



A P P E N D I X

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# REHABILITATION STRATEGY



# SNOWY 2.0 MAIN WORKS

## Rehabilitation Strategy

### Prepared for:

Future Generation Joint Venture  
Level 5, 100 Walker Street  
North Sydney NSW

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## BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Future Generation Joint Venture (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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# 1 Introduction

## 1.1 Background

Snowy Hydro Limited (Snowy Hydro) proposes to develop Snowy 2.0, a large-scale pumped hydro-electric storage and generation project which would increase hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme). Snowy 2.0 is the largest committed renewable energy project in Australia and is critical to underpinning system security and reliability as Australia transitions to a decarbonised economy. Snowy 2.0 will link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and a new hydro-electric power station will be built underground.

Snowy 2.0 has been declared to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) by the former NSW Minister for Planning under Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and is defined as CSSI in clause 9 of Schedule 5 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). CSSI is infrastructure that is deemed by the NSW Minister to be essential for the State for economic, environmental or social reasons. An application for CSSI must be accompanied by an environmental impact statement (EIS).

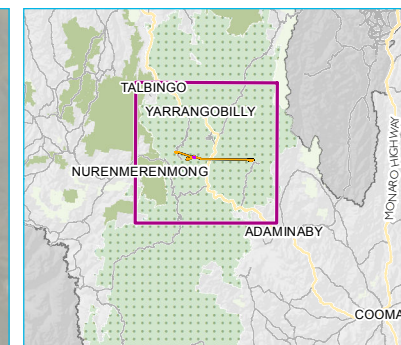
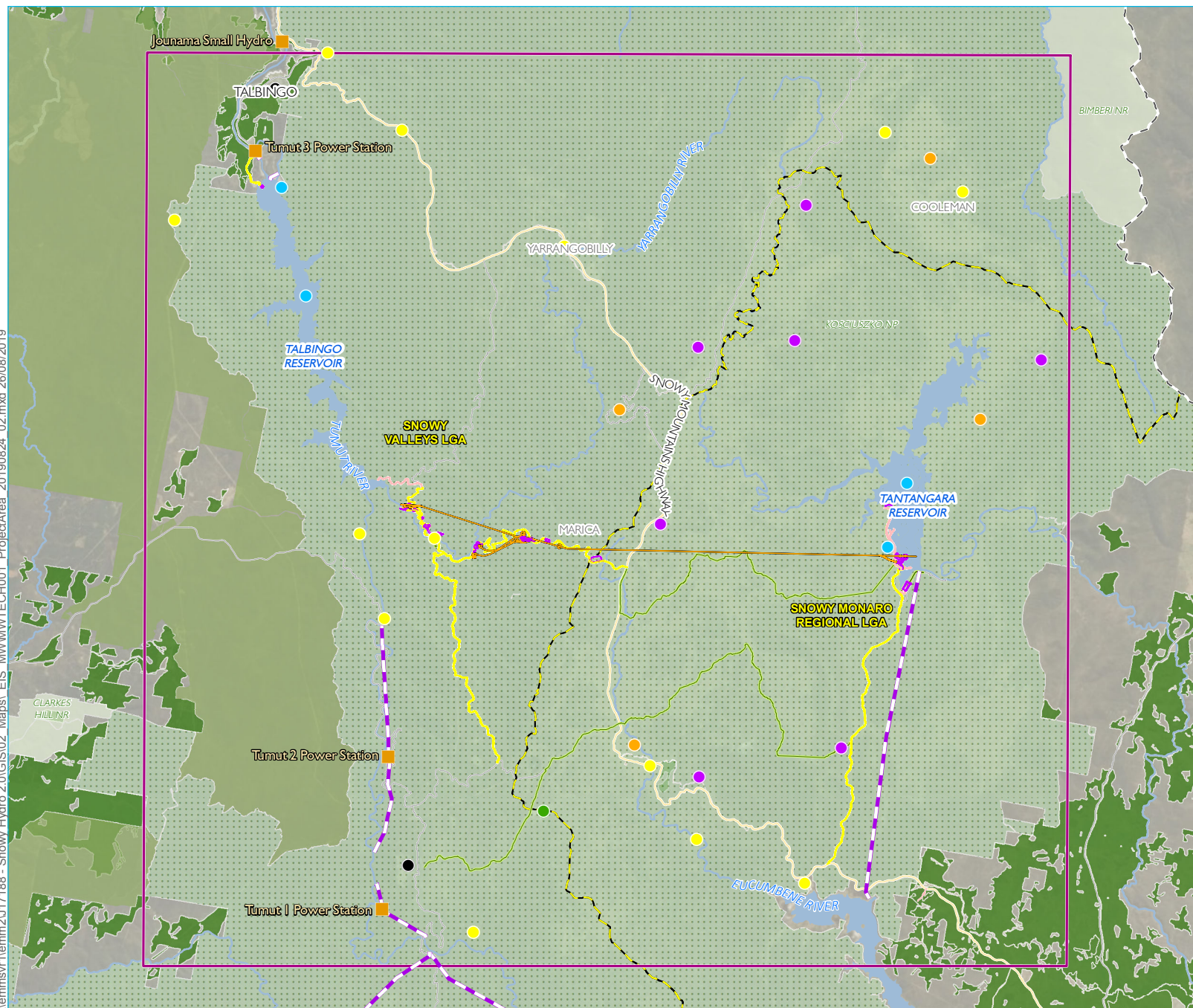
Separate applications are being submitted by Snowy Hydro for different stages of Snowy 2.0 under Part 5, Division 5.2 of the EP&A Act. This includes the preceding first stage of Snowy 2.0, Exploratory Works for Snowy 2.0 (the Exploratory Works) and the stage subject of this current application, Snowy 2.0 Main Works (the Main Works). In addition, an application under Part 5, Division 5.2 of the EP&A Act is also being submitted by Snowy Hydro for a segment factory that will make tunnel segments for both the Exploratory Works and Main Works stages of Snowy 2.0.

