CHAPTER 1

INTRODUCTION

1 Introduction

This chapter provides a background to the Snowy 2.0 Exploratory Works and the purpose of this Environmental Impact Statement.

1.1 Preamble

In March 2017 Snowy Hydro Limited (Snowy Hydro) announced a plan to conduct a Feasibility Study into a possible pumped hydro-electric expansion of the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme), called 'Snowy 2.0'. The Feasibility Study released in December 2017 confirmed that Snowy 2.0 is economic, technically feasible and financeable.

Snowy 2.0 is an effective way to provide large-scale storage and quick start energy generation across the National Electricity Market (NEM). As the NEM moves to an energy mix with a higher penetration of intermittent renewables and retiring thermal generation, Snowy 2.0 will underpin its reliability and stability. Snowy 2.0 (and the capabilities of the existing Snowy Scheme) will provide a significant contribution to ensure an orderly transition as the economy decarbonises.

Snowy 2.0 will increase pumped hydro-electric capacity within the existing Snowy Scheme by linking the existing Tantangara and Talbingo reservoirs through a series of underground tunnels and a new underground hydro-electric power station. Snowy 2.0 will increase the generation capacity of the Snowy Scheme by almost 50%, providing an additional 2,000 megawatts (MW) generating capacity, and making approximately 350,000 megawatt hours (MWh) (175 hours of energy storage) of storage available to the NEM.

This environmental impact statement (EIS) is for Exploratory Works (described in detail in Chapter 2) to undertake investigative works to gather important technical and environmental information for the main Snowy 2.0 project. The main project will be subject of a separate application and EIS. Exploratory Works are critical for the project as the works will inform the design and construction of the cavern for the underground power station which is one of, if not the most, challenging areas for the design of Snowy 2.0.

Exploratory Works will confirm and build on the geological data already collected and confirm the orientation of the cavern and its construction method almost 850 metres (m) below ground level. To date the geological investigation program has only drilled down vertically from the surface and at large intervals apart. Exploratory Works involves extensive horizontal drilling in situ, and at depth so detailed geological data can be collected about the rock types, conditions, ground temperature and stress conditions. It is common practice internationally for hydro-electric power projects, particularly with large caverns, to establish an exploratory tunnel to the top of the underground power station cavern and drill numerous horizontal investigation probes.

In recognition of the significant role that Snowy 2.0 will play, the Minister for Planning declared Snowy 2.0 to be State Significant Infrastructure and Critical State Significant Infrastructure (CSSI) under the provisions of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 7 March 2018. The declaration acknowledges that the project is critical to the State for environmental, economic or social reasons. The NSW Minister for Planning is the consent authority for applications for CSSI.

The transmission works associated with Snowy 2.0 were also included in the CSSI declaration. The proponent for the transmission works will be TransGrid. Their transmission works will be subject to a separate application(s) and detailed in a separate EIS to Snowy 2.0.

As with most of the existing Snowy Scheme, the majority of Exploratory Works are in the Kosciuszko National Park (KNP). The values of the KNP are set out in the KNP Plan of Management (PoM) (NPWS 2006) as required by the NSW *National Parks and Wildlife Act 1974* (NPW Act). The values of KNP are listed below.

- The KNP is unique as it contains Australia's highest mountains, unique glacial landscapes and unusual assemblages of plants and animals.
- The KNP has a rich Aboriginal and European history.
- The KNP has a variety of recreational uses and is Australia's pre-eminent skiing destination due to the presence of snow fields and alpine resorts.

The values of the KNP and their interactions with Exploratory Works are detailed further in Section 5.2. Snowy Hydro has consulted with NSW National Parks and Wildlife Services (NPWS) since the announcement of Snowy 2.0 in March 2017.

The design for Exploratory Works adopted underpinning principles of avoiding and minimising environmental impacts where possible.

A referral was made to the Commonwealth Government under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for Exploratory Works. On 10 July 2018 the Assistant Minister for the Environment (as delegate) determined that Exploratory Works is not a controlled action and therefore, do not require any further assessment or approval under the EPBC Act.

1.2 Overview of Exploratory Works

Snowy Hydro is seeking approval to construct Exploratory Works in the KNP. Exploratory Works is construction works associated with further detailed investigations for Snowy 2.0. Exploratory Works involves horizontal drilling in situ, and at depth so detailed geological data can be collected about the rock types, conditions, ground temperature and stress conditions. This information will inform the design and construction of the cavern for the underground power station which is one of, if not the most, challenging areas for the design of Snowy 2.0.

Exploratory Works include the following elements:

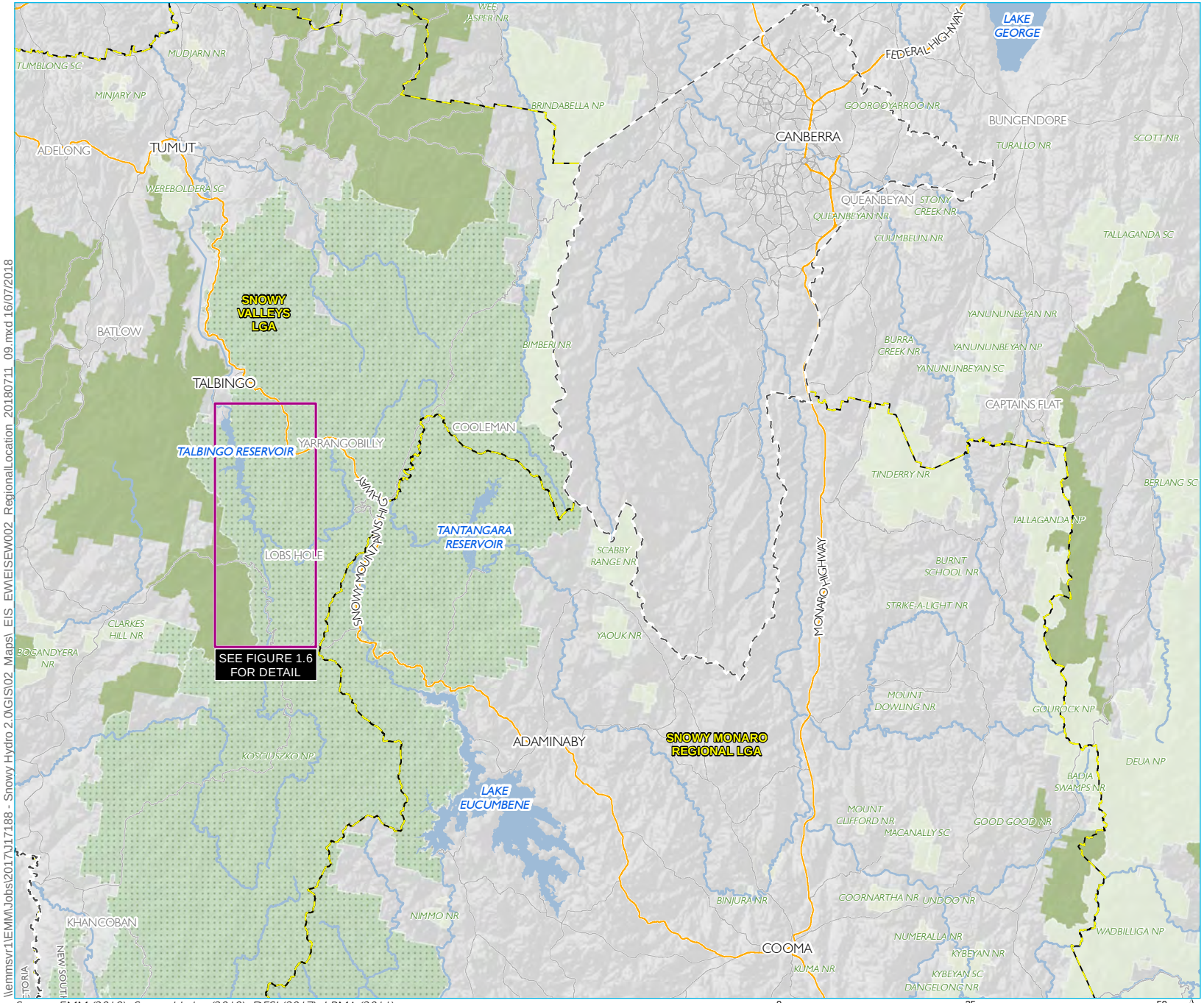
- an exploratory tunnel to the site of the underground power station for Snowy 2.0;
- horizontal and other test drilling, investigations and analysis in situ at the proposed cavern location and associated areas, and around the portal construction pad, access roads and excavated rock management areas all within the disturbance footprint;
- a portal construction pad for the exploratory tunnel;
- an accommodation camp for the Exploratory Works construction workforce;
- road works and upgrades providing access and haulage routes during Exploratory Works;
- barge access infrastructure to enable access and transport by barge on Talbingo Reservoir;
- excavated rock management, including subaqueous placement within Talbingo Reservoir;

