4.0 Proposed Development

4.1 Overview

Tahmoor Coal is seeking development consent for the continuation of mining at Tahmoor Mine, extending underground operations and associated infrastructure south, within the Bargo area. The proposed development seeks to extend the life of underground mining at Tahmoor Mine for an additional 13 years until approximately 2035.

The proposed development would use longwall mining to extract coal from the Bulli seam within the bounds of CCL716 and CCL747. Coal extraction of up to four (4) million tonnes of ROM coal per annum is proposed as part of the development with extraction of up to 48Mt of ROM coal over the life of the project. The project would consist of approximately:

- 35Mt coking product;
- 3.5Mt thermal product; and
- 9.5Mt rejects.

These approximate market mix volumes include moisture and are therefore an estimate only. Once the coal has been extracted and brought to the surface, it would be processed at Tahmoor Mine's existing CHPP and coal clearance facilities, and then transported via the existing rail loop, the Main Southern Railway and the Moss Vale to Unanderra Railway to Port Kembla and Newcastle (from time to time) for Australian and international markets. Up to 200,000 tonnes per annum of either product coal or reject material is proposed to be transported to customers via road.

The proposed development would use the existing surface infrastructure at the Tahmoor Mine Surface Facilities Area. Some upgrades are proposed to facilitate the extension.

The proposed development also incorporates the planning for rehabilitation and mine closure once mining ceases.

The components of the proposed development are shown on **Figure 4.1** to **Figure 4.10**, and in summary comprise:

- longwall mining in the Central Domain (refer to **Section 4.2.1**);
- mine development including underground redevelopment, ventilation shaft construction, pre-gas drainage and service connection (refer to **Section 4.2.2**);
- upgrades to the existing Surface Facilities Area including:
  - upgrades to the CHPP;
  - expansion of the existing REA;
  - additional mobile plant for coal handling;
  - additions to the existing bathhouses and associated access ways; and
  - upgrades to onsite and offsite service infrastructure, including electrical supply (refer to **Section 4.3**);
- rail transport of product coal to Port Kembla and Newcastle (from time to time) (refer to **Section 3.2.7**);
- Up to 200,000 tonnes per annum of either product coal or reject material is proposed to be transported to customers via road;
- mine closure and rehabilitation (refer to **Section 4.4**); and
- environmental management (refer **Section 4.7**).

Each of the individual components of the proposed development, along with an overview of the proposed environmental management measures, is described in further detail in **Sections 4.2** to **4.7**.

4.2 Underground Mining Operations

4.2.1 Mining Area

Coal from the Bulli Seam would be mined within CCL 747 and CCL 716 (refer to **Figure 1.2**) as part of the Tahmoor South Project. The lease areas for the proposed development have been operationally divided up into different mining domains based on geological complexity and mining potential, as described in **Section 5.4**. The Tahmoor South Project comprises mining in the Central Domain only (refer to **Figure 1.4**). Further discussion on the other domains and alternatives considered is provided in **Section 5**.

The proposed development seeks to undertake longwall mining of the Bulli seam within the Central Domain, at a depth of between approximately 365 m and 410 m below ground level. The Central Domain, depicted in **Figure 1.4** is bounded by known geological fault zones.

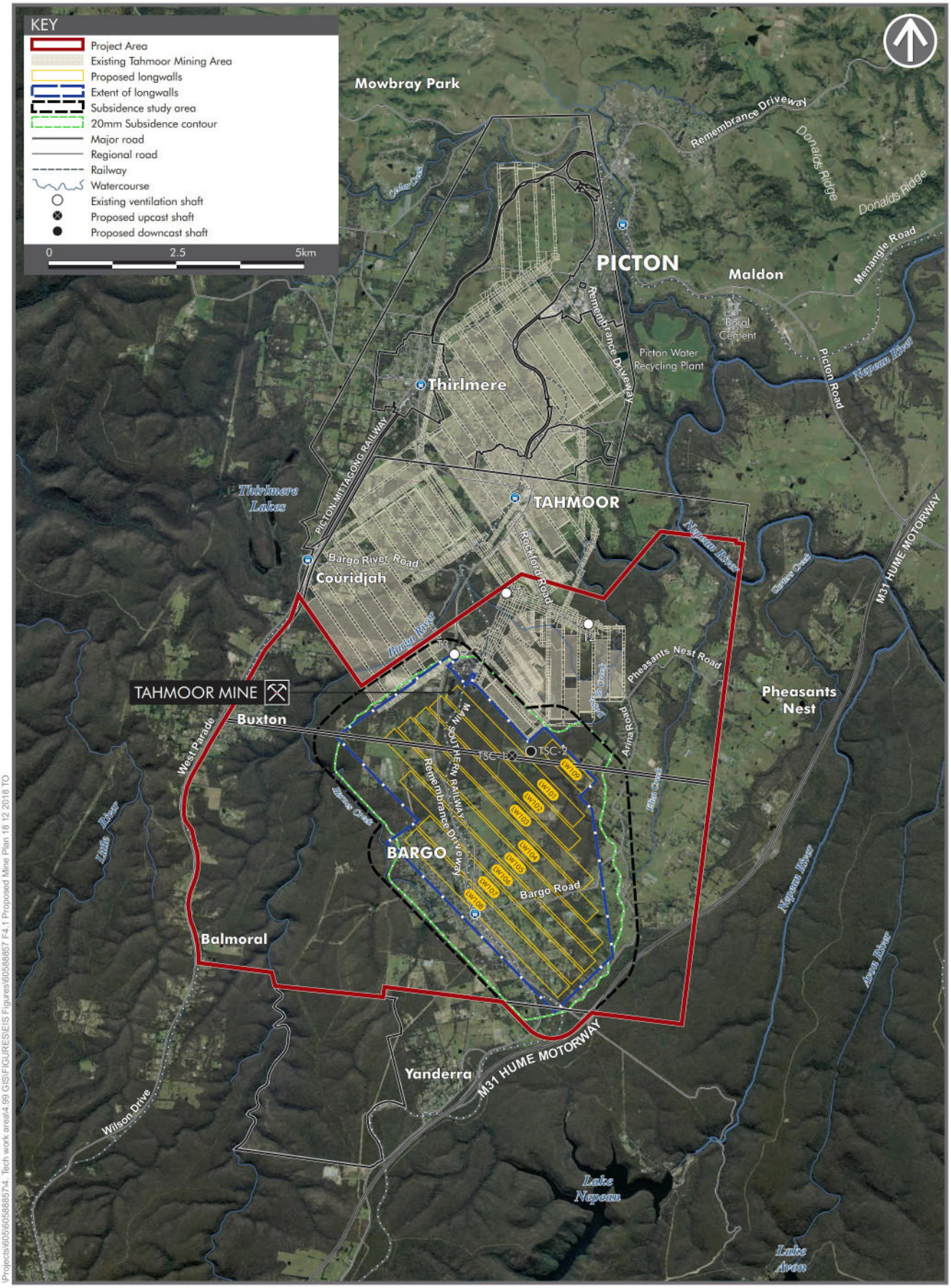
During the mine planning process, a constraints analysis, risk assessment and preliminary fieldwork were undertaken to identify sensitive natural surface features (such as waterways, cliffs, and Aboriginal heritage sites) and to develop RMZs. Subsequent to the risk assessment the proposed longwall layout was modified to minimise significant subsidence impacts to these natural features. The underground extent of the mine proposed on **Figure 4.1** represents this configuration. Further detail regarding how each environmental and social issue has been taken into account during the mine planning process is described in **Sections 5.0** and **6.0**.

The indicative longwall panel layout is shown on **Figure 4.1**. The longwall layout is conceptual only and would be refined in the extraction plan process. The refined longwalls plan would remain within the extent of longwalls. Longwalls in the Central Domain would be orientated in a south-east/north-west direction and would be located within the Bargo area.

The extent of longwalls shown on **Figure 4.1** defines the maximum extent of the footprint of the proposed longwall mining and consists of both first (roadways) and secondary (longwall) workings. The impact assessment for the proposed development focuses on the SSA and assumes that longwall mining only occurs within the extent of longwalls, with the exception of main development roadways (first workings).

The extent of longwalls provides for some flexibility for changes to mining development work and longwall layout during detailed design, subject to geological conditions. It is proposed that minor changes to the layout would be approved under the EP approval process. The final detailed design of the longwall layouts would be subject to review and approval in consultation with the relevant authorities and to the satisfaction of the Secretary of the DPE. Mining operations which are proposed to be undertaken within the area designated as the extent of longwalls include first workings; comprising main headings, gate roads and cut throughs, as well as the development of the longwall panels (secondary workings).

As part of the proposed development, subsidence predictions have been undertaken for residential, commercial and business structures, public infrastructure such as pools and public amenities, utility services such as water and gas mains, and other associated infrastructure. These predictions and potential impacts would be captured within an EP prior to longwall mining for the proposed development and would incorporate the management measures identified herein.



\Projects\605\605888574. Tech work area\4 99 GIS\FIGURES\EIS Figures\605888857 F4.1 Proposed Mine Plan 18 12 2018 TO

SIMEC MINING

PROPOSED MINE PLAN AND VENTILATION SHAFTS

Tahmoor South Project
Environmental Impact Statement

FIGURE 4.1

Note: The 'extent of longwalls' boundary encompasses the proposed extent of underground workings, being the proposed longwall panels and mains headings (first workings).

4.2.2 Mine Development

To enable the continuation of mining to occur sequentially with the current mining operations in Tahmoor North, which are scheduled for completion during 2022, it is anticipated that Tahmoor South Project's development works need to commence in approximately 2019 under existing development consents. These pre-development activities include:

- recovery of existing underground development roadways;
- redevelopment of the underground pit bottom;
- pre-gas drainage;
- longwall development including establishment of gate roads;
- installation of electrical, water and gas management networks; and
- the purchase and installation of equipment.

An additional 50 -175 personnel would be required for the Tahmoor South Project development works, which may occur concurrently with the ongoing mining operations at Tahmoor North. Additional site amenities, including bath houses and additional onsite car parks would be required to accommodate the increased workforce during the transition period from mining operations at Tahmoor North and the Tahmoor South Project's development works.

4.2.3 Mine Ventilation

The proposed development would partially use the existing mine ventilation system, comprising three ventilation shafts one upcast (T2) and two downcast shafts (T1 and T3). However, the upcast shaft (T2) would only be used in emergency situations.

Two additional ventilation shafts would be required to provide a reliable and adequate supply of ventilation air to personnel in the mine:

- TSC1: an upcast ventilation shaft that would be located on Tahmoor Coal's Charlies Point Road property; and
- TSC2: a downcast ventilation shaft that would be located on Crown Land adjacent to Tahmoor Coal's Charlies Point Road property.

The locations of the ventilation shafts are shown on **Figure 4.2.**

The construction of the ventilation shafts would require the disturbance of a footprint of approximately 4 to 6 hectares at each location. Access to TSC1 and TSC2 would be from the existing road network.

A conceptual construction site layout for each of the two proposed ventilation shafts is shown in **Figure 4.3** and **Figure 4.4**. Construction would involve the following:

- Construction of internal roads to allow access for construction and operational maintenance vehicles.
- Establishment of the construction site to allow sufficient space for stockpiling of shaft liners for TSC1 and TSC2, temporary spoil emplacement, water management, storage and safe movement on-site during construction activities. Establishment of the ventilation shaft site would involve:
    - Installation of environmental controls such as silt fences, fencing and a lockable gate, as well as display of appropriate signage relating to restricted entry;
    - Clearing of vegetation and stripping of topsoil. Topsoil would be temporarily stockpiled for rehabilitation post construction;
    - Excavation and construction of a temporary hardstand area for operation of drilling equipment. The hardstand footprint would be determined by the size and number of liner pieces to be manufactured and excavated to a depth of approximately 0.2 m. The temporary hardstand areas would include:
        - road base surrounding the site compound area and drill rig slab for site facilities;
        - laydown areas and a levelled hardstand area for storage of the ventilation shaft liners;

  - a stable access way between the liner storage area and the shaft to facilitate transport of the cured liner segments on purpose built trailers; and
  - a concrete pad 20 m by 15 m is to be constructed around the top of the shaft as a foundation for the drill rig and to provide a clean work area.
- Connection of 66 kV electrical power and establishment of electrical substations at ventilation shaft sites;
- Sinking of the shaft using blind boring methods (or similar method), and lining of the shafts using a composite concrete and steel liner (or similar method); and
- Construction and installation of ventilation fans. The upcast shaft site fan would also incorporate a fan outlet stack, approximately 30 m high, to control odour discharge from the mine.

The shaft construction sites would incorporate water treatment controls, with water extracted from the ventilation shaft being piped to the existing Surface Facilities Area, treated and discharged via the existing licensed discharge point (LDP1). Following the construction phase, the footprint of the operational area of each ventilation shaft would be reduced to approximately two hectares, plus provision for an access road. The area immediately surrounding the ventilation shaft would be rehabilitated following the construction phase. The ventilation fans would operate for the life of the proposed development.

At the TSC1 ventilation shaft site, additional service surface to seam boreholes would be constructed to provide power, communications, gas drainage and water to the mine and service shafts constructed for ballast and concrete delivery into the mine. A service building housing an office and amenities would also be constructed together with a services compound for stockpiled ballast. A 30,000 litre self bunded diesel fuel tank would also be located at the TSC1 ventilation shaft site to provide a fuel supply to underground equipment.

4.2.4 Gas Drainage Operations

Coal mines need to control underground gas concentration levels to below safe limits so that miners are able to work in a safe environment and mining operations can be undertaken as efficiently as possible.

The coal seams within the Southern Coalfield are generally known to be gassy, with CH_4 and CO_2 released from the goaf during mining. Gas in the underground workings would be managed by a series of gas drainage operations including:

- pre gas drainage, whereby gas would be extracted from the coal seam prior to longwall mining;
- post gas drainage, whereby gas would be extracted from the goaf; and
- gas extraction via the mine ventilation system, which would occur throughout mining.

Gas management would continue to use the existing infrastructure, including the Tahmoor Mine Gas Plant, Gas Plant Vent and Flare Plant, as well as the WCMG Power Plant. Some components of the existing gas management infrastructure may need to be upgraded throughout the life of the proposed development, such as the installation of the additional two vacuum pumps at the Gas Plant when required.

Pre Gas Drainage

The purpose of pre gas drainage is to reduce gas volumes in the coal seams prior to mining, with the Bulli, Wongawilli and Balgownie seams targeted for pre gas drainage at Tahmoor Mine. Pre gas drainage of the gas levels in the seams is required to facilitate the timely commencement and progression of mining as well as to reduce the demands on the mine ventilation system for the purpose of gas dilution during operations.

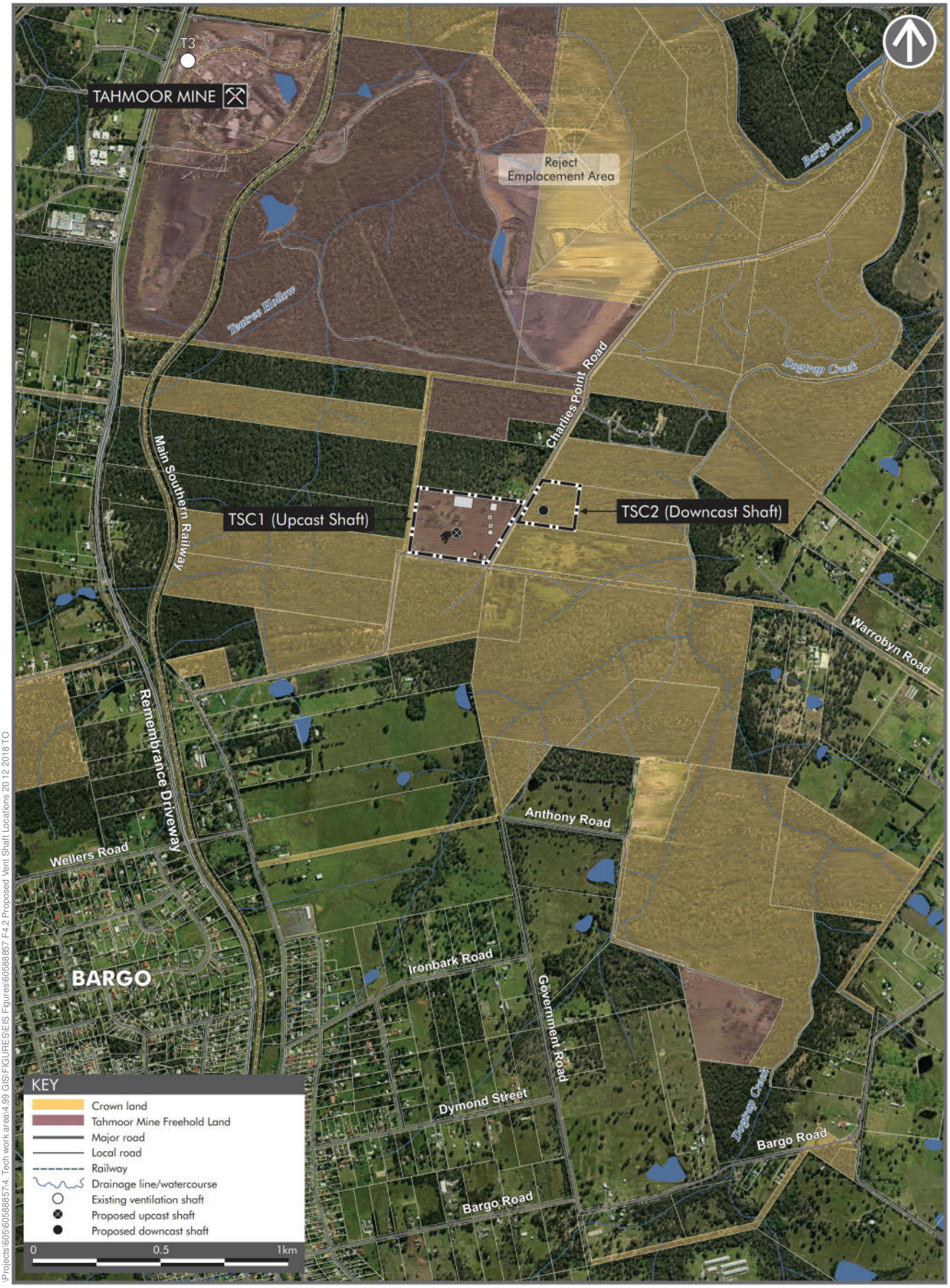
Pre gas drainage activities are mainly undertaken underground, via drilling and drainage from the roadways developed for longwall panels. Underground pre gas drainage works at Tahmoor Mine would drain gas following development of the mine roadways and prior to longwall development. Gas would be drawn from the coal seam by vacuum and piped to the Gas Plant at the Surface Facilities Area via the underground pipe network. Underground gas drainage of the coal seam would continue ahead of longwall development for the life of mining.

Post Gas Drainage

Post gas drainage would be required as strata relaxation caused by the retreating underground longwall face would liberate volumes of gas into the mine workings from the underlying Wongawilli seam and from overlying strata, released due to fracturing of the goaf. To capture this gas during the proposed development, cross-measure boreholes are proposed to be drilled from the mine workings into the Wongawilli seam. These boreholes would be designed to collect the gas at its source or to intercept gas before it migrates into the mine workings. At the conclusion of mining from each panel, the panel would be sealed and gas drawn from the sealed areas as part of the post gas drainage operations. The gas collected from the in-seam and cross-measure boreholes would be drawn by vacuum via the underground pipe network to the Gas Plant located at the Surface Facilities Area.

Gas in Ventilation

The ventilation system would deliver fresh air into the mine from the existing and proposed downcast ventilation shafts and would extract stale air from the mine via the existing and proposed upcast ventilation shafts (refer to **Section 4.2.3**). Similar to the existing operations, the ventilation system would carry the remaining diluted gases out of the mine via the upcast mine ventilation shafts (refer to **Section 4.2.3**).



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888857 F4.2 Proposed Vent Shaft Locations 20 12 2018 TO

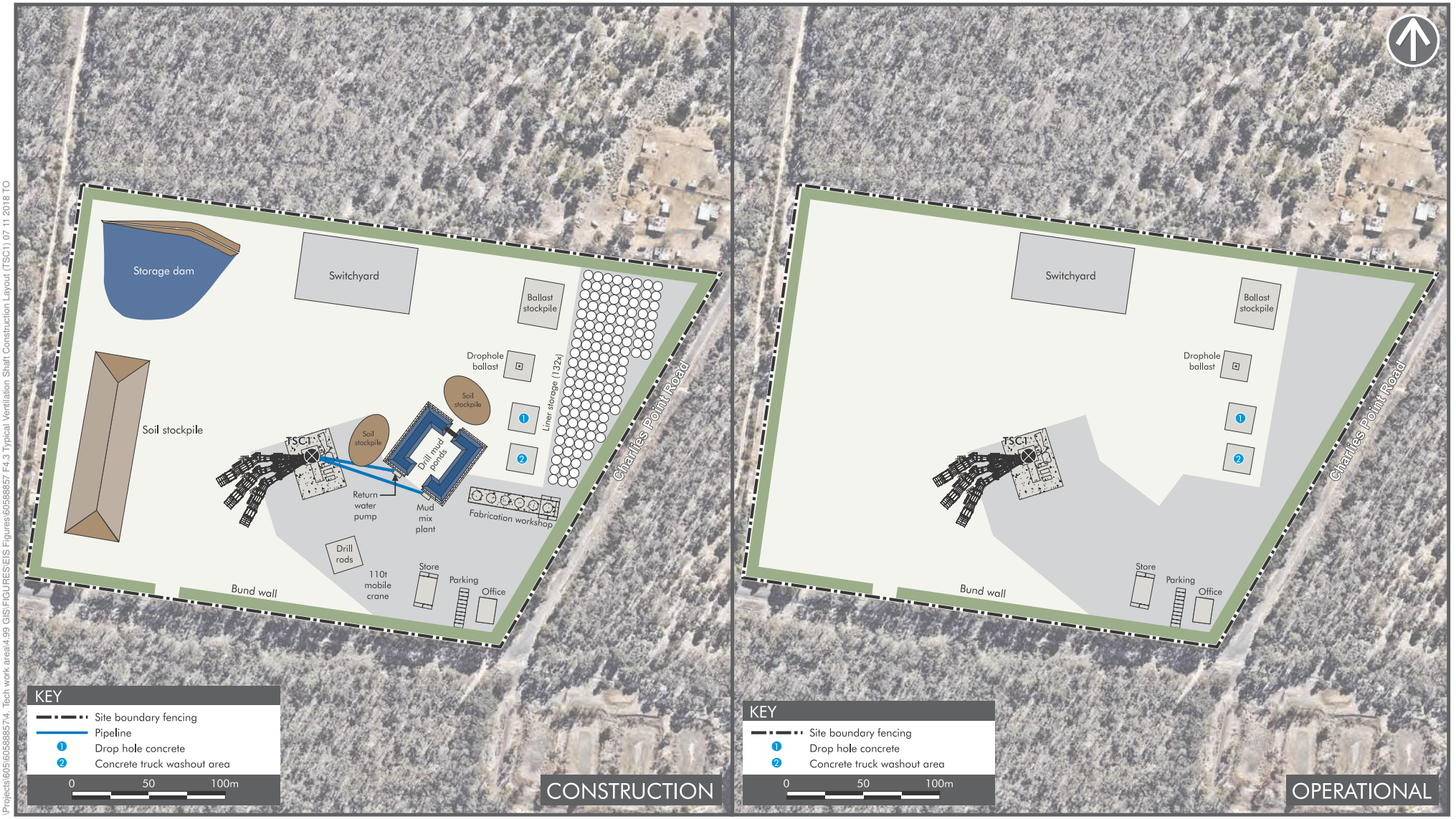
SIMEC MINING

PROPOSED VENTILATION SHAFT LOCATIONS

Tahmoor South Project
Environmental Impact Statement

FIGURE 4.2

This page has been left blank intentionally.



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\60588857 F4.3 Typical Ventilation Shaft Construction Layout (TSC1) 07 11 2018 TO

SIMEC MINING

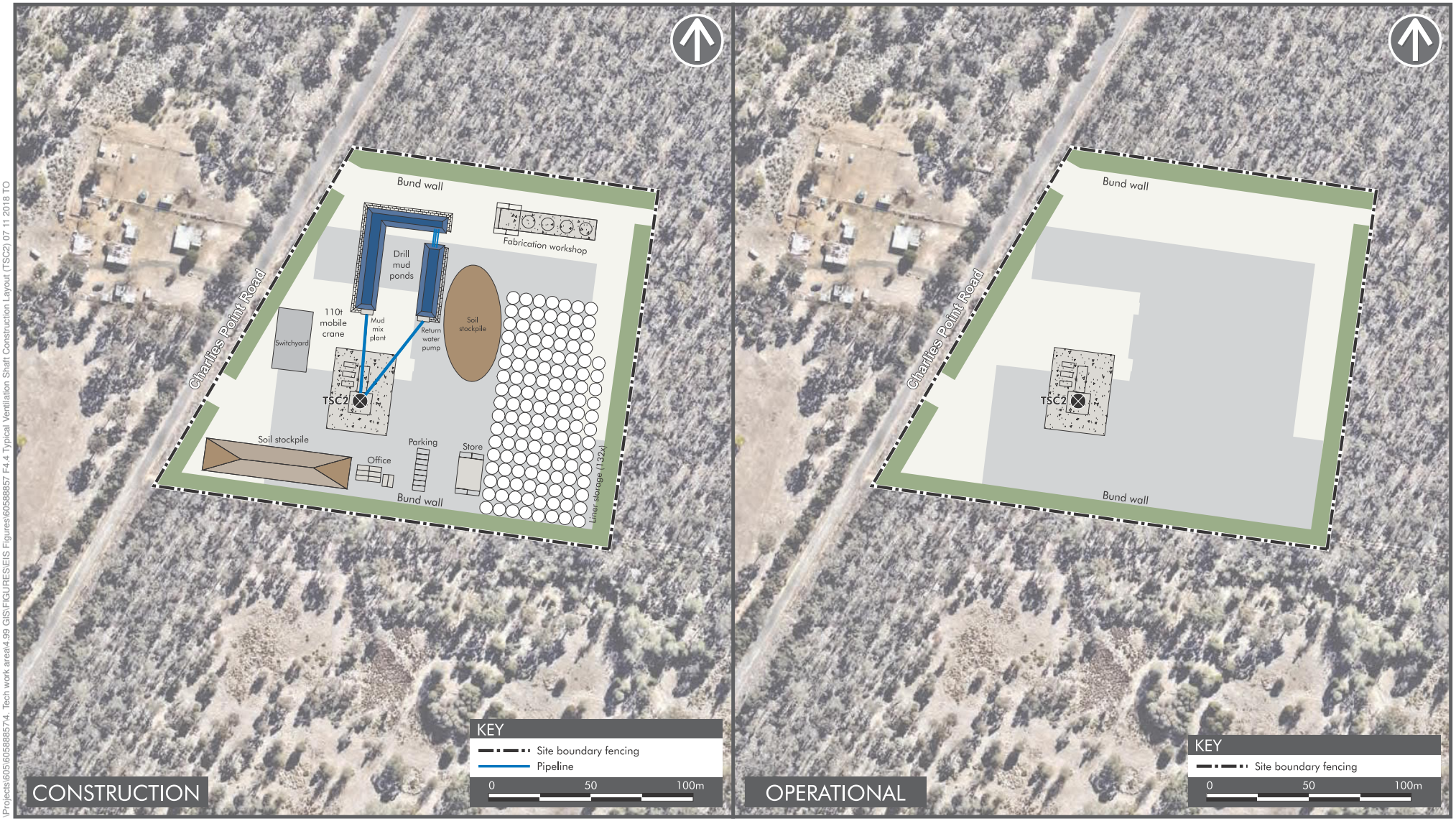
CONCEPTUAL VENTILATION SHAFT LAYOUT (TSC1)

Tahmoor South Project

Environmental Impact Statement

FIGURE 4.3

This page has been left blank intentionally.



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888574 F4.4 Typical Ventilation Shaft Construction Layout (TSC2) 07 11 2018 TO

SIMEC MINING

CONCEPTUAL VENTILATION SHAFT LAYOUT (TSC2)

Tahmoor South Project

Environmental Impact Statement

FIGURE 4.4

4.2.5 Mining Method and Equipment

Underground mining would be undertaken via the main roadway and longwall development using continuous miners. Longwall development refers to the mining of a series of roadways (gate roads) and cut-throughs, to form pillars of coal that would support the overlying strata during the extraction of coal. Longwalls would be up to approximately 305 m wide. The gate roads would be approximately 5.2 m wide and have a height of up to 3 m. **Figure 3.2** and **Figure 4.5** provide a schematic illustration of the relationship between the longwalls and gate roads.

Coal would be cut from the coal face by the longwall shearer, loaded onto the armoured face conveyor and transported to the Surface Facilities Area via a series of underground conveyors. The longwall would retreat as coal is mined and the overlying rock strata would collapse into the void left by the coal extraction, forming the goaf.

Tahmoor Coal would continue to review and investigate improved or alternate mining methods and technology throughout the life of the proposed development. Improved methods would be utilised where available and found to be commercially viable to allow for the efficient and economically viable extraction of the coal resource. Tahmoor Coal would ensure that the resulting environmental and social impacts of improved or alternate methods are consistent with those predicted in this EIS.

4.2.6 Mine Access

The proposed development would use the existing infrastructure at Tahmoor Mine for employee and material access to the mine. Access to the Central Domain would be via the existing Tahmoor Mine Surface Facilities Area, the existing drift, and men and materials travel lift installed within the T3 downcast shaft. The T3 vertical men and material travel lift has a capacity for 70 persons and approximately 12 tonnes of materials.

4.2.7 Coal Production and Transport

Product coal would continue to be transported from Tahmoor Mine to Port Kembla, via the existing mine rail load out, rail loop, the Main Southern Railway and the Moss Vale to Unanderra Railway (**Figure 1.1**). Transport of product coal from the proposed development to Newcastle (Port Waratah) could also occur from time to time.

Tahmoor Mine currently has four allocated train paths per day from ARTC for the rail network between the Tahmoor Mine and Port Kembla. This current allocation is equivalent to the transport of approximately 4.6 million tonnes of product coal per annum and is sufficient for the life of the Tahmoor South Project (which is expected to generate up to 3.5 million tonnes of product coal per annum). A rail transport study has been undertaken for the proposed development, which indicates that the existing rail capacity would be sufficient for the proposed transport of product coal to Port Kembla under the proposed development, and no increase in rail capacity between Tahmoor Mine and Port Kembla would be required. As such, existing rail infrastructure and the number of allowable train movements would remain unchanged (refer to **Section 11.14.4** for further details).

The proposed development would also transport and receive the following by road transport:

- Product coal to domestic end users where rail transport is unavailable;
- Imported coal to blend with Tahmoor Coal for special blends to meet specific customer requirements; and
- Reject material to potential domestic users where rail transport is unavailable and a market opportunity for beneficial use of rejects exists or is being investigated.

Transport of product coal, rejects from the Tahmoor Mine and importation of coal would be restricted to a maximum of 200,000 tonnes per annum and a maximum of 3,000 tonnes per day. Road transport would be generally on a campaign basis and during these transport campaign periods generate a maximum of eight truck movements per hour during the period between 6 am to 7 pm.