The first stage of Snowy 2.0, the Exploratory Works, includes an exploratory tunnel and portal and other exploratory and construction activities primarily in the Lobs Hole area of the Kosciuszko National Park (KNP). The Exploratory Works were approved by the former NSW Minister for Planning on 7 February 2019 as a separate project application to DPIE (SSI 9208).

This *Rehabilitation Strategy* has been prepared to accompany an application and supporting EIS for the **Snowy 2.0 Main Works**. As the title suggests, this stage of the project covers the major construction elements of Snowy 2.0, including permanent infrastructure (such as the underground power station, power waterways, access tunnels, chambers and shafts), temporary construction infrastructure (such as construction adits, construction compounds and accommodation), management and storage of excavated rock material and establishing supporting infrastructure (such as road upgrades and extensions, water and sewage treatment infrastructure, and the provision of construction power). Snowy 2.0 Main Works also includes the operation of Snowy 2.0.

Snowy 2.0 Main Works is shown in **Figure 1**. If approved, the Snowy 2.0 Main Works would commence before completion of Exploratory Works.

\\lemmsvr1\emm2\U17188 - Snowy Hydro 2.0\GIS\02 Maps\ EIS MWMWTECH001 ProjectArea 20190824 02.mxd 26/08/2019



- KEY**
- Existing Snowy Scheme
  - Power station
  - Pipeline tunnel
  - Snowy Tumut pipeline tunnel
  - Project area
  - Recreational use areas
  - Camping
  - Camping - horses permitted
  - Fishing and boating
  - Place of interest
  - Ski resort
  - Township
  - Snowy 2.0 Main Works operational elements
  - Tunnels, portals, intakes, shafts
  - Power station
  - Utilities
  - Permanent road
  - Snowy 2.0 Main Works construction elements
  - Temporary construction compounds and surface works
  - Temporary access road
  - Existing environment
  - Main road
  - Local road
  - Watercourse
  - Waterbodies
  - Kosciuszko National Park
  - NPWS reserve
  - State forest
  - Grazing
  - Local government area boundary
  - State boundary

Snowy 2.0 project area

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 1

Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)



The Snowy 2.0 Main Works do not include the transmission works proposed by TransGrid (TransGrid 2018) that provide connection between the cableyard and the NEM. These transmission works will provide the ability for Snowy 2.0 (and other generators) to efficiently and reliably transmit additional renewable energy to major load centres during periods of peak demand, as well as enable a supply of renewable energy to pump water from Talbingo Reservoir to Tantangara Reservoir during periods of low demand. While the upgrade works to the wider transmission network and connection between the cableyard and the network form part of the CSSI declaration for Snowy 2.0 and Transmission Project, they do not form part of this application and will be subject to separate application and approval processes, managed by TransGrid. This project is known as the Humelink and is part of AEMO's Integrated System Plan.

With respect to the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), on 30 October 2018 Snowy Hydro referred the Snowy 2.0 Main Works to the Commonwealth Department of the Environment and Energy (DoEE) and, on a precautionary basis, nominated that Snowy 2.0 Main Works has potential to have a significant impact on MNES and the environment generally.

On 5 December 2018, Snowy 2.0 Main Works were deemed a controlled action by the Assistant Secretary of the DoEE. It was also determined that potential impacts of the project will be assessed by accredited assessment under Part 5, Division 5.2 of the EP&A Act. This accredited process will enable the NSW Department of Planning, Industry and Environment (DPIE) to manage the assessment of Snowy 2.0 Main Works, including the issuing of the assessment requirements for the EIS. Once the assessment has been completed, the Commonwealth Minister for the Environment will make a determination under the EPBC Act.

## 1.2 Project location

Snowy 2.0 Main Works are within the Australian Alps, in southern NSW, about mid-way between Canberra and Albury. Snowy 2.0 Main Works is within both the Snowy Valleys and Snowy Monaro Regional local government areas (LGAs).

The nearest large towns to Snowy 2.0 Main Works are Cooma and Tumut. Cooma is located about 50 kilometres (km) south east of the project area (or 70 km by road from Providence Portal at the southern edge of the project area), and Tumut is located about 35 km north west of the project areas (or 45 km by road from Tumut 3 power station at the northern edge of the project area). Other townships near the project area include Talbingo, Cabramurra, Adaminaby and Tumbarumba. Talbingo and Cabramurra were built for the original Snowy Scheme workers and their families, while Adaminaby was relocated in 1957 to make way for the establishment of Lake Eucumbene.

