne which runs through Tahmoor. Coal can be transported towards Port Kembla from Tahmoor Coal Mine along the Main Southern Railway, before changing to the Moss Vale to Unanderra Line at the Moss Vale Junction.

The Port Kembla Coal Terminal is the major coal intermodal facility in NSW for the transfer of coal from both road and rail to ship. It has a total capacity of 18 Mtpa (with around 7.5 Mtpa current spare capacity) and can receive up to 16 trains of product coal per day.

3.2 Coal Resource

The primary coal-bearing stratigraphic unit in the Southern Coalfield is the Illawarra Coal Measures, with its most significant resources being the Bulli, Wongawilli, Tongarra and Balgownie Coal Seams. In financial year 2018, raw coal production in the Southern Coalfield totalled 10 million tonnes and supported the direct employment of 2,450 people.

Un-mined resources of prime coking coal are primarily in the Bulli and Balgownie Coal Seams under the Camden-Campbelltown-Picton region; however, this is a rapidly growing metropolitan area of Sydney, and subject to strategic land release and other Government policies which limit opportunities for coal resource development.

The Bulli Coal Seam is generally considered to contain prime quality coking coal with medium to high ash and low to medium volatiles, with an average raw coal production rate of 76%. The Project would target the Bulli Coal Seam, which reaches depths of up to 800 m in the central north of the Southern Coalfield and exceeds 850 m in the north-west. The Bulli Coal Seam is 5 m at its thickest in the north of the Coalfield, and in other regions varies in thickness between 2 and 3 m.

3.3 Thirlmere Lakes Inquiry

The Thirlmere Lakes are a protected wetland system consisting of five lakes (Lake Gandagarra, Lake Werri Berri, Lake Couridjah, Lake Baraba and Lake Nerringong) that form the basis of the Thirlmere Lakes National Park. The lakes are located approximately 3.5 km north-west of the Project's nearest proposed longwall.

Water levels in the Thirlmere Lakes have been falling since 1992. However, the cause(s) of these falls are not straightforward, with some members of the community suggesting that the drying was related to longwall coal mining that had taken place to the east of the lakes, principally between 1995 and 2004.

In 2011, the NSW Government commissioned an inquiry into the possible causes of the water level decline, the Thirlmere Lakes Inquiry. The Inquiry found that there was no evidence of direct impact from mining on the lakes and that changes in lake levels could be accounted for by drought, heavy rains and some groundwater loss. Further research into the lake hydrology and groundwater was recommended.

An Independent Committee was established as part of the Inquiry. This committee provided recommendations for further research, consideration of a 'groundwater mound' to minimise groundwater loss and nomination of Thirlmere Lakes National Park for listing under the Ramsar Convention on Wetlands.

Following these recommendations, a surface water level and rainfall monitoring program was established and an inter-agency committee of scientists is developing a research program into the causes of changes to water levels in the lakes. This work led to a report which highlighted several knowledge gaps and catalogued areas for further research. In October 2017, the Office of Environment and Heritage (OEH) announced a $1.9 million research program, the Thirlmere Lakes Research Program, which would run over four years and help address these knowledge gaps.

3.4 Water Resources

The Project is adjacent to the Sydney Drinking Water Catchment, with drinking water catchments which supply Lake Nepean, Lake Avon, Lake Cordeaux and Lake Cataract located to the east. Lake Nepean is the closest water storage, located approximately 3 km from the closest longwall. These reservoirs are located within the Metropolitan Special Area, where general public entry is prohibited. The Project is downstream of these catchments and the Special Area, and no proposed longwall panels extend into the Special Area.

Tributaries of the Bargo and Nepean rivers traverse the Project area. The Project area is predominantly drained by Tea Tree Hollow and Dog Trap Creeks, which flow north and east toward the Bargo River. To the south-west of the proposed longwall panels, Hornes Creek also flows into the Bargo River. The east of the Project area is predominantly drained by Eliza Creek, which flows northward toward the Nepean River. A small part of the eastern portion of the Project is also drained by Carters Creek, which flows north-eastward to the Nepean River. Cow Creek lies within the Metropolitan Special Area and flows into the Nepean River, which is to the east of the Project area.

The Project area is covered by the *Greater Metropolitan Groundwater Sources Water Sharing Plan*. There are a large number of privately-owned groundwater extraction bores within and surrounding the Project area (ie 791 within the groundwater model area which covers 3,237 km^2).

In December 2006, the NSW Government established an independent inquiry into underground coal mining in the Southern Coalfield. This Inquiry was established because of concerns held in both Government and the community over previous and potential impacts of subsidence covered by underground mining operations on natural surface features.

The terms of reference required the panel conducting the Inquiry to focus its review on subsidence-related impacts on rivers, significant streams, swamps and cliff lines. In July 2008, the Southern Coalfield Inquiry released a report titled *Independent Strategic Review of Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield*. The Inquiry concluded that valley closure and upsidence effects from underground mining cause the majority of impacts on significant natural surface features, such as cracking of stream beds, rock falls from cliff lines and alteration of groundwater chemistry in shallow aquifers.

The Inquiry made a total of 22 recommendations regarding best practice assessment, impact minimisation, management, monitoring and remediation of subsidence impacts. The EIS has considered the Inquiry's recommendations in its assessment of subsidence impacts, including the development of risk management zones.

A review of the findings of the 2008 Inquiry is currently underway by a new Independent Expert Panel for Mining in the Catchment (the Panel) which has been established by the Government and tasked with providing informed expert advice to the Department on the impact of mining activities in the Greater Sydney Water Catchment Special Areas, with a particular focus on risks to the quantity of water in the Catchment.

Under its Terms of Reference, the Panel is focused on the Special Areas of the catchment. As the Project is located outside the Special Areas, it falls outside the Terms of Reference for the Panel.

3.5 Land use

Land use in the region is characterised by a mix of land uses, including village residential, rural residential, agriculture, vacant Crown land and conservation areas. The area predominantly exhibits gently undulating slopes; however, the topography becomes steeper near the Bargo and Nepean river valleys, north and west of the Project, respectively. These steeper areas are also more densely forested.

Nearby conservation areas include the Upper Nepean State Conservation Area (SCA), the Bargo River SCA, Nattai National Park, Thirlmere Lakes National Park and Blue Mountains National Park. The three national parks form part of the Greater Blue Mountains UNESCO World Heritage Area.

The Upper Nepean SCA is the largest of the SCAs surrounding the Project. It was established in 2007 and covers a total area of 25,869 ha. Approximately 171 ha of this area (2%) lies within the Project Area although the proposed development itself does not extend into the SCA. The closest national park is Thirlmere Lakes National Park, located approximately 2.47 km from the closest longwall panel.

Rural residences, villages and towns surround the mine. The nearest towns are Tahmoor and Bargo and the nearest villages are Couridjah, Balmoral, Yanderra and Buxton. The Project would mine directly beneath the town of Bargo, including direct undermining of approximately 750 houses. There are also approximately a further 750 houses located within the subsidence affectation zone (ie subsidence associated with the Project may affect approximately 1,500 houses to some extent).

The Project is located within the Bargo Mine Subsidence District. A district is a land zoning tool administered by Subsidence Advisory NSW (SA NSW) under the *Coal Mine Subsidence Compensation Act 2017* to help protect homes and other structures from potential mine subsidence damage.

Districts are proclaimed in areas where there are potential subsidence risks from underground coal mining that has occurred or may take place in the future. SA NSW regulates building and subdivision works within districts to ensure new homes and structures are built to an appropriate standard that reduces the risk of damage should subsidence occur.

The *Coal Mine Subsidence Compensation Act 2017* also provides for the assessment and management of risks associated with subsidence resulting from coal mining operations and includes provision for compensation or repairs required to mitigate the damage caused by mine subsidence.

The owners of buildings or other surface improvements damaged by mine subsidence can lodge claims for compensation through SA NSW. SA NSW supports property owners throughout the assessment process and facilitates compensation or repair by mine operators where damage results from active mining operations.

The Project would also extend beneath semi-rural and partly forested landscapes in a region with a long history of agricultural use, including poultry, cattle grazing, trotting horse training, greyhound training and horse studs. Large-scale vegetation clearance has occurred on these flat or moderately sloped agricultural areas. Nevertheless, areas of good quality remnant and rehabilitated vegetation also exist within the Project area, particularly to the north-east.

Key infrastructure assets in the area include the:

- Main Southern Railway, which extends north-south through the Project area and supports passenger and freight services between Sydney and Melbourne;
- M31 Hume Highway, to the east;
- Sydney to Moomba gas pipeline;
- Gorodok Ethane pipeline; and
- various other utility infrastructure, including water pipelines and transmission lines.

Land in the Project area is owned by either the Crown, various Government authorities, private owners or Tahmoor Coal. The majority of land is privately-owned, with Crown land and Tahmoor Coal owned land to the north-east and north-west of the Project area.

3.6 A Plan for Growing Sydney

A Plan for Growing Sydney (NSW Government 2014) aims to promote the growth of Sydney by guiding land use planning decision making for the next 20 years. The plan provides a framework based around four key goals including developing a competitive economy, delivering greater housing choice, creating communities and safeguarding the natural environment.

The Project is considered to be broadly consistent with these goals as it would:

- enable ongoing direct employment;
- provide a significant resource-based economic contribution at regional, State and national levels;
- provide jobs closer to homes in south-western Sydney; and
- not conflict with future strategic land use in the Bargo area (ie the Metropolitan Rural Area under the plan).

3.7 Western District Plan

The Western District Plan (Greater Sydney Commission 2018) acknowledges that the Western District is undergoing the most dramatic change of all districts in Greater Sydney. At the same time, it recognises that there are significant mineral resources in the Western District and that primary industries are essential to the area's

economy. It notes that areas with significant resources may need to be protected to avoid transition to higher uses such as suburban residential development.

4. Statutory Context

4.1 State Significant Development

The Project is classified as State significant development (SSD) under Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it is development for the purpose of coal mining and mining related works, which are specified in clause 5 of Schedule 1 to *State Environmental Planning Policy (State and Regional Development) 2011* (the SRD SEPP).

The Minister for Planning is the consent authority for the development. However, under the Minister's delegation of 11 October 2017, the Executive Director, Resource Assessments and Compliance, may determine the development application as neither Wollondilly Shire Council nor Wingecarribee Shire Council objected, there were less than 25 objections from the general public and a political donations disclosure statement has not been made.

4.2 Permissibility

The Project area is located within the Wollondilly and Wingecarribee LGAs. Actual development would be located within the Wollondilly LGA only, on land subject to the *Wollondilly Local Environmental Plan 2011* (Wollondilly LEP).

The surface facilities area and REA are on land zoned RU2 Rural Landscape, while the proposed extraction area extends beneath land zoned primarily E2 Environmental Conservation, E4 Environmental Living, RU1 Primary Production, RU2 Rural Landscape and RU4 Rural Small Holdings. The footprint of the mine plan also includes areas of Low and Medium Density and Large Lot Residential (R2, R3 and R5, respectively) and SP2 Infrastructure (Road and Railway).

Under the Wollondilly LEP the Project is permissible with consent in some land zones and prohibited in other zones. However, particular provisions of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (the Mining SEPP) ensure that the Project is fully permissible with consent. Under this provision, development for the purposes of underground mining is permissible anywhere in the State.

4.3 Objects of the Act

The consent authority must consider the objects of the EP&A Act when making decisions under the Act. The Department has considered the Project against the current objects of the EP&A Act (see section 1.3 of the Act). The objects of most relevance to the decision on whether or not to approve the Project are:

- Object 1.3(a): *to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources*;
- Object 1.3(b): *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment*;
- Object 1.3(c): *to promote the orderly and economic use and development of land*;
- Object 1.3(e): *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats*;

- Object 1.3(f): *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage)*; and
- Object 1.3(j): *to provide increased opportunity for community participation in environmental planning and assessment*.

The Department has formed a preliminary view that the Project could permit the continued proper management and development of a regionally significant coal resource (Objects 1.3(a) and (i)). The Department also considers that the Project could represent an orderly and economic use of land (Object 1.3(c)). These will be further considered in the Department's detailed assessment.

The Department will consider the principles of ecologically sustainable development (ESD, Object 1.3(b)) in its assessment of the Project and whether it is able to be carried out in a manner that is consistent with the principles of ESD. The Department's assessment will seek to integrate all significant environmental, social and economic considerations.

Consideration of the protection of the environment and heritage (Objects 1.3(e) and(f)) will also be further considered and assessed as part of the Department's detailed assessment of the Project.

The Department exhibited the development application and accompanying EIS and also made them publicly available (Object 1.3(j)).

4.4 Environmental Planning Instruments

Under Section 4.15 of the EP&A Act the consent authority is required to consider, amongst other things, the provisions of relevant environmental planning instruments (EPIs), including any exhibited draft EPIs, development control plans (DCPs)[1] or planning agreements.

The EIS includes consideration of several relevant instruments, including:

- State Environmental Planning Policy (SEPP) No.33 – Hazardous and Offensive Development;
- SEPP No.44 – Koala Habitat Protection;
- SEPP No.55 – Remediation of Land;
- SEPP (Sydney Drinking Water Catchment) 2011;
- Mining SEPP;
- Sydney Regional Environmental Plan No.20 – Hawkesbury-Nepean River (No 2-1997);
- Wollondilly LEP 2011; and
- Wingecarribee LEP 2010.

Tahmoor Coal's assessment concludes that the Project is able to be undertaken in a manner that is generally consistent with these instruments. The Department has also considered the SRD SEPP and SEPP (Infrastructure) 2007. The Department has formed a preliminary view that the Project is generally consistent with the aims and objectives of the relevant EPIs. Nevertheless, the Department will further consider these instruments as part of its detailed assessment of the Project.

4.5 Integrated and Other NSW Approvals

Under Section 4.41 of the EP&A Act, several approvals are integrated into the SSD assessment process and consequently are not required to be separately obtained for the proposal. These include:

[1] SEPP (State and Regional Development) 2011 provides that DCPs do not apply to State Significant Development

- various approvals relating to heritage required under the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*; and
- certain water approvals under the *Water Management Act 2000*.

Under Section 4.42 of the EP&A Act, several other approvals are required, but must be substantially consistent with any development consent granted for the Project. These include:

- a mining lease under the Mining Act; and
- an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997*.

Tahmoor Coal would also require other approvals for the Project which are not integrated into the SSD assessment process, including:

- approval under the *Coal Mine Subsidence Compensation Act 2017*;
- approval under the *Crown Lands Act 1989* for any works on Crown land;
- approvals under the *Roads Act 1993*;
- notification under the *Work Health and Safety (Mines) Act 2013* for high risk activities, including emplacement of reject materials; and
- water licences under the *Water Act 1912* and/or the *Water Management Act 2000*.

4.6 Gateway Assessment

Under Clause 50A of the EP&A Regulation, mining and petroleum related development on strategic agricultural land is required to undergo a 'Gateway' assessment prior to submission of a development application. The Gateway assessment is an independent, upfront scientific assessment of the impact of applicable mining and coal seam gas proposals on strategic agricultural land and its associated water resources.

Strategic agricultural land includes:

- Biophysical strategic agricultural land (BSAL) – land that has the best quality soil and water resources and is capable of sustaining high levels of productivity; and
- Critical Industry Cluster (CIC) land – a concentration of significant agricultural industries potentially impacted by coal seam gas or mining development.

As part of the Project, additional mining leases would be required to accommodate a proposed expansion of the existing REA and additional ventilation shafts. On 5 February 2018, the Department issued a Site Verification Certificate (SVC) confirming that the area is not located on BSAL or CIC land. On 23 October 2018, the Department issued a further SVC covering 35 ha of land that was not incorporated in the original SVC application.

Consequently, a Gateway Certificate is not required for the Project.

4.7 Commonwealth Approvals

Tahmoor Coal also needs to obtain an approval from the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), because the Project is a 'controlled action' under the EPBC Act due to its potential impacts on listed threatened species and communities (sections 18 and 18A of the EPBC Act) and a water resource (sections 24D and 24E of that Act).

The assessment process under the EP&A Act has been accredited under the bilateral agreement between the NSW and Commonwealth Governments. This means that the NSW Government is undertaking the assessment on behalf of the Commonwealth and must assess all identified matters of national environmental significance (MNES).

Nevertheless, it is important to recognise that the Commonwealth Minister maintains an independent approval role for the Project and is expected to undertake this determination following the NSW determination.

4.8 NSW Independent Planning Commission

On 15 January 2019, the Minister for Planning requested the Independent Planning Commission of NSW (the Commission) to conduct an initial public hearing into the Project, as soon as practicable after public exhibition of its EIS.

The Minister asked that the Commission consider the EIS, submissions on the Project, and any relevant expert advice and other information. The Minister also asked that the Commission publish a report on the hearing findings including, amongst other things, identification of the key issues requiring detailed consideration by the Department in evaluating the merits of the Project.

Following receipt of the Commission's Issues Report, the Department will complete its detailed assessment of the Project. The development application may be referred back to the Commission for final review before the Department makes its determination.

The Commission may hold further public hearings if directed by the Minister for Planning and Public Spaces, in accordance with its *Guidelines for a Public Hearing Held in Multiple Stages*.

5. Engagement

5.1 Department's Engagement

The Department publicly exhibited the EIS from 23 January 2019 until 5 March 2019 (42 days) and advertised the exhibition in the:

- Sydney Morning Herald;
- Daily Telegraph;
- The Australian;
- Southern Highland News;
- Macarthur Chronicle; and
- Wollondilly Advertiser.

The EIS was made available at the:

- Wollondilly Shire Council office and Wollondilly Library in Picton;
- Wingecarribee Shire Council office in Moss Vale; and
- Bowral Central Library in Bowral.