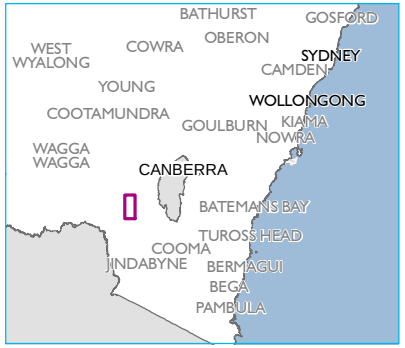
- services infrastructure such as diesel-generated power, water and communications; and
- post-construction revegetation and rehabilitation, management and monitoring.

Exploratory Works is in the Lobs Hole area of the KNP (see Photographs 1.1 and 1.2) and Talbingo Reservoir and is entirely within NSW. The nearest large towns to Exploratory Works are Cooma, Tumut and Tumbarumba. Cooma is approximately one hour and 45 minutes drive (95 kilometres (km) south-east of Lobs Hole. Tumut is approximately one hour and 45 minutes from Lobs Hole. Tumbarumba is approximately one hour and 45 minutes west of Lobs Hole. The regional context of Exploratory Works is shown in Figure 1.1.

Photograph 1.1 Lobs Hole – view looking south-east

Photograph 1.2 Lobs Hole – view looking north-west





KEY

- Exploratory Works project area
- Main road
- Local road
- Watercourse
- Waterbodies
- Kosciuszko National Park
- NPWS reserve
- State forest
- Local government area boundary
- State boundary

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Source: EMM (2018); Snowy Hydro (2018); DFSI (2017); LPMA (2011)

Regional location of Snowy 2.0 and Exploratory Works

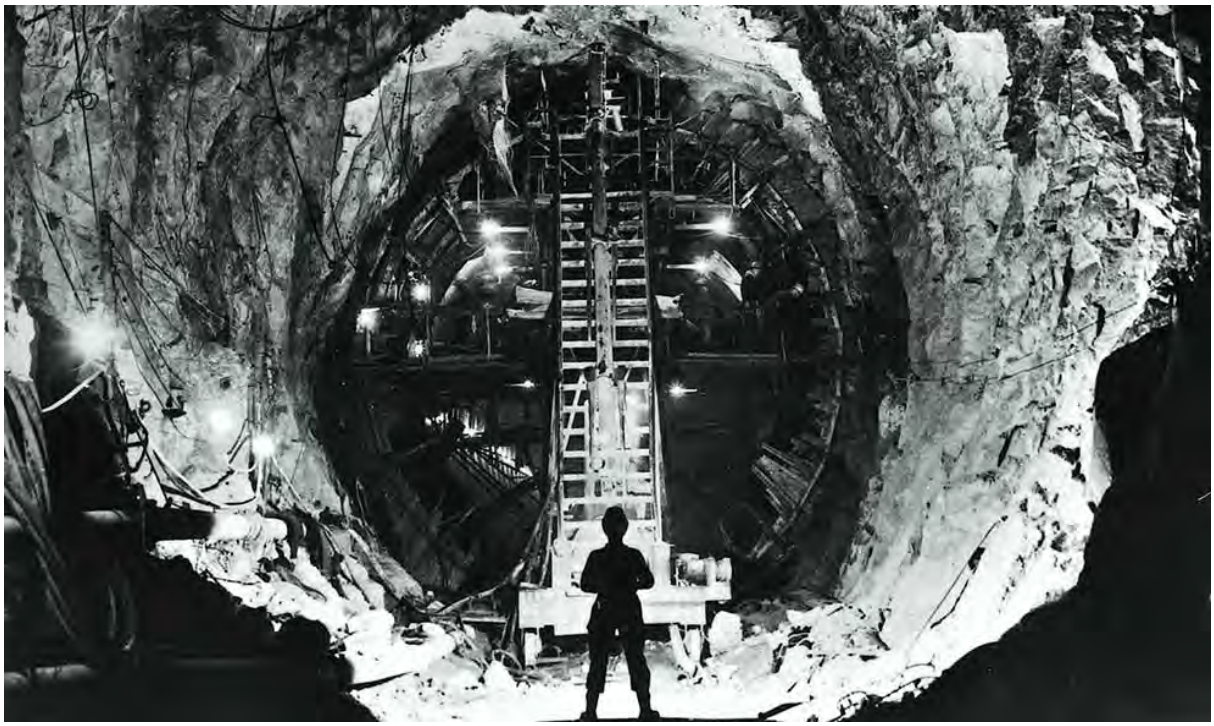
Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.1

1.2.1 History

The Snowy Scheme was designed to collect and store water, divert it through trans-mountain tunnels and power stations and then release it west of the Snowy Mountains into the catchments of the Murray and Murrumbidgee rivers. This long-term water regulation was designed to counteract the effects of severe drought sequences and increase agricultural productivity in the Murray Darling Basin (Snowy Hydro 2017). While the diversion of water for irrigation was always part of the original vision of the Snowy Scheme, the engineers were well aware of the potential for the generation of hydro-electricity.

The Snowy Scheme is the largest engineering project ever undertaken in Australia and is one of the largest and most complex hydro-electric schemes in the world. It took about 100,000 workers around 25 years to build, and resulted in many new towns being established. Its construction is seen by many as a defining point in Australia's history, and an important symbol of Australia's identity as an independent, multicultural and resourceful country (Commonwealth Government 2015).