The location of Snowy 2.0 Main Works with respect to the region is shown in **Figure 2**.

The pumped hydro-electric scheme elements of Snowy 2.0 Main Works are mostly underground between the southern ends of Tantangara and Talbingo reservoirs, a straight-line distance of 27 km. Surface works will also occur at locations on and between the two reservoirs. Key locations for surface works include:

- **Tantangara Reservoir** - at a full supply level (FSL) of about 1,229 metres (m) to Australian Height Datum (AHD), Tantangara Reservoir will be the upper reservoir for Snowy 2.0 and include the headrace tunnel and intake structure. The site will also be used for a temporary construction compound, accommodation camp and other temporary ancillary activities;
- **Marica** - this site will be used primarily for construction including construction of vertical shafts to the underground power station (ventilation shaft) and headrace tunnel (surge shaft), and a temporary accommodation camp;

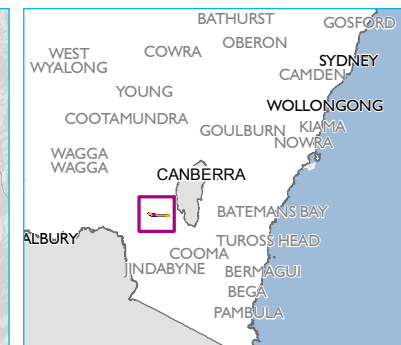
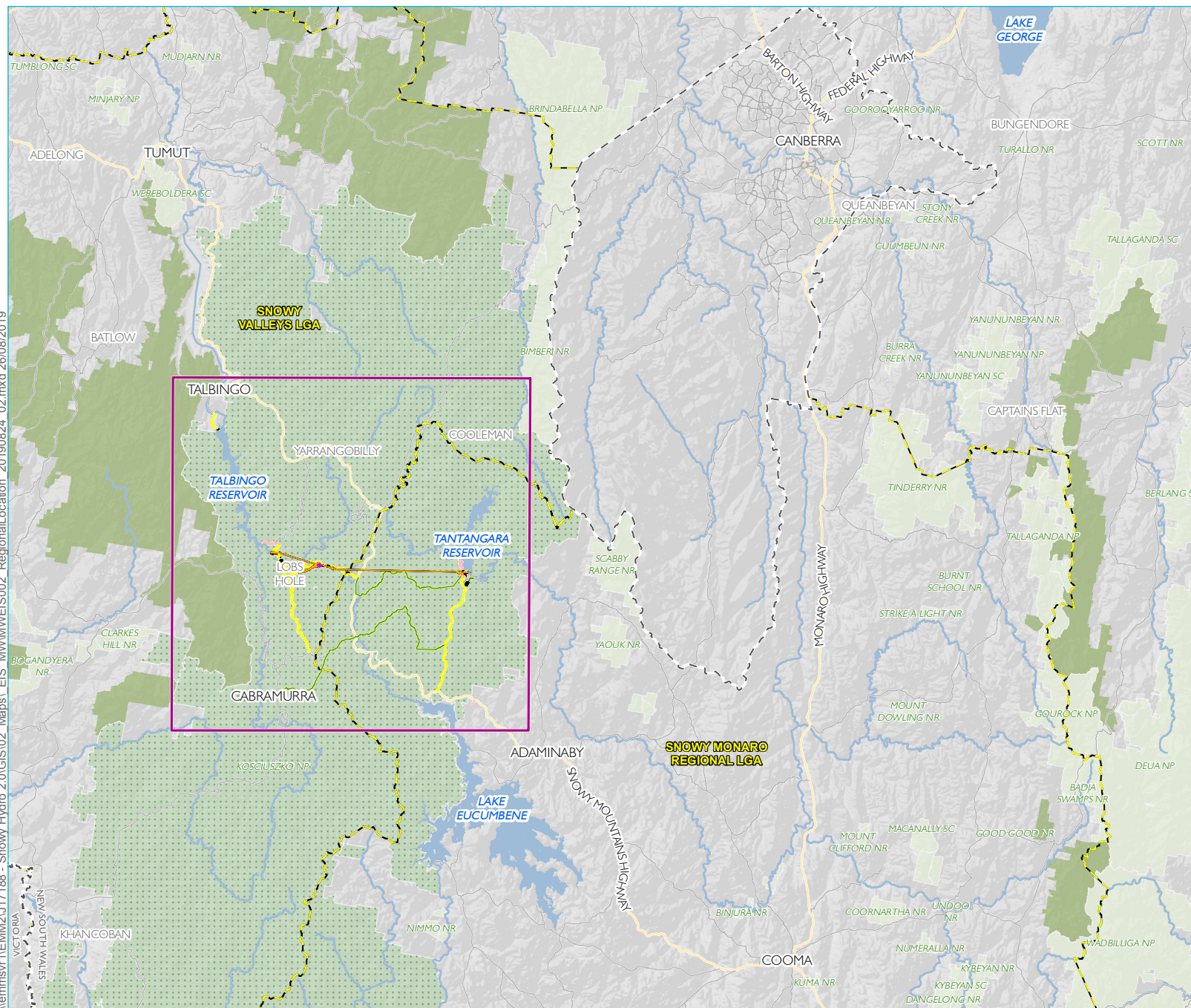
- **Lobs Hole** - the site will be used primarily for construction but will also become the main entrance to the power station during operation. Lobs Hole will provide access to the Exploratory Works tunnel, which will be refitted to become the main access tunnel (MAT), as well as the location of the emergency egress, cable and ventilation tunnel (ECVT), portal, associated services and accommodation camp; and
- **Talbingo Reservoir** - at a FSL of about 546 m AHD, Talbingo Reservoir will be the lower reservoir for Snowy 2.0 and will include the tailrace tunnel and water intake structure. The site will also be used for temporary construction compounds and other temporary ancillary activities.