The Department also notified Wollondilly Shire Council and Wingecarribee Shire Council and relevant Government agencies.

Following exhibition on 2 April 2019, the Department met with Department of Primary Industries – Water (including Natural Resources Access Regulator (NRAR)), Tahmoor Coal and its consultants and the Department's independent groundwater expert to discuss issues regarding groundwater modelling and potential impacts (see **Sections 5.3** and **6.2**).

On 10 April 2019, the Department also met with the Environment Protection Authority (EPA) and Tahmoor Coal to discuss issues surrounding the Project's noise modelling and predicted impacts (see **Sections 5.3** and **6.3**).

5.2 Submissions

During the exhibition period of the EIS, the Department received a total of 83 submissions, including:

- 6 from special interest groups (SIGs); and
- 77 from the general public (including individuals and businesses).

Late submissions were received following the exhibition period from one individual and two SIGs (the National Parks Association and Doctors for the Environment Australia) giving a total of 86 submissions. The Department also received advice from 12 Government agencies.

A summary of submitters is provided in **Table 3** below, and a full copy of all submissions and advice is provided in **Appendix B.**

Table 3 | Summary of Government advice and special group submissions

Submitters	Total	Object	Support	Comment
Government Agencies	**12**	**0**	**0**	**12**
EPA, DoI (including NRAR), OEH, Heritage Council of NSW, the Department's Division of Resources and Geoscience (DRG), NSW Resources Regulator, NSW Health, Transport for NSW, Subsidence Advisory NSW (SA NSW), Roads and Maritime Services (RMS), Rural Fire Service (RFS) and Water NSW				
Councils	**2**	**0**	**0**	**2**
Wollondilly Shire Council and Wingecarribee Shire Council				
Special Interest Groups (SIGs)	**8**	**5**	**1**	**2**
Greater Blue Mountains World Heritage Advisory Committee				Comment
National Parks Association - Macarthur Branch		Object		
Ironlaw Pty Ltd		Object		
Endeavour Energy				Comment
RStar Mining			Support	
The National Trust of Australia		Object		
Undermined Inc		Object		
Doctors for the Environment Australia		Object		
Community	**78**	**6**	**72**	**0**
TOTAL Community and SIGs (No. / %)	**86**	**11(13%)**	**73(85%)**	**2 (2%)**

Seventeen submissions were received from community members in the Tahmoor, Thirlmere, Bargo and Picton post codes. These localities are within either the existing or proposed Project boundary. Of these submitters, three objected to and 14 supported the Project. Thirty-seven submitters reside outside of the Project area, but within 30 km of it, with all but one in support of the Project (see **Table 4**).

Table 4 | Summary of submissions from members of the community

Distance from Project	Total	Object	Support	Comment
Within Project boundary	17	3	14	0
Within 30 km of Project boundary	37	1	36	0
More than 30 km from Project boundary	24	2	22	0

5.3 Key Issues – Government Agencies

None of the Government agencies objected to the Project. However, most agencies raised issues, either of a technical nature or about its potential impacts, and/or made recommendations as to how these impacts should be avoided or minimised. Key issues raised by Government agencies are summarised below.

5.3.1 Water Resources

- DoI – Water and NRAR recommended that Tahmoor Coal demonstrate its ability to obtain water access licences (WALs) to account for its predicted maximum take of both surface water and ground water, in accordance with the *Aquifer Interference Policy* (AIP).
- DoI – Water and NRAR raised concerns over the surface water modelling and questioned the reliability of the groundwater models' predictions. As such, it did not have confidence in its predictions about impacts on groundwater users.
- EPA considered that the EIS does not adequately assess potential water quality impacts of discharges from the Project and made several recommendations for further assessment.
- DoI - Fisheries requested that any water quality monitoring program include monitoring of baseflow in creeks and iron floc entering the Bargo River.
- WaterNSW acknowledged the amendments to Glencore's previous mine plan, to avoid mining in the Sydney Drinking Water Catchment. Nevertheless, given the proximity of the proposed longwalls to the Metropolitan Special Area, WaterNSW assessed any potential impacts. WaterNSW considered that groundwater drawdown and baseflow reduction would pose a low risk to water quantity in the catchment area.
- OEH recommended that the flood assessment should be updated to address flooding characteristics across the full range of flood events, rather than depicting the extent of flooding for pre and post development only.

5.3.2 Subsidence

- SA NSW raised concerns over the potential subsidence impacts for the township of Bargo, as the area is densely populated. SA NSW recommended that the Project be modified to substantially reduce predicted subsidence impacts to Bargo.
- DoI Agriculture was satisfied that the EIS adequately addressed potential subsidence impacts relevant to agricultural operations and infrastructure.

5.3.3 Amenity Issues

- EPA advised that the noise impact assessment contained significant deficiencies and as a result it is not able to evaluate the potential noise and vibration impacts or the adequacy of proposed mitigation measures.
- EPA also advised that the air quality assessment was completed in accordance with the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW 2016*.
- NSW Health noted that the EIS predicted exceedances of noise and air quality emission standards without assessing the current and future health impacts. NSW Health recommended that Tahmoor Coal complete a Health Impact Assessment (see **Section 6.3.2**).

5.3.4 Biodiversity and Heritage

- OEH recommended that Tahmoor Coal explore alternatives to avoid and/or minimise the impacts of native vegetation clearance. OEH requested that Tahmoor Coal undertake further work to consider the impacts of vegetation clearance on hollow-bearing trees and several species including Koala, *Persoonia bargoensis* and the Eastern Pygmy-possum. Following consideration of avoidance principles, OEH also recommended that Tahmoor Coal further develop its proposed biodiversity offset strategy to demonstrate that any required offsetting of residual impacts could be achieved.
- To protect significant rock shelter artworks on Dog Trap Creek and reduce impacts to watercourses, OEH requested further subsidence, hydrological, vibration and dust assessment and recommended that longwalls 101, 102 and 103 are reduced in length and longwall 109 is redesigned to avoid impacts on natural and heritage features.
- OEH also recommended that Tahmoor Coal undertake its proposed archaeological test excavations for surface infrastructure and recommended that a Heritage Management Plan is developed in consultation with the local Aboriginal community. The Department notes that this requirement is a standard condition required under contemporary underground mining development consents and would be applied to the Project should it be approved.
- Heritage Council of NSW advised that the EIS did not adequately address historic heritage and requested that Tahmoor Coal complete detailed assessment of all historic heritage items with the Wirrimbirra Sanctuary, refine its proposed subsidence mitigation measures and prepare a site-specific Statement of Heritage Impact report for the Wirrimbirra Sanctuary.

5.3.5 Transport

- RMS did not object to the Project; however, recommended that Tahmoor Coal be required to proactively manage impacts on RMS infrastructure, functionality and road user safety to acceptable levels and that this be done under an Extraction Plan process. The Department notes that this requirement is a standard condition required under contemporary underground mining development consents and would be applied to the Project should it be approved.
- Transport for NSW reviewed the EIS and did not provide any comment.

5.3.6 Final Landform and Rehabilitation

- NSW Resources Regulator advised that the EIS contained insufficient detail in relation to rehabilitation commitments and completion criteria.
- DoI – Water and NRAR advised that the REA is within waterfront land and rehabilitation should be in accordance with the *Guidelines for Working on Waterfront Land*. NRAR also requested to be consulted during the development of any Rehabilitation Management Plan for the Project.

5.3.7 Resource and Titles

- DRG advised that additional mining titles would be required for the expansion of the REA, as it is an ancillary mining activity requiring a licence. For the surface infrastructure required for the drainage of gas and ventilation, DRG advised it would consider the requirements needed to satisfy section 81 of the Mining Act in respect of surface activity undertaken by a holder of a subsurface lease.

A detailed summary of issues raised by the individual agencies is provided in **Appendix C1.**

5.3.8 Bushfire Management

- RFS recommended that a Fire Management Plan be prepared for the Project. The Department notes that bushfire management is a standard condition required under contemporary underground mining development consents and would be applied to the Project should it be approved.

5.4 Key Issues – Councils

5.4.1 Wollondilly Shire Council

Wollondilly Shire Council noted that while it had not adopted a formal position on the Tahmoor Coal Mine, it does not oppose underground mining in its LGA, provided it can occur without adverse impacts to the natural, cultural and built environment. It recognises that the Project would have local economic benefits and is an important source of coking coal for steel manufacturing.

However, Wollondilly Shire Council advised that it has concerns with the following aspects of the Project:

- Tahmoor Coal's consideration of potential impacts to proposed and future developments, particularly assessment of local growth and sub-division applications;
- potential traffic impacts and reductions in Level of Service at Remembrance Driveway, particularly during peak traffic periods;
- modelling and assessment of impacts on ground and surface water from subsidence;
- assessment of subsidence and water impacts occurring through post-approval Extraction Plans;
- potential impacts to the hydrology of Thirlmere Lakes from undermining of watercourses and whether any impacts could be successfully rehabilitated;
- potential impacts from the discharge of water from the Project site and its impacts on aquatic ecology;
- potential impacts to Council's Bargo Waste Management Centre;
- a lack of investigation of alternative options for the REA; and
- the level of vegetation clearance and Tahmoor Coal's ability to offset the proposed clearance.

Wollondilly Shire Council made several requests for further information or recommendations to address these concerns, as summarised below.

Water Resources

To address concerns relating to the potential impacts to Thirlmere Lakes, Council recommended that additional investigations are undertaken which consider Tahmoor Coal's groundwater assessment and the findings of the Thirlmere Lakes Research Program. The Council considered that a recent study on the impacts of mining on the condition of Redbank Creek should have been investigated by Tahmoor Coal during preparation of its EIS.

Vegetation Clearance and the REA

Council recommended that options for the re-use of coal rejects should be investigated to reduce the environmental impact of the proposed REA. It also identified concerns over the EIS's biodiversity assessment, including how clearance of vegetation has been avoided or minimised, the ability to offset impacts and its assessment of threatened species (ie Koala).

Subsidence Impacts

Council recommended that specialist advice is sought over the suitability of the "Tammetta Model" used by Tahmoor Coal to model subsidence impacts, given IESC comments on its use in the assessment of the Hume Coal Project (see **Section 5.6**).

Other

Wollondilly Shire Council also made several requests in its submission which will be considered outside of this preliminary identification of key Project issues (eg requests to meet, making advice public, obtaining legal advice etc). The Department is proposing to consult further with representatives of Wollondilly Shire Council to discuss the assessment process and the issues raised by Council.

The Department will also request that Tahmoor Coal responds to all concerns raised by Council.

5.4.2 Wingecarribee Shire Council

Since 2010, Wingecarribee Shire Council has adopted a policy position of opposing longwall mining and any new coal mine proposals within its LGA due to potential impacts on groundwater, water catchments, agricultural land and tourism.

However, Wingecarribee Shire Council acknowledged that the proposed mine design avoids locating mine infrastructure or longwalls within its LGA. The submission was submitted through the Department's online portal as 'comments'.

Wingecarribee Shire Council made several comments regarding rail transport of coal product, including for covered rail wagons to be considered.

Given the above, the Department considers that this is not a formal objection to the Project.

A detailed summary of the issues raised by these two Councils is provided in **Appendix C2.**

5.5 Key Issues – Community and Special Interest Groups

The majority of submitters (85%) supported the Project, considering that it would:

- provide continuing employment for existing staff both at Tahmoor Coal Mine and the steelworks;
- create additional employment opportunities;
- generate flow-on employment opportunities in the local area;
- provide a benefit to NSW through the generation of royalties, tax and export revenues; and
- be managed to minimise social and environmental impacts to the community.

Objecting submissions (13%) raised several issues related to:

- anthropogenic climate change and greenhouse gas emissions;
- property damage and the impacts of subsidence;
- groundwater impacts, particularly in relation to Thirlmere Lakes;
- potential damage to a UNESCO world heritage site (ie the Thirlmere Lakes National Park, which is part of the Greater Blue Mountains World Heritage Area); and
- biodiversity impacts.

A summary of the issues raised by the community and special interest groups is provided in **Appendix C3** and **C4**.

5.6 Independent Expert Scientific Committee Advice

In January 2018, the Department and the Commonwealth Department of the Environment and Energy (DoEE) jointly requested the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Mining Development (IESC) to provide advice on the Project. The IESC has since provided its advice to the Department and DoEE (see **Appendix D**).

The IESC noted that the numerical groundwater model's strengths included assessment of cumulative impacts and good use of available data, however the IESC considered that the groundwater model understates the likely height of fracturing above the longwall panels.

The IESC identified several areas where it considered additional work is required to address potential impacts, including:

- review, comparison and consideration of observations described in the EIS's Geotechnical Assessment with the predicted height of fracturing presented in its Groundwater Impact Assessment;
- further analysis and modelling of existing baseline data to better inform estimates of the upper and lower bounds of potential impacts on surface water losses to near-surface fracture zones;
- consideration of alterations to longwall placement and/or orientation to reduce impacts of connective cracking above longwalls and to reduce surface cracking and near-surface fracturing on creeks and groundwater dependent ecosystems; and
- development of a Receiving Environment Management Plan to monitor and manage discharges to the environment.

The IESC also raised some concern with the use of the "Tammetta model" and considered that the groundwater model may understate the likely height of fracturing above the longwalls. This finding was primarily based on identified discrepancies between the assumed height of the fracture zone above the longwall panels (ie the "Tammetta model") and available observations. The IESC recommended that the groundwater model reflect previous observations at Tahmoor Coal Mine.

The issues raised by the IESC are discussed further in **Section 6.2**, including advice from the Department's independent groundwater expert.

6. Preliminary Issues Review

The Department has undertaken a preliminary review of the development application, EIS and submissions received on the Project. It has also engaged Hugh Middlemis of Hydrogeologic as an independent groundwater expert to review the key groundwater aspects of the Project.

Based on its preliminary review, the Department has identified several key issues that will require further consideration during the detailed assessment of the Project. These issues are outlined below.

Following the initial public hearing by the Commission, the Department will undertake a comprehensive assessment of the merits of the Project in accordance with the requirements of the EP&A Act, relevant NSW Government policy and guidelines and the matters raised in meetings, hearings and submissions as identified above.

The Department will also undertake an assessment of the Project's impacts on Matters of National Environmental Significance (MNES) on behalf of the Commonwealth, in accordance with the Assessment Bilateral Agreement between the Commonwealth and NSW Governments.

6.1 Subsidence and Geomorphology

'Subsidence effects' refer to deformation of the groundmass due to mining, including all mining-induced ground movements. 'Conventional subsidence' includes vertical displacement, tilt, and tensile and compressive strains. Additional 'non-conventional subsidence' components include those arising in steep or incised topography (ie valley closure and upsidence) and far-field horizontal movements.

Tahmoor Coal predicts that extraction of proposed Longwalls 101 to 109 would result in conventional subsidence of up to 1,900 mm, tilts of up to 12 mm/m, tensile strains up to 3.0 mm/m and compressive strains up to 5.0 mm/m. These predictions are based on longwall void dimensions of up to 305 m width and 2.85 m extraction height. The subsidence predictions are higher than those predicted and observed at Tahmoor North, primarily

due to differences in proposed mining geometry. Maximum observed subsidence at Tahmoor North (Longwall 25) was 1,361 mm. However, other mines in the Southern Coalfield have similar geometry and the magnitude of subsidence of these mines is similar to the predictions for the Project.

6.1.1 Built Features

The Project differs from most others in the Southern Coalfield in that it would directly undermine a significant urban community, being the town of Bargo and other built features.

Undermining Bargo is a critical issue which requires careful consideration. 751 houses are located directly above the proposed longwalls and approximately 750 additional houses are located within the subsidence affectation zone. The Department notes that, of the 751 houses located directly above the proposed longwalls, 560 (~75%) are located above proposed Longwalls 107 and 108.

The Department notes that, while this is a critical issue, it is not dissimilar to the existing operations at Tahmoor North which have or will undermine a total of 1,259 houses, with 1,891 being in the overall subsidence affectation zone. The nearby Bulli Seams Operations project also has or will directly undermine 928 houses, with a total of 1,294 in the subsidence affectation zone. Other underground mines in NSW also regularly undermine smaller numbers of houses and other built features.

Tahmoor Coal has assessed the potential impacts to houses and assigned repair categories consistent with those applied by SA NSW, ranging from 'No claim/R0' to 'R5 - Re-build'. The intensity of works required to repair a house increases with each of these categories (see **Tables 5** and **6**).

Table 5 | Assessment and repair categories for residences potentially affected by the Project

Group	Repair Category			
	No Claim or R0	R1 or R2	R3 or R4	R5
All houses (1,458)	1,019 (70%)	296 (20%)	115 (8%)	28 (2%)
Directly above proposed longwalls (751)	391 (52%)	234 (31%)	100 (13%)	26 (3%)
Directly above solid coal (707)	628 (89%)	62 (9%)	15 (2%)	2 (<0.5%)

Table 6 | Repair category classifications

Repair Category	Extent of Repairs
Nil/No claim	No repairs required
R0 - Adjustment	One or more of the following, where the damage does not require the removal or replacement of any external or internal claddings or linings: • door or window jams or swings; or • movement of cornices; or • movement at external or internal expansion joints.
R1 - Very minor repair	One or more of the following, where the damage can be repaired by filling, patching or painting without the removal or replacement of any external or internal brickwork, claddings or linings: • cracks in brick mortar only, or isolated cracked, broken, or loose bricks in the external façade; or • cracks or movement <5 mm in width in any external or internal wall claddings, lining or finish; or • isolated, cracked, loose, or drummy floor or wall tiles; or • minor repairs to any services or gutters.