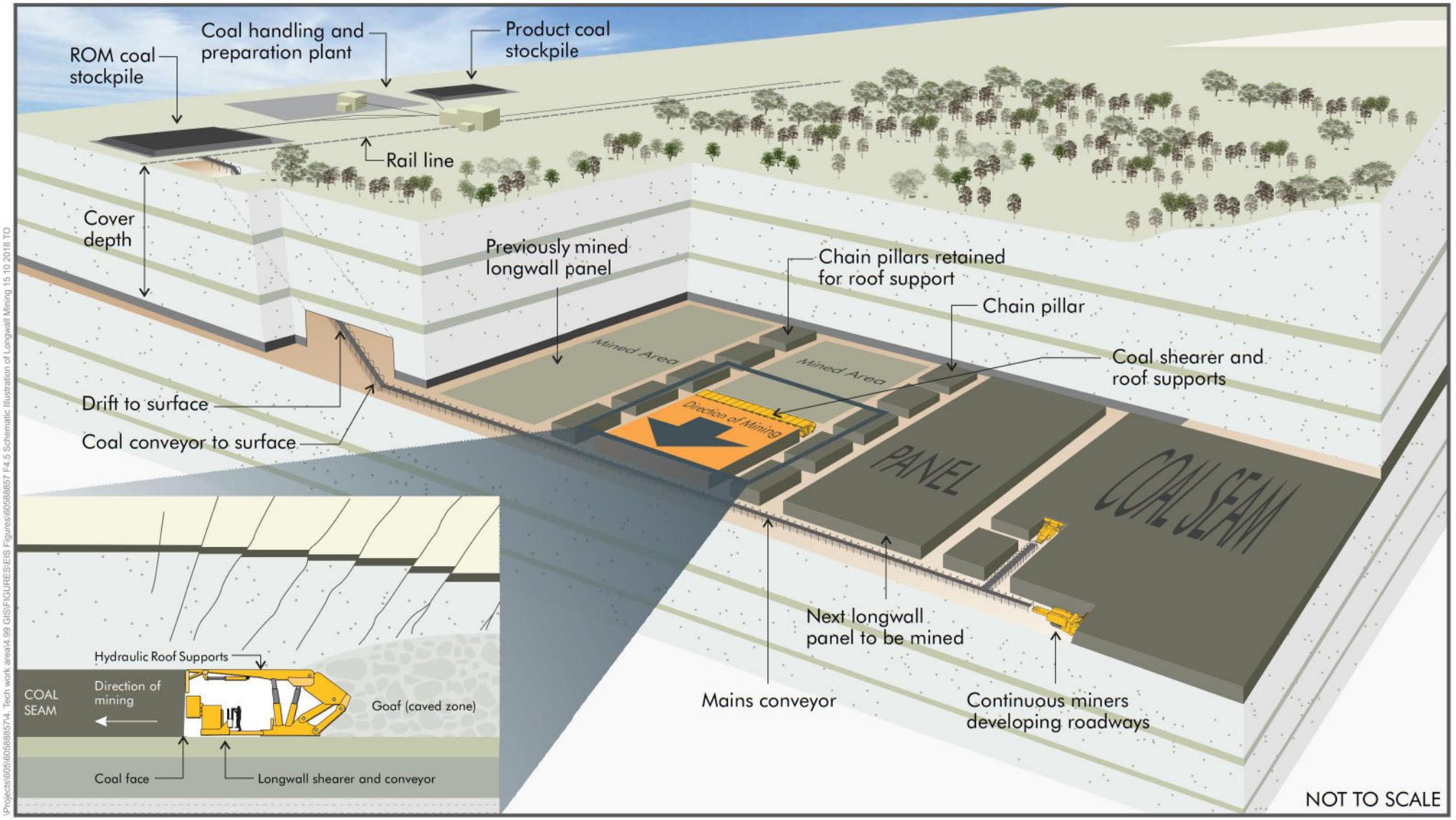
4.2.8 Mine Dewatering

To maintain a safe and efficient underground mine environment, water entering the underground workings needs to be managed. Mine water is proposed to be collected in underground sumps and pumped from the mine to the existing water management system at the Surface Facilities Area for treatment. Treated mine water would be either reused underground for non-potable uses or discharged at the surface via the existing LDP1 to Tea Tree Hollow.

The proposed development is predicted to generate average daily groundwater inflows ranging from around 4.7ML/d to a peak of around of 7.5-8 ML/d in 2029-30 and 2032. In annual terms, the inflows equate to an average of 1,700 ML of water per annum over the period of mining for the proposed development. The peak annual flows are predicted to be approximately 2,850ML in 2029 and 2,600 ML of water in 2032.

A site water balance assessment undertaken for the proposed development (HEC, 2018) indicated that simulated average releases of treated water to Tea Tree Hollow via LDP1 over the life of the proposed development remained compliant with the current EPL daily volumetric limits (refer **Section 11.3.5**). An application would be made to vary the EPL in the instance that discharge volumes at the mine increase beyond this estimate.

This page has been left blank intentionally.



SIMEC MINING

SCHEMATIC ILLUSTRATION OF LONGWALL MINING

Tahmoor South Project
Environmental Impact Statement

FIGURE 4.5

I:\Projects\605\605688574_Tech work area\4.99 GIS\FIGURES\EIS Figures\605688574 F4.5 Schematic Illustration of Longwall Mining 15.10.2018.TO

4.3 Surface Facilities Area

The existing surface facilities and infrastructure at the Tahmoor Mine Surface Facilities Area, operating within surface CCL 716 and Mining Lease 1642, would be utilised for the proposed development.

Upgrades to some aspects of the Surface Facilities Area would be required and are associated with the increase in annual coal production for the proposed development. Upgrades to existing surface infrastructure would be undertaken within the footprint of the existing Tahmoor Mine surface lease (Mining Lease 1642) and additional surface lease areas required for the proposed development, as shown on **Figure 1.5**.

4.3.1 Coal Handling and Preparation Plant

The existing CHPP would be utilised for the proposed development. The existing CHPP would be upgraded as shown on **Figure 4.6**, including the installation of:

- a new coarse rejects screen;
- additional belt press filter capacity;
- an increase in thickener capacity; and
- other upgrades as required.

The existing ROM stockpile area would continue to be used. During peak production ROM coal may be trucked from the ROM stockpile to the coal product stockpiles and re-trucked back to the ROM stockpile when required. Reject material generated from the coal washing process at the CHPP would be transported to the expanded REA via the existing reject conveyor to the reject bin for disposal. It would then be transported by haul truck to the REA (refer to **Section 4.3.2**).

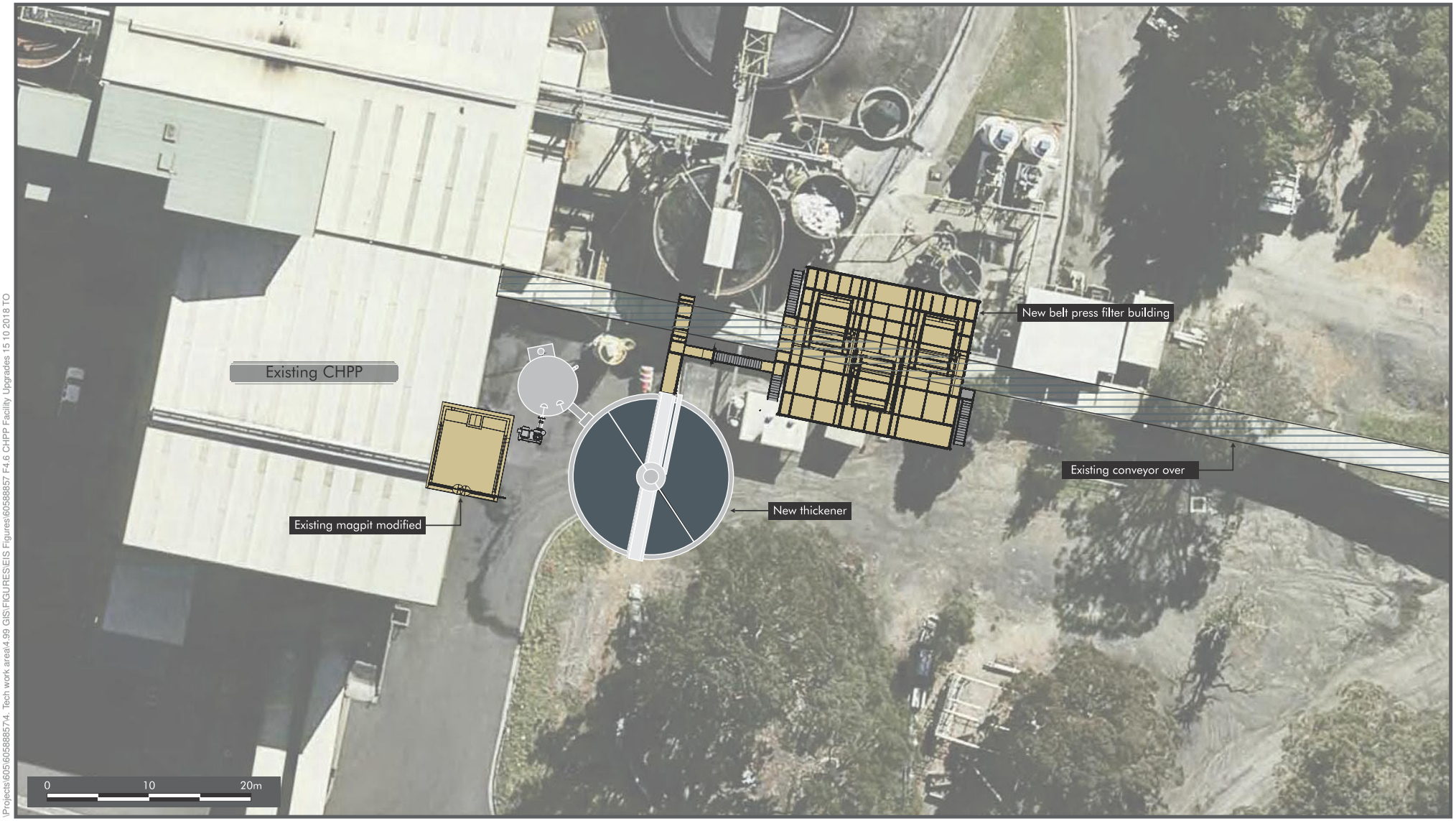
4.3.2 Rejects Management

The existing REA has an area of approximately 89 ha and an approved capacity of about 13 Mt, of which about 4 Mt of capacity remains, which is expected to be used for the completion of the Tahmoor North operations. The existing REA would be expanded onto adjacent areas to accommodate the reject material associated with the proposed development (**Figure 4.7**).

The expansion area would cover up to an additional 43 hectares, providing the additional emplacement capacity required for the life of the proposed development: approximately 12 million tonnes of rejects (refer to **Figure 4.8**). The maximum height of the REA would be increased from RL 300 m to RL 305 m in the southern section of the REA (refer to **Figure 4.9**).

The rejects disposal method has been selected based on a review of a range of disposal options taking into consideration a number of project objectives including:

- provide a safe solution, causing no hazards to mine operations and with low impact on mine stability;
- minimise the impact on the environment where possible, including dust emissions, visual impact, groundwater and sub-surface contamination, use of foreign reagents;
- provide an economic solution, with minimal capital and operating cost, returning a positive benefit to cost ratio, providing employment for the local community and minimising the impact on mine production;
- adopt a sound technical solution, utilising proven technology with high availability and reliability, versatility and flexibility; and
- provide a solution that would enable the disposal of the total volume of rejects forecast for the Tahmoor South project.



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888574 F4.6 CHPP Facility Upgrades 15 10 2018 TO

SIMEC MINING

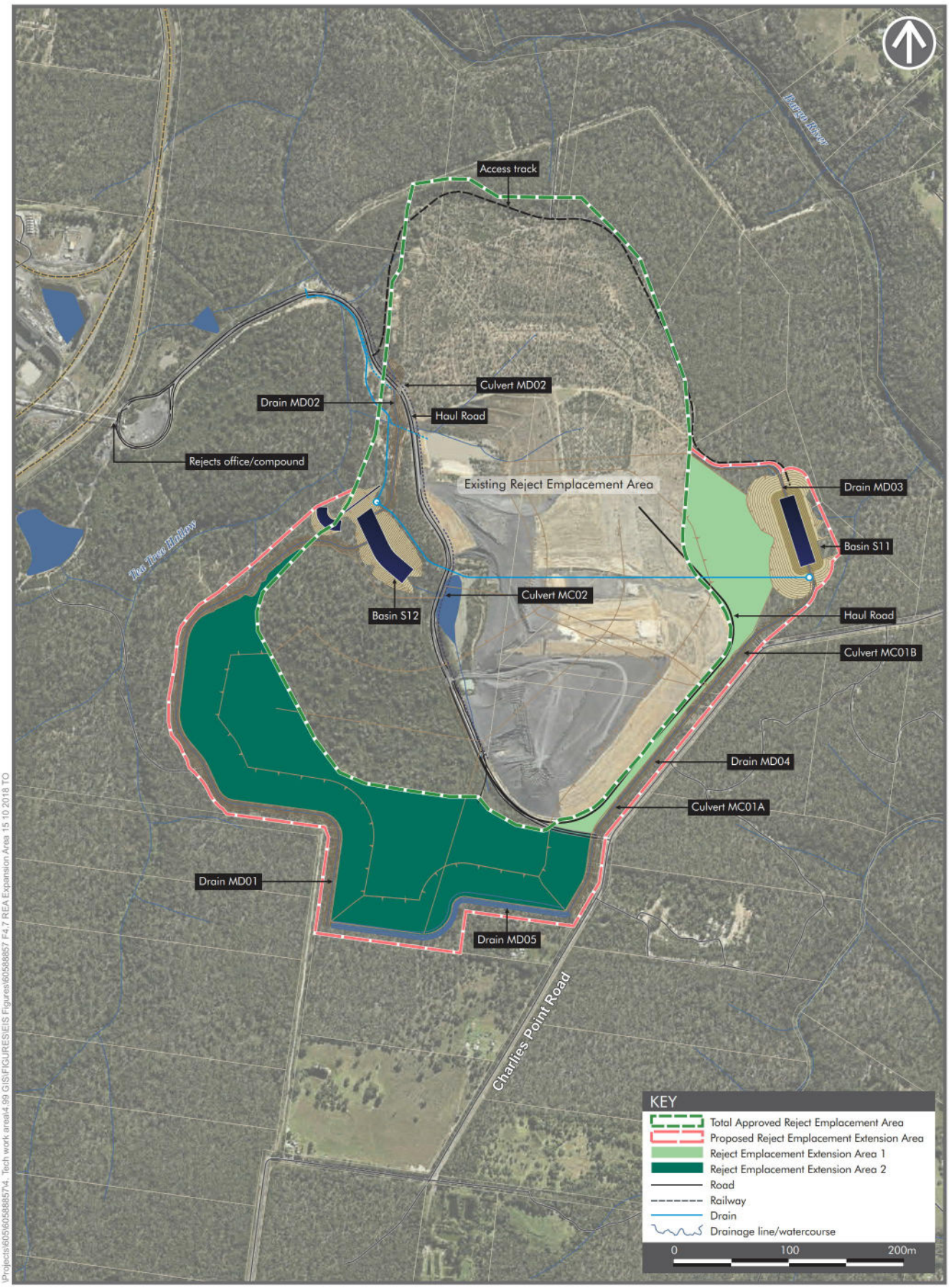
CHPP FACILITY UPGRADES

Tahmoor South Project

Environmental Impact Statement

FIGURE 4.6

This page has been left blank intentionally.



\Projects\605\605888574_Tech work area\4 99 GIS\FIGURES\EIS Figures\605888857 F4.7 REA Expansion Area 15 10 2018 TO

SIMEC MINING

REJECT EMPLACEMENT EXTENSION AREAS

Tahmoor South Project
Environmental Impact Statement

FIGURE 4.7

The proposed expansion of the existing REA takes into consideration a balance of environmental impacts including dust, noise and visual impacts to surrounding properties as well as the impacts to biodiversity.

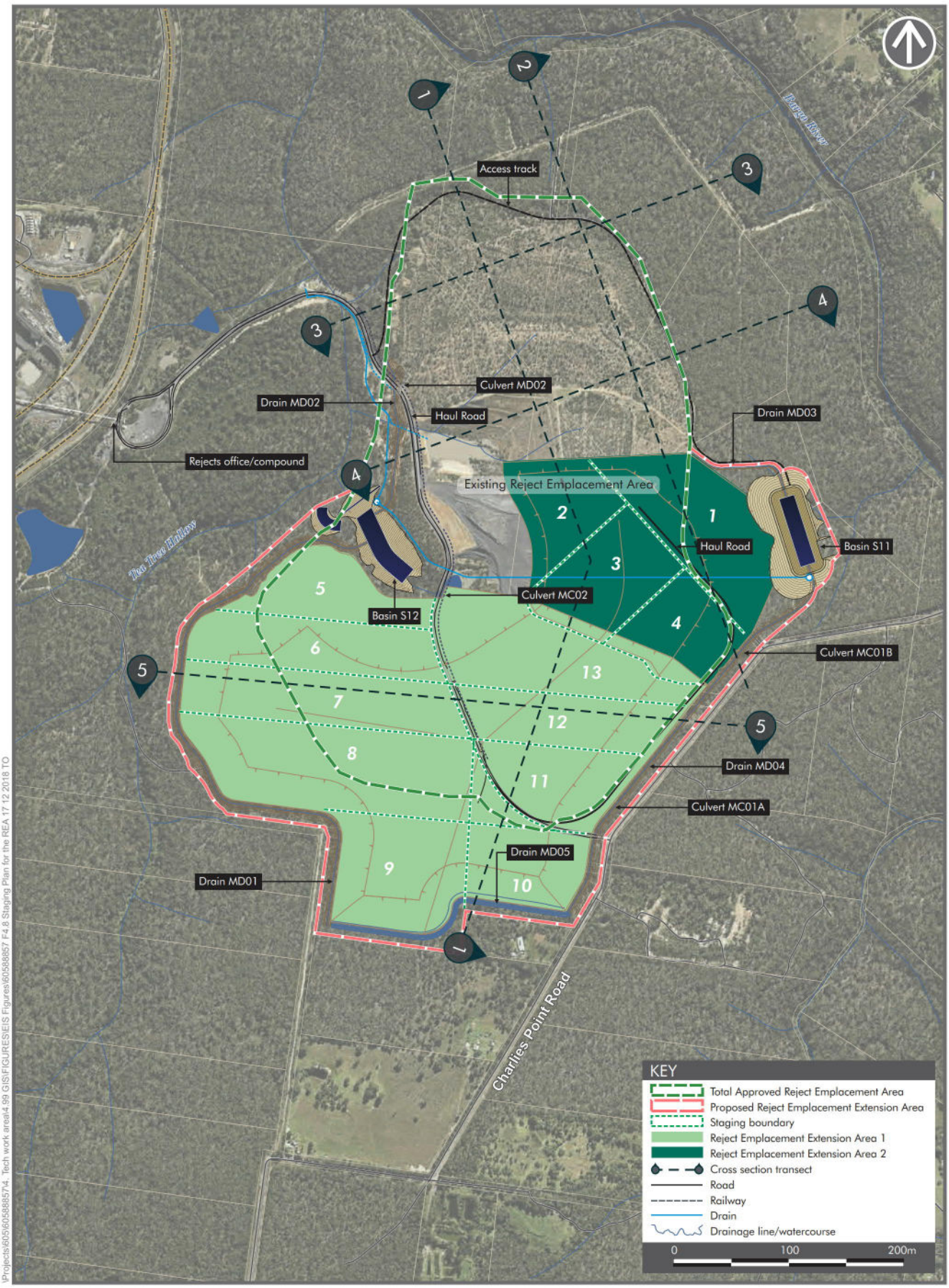
The southern section of the REA is proposed to be increased in height. Consideration was given to raising the northern section of the existing REA which has been rehabilitated however this increased the number of impacted properties from dust and noise impact, hence was not included in the proposed final design.

The preferred disposal strategy consists of two new areas adjoining the existing REA, using a staged fill plan approach. The REA would be progressively rehabilitated over the life of the mine.

Construction and maintenance of new internal haul roads around and within the REA would be required to cater for the REA expansion. The existing stormwater infrastructure would be expanded to include bunding, additional surface water drainage controls and sedimentation dams for the additional areas.

Alternative uses for rejects would be investigated during the life of the project and to facilitate beneficial uses of reject material.

Rejects management for the proposed development is discussed in further detail in **Section 11.20.**



\Projects\605\605888574_Tech work area\4 99 GIS\FIGURES\EIS Figures\605888857 F4.8 Staging Plan for the REA 17 12 2018 TO

SIMEC MINING

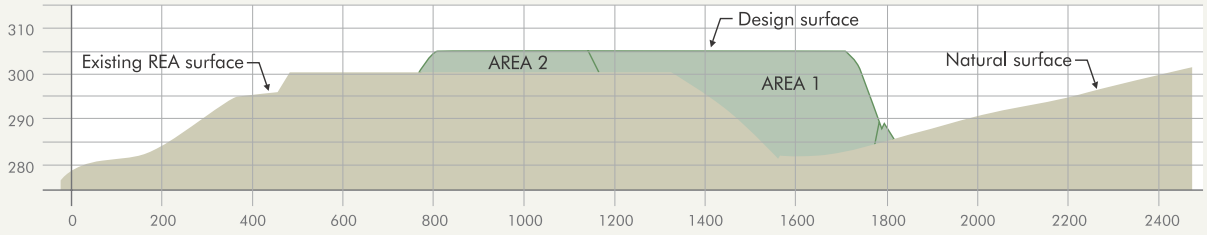
STAGING PLAN FOR THE REA

Tahmoor South Project
Environmental Impact Statement

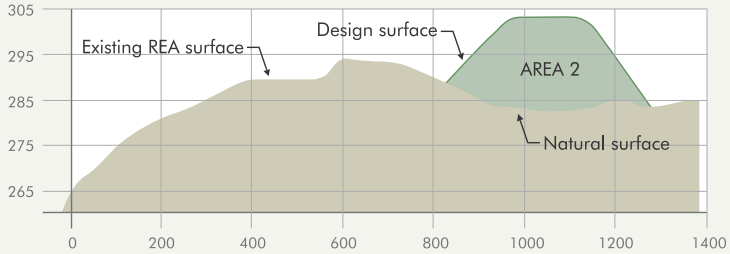
FIGURE 4.8

This page has been left blank intentionally.

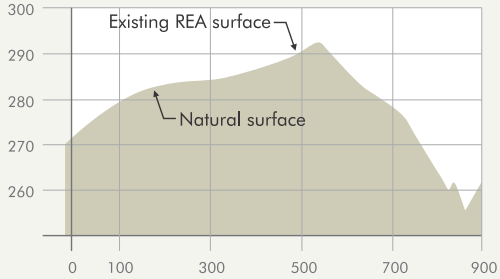
SECTION 1



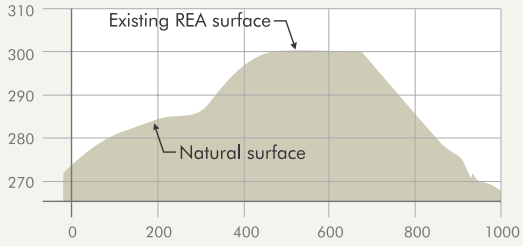
SECTION 2



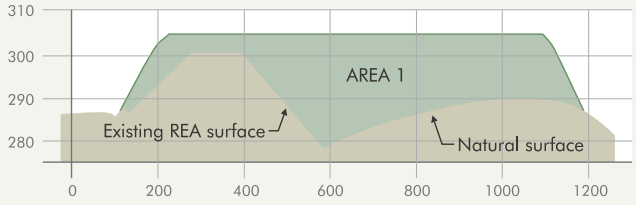
SECTION 3



SECTION 4



SECTION 5



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888857 F4.9 Site Sections for the Proposed REA 10 11 2018 TO

SIMEC MINING

SITE SECTIONS FOR THE PROPOSED REA

Tahmoor South Project
Environmental Impact Statement

FIGURE 4.9

4.3.3 Plant and Equipment

The proposed development would use existing plant and equipment at the Surface Facilities Area. It would also require:

- additional mobile plant for coal material handling at the Surface Facilities Area, and
- ancillary equipment such as trucks, cranes and forklifts for use around the Surface Facilities Area to manage product and equipment stores.

Tahmoor Coal would investigate and utilise improved or alternate coal handling and preparation methods and technology throughout the life of the proposed development to allow for the efficient processing of coal and reject. Tahmoor Coal would ensure that environmental and social impacts resulting from the use of alternate methods are consistent with those predicted in this EIS.

4.3.4 Site Amenities and Layout

While the existing site amenities at the Tahmoor Mine Surface Facilities Area would be used for the proposed development, additional bathhouses would be required to accommodate the expanded workforce.

These would be constructed adjacent to the existing amenities and would consist of pre-fabricated modular buildings (**Figure 4.10**). The existing sewage treatment plant would be upgraded to accommodate the additional employees.

The proposed development would also require minor upgrades of the existing services such as onsite firefighting, water reticulation and power supply systems (**Figure 4.10**).

4.3.5 Infrastructure Services Upgrades

A range of infrastructure services including existing offsite electrical, telecommunications and water reticulation infrastructure currently servicing the Tahmoor Mine would continue to be used with some upgrades. In addition, the construction and commissioning of an extension to the existing 66kV overhead power line from the REA along Charlies Point Road to the proposed ventilation shaft sites would be required.

4.3.6 Site Access and Improvements

The existing vehicular access arrangements to Tahmoor Mine's Surface Facilities Area via Remembrance Driveway, approximately three kilometres south of Tahmoor and five kilometres north of Bargo would continue to provide access for mine personnel, contractors and materials.

There is currently a passing lane northbound and a deceleration turning lane southbound on Remembrance Driveway at the turnoff to Tahmoor Mine. These lanes allow vehicles entering Tahmoor Mine from the south to turn into the Mine without impeding other traffic on Remembrance Driveway.

The existing intersection at the entry to Tahmoor Mine from Remembrance Driveway would be upgraded as part of the proposed development to provide a dedicated right hand turning bay for vehicles entering the Surface Facilities Area from the south and extended acceleration and deceleration lanes for vehicles entering and exiting from the north and south.

The intersection upgrade would accommodate additional traffic movements during the concurrent undertaking of pre-mining activities for the proposed development and the finalisation of longwall mining in Tahmoor North. The intersection upgrade is described further in **Section 11.13**. The upgraded intersection would provide a Level of Service (LoS) of A/B, which is appropriate for the projected traffic along Remembrance Driveway for the life of the project.

Car Parking

The proposed development would involve the construction of a new car parking area with approximately 150 new spaces, to relieve the pressure on existing facilities and to provide additional capacity for the proposed development. The new car parking area would be located to the south of the existing entrance to Tahmoor Mine (**Figure 4.10**).

4.4 Rehabilitation and Mine Closure

A conceptual Mine Closure Plan has been developed for the proposed development, and is included in **Appendix V**. Rehabilitation of the proposed development would be undertaken using a staged approach comprising:

- progressive rehabilitation of the expanded REA; and
- mine closure and rehabilitation of the Surface Facilities Area and ventilation shafts.

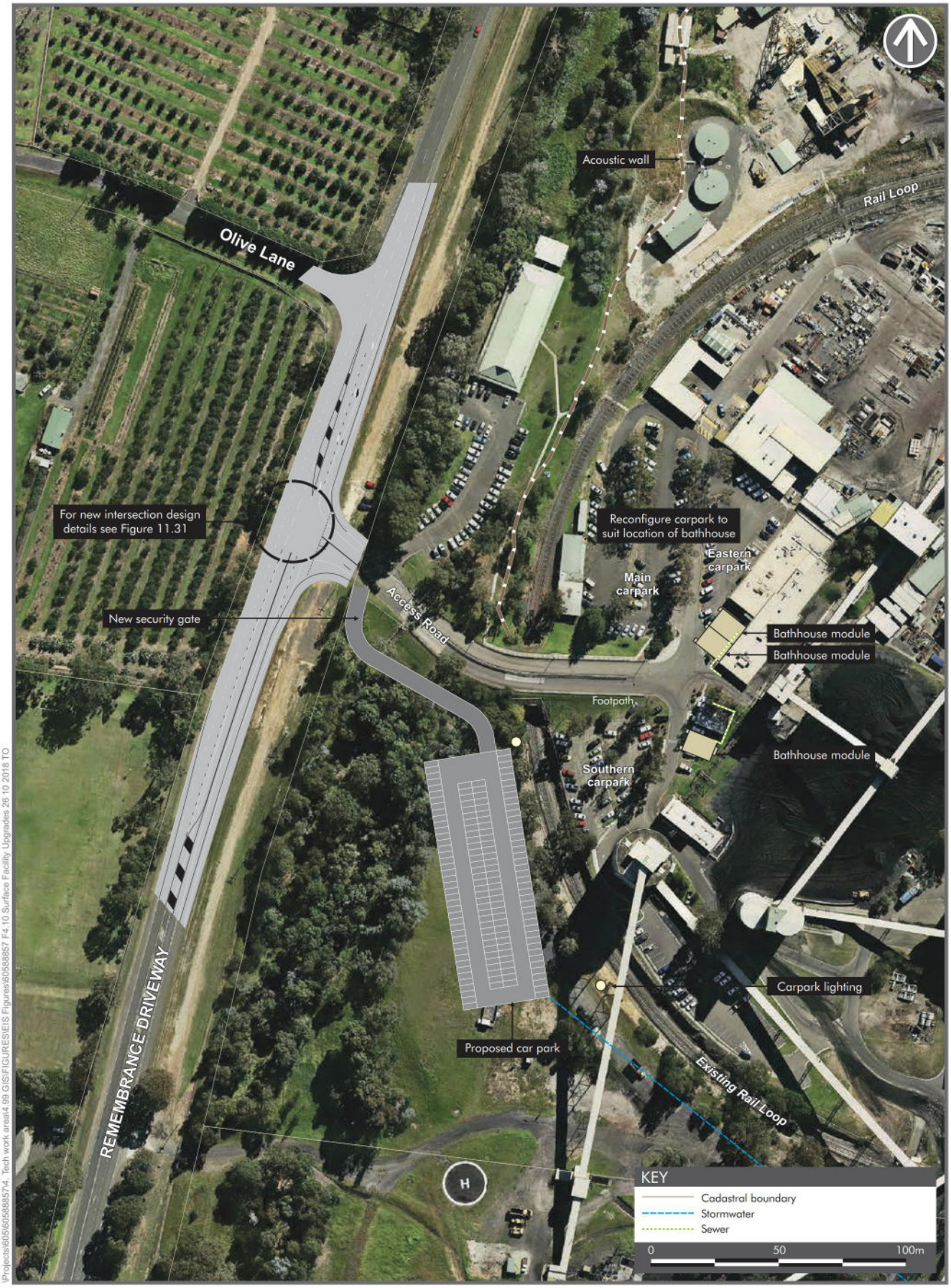
Areas of the REA would be progressively rehabilitated over the life of the proposed development. This process would involve capping the reject material with topsoil and establishing vegetation. Annual monitoring would be undertaken to determine the success of revegetation and to inform ongoing management of the rehabilitated areas.

There are a number of post mining land use options that may be applicable to the proposed development including passive recreation, native bushland conservation or employment lands such as light industrial. Currently, it is considered that the likely final land use option for most of the surface areas would be native bushland. However, final land use options would be confirmed in a detailed closure planning process, which involves undertaking a final land use analysis. A detailed closure plan would be developed no later than five years from mine closure. In broad terms, rehabilitation of the Surface Facilities Area and ventilation shafts would involve:

- removal of infrastructure and services;
- levelling, re-contouring and grading to achieve safely battered slopes and surfaces;
- applying topsoil for rehabilitation where required;
- establishing native bushland vegetation which would require minimal ongoing care and maintenance; and
- monitoring of rehabilitated areas to assess the success and inform the management of areas of re-established vegetation.

Infrastructure and facilities may be retained where compatible with the end land uses which would be identified in the detailed closure planning process.

This page has been left blank intentionally.



\Projects\605\605888574_Tech work area\4 99 GIS\FIGURES\EIS Figures\605888857 F4.10 Surface Facility Upgrades 26 10 2018 TO

SIMEC MINING

SURFACE FACILITY UPGRADES
Tahmoor South Project
Environmental Impact Statement

Source: Arkhill Engineers (11/06/2013)

FIGURE 4.10

4.5 Project Timeframes

4.5.1 Indicative Mining Schedule

The proposed development seeks to extend the life of underground mining at Tahmoor Mine beyond the predicted completion of mining at Tahmoor North in 2022, with this timing depending upon geological, mining and economic conditions.

A number of pre-mining activities are required to be completed prior to commencement of longwall mining for the Tahmoor South Project. These pre-mining activities include:

- gas drainage;
- redevelopment of the pit bottom;
- longwall development including establishment of gate roads;
- installation of electrical, water and gas management networks; and
- the purchase and installation of equipment.

The proposed development's pre-mining activities are anticipated to take approximately three to four years to complete before longwall mining can commence in the Central Domain. Longwall mining is proposed to commence in the Central Domain once mining is completed at Tahmoor North. Mining at Tahmoor North is anticipated to be completed by 2022 depending upon geological, mining and economic conditions.

Mining for the proposed development would be complete by approximately 2035, with surface works, rehabilitation and mine closure occurring after the completion of mining activities. **Table 4.1** provides an outline of the indicative schedule for mining.

Table 4.1 Indicative mining schedule (dependent on geological, mining and economic conditions)

Activity	Year
Pre mining activities	Start in 2019
Central Domain development	Approximately 2019
Mining of Tahmoor North complete	Approximately 2022
Central Domain longwall mining	Approximately 2022 – 2035

4.6 Workforce and Hours of Operation

4.6.1 Workforce

The proposed development would involve ongoing employment of the existing workforce at Tahmoor Mine, which totals approximately 390 ongoing permanent and contract staff. In addition, there would be a period of concurrent operations for a period of approximately three to four years, involving pre-mining activities for the proposed development and longwall mining in Tahmoor North, during which time approximately 50 to 175 additional people would be required to augment the current workforce.