Works will also be required within the two reservoirs for the placement of excavated rock and surplus cut material. Supporting infrastructure will include establishing or upgrading access tracks and roads and electricity connections to construction sites.

Most of the proposed pumped hydro-electric and temporary construction elements and most of the supporting infrastructure for Snowy 2.0 Main Works are located within the boundaries of KNP, although the disturbance footprint for the project during construction is less than 0.25% of the total KNP area. Some of the supporting infrastructure and construction sites and activities (including sections of road upgrade, power and communications infrastructure) extends beyond the national park boundaries. These sections of infrastructure are primarily located to the east and south of Tantangara Reservoir. One temporary construction site is located beyond the national park along the Snowy Mountains Highway about 3 km east of Providence Portal (referred to as Rock Forest).

The project is described in more detail in **Section 2**.

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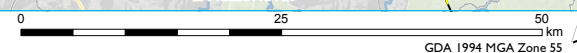


- KEY**
- Project area
  - Snowy 2.0 Main Works operational elements
    - Tunnels, portals, intakes, shafts
    - Power station
    - Utilities
    - Permanent road
  - Snowy 2.0 Main Works construction elements
    - Temporary construction compounds and surface works
    - Temporary access road
  - Existing environment
    - Main road
    - Local road
    - Watercourse
    - Waterbodies
    - Kosciusko National Park
    - NPWS reserve
    - State forest
    - Local government area boundary
    - State boundary

Regional setting

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 2

Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)



### 1.2.1 Project area

The project area for Snowy 2.0 Main Works has been identified and includes all the elements of the project, including all construction and operational elements. The project area is shown on **Figure 1** and **Figure 2**. Key features of the project area are:

- the water bodies of Tantangara and Talbingo reservoirs, covering areas of 19.4 square kilometres (km<sup>2</sup>) and 21.2 km<sup>2</sup> respectively. The reservoirs provide the water to be utilised in Snowy 2.0;
- major watercourses including the Yarrangobilly, Eucumbene and Murrumbidgee rivers and some of their tributaries;
- KNP, within which the majority of the project area is located. Within the project area, KNP is characterised by two key zones: upper slopes and inverted treelines in the west of the project area (referred to as the 'ravine') and associated subalpine treeless flats and valleys in the east of the project area (referred to as the 'plateau'); and
- farm land southeast of KNP at Rock Forest.

The project area is interspersed with built infrastructure including recreational sites and facilities, main roads as well as unsealed access tracks, hiking trails, farm land, electricity infrastructure, and infrastructure associated with the Snowy Scheme.

## 1.3 Proponent

Snowy Hydro is the proponent for the Snowy 2.0 Main Works. Snowy Hydro is an integrated energy business – generating energy, providing price risk management products for wholesale customers and delivering energy to homes and businesses. Snowy Hydro is the fourth largest energy retailer in the NEM and is Australia's leading provider of peak, renewable energy.

## 1.4 Purpose of this report

This *Rehabilitation Strategy* supports the EIS for the Snowy 2.0 Main Works. It has been prepared as a high level document to outline the framework and proposed approach to decommissioning and rehabilitation activities associated with the Main Works phase of Snowy 2.0. The Rehabilitation Strategy provides the overarching standard for decision making in terms of rehabilitated landscape and complements the post approval Rehabilitation Management Plan which provides further specific details for implementation, management and monitoring of all aspects rehabilitation and decommissioning.

The objective of all landscape and rehabilitation works undertaken will be to leave a legacy that enables Snowy 2.0 to co-exist within the KNP and maintain its values. The project will aim to establish and execute a rehabilitation methodology of the highest standard that sets an international benchmark as an integral part of significantly large infrastructure projects.

This Rehabilitation Strategy is intended to outline the approach to rehabilitation and decommissioning and to demonstrate the understanding of, and commitment to, the protection and rehabilitation of KNP throughout all Snowy 2.0 works. Following approval of Main Works, a Rehabilitation Management Plan will be prepared during detailed design to provide further resolution to rehabilitation methodologies in accordance with approval conditions.

Given that most of Snowy 2.0 Main Works is within the boundaries of the KNP, Snowy Hydro will liaise closely with NPWS to determine the final end land use and the extent of decommissioning of temporary construction facilities and rehabilitation activities to be undertaken following the construction of Snowy 2.0 Main Works. This approach will be taken to ensure that decommissioning allows for integration with future planned recreational uses of these areas and to maintain the values of KNP and be consistent with the KNP Plan of Management (NPWS, 2006).

Rehabilitation will be considered during all phases of construction, from design and site preparation, through to stabilisation and revegetation.