Repair Category	Extent of Repairs
R2 - Minor repair	One or more of the following, where the damage affects a small proportion of external or internal claddings or linings, but does not affect the integrity of external brickwork or structural elements: • continuous cracking in bricks <5 mm in width in one or more locations in the total external façade; or • slippage along the damp proof course of 2 to 5 mm anywhere in the total external façade; or • cracks or movement >5 mm in width in any external or internal wall claddings, linings, finish; or • several cracked, loose or drummy floor or wall tiles; or • replacement of any services.
R3 - Substantial repair	One or more of the following, where the damage requires the removal or replacement of a large proportion of external brickwork, or affects the stability of isolated structural elements: • continuous cracking in bricks of 5 to 15 mm in width on one or more locations in the total external façade; or • slippage along the damp proof course of 5 to 15 mm anywhere in the total external façade; or • loss of bearing in isolated walls, piers, columns or other load-bearing elements; or • loss of stability of isolated structural elements.
R4 - Extensive repair	One or more of the following, where the damage requires the removal or replacement of a large proportion of external brickwork, or the replacement or repair of several structural elements: • continuous cracking in bricks >15 mm in width in one or more locations in the total external façade; or • slippage along the damp proof course of 15 mm or greater anywhere in the total external façade; or • re-levelling of building; or • loss of stability of several structural elements.
R5 - Re-build	Extensive damage to house where Tahmoor Coal and the owner have agreed to rebuild as the cost of repair is greater than the cost of replacement.

Tables 5 and **6** indicate that, of the 1,458 homes in and around the township of Bargo. 1,315 (90%) are expected to be either not impacted by mine subsidence or else to require no more than minor repairs. A further 115 (8%) are expected to suffer substantial or extensive damage but to be repairable. The final 28 (2%) are expected to need to be rebuilt. Nonetheless, only one objection has been received from the township of Bargo.

The Department also notes that the anticipated subsidence impacts would occur over several years. This is because a minimum of four longwall panels must typically be extracted before subsidence is considered stable and complete. Once the preceding longwall panel, the undermining panel and two subsequent panels have been extracted, then a parcel of land affected by undermining would generally be considered stable for repair and/or development. Any movements after this time would be very small.

The subsidence process could therefore result in stress and anxiety to homeowners as to whether their house would be impacted, then experiencing that damage, then having to go through the claims process and the delays in having damage finally rectified (see **Section 6.5**). These delays are due to having to wait until subsidence has settled before undertaking final repair works (ie 3-4 years).

Under the *Coal Mine Subsidence Compensation Act 2017,* Tahmoor Coal would be liable to rectify any damage caused to houses as a result of subsidence. SA NSW has advised that Tahmoor North is estimated to have caused impacts to approximately 40% of houses in its subsidence zone, with an average repair cost of $75,000 per house.

The expected cost of repair of subsidence impacts for structures has been factored in by Tahmoor Coal as an operating cost for the Project and estimated at $25.7 million (undiscounted), with a further $1.5 million (undiscounted) allocated for rail repairs (see **Section 6.6**). It is unknown at this time what the average cost of repair is for this calculation.

It is also noted that six longwalls would be extracted prior to Longwalls 107 and 108 (the longwalls over which the majority of houses occur) which would allow time to compare and analyse predicted versus observed measurements and implement any appropriate changes to longwall width, length or extraction height through the Extraction Plan process. If the Project were approved, Longwall 107 would be mined in approximately 2033. In other words, there is sufficient time in which to apply adaptive management measures to minimise the potential subsidence impacts as the mine progresses.

The Project also has implications for future development in the area. The Subsidence Assessment included a simulation exercise to consider Wollondilly Shire Council's plans for future expansion of Bargo township (in the order of an additional 2000 dwellings prior to 2036).

This has the potential to increase the costs to Tahmoor Coal and extend the impacts of mine subsidence to a greater number of house and property owners. These costs should be weighed against the costs to the State in terms of loss of royalties, taxes and stamp duty of sales and sterilisation of resources, and loss of fees for development applications and potential rating revenue for local councils.

There are also several built features associated with the Bargo township and located in the Project area which would be directly undermined and potentially affected by subsidence. These features include businesses; public amenities; local roads; bridges; water, wastewater, gas, electrical and telecommunications infrastructure; heritage and archaeological sites; dams and reservoirs; the M31 Hume Motorway and its bridges and culverts; the Main Southern Railway and its bridges, signalling and electrical equipment; the Moomba – Sydney gas pipeline; farmland and agricultural infrastructure (including fences, farm dams and irrigation systems); Bargo Waste Management Centre; and existing mine infrastructure. Wollondilly Shire Council raised concerns about the impacts on local infrastructure and services, particularly its Bargo Waste Management Centre.

It is not unusual for underground mines to undermine such features as those listed above, including in the Southern Coalfield. Undermining of such features is managed through the Extraction Plan process which is required for all contemporary underground mines across the State, as discussed further below.

The extent of the proposed longwalls covers a surface area of approximately 1,321 ha. The Department notes that the township of Bargo has an overall area of approximately 217 ha. The extent of the longwalls underlying the Bargo township is approximately 128 ha. This can be interpreted two ways:

- the township of Bargo covers approximately 9.7% of the extent of the proposed longwalls; and
- the extent of the Bargo township covering the proposed longwalls is approximately 58.9% of the total Bargo township area.

It is also important to note that most of the Bargo township is also within the broader subsidence affectation zone.

As discussed below in **Section 6.1.2**, Tahmoor Coal made several revisions to the original mine plan, including not proposing to mine the Eastern Domain, shortening of longwalls to avoid undermining the Metropolitan Special Area, and avoiding sensitive natural features.

The Department also understands that Tahmoor Coal is currently revising its mine plan. It is likely that any revisions would reduce potential subsidence impacts on the township of Bargo.

6.1.2 Natural Features

The 2008 Southern Coalfield Inquiry concluded that valley closure and upsidence effects from underground mining create most impacts on significant natural features, such as cracking of stream beds, rock falls from cliff lines and alteration of groundwater chemistry in shallow aquifers.

In recognition of the key risk management zones associated with the Project area, Tahmoor Coal made several revisions to Glencore's original mine plan, including not proposing to mine the Eastern Domain (see **Section 2**), shortening of longwalls to avoid undermining the Metropolitan Special Area, and avoiding sensitive natural features such as strongly incised creeks and rivers, particular items of Aboriginal heritage and significant landscape features.

Nevertheless, the proposed longwalls would undermine or cause some degree of subsidence impact on a variety of natural features, including watercourses; aquifers; catchment areas or declared Special Areas; cliffs and steep slopes; flood prone land; State Conservation Areas (SCAs); native vegetation; and threatened or protected species.

The Department has considered potential issues related to subsidence impacts and effects on natural features as follows:

- groundwater, including potential impacts on Thirlmere Lakes and the Metropolitan Special Area in **Section 6.2.1**;
- surface water, including potential impacts on watercourses in the Project area and potential impacts on watercourses in the Special Area in **Section 6.2.2**;
- biodiversity, including potential impacts to threatened species and communities, aquatic ecology and stygofauna in **Section 6.4**; and
- Aboriginal and historic heritage items in **Section 6.7**.

The Department also notes that the Project has the potential to impact cliffs and steep slopes and has provided initial consideration of this issue below.

Cliffs

In accordance with previous inquiries and reviews by the then Planning Assessment Commission (ie Metropolitan Coal Project and Bulli Seam Operations) and the Department's previous practice, Tahmoor Coal has defined a 'cliff' as a continuous rockface having a maximum height greater than 10 metres, a minimum length of 20 metres and a minimum slope of 2 in 1.

A total of 24 cliffs are located within the Project's subsidence affectation zone. The cliffs are generally located within the valleys of the Bargo River, Dog Trap Creek and the lower reaches of Hornes Creek. The cliffs are commonly between 10 and 20 metres in height and less than 100 metres in length. There is one cliff longer than 200 metres, located along the Bargo River valley. No cliffs are higher than 40 metres.

The great majority of cliffs (23 out of 24) would not be directly undermined. These include the cliffs along the Bargo River and Hornes Creek which are located outside the extents of the proposed longwalls, at minimum distances of 1070 m and 625 m respectively. There are also several cliffs along Dog Trap Creek which would not be undermined.

The maximum predicted vertical subsidence movements for these cliffs are less than 20 mm, and they are not predicted to experience any substantial conventional tilts, curvatures or strains.

However, one cliff along Dog Trap Creek is located directly above proposed Longwall 103. This cliff is 55 m long and 10 m high. It is expected that this cliff could experience the full range of predicted subsidence movements. Based on previous experience of undermining cliffs in the Southern Coalfield, it is expected that subsidence would affect between 3% to 5% of the total length of this cliff and lead to a number of minor rockfalls over time.

The Department notes that the management of cliffs and steep slopes (see below) is regulated through performance measures and in Extraction Plans, including Landscape Management Plans and Public Safety Management Plans. Managing these risks under the Extraction Plan process has been successful for underground mines across NSW for many years, as discussed further below. The requirement to prepare an Extraction Plan would be included in any recommended conditions.

Steep slopes

As above, in accordance with previous inquiries and reviews by the then Planning Assessment Commission and the Department's previous practice, Tahmoor Coal has defined a 'steep slope' as an area of land having a gradient greater than 1 in 3. The steep slopes on the sides of valleys are predominantly found in Hawkesbury Sandstone. Most of these slopes are stabilised, to some extent, by natural vegetation.

The steep slopes in the upper reaches of the tributaries, which are proposed to be directly mined beneath, are typically less than 1 in 2. The ranges of the predicted subsidence parameters for the steep slopes are similar to those predicted for the streams, which are provided in **Section 6.2.2**.

The Department notes that there has been extensive experience of mining beneath steep slopes in the Southern Coalfield, including along the Cataract, Nepean, Bargo and Georges Rivers and streams such as Myrtle Creek and Redbank Creek. No large-scale slope failures have been observed on these slopes. However, surface cracking and minor rock falls from rock outcrops have been observed.

Tahmoor Coal predicts that potential impacts on steep slopes would generally result from the movement of soils, causing tension cracks to appear at the top of slopes and compression ridges to form at the bottom of slopes. If tension cracks are left untreated it is possible that soil erosion could occur. Therefore, some remediation may be required (see **Section 6.1.3**).

In addition to surface cracking, there remains a low probability of large-scale slope slippage. Tahmoor Coal has assessed this probability to be low due to the substantial depths of cover. The Department notes that, while the risk may be low, it is an issue that would require detailed assessment and particular attention to be paid to any structures or roads that may be located in the vicinity of steep slopes.

6.1.3 Mitigation Measures

To mitigate and/or manage subsidence impacts, Tahmoor Coal has outlined several strategies in the EIS including on-going monitoring programs; implementation of adaptive management through preparation of detailed Extraction Plans; repair of built infrastructure; and rehabilitation of subsidence affected land.

Extraction Plans

Tahmoor Coal is proposing to manage subsidence impacts under the Extraction Plan process. The Department notes that requirements for Extraction Plans are a standard condition of consent for any underground mining development in NSW.

Each Extraction Plan is prepared in consultation with relevant State agencies and is required to be approved by the Department's Secretary before commencing extraction of the specified longwall panel(s). The Extraction Plan, including performance measures and monitoring requirements, provides a framework to avoid, minimise and mitigate subsidence impacts and maintains a robust adaptive management framework.

The preparation of an Extraction Plan for each group of longwall panels allows the assessment of impacts on all built and natural features to be focussed at the local level, ensuring that impacts are appropriately monitored, and impact management regimes are further refined during the life of the project in response to the results of subsidence monitoring and recorded impacts.

Remediation and rehabilitation

Tahmoor Coal's proposed rehabilitation of land-based subsidence impacts relates primarily to the rehabilitation of two broad categories of subsidence impacts:

- surface cracking of land; and
- impacts to watercourses and drainage lines.

Tahmoor Coal has proposed to rehabilitate surface cracks as soon as practical, post-subsidence, using standard techniques including ripping, filling and seeding. Rehabilitation of watercourses would be covered under individual Extraction Plans and would include specific performance measures and completion criteria to determine success. These would be developed in consultation with relevant agencies.

In regard to built features, the Project is located within the Bargo Mine Subsidence District. The *Coal Mine Subsidence Compensation Act 2017* provides for the assessment and management of risks associated with subsidence resulting from coal mining operations on buildings and infrastructure and includes provision for compensation or repairs required to mitigate the damage caused by mine subsidence. SA NSW is the NSW Government agency responsible for administering this Act.

The owners of buildings or other surface improvements damaged by mine subsidence can lodge claims for compensation through SA NSW. SA NSW supports property owners throughout the assessment process and facilitates compensation or repair by mine operators where damage results from active mining operations.

6.1.4 Conclusions

The Department, SA NSW, OEH and Wollondilly Shire Council have concerns over the Project's potential subsidence impacts to natural and built features, and in particular the modelled scale of impacts to residences within Bargo. Similar concerns were also raised by community submitters objecting to the Project.

Agency and community submissions have specifically raised concerns over potential subsidence impacts on Bargo Waste Management Centre, water resources, cliffs, biodiversity, Aboriginal heritage and other heritage items. The Department will thoroughly assess all subsidence impacts associated with the Project as part of its detailed assessment. All concerns raised by Government agencies, Councils, the community and special interest groups will be considered. To assist in its assessment, the Department has requested that Tahmoor Coal address the concerns raised by the Department, Government agencies and submitters.

The Department understands that Tahmoor Coal is currently revising its mine plan based on submissions and advice from agencies. Any revisions would likely reduce potential subsidence impacts for particular built features, including the township of Bargo.

6.2 Water Resources

As with any longwall mining application, the Project has the potential to affect water resources, including aquifer interference, baseflow changes, groundwater drawdown and use, groundwater quality, surface water management and flooding behaviour.

Natural surface features related to the groundwater assessment of the Project include:

- Thirlmere Lakes, which are considered Groundwater Dependent Ecosystems (GDEs);

- catchment areas or declared Special Areas, including five major water storage reservoirs operated by WaterNSW; and
- waterways and other high value water features.

6.2.1 Groundwater

A Groundwater Assessment for the Project was prepared by HydroSimulations and peer reviewed for Tahmoor Coal by Prathapar & Associates. The peer review considered the Groundwater Assessment to be robust, technically appropriate and consistent with relevant guidelines and policies.

The Department's independent groundwater expert, Hugh Middlemis, also reviewed the Groundwater Assessment (see **Appendix E**).

Groundwater model

Mr Middlemis found that the hydrogeological and groundwater modelling in the Groundwater Assessment is fit for purpose. Mr Middlemis considered that the groundwater model's "software, design, extent, layers, grid, boundaries and parameters are consistent with best practice design and execution". HydroSimulations, the peer reviewer and Mr Middlemis are all in general agreement that the model is well calibrated to historical inflow, which provides confidence in its inflow predictions. The peer reviewer noted that "… calibration is appropriate and predicted fluxes are plausible". Mr Middlemis agreed, in that the groundwater model calibration is acceptable statistically and sound, with the methodology applied well-executed and conservative assumptions applied where appropriate.

However, DoI Water raised several concerns over the groundwater model and recommended that the model be re-run to confirm the magnitude of potential impacts. DoI Water was particularly concerned over the large error ranges presented in the model and therefore considered that the model may not be able to make reliable predictions. DoI Water raised several other concerns, including requirements for steady-state modelling, sensitivity and uncertainty analysis (see Thirlmere Lakes section below), bore abstraction, model calibration and justification of errors. DoI Water and Mr Middlemis both agreed that the groundwater modelling could be improved by incorporating shallow surface cracking (see below) and transient watercourses into the model, and Tahmoor Coal has agreed to do this.

Mr Middlemis found that the modelling assessments provide good detail on water balance issues and drawdown impacts on private users and GDEs. Mr Middlemis considers that the model is adequate for licensing purposes. Furthermore, Mr Middlemis is of the view that the impact assessments and interpretations are supported by available data and evidence. As with all groundwater models, ongoing monitoring and other investigations would provide additional data for future model refinements and improvements, and Mr Middlemis considers that the ongoing monitoring program for the Project is well-designed to provide such data in the future.

The Department and Mr Middlemis met with DoI Water, Tahmoor Coal and HydroSimulations on 2 April 2019 to discuss and clarify these concerns. HydroSimulations was able to demonstrate that errors are small in the shallow strata units, which supply the environmental features and most of the groundwater users, with the larger error ranges confined to the coal seams and the deeper Narrabeen Group strata.

The IESC, OEH and Wollondilly Shire Council all raised concerns that the groundwater model did not adequately simulate surface cracking. The Department considers this to be a key flaw in the model's ability to predict surface impacts. This was discussed at the meeting on 2 April 2019, and Tahmoor Coal confirmed that the groundwater model will be re-run to simulate this process.

Mr Middlemis will be asked to review and provide advice to the Department on any revised model.

Height of fracturing

HydroSimulations' modelling of the height of connective fracturing was based on its experience of monitoring and groundwater modelling at Tahmoor Coal Mine and at other underground coal mines in the Southern Coalfield in NSW. **Figure 5** shows a conceptual model of the predicted height of fracturing for the Project. This was combined with the most recent available research for subsidence impacts on aquifers, including a recent height-of-fracturing monitoring drillhole and associated report commissioned by Tahmoor Coal into fracturing above one of its longwalls, as well as predicted changes to permeability in the goaf and overburden via geotechnical modelling.

The height-of-fracturing monitoring drillhole is particularly important because it shows *in situ* behaviour of groundwater levels in response to mining at Tahmoor Coal Mine at a location only a few hundred metres from the proposed longwalls. The investigation demonstrated that a clear downward gradient existed in the lower Hawkesbury Sandstone, but there was neither the connectivity nor a gradient strong enough to alter groundwater levels to any observable degree within the upper Hawkesbury Sandstone, ie that the height of connected fracturing extended from the mined horizon to the lower Hawkesbury Sandstone but not above this level.