4.6.2 Hours of Operation

The proposed development, including construction activities, would operate 24 hours a day, seven days per week, consistent with the working hours of the current operations at the Tahmoor Mine.

Construction of the ventilation shafts, upgrades and augmentation of the existing infrastructure, services and amenities at the Surface Facilities Area, and upgrades to the intersection at the entrance to the Surface Facilities Area would be generally undertaken between Monday and Sunday from 7 am to 6 pm. During ventilation shaft construction, the shaft drilling rig and shaft lining would operate continuously 24 hours a day, seven days a week.

4.7 Environmental Management

Environmental management at Tahmoor Mine is currently governed by the *Environmental Management System Strategy and Framework* (refer to **Section 3.7**). The proposed development would be managed within this Framework and in line with existing procedures. Where required, the existing procedures and management plans would be updated to reflect the specific details of the proposed development.

In addition, a MOP or RMP would be prepared to meet the requirements of the Mining Act and *Mining Regulation 2016*. The DRG would be consulted to ensure that the MOP or RMP is prepared in accordance with the current guidelines at the time.

4.7.1 Subsidence Monitoring and Management

Tahmoor Mine currently manages and monitors subsidence as part of the existing operations at Tahmoor North. The systems and programmes currently in place to monitor and manage subsidence (refer **Section 3.2.9**) would continue during the proposed development and would be augmented to monitor the effects of mining within the Central Domain (refer to **Section 11.1**).

Specifically, subsidence would be managed through implementation of an EP in consultation with stakeholders. The management plans would describe measures to be undertaken to monitor surface subsidence and physical changes that are predicted to occur during mining. Measures detailed in the management plans would include:

- the requirements for inspection regimes for natural and built surface features;
- the layout of monitoring points and parameters to be measured;
- monitoring methods and accuracy;
- the timing and frequency of surveys and inspections; and
- processes for recording and reporting of monitoring results.

The management and monitoring plans would be prepared and lodged with the DRG prior to the commencement of mining.

4.7.2 Water Management

Surface water runoff from operational areas and stockpiles would continue to be captured by the existing stormwater treatment dams at the Surface Facilities Area. Following treatment, the water would continue to be discharged to Tea Tree Hollow at LDP1.

Potable water supply for use at the Surface Facilities Area and underground would be drawn from the town water main, and non-potable supply sourced from the recycled water treatment plant at the Surface Facilities Area. Mine water would be treated and recycled for non-potable underground use, or pass through the stormwater treatment dams and be discharged via the LDP and LOPs.

Licensed Discharge Point

The proposed development would collect water underground in sumps and pump this water via underground pipes to the surface. As per the existing operations, the proposed development would continue to discharge a portion of the stormwater and treated mine water via licensed discharge point LDP1 under EPL 1389 (see **Section 3.3.6**).

Site Water Balance

The major components of the mine water balance for the proposed development would be:

- inflows from surface runoff, direct rainfall onto dam surfaces, potable water draw and groundwater inflows to the underground operations; and
- outflows including discharges to the Bargo River catchment via the LDP and LOPs to Tea Tree Hollow; evaporation from dam surfaces; and water loss to product coal and coarse rejects.

The site water balance is discussed in detail in **Section 11.4**.

Site Water Management Plan

Water management during operation of the proposed development would be governed by the water management plan currently in place at Tahmoor Mine. The water management plan would be updated to encompass the operations associated with the proposed development and would be implemented in line with the following objectives:

- utilise available surface water runoff for use as process water;
- minimise instances of licensed discharge;
- minimise the magnitude of licensed discharge; and
- the quality and quantity of water discharged to be in accordance with licensed water quality criteria.

5.0 Mine Design Considerations

Pre-feasibility and feasibility investigations were undertaken for the proposed development to inform the extent of mining and the longwall layout. These studies considered the way in which the geology and surface environment of the Project Area may constrain the extent of longwall mining that could feasibly be undertaken as part of the proposed development.

In addition, significant surface environmental features, likely to be sensitive to subsidence impacts, were identified and mapped. A risk management approach was adopted to consider the potential impacts of the proposed development on these significant and sensitive environmental features using early subsidence predictions. The risk management approach was then used to identify preliminary RMZs for the proposed development. These preliminary RMZs informed the development of the mine plan including the extent of mining and the proposed layout of the longwalls.

This section details the geology, hydrogeology and surface environmental features as they relate to the development of the mine plan within the Project Area.

5.1 Geology

Tahmoor Mine is situated within the Southern Coalfield of NSW which is part of the greater Sydney-Bowen Geological Basin. This major basin extends from Central Queensland to Wollongong in southern NSW. The Basin is bound by the Lachlan Fold Belt to the west and New England Fold Belt to the east.

5.1.1 Stratigraphy

Geology of the Sydney Basin is characterised by numerous coal sequences. Permian Illawarra Coal Measures are the main coal bearing sequence in the Southern Coalfield, which are overlain by Triassic strata of the Narrabeen and Wianamatta Groups (**Figure 5.1** and **Figure 5.2**). The Illawarra Coal Measures range in thickness from 80 m to 130 m and contain the economically important Bulli and Wongawilli coal seams.

The overlying Triassic strata are up to 400 m thick and contain sandstone (Hawkesbury Sandstone) and shale (Wianamatta Group). These are the only rock units to outcrop within the Project Area. The basement rock in the region is defined by Palaeozoic igneous to metamorphic rocks of the Lachlan Fold Belt.

The Permian Illawarra Coal Measures are an interbedded geological sequence that is up to 100 m thick and includes layers of siltstone, sandstone, claystone and contain seven identified coal horizons, namely the:

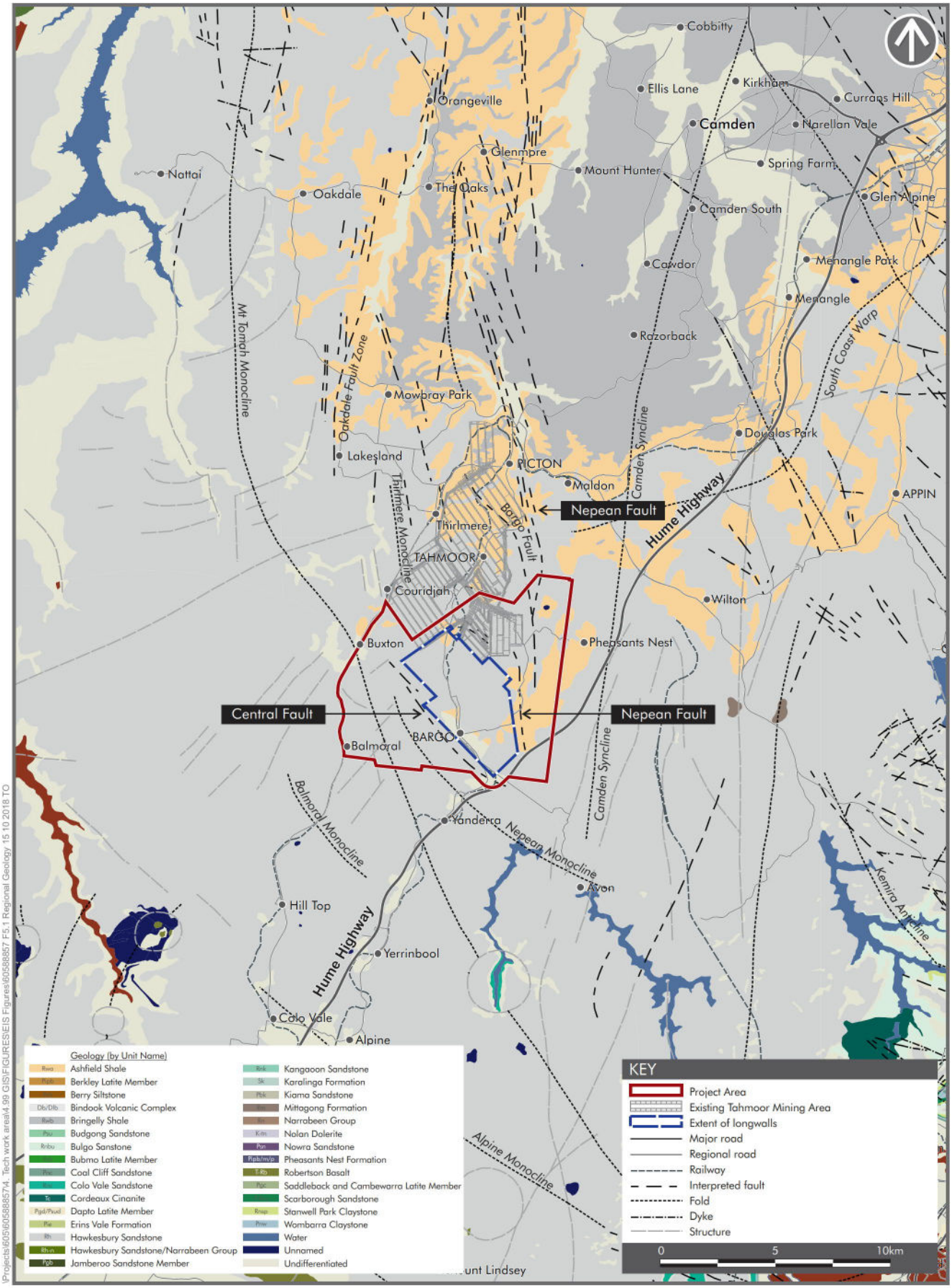
- Bulli seam;
- Balgownie seam;
- Cape Horn seam;
- Wongawilli seam;
- American Creek seam;
- Tongarra seam; and
- Woonona seam.

Of the above listed coal seams, only Bulli, Wongawilli and Tongarra seams are thick enough to be considered as potential mining targets within Tahmoor Coal's leases.

Bulli Seam

The Bulli seam is a hard coking coal with a seam thickness that ranges from 1.6 m – 3.4 m within the Project Area. However, towards the southwest of the Project Area, the Bulli seam thins to less than 1 m thick. For most of the Project Area, a stone parting with average thickness of 0.1 m splits the bottom of the Bulli seam.

This page has been left blank intentionally.



I:\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888857 F5.1 Regional Geology 15 10 2018 TO

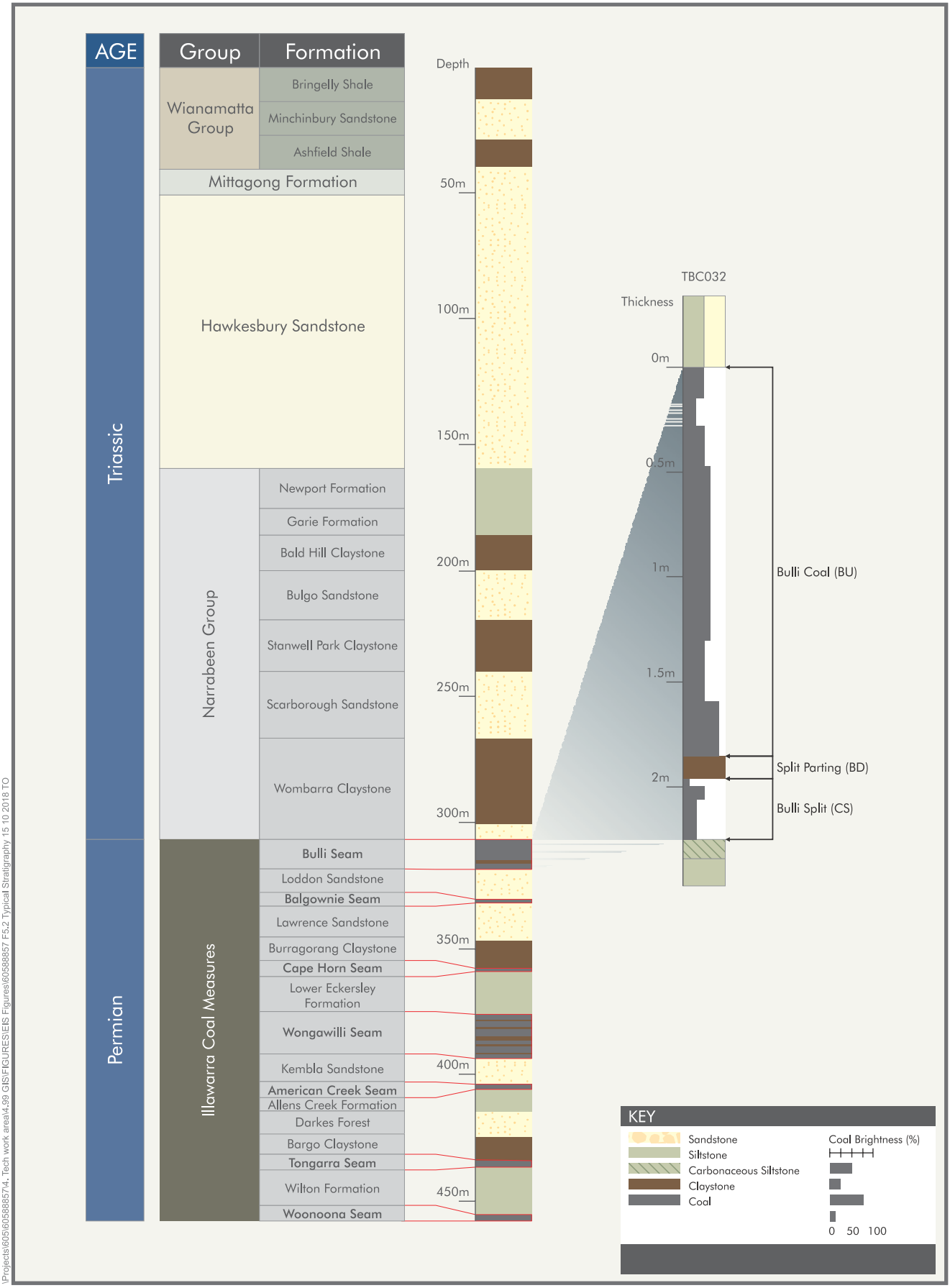
SIMEC MINING

REGIONAL GEOLOGY

Tahmoor South Project
Environmental Impact Statement

FIGURE 5.1

This page has been left blank intentionally.



\Projects\605\605888574; Tech work area4.99 GIS\FIGURES\EIS Figures\605888857 F5.2 Typical Stratigraphy 15 10 2018 TO

SIMEC MINING

TYPICAL STRATIGRAPHY OF THE REGION

Tahmoor South Project
Environmental Impact Statement

Source: McElroy Bryan Geological Services (July 2013)

FIGURE 5.2

The Bulli seam can be described in three sections:

- Bulli Coal - The top and most consistent section across the deposit comprising bright/dull coal with an average thickness of 2.2 m;
- Bulli Parting - A stone parting located towards the base of the seam with average thickness of 0.1 m (reaches 0.7 m thick in isolated parts of the deposit) and comprises carbonaceous claystone tending to tuff; and
- Bulli Split - A basal coaly band with average thickness of 0.2 m and comprising dull to stony coal.

Balgownie Seam

The Balgownie Seam is located approximately 10 m below the Bulli seam and comprises dull and bright banded coal with average thickness of 0.3 m. Strata between Bulli and Balgownie seams comprises Loddon Sandstone which is characterised by fine-medium sandstone with sporadic carbonaceous siltstone. Directly below the Balgownie Seam is fine sandstone grading to siltstone and is known as the Lawrence Sandstone.

Balgownie Seam deteriorates towards the south to carbonaceous claystone and completely disappears in the southern half of the Project Area.

Cape Horn Seam

The Cape Horn Seam sits approximately 5 m below the Balgownie Seam and is a coal horizon varying from 0.1 m - 0.7 m thick. This coal band deteriorates to carbonaceous shale in some areas of the deposit. Below this coal seam is the Lower Eckersley Formation, ranging from 2 m – 7 m thick and comprising an interbedded sequence of siltstone/claystone overlying the Wongawilli Seam.

Wongawilli Seam

The Wongawilli Seam is mined elsewhere within the Southern Coalfields and may be targeted in the future for longwall mining within the Project Area but does not comprise part of the current proposed development. This seam sits 8 m – 22 m below the Bulli seam and has an approximate thickness of 10 m. The seam comprises two sections (upper and lower) separated by the Farnborough Tuff. The Farnborough Tuff is a tuffaceous claystone varying in thickness from 0.5 m - 1.5 m thick, and is a distinctive regional marker horizon. The buff to grey coloured claystone has abrupt upper and lower contacts.

American Creek Seam

The American Creek Seam occurs approximately 7 m below the Wongawilli Seam and is approximately 1 m thick. This seam is usually found as two plies comprising dull coal tending to carbonaceous claystone with a siltstone parting between the plies.

Tongarra Seam

The Tongarra Seam sits approximately 30 m below the American Creek Seam and 60 m below the Bulli seam. This seam consists of dull coal with thin claystone bands and ranges from 1 m – 2 m thick.

Woonona Seam

The Woonona Seam is the deepest seam intersected within the Project Area at depths ranging from 360 m – 530 m. This seam is approximately 20 m below the Tongarra Seam with approximate thickness of 2 m.

5.1.2 Geotechnical Constraints

Geotechnical constraints to longwall mining include the presence of geological fault zones and igneous intrusions.

The southern portion of the Sydney Basin contains numerous regional scale geological structures. These structures form a linear north-northeast trending structurally complex zone comprising the Lapstone Monocline and Fault System and Nepean Fault further south. The Nepean Fault Zone marks the eastern boundary to mining at Tahmoor North. For the proposed development the Central Domain is bounded to the east by the Nepean Fault Zone and to the west by the Central Fault. The sub-parallel trending Oakdale Fault, Glenbrook Fault, Bargo Fault and Thirlmere Monocline are also present within the regional structural zone.

The Project Area is situated on the western limb of the north plunging Camden Syncline. This area sits within the Macdonald Trough which is bound to the west by the Blue Mountains and to the east by the Illawarra Escarpment. The northwest trending Mount Tomah Monocline is associated with a regional hinge line which defines the boundary between these two structural domains.

Geological Faults

Two major fault zones exist within the Project Area (refer to **Figure 5.1**): the Nepean Fault and the Central Fault zones. The presence of these fault zones within the Project Area has constrained the extent of longwalls and defined the mining domain for the proposed development. The Central Domain is bounded to the east by the Nepean Fault Zone and to the west by the Central Fault.

The Nepean Fault Zone is the most significant geological structural feature in the Project Area and is approximately 350 m wide and trends north south. It is a normal fault system which appears to exhibit an echelon style. Seismic surveys indicate the Nepean Fault Zone comprises many near vertical faults with an overall displacement in the order of up to 60 m.

The Central Fault is a normal fault trending northwest with a vertical displacement up to 20 m, east side up. The Central Fault has surface expression which affects the dissected valley of Hornes Creek as it flows towards the Bargo River gorge. This fault was identified in the 2D seismic surveys undertaken for the proposed development and was also intercepted in one drill hole where the Wongawilli Seam has been displaced.

Igneous Activity

As with other parts of the Sydney Basin, the Southern Coalfield has been affected by post Permian igneous activity. Igneous intrusions of Tertiary age are prevalent in the eastern and central parts of the Southern Coalfield. When intersected at the coal seam level these intrusion have an adverse effect on coal quality. Igneous activity at depth can also cause the doming of strata in the southern-central portion of the Southern Coalfield which in turn impacts on the feasibility of coal extraction.

Surface basalt flows are predominately confined to the southern portion of the Southern Coalfield and are not present within the Project Area. The Coombes Sugarloaf diatreme is the only known igneous feature which outcrops within the Project Area. The Coombes Sugarloaf diatreme is located in the north-east corner of the Project Area and has an approximate diameter at surface of 280 m.

Dykes and sills have been encountered in underground mining operations at Tahmoor North and may also be encountered during operation of the proposed development. At this point in time, the only igneous body identified within the Project Area, at the level of the Bulli seam, is a sill approximately 30 cm thick and located in the southeast corner of the Project Area.

The small scale igneous bodies at Tahmoor North have not caused significant operational issues, and it is not expected that similar features encountered during mining at Tahmoor South would disrupt operations.

5.2 Hydrogeology

Groundwater inflow (water make) enters underground mines from the target coal seam as well as the surrounding strata. The volume of groundwater inflow varies depending on natural inputs to the system, aquifer properties and dimensions of the mine workings. Water make is managed through a system of underground pumps and holding dams prior to extraction of some water make to the surface water management system, including processing at the recycled water management plant, with excess water discharged to Tea Tree Hollow via LDP 1.

Groundwater monitoring has been undertaken within the Project Area in order to provide input into a regional hydrogeological model. The groundwater monitoring has included packer testing of the Bulli and Wongawilli Seams to determine seam permeability.

Vibrating wire piezometers have been installed in numerous holes at specific stratigraphic horizons to gain groundwater hydraulic pressure data. In 13 bore holes, up to 10 piezometers were installed within the stratigraphic package from Hawkesbury Sandstone down to the Wongawilli Seam. In 17 bore holes, one piezometer was placed at each of the Bulli and Wongawilli Seams.

Conceptual and numerical hydrogeological models were established for the proposed development to assess the adequacy of the current management of water make (refer **Section 11.3**). The hydrogeology of the Project Area is discussed in detail in **Section 11.3**.

5.3 Environmental Planning Constraints and Considerations

The mine design for the proposed development took into account the geological constraints, the sensitivity and significance of the surface features as well as RMZs for those surface features. The approach taken to mine design is detailed below.

The principles of mine design for the proposed development involved a risk management approach in the context of recent publications regarding impacts of longwall mining in the Southern Coalfields. These include:

- the *2008 Southern Coalfield Inquiry (Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield – Strategic Review)*;
- the Thirlmere Lakes Inquiry Chief Scientist and Engineer reports; and
- the NSW Planning and Assessment Commission (PAC) reports for Metropolitan Coal Project and the Bulli Seam Operations Project.

5.3.1 Southern Coalfield Inquiry

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

The purpose of the Southern Coalfields Inquiry was to:

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

The Southern Coalfields Inquiry, in considering the natural features of the Southern Coalfields and the impacts of subsidence, concluded:

- the site conditions within the Southern Coalfields including a dissected landscape of incised rivers and gorge country as well as geological features including faults and dykes, give rise to non-conventional subsidence impacts such as valley closure, upsidence and regional far-field horizontal displacement; and

- it is the valley closure and upsidence effects from underground mining that create the majority of impacts on significant natural features such as the cracking of stream beds, rock falls from cliff lines and alteration of groundwater chemistry in shallow aquifers.

The Southern Coalfields Inquiry made recommendations regarding best practice in relation to the assessment of subsidence impacts, ways to minimise adverse impacts on significant natural features, and the management, monitoring and remediation of subsidence and subsidence related impacts.

This environmental assessment for the proposed development has considered the recommendations of the Southern Coalfield Inquiry report as summarised in **Table 5.1**, and further discussion of the relevant environmental impacts and proposed management measures is included in **Section 11.0**.

Table 5.1 Consistency of the proposed development with recommendations of the Southern Coalfields Inquiry

Recommendations for environmental assessments	Comment	Section of EIS
A minimum of two years of baseline data, collected at an appropriate frequency and scale, should be provided for significant natural features, whether located within an RMZ or not.	At least two years of baseline data has been collected for surface water (hydrology and water quality), groundwater (level and geochemistry) and ecology (terrestrial and aquatic).	**Sections 11.3**, **11.4**, **11.6**, and **11.7** **Appendix I, J**, and **K**
Identification and assessment of significance for all natural features located within 600 m of the edge of secondary extraction.	Natural features within 600 m of the edge of secondary extraction have been identified and assessed in terms of significance.	**Sections 11.1**, **11.2**, **11.3, 11.4**, **11.5**, **11.6**, **11.7**, **Appendix F, H, J, K**
Better distinction between subsidence effects, subsidence impacts and environmental consequences.	A Subsidence Impact Assessment (MSEC, 2018) was undertaken for the proposed development. The environmental consequences of subsidence impacts have been assessed by the Geomorphology, Groundwater, Surface Water and Ecology assessments.	**Sections 11.1**, **11.2**, **11.3**, **11.4**, **11.5**, **11.6** and **11.7**, **Appendix F, H, I, J, K**
Increased transparency, quantification and focus in describing anticipated subsidence impacts and consequences.	A Subsidence Impact Assessment (MSEC, 2018) was undertaken for the proposed development and included a detailed methodology and assessment of subsidence impacts.	**Section 11.1** and **Appendix F**
Establish the presence of, and understand major geological features such as faults and dykes which may lead to non-conventional subsidence.	Tahmoor Coal has undertaken an extensive exploration program to identify geological features. The Subsidence Impact Assessment (MSEC, 2018) considered the presence of geological features which may lead to non-conventional subsidence and included discussion of impacts in the context of elevated levels of subsidence observed in the vicinity of the Nepean Fault at Tahmoor North.	**Section 11.1** and **Appendix F**

Recommendations for environmental assessments	Comment	Section of EIS
Increased communication between subsidence engineers and specialists in ecology, hydrology, geomorphology, etc.	The subsidence engineers and specialists in ecology, hydrology, geomorphology, and archaeological heritage collaborated during the preparation of this EIS in order to identify the significance of natural features and to quantify the risk of impacts to natural features within the Project Area. This collaboration took the form of a series of risk workshops for the proposed development and a three day field visit to walk the length of key waterways as a group.	**Section 5.3.6**
Key aspects of the subsidence assessment (particularly in respect of predicted impacts on significant natural features and their consequences) should be subject to independent scientific peer review and/or use of expert opinion in the assessment process.	The Subsidence Impact Assessment (MSEC, 2018) was subjected to an independent peer review by Ken Mills, Principal Geotechnical Engineer at SCT Operations Pty Ltd.	**Section 11.1** and **Appendix F**
Increased use of net benefit reviews by both mining proponents and regulatory agencies in assessing applications.	The net benefit of the proposed development has been considered in the context of environmental, social and economic impacts.	**Section 13.1**
Validation of subsidence prediction technology through monitoring of results against earlier predictions to improve the accuracy and confidence of subsidence predictions.	The Subsidence Impact Assessment (MSEC, 2018) included a summary of subsidence observations from the existing operations at Tahmoor North. These observations were used to inform the impact assessment for the proposed development, particularly relating to the potential for unconventional subsidence to occur.	**Section 11.1** and **Appendix F**
Mining companies should not rely on mitigation measures, for stream bed cracking, as a forward management strategy for highly-significant features. Where mitigation measures are proposed as a contingency, detailed information and evidence concerning the effectiveness of proposed remediation measures is required.	Where highly significant features have been identified (such as the Bargo River gorge, the Nepean River, Eliza Creek and Aboriginal heritage sites along Dog Trap Creek) the first management strategy employed for the proposed development has been to avoid the impacts through re-design of the mine plan and shortening of longwalls. Secondary management strategies for these and other natural features include mitigation measures.	**Section 5.3.7**

A review and update of the findings of the *2008 Southern Coalfield Inquiry (Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield – Strategic Review)* is currently underway for mining operations at the Dendrobium, Metropolitan, Russell Vale and Wongawilli mines, including recommending measures to improve the way mining effects, impacts and consequences in relation to water quantity are assessed and managed.

5.3.2 Thirlmere Lakes Inquiry

The Thirlmere Lakes are located in Thirlmere Lakes National Park, which forms part of the Greater Blue Mountains World Heritage Area. The lakes are made up of a group of waterways including Lake Gandangarra, Lake Werri Berri, Lake Couridjah, Lake Baraba and Lake Nerrigorang.

In response to community concerns, in 2011 the NSW Government commissioned an inquiry into the possible causes of water level decline in the lakes. An Independent Committee was established as part of the inquiry, comprising four independent scientists and a community representative. Mining activities at Tahmoor Mine were evaluated as one of the possible causes of the water level decline.

The Inquiry found that variations in climate such as droughts and floods were the primary influence on water level changes in Thirlmere Lakes, however identified that other factors may be involved in the present low levels. The Inquiry found evidence of groundwater leakages from the Lakes towards the east and north-east within the Hawkesbury Sandstone Aquifers and towards the west and down Blue Gum Creek. The enquiry did not find any direct evidence of longwall mining impacting on lake water levels or breaching geologic containment structures underneath the lakes, including the Bald Hill Claystone bed.

The Inquiry concluded that there was still much unknown about the geomorphology and hydrology of the lakes and without more research, the exact causes of the decreasing water levels of the lakes could not be determined, highlighting the needed for more research into the hydro-geological functioning of the Lakes system.

The Independent Committee provided:

- five specific recommendations for more research, including further studies and monitoring;
- three recommendations relating to consideration of a 'groundwater mound' to minimise groundwater loss; and
- a recommendation to nominate Thirlmere Lakes National Park as a listing under the Ramsar Convention on Wetlands.

This environmental assessment for the proposed development has considered the recommendations of the Inquiry, including undertaking detailed numerical groundwater and surface water modelling of the project, which incorporated the behaviour of Thirlmere Lakes. Further discussion of the relevant environmental impacts and management measures is included in **Section 11.5**.

NSW Chief Scientist and Engineer Review of the Final Report of the Thirlmere Lakes Inquiry Independent Committee

The NSW Government's Chief Scientist and Engineer undertook a review of the Final Report of the Independent Committee – Thirlmere Lakes Inquiry on behalf of the then Minister for the Environment, the Hon. Robyn Parker MP. The review was completed in February 2013 and was undertaken to assess the validity of the findings of the Thirlmere Lakes Inquiry report, and the link between the findings presented in the report and the recommendations put forward by the Independent Committee. The Chief Scientist and Engineer summarised and commented on the findings of the Thirlmere Lakes Inquiry report, strongly supporting the Inquiry's call for further research and monitoring, rather than providing additional findings regarding the impacts of mining on Thirlmere Lakes.

Thirlmere Lakes Research Program

Following on from the findings of the Thirlmere Lakes Inquiry, the NSW Government committed $200,000 to establish a monitoring program of surface water levels and rainfall at Thirlmere Lakes. In addition, an inter-agency committee of scientists from the Office of Environment and Heritage (OEH), DI Water (formerly Department of Primary Industries - NSW Office of Water), WaterNSW (formerly Sydney Catchment Authority) and the Office of the Chief Scientist and Engineer was established to develop a research program into the causes of changes in water levels in the lakes, based on scientific data and recommendations in the Inquiry Report.

In November 2016, the Inter-Agency Working Group published *The Mysterious Hydrology of Thirlmere Lakes*, summarising the existing scientific understanding of the lakes system and identifying knowledge gaps to help inform a comprehensive research strategy into the Thirlmere Lakes. The report considered knowledge gaps and catalogued areas for further research in the areas of geology, geomorphology and water balance.

In October 2017, the OEH announced a $1.9 million research program over four years to help address the knowledge gaps identified in the Inter-Agency Working Group publication of 2016 and the 2011 Thirlmere Lakes Inquiry.

The new Thirlmere Lakes Research Program will collaborate with research partners at the University of NSW, University of Wollongong and Australian Nuclear Science and Technology Organisation (ANSTO), to investigate the sensitivity of these wetland systems to external influences, including the potential effects of mining activity and groundwater extraction and provide a detailed understanding of the hydrological dynamics of Thirlmere Lakes, including the geology, geomorphology, hydrogeology and hydrology of the system.

As part of this EIS, a conservative assessment of the potential impacts of the project on surface and groundwater has been completed, consistent with the precautionary principle. The assessment includes recommended management and mitigation measures including ongoing monitoring to continually assess, minimise and manage the impacts of the project over the life of the project. Any findings and recommendations resulting from the Thirlmere Lakes Research Program would be considered at the time of release to determine their relevance to the project and to incorporate any new information into the Mine's environmental management programs, if required, in consultation with relevant agencies.

5.3.3 Report on Cumulative Impacts of Activities in Sydney Water Catchment

On 30 May 2014 the NSW Chief Scientist and Engineer provided findings "On measuring the cumulative impacts of activities which impact ground and surface water in the Sydney Water Catchment". Activities assessed as part of the report were coal seam gas developments and underground coal mining.

The report was completed to assess the current approaches to cumulative impact assessment within the catchment and determined whether a more quantitative approach would be possible. Experts in the fields of groundwater and surface water assessments were consulted as part of the review.

The report concluded that with regards to water quality, impacts resulting from activities can generally be mitigated through treatment. However, with regards to quantity, the report determined that "measuring and predicting the impact of single activities is difficult" due to the lack of a unified data set.

Notwithstanding the current limitations associated with cumulative impact assessment, the report concluded that "current activities should proceed while this data is gathered; the current impacts do not seem to affect water quantity in a major way".

5.3.4 Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)

The IESC on Coal Seam Gas and Large Coal Mining Development (IESC) is a body commissioned under the EPBC Act to provide scientific advice to the Commonwealth Minister of the Environment and relevant State Ministers in relation to coal seam gas or large coal mining development proposals which are likely to have a significant impact on water resources.