## 1.5 Assessment Requirements and Guidelines

### 1.5.1 Secretary's Environmental Assessment Requirements

This Rehabilitation Strategy has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for Snowy 2.0 Main Works, issued on 31 July 2019, as well as relevant government assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

**Table 1** lists the matters described in the SEARs relevant to rehabilitation and where they are addressed in this report.

**Table 1 Relevant matters raised in the SEARs**

Requirement	Section Addressed
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:	
- a full description of the project accompanied by suitable maps and plans, including the:	Section 2 of this report and Chapter 2 of the EIS.
- a strategy to manage the progressive rehabilitation of the land disturbed by the project and enhance any new landforms created;	Section 5

To inform preparation of the SEARs, the DPIE invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were taken into account by the Secretary for DPIE when preparing the SEARs.

### 1.5.2 Policies and Guidelines

The following policies and guidelines have been considered in the preparation of this Rehabilitation Strategy:

- *Australian Alps Rehabilitation Manual* (NSW DECC for NPWS, 2007);
- *Rehabilitation Guidelines for the Resort Areas of Kosciuszko National Park* (Good, R. [Australian Alps Liaison Committee], 2006);
- *Kosciuszko National Park Plan of Management* (NPWS, 2006);
- *Managing Urban Stormwater – Soils and Construction, Volume 2A Installation of Services* (DECC, 2008a).
- *Managing Urban Stormwater – Soils and Construction, Volume 2C Unsealed Roads* (DECC, 2008b);

- *Global Acid Rock Drainage Guide* (INAP, 2009);
- *Managing Urban Stormwater – Soils and Construction, Volume 1, 4th edition* (Landcom, 2004);
- *Consultation Draft Code of Practice: Rehabilitation Management Plan for Large Mines* (DPE, 2018a);
- *Consultation Draft Guideline 1: Rehabilitation Risk Assessment* (DPE, 2018b);
- *Consultation Draft Guideline 2: Rehabilitation Records* (DPE, 2018c); and
- *Consultation Draft Guideline 3: Rehabilitation Controls* (DPE, 2018d).

## 1.6 Related projects

There are three other projects related to Snowy 2.0 Main Works, they are:

- Snowy 2.0 Exploratory Works (SSI-9208) – a Snowy Hydro project with Minister’s approval;
- Snowy 2.0 Transmission Connect Project (SSI-9717) – a project proposed by TransGrid; and
- Snowy 2.0 – Segment Factory (SSI-10034) – a project proposed by Snowy Hydro.

While these projects form part of the CSSI declaration for Snowy 2.0 and Transmission Project, they do not form part of Snowy Hydro’s application for Snowy 2.0 Main Works. These related projects are subject to separate application and approval processes. Staged submission and separate approval is appropriate for a project of this magnitude, due to its complexity and funding and procurement processes. However, cumulative impacts have been considered in this report where relevant.

## 2 Project Description

This chapter provides a summary of the Snowy 2.0 Main Works project. It outlines the functional infrastructure required to operate Snowy 2.0, as well as the key construction elements and activities required to build it. A more comprehensive detailed description of the project is provided in Chapter 2 (Project description) of the EIS, which has been relied upon for the basis of this technical assessment.