However, the IESC raised concerns that the height of connected fracturing may be underestimated in the Groundwater Assessment and recommended that the height of fracturing be estimated by panel width (ie not by the "Tammetta model", as currently utilised in the EIS). OEH also raised concern that there could be potential for seam to surface fracturing about the proposed longwalls.

The IESC's position was primarily based on identified discrepancies between the assumed height of the fracture zone above the longwall panels (based on the "Tammetta model") and available observations. However, Mr Middlemis considers that the groundwater model appropriately considered spatial and temporal variability of parameters to represent the height of fracturing above the proposed longwalls. Mr Middlemis also concluded that the methods and data applied are consistent with the EIS's geotechnical report.

Whilst both the IESC and Mr Middlemis agree that panel width is a key factor in determining the height of fracturing and enhanced groundwater connectivity, the IESC made no mention of the influence of the other key factors, ie seam extraction height and thickness of overburden strata. Consideration of these factors in the groundwater model is consistent with recent advice from the Independent Expert Panel for Mining in the Catchment.

There was agreement between the IESC and Mr Middlemis that the groundwater model did not address shallow surface cracking. However, Mr Middlemis considered that this cannot be extended to suggest that the height of fracturing is 'underestimated'. Rather, Mr Middlemis is of the view that there is strong evidence presented in both the EIS's geotechnical report and the Groundwater Assessment that there is a clear separation between the potential shallow surface cracking horizon and the fractured zone above the longwalls.

Furthermore, Mr Middlemis considered that the Groundwater Assessment is based on conservative assumptions that would tend to over-estimate, rather than underestimate, mine dewatering effects, including the adoption of "Tammetta model".

The Department notes that the use of the "Tammetta model" is consistent with the recommendations of the Independent Expert Panel for Mining in the Catchment (see **Section 3.4**) which recommends deferring to the Tammetta equation until such time as further investigations are complete, or a better alternative is provided. The Department will consider this issue in more detail in consultation with relevant agencies and Mr Middlemis.

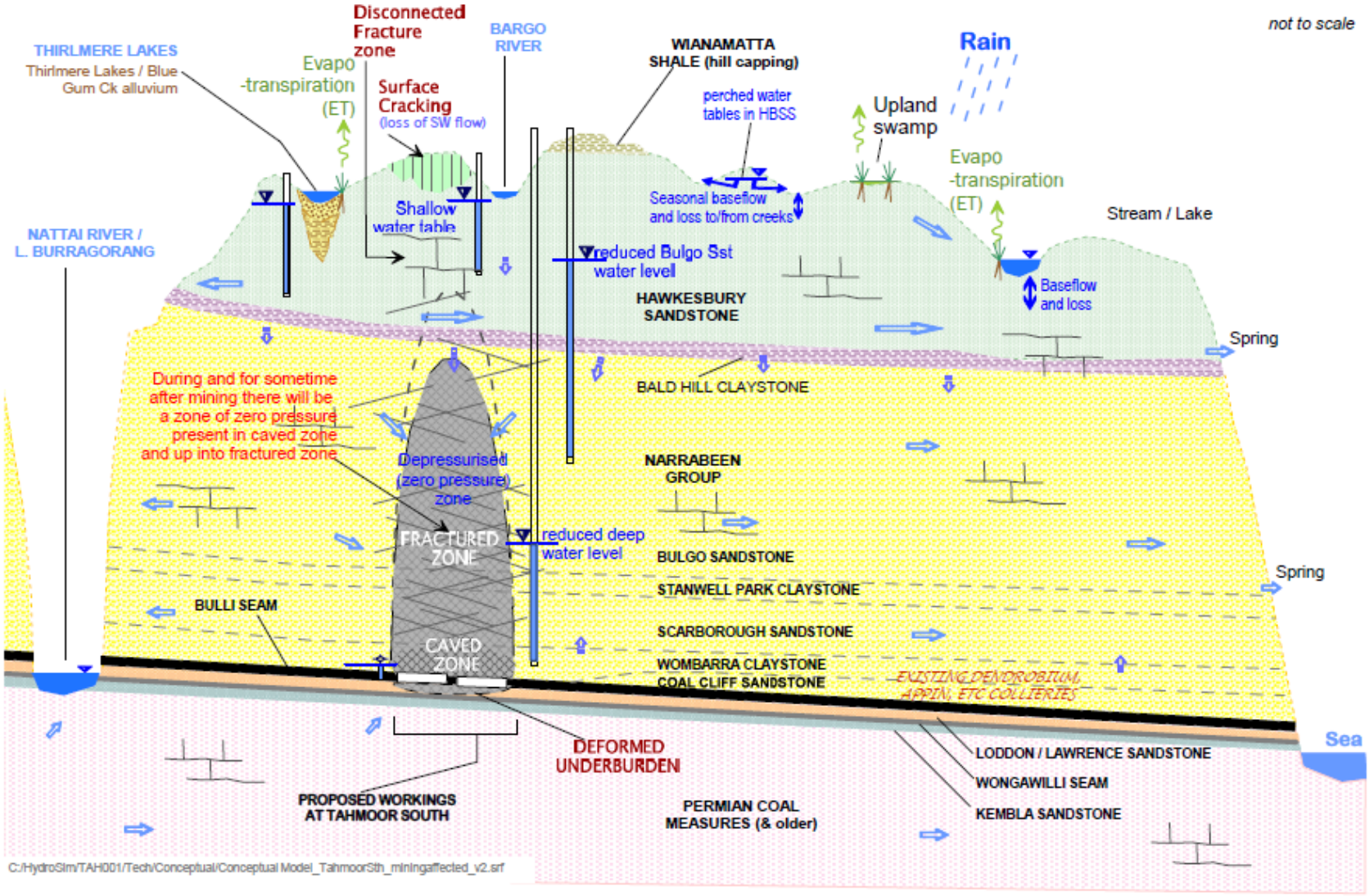

Figure 5 | Post-mining hydrogeological conceptual model - height of fracturing

Baseflow

Baseflow capture is the process of inducing leakage from a creek or river into the aquifer via initiating a downward groundwater gradient or weakening an upward groundwater gradient. The groundwater modelling predicts that baseflow impacts from the Project (and cumulatively) would likely be greatest at:

- Dog Trap Creek, with peak reductions up to 5.3 – 5.7% of mean daily flow;
- Tea Tree Hollow, with peak reductions up to 3.7 – 4.5% of mean daily flow; and
- Bargo River, with peak reductions up to approximately 2% of mean daily flow.

The Department notes that these impacts would occur at different times and in some cases after the operational life of the Project. It is also important to note that the lower reaches of Tea Tree Hollow and Dog Trap Creek have previously been affected by mining-induced subsidence associated with Tahmoor Coal Mine. Overall, the percentage of mean flow reduction (as a result of baseflow changes) for all waterways would be less than 3.8% for Project-only and less than 4.9% cumulatively.

Further information on the characteristics of each creek and the Bargo River is provided in **Section 6.2.2**.

Mine Inflows

Mine inflows at the existing operations range from 1 – 4.5 ML/day with water coming from the deeper aquifers in the Narrabeen Group and Permian strata. Over the past five years, this rate has been steady at 3 – 4 ML/day. The inflow rates for the Project are predicted to average approximately 4.7 ML/day which is similar to existing operations. Peak daily groundwater inflows of approximately 7.5 - 8 ML would occur in 2029-2030 and 2032.

In terms of annual inflows, this equates to an average of 1,700 ML/year over the period of mining under the Project, with peaks annual flows of 2,850 ML in 2029 and 2,600 ML in 2032.

By comparison the Tahmoor Coal Mine generally experiences more inflow than some other mines in the Southern Coalfield, although this might be in part due to a large mined area compared to other mines (see Table 3-14 of Appendix I of the EIS). Of note though, is that the variation in inflow rates between the mines is not huge and importantly, Tahmoor Coal Mine inflows do not appear responsive to rainfall events (ie no to limited connective fracturing).

Tahmoor Coal has historically successfully managed mine inflows at similar levels to those predicted and proposes to continue to do so. The Department will assess the proposed management of mine inflows as part of its detailed assessment of the Project.

Groundwater users

Privately-owned groundwater bores are the primary built surface features considered in the Groundwater Assessment.

The Project area is covered by the *Greater Metropolitan Groundwater Sources Water Sharing Plan 2011,* which manages several groundwater sources or 'Groundwater Management Areas'. The Groundwater Management Area relevant to the Project is 'Sydney Basin – Nepean Sandstone' which is further divided into Management Zones. The Project lies within Zone 2 of the Sydney Basin – Nepean Sandstone Groundwater Management Area. This groundwater resource is defined as 'highly productive' under the AIP.

The Department notes that this categorisation does not distinguish between the higher-yielding Hawkesbury Sandstone groundwater system, the low-yielding Narrabeen Group and the Permian strata groundwater systems.

In terms of the Department's assessment, specific consideration will be given to users likely to be affected by impacts to the higher-yielding Hawkesbury Sandstone groundwater system, as this is the key resource in the area.

A database search identified 982 registered groundwater bores within the groundwater model area (ie some 3,237 km^2), of which 791 hold WALs. The Department notes that the groundwater model area is significantly larger than the Project area. Approximately 89% of these extract from the Hawkesbury Sandstone aquifers. The maximum water table drawdown associated with the Project would be approximately 1 m, but there are areas of >2 m (and up to 5-10 m) of drawdown predicted to occur above and close to the proposed longwalls. The Project does not meet the AIP's minimal impact considerations, as significant impacts (ie >2 m drawdown) are predicted on up to 94 privately-owned groundwater bores (see **Table 7**).

Table 7 | Number of registered bores with predicted impacts above AIP minimal threshold

Degree of impact (m)	Number of bores exceeding threshold	
	Project only	Cumulative
Degree of impact (m) (% of total bores)	30 (~3.8%)	94 (~12%)

Of the 30 bores predicted to experience >2 m maximum drawdown, 14 are predicted to experience >5 m drawdown and 4 to experience >10 m drawdown. Tahmoor Coal has historically utilised 'make good' provisions on three occasions where bores have been impacted by mining and has committed to continue this process for the Project. Mr Middlemis is of the view that the information provided is suitable for impact assessment and management plan development, including any 'make good' provisions and licensing required.

Prior to mining, Tahmoor Coal would undertake a bore water census to determine the pre-mining condition of the private groundwater bores. The process involves a pre-mining bore census and generally monitoring on a six-monthly basis for a period after the end of the longwall. If any subsidence impacts are found or the property owner raises any issues, Tahmoor Coal investigate and come up with a remediation plan in consultation with SA NSW. The make good procedures for impacted bores are detailed within the existing Groundwater Management Plan.

The Department considers the predicted impacts to privately-owned groundwater bores to be a significant, but manageable, consideration for the Project and will be assessing this in detail as part of its assessment of the Project. The Department is particularly interested in how much additional drawdown can be attributed to the Project for the bores that are already predicted to experience drawdown from existing operations. The Department is also interested in which bores would be most impacted and what these bores are currently utilised for. Based on advice from agencies and the IESC, the Department will also closely examine Tahmoor Coal's proposed 'make good' provisions.

Groundwater quality

It is generally accepted that historical natural leakages of saline hard rock groundwater from the Permian strata to the more productive aquifers or alluvium would have been limited, due to the low vertical conductivity of the strata. Nonetheless, over long periods of time, salinity can increase within aquifers and at the edges of alluvial sediments. During and immediately after mining, this salinity increase is reduced as a result of mine-related groundwater drawdown. However, over the long term, ingress of water from the surface and from up-gradient Permain strata eventually fills the groundwater 'void' caused by mining. Increased fracturing may then allow larger quantities of this saline groundwater to eventually rise, displacing the better quality groundwater.

To evaluate such a complex issue (ie the likelihood of and time over which such changes might occur), the Department predominantly relies on groundwater modelling. The groundwater model in the EIS indicates that the Project is unlikely to alter the beneficial uses of groundwater as a result of these processes.

The potential for the REA and other surface site facilities to impact groundwater quality (and surface water quality) was raised as a concern by EPA. The Department notes that the REA has been operated for most of the life of the approval with previous water quality monitoring suggesting no adverse effect on local groundwater quality from the coal rejects within the REA. Nevertheless, the Department will consider the proposed expansion of the REA and its potential impacts on groundwater quality in its detailed assessment of the Project, in consultation with the EPA.

Groundwater licensing

Tahmoor Coal holds an existing groundwater entitlement for 1,642 ML/year. Based on a maximum predicted inflow of 2,850 ML in 2029 (see above), Tahmoor Coal has a shortfall of approximately 1,208 ML/year and will require additional groundwater entitlements for the Project.

DoI Water raised some concerns over the groundwater model and its ability to accurately predict impacts (see above), including whether Tahmoor Coal would require additional licence allocations once the groundwater model is re-run (as it recommended).

The Department notes that this issue will need to be considered further in its detailed assessment once the results of the revised groundwater model are available.

Thirlmere Lakes and other groundwater dependent ecosystems

The Thirlmere Lakes are listed as a High Priority GDE in the *Greater Metropolitan Groundwater Sources Water Sharing Plan*, specifically for the Sydney Basin – Nepean Groundwater Source. The Thirlmere Lakes are located 3.5 km from the closest proposed longwall (see **Section 3.5**). It could be expected that the Project would not cause significant subsidence impacts on Thirlmere Lakes as they are not proposed to be undermined and they are located well outside of the Project area and even further outside of the area anticipated to experience subsidence.

However, the Department notes that surface water-groundwater interactions within the Lakes and their associated alluvial systems are an important component of the lake water balance, as perched groundwater within the alluvium recharges the deeper bedrock water table. The water balance model for the lakes determined that the most significant outflow component is evaporation/evapotranspiration (approximately two-thirds of outflows). However, groundwater recharge comprises approximately one quarter of outflows, and there is potential for the Project to affect groundwater recharge at least to some extent. Modelled drawdowns are shown in **Table 8**.

Table 8 | Predicted groundwater drawdown at Thirlmere Lakes

Lake	Predicted maximum drawdown (m)	
	Project only	Cumulative
Gandangarra	0.02	0.05
Werri Berri	0.01	0.03
Couridjah	0.03	0.05
Baraba	0.02	0.05
Nerrigorang	0.02	0.05

The modelled levels of change are very small compared to natural variability. They are very close to the limits of the model's sensitivity and are predicted to naturally recover, albeit over a significant length of time (150 years post-mining).

That being said, both the IESC and Mr Middlemis have raised concerns about the modelling used to determine impacts to Thirlmere Lakes. Mr Middlemis identified several flaws in the methodology and results of the GoldSim water balance modelling and considers that the reporting is inadequate to resolve these issues without provision of further information by Tahmoor Coal's consultants.

These issues primarily relate to the "reported levels of the lake beds and overflow points, and their sometimes-inconsistent representation in the groundwater model and, more importantly, in the GoldSim water balance model". Other key issues include using data that allows for lake leakage when lake levels fall below the bed of the lake and treating Lake Nerrigorang as a losing lake when in reality groundwater levels are sometimes higher than the lake level, causing gaining conditions. Mr Middlemis is of the view that these issues can be readily addressed via re-runs of the model and also notes that the rates and volumes of exchange fluxes between the lakes and groundwater are relatively small and therefore would not be expected to increase the relatively low risk of groundwater impacts on Thirlmere Lakes.

Both DoI Water and the IESC raised concerns with the level of sensitivity and uncertainty analysis. However, Mr Middlemis considers that a comprehensive/stochastic uncertainty analysis is not strictly warranted at this stage in terms of the IESC guidance material on uncertainty analysis (Middlemis and Peeters 2018). The key reasons for this view include the Project being a brownfields site (ie mature model conceptualisation and availability of a good data set), the multi-criteria calibration performance of the model and its linear uncertainty analysis.

As mentioned previously, the Lakes remain a key consideration for the assessment of this Project, given the possible historical link to mining (see the cumulative predictions in **Table 8**), their protected status and the community sentiment they hold. The Department will closely examine potential impacts to the lakes as part of its detailed assessment of the Project, and Mr Middlemis and DoI Water will be asked to review and provide advice to the Department on any revised model and its outcomes.

Finally, it is noted that no upland swamp communities or Cumberland Plain Woodland have been identified in the Project area.

Metropolitan Special Area

The groundwater model also considered the proximity of five WaterNSW water storage reservoirs, the closest being Lake Nepean located approximately 3 km from the closest longwall. The predicted leakage rates associated with the Project for the closest reservoirs are approximately 0.007 ML/day for Lake Nepean and 0.006 ML/day for Lake Avon. To put this in context, Lake Nepean has a total capacity of approximately 70 ML, and Lake Avon has a total capacity of approximately 214,360 ML. The predictions also reflect the fact that no groundwater model can ever contain null values for transmissivity between layers and therefore a predicted impact always results in the modelling outputs.

The Project is predicted to result in <0.05 ML/day (<18 ML/year) decline in baseflow in the Metropolitan Special Area, with the peak occurring in 2100. It is noted that a large proportion of stored waters released from the Metropolitan Special Area flows out through Maldon Weir, which has an average daily flow of 180 ML/day. The Project is therefore predicted to result in a depletion of 0.1% of mean daily flow. Cumulatively, baseflow is predicted to decline by a maximum of 0.16 ML/day (60 ML/year).

Impacts to baseflow in the Warragamba Special Area are predicted to be <0.005 ML/day (<2 ML/year) and <0.001% of the mean flow for the area. The Project would result in a predicted flow depletion of <0.001% of mean daily flow. Cumulatively, baseflow is predicted to decline by a maximum of 0.005 ML/day (2 ML/year).