A timeline of the development of the Snowy Scheme is provided in Figure 1.2. An image of tunnelling during the original Snowy Scheme construction is shown in Photograph 1.3, and construction of Tantangara Reservoir is shown in Photograph 1.4.



Photograph 1.3 Worker inside a tunnel constructing the Snowy Scheme

Photograph 1.4 Construction of Tantangara Reservoir - 1959

1.2.2 The Snowy Scheme today

The Snowy Scheme plays a critical role in the NEM today and has been modernised and well maintained over the decades since its construction. Its quick-start dispatchable generation provides energy security and reliability across the NEM in times of high energy demand. It is expected that as the economy continues to decarbonise, the demand for the energy products that Snowy Hydro produce today (such as energy storage, capacity, firming and ancillary services) will increase.

The Snowy Scheme operates predominantly within the KNP under a lease (the Snowy Park Lease) from the NSW Minister for the Environment. The Snowy Scheme (shown in Figure 1.3) consists of:

- sixteen major reservoirs with a total storage capacity of 7,000 gigalitres (GL);
- nine power stations;
- one pumping station and one pump storage capability at Tumut 3 power station; and
- 145 km of tunnels and pipelines and 80 km of aqueducts.

The Snowy Scheme has 4,100 MW of existing hydro-electric generating capacity and produces 4,000 GWh on average each year for households and businesses across the NEM. The Snowy Scheme comprises two major developments: the northern Snowy-Tumut Development and the southern Snowy-Murray Development.

1949 – The Snowy Mountains Hydro-electric Authority was established

1949

1951 – Enlgish classes in Cooma

1951

1955 – T1 power station construction

1955

7 July 1949 –
The Commonwealth Parliament passed the *Snowy-Mountains Hydro-electric Power Act 1949* which established the Snowy Mountains Hydro-electric Authority, the construction body for the Snowy Scheme.

1949

17 October 1949 –
Construction started on the Snowy Scheme.

November 1951 –
Construction of the Snowy Scheme's first power station at Guthega started.

1951

1954 –
Cabramurra township was established as part of the Snowy Scheme.

1954

May 1955 –
Construction of Tumut 1 power station commenced.

1955

May 1956 –
Construction of Eucumbene Dam commenced.

1956

1956-1957 –
The township of Adaminaby is relocated to make way for the rising waters of Lake Eucumbene.

1956-1957

1958 –
Eucumbene Dam construction is completed. It is nine times the size of Sydney Harbour and the central dam of the Snowy Scheme.

1958

1958 - 1960
Tantangara Reservoir construction

1958-1960

December 1962 –
Construction of Murray 1 power station commenced.

1962

19 December 1964 –
The township of New Jindabyne was opened after being relocated to make way for Lake Jindabyne.

1964

1966 –
Construction of Murray 2 power station, Jindabyne pumping station and Blowering power station commenced.

1966

1968 - 1971
Construction of Talbingo Reservoir

1968-1971

21 October 1972 –
Official opening of the Tumut 3 project marking completion of the works on the Snowy Scheme.

1972

August 1974 –
The Snowy Scheme became fully operational. Tumut 3 is the largest power station within the Snowy Scheme.

1974

January 1997 –
Snowy Hydro Trading Pty Ltd established as a company to trade electricity from the Snowy Scheme.

1997

13 December 1998 –
The National Electricity Market commenced creating the Australian wholesale electricity market connecting the states of QLD, NSW, VIC and SA.

1998

June 2002 –
Snowy Mountains Hydro-electric Authority and Snowy Hydro Trading Pty Ltd were corporatised to become Snowy Hydro Limited with the Commonwealth, NSW and VIC governments becoming the shareholders of the new company.

2002

June 2010 –
Jounama Small Hydro power station opened.

2010

2012 –
A major milestone of the Snowy Scheme's modernisation was accomplished with the completion of the Tumut 3 upgrade.

2012

March 2017 –
Snowy 2.0 feasibility study was announced by Snowy Hydro.

2017

1955 - 1958 – Eucumbene -Tumut tunnel

1955 - 1958

1958 - 1960 – Tantangara Reservoir construction

1958 - 1960

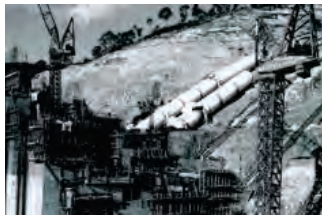
1966 – Murray 2 power station

1966

1968 - 1971 – Construction of Talbingo Reservoir

1968 - 1971

1974 – T3 power station under construction (opened 1974)



1974

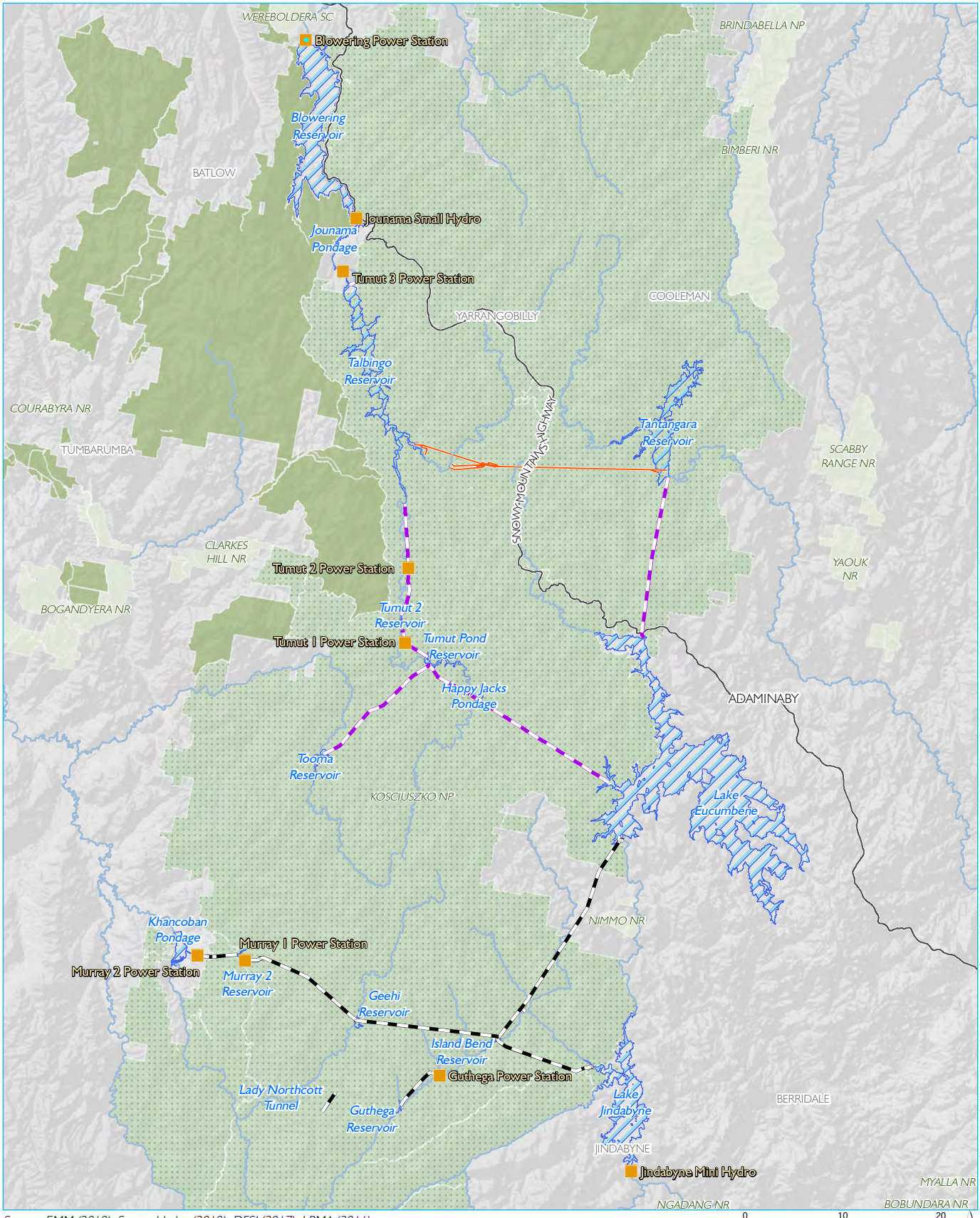
2012 – T3, the largest power station in the Snowy Scheme today