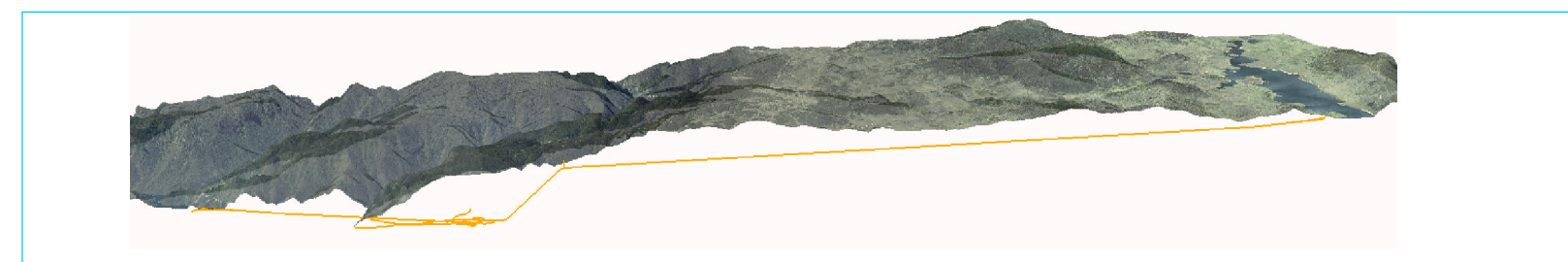
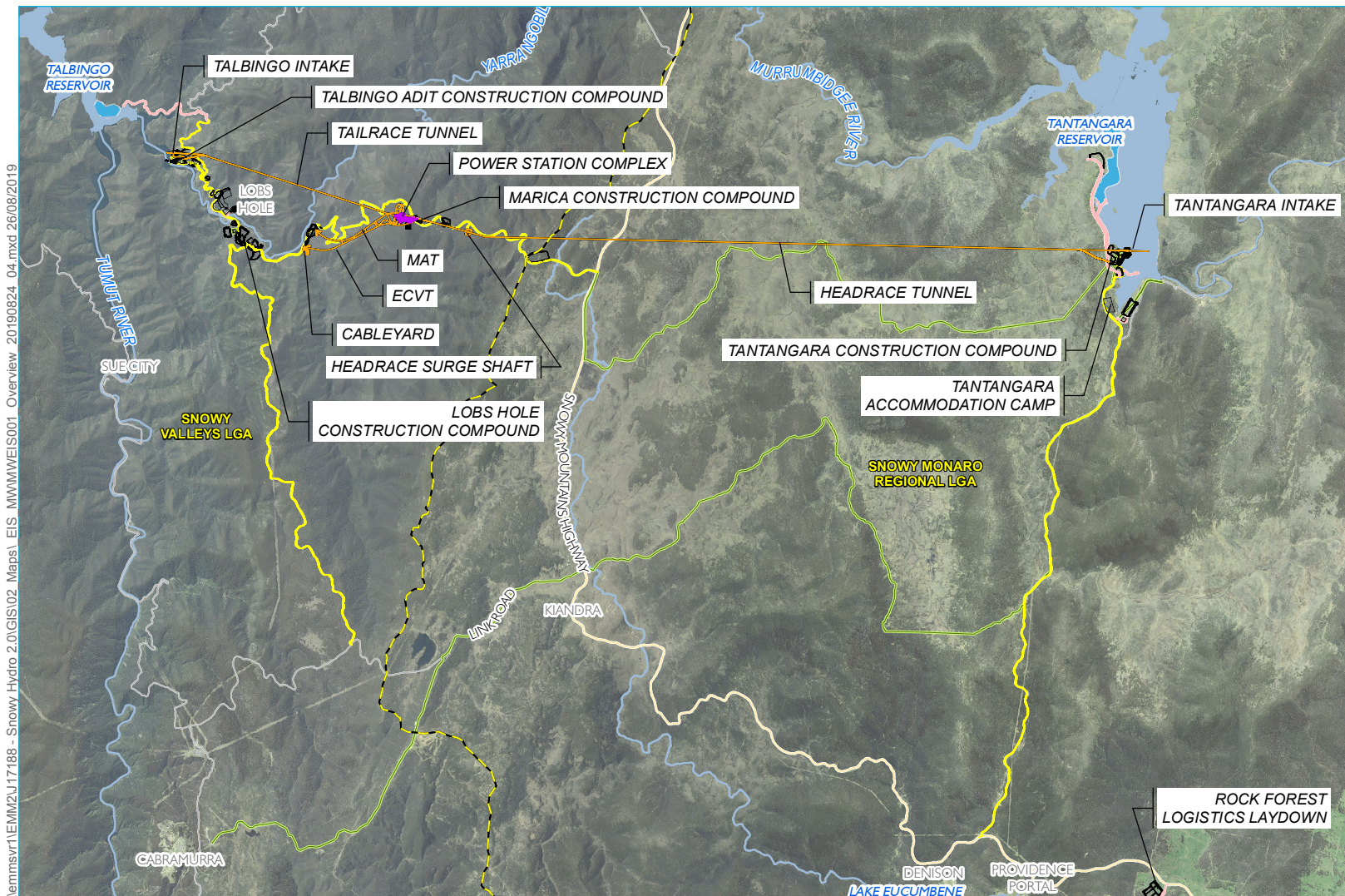
### 2.1 Overview of Snowy 2.0

Snowy 2.0 will link the existing Tantangara and Talbingo reservoirs within the Snowy Scheme through a series of underground tunnels and a new hydro-electric power station will be built underground. An overview of Snowy 2.0 is shown on **Figure 3**, and the key project elements of Snowy 2.0 are summarised in **Table 2**.

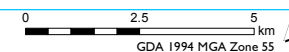
**Table 2 Overview of Snowy 2.0 Main Works**

Project element	Summary of the project
Project area	The project area is the broader region within which Snowy 2.0 will be built and operated, and the extent within which direct impacts from Snowy 2.0 Main Works are anticipated.
Permanent infrastructure	<p>Snowy 2.0 infrastructure to be built and operated for the life of the assets include the:</p> <ul style="list-style-type: none"> <li>- intake and gate structures and surface buildings at Tantangara and Talbingo reservoirs;</li> <li>- power waterway tunnels primarily comprising the headrace tunnel, headrace surge structure, inclined pressure tunnel, pressure pipelines, tailrace surge tank and tailrace tunnel;</li> <li>- underground power station complex comprising the machine hall, transformer hall, ventilation shaft and minor connecting tunnels;</li> <li>- access tunnels (and tunnel portals) to the underground power station comprising the main access tunnel (MAT) and emergency egress, communication, and ventilation tunnel (ECVT).</li> <li>- establishment of a portal building and helipad at the MAT portal;</li> <li>- communication, water and power supply including the continued use of the Lobs Hole substation;</li> <li>- cable yard adjacent to the ECVT portal to facilitate the connection of Snowy 2.0 to the NEM;</li> <li>- access road and permanent bridge structures needed for the operation and maintenance of Snowy 2.0 infrastructure; and</li> <li>- fish control structures on Tantangara Creek and near Tantangara Reservoir wall..</li> </ul>
Temporary infrastructure	<p>Temporary infrastructure required during the construction phase of Snowy 2.0 Main Works are:</p> <ul style="list-style-type: none"> <li>- construction compounds, laydown, ancillary facilities and helipads;</li> <li>- accommodation camps for construction workforce;</li> <li>- construction portals and adits to facilitate tunnelling activities;</li> <li>- barge launch ramps;</li> <li>- water and wastewater management infrastructure (treatment plants and pipeline);</li> <li>- communication and power supply; and</li> <li>- temporary access roads .</li> </ul>
Disturbance area	The disturbance area is the extent of construction works required to build Snowy 2.0. The maximum disturbance area is about 1,680 hectares (ha), less than 0.25% of the total area of KNP. Parts of the disturbance area will be rehabilitated and landformed and other parts will be retained permanently for operation (operational footprint).
Operational footprint	The operational footprint is the area required for permanent infrastructure to operate Snowy 2.0. The maximum operational footprint is about 99 ha. This is 0.01% of the total area of KNP.