Geological considerations

The Department will be considering key geological features such as faults and lineaments within the Project area. The Department notes that most geological faults in the area are thought to act as barriers to flow (ie hydraulic barriers that, while being not impermeable, are less permeable than the surrounding rock mass). However, water inflows at Tahmoor North were observed to be higher than normal at a point where the mine workings intersected the Nepean Fault zone. Mr Middlemis notes that the Groundwater Assessment has invoked a bias towards conservative assumptions by treating the Nepean Fault as transmissive in the base case and by including an uncertainty scenario that also assumes a transmissive T2 fault.

The Department will consider this finding and its potential impacts on water resources in further detail during its assessment of the Project.

6.2.2 Surface Water and Flooding

A Surface Water Assessment for the Project was undertaken by Hydro Engineering & Consulting Pty Ltd.

The IESC was requested to provide advice on the Project's potential water impacts. The IESC reported that it did not have confidence in the EIS's predictions of impacts on surface water resources because of:

- inconsistencies between modelled and observed subsidence and mining-induced ground movements near watercourses and the Nepean fault;
- limitations in the ability of the groundwater model to adequately consider the effects of fracturing, particularly in the near-surface zone;
- a paucity of baseline data to substantiate assumptions regarding existing mining activities; and
- a general lack of information about the influence of modelling assumptions on the likely upper and lower bounds of estimates on surface water impacts.

The Department has expanded on these concerns below.

Catchment and licensing context

The Illawarra Escarpment acts as a catchment divide with most rivers and creeks flowing westwards into the Nepean catchment. The Nepean River is perennial and flows from the south, through Lake Nepean (located east of the Project) and north through Camden to Penrith.

The Avon and Cordeaux Rivers are the largest tributaries of the Nepean River, with the confluence of these lying east of the Project. The Bargo River flows through the middle of Tahmoor Coal's leases, before joining the Nepean River.

The Project area is located within the Bargo River catchment and is covered by the *Greater Metropolitan Region Unregulated Water Sources Water Sharing Plan* (2011) and specifically the Upper Nepean River Source and its segmented management zones. The Project is covered by three management zones, namely the Pheasants Nest Weir to Nepean Dam, Stonequarry Creek and Maldon Weir management zones.

DoI Water and NRAR noted that the REA covers waterfront land and should be rehabilitated in accordance with the *Guidelines for Working on Waterfront Land*. They further recommended that Tahmoor Coal clearly demonstrate its ability to obtain the necessary authorised water entitlement to account for the maximum take of surface water. The EIS predicts daily losses of 172 ML/year (ie maximum surface flow reduction) for the Bargo River, Tea Tree Hollow and Dog Trap Creek combined. The Department notes that Tahmoor Coal will be required to consider these issues in its Response to Submissions (RTS).

Tahmoor Coal currently releases water via one licensed discharge point (LDP1) in accordance with its EPL. The REA has three sedimentation ponds which overflow at three licensed overflow points (LOPs 3, 4 and 5). All discharge points release water into Tea Tree Hollow.

Under the *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*, all development in the Sydney drinking water catchment is required to demonstrate a neutral or beneficial effect (NorBE) on water quality. The Project would not be carried out on land designated as Sydney drinking water catchment. Nevertheless, a NorBE assessment was completed for the Project and determined that there would be no identifiable potential impacts on the catchment.

Potentially impacted watercourses

Watercourses potentially impacted by the Project and associated maximum predicted subsidence parameters are summarised in **Table 9** and seen on **Figure 6**. In summary Hornes Creek is a 4th order stream with a total catchment of 19.5 km², of which approximately 3% lies within the Project area. Flows within this creek are affected by stormwater runoff from the southern part of the township of Bargo.

Tea Tree Hollow is a 3rd order stream which drains the portion of the Project area overlying the western part of the proposed mine area. It flows from its headwaters in the northern part of the township of Bargo, through the Project area and on past the existing Tahmoor Coal Mine pit top and REA to the Bargo River. It drains an area of approximately 6.8 km² and comprises two main tributaries which join upstream of the existing REA. Tea Tree Hollow has a mean daily flow of 6.3 ML/day.

Dog Trap Creek is a 3rd order stream that drains the portion of the Project area overlying the eastern part of the proposed mining area. The catchment rises along a low ridge line which runs through the centre of the Bargo Township. The creek drains a total area of 13.6 km² at its confluence with the Bargo River. The upper reaches comprise three main tributaries. Dog Trap Creek has a mean daily flow of 4.96 ML/day.

It is important to note that Bargo River has previously been undermined by Tahmoor Coal, however specific consideration has been given to avoiding undermining of Bargo River as part of the Project, along with avoidance of the Special Area and its associated creeks.

Table 9 | Watercourses within the subsidence affectation zone, stream order, proximity to longwalls and maximum predicted subsidence

Watercourse	Stream Order	Description in relation to proposed longwalls (LWs)	Maximum predicted subsidence (mm)	Maximum predicted upsidence (mm)	Maximum predicted closure (mm)
Bargo River	5th	Not directly undermined and located 975 m from LW102. A 165 m length of Bargo River is located within the subsidence affectation zone. This length of river is a 4th order perennial stream	<20	<20	<20
Hornes Creek	4th	Not directly undermined and located 360 m from LW108	50	30	50
Dog Trap Creek	3rd	Located directly above LWs 101-109, with a total length of 3.1 km to be undermined	1850*	550*	425*
Tea Tree Hollow	3rd	Located directly above LWs 101-105, with a total length of 1.9 km to be undermined	1400*	400*	275*

Tributary 1 to Dog Trap Creek	2nd	Located directly above LWs 101-107, with a total length of 2.6 km to be undermined	1850	750	725
Tributary 2 to Dog Trap Creek	2nd	Located directly above LWs 101-107, with a total length of 2.4 km to be undermined	1800	525	450
Tributary to Tea Tree Hollow	3rd	Located directly above LWs 101-106, with a total length 2.4 km to be undermined	1700	475	400

*downstream sections of Dog Trap Creek and Tea Tree Hollow have been previously undermined by Tahmoor Coal's LW 12 and LWs 1 and 2, respectively. The maximum predicted parameters provided above include extraction of these earlier longwalls.

Watercourses that lie directly over the proposed longwalls (ie Dog Trap Creek and Tea Tree Hollow) are predicted to experience a greater range of subsidence impacts, including:

- impacts to flow rate or the quantity of flow;
- changes to the hydraulic characteristics and associated impacts to physical stability; and
- impacts to water quality.

OEH raised concern that several 3rd order streams and tributaries would be either directly undermined or are in close proximity to the proposed longwalls (ie Dog Trap Creek and Tea Tree Hollow) and therefore would be impacted. OEH recommended that Tahmoor Coal consider revising its mine plan to avoid impacts on 3rd or higher order streams. Wollondilly Shire Council raised concern over potential impacts to surface water quality and reductions in surface water flows from subsidence induced cracking (see below).

The total affected length of 3rd order streams is approximately 3.5 km. This is less than that approved for Tahmoor North, which has or will undermine approximately 6.2 km of 3rd order streams. The creeks overlying the Project would generally experience greater maximum predicted subsidence but similar maximum upsidence and closure, compared to the creeks above Tahmoor North (ie Myrtle Creek and Redbank Creek). The Department notes that these latter subsidence parameters are typically the cause of impacts to creeks, consistent with the findings of the Southern Coalfield Inquiry. The exception is Dog Trap Creek Tributary 1, which is predicted to experience greater maximum upsidence and closure than Myrtle Creek and Redbank Creek.

The Project is predicted to decrease average water levels in Thirlmere Lakes by 0.01 m – 0.06 m over the life of the Project. These changes would generally be considered imperceptible; however, the Department will give further consideration to the Lakes as part of its detailed assessment of the Project. OEH, as lead of the Thirlmere Lakes Research Program, did not raise any significant concerns in this regard.

The Department understands that Tahmoor Coal is currently looking to revise its mine plan based on submissions and advice from agencies. It is possible that revisions could reduce potential subsidence impacts on watercourses, however the Department does not currently have any details on any revisions to the mine plan and therefore cannot comment further at this stage.

Impacts to flow

The Bargo River is a consistently high flow stream (23.9 ML/day). Dog Trap Creek is a stream with moderate flow (4.95 ML/year), with flow being highly variable due to high velocities in the relatively steep bed gradient and lower velocities in the upper reaches where the channel is flatter. Tea Tree Hollow has a consistently moderate flow due to the release of water from Tahmoor Coal Mine in accordance with its EPL. In the absence of this discharge, Tea Tree Hollow would be an ephemeral creek, flowing only after rainfall.

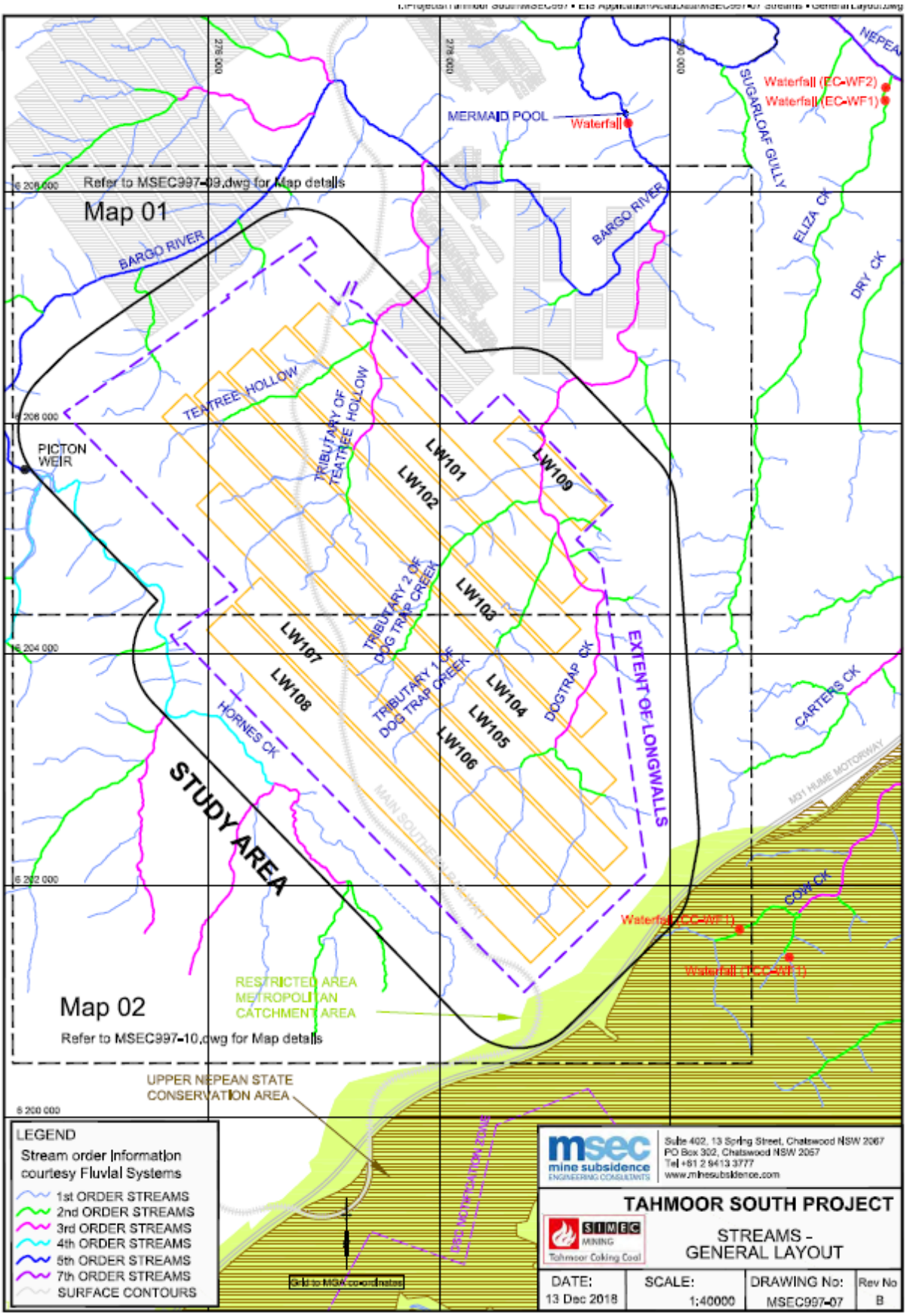

Figure 6 | Watercourses above and in proximity to the Project

Changes to flow in watercourses can result from reductions in catchment size, subsidence induced fracturing, baseflow reduction, trapping of runoff in subsidence depressions, and controlled discharges and overflows. DoI Water has sought clarification and validation of the surface water modelling approach used, particularly when predicting low base flows.

- *Catchment size*

The proposed expansion of the REA would reduce the size of the Tea Tree Hollow and Bargo River catchments and thereby reduce surface flow in these areas. Conversely, these two catchments are likely to experience increased flows downstream of the REA as a result of increases in controlled discharges via LDP1. Tahmoor Coal contends that this would offset the flow reductions resulting from the expansion of the REA.

- *Subsidence-induced fracturing*

As with most underground mines in the Southern Coalfield, localised flow reductions are predicted to occur due to subsidence-induced fracturing of watercourses. Tahmoor Coal has noted that cracking is likely to occur along stream beds and that there is potential for some diversion of surface water and drainage of pools. These risks are considered greatest at Dog Trap Creek (which contains 2 of the mapped 14 pools at moderate risk) and Tea Tree Hollow (which contains 14 of the 70+ mapped pools at moderate to high risk).

The IESC noted that streambed cracking and surface flow diversions are likely for streams directly above the proposed longwalls. It considered that Tahmoor Coal had not provided convincing evidence for self-remediation or the potential success of active remediation. The IESC recommended that consideration be given to reducing surface cracking and near-surface cracking in creek beds and associated GDEs by making alterations to the mine plan.

While agreeing that Tahmoor Coal should provide additional information, the Department notes that there are a number of case studies of successful remediation of creek beds impacted by mining within the Southern Coalfield, most notably the Georges River Remediation Project.

As discussed already, the Department understands that Tahmoor Coal is proposing to alter its mine plan to address concerns raised in submissions, including those by the IESC.

- *Baseflows*

HydroSimulations provided predictions for baseflow reductions in Bargo River, Dog Trap Creek and Tea Tree Hollow (see **Section 6.2.1**). As expected, the surface water assessment reports that baseflow reductions would be most noticeable in periods of low flow. The probability that flow would be >0.1 ML/day would:

- decrease from 99% to 97% of days in the Bargo River. The Department notes that this is considered imperceptible compared to natural variation; and
- decrease from 87% to 45% of days in Dog Trap Creek, which is clearly distinguishable from natural variation and therefore significant.

Tahmoor Coal contends that downstream impacts in Tea Tree Hollow would be offset by discharges from LDP1 and therefore negligible. However, upstream surface flow impacts are likely to be similar to those in Dog Trap Creek. Based on this, the Department considers that Dog Trap Creek and the upstream section of Tea Tree Hollow are likely to experience significant changes to flow and require further specific consideration in the Department's detailed assessment of the Project.

- *Ponding*

The Department notes that localised changes in surface ponding are predicted to be minor due to the predicted minimal stream bed changes (see below). Nevertheless, the Department notes that ponding can have impacts on built features, Aboriginal heritage and/or biodiversity, depending on location and depth. Furthermore, the IESC has raised a number of concerns about the potential impacts of the Project on GDEs and aquatic biodiversity. Therefore, the Department will further consider ponding in its detailed assessment of the Project.

Impacts to watercourse hydraulics and stability

The Department notes that changes to flow velocity and bed shear stress have the potential to cause increased localised erosion and scouring. The Project is predicted to increase peak flow velocities in some areas, with decreases in others. Modelling demonstrated no significant changes to the pattern or distribution in stream bed shear stresses. However, isolated sections of Dog Trap Creek and Tea Tree Hollow may experience localised increases in bed shear stress.

Changes to stream bed grade would typically be <1% of existing grades. The predicted maximum grade increase is 1.2%. The Department notes that this is relatively small compared to natural gradients, and that therefore increased potential for scouring is low.

The Department notes that stream stability can also be indirectly impacted by subsidence impacts to riparian vegetation, caused by fracturing and groundwater changes. However, extensive underground mining in the Southern Coalfield has not led to previous reports of any such significant impacts. Regardless, the Department will further consider watercourse hydraulics and stability in its detailed assessment of the Project.

Impacts to water quality

The Project could potentially impact surface water quality via:

- discharge or spill of contaminants;
- liberation of metal ions from subsidence induced fracturing;
- changes to chemical characteristics of surface water due to increased or decreased baseflow contributions; and
- drainage and expression of strata gas in surface water.

Modelling indicates that the total discharges from the Tahmoor Coal pit top (ie the Approved Project and the Project cumulatively) are unlikely to increase above current EPL limits. Therefore, it is unlikely that the Project would result in additional water quality impacts, when compared to existing operations.

Subsidence fracturing of bedrock and upsidence-related buckling of stream beds are predicted to occur along some sections of watercourses. Based on experience in the Southern Coalfield, this may lead to releases of metal ions, including aluminium, iron, manganese and zinc. Such events are predicted to occur in Dog Trap Creek, Tea Tree Hollow and downstream watercourses, whenever subsidence is active. However, it is likely the events would be localised and relatively transient.

The EPA raised concern that the EIS did not adequately assess the potential water quality impacts of discharges via LDP1 and that it only considered past and current Pollution Reduction Programs attached to the site's EPL. One such example includes reference made to PRP 23. EPA contends that the findings of this prior PRP do not provide

a contemporary assessment of the potential impact of ongoing saline (and other ion) discharges related to the Project as it does not consider:

- any current or emerging issues with watercourse salinity, including new research;
- additional salinity loads from extending the mining period and increasing discharge volumes; and
- any potential changes to salinity or related impacts.