2012

snowy2.0 EMM creating opportunities

Timeline for the Snowy Scheme

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.2



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Source: EMM (2018); Snowy Hydro (2018); DFSI (2017); LPMA (2011)

0 10 20 km
GDA 1994 MGA Zone 55

N

KEY

- Scheme storage
- Power station
- Pipeline tunnel
- Snowy Murray
- Snowy Tumut
- Indicative Snowy 2.0 alignment
- Main road
- Watercourse
- Kosciuszko National Park
- Other NPWS reserve
- State forest

Existing Snowy Scheme

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.3

The existing Snowy Scheme operates within the KNP in accordance with the NSW *Snowy Hydro Corporatisation Act 1997* (SHC Act). Part 6, section 37(2) of the SHC Act entitles Snowy Hydro to the grant of a lease, licence, easement or right of way over KNP, for the purposes of the existing Snowy Scheme development. The Snowy Park Lease was granted to Snowy Hydro by the NSW Minister for Environment in 2002 and has a term of 75 years. Snowy Hydro operates the Snowy Scheme under a stringent water licence administered by the NSW Department of Industry - Lands & Water (DoI Water) that allows for water collection, storage, diversion and release in order to generate electricity.

Tantangara and Talbingo reservoirs are existing water storages within the northern Snowy-Tumut Development of the Snowy Scheme. Snowy Hydro controls the water levels within these reservoirs. The maximum and minimum water levels for reservoirs within the Snowy Scheme are stated in the Snowy Water Licence and referred to as Full Supply Level (FSL) and Minimum Operating Level (MOL), respectively.

1.3 Strategic justification for Snowy 2.0

1.3.1 Snowy 2.0

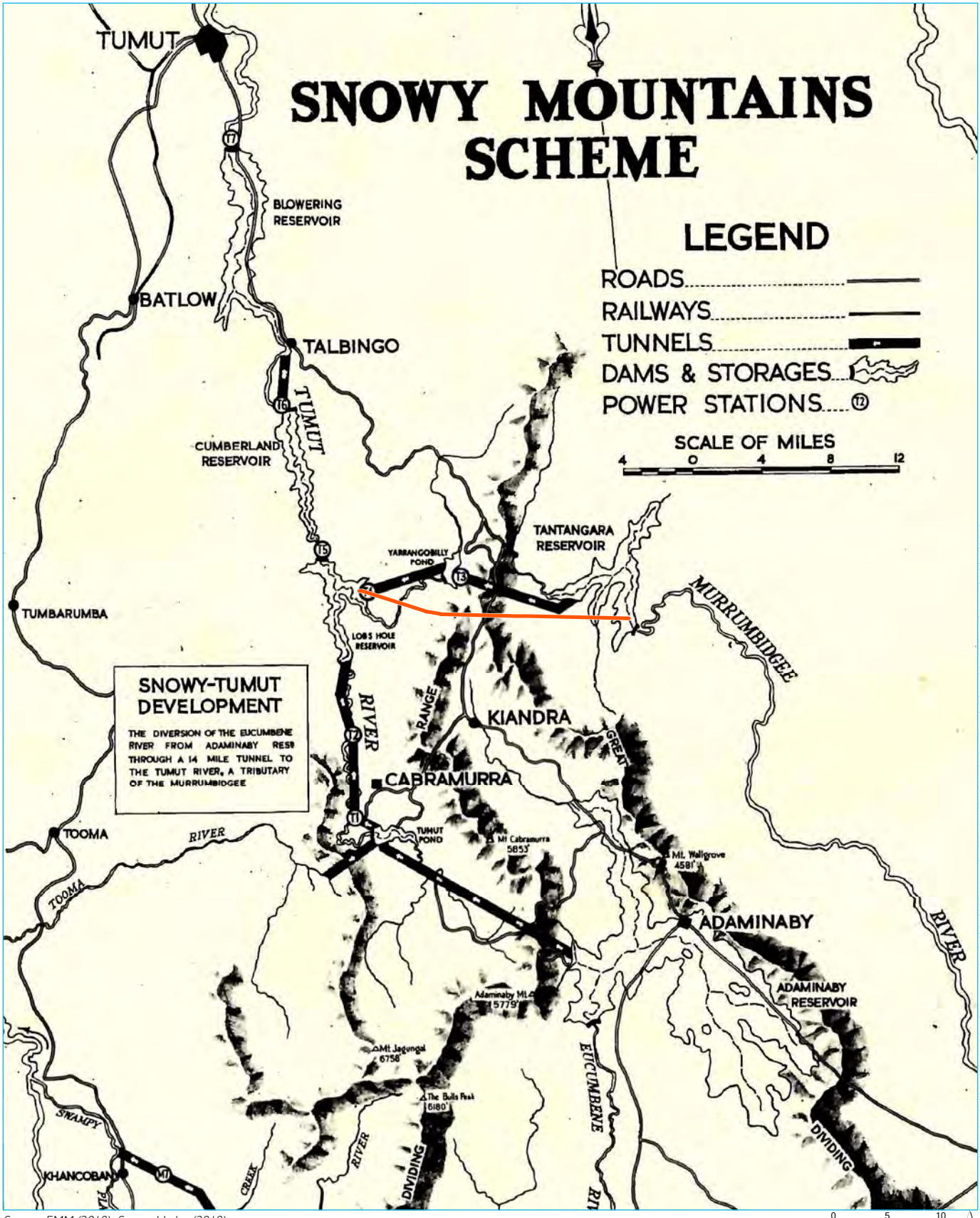
Snowy 2.0 involves linking Talbingo and Tantangara reservoirs. This tunnel link can be seen on a number of historical plans for the Snowy Scheme, but was not built at the time. A historical plan showing the tunnel link between the two reservoirs is shown in Figure 1.4. Snowy 2.0 in the context of the Snowy-Tumut development of the existing Snowy Scheme is shown in Figure 1.5.