Project element	Summary of the project
Tunnelling and excavation method	The primary tunnelling method for the power waterway is by tunnel boring machine (TBM), with portals and adits using drill and blast methods. Excavation for other underground caverns, chambers and shafts will be via combinations of drill and blast, blind sink, and/or raise bore techniques.
Excavated rock management	Excavated rock will be generated as a result of tunnelling activities and earthworks. The material produced through these activities will be stockpiled and either reused by the contractor (or NPWS), placed permanently within Tantangara or Talbingo reservoirs, used in final land forming and rehabilitation of construction pads in Lobs Hole, or transported offsite.
Construction water and wastewater management	Water supply for construction will be from the two existing reservoirs (Talbingo and Tantangara) and reticulated via buried pipelines (along access roads). Raw water will be treated as necessary wherever potable water is required (eg at accommodation camps). Water to be discharged (comprising process water, wastewater and stormwater) will be treated before discharge to the two existing reservoirs (Talbingo and Tantangara) as follows: <ul style="list-style-type: none"> <li>- treated process water will be reused onsite where possible to reduce the amount of discharge to reservoirs, however excess treated water will be discharged to the reservoirs;</li> <li>- collected sewage will be treated at sewage treatment plants to meet the specified discharge limits before discharge and/or disposal; and</li> <li>- stormwater will be captured and reused as much as possible.</li> </ul>
Rehabilitation	Rehabilitation of areas disturbed during construction including reshaping to natural appearing landforms or returning to pre-disturbance condition, as agreed with NPWS and determined by the rehabilitation strategy. This includes construction areas at Lobs Hole which comprise surplus cut materials that are required for the construction. Areas to be used by Snowy Hydro in the long-term may be re-shaped and rehabilitated to maintain access and operational capabilities (eg intakes and portal entrances).
Construction workforce	The construction workforce for the project is expected to peak at around 2,000 personnel.
Operational life	The operational life of the project is estimated to be 100 years.
Operational workforce	The operational workforce is expected to be 8-16 staff, with fluctuations of additional workforce required during major maintenance activities.
Hours of operation	Construction of Snowy 2.0 will be 24/7 and 365 days per year. Operation of Snowy 2.0 will be 24/7 and 365 days per year.
Capital investment value	Estimated to be \$4.6 billion.



Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)



Snowy 2.0 project elements

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 3



## 2.2 Construction of Snowy 2.0

A number of construction activities will be carried out concurrently, and across a number of different sites. Specific details on these activities as well as an indicative schedule of construction activities is provided in Chapter 2 (Project description) of the EIS. This section summarises the key construction elements of the project.

**Table 3** provides an overview of the construction elements, their purpose and location within the project area.

**Table 3 Snowy 2.0 Construction Elements**

Construction element	Purpose	Location
Construction sites	<p>Due to the remoteness of Snowy 2.0, construction sites are generally needed to:</p> <ul style="list-style-type: none"> <li>- Provide ancillary facilities such as concrete batching plants, mixing plants and on-site manufacturing;</li> <li>- Store machinery, equipment and materials to be used in construction;</li> <li>- Provide access to underground construction sites; and</li> <li>- Provide onsite accommodation for the construction workforce.</li> </ul>	Each construction site needed for Snowy 2.0 is shown on Figures 4 to Figure 9.
Substations and power connection	One substation is required to provide permanent power to Snowy 2.0, at Lobs Hole. This substation is proposed as part of a modification to the Exploratory Works with a capacity of 80 mega volt amp (MVA). It will continue to be used for Main Works, however requires the establishment of further power supply cables to provide power to the work sites and TBM at Tantangara, as well as Talbingo, in particular to power the TBMs via the MAT, ECVT, Talbingo and Tantangara portals.	The supporting high voltage cable route mostly follows access roads to each of the work sites, using a combination of aerial and buried arrangements.
Communications system	Communications infrastructure will connect infrastructure at Tantangara and Talbingo reservoirs to the existing communications system at the Tumut 3 power station (via the submarine communications cable in Talbingo Reservoir established during Exploratory Works) and to Snowy Hydro's existing communications infrastructure at Cabramurra.	The cable will be trenched and buried in conduits within access roads. Crossing of watercourses and other environmentally sensitive areas will be carried out in a manner that minimises environmental impacts where possible, such as bridging or underboring.
Water and waste water servicing	<p>Drinking water will be provided via water treatment plants located at accommodation camps. Water for treatment will be sourced from the nearest reservoir.</p> <p>There are three main wastewater streams that require some form of treatment before discharging to the environment, including:</p> <ul style="list-style-type: none"> <li>- Tunnel seepage and construction wastewater (process water);</li> <li>- Domestic sewer (wastewater); and</li> <li>- Construction site stormwater (stormwater).</li> </ul>	<p>Utility pipelines generally follow access roads.</p> <p>Water treatment plants (drinking water) will be needed for the accommodation camps and will be located in proximity.</p> <p>Waste water treatment plants will similarly be located near accommodation camps.</p> <p>Process water treatment plants will be at construction compounds and adits where needed to manage tunnel seepage and water during construction.</p>