Furthermore, EPA considered that the information provided does not justify whether the existing EPL salinity limit of 2,600 µS/cm remains acceptable for the Project. EPA recommended that Tahmoor Coal provide an impact assessment for controlled surface water discharges of mine water that may contain potentially elevated levels of salinity, metals or other pollutants. The IESC, OEH and Wollondilly Shire Council provided similar comments in that mine waste water discharges should be further assessed.

DoI Fisheries recommended that Tahmoor Coal's proposed monitoring program include baseflow monitoring in the creeks and monitoring of iron floc entering the Bargo River. The primary reason for this recommendation was to monitor the potential impacts of poor-quality water entering the downstream sections of the Bargo and Nepean Rivers. Poor water quality can generate iron floc which has a smothering effect on the eggs of the Macquarie Perch.

The Department agrees that potential water quality impacts arising from site discharges are a key assessment issue and that further assessment is required.

The IESC noted that Tahmoor Coal had identified all likely water quality impacts but considered that their potential magnitude may have been underestimated. Further, such impacts may, possibly be irreversible due to surface cracking and near-surface cracking not being incorporated in the groundwater model (see **Section 6.2.1**). The Department notes that Tahmoor Coal has been undertaking work to improve water quality leaving the site and that further information and assessment in this regard has been requested. Further, Tahmoor Coal has advised that it will be re-running the groundwater model taking this into account.

Flooding

As might be expected, the EIS's flood study predicted that the upper reaches of catchments are more likely to be susceptible to localised flood inundation due to flatter terrain and low-capacity drainage channels. The effect of culverts and other constrictions in the more urbanised upland areas also has the potential to increase the extent of flooding in these areas.

The flood study modelled peak flood inundation under pre-subsidence and post-subsidence conditions. Localised increases of inundation during flood events are predicted for Tea Tree Hollow (upstream) at Remembrance Drive near Caloola Road, which is near the Bargo township. Tahmoor Coal is proposing drainage enhancement works, including provision of additional drainage culverts or pipes under Remembrance Drive, to reduce impacts at this location. The Department notes that negligible changes to flooding are predicted at other locations in the catchments.

The flood study also specifically assessed the potential for subsidence to increase local flooding in Bargo, focusing on the location of overland flow paths in the township. The study found that flooding is unlikely in Bargo township, except for minor localised flooding at Dymond Road and Wattle Street. However, it was noted that this flooding would not impact surrounding residents and would have no impacts on existing flood management protocols.

OEH noted that the models used in the flood study provide adequate information on flooding behaviour; however, considered that the study could be improved by addressing flooding characteristics for the full range of flood events rather than just pre and post development.

The IESC concurred in that it had confidence in the assessment of the relative impacts of flood risks and agreed that the likely impacts of the Project on flooding risk is low. However, it was not as confident regarding absolute estimates of flood risk, because of the configuration the adopted flood model was based on regional information without calibration and with no information provided on some key modelling assumptions.

The Department has requested Tahmoor Coal to address all issues raised in submissions. The Department will be further considering the potential flooding impacts of the Project, particularly those on Bargo township during its detailed assessment of the Project.

Site water management

While efforts would continue to be made to contain water on site, the EIS's water balance identified the on-going need for continued releases of treated water to Tea Tree Hollow, via LDP1, of approximately 2,200 ML/year over the life of the Project.

Tahmoor Coal is proposing to continue to implement its existing site water management system with a few minor modifications, including:

- development and expansion of stormwater drainage management and runoff control for the planned staged expansion of the REA;
- upgrading of existing water supply and water reticulation infrastructure to handle increased coal throughput and coal handling facilities;
- changes to underground mine water supply and mine dewatering reticulation to service the Project;
- development of an underground storage within goafed areas of the Tahmoor North Mine to temporarily store water; and
- upgrade of the sewage treatment plant at the pit top to treat sewage on site.

The site's waste water treatment plant has a capacity of 6 ML/day. This in combination with the proposed 4,751 ML capacity of underground water storage, would be adequate to ensure continued treatment of water discharged via LDP1 at least until 2031. Thereafter, a capacity upgrade at the treatment plant would be required.

The development of underground water storage within goafed areas at Tahmoor Mine could create potential risks to groundwater quality, if the storages are near watercourses or abut geology with cracking or high permeability. The Department considers that Tahmoor Coal should further assess this option and provide more detailed justification, including proposed mitigation measures.

The EPA made several recommendations regarding surface wastewater storage liners, goaf storage, trigger values, sediment basin discharges and sewage treatment. DoI Water recommended that the surface water monitoring network is expanded to improve monitoring of stream flow and pool water levels.

The Department has requested Tahmoor Coal to consider all issues raised in submissions and address all recommendations.

6.3 Amenity and Health Impacts

The EIS includes several impact assessment studies undertaken to assess the human amenity and health-related impacts of the Project; including noise and vibration, air quality, odour and greenhouse gas emissions.

The assessments are based on reasonable and feasible avoidance and mitigation measures first being adopted and applied by Tahmoor Coal to reduce impacts. Key proposed mitigation measures include:

- noise reduction treatments within the CHPP;
- noise reduction treatment of other selected plant and infrastructure;

- operational controls to reduce noise at night;
- dust suppression controls on roads, exposed areas and stockpiles; and
- operation of a Waste Coal Mine Gas Power Plant or Tahmoor Mine Flare Plant to burn fugitive methane emissions that would otherwise contribute to climate change.

6.3.1 Noise and Vibration

Tahmoor Coal Mine has a long and complicated history of noise management. Several factors have contributed to this, including the original noise assessment pre-dating the issue of the *Industrial Noise Policy* (INP), the nature of the existing consent's compliance monitoring requirements, the use of several different consultants over time and urban growth leading to residences being built closer to existing mine infrastructure.

Tahmoor Coal Mine's existing 1994 development consent requires Tahmoor Coal to ensure that noise does not exceed an 'L10' level of 45dB(A), when measured within 3 m of any residence. Lower criteria (ie a L10 level of 37 dB(A) or background +5dB(A), whichever is greater) were additionally applied for noise emanating from the REA operations. The development consent does not contain any night time criteria. Similarly, the EPL for the site (EPL 1389) does not currently contain any noise limits relevant to the site or any requirement to monitor noise emissions. However, the Department notes that the site has been/is subject to several noise PRPs which are attached to its EPL.

The Department and the EPA both acknowledge that these criteria are out of date and that the Project provides an opportunity to apply current best practice and policy for noise to the site. This is particularly important because urban growth has led to residential dwellings being approved and built nearer to the mine's pit top site than those that existed at the time of the 1994 consent (eg Olive Lane).

The main operational noise sources at the site are the CHPP and bulldozers operating on coal stockpiles and/or the REA. Other significant sources that contribute to off-site noise emissions include rail loading activities (locomotives and loading coal into rail wagons), compressors and the reject haul truck. These noise sources are located in close proximity to where new residential receivers are located.

The Secretary's Environmental Assessment Requirements for the Project required its Noise Impact Assessment (NIA) to be completed in accordance with the INP, with consideration of the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP). The Noise Impact Assessment (NIA) within the EIS has been undertaken in accordance with the INP, but with additional reference to the current *Noise Policy for Industry* (NPfI) and VLAMP where relevant.

The applicable Project Specific Noise Levels (PSNLs) for the Project were determined as being the lower of either the intrusive criteria or the amenity criteria. For all receivers, the intrusive criteria were the lower and therefore generated the PSNLs. Given the large number of receivers present around the Project, the NIA divided receivers into noise catchment areas (NCAs). The PSNLs for the various NCAs ranged from 35 – 49 dB $L_{Aeq\ (15\ min)}$ in the day period, 35 – 45 dB $L_{Aeq\ (15\ min)}$ in the evening period and 35 – 39 dB $L_{Aeq\ (15\ min)}$ in the night period.

The EIS predicted that:

- with the exception of two private residences (185 and 215 Charles Point Road), overall operational noise impacts are significantly lower than for the Approved Project;
- construction noise impacts would be largely consistent with the operational noise impacts, except at two receivers, where construction of the ventilation shafts would exceed applicable noise management levels (based on EPA's *Interim Construction Noise Guideline*). Tahmoor Coal has commenced negotiations with the owners of these properties; and
- sleep disturbance, rail and cumulative noise emissions and vibration would all comply with applicable criteria.

Nonetheless, even when taking Tahmoor Coal's proposed mitigation measures into account, the Project would still cause exceedances of the calculated PSNLs under both noise-enhancing and calm meteorological conditions. For example, during the day time period in noise enhancing conditions, up to 2,683 receivers would experience up to 2 dB exceedances of the PSNLs, 70 receivers would experience 3-5 dB exceedances and 10 would experience greater than 5 dB exceedances. These impacts reduce under calm meteorological conditions to 2,749, 12 and 2 receivers respectively.

The Department notes that these exceedances broadly reflect the existing noise situation at the mine and emphasises that the Project would result in improved noise outcomes for the vast majority of receivers (ie all bar 2). In other words, nearly all receivers would experience continued higher noise levels should the Project not be approved, for the remaining life of the existing approved operation.

The EPA considered that the NIA had significant technical deficiencies regarding low-frequency noise, how the VLAMP was applied, noise modelling predictions, discrepancies in existing mine noise figures, assessment of sleep disturbance and the veracity of background noise levels. The EPA also considered that potential sources of vibration had not been adequately assessed.

The Department, EPA, Tahmoor Coal and its noise consultant EMM met on 10 April 2019 to discuss EPA's technical concerns and determine an appropriate way forward. It was generally accepted that the Project would likely provide improved noise and vibration outcomes for the vast majority of receivers and that the focus should be on assessing whether every reasonable and feasible mitigation measure has been applied and providing further justification for the options presented. The application of the most current noise policy (ie the NPfI) was also discussed.

The Department will request that, as part of its RTS, Tahmoor Coal assess the Project under the NPfI, including relevant meteorological conditions and background noise levels. This would require establishing criteria for the existing operations and then converting these criteria (L10, calm wind, LFN etc) to contemporary $L_{Aeq\ (15\ min)}$ or other applicable criteria.

In addition to a new assessment under the NPfI, the Department and EPA both require that further consideration is given to low frequency noise, including addressing historic low-frequency noise issues at the site. Priority should be placed on mitigating low-frequency noise emissions from the CHPP rather than only focusing on the expected overall (ie A-weighted) noise reductions.

Overall, the Department considers that the issues related to Project noise relate to resolving historical issues, applying the current policy context, refinement of technical inputs and provision of further justification and clarification for the EIS's proposed mitigation and management measures. It is generally accepted that the outcomes of the Project would be improved noise and vibration emissions for most receivers. Given that a revised NIA is to be undertaken, the Department has not provided any further discussion on potential issues associated with noise outcomes in this preliminary issue identification.

6.3.2 Air quality

The key air quality issue for mining are emissions of dust and particulate matter (PM). Mining generates PM from numerous activities including vegetation stripping and topsoil removal, removal and handling of overburden, removal and handling of coal, hauling by heavy vehicles and wind erosion from stockpiles and exposed surfaces. Suspended PM can be defined by its size, chemical composition and source. Particle size is an important factor influencing particle dispersion and transport in the atmosphere and potential effects on human health. Generally speaking, underground mining has less air quality impacts compared with open cut mining methods.

The key Project activities potentially affecting air quality include the construction and operation of the two additional ventilation shafts, gas drainage operations, increased coal production, expansion of the REA and coal haulage.

The EIS predicted that:

- air quality emissions would comply with applicable criteria for annual average $PM_{2.5}$, annual average PM_{10}, annual average TSP and annual average total deposited dust (based on the EPA's current *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW*), both Project-only and cumulative at all sensitive receivers throughout the life of the Project. In addition, no sensitive receivers are predicted to exceed the maximum 24-hour $PM_{2.5}$ criterion in respect of Project-only contributions;
- however, one sensitive receiver near the REA (R10) is predicted to experience occasional exceedances of the maximum 24-hour average PM_{10} criterion (50 µg/m^3) from Project-only contributions, with one modelled exceedance per year; and
- seven sensitive receivers are predicted to experience exceedances of the maximum 24-hour average PM_{10} criterion (50 µg/m^3) from cumulative contributions, with up to 9 modelled exceedances per year, and R10 being the most affected receiver.

Tahmoor Coal advised that its Air Quality Trigger Action Response Plan and dust management practices would be used to manage these modelled exceedances. The EPA recommended that the site's existing construction and operational Air Quality Management Plans are updated post-approval, and additional real-time PM_{10} monitors are installed to target the most sensitive receivers.

While acknowledging Tahmoor Coal's proposed mitigation and management measures, NSW Health remained concerned that it is not possible from the EIS to estimate the likely health impacts on residents located close to the proposed ventilation shafts. The Department notes that the EPA's recommended air quality criteria, which form part of the Department's standard condition for underground mines, are health and amenity-based criteria and would be applied to the Project, if approved. Nevertheless, the Department agrees that further information could be provided in this regard and will request this be included as part of the RTS.

The Department has not identified any significant issues regarding air quality that require special consideration. The Department is of the view that air quality issues can be satisfactorily addressed as part of its detailed assessment of the Project.

6.3.3 Greenhouse gas emissions

The EIS estimated that total greenhouse gas emissions (ie Scope 1,2 and 3) would total 119.5 million tonnes of CO_2-e over the life of the Project. This included 13.5 million tonnes of Scope 1 emissions, which would be predominantly fugitive methane emissions[2]. Scope 2 emissions (associated with electricity use) would total 1.5 million tonnes of CO_2-e over the life of the mine. Scope 3 emissions are the largest source of emissions, predominantly due to combustion of coal for steel production, which would total 104.5 million tonnes of CO_2-e.

Four objecting submissions raised concerns about climate change. One noted that, despite the small contribution to Australia's overall emissions, Australia is far behind projections in meeting its Paris commitments, with an overall increase in emissions predicted by the Climate Action Tracker (an independent scientific analysis produced by three research organisations tracking climate action since 2009). Other objecting submissions:

- noted a recent refusal of another NSW coking coal project (Rocky Hill Coal Mine, in Gloucester) by the NSW Land and Environment Court, with the refusal being partly due to its expected climate change impacts;
- suggested that the small fraction of global total emissions which would result from the Project was irrelevant, as multiple local actions to mitigate emissions were required;

[2] Under a scenario where the Project's Waste Coal Mine Gas (WCMG) Power Plant is operating. The WCMG currently has a commercial agreement to operate until 2020; if the WCMG closes, mine gas containing methane would be diverted to the Tahmoor Mine Flare Plant and total Scope 1 emissions would increase to 17.4 million tonnes of CO_2-e.

- highlighted the NSW Government's endorsement of the Paris Agreement and its target for its own activities of net zero emissions by 2050, and that burning of a new fossil fuel resource would increase greenhouse gas emissions;
- noted a 39% decline in demand for coking coal from 2016 to 2040, as forecast by the International Energy Agency; and
- argued that producing coking coal was not a justification for greenhouse gas emissions, and that improvements in technology that did not rely on coking coal (eg electric arc furnaces) could reduce demand for coking coal.

Ironlaw's submission also noted that total greenhouse gas emissions (ie Scope 1,2 and 3) would equal 1.68% of Australia's commitment under the Paris Agreement. It suggested that the Project's proposed greenhouse gas mitigation measures were 'vague and uncertain', with no suitable measures being proposed.

The objecting submission from Doctors for the Environment noted that the Rocky Hill Coal Project had considerably lower projected emissions than the Project. It highlighted the importance of considering Scope 3 emissions and also noted the health benefits of limiting global atmospheric warming to 1.5°C.

Recent data on Australia's national inventory of greenhouse gas emissions data is currently only available up to September 2018. Australia's greenhouse gas emissions are estimated at 536 Mt CO2 -e for 2018. In comparison, emission totals for the same period in 2017 were 531.4 Mt CO2 -e. This reflects a 0.9 % increase, which is attributed to increased Liquid Natural Gas (LNG) production and export. The largest source of national emissions is electricity generation totalling 33.7% of Australia's emissions to September 2018 (ie black coal, brown coal, renewables and gas). There have been reduced emissions in this sector as a result of increased renewable energy generation and reductions in brown coal and gas-fired generation.

Stationery energy (excluding electricity but including emissions from direct combustion of fuels in the manufacturing, mining, residential and commercial sectors) accounted for 19.0% of Australia's national inventory. Fugitive emissions from production, processing, transport, storage, transmission and distribution of fossil fuels accounted for 10.7 per cent of Australia's national inventory.

Average annual Scope 1 emissions would contribute approximately 0.2% of Australia's commitment under the Paris Agreement. Scope 2 emissions for the Tahmoor South project would result from electricity consumption in the extraction of coal and mining support services (ie administration activities). To reduce its Scope 2 emissions, Tahmoor Coal intends to develop an Energy Savings Action Plan which would include an energy monitoring program focusing on reducing and improving energy efficiency.

The Department acknowledges the importance of reducing greenhouse gas emissions and recognises that the assessment of greenhouse gas emissions will be an important consideration for the Project. Hence, it is highlighted here as a key issue requiring further detailed assessment. The Department's assessment will be further informed by Tahmoor Coal's responses to the submissions that raised concerns over greenhouse gas emissions and their connection to global warming and climate change.

6.4 Biodiversity

The EIS includes a biodiversity assessment undertaken in accordance with the *Framework for Biodiversity Assessment* (FBA) and prepared by Niche Environment and Heritage. The biodiversity assessment includes assessments of terrestrial ecology, aquatic ecology and stygofauna.