1.3.2 National Electricity Market

Snowy 2.0, particularly through its energy storage capacity and quick-start dispatchable generation delivery, is intended to provide energy security and reliability to the NSW energy system and the NEM. The NSW energy system (and broader NEM) is facing major and unprecedented challenges through rising energy costs, deterioration in energy system security and reliability, and a transition in the generation mix away from coal-fired, dispatchable, base-load power to intermittent renewable wind and solar power (also known as variable renewable energy or VRE, meaning energy sources that are non-dispatchable and fluctuating in nature like solar and wind). The principal drivers of these challenges are:

- a requirement for replacement capacity due to the retirement of base-load coal-fired power stations (eg proposed retirement of Liddell power station in 2022);
- reducing costs of intermittent renewable generation; and
- carbon emission reduction policies, including the NSW Climate Change Policy Framework and NSW Renewable Energy Action Plan.

The growth of renewable generation from wind and solar across the NEM has displaced some traditional coal-fired generating capacity, leading to reduced capacity to respond to network disturbances. This means the power system is less secure during some operating conditions, which has led to system blackouts (the most recent notable example occurred in South Australia in September 2016). In this regard, the *Independent Review into the Future Security of the National Electricity Market - Blueprint for the Future* (Finkel et al 2017) (also known as the Finkel review) concluded that a secure power system is a necessary condition for a reliable supply of electricity to consumers and recommended options for improving security, including large scale pumped hydro-electric storage.



Source: EMM (2018); Snowy Hydro (2018)

0 5 10 km
GDA 1994 MGA Zone 55

N

KEY

Indicative Snowy 2.0 alignment

Historic plan showing a tunnel link between Tantangara and Talbingo Reservoirs

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.4

snowy 2.0

EMM creating opportunities

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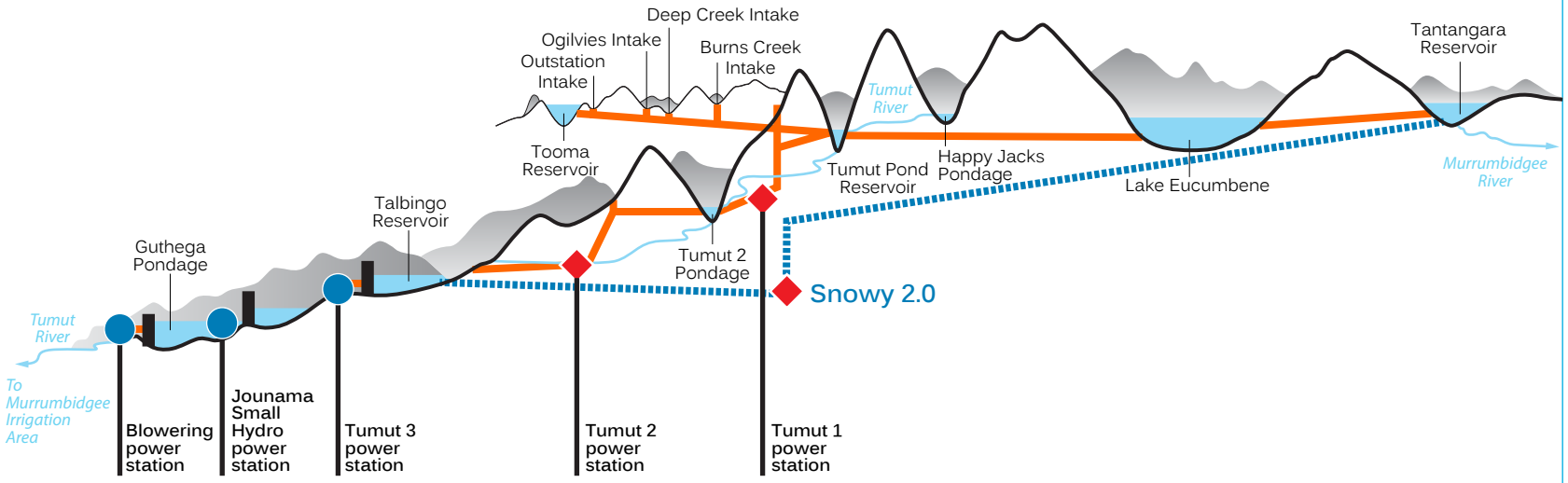


KEY

- Underground Pumping Station
- Power or Pumping Station
- Tunnels and Shafts
- Snowy 2.0

Indicative section of Snowy 2.0 within the Snowy Scheme

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.5

snowy 2.0

EMM creating opportunities

1.3.3 Snowy 2.0 and the NEM

Snowy 2.0 will be able to dispatch significant quantities (ie up to 2,000 MW) of electricity to major load centres at any time within minutes. This would be a more effective means of meeting peak demand than the most common alternative solutions – gas-fired and diesel peak electricity generating plants, which take a lot longer to start up and are less flexible in meeting rapid changes in load. Snowy 2.0 would also increase generation competition in the NEM at the peak times, and thus exert downward pressure on peak energy prices. With the planned retirement of generation powered by fossil fuels, the reserve generation capacity available in the NEM and in NSW is rapidly declining (AEMO 2017a), making the electricity supply less reliable.

As the proportion of intermittent renewable generation increases over the next decade, energy storage projects are required to stabilise the grid (Marsden Jacobs Associates 2018). A mix of both pumped hydro energy storage and batteries are likely to contribute to meeting future energy storage needs (Finkel 2017).

Snowy 2.0 would perform the same function as batteries but on a very large scale, pumping and storing energy when surplus cheap electricity is available (likely to be from solar and wind) and generating electricity when there is a deficiency of electricity. Pumped hydro-electric storage has high full cycle energy efficiency of about 75%. Snowy 2.0 would also have a long life span with a life span over 50 years for the electrical plant and 100 years for the civil infrastructure. Snowy 2.0 would have the capacity to provide around 350,000 MWh in storage capacity, which is enough to operate at full power for around 175 hours. This will increase the security and reliability of the NEM.

The large scale pumped hydro-electric storage and generation proposed under Snowy 2.0 plays a major role, at the least possible cost, in providing security against the intermittency of the primary renewable technologies (wind and solar) that are expected to supply a large portion of the NEM's future energy needs. The development of Snowy 2.0 would therefore play a key role in helping NSW and the broader NEM achieve energy system reliability and security, with relatively low costs and emissions.

Snowy Hydro's Feasibility Study completed in December 2017, provided a cost estimate, schedule and execution plan. The Feasibility Study found that Snowy 2.0 is expected to be economic, technically feasible and financeable (Snowy Hydro 2017).

1.4 Need for Exploratory Works

The underground power station is one of the most challenging aspects for the final design of Snowy 2.0. Design and construction of excavations of this size and complexity are highly dependent on the rock properties and structural geology at the potential locations. The underground power station for Snowy 2.0 consists of large caverns, approximately 850 m below ground level. The machine hall, the largest component of the underground power station, is likely to be contained in a cavern about 240 m long, over 30 m wide and approximately 50 m high. This would be one of the largest underground caverns for a hydro-electric power project in the world.

The Ravine Beds geological unit is the main underlying strata to be intersected by a large portion of the underground components of Snowy 2.0, primarily the caverns and tunnels. No existing Snowy Scheme tunnel or excavation currently intersects the Ravine Beds geological unit, and therefore it is extremely important to understand excavation conditions, water seepage, rock bedding and faulting conditions, particularly in the area of the power station cavern.