The *Information Guidelines for Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals* (IESC Guidelines, 2015) outline the information required by the IESC in order to provide robust scientific advice on the potential water-related impacts of coal seam gas or large coal mining development proposals.

The proposed development has been assessed against the requirements of the IESC Guidelines 2015 and a table outlining where in the EIS each requirement has been met is provided in **Appendix A**.

5.3.5 Planning Assessment Commission Reports

Subsequent to the Southern Coalfields Inquiry, several applications for the approval of underground mining projects in the Southern Coalfields have been reviewed by the PAC. The outcomes of a number of these reviews have implications for future mining development in the Southern Coalfields, particularly in regards to the way in which environmental assessments are undertaken for future applications.

The PAC reports build on the recommendations of the Southern Coalfields Inquiry and provide further guidance for the environmental assessment of future mining projects in the Southern Coalfields. The recommendations of two PAC reports, for the Metropolitan Coal Project and the Bulli seam Operations Project, are discussed below in the context of the environmental assessment processes which have been undertaken for the proposed development. The reports for the Metropolitan Coal Project and the Bulli seam Operations Project are considered to be the most relevant PAC reports given their location in proximity to the proposed development.

Metropolitan Coal Project

The Metropolitan Coal Project (Peabody Energy) sought approval for an extension of mining operations of the Metropolitan Colliery, located approximately 30 km north of Wollongong, NSW, at Helensburgh. The Metropolitan Coal Project was delegated to the PAC in 2008 and was the first mining proposal to be assessed since the Southern Coalfield Inquiry report was published. The Terms of Reference (ToR) for the PAC with respect to the Project were to:

- Carry out a review of the potential subsidence related impacts of the Metropolitan Coal Project on the value of Sydney's drinking water catchment, and in particular its impact on the Waratah Rivulet and Woronora Reservoir, taking into consideration the recommendations of the Southern Coalfield Inquiry;
- Advise on the significance and acceptability of these potential impacts, and recommend appropriate measures to avoid, minimise or offset these impacts; and
- Identify and comment on any other significant issues raised in submissions regarding the Metropolitan Coal Project or during the public hearings.

In accordance with the ToR, Public Hearings were held on 11 and 12 March 2009. There were 17 verbal submissions at the hearings, comprising three from Government agencies, nine from special interest groups, four from members of the public and one from a mining company, as well as an oral submission from Peabody Energy.

The PAC reviewed relevant information prior to and following the public hearing including the Southern Coalfield Inquiry report, the Environmental Assessment for the Project, additional information provided by the Proponent and its consultants and Government agencies, submissions received on the Environmental Assessment and the Proponent's Preferred Project Report, including a revised mine plan. The information contained in these documents, along with the public hearing submissions were used to inform the determination made by the PAC.

The PAC was directed to specifically take account of the Southern Coalfield Inquiry recommendations in reviewing the Project. In its review of the Metropolitan Coal Project environmental assessment, the PAC made several recommendations with respect to improving the robustness of environmental impact assessments for underground coal mining projects in the Southern Coalfields, particularly in relation to consideration of sensitive landscape features and the extent of background environmental data on which environmental assessments are based. The PAC paid particular attention to the assessment of the following sensitive landscape features:

- significant natural features;
- surface waters including catchment yield, stream health and site water management;
- groundwater;
- swamps;
- terrestrial and aquatic ecosystems;

- cliffs and overhangs; and
- Aboriginal heritage.

The recommendations made by the PAC in its review of the Metropolitan Coal Project environmental assessment and the incorporation of these recommendations in this EIS are provided in **Table 5.2**.

Table 5.2 Consistency of the proposed development with recommendations of the Metropolitan Coal Project PAC report

Recommendations for environmental assessments	Comment	Section of EIS
Application of a risk framework, as expanded by the PAC, for natural features using a RMZ concept and determination of the relative significance of natural features and the acceptability or otherwise of subsidence induced impacts and consequences for those features	RMZs have been developed to inform the extent of longwall mining for the proposed development.	**Section 5.3.7**
Implementation of an 'outcomes based approach' for situations where the predicted subsidence impacts could lead to unacceptable environmental consequences for significant natural features, rather than a prescriptive approach of arbitrary limits and setbacks for mining	An outcomes based approach has been taken for the development of mitigation measures for the project where practicable. For example, should monitoring detect the early development of potentially severe differential movements during the extraction of the initial longwalls, consideration would be given to shortening the commencing position of subsequent longwalls.	**Section 11**
Implementation of the following framework to determine the impact of subsidence on natural features: 1) identify the mine characteristics and types of subsidence impacts likely to be experienced;	Consideration of potential subsidence has informed the mine plan for the proposed development including the development of RMZs. Two Subsidence Risk Workshops were held in March 2013 and December 2013 and attended by Tahmoor Coal, AECOM and relevant project technical specialists. A Subsidence Impact Assessment for the proposed development was undertaken for the project.	**Section 5.3.7** and **Section 11.1**
2) identify significant natural features that might be at risk from the subsidence impacts that could be expected from the proposal;	A number of significant or sensitive natural features were identified within the Project Area. The identification of significant or sensitive items resulted in changes to the mine plan where possible, additional impact assessment, or the preparation of specific treatment plans.	**Section 5.3.7**
3) assess features identified in Step 2 that warrant special significance status in a proposed risk management plan;	Significant or sensitive items and natural features that were assessed as being medium to high risk, and prompted consideration of modifications to the mine plan. These significant natural features informed the development RMZs for further assessment. The RMZs identified via the risk assessment process are presented on **Figure 5.3**. Revision of the	**Section 5.3.7**
4) using the criteria set out in the Southern Coalfields Inquiry Report for deriving RMZ boundaries, draw a RMZ around those features from Step 2 and Step 3 and assess the risk to the feature (or relevant part of the feature); and		

Recommendations for environmental assessments	Comment	Section of EIS
5) develop risk management plans for those features of special significance identified in Step 3, where a risk of impact is a real possibility and for those features identified in Step 2 where a risk of significant impact is a real possibility.	water management plan would be undertaken as described in **Section 11.4.6**.	

Bulli Seam Operations Project

The Bulli Seam Operations Project (BHP Billiton Ltd) sought approval for continued and extended coal mining operations at Appin Mine and West Cliff Colliery; both located approximately 25 km northwest of Wollongong, NSW. More than 70 submissions were received on the Environmental Assessment, resulting in the Bulli Seam Operations Project being delegated to the PAC in 2009. An initial PAC review was undertaken in 2009 for the Project, with further review undertaken in 2011 following the submission of a Preferred Project Report.

The PAC review was focused on subsidence-related impacts of the project on significant natural features, built infrastructure and the values of Sydney's drinking water catchment. The review raised concerns of potential mining beneath near-pristine areas, including conservation areas.

The PAC made a series of recommendations relating to the technical studies required to inform the environmental assessments of future proposals so that sufficient information is made available to Government agencies. The recommendations of the Bulli Seam Operations Project PAC report, relevant to a proponent's environmental impact assessment, are presented in **Table 5.3** along with a cross reference to where the recommendation has been addressed as part of this EIS.

Table 5.3 Consistency of the proposed development with recommendations of the Bulli Seam PAC report

Recommendations for environmental assessments	Comment	Section of EIS
Exploration drilling and core testing is to be undertaken to establish the mechanical and hydraulic properties in proximity to water-dependent systems.	Extensive exploration drilling has been undertaken across the Project Area and the results of the core testing used to inform the subsidence and groundwater assessments.	**Sections 11.1** and **11.3**.
Installation of a regional network of shallow piezometers targeting water dependent systems and underlying rock strata be undertaken to inform an understanding of the hydrology and climatic implications.	An extensive network of piezometers has been installed across and to the north of the Project Area.	**Appendix I, Section 11.3**
Establishment of a network of deep pore pressure monitoring bores be undertaken to assess/quantify the impacts of fracturing within the subsidence zone.	An extensive network of piezometers has been installed across and to the north of the Project Area.	**Appendix F, Appendix I, Sections 11.1** and **11.3**.
Numerical modelling be utilised to enhance the prediction of subsidence zone fracture distributions, connectivity and potential fracture conduit (groundwater) transmission capacities.	Numerical models have been prepared to inform assessments of subsidence and groundwater impacts of the proposed development.	**Appendix F, Appendix I, Sections 11.1** and **11.3**.
Borehole census should be conducted on all potentially yield (or structurally) affected boreholes.	A borehole survey (census) of private bores throughout the Project Area was undertaken.	**Appendix I, Section 11.3**
A comprehensive independent audit of the groundwater model.	The groundwater model and assessment for the proposed development was	**Appendix I, Section 11.3**

Recommendations for environmental assessments	Comment	Section of EIS
	subject to an independent peer review.	
Greater collaboration between specialist areas (for subsidence, hydrology, geomorphology, ecology and Aboriginal heritage) is required to provide a holistic assessment of sensitive surface features.	Throughout the environmental assessment for the proposed development, the subsidence engineers and hydrological, groundwater, heritage and ecological technical specialists collaborated with regards to determining the significance of natural features and the potential consequences of subsidence-induced impacts.	**Section 11**

Incorporation of PAC Recommendations for this EIS

Tahmoor Coal has taken into account the PAC's critique of the Metropolitan Coal Project and Bulli Seam Operations Project environmental assessments, and has implemented a number of steps during the mine planning and environmental assessment processes to address its findings. A particular finding of the reports was that the PAC recognised the close connection that exists between a suite of specialist areas (subsidence, hydrology, geomorphology, ecology and Aboriginal heritage) and outlined the need for all of these specialist areas to be considered in a holistic manner to protect sensitive surface features.

During the preparation of this EIS, the technical specialists have collaborated with regards to determining the significance of natural features and the establishment of RMZs to guide the mine planning process. In addition, the technical specialists have relied on the technical reports of interrelated disciplines when completing each assessment. This approach has allowed for a holistic assessment of potential environmental impacts associated with the proposed development.

5.3.6 Collaboration between Specialists

Throughout the environmental assessment for the proposed development, the subsidence engineers and hydrological, groundwater, heritage and ecological technical specialists collaborated with regards to determining the significance of natural features and the potential consequences of subsidence-induced impacts. Specifically, three days of collaborative group survey of natural surface features within the Project Area, a series of subsidence risk management workshops, follow-up meetings and discussions between technical specialists was undertaken for this purpose. This co-operative process influenced the development of RMZs and the mine planning process for the proposed development.

The approach and outcomes of the collaborative survey and workshops is presented in a summary report *Tahmoor South Project Subsidence Workshop* (Glencore, 2014). This report is provided in **Appendix D**.

During preparation of the technical reports for the EIS, a geotechnical engineer attended and provided input to meetings with the authors of the subsidence and groundwater reports. The technical reports for subsidence and groundwater were subsequently peer reviewed. Further, additional and specific geotechnical reports were prepared for input into the subsidence report including:

- Review of the Hydraulic Conductivity and Geotechnical Characteristics of the overburden at Tahmoor South (SCT, 2013);
- Longwall 10A Height of Fracture Borehole for Tahmoor South Project – observations, Measurements and Interpretation (SCT, 2014); and
- Subsidence Impact Assessment for Selected Archaeological Heritage Sites at Tahmoor South Project (SCT, 2013).

5.3.7 Development of Risk Management Zones

A key outcome of the collaboration between technical specialists described above was the development of the RMZs (Glencore, 2014). In developing RMZs for the proposed development, Tahmoor Coal has incorporated the framework outlined in the Southern Coalfields Inquiry, Metropolitan Coal Project PAC Report and Bulli Seam Operations PAC Report relating to RMZs, for significant natural features warranting protection.

To assist with the identification of the RMZs, the subsidence engineers and technical specialists for hydrology, geomorphology, groundwater, ecology and heritage collaborated during a three day long field visit (6 to 9 March 2013) to waterways within the Project Area (Glencore, 2014). Subsequent to the field visit, two qualitative risk workshops were undertaken involving the relevant stakeholders. A follow up workshop was held on 12 December 2013 (Glencore, 2014).

Subsidence Risk Workshops

The scope of the risk workshops was to identify significant natural features to develop RMZs. In accordance with the Southern Coalfields Inquiry, the risk workshop was limited to consideration of the natural features, including rivers, streams, swamps, cliff lines, Aboriginal heritage, conservation, scenic and recreational values. For each natural feature the potential consequences and causes were considered and significance and sensitivity assigned.

The first risk workshop held in March 2013 identified features that required detailed assessment during preparation of the EIS. The second risk workshop in December 2013 considered the outcomes of the assessments and whether a residual risk still existed (Glencore, 2014).

The working group that took part in the workshops was made up of key stakeholders involved in the proposed development including Tahmoor Coal employees, technical specialists and EIS authors (Glencore, 2014). The involvement of these key stakeholders ensured that the significance and sensitivity of natural features identified through the process were ranked by experienced technical specialists, who understand the proposed development, and Tahmoor Coal employees who have the authority to action key findings and outcomes that resulted from the risk workshop. The workshop attendees are listed in **Appendix D**.

During the risk workshop the working group was tasked with:

- identification of key elements and associated risk descriptions and consequences;
- identification of the cause;
- achieving group consensus on the significance and sensitivity for each potential risk; and
- identification of appropriate treatment plans.

A traffic light approach was adopted and each element was ranked as either having a low, medium or high significance and sensitivity. Where an element was identified as having a medium or high significance and/or sensitivity, a treatment plan was identified.

Identified Areas of Significance

A number of significant or sensitive natural features were identified within the Project Area. The identification of significant or sensitive items resulted in changes to the mine plan where possible, additional impact assessment, or the preparation of specific treatment plans. Significant or sensitive items considered were:

- areas of high environmental, heritage, archaeological and Aboriginal cultural heritage significance;
- wetlands, swamps and water related ecosystems;
- catchments exacerbating erosion and drainage pattern changes;
- significant watercourses;
- significant groundwater resources;
- threatened and protected species;

- stability of escarpments and significant cliff lines, pagodas or steep slopes; and
- prescribed dams.

Significant or sensitive items and natural features that were assessed as being medium to high risk, and prompted consideration of modifications to the mine plan were:

- Pagodas, cliffs, steep slopes which were identified as a public safety risk. The mine plan was designed to minimise potential for impacts to significant cliffs along the Bargo and Nepean Rivers;
- Aboriginal rock shelters which were identified as areas of high archaeological and / or Aboriginal cultural heritage significance. Previous mining at similar depth of cover has shown minimal impacts in the vicinity of Tahmoor Mine. However, the mine plan was designed to minimise potential for impacts to significant rock shelters at Dog Trap Creek as shown on **Figure 5.3**. (Please note that whilst Dog Trap Creek is shown within the longwall extent boundary on **Figure 5.3**, the longwalls themselves have been set back from undermining significant rock shelters under this creek);
- Watercourses directly overlying the longwalls where potential cracking in the rock bed and/or dewatering of pools may occur, including Dog Trap Creek, Horne Creek and Eliza Creek;
- The mine plan was designed to restrict long wall mining to the west of the M31 Hume Highway, thereby minimising impacts to the MSA and associated Upper Nepean State Conservation Area;
- Significant watercourses including the Bargo River and Nepean River. The mine plan was designed to avoid undermining the Bargo River and Nepean River; and
- Groundwater beneath Thirlmere Lakes.

These significant natural features informed the development RMZs for further assessment. The RMZs identified via the risk assessment process are presented on **Figure 5.3**. The modifications to the mine plan to avoid or minimise impacts to significant or sensitive items and natural features is outlined **Section 6.2.4**.

Subsidence Study Area

Consistent with the recommendations from the Southern Coalfields Inquiry made regarding the assessment of subsidence impacts, a SSA was developed for the proposed development in order to define the maximum surface area extent of predicted subsidence, and form the basis of the impact assessment undertaken for the proposed development.

Within the SSA, natural surface features and items of infrastructure were identified and assessed for their potential to experience mine subsidence impacts as a result of the proposed extraction of Longwalls 101 to 109 (extent of longwalls). The extent of the SSA was derived by combining the areas bounded by the following limits:

- The predicted limit of vertical subsidence as a result of the extraction of coal from within the extent of longwalls (**Figure 4.1**). The limit of vertical subsidence was taken as the 20 mm subsidence contour determined using the Incremental Profile Method (IPM); and
- A minimum distance of 600 m from the nearest edge of the proposed longwalls, as recommended by the independent *Inquiry into underground coal mining in the Southern Coalfields of NSW* (SCI, 2008).

In some instances, the predicted limit of vertical subsidence (20 mm contour) extends beyond the recommended 600 m. Therefore, to ensure a conservative assessment, the SSA has been defined based on whichever delineation is furthest from the proposed longwalls. The SSA is shown on **Figure 4.1**.

The SSA defines the limit of main development workings proposed. Main development roadways are the only form of mining that is proposed to be undertaken within the area between the extent of longwalls boundary and the SSA boundary.

Extent of Longwalls

The development of RMZs has influenced the extent of the longwalls as part of the mine plan for the proposed development. The initial mine plan(s) underwent revisions to avoid longwall mining directly under sensitive features such as the MSA, bedrock rivers with standing pools, items of Aboriginal heritage and significant landscape features such as river gorges. Further information regarding modification to the extent of longwalls is provided in **Section 6.2.4**.

5.3.8 Summary

The mine planning process and environmental impact assessment for the proposed development have taken into account the findings of the *Southern Coalfields Inquiry* (2006), Chief Scientist and Engineer reports and the PAC reports for Metropolitan Coal Project and the Bulli Seam Operations Project. In particular, the process adopted for the impact assessment allowed for extensive collaboration between technical specialists to determine RMZs and inform the extent of longwall mining for the proposed development.

5.4 Project Area Mine Design

The mine design for the Project Area evolved during the pre-feasibility and feasibility studies for the proposed development. Tahmoor Coal undertook a series of mine design revisions as environmental and geological constraints became known. The earlier mine designs are attached in **Appendix E**.

The geology and surface features within the Project Area have constrained the mine plan for the proposed development. Consequently, the proposed development consists of a single mining domain only, the Central Domain, which is bounded to the east by the Nepean Fault Zone and to the west by the Central Fault.

Alternative mining domains, the Southern Domain and the Eastern Domain, were identified during project planning and pre-feasibility studies. Mining in the Southern domain is not proposed as part of the proposed development due to geological features and resource definition considerations. The Southern Domain is bounded to the east by the Central Fault and to the west by the CCL747 lease boundary.

The Eastern Domain lies along the eastern side of the Tahmoor South lease and is limited to the west by the Nepean Fault Zone. Mining in this domain is not proposed as part of the Tahmoor South Project due to geological features, resource definition considerations and the requirement for additional surface infrastructure for secondary egress for mine personnel.

5.5 Bulli Seam Coal Resources

Three coal resource categories have been defined within the Project Area, based primarily on drill hole spacing, 2D seismic surveys and underground workings at the southern extent of the existing operations.

The Bulli seam is consistent across the Project Area and was intersected in all exploration drill holes. 2D seismic surveys have, in most instances, acquired reliable data enabling interpretation of coal seam continuity, overall stratigraphy and structures within the deposit. Seismic surveys were carried out on a grid pattern of approximately one kilometre by 300 m within the Central Domain where the proposed mine plan is located.

A Coal Resource Statement for the proposed development has been completed in accordance with the 2012 Joint Ore Reserves Committee Code and coal resources within the Project Area are presented in **Table 5.4**.

Table 5.4 Coal Resources within the Project Area (Glencore Xstrata Resources and Reserves Report, 2017)

	Measured Resources	Indicated Resources	Inferred Resources
Project Area	20 million tonnes	243 million tonnes	114 million tonnes

5.6 Geological Risks

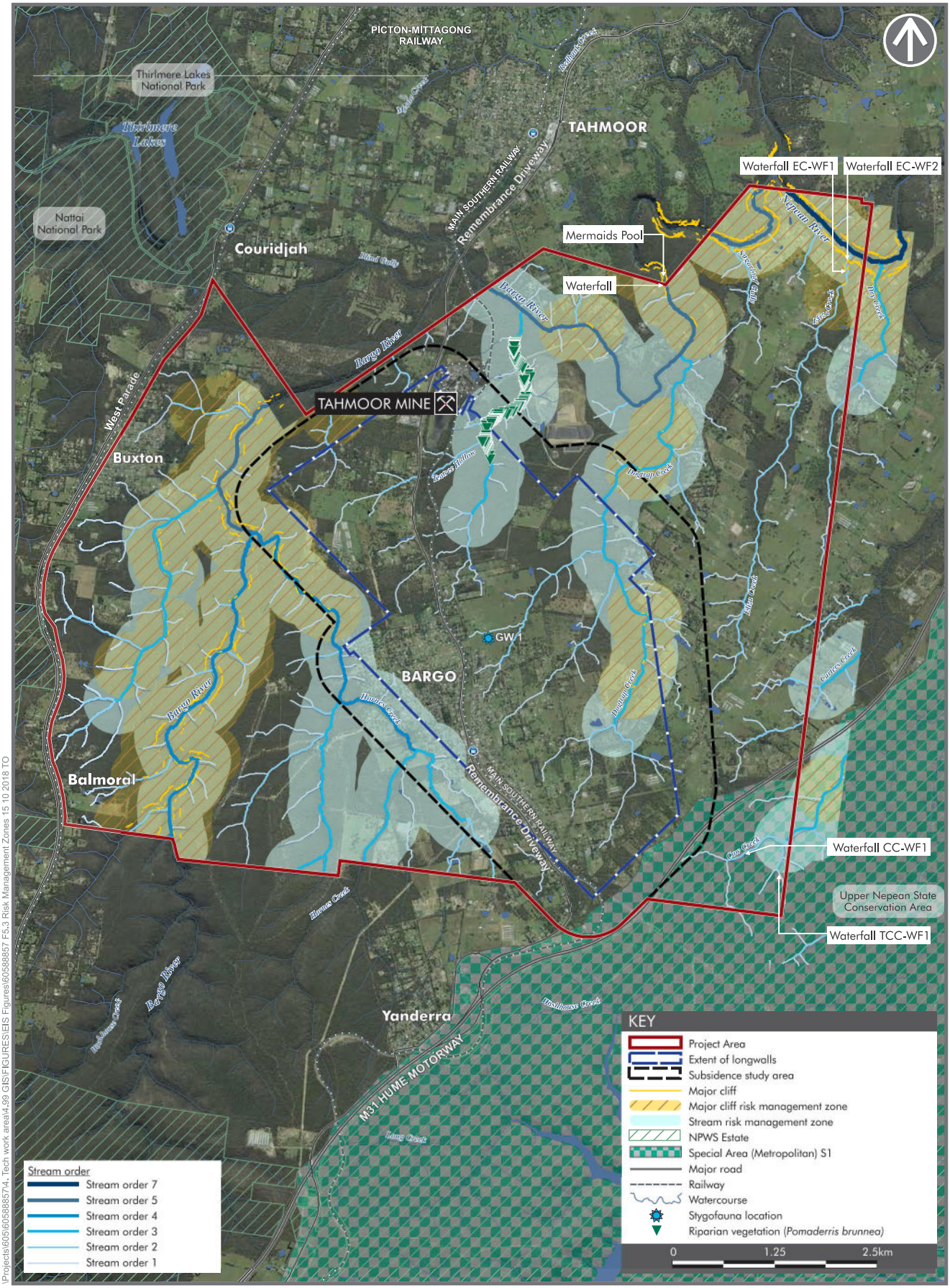
The main geological risks to underground mining identified within the Project Area are:

- the boundary of the intrusive activity (sill) within the Bulli seam close to the southern boundary of CCL747;
- potential for unknown faults and geological structures;
- potential for unknown intrusive bodies (dykes, diatremes) within the boundaries of the mine plan; and
- the potential for seam split in the basal portion of the Bulli seam as this would impact on product yield.

In order to quantify and manage the geological risks listed above, further exploration may be required in the future, which may include:

- a drilling program and survey along the southern boundary of the Project Area to determine the extent of the igneous intrusions;
- a drilling program and survey to further define extent of faulting and geological structure;
- a high resolution airborne magnetic survey over the mine plan area to identify intrusive bodies (dykes and diatremes) reaching the surface; and
- resource drilling within the Project Area to gain greater certainty of the coal resource and increase resource classification to Measured Resources.

Any future exploration activities will be undertaken in accordance with the necessary approvals from the NSW DRG.



\Projects\605\605888574; Tech work area\4.99 GIS\FIGURES\ETS Figures\605888857 F5.3 Risk Management Zones 15 10 2018 TO

SIMEC MINING

RISK MANAGEMENT ZONES

Tahmoor South Project
Environmental Impact Statement

FIGURE 5.3

This page has been left blank intentionally.

6.0 Project Need and Alternatives

6.1 Need for the Project

The high quality coking coal mined at Tahmoor Mine is a valuable source of raw material for steel manufacturing. The proposed development would allow for the continued supply of this valuable product to existing domestic and international markets.

Similarly, the proposed extent of underground mining and the rate at which extraction would take place (up to four (4) million tonnes of ROM coal per annum) reflects the consideration of known geological, environmental and rail transport limitations. This scale of development also balances the economic viability and capital expenditure required for the development, with the ability to supply product coal into established export markets.

Moreover, in responding to the demands of the export markets, it is considered preferable from an environmental, economic and social perspective to continue an existing mining operation and utilise existing facilities rather than to establish a separate, new mine to access this resource (refer to **Section 6.2.2** for details).

Without approval, completion of mining in the Tahmoor North mining area would result in closure of Tahmoor Mine by approximately 2022 prohibiting the extraction of a coking resource via existing infrastructure. Conversely, if approved, the proposed development would prolong the life of Tahmoor Mine and enable recovery of a greater proportion of the existing resource, which in turn would enable ongoing supply to existing customers and direct ongoing employment for 390 employees for a further 13 years and between 50 and 175 additional employees during the transition period.

6.2 Alternatives Considered

Tahmoor Coal considered alternatives to the proposed development during the concept (pre-feasibility) and detailed design (feasibility) stages of the project planning, over a period of three years. The alternatives considered related to:

- a do nothing option whereby the coal resource within the Project Area would not be developed;
- sequential mining operations or the concurrent operation of two mining operations, including various associated infrastructure configurations;
- a single or multi-seam operation, whereby the proposed development would extract coal from the Bulli and the Wongawilli seams;
- various mine plan scenarios with regards to extent and configuration of longwalls;
- methods of coal extraction; and
- options for rejects emplacement.

The pre-feasibility and feasibility investigations were driven by the aim of avoiding or minimising environmental, social and economic impacts, particularly to key sensitive surface features and achieving operational project objectives including:

- provide a safe solution, causing no hazards to mine operations and with low impact on mine stability;
- minimise the impact on the environment where possible, including dust emissions, visual impact, groundwater and sub-surface contamination, use of foreign reagents;
- provide an economic solution, with minimal capital and operating cost, returning a positive benefit to cost ratio, providing employment and minimising impacts on mine production;
- adopt a sound technical solution, utilising proven technology with high availability and reliability, versatility and flexibility; and
- provide a solution that would enable the disposal of the total volume of rejects forecast for the Tahmoor South project.

In this context, several configurations of project components were considered, to identify the 'optimum' balance between project objectives and minimisation of associated impacts. These alternatives are discussed in the following sections.

6.2.1 Do Nothing

Without development approval, the extraction of coal at Tahmoor Mine cannot continue beyond the completion of mining within the Tahmoor North mining area. Closure of the mine would lead to the loss of approximately 390 jobs in approximately 2022 and loss of the potential for around $699.5 million in net benefits over the project life including flow-on implications for local businesses, and royalties and revenue for government. Closure of the mine would also remove the environmental and amenity impacts associated with operation of the mine, including those which are currently managed within acceptable limits.

Without development approval, mining could continue within the Tahmoor North mining area under Tahmoor Mine's existing development consents (1975 Tahmoor Consent, 1979 Tahmoor Consent, 1994 Tahmoor North Consent and 1999 Tahmoor North Consent). However, the remaining coal reserves within this approved area would be exhausted within approximately four years, projected at the current rate of extraction. Subsequent to completion of mining within the Tahmoor North mining area, and in the absence of development approval for the expansion of mining, Tahmoor Mine would be subject to mine closure and site rehabilitation.

Coal is a major commodity export for Australia and the proposed development would continue to supply coking coal to the global market and associated revenue to the State government. If approved, the proposed development would benefit the local, regional and State economies through:

- direct and indirect ongoing employment for approximately 390 existing personnel and up to 175 additional personnel during the transition phase, allowing for the continued utilisation of an existing and skilled workforce;
- the continuation of economic benefits to local, regional and State communities and governments in the form of additional wages, royalties and flow-on effects with a net benefit of approximately $699.5 million over its 13 year life; and
- local and regional benefits from capital investment and purchasing.

These benefits would not be realised through adoption of the 'do nothing' alternative. The negative consequences of not proceeding with the proposed development therefore relate to lost employment opportunities, and unrealised financial benefits to Tahmoor Coal, local and regional communities and the government.

6.2.2 Separate, Concurrent Operation of Tahmoor Mine and Bargo Mine

In the early stages of mine planning in 2012-2013, Tahmoor Coal investigated the continuation of operations at the existing Tahmoor Mine against an alternate option to duplicate this operation through the establishment of a second, separate mining operation within the Tahmoor South mining area that would operate in addition to the current facilities. Production at the second mine would occur concurrently with operation of the existing Tahmoor Mine Surface Facilities Area.

Establishment of a second mine to the south of the existing operations would enable a significant increase in the rate of ROM coal extraction, product coal production and transport per annum for the company. To enable this production, a second mine would also require duplication of surface facilities, personnel and equipment as well as increased capacity to the coal chain infrastructure. This duplication of mining operations would see increased employment and economic benefits. However, it would rely upon the injection of significant additional capital and operational expenditure by Tahmoor Coal.

Duplication of extraction and production rates from operation of the two adjacent mines would likely increase environmental, social and economic impacts in the local area, including the cumulative effects of the two mines operating concurrently. The significant capital investment required to develop a completely new mine for the Tahmoor South Project was assessed, during the pre-feasibility stage of the proposed development, as not financially viable.

In comparison, operation of a single mine to develop the resource would enable the continued use of the existing Tahmoor Mine infrastructure, requiring lower capital and operational expenditure. For this option, environmental and amenity impacts would be contained within a smaller area of affectation compared to the cumulative potential impacts of two adjacent mines, while economic benefits would still be available to the company, community and governments through operation of the single mine. The extraction and production rates at which the mine could operate would be determined by the current or augmented capacity of the mining infrastructure and processing plant.

The surface infrastructure options investigated during the pre-feasibility assessment were:

1. establishment of a second, separate, independent mining operation to allow concurrent operations, with new surface infrastructure located:
    a. within and relying on previously approved development at the Bargo Colliery (the Bargo Option);
    b. immediately to the north of the existing surface infrastructure area of Tahmoor Mine (the Northern Option); or
    c. south of the existing surface infrastructure area of Tahmoor Mine (the Southern Option).
2. Continued use of existing surface infrastructure of the existing mining operation, integrated and augmented to facilitate mining into the coal resource areas to the south.

These infrastructure options are discussed in further detail in the following sections.

Bargo Option

As outlined in **Section 1.2.2**, new surface infrastructure associated with the Bargo Mine, was approved in 1975/76 by both Wollondilly and Mittagong (now Wingecarribee) Councils for a location approximately 5.5 km to the south-west of the existing Tahmoor Mine between the town of Bargo and the Bargo River.

Development of a separate underground mine at this location was considered during the pre-feasibility assessment for the proposed development. The Bargo Option would have involved the duplication of surface infrastructure facilities to process coal extracted from the Tahmoor South mining area.

The Bargo Option consisted of:

- construction of new surface infrastructure, product stockpile area and rail loop;
- excavation of a new drift entry;
- sinking of additional ventilation shaft sites;
- establishment of an additional REA; and
- extraction of coal from the Bulli seam via longwall mining.

The Bargo Option was ultimately not pursued due to the requirement for significant capital expenditure and the environmental constraints associated with establishment of this additional mining infrastructure, including impacts to key sensitive surface features. The capital expenditure of the Bargo Option was estimated to be almost double the expenditure required for either of the Northern or Southern options (outlined in the following sections) and approximately triple that required for the continuation of activities at the existing Tahmoor Mine Surface Facilities Area.

The Bargo infrastructure option would also have required the Surface Facilities Area to be located within undeveloped forested land, resulting in:

- potential impacts to watercourses located within the footprint of the new Surface Facilities Area;
- exposure to areas of high bushfire risk;
- clearing of up to 220 ha of vegetation mapped as being of high significance due to its relatively undisturbed condition and potential for koala habitat; and
- potential impacts to archaeologically sensitive areas associated with Hornes Creek.

From an economic and environmental perspective the Bargo Option was deemed to be the least favourable of the pre-feasibility mine and surface facilities establishment options assessed to support the extension of mining.