6.4.1 Direct Impacts

Direct impacts to vegetation from the Project are primarily vegetation clearing for the surface works associated with expansion of the REA, construction of two new ventilation shafts and the expanded car park. The total amount of vegetation clearing and the associated credit requirement generated under the FBA are provided in **Table 10**.

Tahmoor Coal is proposing to offset the impacts of the Project through establishment of offset sites, purchase of credits available on the public register (noting that there are currently no credits available to offset *Persoonia bargoensis*) and payment into the Biodiversity Conservation Fund, if required. OEH and the Department note that the Project currently has a shortfall in physical credits (see **Table 10**).

Table 10 | Summary of direct biodiversity impacts of the Project and required credits

To be cleared or removed	Conservation status	Total	Credits required	Credit shortfall
Shale Sandstone Transition Forest	Critically Endangered Ecological Community (CEEC)	43.4 ha	2,246	1,847
Upper Georges River Sandstone Woodland	Not listed	5.7 ha	287	40
Other planted vegetation	Not listed	0.1 ha	-	-
Grevillea parviflora subsp. *parviflora*	Vulnerable	2,324 individuals	32,536	-
Persoonia bargoensis	Endangered (BC Act*) Vulnerable (EPBC Act)	100 individuals	7,700	5,953
Potential habitat for Large-footed Myotis	Vulnerable (BC Act only)	7.4 ha	163	-
Potential habitat for Koala	Vulnerable (BC Act only)	43.5 ha	1,131	-

**Biodiversity Conservation Act 2016*

6.4.2 Indirect Impacts

The area above the proposed longwalls would be subject to both surface and subsurface subsidence impacts. Subsidence impacts could include surface cracking of soils and topographic depression causing water ponding, erosion and/or hydrological changes (including groundwater drawdown below GDEs).

The assessment of aquatic ecology found that Tea Tree Hollow, Dog Trap Creek and downstream watercourses may be impacted by subsidence due to changes to stream bed profiles and cracking, alteration of surface water flows and ponding, and changes to water quality. Significant impacts to threatened species were considered unlikely and low to moderate impacts were predicted for stygofauna and hyporheic sites. Nevertheless, OEH has requested that mine water discharges, which are saline and have high levels of bicarbonate, are further assessed.

6.4.3 Conclusion

The Department's principal concern regarding biodiversity is the direct clearing of CEEC and threatened species as outlined in **Table 10**. The onus is on Tahmoor Coal to demonstrate that the local populations of these communities and species would not be put at risk of extinction or have significantly reduced viability. OEH considers that Tahmoor Coal did not adequately demonstrate that the principle of 'avoiding' biodiversity impacts had been thoroughly considered, and recommended it further evaluate options for the REA, including alternative locations, underground or offsite disposal, or reuse. Overall, its view is that vegetation clearing should be reduced.

OEH also raised concerns over the proposed offset strategy, including the exclusion of some species (eg Red-crowned Toadlet and Cumberland Land Snail). It also noted that all Commonwealth-listed species must be offset 'like-for-like' in accordance with the Bilateral Agreement. The National Trust of Australia raised concern that the proposed offsets were unsuitable due to being associated with airshafts or largely cleared farmland. The Department will be closely examining the proposed offsets during its detailed assessment of the Project.

The National Trust of Australia also outlined several other concerns, including that there was a lack of information regarding fauna species inhabiting the area and that impacts on the general biodiversity of the region had not been

assessed. One community objector was concerned that impacts to water volumes and water quality in streams would affect the Platypus, which is occasionally sighted in the Bargo River.

Following discussions with Tahmoor Coal, the Department understands that changes will be made to the proposed REA extension to address several of the above concerns. The Department will be considering all issues identified as part of its detailed assessment of the Project.

6.5 Social

The EIS includes a Social Impact Assessment (SIA) of the Project undertaken generally in accordance with the Department's *Social Impact Assessment Guideline for State Significant Mining, Petroleum Production and Extractive Industry Development*. The SIA includes social baseline information, an overview of community and stakeholder engagement undertaken for the assessment (and previously) by Tahmoor Coal and an assessment of the Project's expected positive and negative social impacts.

The SIA proposes mitigation measures and ongoing monitoring to avoid, manage and/or mitigate identified social impacts. The Department will carefully consider the relevance, completeness and likely effectiveness of these proposed strategies in its detailed assessment of the Project.

The SIA advises that the highest residual negative impacts after mitigation are:

- impacts to natural features and amenity (particularly surface water, subsidence, groundwater and construction noise);
- impacts to population and way of life due to (eventual) mine closure;
- impacts to use of infrastructure, services and facilities due to subsidence; and
- cumulative environmental impacts from mining.

The Department notes that this list implies that these are the main issues the community is concerned about and that there are no significant impacts on other social aspects such as way of life, community and culture etc.

The greatest social benefits of the Project would be increased/continued employment, community contributions and payment of royalties (which leads to the provision of public services by the State Government). Most of the supporting submissions referred to these types of benefits.

The Department recognises that there is limited experience for NSW mining companies and consultants in applying the Department's SIA guidelines. In this context, it considers that Tahmoor Coal has generally applied the guideline and presented an adequate case for its proposal.

That being said, the Department considers that further work could be done to strengthen the SIA, and in particular the social impacts of four key matters; being undermining of houses, Aboriginal heritage, impacts to groundwater bores, and perceptions of impacts to natural features (especially Thirlmere Lakes).

SA NSW advised that there are significant social impacts for communities affected by mine subsidence. Whilst the SIA recognises that 70% of the 1,458 houses in the subsidence study area are predicted to have "No Claim or R0 impacts" (ie nil impacts or minor adjustments), no mention is made in the SIA of the number of houses falling under the more severe R1-R4 categories and the associated social impacts. There does not appear to be any analysis in the SIA of social impacts such as anxiety, uncertainty, the extended duration of potential impacts and going through a protracted claims process.

SA NSW noted that properties can be influenced by multiple longwalls, with active subsidence therefore occurring episodically over a total period of 3 – 4 years, resulting in significant delays before compensation claims can be

finalised. SA NSW suggested that the proposal be modified to substantially reduce subsidence impacts to Bargo township. Ironlaw's submission stated that the Project should be refused due to the social impacts from subsidence, including incompatibility with Council zonings and sterilisation of surface development whilst undermining is occurring. Ironlaw considered that sterilisation impacts had not been assessed in the SIA. The Department notes that underground mining does not 'sterilise' potential surface development, however acknowledges that it can cause significant delays in when that development can occur.

The SIA categorises the risks of subsidence on groundwater bores as extreme, with major consequences likely without mitigation, and high with moderate consequences likely once mitigation is applied. Whilst Tahmoor Coal has committed to 'make good' provisions (see **Section 6.2.1**), there is very little discussion about how subsidence impacts to groundwater bores would affect people's livelihood, way of life and well-being.

The Thirlmere Lakes are a highly sensitive and protected ecosystem that are considered a special place by many people. Along with environmental values, the Lakes are considered by certain parties to hold recreational, sentimental and/or amenity values. Whilst subsidence impacts are likely to be low (see **Section 6.2.1**) there are perceptions (ie fears, anxiety and perceived threats to aspirations) that have not been adequately explored by Tahmoor Coal in its SIA.

Aboriginal sites are valuable from both cultural and archaeological perspectives. Any potential subsidence impacts to Aboriginal sites should also be explored from a social impact perspective. Loss or destruction of sites could have consequences for the sense of being, identity or sense of place for Aboriginal stakeholders. These concepts should be further explored by Tahmoor Coal.

Community submitters also raised concerns about subsidence impacts to roads and infrastructure and the stress related to uncertain subsidence impacts on houses; impacts to water quality and water availability (particularly in times of drought); and impacts to 'pristine' environments, particularly potential groundwater reduction impacts on the Thirlmere Lakes.

The SIA also focuses on a technical perspective, rather than a social perspective. There is very little that demonstrates an understanding of issues *from the perspective of* the affected people or stakeholders.

In summary, the Department has identified key areas where further work is required by Tahmoor Coal and notes that such further work should focus on impacts *as they are likely to be experienced by the community*. Once all information is received, the Department will further consider social impact issues in its detailed assessment of the Project.

6.6 Economics

The Project would have economic impacts on and benefits to the local community and more broadly to NSW. The EIS contains an Economic Impact Assessment (EIA) prepared in accordance with the Department's *Guideline for the Economic Assessment of Mining and Coal Seam Gas Proposals* and supporting Technical Notes. The EIA includes a Cost Benefit Analysis (CBA) which estimates both the costs and benefits of the Project to NSW, and a Local Effects Analysis (LEA) which considers the impacts of the Project on the Wollondilly local community.

The CBA estimates that the Project would result in a net benefit to NSW of approximately $700 million, net present value (NPV), including:

- $276 million NPV in royalties, council rates and taxes;
- $212 million NPV in worker benefits, for an average of 353 full time equivalent employees;
- $211 million NPV in supplier benefits; and
- $0.1 million NPV of indirect costs, attributed to greenhouse gas emissions.

DRG considered that recovery of a total of approximately 38 Mt product coal from the Project is feasible and, considering the constraints outlined in the EIS, that the mine plan adequately recovers coal resources. DRG also considered the Project would provide an appropriate return to the State, in the order of $249 million NPV. The Department notes that Tahmoor Coal's royalty predictions are more conservative, estimated at $149.1 million NPV.

A sensitivity analysis identified that the Project is, not surprisingly, most sensitive to coal price fluctuations. The sensitivity analysis also provided upper and lower bounds of estimated benefits under different scenarios and can be used to infer the level which non-quantified negative externalities would need to reach before the Project no longer results in a net benefit to NSW. Under a worst-case scenario it is estimated that externalities would need to exceed $497.7 million NPV for the Project to result in a net negative return to NSW. Under more optimistic assumptions, net benefits could be in the order of $859.1 million NPV.

The LEA estimates a net benefit of $132 million NPV to the Wollondilly region, based on:

- 45% of mine employees living in the Wollondilly area;
- benefits to local suppliers; and
- local council rates.

The Department understands that Tahmoor Coal intends to enter into a Voluntary Planning Agreement (VPA) with Wollondilly Shire Council, if development consent is granted, and expects to resolve the terms of this prior to any determination of the Project. The Department notes there is no current existing VPA for the mine.

Most supporting submissions considered the Project's economic benefits as the primary reason for supporting the Project, particularly its ongoing employment benefits.

Two SIGs objecting to the Project raised concerns over the EIA. Undermined Inc. considered that the EIA focussed on short-term economic benefits to mine owners, employees and NSW Government royalties and did not consider the economic costs of social and environmental impacts. Ironlaw Pty Ltd raised similar concerns that the Project's economic and public benefits are uncertain, overstated and are not shown to be greater than the public costs of the Project. Ironlaw Pty Ltd also argued that the loss or delay of future development (eg its own subdivision proposal) within the Project area had not been considered in the EIA.

Wollondilly Shire Council acknowledged the economic benefits that mining can provide but also raised concerns regarding assessment of subsidence impacts and the proposed mitigation measures for the Bargo Waste Management Centre and the impacts to future and proposed development.

The Department has completed an internal review of the EIA which identified areas requiring additional information, including:

- further justification of disutility of working in mining;
- further justification of the sensitivity analysis scenario results; and
- discussion in the LEA of local environmental, social and transport impacts, including integration with the SIA results.

6.6.1 Conclusion

The Department considers that the LEA requires further work as it is focussed on the benefits the Project may bring to the Wollondilly region in terms of direct employment. There is limited discussion of any indirect employment benefits and no qualitative discussion of the local environmental and social costs to the community. The Department expects these issues to be addressed by Tahmoor Coal and the Department will further consider them as part of its detailed assessment of the Project.

As previously identified, the Department understands that Tahmoor Coal is looking to make changes to the proposed mine design. It is likely that subsidence, groundwater and biodiversity impacts, and the costs required to mitigate these impacts, would be reduced. However, changes to the mine plan could potentially reduce the amount of coal extracted, also reducing the projected benefits.

6.7 Other Issues

The Department has identified a range of other issues, including Aboriginal and non-indigenous heritage, traffic and transport, visual impacts, rehabilitation, hazards and waste. Most of these issues will require further information and/or assessment from Tahmoor Coal to respond to the issues raised. All of these issues will be carefully considered by the Department in its detailed assessment of the Project, in accordance with the requirements of the EP&A Act and applicable government policies and guidelines. **Table 11** provides a summary of the other issues identified.

Table 11| Summary of other key issues

Issue	Summary
Visual	• The EIS included an assessment of the potential visual impacts from construction and operation of the REA and ventilation shafts. Tahmoor Coal considers that the surrounding landscape, which includes ridgelines and tree cover, has the ability to absorb these changes without significant impact. • While equipment (including cranes and drill rigs) would be partially visible during construction, the REA and ventilation shafts would not be visible from surrounding urban centres, the majority of local roads or major transport corridors. Tahmoor Coal predicts that any residual impacts would be low, due to tree cover and screening by undulating landforms. • Visual impacts were not raised as a concern by submitters, Council or Government agencies. However, the Department notes that Wollondilly Shire Council and OEH raised concerns over vegetation clearing for the proposed REA. The Department understands that Tahmoor Coal is redesigning aspects of the Project as a result of submissions and agency advice. Any revisions to Project design would likely result in a reduction in visual impacts.
Traffic	• Tahmoor Coal provided an assessment of the proposed increase in vehicles arriving at and leaving the mine's surface facilities. The Traffic Impact Assessment (TIA) estimated that peak employment would occur in 2020. While this is likely to remain the case, the Department understands that the TIA analysis was conducted on a previous mine design that included significantly higher employment levels. • Tahmoor Coal proposes to upgrade the Mine Access Road/Remembrance Driveway intersection to allow for the increased traffic movements and to improve road safety. RMS made no specific comments in relation to the additional traffic impacts. • Wollondilly Shire Council raised several concerns in relation to the TIA, including reductions to the Level of Service (LoS) at some intersections, increased traffic in morning and afternoon peak periods around the Wollondilly Anglican College and potential damage to infrastructure from additional heavy vehicles. The Department has requested

Issue	Summary
	that Tahmoor Coal clarifies the mine design used as the basis of the TIA and that it addresses Wollondilly Shire Council's concerns in its RTS.
Aboriginal Heritage	• 39 Aboriginal archaeological sites and one Aboriginal cultural site were identified within the Project area. Dog Trap Creek features a high concentration of archaeological and culturally significant sites, particularly rock shelters with artworks. Tahmoor Coal's mine plan was designed to avoid mining directly beneath four rock shelters along Dog Trap Creek and to avoid subsidence impacts to archaeological heritage sites in the southeast of the Project area. • However, 26 archaeological sites have the potential to be impacted by subsidence impacts, and one archaeological site has been identified as having potential to be directly impacted by surface infrastructure. • OEH raised several concerns over the Project's potential impacts on Aboriginal heritage. Notably, OEH recommended that the mine plan was amended to shorten longwalls near Dog Trap Creek. OEH considered that this would reduce impacts to sites on Dog Trap Creek from vibration, bed rock fracturing and changes in hydrological patterns. • OEH also considered that some comments from the Aboriginal community were not addressed. • OEH further requested that Tahmoor Coal ensure all recorded sights are assessed at part of this Project. • The Department will be considering all potential impacts of the Project on Aboriginal heritage and all issues raised as part of its detailed assessment of the Project.
Historic Heritage	• Within the Project area, 23 historical heritage items were identified (including a homestead, cemetery, timber cottages, pub, post office, railway station and bridges and various public buildings), with 19 items located directly above the proposed longwalls. • Of these items, only one State-listed item was identified (the Wirrimbirra Sanctuary), however 21 are listed in the Wollondilly LEP 2011 as locally significant heritage items. • Tahmoor Coal notes that these items would be subject to subsidence but considers that significant impacts are unlikely. To mitigate any subsidence impacts, Tahmoor Coal intends to prepare and implement site-specific Heritage Management Plans. • The Wirrimbirra Sanctuary is identified as an area with historical and natural heritage values. Tahmoor Coal has assessed the expected impacts of the Project on Wirrimbirra Sanctuary as minor. However, fracturing of the rock bed at Tea Tree Hollow is likely and diversion of surface water and the draining of pools may impact on the site's natural heritage values. • In its submission, the National Trust of Australia commented that it was not approached by Tahmoor Coal to allow access to the Wirrimbirra Sanctuary and that there had been no engagement by Tahmoor Coal to arrange access to remediate the Project's potential subsidence impacts. • The Heritage Council of NSW raised concerns over several areas of the heritage assessment, including the lack of detailed condition reports and inadequate consideration of adverse impacts or detailed monitoring and mitigation measures.

Issue	Summary
	• The Department will be considering all potential impacts of the Project on historic heritage and all issues raised as part of its detailed assessment of the Project.
Rehabilitation and Final Landform	• Tahmoor Coal provided a Conceptual Mine Closure Plan for the Project as part of the EIS. This Plan assumes that, at closure, all existing mine-related infrastructure would be entirely removed, and the land returned to a land use as close as possible to pre-mining land use. • This Plan is tailored to address the closure requirements for different domains (ie the REA, mine ventilation, surface facilities areas). • Rehabilitation activities would include reshaping and revegetation of disturbed areas to blend with the surrounding landscape. A monitoring program would also be implemented to ensure a sustainable landform is achieved. • Undermined Inc., in objecting to the Project, considered that the EIS did not acknowledge that rehabilitation of the site is Tahmoor Coal's responsibility. It also recommended that funding to complete mine rehabilitation is put in trust so that it is available at the end of the Project life. The Department notes that it is standard practice for the Resources Regulator to hold a rehabilitation bond to ensure that funds are available to complete rehabilitation in the event that a mining company defaults on its rehabilitation obligations. • The Resources Regulator advised the Department that the SEARs had not been fully addressed and requested additional information regarding the final landform, rehabilitation of watercourses and rehabilitation completion and performance criteria. The Department will be requesting that Tahmoor Coal provides this information in its RTS. • The Department understands that Tahmoor Coal may be making changes to its mine plan. Revisions to the mine plan may result in changes to rehabilitation and the final landform, particularly in the case of the REA.