1.4.1 Exploratory tunnel

The existing geotechnical investigation program is largely a surface-based program that utilises deep drill holes to access the depths of the proposed underground caverns. This approach has provided useful information to the design process but has some limitations. For example when the targets are deep, such as for Snowy 2.0, the drilling process is long and measurements for geotechnical design parameters such as in-situ stress are complicated and sometimes not possible.

Other limitations include the orientation of drill holes that are typically vertical with a possible variation angle of plus or minus 20 degrees. The lack of horizontal holes limits the level of detail possible to define the predominantly horizontal excavation conditions.

It is common practice internationally for hydro-electric power projects, particularly with large caverns, to establish an exploratory tunnel to the top of the underground power station cavern and drill numerous horizontal investigation probes. The associated testing includes in-situ stress testing to confirm the precise cavern location for the underground power station complex location suitable orientation for the stress conditions at depth as well as its construction method.

Snowy Hydro (as the Snowy Mountains Hydro-electric Authority) previously designed and constructed both Tumut 1 and Tumut 2 underground power station complexes. For both Tumut 1 and Tumut 2, exploratory tunnels were completed prior to the finalisation of the orientation and detailed design of the caverns and underground power station. It is important to note that the depths of Tumut 1 and Tumut 2 power stations are approximately one third the depth of the Snowy 2.0 power station and that the previous largest excavations for underground power station complexes in the existing Snowy Scheme were significantly smaller than those proposed for Snowy 2.0. The Tumut 1 underground power station machine hall is shown in Photograph 1.5.

An added advantage of excavating an exploratory tunnel to reach the underground power station is the significant amount of underground condition information that will be documented during the excavation of the tunnel itself which will further inform design for the main construction works of Snowy 2.0.

Photograph 1.5 Machine hall inside the existing Tumut 1 underground power station

1.4.2 Do nothing alternative

To achieve the objectives of Snowy 2.0 in a timely manner, the do nothing alternative to Exploratory Works is to proceed with the application and approval for Snowy 2.0 without a better understanding of the site conditions (rock conditions, ground temperature and stress conditions) for the largest proposed cavern housing the underground power station. The works would be undertaken within the Ravine Beds geological unit, which has not been intersected by any other excavation or tunnel for the existing Snowy Scheme. This is an area of high importance for the design of Snowy 2.0, and this condition information is required to increase confidence in the power station cavern design.

As previously stated it is common practice internationally for hydro-electric power projects to establish an exploratory tunnel to the top of the underground power station cavern and conduct horizontal drilling. Without Exploratory Works, there will be a significant lack of detailed geological condition information, which is vital to feed into the design of the underground cavern for Snowy 2.0, and would be subject to a further assessment and approvals process.

Should Exploratory Works not proceed there is a risk that a lack of information on rock conditions could lead to unsuitable areas being excavated which would, in turn, have several additional negative impacts including the potential for additional works, greater surface and underground disturbance and time delays. The do nothing alternative has therefore been discounted to ensure the design and construction of Snowy 2.0 meets high standards for quality, safety, efficiency and the environment to meet the objectives of providing timely security and reliability to the NEM.

1.5 Location of Exploratory Works

1.5.1 Exploratory Works project area

The area in which Exploratory Works will be undertaken is referred to herein as the project area. The Exploratory Works project area is shown on Figure 1.6 and is described in further detail in Chapter 2.

The project area for Exploratory Works (shown on Figure 1.6) comprises:

- **Lobs Hole:** Lobs Hole will accommodate the excavated rock emplacement areas, an accommodation camp as well as associated infrastructure, roads and laydown areas close to the portal of the exploratory tunnel and portal construction pad at a site east of the Yarrangobilly River;
- **Talbingo Reservoir:** installation of barge access infrastructure near the existing Talbingo Spillway, at the northern end of the Talbingo Reservoir, and also at Middle Bay, at the southern end of the reservoir, near the Lobs Hole facilities, and installation of a submarine cable from the Tumut 3 power station to Middle Bay, providing communications to the portal construction pad and accommodation camp. A program of subaqueous rock placement is also proposed;
- **Mine Trail Road** will be upgraded and extended to allow the transport of excavated rock from the exploratory tunnel to sites at Lobs Hole that will be used to manage excavated material, as well as for the transport of machinery and construction equipment and for the use of general construction traffic; and
- several sections of **Lobs Hole Ravine Road** will be upgraded in a manner that protects the identified environmental constraints present near the current alignment.

Source: EMM (2018); Snowy Hydro (2018); SMEC (2018); Robert Bird (2018); DFSI (2017); LPMA (2011)

0 2.5 5 km

N

GDA 1994 MGA Zone 55

KEY

- Exploratory tunnel
- Access road upgrade
- Access road extension
- Communications cable
- Main road
- Local road
- Major watercourse
- On land rock management
- Subaqueous excavated rock placement
- Disturbance footprint
- Avoidance footprint

Exploratory Works project area

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.6

snowy 2.0

EMM creating opportunities

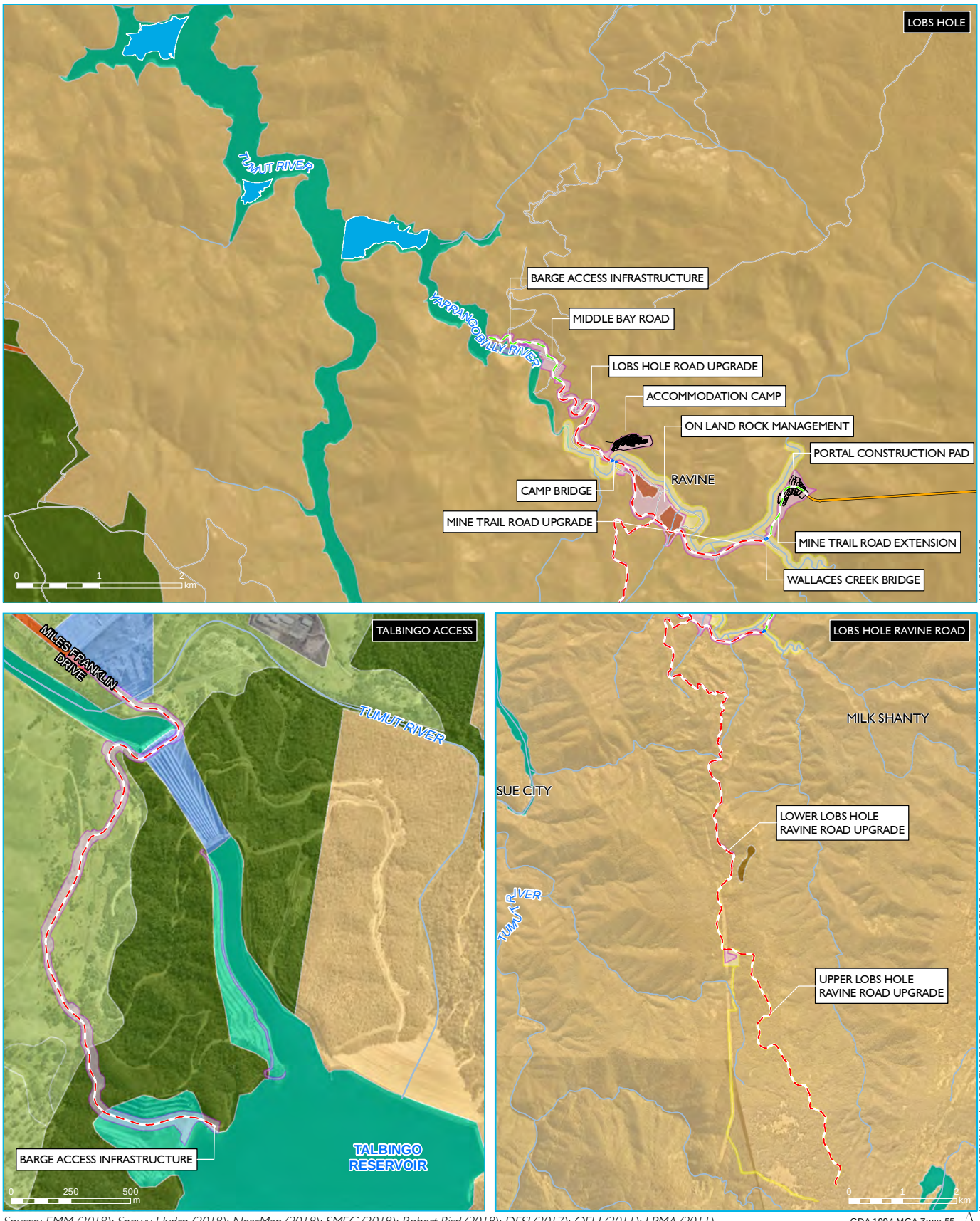
1.5.2 Land use, infrastructure and tenure