Northern Option

The Northern Option included the construction of a new Surface Facilities Area immediately to the north of Tahmoor Mine's existing Surface Facilities Area, and the configuration of new ROM and product stockpiles. However, analysis of the Northern Option during the pre-feasibility assessment found it too capital intensive, to be a viable option to be carried forward in development of the project.

The pre-feasibility assessment also highlighted the likelihood of increased environmental impacts associated with concurrent operation of the Northern Option and the existing Surface Facilities Area. The Northern Option would require additional clearing of vegetation, including vegetation which may consist of Shale Sandstone Transition Forest (SSTF), a listed ecologically endangered community (EEC). Additionally, the Northern Option would be located closer to residences than the existing Surface Facilities Area, potentially resulting in adverse construction and operational noise impacts.

Southern Option

The Southern Option considered the construction of a new Surface Facilities Area to the south of the existing Tahmoor Mine Surface Facilities Area, along with upgrades to the existing Surface Facilities Area and rail loop. Similar to the Northern Option, analysis of the Southern Option during the pre-feasibility assessment identified this option to be too capital intensive to be viable, and it was discounted from further assessment.

With regards to environmental consequences of this option, the Southern Option would have also resulted in additional clearing of vegetation which may consist of SSTF EEC. The Southern Option would also have been located closer to residences than the existing Surface Facilities Area, with a greater potential for adverse noise impacts.

Option for Sequential Extension of Operations

The alternative to the concurrent operation of two separate mines to access the coal resource is the option to sequentially extend longwall mining into the Tahmoor South mining area via the existing surface infrastructure facilities at Tahmoor Mine.

The pre-feasibility assessment found this option to be the least capital-intensive option with fewer environmental impacts. Sequential extraction of the coal resource within the Project Area would allow the continued use of the existing Tahmoor Mine surface infrastructure area and coal chain logistics, with only upgrades and augmentation of these facilities needed to meet required production rates.

This option would not introduce increased cumulative amenity impacts associated with the concurrent operation of an adjacent mine. However, by its nature, the sequential extension of mining has the potential to extend the period over which operational impacts may occur.

6.2.3 Multi-seam Operation

Options for developing the coal resources for the proposed development included either:

- mining the Bulli seam only; or
- mining the Bulli seam and the Wongawilli seam.

Tahmoor Coal investigated the feasibility of a single or multi-seam operation whereby coal would be extracted from the Bulli seam and the Wongawilli seam below. The pre-feasibility study concluded that mining of the Bulli seam only is the preferred option for the following reasons:

- capital expenditure implications:
  - the existing Tahmoor Mine infrastructure is currently configured for extraction from the Bulli seam and additional mine infrastructure, including drifts, shafts and CHPP would be required to extract from the Wongawilli seam.
- operational expenditure implications:

  - mining of the Wongawilli seam requires greater expense due to the increased depth of the seam, when compared to the Bulli seam; and
  - higher ash content and partings within the Wongawilli seam results in decreased yield in comparison to the Bulli seam, which would require additional capital for CHPP upgrades and additional reject disposal considerations.
- market considerations:
  - the coal from the Bull Seam meets the specifications of the coal currently supplied by Tahmoor Coal under its existing contracts.
- environmental considerations:
  - a higher level of subsidence would likely result from a greater seam thickness extraction in the Wongawilli than the Bulli seam. This, coupled with cumulative subsidence levels of a multi-seam operation would introduce increased environmental and social consequences and the need for additional mitigation and management measures at the surface than those required for mining the Bulli seam alone.

Resolution of the current expenditure constraints and market limitations, along with development of suitable subsidence management measures in future years, may allow mining of the Wongawilli seam under a future consent. However at the current time single seam mining of the Bulli seam is preferred.

6.2.4 Alternative Mine Plan Options

The mine plan for the proposed development has been developed over a period of several years, taking into account the coal quality, sensitive environmental features and geological constraints of the Project Area. The mine plan refers to the orientation, extent and configuration of longwalls and associated mains, as well as the number and location of ventilation shafts.

A formal constraints analysis was undertaken to determine the presence of key sensitive surface features within the Project Area, such as bedrock rivers with standing pools, items of Aboriginal heritage and significant landscape features such as river gorges. Based on this constraints analysis, key features, such as the Bargo River gorge and the MSA, were identified and longwall configurations were designed to avoid those sensitive surface features, as discussed in **Section 5.3**.

Early mine plans for the proposed development included longwalls beneath the Bargo River in the west and south of the mining lease areas (**Appendix E**). However, due to the environmental and social significance of this river, the initial mine plan underwent a revision to avoid longwall mining directly under these sensitive surface features.

Further assessment and survey of sensitive heritage, geomorphological and ecological surface features along Dog Trap Creek has been undertaken as part of baseline monitoring and preparation of this EIS. The results of this assessment have fed into an analysis of the risk of potential impacts to these sensitive surface features due to subsidence, and into the mine planning process, resulting in modification to the extent of longwalls and the location of ventilation shafts in these areas.

The proposed longwalls have been designed to avoid mining beneath four rock shelter sites along Dog Trap Creek with artwork that is of high cultural and archaeological significance. The surface infrastructure for the proposed development would also avoid all grinding grooves and rock shelters and therefore avoid potential surface disturbance impacts to archaeological sites with moderate or high scientific significance.

Additional mine planning undertaken in 2017/2018 identified that mining within the Eastern Domain would not be optimal due to geological and technical mining considerations, in particular, difficulties associated with safe mine personnel egress in the case of a seismic event along the Nepean fault. The removal of longwall mining within the Eastern Domain would result in reduced subsidence impacts to Eliza Creek, which was proposed to be undermined by longwalls within this domain. The reduced area of longwall mining would also reduce the length of mining at the Tahmoor South Project from an estimated 18 years (under both the Central and Eastern Domains) to 13 years (under the current proposed Central Domain only), thereby reducing the overall length of operational impacts of the proposed development.

The change to mining area has also allowed the rationalisation of the number of ventilation shafts required for the proposed development from four ventilation shafts to two, thereby reducing the land clearance requirements associated with electricity and service connections to the ventilation shaft sites. When taking into account the vegetation clearing savings associated with the changes to mine shaft number and locations, the Central Domain-only option would require around four hectares less of vegetation clearing compared to the combined Central and Eastern Doman option. Whilst not mining in the Eastern Domain would result in the foregoing of coal resources to market, given the safety risks to personnel and environmental benefits, the Central Domain-only option was identified as the preferred mine plan.

Further details regarding the mine planning process and identification of the proposed mine plan have been discussed in **Section 5.3**. Previous mine plans for the proposed development are presented in **Appendix E**.

6.2.5 Alternative Coal Extraction Methods

Alternative coal extraction methods which have been considered by Tahmoor Coal during the feasibility studies for the proposed development included alternative methods of coal extraction and longwall widths. These alternative methods of coal extraction are limited by technical, economical, subsidence, environmental and safety reasons. Consequently, they have not been pursued as part of the proposed development.

The alternative coal extraction options considered were:

- Open cut mining. Feasibility dismissed on economic and environmental grounds, with the strip ratio considered to be impractical and too high to be technically viable due to the depth to the Bulli seam (350-420 m below ground level);
- Bord and pillar mining methods. Although these methods may result in lower levels of subsidence and fewer environmental consequences, they would result in low production rates and were assessed as not economically viable;
- Top coal caving. The Bulli seam is not thick enough to support this extraction method within the Project Area, therefore this method was deemed not to be a technically viable option; and
- Longwall mining. This mining method is considered to be the best mining method for the depth of and thickness of the Bulli seam, and would enable financially viable production rates to be achieved. This method has reduced environmental consequences when compared to open cut mining, could utilise existing mine infrastructure, and was assessed as being technically and economically viable within the Project Area.

The alternative longwall width options considered were:

- Longwalls of 305 m in width: assessed as being able to best balance subsidence levels and associated environmental consequences with viable production rates and cost efficiencies within the Project Area;
- Longwalls narrower than 305 m: narrower longwalls would have reduced levels of associated subsidence and environmental consequences at the surface. However, longwalls less than 300 m in width were assessed to be sub-optimal economically, as a function of production and cost efficiency, and therefore implementation of narrower longwalls may preclude the proposed development on financial grounds; and
- Longwalls wider than 305 m: wider longwalls would result in increased subsidence risk and environmental consequences at the surface, as well as the introduction of increased geological constraints. This alternative was not considered to be technically viable.

6.2.6 Alternative Options for Rejects Disposal

Options Study - 2013

Methods of disposal for the washery rejects, alternate to the current operation of the surface REA, were investigated addressing technical, environmental and financial issues and constraints, as the basis for the identification of a preferred option. The Rejects Disposal Options Study (SKM, 2013) for the proposed development is provided in **Appendix U**.

Six disposal options were initially considered, incorporating both underground and surface disposal areas. A multi criteria analysis approach was adopted to determine the relative merit of each option and to shortlist options for further detailed assessment. Key considerations in the shortlisting of options included insufficient volume for storing of rejects in old workings or former goaf areas, the velocity required to move slurry (rather than paste) through a pipeline and the resulting excessive pipe wear, impact to operations and consequential reduced productivity, excessive capital and operating costs. The options that were identified for further detailed investigation were:

- surface disposal at an expanded existing REA; and
- underground disposal as paste material (active goafs via a trailing pipe).

The surface disposal option would involve a continuation of the current rejects disposal methods and an expansion of the existing REA. The technical risks are therefore known and the operation is well established. As this operation is undertaken completely on the surface, personnel would not be exposed to the hazards of the underground environment and this option is therefore considered to be safer than underground alternatives. Although there is sufficient space to expand the existing REA on the surface, the expansion would require clearing of native vegetation (refer to **Section 11.6**). The surface disposal option would also generate noise and dust impacts which require appropriate management (refer to **Sections 11.10** and **11.11**).

The option to dispose of the rejects as paste material into the active goaf is technically complex. The void above the caved zone is highly variable in nature and even under ideal rock conditions, the available volume would be significantly less than required over the life of the mine. When taking into account less than ideal situations, the available volume would be limited and could be reduced to zero.

An options workshop was held to further analyse the shortlisted options. This examination of the two options involved subjecting them to a series of criteria and scoring their suitability against each specific criterion. During the workshop it was identified that due to the capacity of the paste plant, the disposal underground into the active goaf would still require a proportion of the rejects to be disposed within an expanded REA. Consequently, this option developed into and was evaluated as a co-disposal option with approximately 70 per cent of material to be disposed underground and 30 per cent to be disposed on the surface at an expanded REA.

The two options assessed during the options workshop were:

- surface disposal – expanded REA; and
- co-disposal – underground paste material (active goaf via trailing pipe) and surface REA.

These two options were taken into the cost-benefit analysis and options analysis.

Based on the economic decision criteria used to evaluate the cost-benefit analysis, the expansion of the existing REA was determined to be the preferred option. When assessed in the options analysis, it was found that the expansion of the existing REA performed better than the co-disposal option against the following criteria:

- benefit to cost ratio;
- impact on available coal reserves;
- impact on production;
- minimal processing of rejects;
- water usage;
- risk of surface/groundwater and subsurface water chemical contamination;
- control of spills;
- hazards to mine operations;
- potential to damage bulkheads;
- impact of geology / geotechnical to design and operate system;

- low maintenance; and
- proven technology.

Co-disposal performed better than the expansion of the existing emplacement area under the following criteria:

- visual impact; and
- impacts to vegetation.

Options for the expansion of the REA

The expansion of the REA required the reconfiguration and raising of the maximum height for the existing REA. Two options were considered:

- Raising the northern section of the REA (this section has previously been rehabilitated); and
- Raising the southern section of the REA.

It was determined that raising the northern section of the existing REA would increase the total number of properties potentially impacted by dust and noise. Raising the southern section of the REA would not increase the total number of properties potentially impacted by dust and noise and therefore this option was preferred for the proposed development.

Current situation

Since the Rejects Disposal Options Study (SKM) was completed in 2013, underground coal mines have continued to investigate the potential for underground disposal of tailings.

In Australia underground disposal of fly ash or tailings has primarily been used in shallow workings as a measure to prevent damage to infrastructure due to subsidence. There has been limited disposal of tailings or waste rock to active longwall mines due to cost. Underground tailings disposal has been used in active mines in China and India as a subsidence mitigation measure when mining below urban areas (Department of the Environment, 2015).

In order to reduce the volume of coal reject that requires off-site transport Metropolitan Coal Mine in Helensburgh NSW has been trialling the disposal of a portion of its coal rejects via underground backfilling of the mine void. Coal reject material is transported by truck to Glenlee Washery for emplacement and/or disposed in underground workings via the Coal Reject Paste Plant (Metropolitan Coal Mine Waste Management Plan). The trial includes fine rejects only, with course rejects hauled from site, and is not currently run at a commercial scale.

In the case of Tahmoor, expansion of the REA is still the preferred option for rejects disposal, from both a cost and feasibility perspective. This is because the technology required for underground co-disposal is not yet sufficiently advanced in Australia.

6.3 Preferred Option and Project Refinements

The pre-feasibility and feasibility studies and investigation into alternative options determined that the preferred option for the proposed development is:

- the sequential extension of operations at Tahmoor Mine;
- use of the existing surface infrastructure area at Tahmoor Mine;
- single seam mining within the Bulli seam;
- the use of longwall mining methods;
- the development of a mine plan that avoids impacts to sensitive surface features;
- developing longwalls with a maximum panel width of 300 m; and
- surface rejects disposal with an expanded REA.

Sequential operations, rather than duplication of production and establishment of a second mining operation, was identified as feasible due to the cost savings associated with using existing infrastructure and the avoidance of greater environmental and amenity impacts associated with the development of a separate Surface Facilities Area. Sequential extraction of the coal resource within the Project Area would allow for the continued use of existing infrastructure and workforce, providing benefits by way of continuation of employment for the existing, established workforce for a further 13 years.

The preferred mine plan precludes longwalls beneath the Nepean and Bargo Rivers, resulting in fewer impacts to the environment while maximising project feasibility. The preferred option proposes mining from the Bulli seam via longwalls optimised at up to 300 m in width. The preferred mine plan and chosen method of coal extraction forms an optimised outcome for mining which was derived from the careful consideration of potential impacts on sensitive surface features, consistent with recommendations of the Southern Coalfield Inquiry and recent PAC reports for the Metropolitan Coal and Bulli Seam Operations projects.

On the basis of a comparative assessment, it was determined that, on balance, when considered against a number of economic, environmental, social, technical and safety criteria, the surface disposal at an expanded REA was the preferred strategy for disposing of reject material associated with the proposed development. This conclusion is supported by a cost benefit analysis which found that the benefits of surface disposal at an expanded REA far exceeded those associated with the underground co-disposal option.

The preferred disposal strategy consists of two new areas adjoining the existing REA, using a staged fill plan approach (refer to **Figure 4.8**).

6.4 Summary

The proposed development, being an expansion of an existing mine, would enable continuing use of existing infrastructure and allow for the continued extraction of the resource at Tahmoor Mine. On balance, the environmental, social and financial consequences of proceeding with alternative options would be greater than proceeding with expansion of the existing mine as proposed.

This page has been left blank intentionally.

7.0 Environmental Assessment and Consent Framework

This section presents the assessment and consent framework for the proposed development. Included is the consent strategy and assessment pathway for the proposed development and an outline of how development consent, if granted, would affect the existing approvals at Tahmoor Mine. A discussion is also provided regarding the influence of the outcomes of the Southern Coalfields Inquiry and the PAC review of underground mining projects in the Southern Coalfields on the proposed development.

7.1 Proposed Tahmoor South Project Development Consent Strategy

Tahmoor Mine currently operates under a framework of historical development consents relating to the Tahmoor Mine, which commenced operations in 1979 and has continued coal production until the present day.

The assessment pathway for the proposed development involves an application to the Minister for Planning under Division 4.7 of Part 4 of the EP&A Act for State significant development. A single, new development consent is sought to govern the operation of underground mining for the proposed development, including the continued use of the existing Tahmoor Mine surface facilities, following the surrender of the existing consents that relate to the Tahmoor Mine surface facilities. The underground mining operations for the existing Tahmoor North mining operations would continue to be governed by the existing Tahmoor North consents that relate to the underground mining within Tahmoor North.

The environmental assessment pathway was discussed with DPE at several pre-lodgement meetings held with Tahmoor Coal. The DPE generally agreed with the proposed approach which seeks to streamline and modernise the current and proposed regulatory framework at Tahmoor Mine.

7.2 Relationship to Existing Consents

The history of Tahmoor Mine consists of the separate development of the former Tahmoor and Bargo Mines, with exploration and approval of mining of the coal resource within both the Tahmoor and Bargo areas commencing in the 1960s and 1970s.

The history of activities and sequence of development consents at Tahmoor Mine has been provided previously in **Section 1.2**. Underground mining at the Mine is currently being undertaken by Tahmoor Coal within the Tahmoor North mining area under the existing approvals listed in **Table 7.1**.

The environmental assessment pathway for the extension of operations at Tahmoor Mine and the surrender of some of the existing consents is reliant on the approval of the proposed development. If approval is granted, some of the existing consents for the Bargo and Tahmoor Mines would be surrendered based on a schedule of completed activities as presented in **Table 7.1**.

Table 7.1 Relationship of assessment pathway with existing consents for Tahmoor and Bargo Mines

Existing Consent	Scope of Development	Proposed Action in relation to New Development Approval
Bargo Mine		
Bargo Consent Granted by Wollondilly Shire Council on 21 April 1976 and by Mittagong Shire Council on 17 September 1975 (referred to as the Bargo consent).	Development of an underground mine and associated surface facilities to the west of the town of Bargo.	The Bargo Consent would be surrendered.

Existing Consent	Scope of Development	Proposed Action in relation to New Development Approval
Tahmoor Mine		
1975 Tahmoor Consent Reference number: 7105/47 Granted by Wollondilly Shire Council on 26 March 1975 (referred to as the 1975 Tahmoor Consent).	Development and operation of a coal mine approximately three kilometres south of the town of Tahmoor, along with the construction of two man-access shafts.	Consent would be surrendered and the Surface Facilities Area would be governed by the new development consent only.
1979 Tahmoor Consent Granted by the NSW Planning and Environment Commission (referred by Wollondilly Shire Council) on 23 August 1979 (referred to as the 1979 Tahmoor Consent).	Longwall mining; approval for CHPP and REA; and subsequent modifications which enabled gas extraction from the mine, the extension of existing coal washery, the transport of product coal to Port Kembla by rail and the transport of coal by road within the Wollondilly LGA or in the event that rail transport is unavailable.	Consent would be surrendered following completion of the current mining activities at Tahmoor North, and the Surface Facilities Area would be governed by the new development consent only.
1994 Tahmoor North Consent Reference number: D47-0029 Granted by the Land and Environment Court on 7 September 1994 (referred to as the1994 Tahmoor North Consent).	Extension of longwall mining into the Tahmoor North mining area, emplacement of rejects on site and approval to increase production to 3.0 million tonnes ROM coal per annum.	Consent relates to the extension of mining and is required for the completion of mining at the Tahmoor North mining area. This consent would remain valid until the completion of mining in 2022 and mine closure in the Tahmoor North mining area and would then be surrendered.
1999 Tahmoor North Consent Reference number: DA No. 67/1998 Granted by the Minister for Urban Affairs and Planning on 25 February 1999 (referred to as the 1999 Tahmoor North Consent).	Extension of longwall mining into Mining Lease 1376.	Consent relates to the extension of mining and is required for the completion of mining at the Tahmoor North mining area. This consent would remain valid until the completion of mining in 2022 and mine closure in the Tahmoor North mining area and would then be surrendered.
Tahmoor Gas Extraction Reference number: 190/85 Granted by Wollondilly Shire Council on 16/12/1985	Surface civil and mechanical work for gas extraction.	Consent would be surrendered.

The approach of surrendering the existing consents would allow for operations in the Tahmoor North mining area to continue to completion and for the smooth transition to a single consent which would govern activities and the final closure and rehabilitation of Tahmoor Mine as a whole. Further details regarding the timing of mine closure and rehabilitation of Tahmoor Mine and the interrelationship with the existing operations is provided in **Section 11.23**.

8.0 Statutory Planning

This section provides an outline of the statutory context for the determination of the development application for the proposed development, together with details of approvals required under relevant State and Commonwealth legislation. The permissibility of the proposed development and the relevant environmental assessment pathway, under State legislation and relevant environmental planning instruments, is presented.

8.1 Environmental Planning and Assessment Act 1979

Development in NSW is assessed and determined in accordance with the relevant provisions of the EP&A Act. Environmental Planning Instruments, including State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) are an integral component of the development consent process, particularly in relation to the permissibility of development and matters which should be considered by the consent authority when determining an application for development. The environmental planning instruments relevant to the proposed development are discussed in more detail below.

8.1.1 Permissibility

Clause 7(1) of *State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) states:

> *Development for any of the following purposes may be carried out only with development consent:*
>
> *a. underground mining carried out on any land,*
>
> *b. mining carried out:*
>
> *i. on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or*
> *ii. on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,*
>
> Clause 3 of the Mining SEPP defines 'underground mining' and 'mining' as follows:
>
> *Mining means the winning or removal of materials by methods such as excavating, dredging, or tunnelling for the purpose of obtaining minerals, and includes:*
>
> *(a) the construction, operation and decommissioning of associated works, and*
>
> *(b) the stockpiling, processing, treatment and transportation of materials extracted, and*
>
> *(c) the rehabilitation of land affected by mining.*
>
> *Underground mining means:*
>
> *(a) mining carried out beneath the earth's surface, including board and pillar mining, longwall mining, top-level caving, sub-level caving and auger mining, and*
>
> *(b) shafts, drill holes, gas and water drainage works, surface rehabilitation works and access pits associated with that mining (whether carried out on or beneath the earth's surface),*
>
> *but does not include open cut mining.*

As outlined in **Section 1.1**, Tahmoor Coal is seeking development consent for the proposed extension of underground mining to the south of the existing Surface Facilities Area at Tahmoor Mine, including longwall mining, additional ventilation shaft construction and the expansion of the REA. The proposed development is considered permissible with consent pursuant to clause 7 (1) (a) of the Mining SEPP because it involves *development for the purposes of* 'underground mining carried out on any land'.

The Surface Facilities Area including REA is located on land zoned RU2 Rural Landscape under the *Wollondilly Local Environmental Plan 2011* (Wollondilly LEP 2011). Under this zoning, development for the purposes of agriculture is permissible. The activities proposed in the REA and surface facility area include "*stockpiling, processing, treatment and transportation"*, as defined under 'mining' in clause 3 of the Mining SEPP. Therefore, activities at the REA and surface area are also considered to be permissible with consent, pursuant to Clause 7(1) (b) (i) of the Mining SEPP as 'development for the purposes of mining' (which includes mining by *tunnelling*), carried out on land on which agriculture may be carried out.

The Project Area extends across the Wollondilly and Wingecarribee LGAs. Within the Project Area, the proposed development would be located within the Wollondilly LGA only, on land subject to the Wollondilly LEP 2011. The proposed development constitutes development that is ordinarily permitted with consent in some land use zones, whilst being prohibited in other zones under the Wollondilly LEP 2011 (refer to **Section 8.1.3**). However, pursuant to clause 3 of the Mining SEPP, in the case of an inconsistency with any other environmental planning instrument, the Mining SEPP prevails to the extent of the inconsistency. As such, the Mining SEPP prevails over the Wollondilly LEP 2011 and the proposed development is permissible with consent pursuant to the Mining SEPP on the Project Area within the LGA.

8.1.2 State Significant Development

The proposed development is declared to be State significant development (SSD) because of the combined effect of section 4.36 of the EP& A Act, which states that a State environmental planning policy (SEPP) may declare any development, or any class or description of development, to be State significant development, and clause 8(1) of *State Environment Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP) which declares development in Schedules 1 and 2 of the SEPP to be State significant development. Clause 5 of Schedule 1 of the State and Regional Development SEPP includes the following class of development as State significant development:

> *"(1) Development for the purpose of mining that:*
>
> *(a) Is coal or mineral sands mining, or*
>
> *(b) Is in an environmentally sensitive area of State significance, or*
>
> *(c) Has a capital investment value of more than $30 million.*
>
> *(2) Extracting a bulk sample as part of resource appraisal of more than 20,000 tonnes of coal or of any mineral ore.*
>
> *(3) Development for the purpose of mining related works (including primary processing plants or facilities for storage, loading or transporting any mineral, ore or waste material) that:*
>
> *(a) Is ancillary to or an extension of another State significant development project, or*
>
> *(b) Has a capital investment value of more than $30 million.*
>
> *(4) Development for the purpose of underground coal gasification."*

The proposed development meets the category of development identified in Clause 5 of Schedule 1 of the State and Regional Development SEPP, as it is for the purposes of coal mining and as such is classified as State ignificant development for the purposes of Section 4.36 of the EP&A Act. Due to its declaration as State significant development, the proposed development is subject to assessment and determination under Division 4.7, Part 4 of the EP&A Act. The Minister for Planning (or delegate) is the consent authority for the proposed development under Section 4.5 (2)(a) of the EP&A Act. This EIS supports the application for development consent made by Tahmoor Coal, and has been prepared in accordance with section 4.15 of the EP&A Act and Schedule 2 of the EP&A Regulation.

Following submission of the PEA for the proposed development to the Secretary on 1 May 2017, the SEARs were issued to Tahmoor Coal on 9 June 2017 and subsequently revised on 20 June 2018 (in relation to SIA requirements). On 12 January 2018, the proposal was determined to be a controlled action under the EPBC Act in relation to potentially significant impacts on listed threatened species and communities and water resources in relation to a large coal mining development. Subsequently, supplementary SEARs covering Commonwealth environmental assessment requirements were issued for the proposal on 14 February 2018.

This EIS has been prepared to comprehensively address the SEARs and relevant requirements of Schedule 2 of the EP&A Regulation (refer to **Table 1.6**).

8.1.3 Environmental Planning Instruments

In addition to the State and Regional Development SEPP, the following environmental planning instruments include provisions relating to issues that are relevant to the environmental impact assessment of the proposed development:

- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*;
- *State Environmental Planning Policy No. 33 — Hazardous and Offensive Development*;
- *State Environmental Planning Policy No. 44 – Koala Habitat Protection*;
- *State Environmental Planning Policy No. 55 – Remediation of Land*;
- *Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River (No 2- 1997)*;
- *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*;
- *Wollondilly LEP 2011*; and
- *Wingecarribee LEP 2010.*

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The Mining SEPP consolidates and contains specific planning provisions related to mining and extractive industries, and is the principal environmental planning instrument that governs the carrying out of the proposed development. The Mining SEPP recognises the importance of mining, petroleum production, and extractive industries within the State. Clause 7 of the Mining SEPP identifies mining development that is permissible with development consent as discussed in **Section 8.1.1**.

The aims of the Mining SEPP are:

> *"(a) To provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
>
> *(b) To facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
>
> *(c) To establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources."*

Clauses 12AB to 17 of Part 3 of the Mining SEPP contain specific matters that a consent authority must consider before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry. Detailed assessments of the potential environmental impacts of the proposed development are appended to this EIS and summarised in **Section 11.0**.

Table 8.1 specifically refers to clauses 12AB to 17 of the Mining SEPP and refers to how each of the matters has been addressed in **Section 11.0** of this EIS.

Table 8.1 Heads of consideration under Part 3 of the Mining SEPP

Matter for consideration	Corresponding assessment
Clause 12AB: non-discretionary development standards for mining.	This clause identifies development standards in relation to air quality, noise, blast impacts and aquifer interference for mining development. Where an environmental impact assessment indicates that a mining development would meet these standards, then more onerous requirements cannot be applied by a consent authority. However, the clause also provides that not meeting these standards does not prevent a consent authority from granting consent. **Sections 11.10, 11.11** and **11.3** respectively, of this EIS provide an assessment of potential environmental impacts relating to the proposed development on cumulative noise, cumulative air, and aquifer interference. The proposed development would not involve any blasting. Based on the conclusions of this EIS, cumulative air quality is predicted to achieve the annual average PM_{10} development standards identified in this clause, however there is expected to be residual noise and aquifer interference impacts resulting from the proposed development which fall outside of the standards identified. With respect to operational noise, the assessment has determined project specific noise levels considering intrusive and amenity noise criteria and taking into account existing industrial noise sources in the modelling, and the noise assessment demonstrates a noise reduction compared to the existing situation. With respect to aquifer interference, the impact assessment indicates drawdown impacts of greater than two m at some private bores and a cumulative risk of drawdown under Thirlmere Lakes in the Hawkesbury Sandstone of 0.05m. The existing Tahmoor Mine has operated for over 30 years and successfully managed subsidence and groundwater impacts from longwall mining over that time through the implementation of TARP and 'make good' measures at affected groundwater bores. Subsidence and groundwater impacts associated with the proposed development would be managed using a similar approach informed by the extensive experience of longwall mining in the area. Detailed management measures have been identified in **Sections 11.1-11.5** and **11.10** and **11.11**. In addition, **Sections 6** and **13** of this EIS have assessed the need for the project considering the environmental impacts and net project benefits for the Tahmoor South project, which indicate that the proposed development as a whole is justified and in the public's interest.
Clause 12: compatibility of the proposed development with other land uses.	**Section 11.18** and **11.19** describes the existing uses and approved uses of land in the vicinity of the proposed development, presents the impacts of the proposed development on the existing uses and outlines the measures proposed to avoid or minimise incompatibility with these other uses. The Tahmoor Mine is an existing operation that has operated in the area for over 30 years and the proposed development would involve extending the life of mining operations with proposed activities primarily confined below ground and largely to existing surface facilities. Subsidence and related impacts to surrounding receivers and land use would be managed through the implementation of well-established protocols and measures developed over the years of successful longwall mining operations at the site. Based on the assessment presented in the EIS, the proposed development is considered unlikely to significantly impact on surrounding and future land uses in the area.

Matter for consideration	Corresponding assessment
Clause 12A: Consideration of *voluntary land acquisition and mitigation policy*	**Sections 11.1 – 11.24** of this EIS provide an assessment of potential environmental impacts relating to the proposed development and details of the measures proposed to mitigate and manage potential impacts relating to noise and other environmental factors outlined in the policy. **Section 11.10** (operational noise) of the EIS identifies that there may be instances where noise exceedance would trigger acquisition procedures under the voluntary land acquisition and mitigation policy and this is further detailed in **Section 11.10**.
Clause 13: Compatibility of proposed development with mining, petroleum production or extractive industry.	**Sections 1.2 and 2.2.1**of this EIS presents the mining leases associated with the proposed development and outlines the context of the proposed development within the Southern Coalfields. The proposal would not affect other mines in the Southern Coalfields either directly or indirectly. The Tahmoor Mine is one of a number of underground coal mines operating in the Southern Coalfields and the proposed development would be sited alongside existing operations and as such is considered to be compatible with mining industry in the area.
Clause 14: Natural resource management and environmental management	**Sections 11.4** and **11.3** of this EIS provide the outcomes of a surface water impact assessment (**Appendix J**) and groundwater impact assessment (**Appendix I**) respectively, and details of the measures proposed to mitigate and manage potential impacts on these water resources. **Sections 11.6** and **11.7** and **Appendices J** and **K,** respectively outline the ways in which the proposed development has minimised potential impacts on terrestrial and aquatic ecology. A GHG and energy efficiency assessment identified a number of ways in which Scope 1 and 2 emissions can be reduced, including the ongoing use of the existing WCMG Power Plant at the Surface Facilities Area (refer to **Section 11.12** and **Appendix O**).
Clause 15: Resource recovery	The mine planning process for the proposed development has optimised the efficiency of resource recovery within the context of environmental and geological constraints. The mine planning process is presented in **Section 5.0**. The upgrades proposed for the Surface Facilities Area would optimise the efficient recovery of extractive materials and minimise the creation of coal reject material.
Clause 16: Transport	**Sections 11.13** provides the outcomes of a traffic and transport impact assessment (**Appendix P**). Coal transport within the site would involve: ROM coal being delivered by conveyors from the underground workings to the ROM coal stockpile and the CHPP. Reject material would then be transported by trucks to the REA via a private haul road. There would be no change to existing product coal transportation arrangements (which occurs via rail to Port Kembla and at times to Port Waratah) as a result of the proposal. The proposal would not require an increase to the number or frequency of train movements currently approved for product coal transport. There would also be an allowance for coal transport by road in certain circumstances as detailed in **Section 4.2.7.** Traffic and transport impacts associated with the proposed development have been assessed and found to be manageable and within the capacity of the existing road network.

Matter for consideration	Corresponding assessment
Clause 17: Rehabilitation	The underground nature of the mine plan means that surface disturbance is limited. **Section 11.23** describes the proposed rehabilitation and mine closure elements of the proposed development. In addition, a concept Mine Closure and Rehabilitation Plan has been developed for the proposed development (**Appendix V**) which details the proposed end use and landform of the land once rehabilitated.