7. Conclusion

The Department has undertaken a preliminary review of the development application, EIS and submissions for the Project. It has also engaged an independent groundwater expert to review key groundwater aspects of the Project.

Some of the key issues raised in submissions, and/or the Department's preliminary review include:

- subsidence – including its impacts on property and other built features and groundwater and surface water resources;
- water resources – including further clarification and details of the groundwater modelling, groundwater sensitivity assessment and exchange between the surface and groundwater, and the management of impacts to groundwater bore users;
- amenity impacts – including application of current noise policy and technical inputs;

- biodiversity impacts – including removal of a critically endangered native vegetation community and other threatened species, further clarification on biodiversity offset availability and consideration of other reject emplacement methods;
- social impacts – including impacts on the owners of potentially affected properties, the local Aboriginal community and people with a connection to Thirlmere Lakes; and
- economic - including assumptions used to calculate employment benefits and distillation of the Project's local environmental, social and transport impacts.

All of these issues raised in submissions, as well as the issues identified in the Commission's public hearing report, will be considered in the Department's detailed assessment of the Project. This assessment will be completed following receipt of the Commission's public hearing report and additional information from Tahmoor Coal responding to the issues raised in submissions, agency advice and the public hearing.

The Department will continue to undertake targeted consultation with key stakeholders prior to finalising its detailed assessment report and make its expert available through the assessment process.

Once the Department has completed its assessment, the Commission *may* undertake further consultation prior to making a final determination of the Project, in accordance with its *Guidelines for a Public Hearing Held in Multiple Stages*.

This Preliminary Issues Report is hereby presented to the Commission for its consideration in the public hearing for the Project.

Howard Reed

Howard Reed 6.6.19
Director
Resource Assessments

Michael Young

Mike Young 6.6.19.
A/Executive Director
Resource Assessments and Compliance

Appendices

Appendix A – Environmental Impact Statement

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8445

Appendix B – Agency Advice and Public Submissions

See the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8445

Appendix C – Submissions summary

Table C1: SUMMARY OF KEY ISSUES – Government Agencies

Summary of key issues
Division of Resources and Geoscience (DRG) considered that the proposal represents an efficient use and development of the State's coal resources, and that the risks and opportunities can be effectively regulated under the conditions of mining authorities under the *Mining Act 1992*. The Division advised that additional mining leases would be required for the expansion of the reject emplacement area and proposed ventilation shafts.
The ***Resource Regulator*** advised that in May 2017 it requested that its standard mining development rehabilitation SEARs be applied to this project. The Resource Regulator's request was attached to the SEARs; however, a less comprehensive set of rehabilitation requirements were included in the SEARs themselves. The Resource Regulator considers that additional information is required to demonstrate that sustainable rehabilitation outcomes can be achieved, including: • a more detailed final landform plan which includes contours and covers the reject emplacement area and all applicable mining domains; • more detailed information outlining commitments and completion criteria for the rehabilitation of watercourses; and • clarification of the preliminary rehabilitation success criteria outlined in the EIS. The Resource Regulator advised that it considered the conceptual Mine Closure Plan to be acceptable and did not identify any risks that warranted comment.
Environment Protection Authority (EPA) considered that further assessment and clarification was necessary and requested additional information in relation to: • Noise Emissions: the noise impact assessment provided does not adequately address the EPA's requests attached to the SEARs including assessment of low frequency noise and application of the VLAMP; • Water Pollution: the EIS does not include a contemporary assessment of the potential impact of the ongoing saline discharge on the Bargo River and other receiving waters; • Reject Emplacement Area: the EIS does not include a contemporary assessment of underground reject emplacement; and • Air Quality: development of an air quality management plan focused on real time monitoring near sensitive receivers.
Office of Environment and Heritage (OEH) recommended that Tahmoor Coal explore alternatives to avoid or minimise the impacts of clearing native vegetation, reducing impacts to listed threatened entities and offsetting the residual impacts. OEH also recommended that Tahmoor Coal complete a hollow-bearing tree survey to quantify impacts to species that depend on that habitat and to determine any further site constraints so impacts can be avoided and/or minimised. Further concerns were raised by OEH regarding impacts to *Persoonia bargoensis* including that Tahmoor Coal should demonstrate that the local population would not be put at risk of extinction. Furthermore, OEH considered that, in the absence of additional surveying, Tahmoor Coal should assume the Eastern Pygmy-possum is present and include it as a species to be offset. Further consideration of impacts and offset requirements of other threatened species, including Koala, was also recommended. OEH also considered the Biodiversity Offset Strategy should demonstrate that offsetting, after all avoidance measures are applied, could be achieved. In reviewing the credit calculations, OEH noted minor issues which it recommends are resolved prior to submitting the RTS. With regard to Aboriginal heritage, OEH recommended further assessment of subsidence, hydrology, vibration and dust to protect areas of Aboriginal cultural heritage at Dog Trap Creek. OEH also recommended reducing the length of longwalls

101,102 and 103 and redesigning longwall 109 to reduce impacts to areas of Aboriginal cultural heritage at Dog Trap Creek and the watercourses in these locations.

OEH noted that some comments received during community consultation with Aboriginal communities were not addressed in the EIS and recommends these comments are addressed. OEH recommended that Tahmoor Coal undertake the proposed archaeological test excavations for surface infrastructure and prepare a Heritage Management Plan.

With regard to flooding, OEH recommended that the flood assessment is updated to address flooding characteristics across the full range of flood events rather than depicting the extent of flooding for pre and post development conditions only.

OEH recommended further assessment of the impacts of mine wastewater discharge into Bargo River from the Project and remediation options to repair damage from previous mining.

Department of Industry *(DoI*) provided comments from its Lands and Water Branch and the Fisheries and Agriculture branches of the Department of Primary Industries (DoI).

DoI - Water and ***Natural Resource Access Regulator*** (NRAR) made the following requests and recommendations in relation to surface and groundwater water:

- confirmation that Tahmoor Coal can demonstrate the ability to obtain necessary water entitlements to account for its maximum surface and groundwater takes;
- clarification and validation of the surface water modelling approach used, particularly when predicting changes to low base flows;
- that the groundwater model is revised, and predictive scenarios re-run, to confirm the magnitude of estimated impacts, as DoI – Water considers that the model is currently incapable of making reliable impact predictions;
- recommendation to expand the surface water and groundwater monitoring networks to improve monitoring of stream flow and pool water levels and to address uncertainty in groundwater modelling;
- further consideration of predicted Level 1 and 2 impacts under the *Aquifer Interference Policy*. DoI considered that, due to uncertainty in groundwater modelling, all Level 1 impacts should be reconsidered as Level 2 and a make-good plan developed to ensure all adverse impacts can be successfully addressed;
- recommendation that Tahmoor Coal develop an inventory of all bores within the Project model domain showing bore status and any make good or other mitigation measures proposed to be implemented; and
- development of a Trigger Action Response Plan (TARP) that addresses all criteria exceedances to provide confidence that adverse impacts could be successfully remediated if they occurred.

DoI – Water and NRAR also advised that, as the REA covers waterfront land, it should be rehabilitated in accordance with the *Guidelines for Working on Waterfront Land*. NRAR requested that it is consulted in the development of a Rehabilitation Management Plan, should the Project be approved.

DoI – Lands advised that all Crown land and Crown roads within a mining lease must be subject to a Compensation Agreement under section 265 of the *Mining Act 1992,* which must be agreed and executed prior to any mining activity taking place and within 12 months of approval. The Compensation Agreement could require the holder of the mining lease to purchase the impacted Crown land. Similarly, all Crown land and Crown roads within an exploration licence must be subject to an Access Arrangement under section 141 of the *Mining Act 1992,* which must be agreed and executed prior to any exploration activity taking place.

DPI Agriculture was satisfied that Tahmoor Coal's strategies and measures described in the EIS adequately addressed potential subsidence impacts to rural infrastructure, local waterways and groundwater relevant to agricultural operations and/or infrastructure.

DPI Fisheries noted that poor water quality may occur from cracking of the rocky streambeds in Bargo River tributaries allowing water to percolate through the bedrock and potentially generating iron floc. This has a smothering effect on the

Summary of key issues
eggs of Macquarie Perch. DPI Fisheries requested that a water quality monitoring program is developed including baseflow monitoring in the creeks and monitoring of iron floc entering the Bargo River.
Heritage Council requested further information regarding: • more detailed assessment of the condition, significance and associations of all historic heritage items within the Wirrimbirra Sanctuary, including post-1960s structures, and preparation of a detailed site-specific Heritage Management Plan; • consideration and refinement of mitigative measures to ensure adverse subsidence or other impacts on the Sanctuary are avoided or minimised; • preparation of a site-specific Statement of Heritage Impact report for the Sanctuary, in consultation with land owners and the Heritage Council. Heritage Council advised that the additional information should include discussion of further research of heritage values, further pre-mining inspections, monitoring and mitigation measures and once borehole locations have been finalised within the Wirrimbirra Sanctuary, impacts of these boreholes should be considered.
NSW *Health* recommended that a more detailed health impact assessment is provided, as the EIS does not clearly state the air and noise impacts to residents. NSW Health also commented that the SIA's discussion of health and wellbeing is not very comprehensive.
Transport for NSW (TfNSW) advised that it had reviewed the EIS and at this stage has no further comment.
Roads and Maritime Services (RMS) advised that it does not object to the Project, subject to conditions of consent requiring mining impacts to RMS infrastructure to be managed to acceptable levels, should the Project be approved.
Subsidence Advisory NSW (SA NSW) commented that: • ground movements predicted for the town of Bargo are significantly higher than those measured in the Tahmoor North Project area and the Project will result in higher levels of damage to residential structures than experienced at Tahmoor North; • the Tahmoor North Underground Extension in 1998 predicted negligible subsidence to 82% of houses in Tahmoor. SA NSW found that 40% of properties in Tahmoor and Thirlmere were damaged, with an average repair cost of $75,000; • there are significant social impacts for communities affected by mine subsidence, including that properties can be influenced by active subsidence over several years, which can delay compensation and repairs; and • for this Project it is unclear how the potential impacts resulting from non-conventional anomalous movements to surface improvements have been determined. In addition, SA NSW made the following recommendations: • the Project is modified to substantially reduce the predicted subsidence impacts beneath Bargo, where most residential structures are concentrated; • residences subject to final tilts of 7mm/m or greater are assessed under repair category R4; and • any recommended conditions include performance measures to ensure infrastructure is always safe and serviceable. SA NSW advised that it intends to modify the Active Coal Mines Map to reflect the final mining layout, resulting in Tahmoor Coal being liable for any impacts from the Project.
Rural Fire Services (RFS) recommended that a Fire Management Plan be developed for the Project.

Summary of key issues

WaterNSW acknowledged that the revised mining area avoids the Sydney Drinking Water Catchment (SDWC) but noted the proximity of the proposed longwalls to the Metropolitan Special Area. WaterNSW considered that groundwater drawdown and baseflow reduction from the Project would pose a low risk to water quantity in the SDWC.

WaterNSW also considered that the groundwater assessment should be updated to include potential cumulative impacts from any future mining at Dendrobium, when the EIS for the Dendrobium Extension Project is received. WaterNSW noted that it remains a stakeholder and requested that it is consulted during the development of a groundwater management plan for the Project.

Table C2: SUMMARY OF KEY ISSUES – LOCAL COUNCILS

Summary of key issues
Wingecarribee Shire Council advised of its policy to oppose longwall mining and any new coal mine due to concerns over potential impacts on groundwater, water catchments, agricultural land and tourism. The Council acknowledged that no mining component or subsidence zone occurs within its LGA. The Council requested that rail wagons transporting coal to Port Kembla are covered to minimise coal dust along the transport route and advised that it supports the proposed Maldon to Dombarton railway line as an alternative route.
Wollondilly Shire Council advised that it does not oppose underground mining in its LGA, provided it can occur without adverse impacts to the natural, cultural and built environment. It recognises that the Project would have local economic benefits and is an important source of coking coal for steel manufacturing. The Council also raised a range of issues including: Statutory Planning: • concern over the transparency of the SSD planning process and recent reforms to the planning framework; • requested a meeting with the Department to discuss its submission, the planning pathway and Project application; • advised that it considered Tahmoor Coal's and the Department's community engagement inadequate; • requested an extension to the exhibition period; and • requested that any advice received from the IESC is made public. Subsidence: • recommended the Project is not referred to the IPC until after the release of the Independent Expert Panel for Mining in the Catchment's second report; • recommended that assessment of subsidence impacts is not deferred to post-approval management (ie Extraction Plans); • recommended the Department seeks independent specialist advice over the use of the Tammetta Model; • advised that previously there have been some issues with Tahmoor Coal's management of subsidence repair works at private dwellings; and • requested further assessment potential impacts to proposed and future developments, particularly assessment of local growth and subdivision applications. Groundwater: • raised concerns over the potential drawdown and impacts to nearby aquifers and Thirlmere Lake; • questioned whether the EIS was consistent with the information guidelines for IESC proposals and raised concerns over the adequacy of the groundwater modelling and lack of reference to current research programs and Government agency advice within the area (ie Thirlmere Lakes Research Program and Height of Fracturing Study); and • raised concerns over groundwater subsidence related impacts being addressed post- approval. Surface water: • raised concerns over potential impacts to surface water quality and reductions in surface water flows from mine-induced cracking; • raised concerns over the discharge of treated mine water; and • recommended that TARPs should be developed with scientific input. Biodiversity: • recommended further assessment of potential impacts to aquatic ecology;

Summary of key issues
• requested demonstration of how vegetation clearance for the REA and ventilation shafts has been avoided especially as the number of credits required is considered to be excessively high; • recommended additional investigation of alternative uses for coal rejects; • recommended that, should the Project be approved, a condition should be included requiring up to date analysis of Koala movements; and • requested clarification over the framework for the assessment and management of offset sites. Traffic Impacts: • consideration of reductions in the Level of Service on Avon Dam Road, Remembrance Driveway and around the Wollondilly Anglican College entrance; and • recommended that concrete medians rather than painted medians are used to reduce maintenance costs. Greenhouse Gas: • recommended the Department seek and make public legal advice regarding the Land and Environment Court's Rocky Hill Coal Mine decision. Social: • acknowledged the inclusion of a SIA and requested continued consultation with Tahmoor Coal regarding its Corporate Social Involvement Program. Noise: • recommended that, should the Project be approved, a condition should be included requiring on-going noise monitoring results to be made public. Air quality: • recommended ongoing air-quality monitoring and targeted consultation prior to ventilation shaft construction.

Table C3: SUMMARY OF KEY ISSUES PUBLIC SUBMISSIONS

Summary of key issues in objection raised by special interest groups and public submissions
Biodiversity, including:
• loss of vegetation for the REA;
• concern with the proposed offset strategy;
• impacts on World Heritage site;
• impacts to aquatic ecology from reductions in water quantity and quality; and
• the biodiversity assessment lacks detailed information on the impacts to some species.
Cumulative impacts, including:
• on groundwater from current and previous mining; and
• assessment should focus on cumulative impacts, not only incremental change.
Economic, including:
• projected decline in coal demand;
• properties impacted by subsidence will reduce in value; and
• only short-term economic benefits for mine owners, employees and NSW Government royalties considered.
Greenhouse Gas and Climate Change, including:
• Australia is not meeting its commitments under the Paris agreement and the Project contributes to Australia's greenhouse gas emissions;
• the Project should be refused, consistent with the recent refusal of the Rocky Hill Coal Project;
• climate change impacts would cause more extreme weather events (ie drought and bushfires) and would impact on public health;
• impacts to future generations; and
• climate change mitigation is not proposed.
Groundwater, including:
• concern with predicted drawdowns and impacts to bores;
• concern with inputs to and assumptions of the groundwater model;
• concern with impacts to Thirlmere Lakes; and
• previous impacts been have inaccurately predicted.
Subsidence, including:
• property would be damaged by subsidence and concern over quality of repairs;
• creek bed fracturing;
• concern that rehabilitation of impacts may not be successful and could be intrusive and ugly;
• impacts to Wirrimbirra Sanctuary; and
• sterilisation of land above the longwalls is not considered.
Surface Water, including:
• water quality impacts from off-site discharges; and
• reductions to river flows.
Social, including:
• stress and worry over damage to property; and
• SIA is inadequate.

Summary of key issues in objection raised by special interest groups and public submissions
Other impacts, including:
• previous non-compliance by Tahmoor Coal; and
• the Project is incompatible with existing, approved and likely preferred uses of land.

Table C4: SUMMARY OF KEY ISSUES PUBLIC SUBMISSIONS - Supporters

Summary of key reasons identified by special interest groups and public submissions in support
Economics, including:
• continued employment and creation of new jobs;
• benefits to the local economy; and
• benefits to NSW.
Other, including:
• mine impacts can be mitigated or managed;
• Tahmoor Coal has a good safety record;
• the Project is essential for the continued operation of the Bluescope and Whyalla steel works;
• would provide youth opportunities and community donations; and
• general support.

Appendix D – IESC Advice

See the Department's website at:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8445

Appendix E – Expert Peer Review

See the Department's website at:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8445

Groundwater – Hugh Middlemis of Hydrogeologic