Exploratory Works will predominantly be in the Lobs Hole area of KNP. Lobs Hole is between Talbingo Reservoir to the north-west and the Snowy Mountains Highway to the east which connects Adaminaby and Cooma in the south-east to Talbingo and Tumut to the north-west of KNP. Lobs Hole was previously used by surveyors and recreationally during the construction of the Snowy Scheme. Lobs Hole is currently used as a remote campground (known as Ravine campground) within KNP and provides space for recreational activities including camping, fishing, and 4WD.

The overall Snowy 2.0 project is within both the Snowy Valleys and Snowy Monaro Regional local government areas (LGAs), however Exploratory Works is entirely within the Snowy Valleys LGA. As shown in Figure 1.7, the majority of the project area is within the KNP with the predominant land use being a conservation area (OEH 2011a). The only element of Exploratory Works occurring outside the KNP is the proposed barge access infrastructure at the north end of Talbingo Reservoir. The barge ramp location and access road upgrades at the north end of Talbingo Reservoir are on land owned by Snowy Hydro near the Tumut 3 power station. The existing land uses at these locations are river and drainage system, tree and shrub cover, grazing and conservation area (OEH 2011a).

Talbingo Reservoir is an existing reservoir that forms part of the Snowy Scheme. The reservoir is popular for recreational activities such as boating, fishing, water skiing and canoeing, which co-exist with the operation of the Snowy Scheme and the Tumut 3 power station. Other attractions and places of interest in the vicinity of the project area include Selwyn Snow Resort, the Yarrangobilly Caves complex and Kiandra. There are several communities and townships near the project area including Talbingo, Tumbarumba, Cabramurra and Adaminaby.

Talbingo and Cabramurra were built for the original Snowy Scheme workers and their families. Adaminaby was relocated alongside the Snowy Mountains Highway from its original location (now known as Old Adaminaby) in 1957 due to the construction of Lake Eucumbene. Talbingo and Adaminaby provide a base for users of the Selwyn Snow Resort in winter. Cabramurra was modernised and rebuilt in the early 1970s and is owned and operated by Snowy Hydro. It is still used to accommodate Snowy Scheme employees and contractors. Properties at Talbingo are predominantly privately–owned, however Snowy Hydro maintains ownership of some properties which are tenanted by Snowy Hydro employees.



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Source: EMM (2018); Snowy Hydro (2018); NearMap (2018); SMEC (2018); Robert Bird (2018); DFSI (2017); OEH (2011); LPMA (2011)

GDA 1994 MGA Zone 55

N

KEY

- Permanent bridge
- Access road upgrade
- Access road extension
- Portal construction pad and accommodation camp conceptual layout
- Exploratory tunnel
- Main road
- Local road or track
- Watercourse
- On land rock management
- Indicative subaqueous excavated rock placement
- Disturbance footprint
- Avoidance footprint

Land use (OEH 2011)

- Conservation area
- Grazing
- Mining & quarrying
- Power generation
- River & drainage system
- Transport & other corridors
- Tree & shrub cover
- Urban

Land use

Snowy 2.0
Environmental Impact Statement
Exploratory Works
Figure 1.7

snowy 2.0 EMM creating opportunities

1.6 Purpose of this document

This EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Snowy Hydro to support the CSSI application for approval under Part 5, Division 5.2 of the EP&A Act for Exploratory Works. It has been prepared to the form and contents requirements set out in clauses 6 and 7 of Schedule 2 of the *NSW Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).It has also been prepared with consideration of *Preparing an Environmental Impact Statement Guideline (Draft)* (DPE 2017).

The primary objective of this EIS is to inform government authorities and other stakeholders about Exploratory Works and the measures that will be implemented to mitigate, manage and/or monitor potential impacts, together with a description of the remaining social, economic and environmental impacts.

It addresses the specific requirements provided in the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning and Environment (DPE) on 17 May 2018 and revised SEARs received on 20 June 2018. The SEARs and where they have been addressed in this EIS are provided in Table 1.1 and Appendix A. The EIS is supported with input from technical specialists. The EIS study team is provided in Appendix B.

Table 1.1 SEARs and where they are addressed

Requirement	Location in EIS
General requirements	
The Environmental Impact Statement (EIS) for the project must comply with the requirements in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). In particular, the EIS must include, but not necessarily be limited to, the following:	
an executive summary;	Executive summary (page E.1) and https://v2.communityanalytics.com.au/snowy/eis
a full description of the project, including: ● all components, materials and activities required to construct the project (including any ancillary development that may require a separate approvals); ● likely staging or sequencing of the project, including construction and rehabilitation; ● a strategy for the design, management, and rehabilitation of the excavated material stockpiles in the short, medium and long term, including removal, re-use and disposal; ● the likely interactions between the project and any other existing, approved or proposed development in the vicinity of the site, including the existing Snowy Scheme and the broader Snowy 2.0 project;	Chapter 2
a summary of the strategic context for the project having regard to its critical significance for NSW and relevant State and Commonwealth Governments policies and reports relating to energy security and reliability, and the management of the Kosciuszko National Park;	Section 1.5 and Chapter 3