Part 4AA Mining and petroleum development on strategic agricultural land

The NSW Government has introduced a Gateway assessment process, whereby new State significant mining and coal seam gas proposals are required to undertake an up-front assessment of potential impacts on 'strategic agricultural land', prior to submitting a development application. The Mining and Petroleum Gateway Panel, an independent panel of scientific experts, was established to oversee the Gateway assessment process. Strategic agricultural land is defined as:

- 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 land – a concentration of significant agricultural industries potentially impacted by coal seam gas or mining development.

Clause 50A of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) requires that a development application for 'mining or petroleum development' as defined by the Mining SEPP be accompanied by a gateway certificate for land shown on the Strategic Agricultural Land Map as critical industry cluster land, In addition it requires:

- a gateway certificate, in respect of a proposed development on any other land; or
- a site verification certificate that certifies that the land on which the proposed development is to be carried out is not BSAL.

Clause 17A of Part 4AA of the Mining SEPP defines 'mining or petroleum development' as development specified in clause 5 (Mining) of Schedule 1 to the State and Regional Development SEPP if certain criteria are satisfied. This includes the requirement of a mining lease under the *Mining Act 1992*. As part of the proposed development, an additional mining lease would be required to accommodate the expanded REA over Crown Land (**Figure 1.5**). Additional surface mining leases are also required for the proposed additional ventilation shafts. The proposal therefore meets the definition of a 'mining or petroleum development' for the purposes of Part 4AA of the Mining SEPP and Clause 50A of the EP&A Regulation.

The proposal would not affect any land mapped as Critical Industry Cluster land, which comprises equine and viticulture industry land in the Upper Hunter, and as such would not require a gateway certificate for this purpose.

The NSW Government has mapped strategic agricultural land across NSW at a desktop level. There is no mapped BSAL in the Project Area. The nearest area of mapped BSAL is located between Douglas Park and Camden, approximately 20 km to the north-east of the Project Area.

Consistent with Section 50A of the EP&A Regulation and the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (2013), a Site Verification Certificate was approved for the proposed development on 29 October 2018, confirming that the proposal is not located on land mapped as BSAL.

State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) assists the NSW Government, local councils and the communities they support by outlining the process for providing infrastructure in NSW.

The proposed development primarily comprises mining activities which is not specified under any part of the Infrastructure SEPP.

The proposed development would also largely utilise a range of infrastructure services including existing offsite electrical, telecommunications and water reticulation infrastructure currently servicing the Tahmoor Mine. However some upgrade to the existing services may be required. In addition, the construction and commissioning of an extension to the existing 66kV overhead power line from the REA to the new ventilation shafts on Charlies Point Road would be required.

The existing intersection at the entry to Tahmoor Mine from Remembrance Driveway would also be upgraded as part of the proposed development to provide a dedicated right hand turning bay for vehicles entering the Surface Facilities Area from the south and extended acceleration and deceleration lanes for vehicles entering and exiting from the north and south.

These proposed upgrades have been assessed as part of this development application under Clause 7 (1) (a) of the Mining SEPP as they are required for the purpose of underground mining. As a result, individual assessment of these works against the relevant provisions of the Infrastructure SEPP is not required. If further upgrades to infrastructure are required in the future, they may be assessed individually under Divisions 5, 17, 21, 24 of the Infrastructure SEPP.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33) requires a consent authority to consider whether a development may constitute a hazardous or offensive industry as defined by SEPP 33. The provisions of SEPP 33 dictates that proposed mitigation measures are to be taken into account when determining whether a development is a hazardous or offensive industry, and that the consent authority must have sufficient information to make its determination and impose conditions to minimise impacts. The SEPP does not apply to the proposed development, as the development relates to a 'mine' and not an industry.

Although the proposed development is not subject to SEPP 33 the potential land use planning risks associated with the proposed development have been considered in a manner consistent with the approach taken for potentially hazardous industry. An initial screening was undertaken using *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (NSW Department of Planning, 2011) to identify whether the type and quantity of hazardous materials exceed the screening thresholds for potentially hazardous developments (refer to **Section 11.22**). It was confirmed that the proposed development would not exceed the screening thresholds.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

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

Some vegetated areas within the Wollondilly LGA (within which the proposed development would be confined) may constitute potential or core koala habitat under SEPP 44. The Terrestrial Ecology Assessment undertaken as part of this EIS has identified that Potential Core Koala Habitat is present within the footprint of the proposed development. Despite the presence of Koala feed tree species within the proposed development area, the Terrestrial Ecology Assessment considered it unlikely that Koalas would occur regularly within the area, given the absence of Koala sightings or evidence of the presence of Koalas (such as scats, or scratches on trees) during field surveys, despite targeted searches (Niche, 2018).

Given the absence of evidence of a resident population of Koalas, the development area is not considered to represent Core Koala habitat as defined by SEPP 44 and would not require the preparation of a plan of management in accordance with clause 9 of SEPP 44. Notwithstanding, in recognition of the Potential Koala Habitat affected by the project, the removal of 43.5 ha of habitat would be offset as part of the offset strategy for the proposal.

State Environmental Planning Policy No. 55 – Remediation of Land

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

A Phase II Environmental Site Assessment (ESA), undertaken for Tahmoor Mine, identified hydrocarbon contamination within the existing Surface Facilities Area of Tahmoor Mine. The contamination is likely to be diesel from a historical underground storage tank (UST). The extent of migration was considered to be minor given that there was limited hydraulic conductivity and the source of the contamination (diesel) is no longer stored in this area.

Offsite migration of diesel or other Total Petroleum Hydrocarbons (TPH) was considered to be unlikely given the slow recharge of groundwater wells and low hydraulic connectivity. Existing soil and groundwater contamination was considered unlikely to present a risk of harm to human health or the environment. At the time of the Phase II ESA, a remediation action plan was not recommended by SEPP 55.

In order to meet the requirements of SEPP 55, the potential for contaminated land to be encountered as part of the proposed activities has been considered using the outcomes of the Phase II ESA (refer to **Section 11.22**).

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

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

Whilst the Project Area covers the MSA, no elements of the proposed development within the Project Area (including any longwalls or surface infrastructure) would extend into the MSA. Longwall panels in the vicinity of the MSA have been specifically reduced to ensure that they do not extend into MSA land (refer **Section 6.2.4**). As such, the proposed development would not be carried out on land designated as Sydney drinking water catchment. An assessment of neutral or beneficial effects (NorBe) was completed for the proposed development and determined that the project would have no identifiable potential impact on the nearest creek within the MSA.

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

Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2- 1997) (SREP 20) provides a framework to guide and control development in Sydney's greater metropolitan region to protect the environment of the Hawkesbury-Nepean River system. SREP 20 applies to certain land in the greater metropolitan region, situated within a number of local government areas, including the Wollondilly LGA. The Project Area is located within the southern region of the Hawkesbury-Nepean Catchment area, in the Bargo River sub-catchment.

SREP 20 includes planning policies relating to heritage, water quantity (surface flow and groundwater), water quality, and flora and fauna. These planning policies are listed in **Table 8.2**, which also references the location in this EIS where each planning policy has been addressed.

Table 8.2 SREP 20 planning policies

Planning policy	Corresponding assessment
(1) Total catchment management	Surface water impact assessment in **Section 11.4** and **Appendix J**, details the measures proposed to mitigate and manage potential impacts on these water resources. These assessments have been undertaken in consideration of the principles of total catchment management, including the cumulative environmental impact of the proposed development on the catchment.

Planning policy	Corresponding assessment
(2) Environmentally sensitive areas	Surface water impact assessment in **Section 11.4** and **Appendix J**, details the measures proposed to mitigate and manage potential impacts on water quality. Groundwater impact assessment in **Section 11.3** and **Appendix I**, details the measures proposed to mitigate and manage potential impacts on the water table. A geomorphological assessment in **Section 11.2** and **Appendix H,** together with the outcomes of the subsidence impact assessment (**Appendix F** and summarised in **Section 11.1**), details the measures proposed to mitigate and manage potential impacts of the proposed development on bank stability. An ecology impact assessment, in **Section 11.6**, **Section 11.7** and **Appendices J** and **K**, describes the measures proposed to mitigate and manage potential impacts on aquatic habitats (including wetlands) and riverine vegetation. A land use impact assessment in **Section 11.19** and **Appendix T**, together with the ecology impact assessment and surface water impact assessment, describes the measures proposed to mitigate and manage potential impacts on land reserved or dedicated under the *National Parks and Wildlife Act 1974* and conservation area sub-catchments in order to protect water quality and biodiversity.
(3) Water quality	A surface water impact assessment in **Section 11.4** and **Appendix J**, considers potential increases in pollutant loads on receiving waters, water quality goals, the need for an erosion and sediment control plan, and the management of point source and diffuse source pollution. Groundwater impact assessment in **Section 11.3** and **Appendix I** assesses the impact of the proposed development on water quality for groundwater sources.
(4) Water quantity	Surface water impact assessment in **Section 11.4** and **Appendix JL**, considers potential alterations to river flow and stormwater run-off as a result of the proposed development and presents a water balance, including details of onsite water reuse. Groundwater impact assessment in **Section 11.3** and **Appendix J** assesses the impact of the proposed development on water quantity for groundwater sources.
(5) Cultural heritage	A heritage impact assessment in **Sections 11.7**, **11.9** and **Appendix L**, considers potential impact of the proposed development on items and places of cultural heritage significance.
(6) Flora and fauna	An ecology impact assessment, in **Section 11.6, Section 11.7** and **Appendi**x **K**, describes the measures proposed to mitigate and manage potential impacts on flora and fauna communities, particularly threatened species, populations and ecological communities, aquatic habitats, wetland flora, rare flora and fauna, riverine flora, flora with heritage value, habitats for indigenous and migratory species of fauna, and existing or potential fauna corridors.
(7) Riverine scenic quality	A visual impact assessment (VIA), in **Section 11.17** and **Appendix S**, describes the measures proposed to mitigate and manage potential impacts on the scenic quality of riverine corridors including consideration of the need for controls or conditions to protect those scenic areas.
(8) Agriculture/ aquaculture and fishing	An agriculture impact assessment, in **Section 11.19** and **Appendix T**, describes the measures proposed to mitigate and manage potential impacts on agricultural production in rural zones.
(9) Rural residential development	The proposed development would not constitute rural residential development. Impacts of the proposed development on residential properties are described in **Section 11.0**.

Planning policy	Corresponding assessment
(10) Urban development	The proposed development would not constitute urban development. Impacts of the proposed development on rural residential properties are described in **Section 11.0**.
(11) Recreation and tourism	A land use impact assessment, in **Section 11.15, 11.18 and 11.19**, describe the measures proposed to mitigate and manage potential impacts to recreational and tourist assets.
(12) Metropolitan strategy	A land use impact assessment, in **Section 11.19**, describes the proposed development in the context of the vision, goal, key principles and action plan of the *Sydney Metropolitan Strategy for 2036*, also discussed in **Section 8.2**.

Wollondilly Local Environmental Plan 2011

The Wollondilly LEP 2011 presents local environmental planning provisions for land within the Wollondilly LGA, and outlines permissibility of various land uses within individual land use zones.

The majority of the Project Area is contained within the boundaries of the Wollondilly LGA. All of the Surface Facilities Area and the land under which longwall mining in CCL 747 and CCL 716 is proposed are located within this LGA. The Project Area coincides with a number of land use zones under the Wollondilly LEP 2011. The Surface Facilities Area and REA are on land zoned RU2 Rural Landscape, while the longwall mine plan 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) (**Figure 8.1**). The potential impacts of the proposed development on land uses within these land use zones are presented in **Section 11.19**.

The proposed development would constitute activities that are ordinarily permitted with consent in some of these land use zones (RU4), and prohibited in others (RU1 and RU2, for example) under the Wollondilly LEP 2011. However, as discussed in **Section 8.1.1**, the proposed development in its entirety is permissible pursuant to the provisions of the Mining SEPP.

Relevant environmental planning provisions, listed under Part 5 and Part 7 of the Wollondilly LEP 2011, have been considered in the assessment of the proposed development as listed in **Table 8.3**.

Table 8.3 Relevant clauses under Part 5 and Part 7 of the Wollondilly LEP 2011

Matter for consideration	Corresponding assessment
Clause 5.10 Heritage conservation	Development consent would be required where development involves the demolition, moving, alteration, disturbance to, or excavation of a known or unknown item, object, place, conservation area or site of heritage. This clause applies to the proposed development as known, and potentially unknown, Aboriginal and European heritage is located within the Project Area. A European heritage and an Aboriginal archaeology and cultural heritage impact assessment have been prepared for the EIS (refer to **Appendix L**). The Aboriginal cultural heritage assessment (ACHA) was prepared in consultation with members of the local Aboriginal community. The assessment concluded that one of the identified Aboriginal cultural heritage sites has the potential to be impacted by surface disturbance works, while twenty six (26) sites have the potential to be impacted by subsidence impacts. Twenty three (23) historic heritage sites with the SSA are considered unlikely to experience any significant impacts as a result of subsidence from the proposed development. Potential impacts and proposed mitigation measures are provided **Section 11.8** and **11.9**.

Matter for consideration	Corresponding assessment
Clause 7.1 Essential services	Clause 7.1 of the Wollondilly LEP 2011 stipulates that a consent authority must be satisfied that essential services, required by a proposed development, are available or that adequate arrangements have been made to make them available when required. **Section 4.0** of this EIS describes the proposed development including details regarding water supply, electricity supply, and the disposal and management of sewage.
Clause 7.2 Biodiversity protection	This clause relates to the protection of terrestrial and aquatic biodiversity. **Section 11.6** and **Section 11.7** of this EIS provides the outcomes of an ecology impact assessment (**Appendix K**) which describes the measures proposed to mitigate and manage potential impacts on terrestrial and aquatic biodiversity.
Clause 7.3 Water protection	Clause 7.3 of the Wollondilly LEP 2011 relates to the protection of the hydrological functions of riparian land, waterways and aquifers and applies to the proposed development as the Project Area is identified as being within an area identified as sensitive land on the Natural Resources – Water Map. Areas identified as sensitive land on the Natural Resources – Water Map are those riparian areas located adjacent to waterways, essentially acting as a riparian buffer zone for waterways. A greater sensitive area is allocated for larger, more important waterways, including the Bargo River. A surface water impact assessment (refer to **Appendix J**) and a groundwater impact assessment (refer to **Appendix I**) have been prepared for the proposed development. The surface water impact assessment includes a watercourse and catchment assessment, flooding assessment, water balance assessment and assessment of potential water quality impacts from the proposed development. The assessment concluded potential impacts would be localised and minor in nature. Mitigation measures to manage potential hydrological and hydrogeological impacts are identified in **Section 11.4** and **Section 11.3**.
Clause 7.4 Flood planning	Clause 7.4 of the Wollondilly LEP applies to land that is at or below the flood planning level of 1:100 average recurrent interval (ARI) flood event plus 0.5 m freeboard. Clause 7.4 sets objectives to minimise flood risk to life and property, to allow development that is compatible with the lands flood hazard (taking into account projected changes as a result of climate change), and to avoid significant adverse impacts on flood behaviour and the environment. Clause 7.4 applies to the proposed development as the Project Area extends over lands below the flood planning level. Flooding impacts within the Project Area and on the Bargo township were assessed as localised and minor. In addition, the proposed development would potentially impact flood behaviour due to subsidence induced changes to the local hydrological regime. The surface water impact assessment has been prepared for the proposed development identified potential flood impacts and proposed mitigation measures. A summary of the assessment and its conclusions is provided **Section 11.4** and **Appendix J**.
Clause 7.5 Earthworks	Clause 7.5 of the Wollondilly LEP relates to earthworks with the objective to ensure earthworks would not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land. Clause 7.5 is relevant to the proposed development's earthwork requirements for the REA, exploration borehole drilling and ventilation shaft construction. An assessment of soils and potential erosion is provided in **Section 11.18**. A soils and water management plan would be prepared prior to construction of the REA and ventilation shafts to manage potential impacts associated with the proposed earthworks.

A number of amendments to the Wollondilly LEP within the Project Area are under consideration. These are outlined in **Table 8.4**.

Table 8.4 Current status of planning proposals and projects within the Project Area

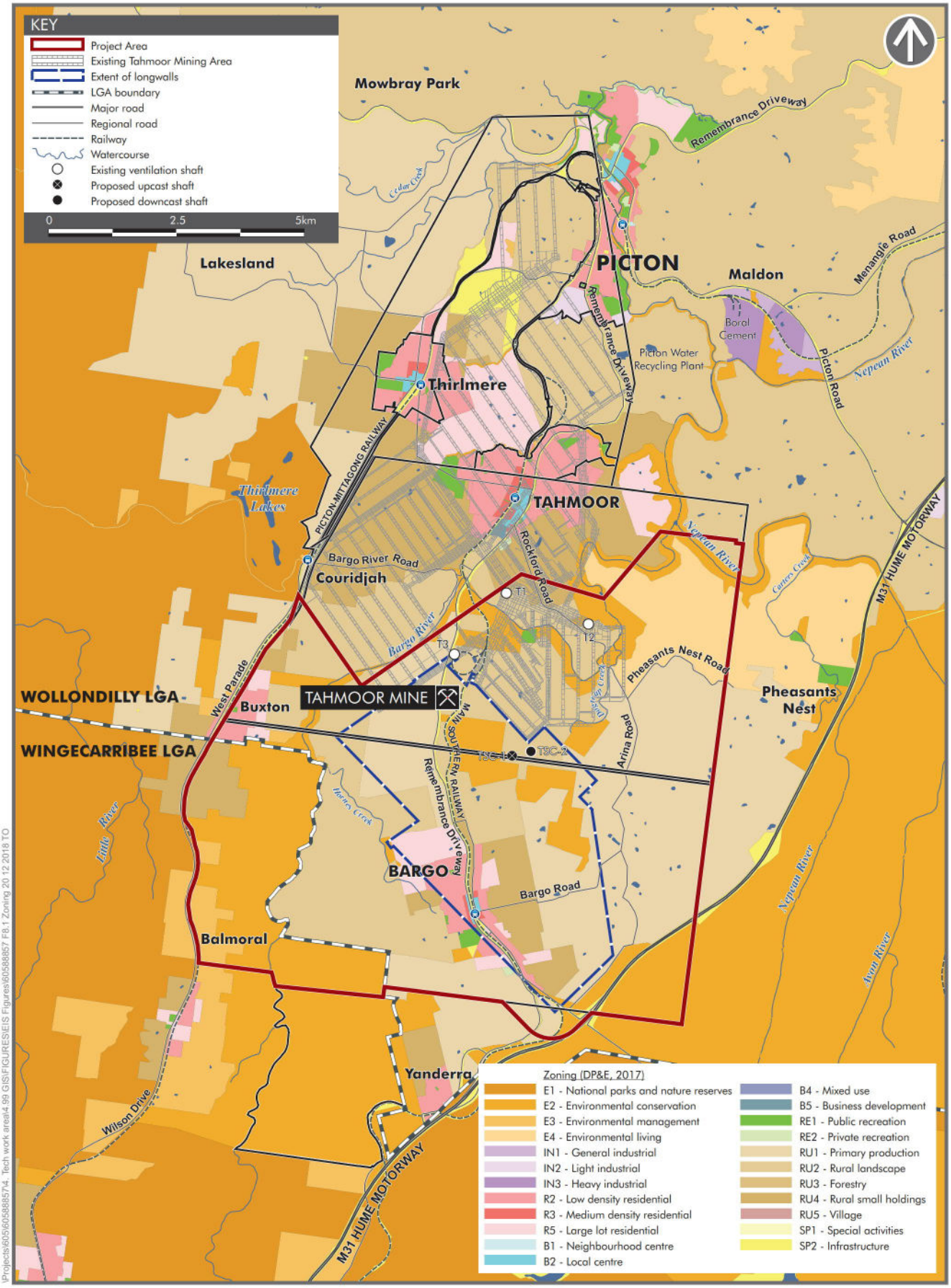
Status	Proposal name	Location	Detail of proposal
Specialist Studies, Public Exhibition & Revision	Land Adjoining Bargo Sportsground	Bargo	Rezone the subject site to allow for future subdivision for large lot residential purposes
	Noongah and Gwynn Hughes Streets	Bargo	Rezone the subject site to permit future subdivision of land for large lot residential and environmental management purposes
	Government Road	Bargo	Rezone the subject site to permit future subdivision for environmental living purposes
	Great Southern Road	Bargo	Rezone the subject site to allow future subdivision of land for low density residential purposes, with a variety of minimum lot sizes
Preliminary Assessment	65-95 Ironbark Road	Bargo	Rezone approximately 8.8 ha of rural zoned land to enable low density residential purposes
Approved	Avon Dam & Hawthorne Roads	Bargo	Rezoning of site to part R2 Low Density Residential and part R5 Large lot residential
	J. R. Stud	Tahmoor	Part R5 Large Lot Residential; Part RE2 Private Recreation; Part Environmental Conservation

Proposed rezoning to allow for additional residential development would increase the number of sensitive receivers in the Project Area, should development proceed. Impacts to potential residential buildings in the Wollondilly LGA have been considered in the subsidence assessment (**Section 11.1**)

Wingecarribee Local Environmental Plan 2010

The proposed development would be undertaken within the Wollondilly LGA. The Project Area extends into Wingecarribee LGA, however no activities associated with the project would take place in the LGA.

Notwithstanding, this relevant environmental planning provisions, listed under Part 5 and Part 7 of the Wingecarribee LEP 2010, have been considered in the assessment of the proposed development, noting that the proposed development would be located in proximity to land subject to this LEP. These matters are listed in **Table 8.5**. No part of the project is in Wingecarribee LGA.



\Projects\605\605888574. Tech work area\4 99 GIS\FIGURES\EIS Figures\605888857 F8.1 Zoning 20 12 2018 TO

SIMEC MINING

LAND USE ZONING

Tahmoor South Project
Environmental Impact Statement

FIGURE 8.1

Table 8.5 Relevant clauses under Part 5 and Part 7 of the Wingecarribee LEP 2010

Matter for consideration[1]	Corresponding assessment
Clause 7.5 Natural resources sensitivity—water	Clause 7.5 relates to the protection of the hydrological functions of riparian land, waterways and aquifers and applies to the proposed development as the Project Area is identified as being within lands identified as 'Natural Water Bodies' on the Natural Resources Sensitivity Map. A surface water impact assessment (refer to **Appendix J**) and a groundwater impact assessment (refer to **Appendix I**) have been prepared for the proposed development. The surface water impact assessment includes a watercourse and catchment assessment, flooding assessment, water balance assessment and assessment of potential impacts on water resources. Mitigation measures to manage potential hydrological and hydrogeological impacts are identified in **Section 11.4** and **11.3**.

Note: 1 Clause 7.5 is considered relevant to the proposed development given potential downstream water resources impacts. Other clauses under Part 5 and Part 7 of the Wingecarribee LEP 2012 are not considered to be relevant because the project would not be undertaken within the LGA.

8.1.4 Other NSW Environmental Approvals

Sections 4.41 and 4.42 of the EP&A Act list other NSW environmental approvals that would not be required for State significant development (section 4.41), or that would need to be issued so that they are substantially consistent with the development consent for the proposed development (section 4.42). Where other environmental approvals are required in addition to those referred to under sections 4.41 and 4.42 of the EP&A Act, these approvals have been considered and outlined where relevant to the assessment of the proposed development.

Notwithstanding, where separate environmental approval processes have been integrated into the assessment regime under the EP&A Act, this EIS has considered and addressed the same issues that would have otherwise been required to be assessed for the separate environmental approval. Each of these separate approvals is considered in **Table 8.6**, **Table 8.7**, and **Table 8.8**.

Table 8.6 Approvals not required under section 4.41 of the EP&A Act

Approval	Comment
Concurrence under Part 3 of the *Coastal Protection Act 1979*.	The *Coastal Protection Act 1979* has been repealed and has been replaced by the *Coastal Management Act 2016.* The Project Area would not be designated as a Coastal Zone as a result of the *Coastal Management Act 2016*.
A permit under section 201of the *Fisheries Management Act 1994 (FM Act).*	The proposed development would not involve dredging or reclamation works.
A permit under section 205 of the FM Act.	The proposed development would not harm marine vegetation and as such, a permit under section 201 of the FM Act would not be required.
A permit under section 219 of the FM Act.	The proposed development is unlikely to result in the blockage of fish passage.
An approval under Part 4, or an excavation permit under section 139 of the *Heritage Act 1977*.	The extent to which the proposed development is likely to impact heritage items has been assessed as part of this EIS (refer to **Section 11.9**).

Approval	Comment
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*.	The dominant features of Aboriginal heritage in the Project Area comprise rock shelters and artwork, artefact scatters and axe grinding grooves associated with the Bargo River and major creek lines such as Dog Trap Creek, and are identified as environmentally sensitive in regards to items of Aboriginal heritage significance. The proposed development and mine plan has been designed to avoid impacts on Aboriginal heritage objects, places, land or persons wherever reasonable and feasible to do so. The extent to which the proposed development is likely to impact on Aboriginal cultural heritage has been assessed as part of this EIS (refer to **Section 11.8**).
A bushfire safety authority under section 100B of the *Rural Fires Act 1997*.	Components of the proposed development would be located in bushfire prone areas. Bushfire prone land would not require subdivision to accommodate the installation of additional ventilation shafts, or for the expansion of the existing REA. Further discussion on bushfire hazards and management is provided in **Section 11.22**.
A water use approval (section 89), a water management work approval (section 90) or an activity approval (other than an aquifer interference approval) (section 91) of the *Water Management Act 2000*.	The proposed development is located within an area covered by the WSP for the *Greater Metropolitan Region Groundwater Sources* (GMRGS). The provisions of this WSP have been considered within assessments undertaken as part of this EIS (refer to **Section 11.3**). The proposed development would involve water supply works and drainage works, as well as the taking of groundwater. The proposed development would also involve works in, on or under waterfront land, as defined by the WM Act. The potential impacts of the proposed development on water resources and waterfront land is discussed in **Section 11.4.** Tahmoor Mine currently extracts groundwater that drains into underground mine workings, and pumps this water to the surface via three dewatering lines before treating the water and discharging it off site. One groundwater licence is currently held under the WM Act which covers this dewatering activity (Licence Number 10WAI18745), with an annual total of less than or equal to 1,642 ML. The groundwater impact assessment (refer to Section **11.3**) for the Tahmoor South Project predicted that the annual take of groundwater (as mine inflows) would be 4.7 ML per day on average, peaking at 7.5 ML to 8 ML per day, which equates to approximately 2,600 ML to 2,850 ML per annum. Given that the groundwater entitlement volume currently held by Tahmoor Coal is 1,642 ML/annum, an additional entitlement of 1,208 ML would need to be secured via licencing to accommodate the peak predicted take of 2,850 ML/annum. The groundwater assessment has identified sufficient unassigned water is available within the Sydney Basin Nepean Groundwater Source and that this licence requirement can be secured.

Table 8.7 Approvals required to be issued consistently under section 4.42 of the EP&A Act

Approval	Comment
An aquaculture permit under section 144 of the FM Act.	The proposed development does not involve aquaculture.
An approval under section 15 of the *Mine Subsidence Compensation Act 1961* and *Mine Subsidence Compensation Amendment Act 2014* (repealed)	The *Mine Subsidence Compensation Act 1961* and *Mine Subsidence Compensation Amendment Act 2014* were repealed on January 1 2018 and have been replaced by the *Coal Mine Subsidence Compensation Act 2017.* The *Coal Mine Subsidence Compensation Act 2017* provides for the assessment and management of risks associated with subsidence resulting from coal mine operations and includes provisions for the compensation or repair services required to mitigate the damage caused by mine subsidence following underground coal mining. Subsidence Advisory NSW (SA NSW) is responsible for administering the *Coal Mine Subsidence Compensation Act 2017*. SA NSW is also responsible for reducing the risk of mine subsidence damage to properties, through its assessment and control of the types of buildings and improvements which can be erected in Mine Subsidence Districts. Part 3 of the *Coal Mine Subsidence Compensation Act 2017* stipulates that approval must be sought from SA NSW to alter or erect improvements within a mine subsidence district. An 'improvement', for the purposes of the *Coal Mine Subsidence Compensation Act 2017* is defined as: *"(a) any building or work erected or constructed on land;* *(b) infrastructure, whether above or below the surface of the land."* The proposed development would involve a number of activities that constitute 'improvements' under this definition. Furthermore, the majority of the Project Area is contained within the boundaries of the Bargo Mine Subsidence District, with a small portion to the north east extending into the Wilton Mine Subsidence District (refer to **Figure 8.2**). As such, approval for the proposed development would be sought from SA NSW in accordance with Part 3 of the *Coal Mine Subsidence Compensation Act 2017.* Mine subsidence impacts of the proposal have been assessed in **Section 11.1** of this EIS, including the claims process for seeking compensation for any damages attributed to the proposed development.

Approval	Comment
A mining lease under the *Mining Act 1992*.	The overarching objective of the Mining Act is to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development. The Mining Act controls the granting of exploration and mining titles and, amongst other legislative instruments, places controls on methods of exploration and extraction, the disposal of mining waste, and rehabilitation and environmental management activities. The proposed development would operate within CCL 747 and CCL 716 and would utilise existing surface infrastructure facilities at the Tahmoor Mine, located within ML 1642 (refer to **Figure 3.3**) As part of the proposed development, an additional mining lease would be required to accommodate the expanded REA over Crown Land (**Figure 1.5**). Additional surface mining leases are also required for the proposed additional ventilation shafts. Approvals would be sought for all required amendments to existing Mining Leases and additional Mining Leases obtained in accordance with the relevant sections of the Mining Act prior to commencement of the proposed development.
A production lease under the *Petroleum (Onshore) Act 1991*.	The proposed development would involve pre-gas drainage of coal seams. The primary purpose of pre-gas drainage is to create a safe environment for longwall mining. As such the works would be ancillary to the mining activity and further approval under the *Petroleum (Onshore) Act 1991* is not required.
An EPL under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in section 43 of that Act).	Mining for coal is listed as a scheduled activity under clause 28(2) (a), Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act). With a capacity to produce more than 500 tonnes of coal per day, the proposed development would exceed the threshold under Clause 28 of Schedule 1 of the POEO Act and as such, licensing for the proposed development is required. Tahmoor Mine currently holds EPL 1389, which regulates water quality, air quality and noise for the existing operation. Subsequent to development consent, should it be granted for the proposed development, variations to EPL 1389 would be required. Such variations may include: • Expansion of the Premises Description within the EPL to cover the area of the expanded REA as well as the proposed additional ventilation shafts. • Modification of the scale of the Scheduled Activities of Coal Works and Mining for Coal from the current EPL limit of 2,000,000 tonnes of product coal to reflect the proposed increased ROM and product coal tonnage. Potential also exists for the current noise, air quality, GHG, and water quality licence conditions to be updated during the variation of EPL 1389. Detailed noise, air quality, greenhouse gas, and water quality impact assessments have been undertaken as part of this EIS, within which improvements and the potential for changed licence limits have been considered (refer to **Sections 11.10**, **11.11**, **11.12** and **11.4**).

Approval	Comment
Consent under section 138 of the *Roads Act 1993*.	One of the key objectives of the *Roads Act 1993* is to regulate the carrying out of various activities on public roads. The proposed development would involve an upgrade to the intersection at the entrance to the Surface Facilities Area on Remembrance Driveway. This would trigger the requirement for approval from RMS under section 138 *of the Roads Act 1993*. Approval for these actions would be sought from RMS prior to the commencement of the proposed development.
A licence under the *Pipelines Act 1967*.	The *Pipelines Act 1967* outlines requirements for licences relating to the construction, alteration, or reconstruction of pipelines. The proposed development would involve the construction and operation of a pipeline, for the purposes of the pre-gas drainage operations, which may require a licence under the *Pipelines Act 1967*.

Table 8.8 Other Approvals

Approval	Comment
Water Management Act 2000 - assessment under the *NSW Aquifer Interference Policy*	The *NSW Aquifer Interference Policy* was released in September 2012. It defines the requirements for assessing the impacts of aquifer interference activities on water resources, with the aim of striking a balance between the water use requirements of towns, farmers, industry and the environment. Under the requirements of the *NSW Aquifer Interference Policy*, an activity's predicted impacts are considered acceptable if they do not exceed the Level 1 thresholds provided within the Policy by no more than the accuracy of an otherwise robust model. A detailed assessment of potential impacts of the proposed development on relevant groundwater resources has been undertaken as part of this EIS (refer to **Section 11.3**). Results of this assessment indicate that the proposed development would be classified as Level 2 within the minimal impact considerations of the *NSW Aquifer Interference Policy*. Consequently, the proposed development would require risk mitigation, prevention or avoidance strategies to be implemented so that groundwater impacts are managed within acceptable limits.