Table 1.1 SEARs and where they are addressed

Requirement	Location in EIS
statutory context for the project, including: ● how the project meets the provisions and objectives of the Environmental Planning and Assessment Act 1979 (EP&A Act) and EP&A Regulation; ● consideration of the project against all relevant environmental planning instruments; ● any approvals that must be obtained before the project can commence; and ● the likely interactions between the *Snowy Hydro Corporatisation Act 1997*, the *National Parks and Wildlife Act 1974*, the Kosciuszko National Park Plan of Management 2006 and the Snowy Park Lease.	Chapter 3 and Appendix C (Regulatory Framework)
an assessment of the likely impacts of the project on the biophysical and socio-economic environment, focusing on the specific issues identified below, including: ● a description of the existing environment likely to be affected by the project; ● a description of how the project has been designed to avoid and minimise impacts; and ● an assessment of the potential impacts of the project, including any cumulative impacts, and taking into consideration relevant guidelines, policies, plans and industry codes of practice;	Chapter 5 and supporting technical assessments (Appendix F to Appendix V)
a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS, and how these measures would be integrated with the environmental management, monitoring and reporting regime for the existing Snowy Scheme; and	Chapter 6
an evaluation of the project as a whole having regard to: ● relevant matters for consideration under the EP&A Act including ecologically sustainable development; ● the strategic need and justification for the project having regard to energy security and reliability in NSW and the broader National Electricity Market; and ● the biophysical, economic and social costs and benefits of the project.	Chapter 7
While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies, and plans that may be relevant to the environmental assessment of the project.	The environmental planning instruments, guidelines, policies, and plans listed in Attachment 1 were considered in preparation of the environmental impact assessments provided in Chapter 5.
Key issues	
Biodiversity	
an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with the NSW *Biodiversity Conservation Act 2016*, the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR);	Section 5.1 Appendix F (Biodiversity development assessment)
a strategy to offset any residual impacts of the project focusing on improving the biodiversity and conservation values of the Kosciuszko National Park in the medium to long term; and	Section 5.1 Appendix F (Biodiversity development assessment)

Table 1.1 SEARs and where they are addressed

Requirement	Location in EIS
an assessment of the impacts of the project on aquatic ecology in Yarrangobilly River, Wallaces Creek, and Talbingo Reservoir, including impacts on key fish habitat and threatened species of fish;	Section 5.1 Appendix G (Aquatic ecology assessment)
Kosciuszko National Park	
an assessment of impacts on the amenity, recreational and conservation values of the Kosciuszko National Park;	Section 5.2 Appendix R (Recreational user assessment within Social assessment)
an assessment of the visual impacts of the project for visitors to the Kosciuszko National Park and key vantage points in the public domain, paying particular attention to any new landforms and minimising lighting impacts;	Section 5.3
identification of the impacts and management measures to allow continued NPWS park operations; and	Section 5.3 Chapter 4
a strategy for managing these impacts during construction and improving the amenity, recreational and conservation values of the Kosciuszko National Park in the medium to long term;	Section 5.3 Appendix R (Recreational user assessment within Social assessment)
Land	
an assessment of impacts of the project on soils and land capability of the site and surrounds;	Section 5.4 Appendix H (Soils and land assessment)
an assessment of the impacts of the project on landforms, including the short and long term geotechnical stability of any new landforms and any seismic or subsidence impacts;	Section 5.3
an assessment of the compatibility of any permanent new landforms with the existing conservation and recreational land uses of the site and surrounds;	Section 5.4 Appendix R (Social assessment including Recreational user assessment)
an assessment of the risk of soil and water contamination based on the predicted geochemistry of the excavated rock and any disturbance of land associated with previous mining activities and naturally occurring asbestos in the vicinity of the site;	Section 5.4 Appendix J (Phase 1 contamination assessment)
an assessment of any impacts on the Yarrangobilly and Ravine Karst system;	Section 5.4 Appendix N (Groundwater assessment)
Water	
an assessment of the impacts of the project on the quantity and quality of the region's surface water resources, including Yarrangobilly River, Wallaces Creek and Talbingo Reservoir, having regard to *NSW Water Quality Objectives*;	Section 5.4 Appendix M (Surface water assessment)
an assessment of the impacts of the project on groundwater aquifers and groundwater dependent ecosystems having regard to the *NSW Aquifer Interference Policy* and relevant *Water Sharing Plans*;	Section 5.5 Appendix N (Groundwater assessment) Appendix F (Biodiversity development assessment)
an assessment of the potential flooding impacts and risks of the project;	Section 5.4 Appendix M (Surface water assessment)

Table 1.1 SEARs and where they are addressed

Requirement	Location in EIS
an assessment of the impacts of emplacement of excavated rock within Talbingo Reservoir (including bathymetry, hydrology, water quality and downstream water users);	Section 5.4 Appendix L (Subaqueous excavated rock placement assessment within Barge infrastructure assessment)
a strategy for managing and monitoring the impacts of emplacement of excavated rock within Talbingo Reservoir; and	Section 5.5 Appendix L (Subaqueous excavated rock placement assessment within Barge infrastructure assessment)
a detailed site water balance for the project, including water supply and wastewater disposal arrangements;	Section 5.5 Appendix M (Surface water assessment)
Transport	
an assessment of the transport impacts of the project on the capacity, condition, safety and efficiency of the local, national park and State road network (including Upper Lobs Hole Ravine Road, Lower Lobs Hole Ravine Road, Mine Trail Road, Middle Bay Wharf access road, and Talbingo Reservoir access roads); and	Section 5.6 Appendix Q (Traffic and transport assessment)
a strategy for managing these impacts having regard to existing road maintenance agreements;	Section 5.6 Appendix Q (Traffic and transport assessment)
Heritage	
an assessment of the Aboriginal and historic heritage (cultural and archaeological) impacts of the project;	Section 5.5 Appendix O (Aboriginal cultural heritage assessment) Appendix P (Historic cultural heritage assessment)
archival and oral history recording for any items with significant heritage values likely to be disturbed or impacted by the project; and	Section 5.5 Appendix O (Aboriginal cultural heritage assessment) Appendix P (Historic cultural heritage assessment)
adequate consultation with the local Aboriginal community and other relevant stakeholders, having regard to the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW DECCW 2010b);	Section 5.5 Appendix O (Aboriginal cultural heritage assessment)
Noise	
including an assessment of the construction noise, road noise and vibration impacts of the project;	Section 5.9 Appendix T (Noise and vibration assessment)
Air	
including an assessment of the air quality impacts of the project;	Section 5.9 Appendix U (Air quality assessment)

Table 1.1 SEARs and where they are addressed

Requirement	Location in EIS
Public safety	
including an assessment of the risks to public safety, paying particular attention to bushfire risks, emergency egress and evacuation, and the handling and use of any dangerous goods; and	Section 5.9 Appendix V (Bushfire risk and hazard assessment)
Social and economic	
including an assessment of the social and economic impacts and benefits of the project for the region and the State as a whole, including consideration of any increase in demand for community infrastructure and services.	Section 5. 8 Appendix R (Social assessment) Appendix S (Economic assessment)
Consultation	
During the preparation of the EIS, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners, including detailed consultation with the National Parks and Wildlife Service. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these have been considered and addressed.	Chapter 4
Further consultation after 2 years	
If you do not lodge the EIS for the project within 2 years of the issue date of these assessment requirements, you must consult further with the Secretary in relation to the preparation of the EIS.	The EIS has been lodged within 2 years of the SEARs issue date.

As referenced in Section 1.1, on 10 July 2018 the Commonwealth Government's Assistant Minister for the Environment (as delegate), determined that Exploratory Works is not a controlled action and therefore, do not require any further assessment or approval under the EPBC Act.