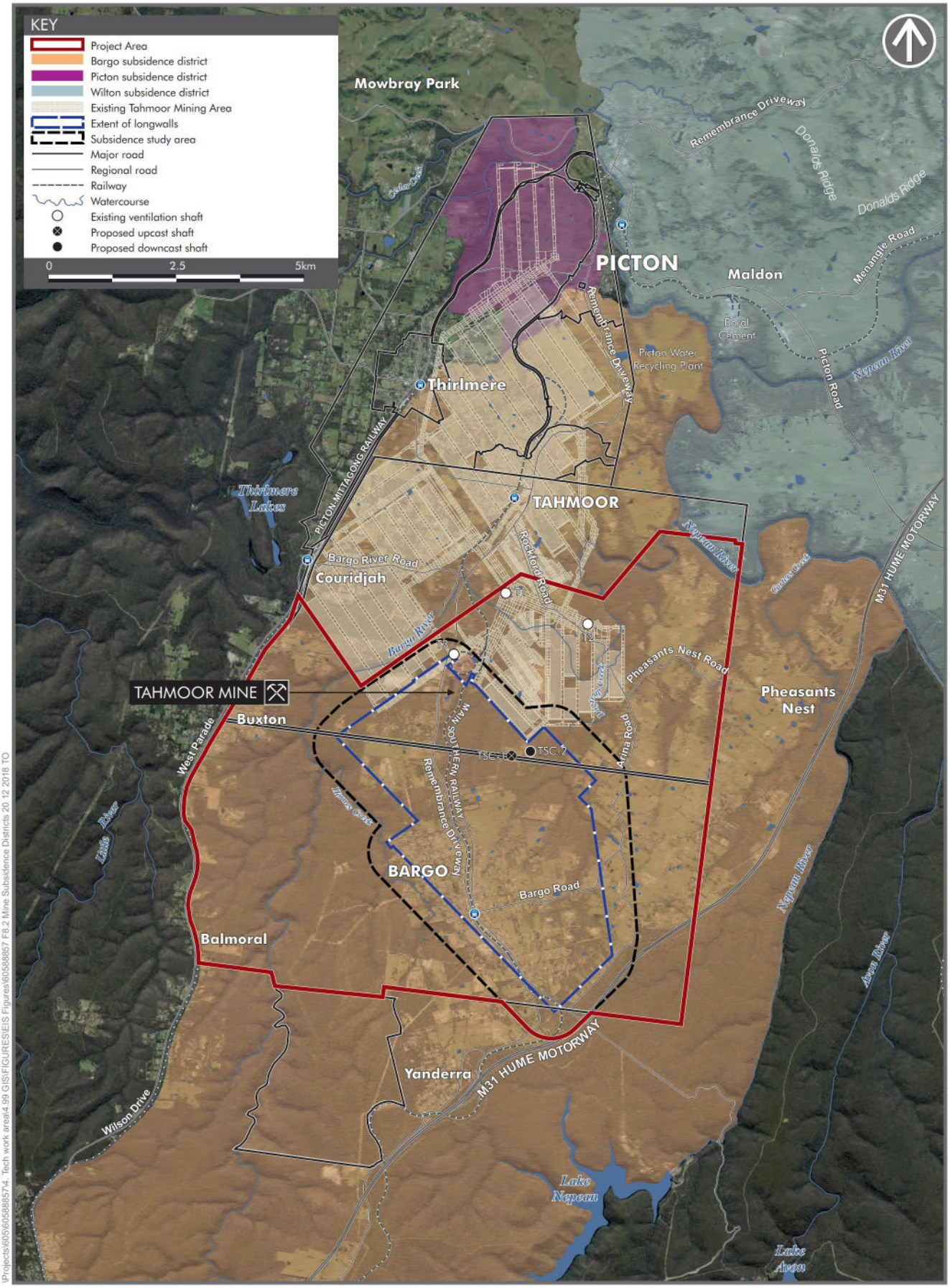
Approval	Comment
Dams Safety Act 1978	The Dams Safety Committee (DSC) is the State's regulator for dam safety under the NSW *Dams Safety Act 1978*. It is responsible for the development and implementation of policies and procedures for effective dam safety management to protect life, property and the environment from dam failures. The DSC acts to prevent or mitigate any damage to a prescribed dam. A listing of prescribed dams is provided within Schedule 1 of the *Dams Safety Act 1978* and includes Nepean Dam, located south-east of the Project Area. Prescribed dams are generally surrounded by a Notification Area, within which mining companies are required to address risks of damage to dam structures as well as risks of loss of stored water through the reservoir floor. The DSC, with approval from the Premier in the case of mining, can issue written notice requiring the cessation of any work as may be reasonably necessary to ensure the safety of the prescribed dam. No far field effects are predicted for the Nepean Dam. Consequently, approval from the DSC is not required for the proposed development. No Mining Leases associated with the proposed development fall within the boundary of the Notification Area. Nonetheless, potential impacts on Nepean Dam are discussed in **Section 11.3** of this EIS.
Biodiversity Conservation Act 2016	The *Biodiversity Conservation Act 2016* (BC Act) replaces the *Threatened Species Conservation Act 1997* (TSC Act) and aims to maintain a healthy, productive and resilient environment for the well-being of the community consistent with the principles of ecologically sustainable development. However, the provisions of Part 7 of this Act relating to biodiversity assessment and approvals does not apply to the proposed development as it meets the transitional provisions under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017.* Under Clause 28, Part 7 of the Regulation, '*Former planning provisions continue to apply to pending or interim planning applications'.* In order to be determined a 'pending or interim planning application', a development must meet one of the definitions provided under Clause 27 of Part 7 of the Regulation, The proposed development meets the definition under sub-clause (b) in that the development application will be submitted within 18 months of the commencement of the BC Act, will be accompanied by an EIS, and the SEARS were issued prior to the commencement of the BC Act. Accordingly, the proposed impacts on biodiversity as a result of the proposed development have been assessed in accordance with the requirements of the *Framework for Biodiversity Assessment* (FBA) (OEH, 2014) under the TSC Act.

8.1.5 Summary of Approvals

Based on applicable legislation outlined in **Section 8.1.4** above, a summary of the approvals and permits required for the proposed development is provided below:

- additional water licence under the *Water Management Act 2000;*
- approval under the *Coal Mine Subsidence Compensation Act 2017*;
- new leases and amendments to existing leases under the *Mining Act 1992*;
- variation to existing EPL under the POEO Act;
- road permit under section 138 of the *Roads Act 1993*; and
- licence under the *Pipelines Act 1967*.

This page has been left blank intentionally.



\Projects\605\605888574. Tech work area\4.99 GIS\FIGURES\EIS Figures\605888857 F8.2 Mine Subsidence Districts 20 12 2018 TO

SIMEC MINING

MINE SUBSIDENCE DISTRICTS

Tahmoor South Project
Environmental Impact Statement

FIGURE 8.2

8.2 Strategic Land Use Planning

Strategic land use plans relevant to the proposed development include the *A Plan for Growing Sydney (NSW Government, 2014)* and Western District Plan (GSC, 2018). The proposed development has been considered in the context of each of these strategic land use plans, as discussed below.

8.2.1 Integrated Mining Policy

The *Integrated Mining Policy* aims to improve regulation and assessment of major mining projects while balancing the economic benefits with environmental impacts, and keeping the community informed. The policy does not reduce environmental standards or community consultation requirements currently in place for mining projects.

The policy includes indicative SEARs which outline common assessment requirements for mining projects, providing early guidance for the consideration of key issues by proponents prior to DPE issuing project specific SEARs for a development. The key issues assessed as part of this EIS are generally consistent with the indicative SEARs identified in the policy and addresses the project-specific SEARs issued for the development. Details of the assessment are provided in **Section 11.0**.

The *Mine Application Guideline 2015* (NSW Government, 2015) contained within the policy has been prepared to assist proponents in preparing development applications for mining proposals. The guideline is intended to ensure applications adequately describe the project description, strategic context for the proposed development, trade-offs that have been made in the design process, key environmental issues, and consultation undertaken. These matters have been addressed in the EIS in **Section 4.0** Proposed Development, **Section 6.0** Project Need and Alternatives, **Section 9.0** Stakeholder Engagement, and **Section 10.0** Identification of Environmental Issues.

The guideline also outlines the requirements for some projects to obtain a site verification certificate or gateway certificate under the Mining SEPP. As discussed in **Section 8.1.3**, a site verification certificate has been obtained for the proposal, confirming that the proposed development would not affect areas mapped as BSAL, consistent with the requirements of clause 50A of the EP&A Regulation.

The policy also contains *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals 2015* (NSW Government, 2015). These guidelines focus on two key matters the consent authority must consider when determining a development application for a mining project, '*the collective public interest of households in NSW and the development's likely environmental, social and economic impacts on the local area*'. An Economic Impact Assessment and Social Impact Assessment (SIA) have been completed for the project and have considered these matters (refer to **Appendix Q** Social Impact Assessment and **Appendix R** Economic Impact Assessment). An assessment of the impacts of the proposed development on the environment is provided in **Section 11.0**.

The development application for the proposed development has been prepared generally in accordance with the guidance material presented within the *Integrated Mining Policy*.

8.2.2 A Plan for Growing Sydney

A Plan for Growing Sydney (NSW Government, 2014) (*Growing Sydney*) aims to promote the growth of Sydney by guiding land use planning decision making for the next 20 years. It provides a framework based around the following four key goals:

- Goal 1 – To develop a competitive economy with world-class services and transport;
- Goal 2 – To deliver greater housing choice to meet changing needs and lifestyles;
- Goal 3 – To create strong, healthy and well-connected communities; and
- Goal 4 – To safeguard the natural environment.

Some of the actions of Growing Sydney relate to transforming the productivity of western Sydney through growth and investment, and growing strategic centres such as Penrith, Liverpool and Campbelltown-Macarthur to provide more jobs closer to home.

Should development consent be granted for the proposed development, mining operations at Tahmoor Mine would be authorised to continue for approximately a further 13 years, maximising the recovery of coal resources within Tahmoor Coal's mining lease areas. The proposed extension of the life of the Mine would enable ongoing direct employment and provide a significant resource-based economic contribution at a regional, State and national level in an area already recognised as resource rich. The benefits of the proposed development would therefore assist the broad aims of *Growing Sydney* in providing jobs closer to homes in south-western Sydney. The proposed development would not impact on other strategic directions of *Growing Sydney*. The proposed development would not conflict with future strategic land use in the Bargo Area, which would be a Metropolitan Rural Area under the plan. Retaining local jobs for local communities of Metropolitan Rural Areas is an important outcome under the plan and the project would be consistent with the outcome.

8.2.3 Western District Plan

Of all the Districts in Greater Sydney, the Western District is undergoing the most dramatic change. The *Western District Plan* (Greater Sydney Commission, 2018) (Western District Plan) recognises that there are substantial mineral resources in the Western District, and that coal mining already takes place. The Plan also recognises that primary industries are essential to the Western District's economy and that they may need to be protected to avoid their transition to higher uses such as suburban residential development.

The proposed development would capitalise on extracting resources in a manner consistent with the aims of the Western District Plan relating to environmental protection through the assessment of environmental impacts and ongoing management. The proposed development would not conflict with future strategic land use in the Bargo Area, which would remain a Metropolitan Rural Area under the plan.

8.2.4 Sydney-Canberra Corridor Regional Strategy 2008

The *Sydney-Canberra Corridor Regional Strategy 2006-2031* (Department of Planning 2008) applies to the Wingecarribee LGA. The primary aim of the *Sydney-Canberra Corridor Regional Strategy 2006-2031* is to accommodate and manage growth while ensuring that the rural landscapes and environmental settings that define the region's character are not compromised. The Regional Strategy notes that the Southern Coalfield is an important source of coking and thermal coal and that LEPs will provide for the protection of extractive industries and mineral resources through appropriate land use zonings and planning controls that limit the potential for land use conflicts in the buffer areas around these resources. The proposed development, through the production of coking coal and thermal coal, would be consistent with the strategic land use outcomes envisaged by the Strategy, in that the Strategy acknowledges the regional importance of, and aims to protect, such mining operations through appropriate planning controls. Job creation by the proposed development (50-175 additional positions during the construction/ transition period and retention of existing employment over the extended 13 year mine life) would also align with the overall objectives of the *Sydney-Canberra Corridor Regional Strategy* of accommodating growth in the region.

8.2.5 Southern Coalfield Inquiry

The Southern Coalfields Inquiry was an independent inquiry into underground coal mining in the Southern Coalfields (see **Section 5.3.1**).

The Inquiry was established by the NSW Government on 6 December 2006, and was established in response to concerns held by the then State Government over past and potential future impacts of mining-induced ground movements on significant natural features in the Southern Coalfields. This action followed community concerns regarding mine-related subsidence impacts to the Cataract River that occurred as a result of mining at Appin West Colliery.

The purpose of the Southern Coalfield Inquiry was to:

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

b. Avoiding and/or minimising adverse impacts on significant natural features;

c. Management, monitoring and remediation of subsidence and subsidence-related impacts; and

3. Report on the social and economic significance to the region and the State of the coal resources in the Southern Coalfields.

The Southern Coalfields Inquiry, in considering the natural features of the Southern Coalfields and the impacts of subsidence, concluded:

- the site conditions within the Southern Coalfields, a dissected landscape of incised rivers and gorge country as well as geological features including faults and dykes, give rise to non-conventional subsidence impacts such as valley closure, upsidence and regional far-field horizontal displacement; and
- it is the valley closure and upsidence effects from underground mining that create the majority of impacts on significant natural features such as the cracking of stream beds, rock falls from cliff lines and alteration of groundwater chemistry in shallow aquifers.

The Southern Coalfields Inquiry made recommendations regarding best practice in relation to the assessment of subsidence impacts, ways to minimise adverse impacts on significant natural features, and the management, monitoring and remediation of subsidence and subsidence related impacts.

This environmental assessment for the proposed development has considered the recommendations of the Southern Coalfield Inquiry report as summarised in **Table 5.1**, and further discussion of the relevant environmental impacts and proposed management measures is included in **Section 11.0**.

8.3 Commonwealth Environmental Approvals

8.3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act requires approval from the Commonwealth Minister for Environment where an action will, or is likely to have, a significant impact on a MNES.

It was identified that the proposed development triggers the requirement for an EPBC Act referral (and potential subsequent need for approval under that Act) through:

1. direct impacts, principally through vegetation clearing associated with the construction and operation of the REA and to a lesser extent, ventilation shafts and surface pre-gas drainage activities; and
2. indirect impacts principally associated with subsidence-related changes to surface elevation, topography and drainage (including potential cracking interactions between groundwater and surface water systems).

The proposed development was referred to the DoEE on 20 October 2017 (EPBC 2017/8084) for consideration as a controlled action, based on potential impacts to listed threatened species and communities, and water resources. The proposed development was determined to be a controlled action by DoEE on 12 January 2018 on the basis that it may impact the following MNES:

- Shale/Sandstone Transition Forest (SSTF) - a Critically endangered ecological community (CEEC) under the EPBC Act, identified within the footprint of the proposed surface facilities including the REA expansion area;
- *Persoonia bargoensis* - listed as vulnerable under the EPBC Act, which has also been identified within the footprint of the proposed REA expansion area;
- *Grevillea parviflora* subsp. *parviflora* - listed as vulnerable under the EPBC Act, which has also been identified within the footprint of the proposed REA expansion area;
- Rufous Pomaderris (*Pomaderris brunnea*) - listed as vulnerable under the EPBC Act; and
- impacts to groundwater resources as a result of longwall mining (Water Trigger).

In addition, the DoEE identified that there is some risk of significant impacts on the following matters and the levels of impact should be further investigated:

- Turpentine-Ironbark Forest of the Sydney Basin Bioregion – Critically Endangered;
- Woronora Beard-heath (*Leucopogon exolasius*) – Vulnerable;
- Koala (*Phascolarctos conereus*) – Vulnerable;
- Macquarie Perch (*Macquaira australasica*) – Endangered; and
- Greater Glider (*Petauroides Volans*) – Vulnerable.

The supplementary SEARs issued by DPE following the declaration of the proposed development as a controlled action confirmed that the proposed development would be assessed in accordance with the NSW Bilateral Agreement (2015).

The potential impacts on listed threatened species and communities, and on water resources, are discussed in detail in **Section 11.3, 11.4, 11.6** and **11.7** , respectively.

It is noted that the DoEE referral and Controlled Action determination of the proposed development was based on an earlier mine plan layout, which included mining in both the Central and Eastern domains. As discussed in **Section 6.2.4**, subsequent mine planning has led to a revised mine plan involving mining in the Central Domain only (current proposed development) which would result in reduced native vegetation clearing and associated habitat loss (49.2 ha compared to 53.3 ha). Terrestrial ecology impacts are further assessed in **Section 11.6**.

8.3.2 Native Title Act 1993

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

To determine the Native Title status of land within the Project Area, a Native Title extinguishment search was conducted for land within the Project Area. The search identified land subject to Native Title which is not extinguished or partially extinguished.

The Gundungurra Tribal Council Aboriginal Corporation has a Native Title claim registered as Gundungurra #6 (dating 21 June 2000) extending from Katoomba to Goulburn and included the Project Area. The claim was withdrawn during June 2014, upon an indigenous land use agreement (ILUA) between the Gundungurra people, the Gundungurra Tribal Council Aboriginal Corporation, Gundungurra Aboriginal Heritage Association and the NSW Government. The ILUA excludes the Project Area.

An ILUA is an agreement between a Native Title group and other parties who use or manage the land and waters. The ILUA process allows for negotiation between indigenous groups and other parties over the use and management of land and water resources, and the ability to establish a formal agreement. An ILUA is binding once it has been registered on the Native Title Tribunal's Register of Indigenous Land Use Agreements. However, the ILUA would not have the potential to impact the proposed development.

During the ACHA for the proposed development Registered Aboriginal Parties and aboriginal stakeholder groups including the Gundungarra Aboriginal Heritage Association Inc. were consulted about the proposed development and given the opportunity to provide input regarding cultural significance (refer to **Section 9.2.2**).

This page has been left blank intentionally.

9.0 Stakeholder Engagement and Project Refinement

Tahmoor Coal has a long history of successful engagement with the local community in which it operates, striving to sustain positive relationships through a process of ongoing consultation and interaction. This interaction provides a means by which Tahmoor Coal can openly and honestly address issues and involve the community in decisions that affect them. Details of existing stakeholder engagement are discussed in **Sections 3.8** and **11.1.3**.

9.1 EIS Consultation

Stakeholder engagement has been undertaken throughout the project planning and environmental impact assessment process, including consultation with local and State Governments, industry regulators, near neighbours, the local Aboriginal community and the wider local community. This section provides an overview of the engagement process applied, its objectives, a description of the various engagement phases and the engagement activities undertaken. Also summarised are the findings of these activities, and references to where these findings have been incorporated and addressed in the assessments undertaken for this EIS.

9.1.1 Planning Focus Meeting

A Planning Focus Meeting (PFM) was held at the DPE Bridge Street Offices on October 18, 2012. The PFM was attended by 10 government regulators representing agencies including DPE, the then NSW Trade & Investment – Division of Resources and Energy (now replaced by the DRG), the then NSW Office of Water (now replaced by DI Water), Wollondilly and Wingecarribee Shire Councils, Sydney Catchment Authority (now Water NSW), NSW EPA, OEH, Roads and Maritime Services (RMS), Transport for NSW, and the Project Team.

The PFM included a presentation and discussion on the proposed development, proposed assessment methodology and identified potential environmental impacts as well as preliminary management and mitigation measures. Key issues raised during the PFM related to:

- the potential impacts of subsidence associated with the proposed development on:
  - infrastructure including the M31 Hume Motorway, railway bridges (refer to **Section 11.1**);
  - Aboriginal heritage values along Dog Trap Creek (refer to **Section 11.8**);
  - the height of fractures and potential impacts on aquifer interference (refer to **Section 11.3**);
  - Thirlmere Lakes (refer to **Section 11.5**); and
- the potential impacts of the proposed development on future land uses (refer to **Section 11.19**).

Following re-commencement of the project and the re-issue of SEARs in June 2017, another Government Agency briefing was held for the proposed development on 18 December 2017 and was attended by DPE, NSW EPA, NSW OEH, and DRG. The purpose of the meeting was to provide DPE and relevant agencies an updated briefing of the proposed development, including the history of the Tahmoor South Project, EIS process to date, and to understand key agency issues for consideration in the EIS. Key issues raised during the meeting, in addition to those raised in 2012, included the following areas for consideration in the EIS:

- impacts to catchment areas/special areas including ephemeral stream impacts, and water quality (refer to **Section 11.4**);
- updates to policy and the Southern Coalfield Inquiry, as they relate to mining in/near special areas, and their role in assessing the proposed development (refer to **Sections 5.3 and 8.0**);
- urban development pressures including:
  - subsidence impacts (refer to **Section 11.1**);
  - compliance of the proposed development with, and the potential for conflict, with strategic planning in the vicinity of the Project Area (refer to **Sections 8.2 and 11.19**); and
- amenity/noise impacts (refer to **Section 11.10**).

9.1.2 Statutory and Agency Consultation

Tahmoor Coal has undertaken comprehensive consultation with key local and State Government agencies as specified in the SEARs for the proposed development. The purpose of this consultation has been to provide agencies with an overview of the proposed development and to seek input into relevant matters addressed in the EIS.

Face to face meetings, where possible, were held with relevant agencies identified in the SEARs to assist with the preparation of the EIS. These agencies included DPE, DPI, NSW EPA, NSW OEH, RMS, Wollondilly and Wingecarribee Shire Councils and Water NSW (formerly the Sydney Catchment Authority). Note at the time of consultation, DPI included the NSW Office of Water (now DI Water). A summary of consultation undertaken with Government agencies is provided in **Table 9.1**.

Table 9.1 Statutory and Agency Consultation Log

Reason for Consultation	Date	Details / issues raised
NSW Department of Planning and Environment (DPE)		
Presentation of proposed development	05/07/12	Overview of proposed development provided to DPE.
Submission of PEA	12/09/12	Overview of proposed development and preliminary identification of potential impacts provided to DPE.
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Consolidation of Consents	22/02/13	Overview of existing development consents at Tahmoor Mine and discussion of proposed consent strategy for the proposed development. The proposed consent framework is presented in **Section 7.0.**
Noise Assessment	05/09/13	Discussion regarding noise monitoring and modelling, application of the *Industrial Noise Policy* (INP) and setting of noise goals. This meeting was also attended by EPA. INP and noise goals were considered as part of the Noise Impact Assessment (refer **Section 11.10**).
Noise Assessment	13/11/17	Overview of the updated project and clarification on the assessment methodology. The DPE confirmed the noise assessment was to be conducted in accordance with the NSW *Industrial Noise Policy.*
Government Agency Briefing	18/12/17	Meeting to provide DPE and relevant agencies a briefing of the proposed development, including history of the Tahmoor South Project EIS process to date, and to understand key agency issues for consideration in the EIS.
Pre-lodgement meeting	16/03/18	Meeting to provide an update on the progress of the EIS and the planned lodgement date.
Briefing on approval pathway	02/05/18	Overview of approval pathway
Social impact assessment discussion	13/07/18	Overview of updated guideline and assessment
Project overview	26/09/18 06/09/18	Overview of project and impact assessment overview
Federal Government Department of Environment & Energy (DoEE)		
EBPC referral briefing	22/09/17	Discussion regarding the EPBC referral for the proposed development.

Reason for Consultation	Date	Details / issues raised
Australian Rail Track Corporation (ARTC)		
Presentation of proposed development and subsidence impacts	29/01/14	Overview of proposed development and identification of potential impacts on ARTC infrastructure. The potential impacts of the proposed development on rail infrastructure are discussed in **Section 11.1**.
DI Water (formerly NSW Office of Water (NOW) under DPI) and Water NSW (formerly Sydney Catchment Authority (SCA))		
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Presentation of the proposed approach to undertaking the Groundwater Assessment.	31/10/12	Presentation of the baseline monitoring program and proposed model for the Groundwater Assessment. Issues raised included: • Thirlmere Lakes; • Groundwater monitoring program • Extent of fracture zone; • Aquifer Interference Guidelines; • Groundwater licensing; and • Groundwater dependent ecosystems. These issues were investigated as part of the Groundwater Assessment for the proposed development (**Section 11.3**).
Presentation of preliminary model results from the Groundwater Assessment.	27/11/13	The preliminary results from the groundwater model were presented to NOW. Issues raised included: • Extent of bore census. The issues raised were addressed in the Groundwater Assessment for the proposed development (**Section 11.3**).
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Presentation of proposed development and discussion of approach to environmental assessments. This meeting was also attended by NPWS.	20/11/12	A field inspection of Cow Creek was undertaken in addition to a meeting on the potential impacts of the proposed development on SCA lands. Impacts to SCA lands have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018), the Groundwater Assessment (HydroSimulations, 2018), the Surface Water Assessment (HEC, 2018) and the Terrestrial Ecology Assessment (Niche Environment and Heritage, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1**, **11.3**, **11.4** and **11.6**).
Presentation of proposed development and discussion of preliminary results from the environmental impact assessments. This meeting was also attended by EPA and OEH.	12/12/13	Concerns were raised by SCA regarding the potential impacts of the proposed development on SCA lands. Impacts to SCA lands have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018), the Groundwater Assessment (HydroSimulations, 2018), the Surface Water Assessment (HEC, 2018) and the Terrestrial Ecology Assessment (Niche Environment and Heritage, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1**, **11.3**, **11.4** and **11.6**).
Project overview	26/09/18	Overview of project and impact assessment overview

Reason for Consultation	Date	Details / issues raised
NSW Department of Industry		
Project overview	22/06/18	Overview of project and impact assessment overview
Wingecarribee Shire Council		
PFM	05/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Presentation to General Manager and senior Council staff	12/11/12	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts. Council raised concerns regarding the impacts of coal mining on lands within the Wingecarribee LGA.
Presentation to Wingecarribee Coal Consultation Committee	29/11/13	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts. Committee raised concerns regarding the impacts of coal mining on lands within the Wingecarribee LGA and noted its objection to longwall mining.
Project Briefing	11/10/17	Tahmoor Coal advised that SEARs have been re-issued for the proposed development and work was being undertaken to finalise the EIS. Advised that whilst the Project Area extends into the Wingecarribee LGA, no activities associated with the proposed development would take place in the LGA.
Wollondilly Shire Council		
General discussion regarding proposed development.	17/09/12	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
General discussion regarding proposed development and status of the EIS	29/07/13	Tahmoor Coal provided an overview of proposed development and potential impacts to Councillors and Council Executive Management of Council. Council raised specific concerns regarding subsidence and some concerns about more general environmental impacts associated with the proposed development. Council representatives also expressed an interest in the potential economic benefits of the proposed development. The potential for the proposed development to cause subsidence movements, and create impacts resulting from subsidence movements on natural and built features, is presented in **Section 11.1**. The economic benefits of the proposed development are discussed in **Section 11.16**.

Reason for Consultation	Date	Details / issues raised
Meeting with Wollondilly Shire Council Strategic Planners regarding urban growth	03/12/13	Tahmoor Coal and Council discussed the urban growth plans for the township of Bargo and the potential impacts of mine subsidence on urban growth areas. The Subsidence Impact Assessment was updated to include an assessment of conventional subsidence parameters for the 2,000 additional houses identified in the *Wollondilly Growth Management Strategy* (2011). A summary is included in **Section 11.1.4**.
General discussion on the implications that the proposed development may pose for Council's future considerations of development applications within the proposed development Area.	23/01/14	Tahmoor Coal and Council had a further discussion regarding the urban growth plans for the township of Bargo and the potential impacts of mine subsidence on urban growth areas. The meeting was held with Wollondilly Shire Council's Strategic Planners, Illawarra Coal and the Mine Subsidence Board (now SA NSW). Potential impacts to land use have been assessed in **Section 11.19**.
Meeting with General Manager and strategic planning staff to discuss development contributions	14/03/14	Development contributions mechanisms discussed.
Meeting to discuss Planning Agreement	02/05/14	Planning agreement mechanism discussed.
Meeting to discuss Planning Agreement	12/06/14	Planning agreement mechanism discussed.
Project Briefing	07/09/17 26/11/18	Tahmoor Coal advised that SEARs have been re-issued for the proposed development and work was being undertaken to finalise the EIS.
Meeting with Wollondilly Shire Council senior managers	31/05/18	Project overview and impact assessment
Meeting with Wollondilly Shire Council Environment team	31/07/18	Project overview and impact assessment
Meeting with Wollondilly Shire Council Friends of Thirlmere Lakes	03/08/18	Project overview and impact assessment
Meeting with Wollondilly Shire Council Councillors	26/11/18	Project overview and impact assessment
Transport for NSW		
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Office of Environment and Heritage		
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
General discussion regarding proposed development. This meeting was also attended by EPA and SCA.	12/12/13	Overview of proposed development and preliminary identification of potential impacts. The preliminary outcomes of technical specialist investigations and modelling were also presented.

Reason for Consultation	Date	Details / issues raised
Biodiversity offsets required to mitigate the biodiversity impacts of the proposed development.	9/7/14	The Biodiversity Offset Strategy for the proposed development was presented and discussed with OEH. OEH provided in principle support for offset strategy presented, detailed in **Section 11.6.5**.
Project briefing	18/12/17	Overview of project, impact assessment overview and plan to submit development application and EIS in 2018.
Overview of subsidence impacts on streams	20/06/18	Overview of project, impact assessment overview
Biodiversity offsets required to mitigate the biodiversity impacts of the proposed development.	11/09/18 13/11/18	The Biodiversity Offset Strategy for the proposed development was presented and discussed with OEH. OEH provided in principle support for offset strategy presented, detailed in **Section 11.6.5**.
NSW Environment Protection Authority		
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Noise Assessment for the proposed development. This meeting was also attended by DPE.	05/09/13	Discussion of noise monitoring and modelling, application of INP and setting of noise goals. INP and noise goals were considered as part of the Noise Impact Assessment (refer **Section 11.10**).
Potential air quality impacts of the proposed development.	09/13	Correspondence regarding the air quality impact assessment (AQIA) undertaken via email in lieu of a face to face meeting.
General discussion regarding proposed development. This meeting was also attended by OEH and SCA.	12/12/13	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts. The preliminary outcomes of technical specialist investigations and modelling were also presented.
Noise Assessment	13/11/17	Overview of the updated project was provided, and clarification sought on the assessment methodology. The NSW EPA confirmed the noise assessment was to be conducted in accordance with the NSW *Industrial Noise Policy*.
Project briefing	18/12/17	Overview of project, impact assessment overview and plan to submit development application and EIS in 2018.
Noise assessment	16/03/18	Overview of the results of the noise assessment.
Project overview	26/09/18	Overview of project and impact assessment overview
NSW DRG (Formerly NSW Trade & Investment – Division of Resources and Energy)		
Presentation of the concept mine plan for the proposed development.	29/06/12	Overview of proposed development and preliminary identification of potential impacts. The DRG provided in principle support for a mine plan capable of maximising the available resource. The importance of managing potential subsidence impacts and other environmental issues was discussed.

Reason for Consultation	Date	Details / issues raised
PFM	18/10/12	Overview of proposed development and preliminary identification of potential impacts. Refer to **Section 9.1.1**.
Meeting to discuss subsidence assessment and impacts	27/11/13	Impacts have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018), the Groundwater Assessment (HydroSimulations, 2018), the Surface Water Assessment (HEC, 2018) and the Terrestrial Ecology Assessment (Niche Environment and Heritage, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1**, **11.3**, **11.4** and **11.6**).
Subsidence infrastructure inspection of: • APA - Sydney - Moomba gas pipeline; and • Gorodok - Ethane pipeline.	28/07/14	Gas pipeline inspection in particular : • Crossing of the pipeline with the Main Southern Railway line; • Location of pipeline in relation to resident's homes; and • Road crossings of pipeline at Avon Dam Road and Remembrance Driveway.
Government Agency Briefing	18/12/17	Meeting to provide DPE and relevant agencies a briefing of the proposed development, including history of the Tahmoor South Project EIS process to date, and to understand key agency issues for consideration in the EIS.
Concept Project Development Plan	16/01/18	Overview of project, impact assessment overview and plan to submit development application and EIS in 2018. An overview of the mine plan constraints and geological background was also provided.
Project briefing	28/06/18	Overview of project
Project overview	05/06/18 22/06/18 26/09/18	Overview of project and impact assessment overview
National Parks and Wildlife Service (NPWS)		
General discussion regarding proposed development This meeting was also attended by SCA.	20/11/12	Field inspection of Cow Creek and a meeting on the potential impacts of the proposed development on SCA lands.
NSW Health		
General discussion regarding proposed development	7/3/14	Overview of the proposed development (via email). NSW Health raised concerns regarding human health impact of the proposed development including air quality and noise impacts. Noise and air quality impacts of the proposed development are presented in **Sections 11.10** and **11.11** respectively.
Subsidence Advisory NSW (SA NSW) (formerly Mine Subsidence Board)		
General discussion regarding proposed development	27/11/13	Overview of proposed development and preliminary identification of potential impacts.

Reason for Consultation	Date	Details / issues raised
General discussion on the implications that the proposed development may pose for Council's future considerations of development applications within the Project Area.	23/01/14	Further discussion regarding the urban growth plans for the township of Bargo and the potential impacts of mine subsidence on urban growth areas. The meeting was held with Wollondilly Shire Council's Strategic Planners, Illawarra Coal and the Mine Subsidence Board. Potential impacts to urban growth areas are considered in **Section 11.15**.
Meeting to discuss subsidence assessment and impacts	27/11/13	Impacts have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018), the Groundwater Assessment (HydroSimulations, 2018), the Surface Water Assessment (HEC, 2018) and the Terrestrial Ecology Assessment (Niche Environment and Heritage, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1**, **11.3**, **11.4** and **11.6**).
Project briefing	16/11/17	Overview of project, impact assessment overview and plan to submit development application and EIS.
Project briefing	17/07/18	Overview of project and impact assessment overview
Roads and Maritime Services (RMS)		
General discussion regarding proposed development	3/12/13	Overview of proposed development and preliminary identification of potential impacts. RMS raised concerns regarding the potential impacts of the proposed development on the M31 Hume Motorway, specifically M31 bridges spanning the Nepean River. The potential impacts of subsidence movements on the M31 Hume Motorway are presented in **Section 11.1.6**.
APA / Gorodok		
General discussion regarding proposed development and subsidence impacts to high pressure gas pipeline	10/12/13	Impacts have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1.**
Sydney Water		
General discussion regarding proposed development and subsidence impacts to Sydney Water assets	19/02/14	Impacts have been assessed as part of the Subsidence Impact Assessment (MSEC, 2018). The potential impacts of the proposed development are summarised in **Sections 11.1.**
Federal Member for Hume- Angus Taylor		
General discussion regarding proposed development	13/6/14	General discussion regarding proposed development.

Reason for Consultation	Date	Details / issues raised
Site inspection of Tahmoor Mine	31/07/14	General discussion and update on the Tahmoor South Project and the Tahmoor Mine. Site surface inspection including the following areas: • Gas extraction plant; gas flare plant; and third party gas power generation plant; • The recycle water treatment plant and the waste water treatment plant; • Water discharge points; • Surface buildings; and • CHPP.
General discussion regarding proposed development	27/09/18	General discussion regarding proposed development.
State Member for Wollondilly – Jai Rowell		
General discussion regarding proposed development	24/9/12 08/04/14 05/02/18	General discussion regarding proposed development.
State Member for Goulburn – Pru Goward		
General discussion regarding proposed development	5/10/12	General discussion regarding proposed development.

9.2 Stakeholder Engagement Plan

Prior to preparation of the EIS, Tahmoor Coal developed a Stakeholder Engagement Plan to guide engagement with the community and other stakeholders and documented activities via a clearly defined and staged process. The objectives of the Stakeholder Engagement Plan are to:

- identify key stakeholders and maintain an accurate database;
- engage with key stakeholders to identify potential issues and concerns relating to the proposed development;
- enable stakeholders to have input into the direction of the EIS and project planning. This includes obtaining and encouraging feedback on operation, environmental and social performance;
- build and maintain trust and credibility, and establish effective and ongoing two way consultation with key stakeholders and the community;
- provide timely and accurate information to stakeholders on operational, environmental and social performance. This includes responding to enquiries or complaints in a timely manner;
- provide feedback to stakeholders on how their input has influenced operations or decisions; and
- manage community awareness and expectations of the proposed development. This includes developing clear and consistent key messages specific to each phase of consultation.

The Stakeholder Engagement Plan guided consultation with the community and Aboriginal stakeholders and also outlined the consultation activities to be undertaken following lodgement of the EIS. Summaries of these consultation efforts are provided below.

9.2.1 Consultation with the Local Community

Community Newsletter

Community newsletters were prepared during the preparation of the EIS and distributed as required via the following methods:

- letterbox drop (approximately 4,000 households);

- mailed to project mailing list (approximately 250 individuals and organisations);
- community noticeboards; and
- site noticeboards for employees (approximate audience of 370).

Each newsletter contained updates on the proposed development and information about the preparation and lodgement of the EIS.

Tahmoor Coal Community Consultative Committee

The TCCCC meets quarterly to provide the community with an avenue for the exchange of information relating to the mine and its operations. The TCCCC comprises the following representatives:

- an independently appointed Chairperson;
- four representatives of the local community and other stakeholders;
- two representatives of the local council; and
- two or three Tahmoor Coal representatives, including the Environment and Community Manager.

The Environment and Community Manager and Community Coordinator are responsible for managing the TCCCC. Minutes of TCCCC meetings are maintained as a record of each meeting and are distributed to all TCCCC members, with a copy of the minutes also published on the Tahmoor Coal website.

During the preparation of the initial EIS in 2012-2014, nine TCCCC meetings (May 2012, September 2012, December 2012, March 2013, June 2013, September 2013, December 2013, March 2014 and June 2014) and one TCCCC Surface Tour (November 2013) were held. The TCCCC meetings were also attended by the Project Team to provide updates on the proposed development. At the TCCCC meeting on 15 June 2017, Tahmoor advised the committee that updated assessment requirements (SEARs) for the Tahmoor South Project were requested from DPE with the intention to recommence the proposed development, including submission of the project's EIS. Project updates were then provided at the September 2017, December 2017, June 2018, September 2018 and December 2018 TCCC meetings.

General Community Information

Relevant information has been provided to the public during the environmental assessment phase through various methods including:

- the Tahmoor Coal website;
- community information sessions; and
- local newspaper articles.

The Tahmoor Coal website (www.tahmoorcoal.com.au) provides access to a range of information, including resident updates and contact details.

Nine community information days have been held since the commencement of the environmental assessment phase: a Seismic Community Day on 20 June 2012 as well as eight general Community Information Days on 6 June 2013, 25 July 2013, 19 December 2013, 1 May 2014, 21 September 2017, 20 November 2017, 29 September 2018 and 30 October 2018. Tahmoor Mine Open Days have also been held, on 12 September 2013, 28 November 2013 and 20 September 2018. Social Impact Assessment surveys were held in Bargo on 18 September 2018, 19 September 2018 and 25 September 2018, and in Tahmoor and Picton on 20 September 2018.

Meetings were also held with community organisations within close proximity of the project where Tahmoor Coal informed the community of the project and provided the opportunity for feedback. A summary of the matters discussed is provided in **Table 9.2**.

Media statements are used on an as needs basis to address specific issues and respond to significant events.

Table 9.2 Community Organisation Consultation Log

Reason for Consultation	Date	Details / issues raised
Bargo Dingo Sanctuary		
General discussion regarding proposed development	17/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Bargo Primary School		
General discussion regarding proposed development	03/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Infrastructure and Emergency Providers		
General discussion regarding proposed development	17/09/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts, including the flood assessment.
National Parks Association of NSW		
General discussion regarding proposed development	28/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Picton Chamber of Commerce		
General discussion regarding proposed development	26/09/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Picton High School		
General discussion regarding proposed development	15/06/18 31/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Rivers SOS		
General discussion regarding proposed development	13/09/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Wollondilly Anglican College		
General discussion regarding proposed development	06/06/14 17/09/18 05/11/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Wirrimbirra Flora & Fauna Sanctuary		
General discussion regarding proposed development	24/04/13 30/08/13 28/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.
Wirrimbirra Dingos		
General discussion regarding proposed development	24/04/13 24/10/18	Tahmoor Coal provided an overview of proposed development and preliminary identification of potential impacts.

Bargo Progress Association

The Bargo Progress Association is a key community group and stakeholder. The group meets on the last Wednesday of each month, with meetings typically held at the Bargo Sports Club. Consultation with the association has been undertaken regularly throughout the environmental assessment phase, with the Tahmoor Coal Approvals Manager and Community Coordinator attending meetings on 25 July 2012, 27 March 2013, 27 November 2013, 26 March 2014, 27 August 2018 and 25 October 2018. The association was presented with updates as well as newsletters and question and answer sessions.

Stakeholder Feedback

Tahmoor Coal recognises the importance of receiving regular feedback from the community in achieving ongoing improvement and determining the effectiveness of initiatives. During the approvals process, both positive and negative feedback has been considered and, where necessary and feasible, changes have been implemented to address identified issues.

Tahmoor Coal also maintains a 24 hour community information telephone service (1800 154 415) and a general enquiries email (tahmoorenquiries@simecgfg.com). This has allowed issues to be raised directly and anonymously.

9.2.2 Aboriginal Community Consultation

In administering its statutory functions under Part 6 of the NSW *National Parks and Wildlife Act 1974*, the OEH requires that proponents consult with Aboriginal people about the Aboriginal cultural heritage values (cultural significance) of Aboriginal objects and/or places within any given development area (DECCW 2010). This consultation is undertaken with the objective of improving the outcomes of the ACHA.

As part of the ACHA completed for the proposed development (**Appendix L**), consultation with Indigenous stakeholders was undertaken in accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC, 2005) and *The Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010).

The mine plan for the project has undergone revisions to avoid longwall mining directly under sensitive features where possible including items of Aboriginal heritage significance. The mine plan has been designed to minimise potential for impacts to significant rock shelters at Dog Trap Creek.

Notification and Registration of Interest

Notifications of the proposed development were sent to Registered Aboriginal Parties (RAPs) on 8 January 2013, 16 September 2017, and 12 October 2018, with the objective of identifying potential cultural knowledge holders (registered parties) for the subject area. Advertisements were also published in the Macarthur Advertiser on 13 February 2013 and 23 August 2017, to invite Aboriginal stakeholders to register an interest.

Twenty-one Aboriginal stakeholders registered an interest in the proposed development and as a result these 21 individuals and organisations became RAPs to the proposed development. Details of these RAPs are provided in **Appendix L**, Tahmoor Coal has consulted directly with all RAPs and individuals about the proposed development and has sought their input regarding cultural significance.

Presentation and Gathering of Information

RAPs were provided with a letter containing information about the proposed development and the proposed methodology for an ACHA in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010) on 25 March 2013 and 13 September 2017. RAPs were also sent an invitation to attend an information session, and to respond to a questionnaire about their group's connection to the area on 13 September 2017. A 28 day period was provided for RAPs to:

- suggest any protocols to be adopted into the information gathering process and assessment methodology; and
- highlight any other matters such as issues or areas of cultural significance that might affect, inform or refine the methodology.

An information session was held at the Tahmoor Colliery on 6 October 2017. Attendees were provided with a presentation on the nature and scale of the proposed development, an overview of the impact assessment process, critical timelines and milestones for the completion of assessment activities and delivery of reports, a discussion of the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information. The information session also provided RAPs with an opportunity to raise any cultural issues or comments/perspectives and assessment requirements (if any) regarding the proposed development or the proposed methodology.

No comments were received from any of the RAPs in regards to the project methodology.

RAPs were also invited to attend site inspections during preparation of the ACHA. Representatives from the following RAPs were available to conduct the site inspections:

- Tharawal LALC; and
- Cubbitch Barta Native Title Claimants.

Additional meetings were held with Tharawal LALC on 1 May 2014, 9 May 2013, 15 July 2014, 25 July 2013, 5 August 2014 and 30 August 2018. An additional meeting was held with Cubbitch Barta Native Title Claimants on 5 August 2014 and 30 August 2018.

A detailed log of the Aboriginal consultation undertaken throughout the preparation of the EIS is provided in the ACHA provided in **Appendix L**.

Review of Draft ACHA Report

A draft ACHA report was provided to the RAPs for their review and comment on 28 December 2017 in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010). A total of 28 days was provided to enable each of the RAPs to submit comments. The closing date for these comments was 31 January 2018. Prior to this closing date an information session was undertaken on 24 January 2018 at Tahmoor Colliery. The purpose of the information sessions was to discuss the key findings of the draft ACHA and to provide an opportunity for RAPs and other community stakeholders and Elders to discuss, ask questions and/or provide comment on the draft ACHA. Three RAPs provided comment on the draft report during the 28 day period:

- Cubbitch Barta Native Title Claimants;
- Woronora Plateau Gundungurra Elders Council; and
- Didge Ngunawal Clan.

To date, feedback from Aboriginal community consultation has been that all sites within the Project Area (archaeological or cultural) are of value to the Aboriginal community. There were a total of 40 Aboriginal cultural sites identified in the ACHA, including some sites previously registered on the Aboriginal Heritage Information Management System (AHIMS) database and some identified during the field work component of the assessment (refer to **Appendix L**). The ACHA found that four of the 40 Aboriginal sites are of high archaeological significance, two are of moderate archaeological significance and the remaining 32 are considered to be of low archaeological significance.

9.2.3 EIS Exhibition

The EIS for the Tahmoor South Project will be on exhibition to allow for public comment on the proposed development. During and following the EIS exhibition period, consultation with the community will be ongoing via:

- an EIS overview which will be provided to all residents in the Project Area via letter drop;
- face to face meetings;
- newsletters;
- TCCCC;
- Tahmoor Coal's website which will include the EIS and project updates;
- Community Information Days;
- Tahmoor Coal Complaints and Enquiries line and email;
- employee toolbox talks; and
- media statements.

Stakeholder engagement activities will be undertaken with the following groups:

- elected State and Federal representatives;
- Wollondilly Shire Council and Wingecarribee Shire Council;

- Government agencies;
- Bargo Progress Association;
- TCCCC; and
- The wider community.

10.0 Identification of Environmental Issues

This section outlines the risk assessment process that has been undertaken for the proposed development in order to identify and prioritise the environmental, social and economic issues.

10.1 Background

Tahmoor Coal utilises a risk assessment process to identify environmental, social and economic risks. The process involves its employees (and contractors where appropriate) undertaking an Environmental Risk Assessment to systematically identify issues and to recognise areas where further information is required to address existing knowledge gaps.

The development of the proposed mine plan and preparation of this EIS was undertaken through a risk-based and consultative approach, involving consultation with government agencies, technical specialists and the community. The objectives of the Environmental Risk Assessment process were to:

- identify potential environment, social and economic risks associated with the proposed development;
- identify the controls necessary to effectively manage these risks; and
- identify those issues where further information or investigation was required in order to address existing knowledge gaps.

Where risks were considered unacceptable, or there was a knowledge gap in the information available, specialist investigations were undertaken to inform the EIS to ensure the residual consequences for the proposed development are acceptable.

10.2 Identification of Potential Impacts of the Proposed Development

The potential impacts of the proposed development and their associated environmental, social and economic consequences have been identified through:

- the preliminary environmental risk screening undertaken for the PEA;
- consultation with Government agencies and other stakeholders;
- consideration of the SEARs issued for the EIS;
- an Environmental Risk Assessment workshop held in December 2012 and attended by Tahmoor Coal, AECOM and relevant project technical specialists;
- two Subsidence Risk Workshops held in March 2013 and December 2013 and attended by Tahmoor Coal, AECOM and relevant project technical specialists; and
- development and maintenance of an Environmental Risk Register for the proposed development (refer to **Appendix C**).

The potential impacts of the proposed development identified through this risk assessment process were grouped into issue categories. Prior to ranking the level of risk associated with each category, it was identified that without risk controls in place the proposed development is likely to have an impact on the following:

- groundwater;
- geomorphology;
- surface water;
- terrestrial ecology;
- aquatic ecology;
- aboriginal heritage;
- non-aboriginal heritage;

- acoustic amenity;
- air quality;
- greenhouse gas;
- traffic and transport;
- infrastructure and services;
- social and economic matters;
- visual landscape;
- land use and land capability;
- soils; and
- hazards (including acid mine drainage and spontaneous combustion potential).

The proposed development has the potential to impact on these issues as a result of:

- subsidence due to underground longwall mining;
- construction, operation, waste generation and vehicle and rail movements to and from the Surface Facilities Area; and
- site closure and rehabilitation activities.

10.3 Prioritisation of Risks

A process of prioritisation of the identified risks was undertaken to determine the need for consideration of various issues during mine planning, and to determine the level of assessment required to adequately and appropriately address each issue identified.

10.3.1 Approach

Each of the environmental, social and economic risks identified for the proposed development were given a risk prioritisation rating using an ordinal scale (comparative measurement), based on the likelihood of the environmental, social or economic risk occurring and the consequence of that risk should it not be mitigated (refer to **Table 10.1** and **Table 10.2**).

Following the allocation of likelihood and consequence against each environmental, social or economic risk identified for the proposed development, a risk prioritisation ranking was calculated using Tahmoor Coal's risk matrix (refer to **Table 10.2**). This risk matrix provides a ranking of low, medium or high risk and allocates a numerical value (1 to 25) to each risk based on increasing levels of likelihood and consequence.

This screening allows for general prioritisation of environmental, social and economic risks based on their potential likelihood and consequences without consideration of mitigation measures to minimise and manage potential impacts.

Table 10.1 Risk Rating: Risk Likelihood and Consequence Criteria

Likelihood of Risk	
Almost certain (E)	• Almost certain to occur; or • Could occur within months.
Likely (D)	• There is between 50% and 99% probability that an environmental effect would occur; or • There is the balance of probability that an environmental effect would occur; or • An environmental effect could occur monthly.
Possible (C)	• There is between 20% and 50% probability that an environmental effect would occur; or • An environmental effect may occur shortly but there is a distinct probability that it will not; or • An environmental effect could occur within two to five years.
Unlikely (B)	• There is between one percent (1%) and 20% probability that an environmental effect would occur; or • An environmental effect may occur but is not anticipated; or • An environmental effect could occur within five to 20 years.
Very unlikely (A)	• There is less than one percent (1%) probability that an environmental effect would occur; or • An environmental effect may occur under exceptional circumstances; or • An environmental effect is exceptionally unlikely, even in the long term future; or • An environmental effect could occur once every 20 years.
Consequence of Risk	
Severe (5)	A risk that may cause the greatest financial, property and investment return impacts, irreversible health and safety effects, disastrous and significant environmental or community/reputation impacts, or major legal and compliance litigation impacts over a prolonged timeframe.
Major (4)	A risk that may cause major financial, property and investment return impacts, severe health and safety effects, serious and significant environmental or community/reputation impacts, and /or major legal and compliance litigation impacts over the medium term.
Moderate (3)	A risk that may cause moderate financial, property and investment return impacts, serious health and safety effects, moderate reversible environmental or community/reputation impacts, and /or significant legal litigation or compliance major breaches over the short term.
Minor (2)	A risk that may cause minor financial, property and investment return impacts, restricted health and safety effects, minor reversible and local environmental or community/reputation impacts, and /or legislative breaches over the short term.
Insignificant (1)	A risk that may cause negligible financial, property and investment return impacts, first aid health and safety effects, negligible reversible environmental or no community/reputation impacts, and /or minor legal issues or breaches.

Table 10.2 Risk Prioritisation Matrix

Likelihood of Effect	Consequence of Effect				
	Severe (5)	**Major (4)**	**Moderate (3)**	**Minor (2)**	**Insignificant (1)**
Almost Certain (E)	High(25)	High (23)	High (20)	Medium (16)	Medium (11)
Likely (D)	High (24)	High (21)	High (17)	Medium (12)	Medium (7)
Possible (C)	High (22)	High (18)	Medium (13)	Medium (8)	Low (4)
Unlikely (B)	High (19)	Medium (14)	Medium (9)	Low (5)	Low (2)
Very Unlikely (A)	Medium (15)	Medium (10)	Medium (6)	Low (3)	Low (1)

Level of Stakeholder Interest

The expected level of stakeholder interest has also been considered for each risk identified, based on a broad review of key issues raised in submissions in relation to recent major coal mining projects and feedback gained from community open days undertaken for the proposed development (refer to **Table 10.3**). Consideration of stakeholder perception of potential environmental, social and economic risks associated with the proposed development is an important part of determining the level of assessment that should be applied during the preparation of the EIS, given that key stakeholder concerns may not necessarily align with a purely technical analysis of environmental, social and economic risks.

Table 10.3 Risk Rating – Expected Level of Stakeholder Interest

Level of Interest	Definition
High	Issues raised in feedback from most stakeholders or in most submissions made on similar developments.
Medium	Issues raised in feedback from some stakeholders or in some submissions made on similar developments.
Low	Issues not raised, or rarely raised, in feedback from stakeholders or in submissions made on similar developments.

Where a high level of stakeholder interest is expected, a potential environmental impact was determined to be an issue requiring assessment irrespective of the outcomes of environmental, social and economic risk prioritisation.

10.3.2 Ranking

Environmental issues relating to the proposed development were ranked as part of preparation of the PEA for the proposed development. Following further consideration of the proposed development and initial environmental assessment to inform the risk assessment workshop, issues were ranked again reflecting the updated information at the time of the workshop.

Based on Tahmoor Coal's risk assessment approach, environmental, social and economic risks relating to the proposed development have been ranked as having an unmitigated risk of either low, medium, or high priority (refer to **Table 10.4**).

The initial findings of the risk assessment were used to:

- inform mine planning;
- prioritise and focus the required environmental assessments for the proposed development;
- ensure that each of the issues were addressed to a level appropriate to the level of risk; and
- focus the development of appropriate management and mitigation options.

Table 10.4 Environmental Risk Assessment Results

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
Subsidence					
Unacceptable subsidence related impacts to natural features such as waterways, escarpments and overhangs.	Unlikely (B)	Major (4)	Medium (14)	High	High
Subsidence impacts to houses.	Likely (D)	Moderate (3)	High (17)	High	High
Cracking of cliff lines due to subsidence.	Unlikely (B)	Minor (2)	Low (5)	High	Low
Terrestrial Ecology					
Vegetation clearance and habitat loss due to extension of the REA.	Likely (D)	Moderate (3)	High (17)	Medium	High
Potential impact on threatened species or Endangered Ecological Communities resulting from vegetation clearing required for the expansion of the REA.	Unlikely (B)	Major (4)	Medium (14)	Medium	Medium
Subsidence induced damage to rock bars and ecological communities due to subsidence resulting in environmental and visual impacts.	Unlikely (B)	Minor (2)	Low (5)	Medium	Low
Aquatic Ecology					
Changes to aquatic ecology as a consequence of subsidence changes to in-stream habitat.	Possible (C)	Moderate (3)	Medium (13)	High	High
Impacts to groundwater dependent ecosystems.	Possible (C)	Moderate (3)	Medium (13)	Medium	Medium
Groundwater					
Changes to volume and quality of inflows, as a result of mining.	Very unlikely (A)	Major (4)	Medium (10)	High	High
Impacts to local bore users due to depressurisation of aquifers.	Possible (C)	Moderate (3)	Medium (13)	High	High
Impacts to aquifers due to subsidence.	Possible (C)	Minor (2)	Medium (8)	High	Medium

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
Surface Water					
Erosion and sedimentation impacts due to mobilisation of disturbed soils during construction.	Possible (C)	Minor (2)	Medium (8)	Low	Medium
Water quality impacts from discharge.	Likely (D)	Minor (2)	Medium (12)	Medium	High
Site water balance impacts on the receiving environment (surplus/ deficit).	Very unlikely (A)	Minor (2)	Medium (3)	Low	Medium
Surface drainage impacts on surrounding areas as a result of ineffective REA surface drainage design.	Unlikely (B)	Moderate (3)	Medium (9)	Low	Medium
Water quality impacts due to subsidence-induced surface cracking and alteration in surface water/groundwater interaction.	Possible (C)	Moderate (3)	Medium (13)	High	High
Impacts due to far field subsidence impacts – e.g. on Thirlmere Lakes or Lake Avon.	Very unlikely (A)	Severe (5)	Medium (15)	High	High
Hydrology					
Property impacts associated with changes to surface flooding regime due to subsidence.	Unlikely (B)	Minor (2)	Low (5)	High	High
Flow regime impacts as a result of flow from Surface Facilities Area and discharge location.	Almost certain (E)	Minor (2)	Medium (16)	Medium	Medium
Subsidence induced changes to bedslope, may result in changes to stream velocity.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Water loss in streams due to mining.	Likely (D)	Moderate (3)	High (17)	High	High
Geomorphology					
Subsidence induced changes to bedslope due to mining.	Unlikely (B)	Minor (2)	Low (5)	Low	Low
Subsidence induced damage to rock bars and pools resulting in environmental and visual impacts.	Likely (D)	Minor (2)	Medium (12)	High	High

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
Noise and Vibration					
Noise impacts during construction of the REA and intersection upgrade.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Noise generated by the operation of ventilation shafts.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Noise associated with increased rail movements associated with the proposed development.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Noise exceeding criteria from REA operation.	Likely (D)	Moderate (3)	High (17)	High	High
Traffic and Transport					
Service impacts associated with an increase in vehicle movements as a consequence of construction and peaks in staffing numbers.	Likely (D)	Minor (2)	Medium (12)	Medium	Medium
Extension of operational traffic movements impacting local networks.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Impacts on rail and port capacity.	Unlikely (B)	Minor (2)	Low (5)	Low	Low
Aboriginal Heritage					
Subsidence impacts to items of Aboriginal heritage, including Aboriginal paintings, standing rock etc. as a result of mining.	Unlikely (B)	Major (4)	Medium (14)	Medium	Medium
Impact to unregistered significant Aboriginal heritage items as a result of inadequate consultation, a reliance on existing data, or a misinterpretation of cultural knowledge.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Impacts to unknown items of Aboriginal heritage as a result of subsidence due to inadequate identification prior to mining.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Non-aboriginal Heritage					
Impacts to locally listed items of European heritage as a result of subsidence.	Unlikely (B)	Moderate (3)	Medium (9)	Medium	Medium

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
impacts to State listed items of European heritage as a result of subsidence	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Visual Landscape					
Impacts from an increase in the size of the REA.	Likely (D)	Minor (2)	Medium (12)	Medium	Medium
Impacts from visible alterations to surface infrastructure.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Additional ventilation shafts resulting in visual impacts.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Subsidence-induced visual impacts to streams, topography, cliffs, items of Aboriginal and non-Aboriginal heritage.	Possible (C)	Insignificant (1)	Low (4)	Medium	Medium
Air Quality					
Air quality impacts associated with the operation of additional ventilation shafts.	Possible (C)	Moderate (3)	Medium (13)	Medium	Medium
Dust generation from expansion of the REA or during construction of the intersection upgrade.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Operational dust generation, such as dust from train wagons during transport.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Dust impacts exceeding criteria from REA and Surface Facilities Area.	Unlikely (B)	Minor (2)	Low (5)	Medium	Medium
Unacceptable odour impacts from new ventilation shaft locations.	Possible (C)	Minor (2)	Medium (8)	High	High
Land Use					
Increase in land-take as a result of the expansion of the REA and installation of additional ventilation shafts.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Limitation on future land use of REA.	Unlikely (B)	Insignificant (1)	Low (2)	Medium	Low

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
Infrastructure and services					
Subsidence-related impacts to infrastructure (road, rail, pipes, civil).	Unlikely (B)	Moderate (3)	Medium (9)	High	High
Subsidence-related impacts to private property.	Unlikely (B)	Moderate (3)	Medium (9)	High	High
Social and Economic					
Noise and dust impacts exceeding criteria from REA.	Likely (D)	Minor (2)	Medium (12)	High	High
Increase in demand for local services due to increased production and peaks in staffing levels.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Decrease in urban amenity.	Possible (C)	Minor (2)	Medium (8)	Medium	Medium
Ongoing employment and creation of new employment opportunities.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Waste					
Disposal of rejects, and construction waste.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Operational waste creation due to lack of waste reduction process.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Waste generation associated with CHPP and the REA.	Unlikely (B)	Minor (2)	Low (5)	Low	Low
Hazard					
Impacts to operations associated with a bushfire event.	Unlikely (B)	Major (4)	Medium (14)	Low	Medium
Hazardous event associated with the on-site storage of dangerous goods.	Unlikely (B)	Major (4)	Medium (14)	Low	Medium
Spontaneous combustion in REA.	Unlikely (B)	Moderate (3)	Medium (9)	Low	Medium
Greenhouse Gases					
Carbon consumption during construction.	Likely (D)	Minor (2)	Medium (12)	Low	Medium
Carbon consumption during operation.	Likely (D)	Minor (2)	Medium (12)	Medium	Medium

Risk	Unmitigated Environmental Risk		Priority Ranking	Stakeholder Level of Interest	Environmental assessment significance
	Likelihood	Consequence			
Downstream end use of coal products from the proposed development causing Scope 3 emissions.	Likely (D)	Moderate (3)	High (17)	High	High
Scope 1 GHG emissions may increase from existing due to a potential operational breakdown of the flare plant and a resultant increase in emissions.	Unlikely (B)	Moderate (3)	Medium (9)	Medium	Medium

10.3.3 Assessment of Environmental, Social and Economic Risk

The scope of technical specialist assessments was determined based on the preliminary environmental risk screening undertaken for the PEA, consultation with Government agencies, consideration of the SEARs, and through the EIS and subsidence risk workshops undertaken for the proposed development.

For each of the issues considered in **Table 10.4**, an assessment of significance was made based on the dominant environmental assessment significance ranking as detailed in **Table 10.5**. For example, in the case of subsidence, groundwater, noise, hydrology and infrastructure and services, at least half of environmental significance rankings for these potential risks were rated as high. As a consequence, these issues have been determined as key for the proposed development. This approach identified the majority of environmental and social issues to be of medium significance to the mine planning and EIS assessment process, while one issue was identified as of low significance. The assessment of significance was undertaken based on the information available at the time (prior to the preparation of the EIS) and the preliminary desktop investigations and fieldwork undertaken to date.

Table 10.5 Identification of Key and Other Environmental Issues

Key issue - High	Key issue - Medium	Other Issue - Low
Subsidence Groundwater Hydrology Noise and vibration Infrastructure and services	Geomorphology Surface water Terrestrial ecology Aboriginal heritage Non-Aboriginal heritage Aquatic ecology Air quality Greenhouse gas Traffic and transport Social and economic Visual landscape Soils Waste Hazards Land use and land capability	Rail transport and port capacity

In summary, the environmental, social and economic risks ranked as being issues of key significance for the proposed development were:

- Subsidence
  - subsidence related impacts to natural features such as waterways escarpments and overhangs.
- Terrestrial ecology
  - vegetation clearance and habitat loss due to extension of the REA.
- Aquatic ecology
  - changes to aquatic ecology as a consequence of subsidence changes to in-stream habitat.
- Groundwater
  - changes to volume and quality of inflows, as a result of mining or inability to manage impacts; and
  - impacts to local bore users due to depressurisation of aquifers.
- Surface water and hydrology
  - water quality and stream flow impacts from subsidence changes to stream hydrology; and
  - water quality impacts resulting from discharge to natural waterways.

  - property impacts associated with changes to surface flooding regime due to alterations of local topography as a result of subsidence; and
  - water loss in streams due to mining.
- Noise and vibration
  - noise generated by the operation of ventilation shafts; and
  - noise exceeding criteria from REA operation.
- Air quality
  - dust impacts exceeding criteria from Surface Facilities Area and REA; and
  - unacceptable odour impacts from new ventilation shafts.
- Infrastructure and services
  - subsidence-related impacts to infrastructure (road, rail, pipes, civil); and
  - subsidence-related impacts to private property.
- Social and Economic
  - noise and dust impacts exceeding criteria from Surface Facilities Areas and the REA.
- Waste
  - inadequate management of waste associated with CHPP and REA.
- Hazards
  - impacts to operations associated with a bushfire event.
- Greenhouse gases
  - downstream end use of coal products from the proposed development causing Scope 3 emissions.

The degree to which each environmental, social and economic risk has been taken into account during mine planning and the scale of the assessment undertaken for each issue as part of this EIS, has been based on the assessed level of risk identified through the processes described in this section.

The potential environmental, social and economic consequences of key significance (high and medium potential level of risk) and other (low risk) environmental and social issues associated with the proposed development have been considered during mine planning and are addressed in **Section 11.0**.

An assessment of significance of the potential impacts associated with these environmental, social and economic risks as a result of the proposed development is also provided in **Section 11.0**.

The controls identified as part of the Environmental Risk Assessment process are detailed in the Environmental Risk Register in **Appendix C**.

Based on this risk ranking process and the impact assessments carried out for the EIS, a number of reasonable and feasible mitigation measures have been identified for the proposed development to minimise those risks identified as of high or medium priority. Mitigation measures developed during the assessment process are presented in detail in **Sections 11.0** and **12.0**.