Construction element	Purpose	Location
Temporary and permanent access roads	<p>Access road works are required to:</p> <ul style="list-style-type: none"> <li>- provide for the transport of excavated material between the tunnel portals and the excavated rock emplacement areas;</li> <li>- accommodate the transport of oversized loads as required; and</li> <li>- facilitate the safe movement of plant, equipment, materials and construction workers into and out of construction sites.</li> </ul> <p>The access road upgrades and establishment requirements are shown on Figure 4 to Figure 9. These roads will be used throughout construction including use of deliveries to and from site and the external road network. Some additional temporary roads will also be required within the footprint to reach excavation fronts such as various elevations of the intakes excavation or higher benches along the permanent roads.</p>	<p>The access road upgrades and establishment requirements are shown across the project area.</p> <p>Main access and haulage to site will be via Snowy Mountains Highway, Link Road and Lobs Hole Ravine Road (for access to Lobs Hole), and via Snowy Mountains Highway and Tantangara Road (for access to Tantangara Reservoir).</p>
Excavated rock management	<p>Approximately 9 million m<sup>3</sup> (unbulked) of excavated material will be generated by construction and require management.</p> <p>The strategy for management of excavated rock will aim to maximise beneficial reuse of materials for construction activities. Beneficial re-use of excavated material may include use for road base, construction pad establishment, selected fill and tunnel backfill and rock armour as part of site establishment for construction.</p> <p>Excess excavated material that cannot be re-used during construction will be disposed of within Talbingo and Tantangara reservoirs, used in permanent rehabilitation of construction pads to be left in situ in Lobs Hole, or transported for on-land disposal if required.</p>	<p>Placement areas are shown on Figure 4 to Figure 9.</p>
Barge launch facilities	<p>Barge launch facilities on Talbingo Reservoir will have already been established during Exploratory Works for the placement of the submarine communications cable, and will continued to be used for Main Works for construction works associated with the Talbingo intake structure. The Main Works will require the establishment of barge launch facilities on Tantangara Reservoir to enable these similar works (removal of the intake plug).</p>	<p>Barge launch sites are shown on Figure 4 to Figure 9.</p>
Construction workforce	<p>The construction workforce will be accommodated entirely on site, typically with a FIFO/DIDO roster. Private vehicles will generally not be permitted and the workforce bused to and from site.</p>	<p>Access to site will be via Snowy Mountains Highway</p>

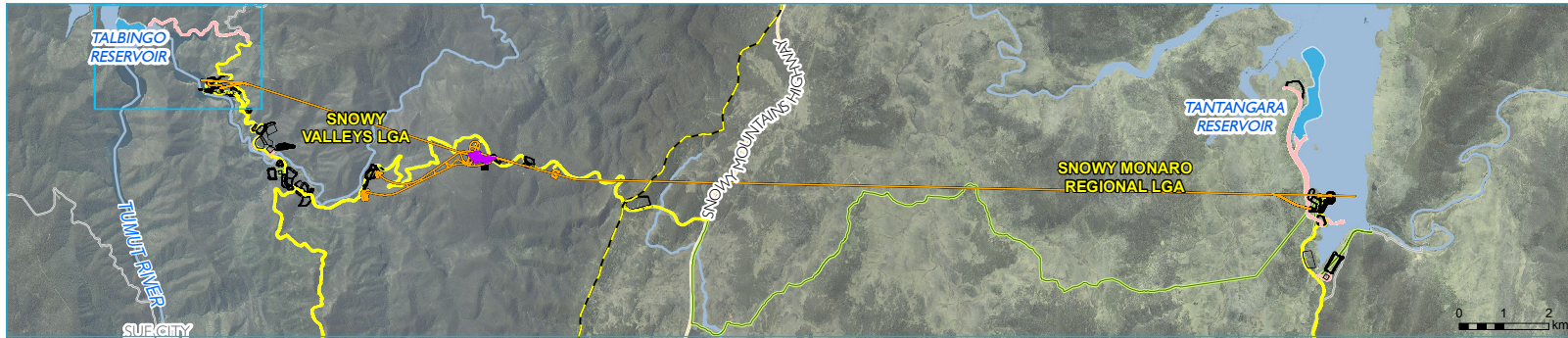
The key areas of construction are shown on **Figure 4 to Figure 9** and can be described across the following locations:

- **Talbingo Reservoir** – Talbingo Reservoir provides the lower reservoir for the pumped hydro-electric project and will include the tailrace tunnel and water intake structure. The site will also be used for temporary construction compounds and other temporary ancillary activities (refer **Figure 4**);

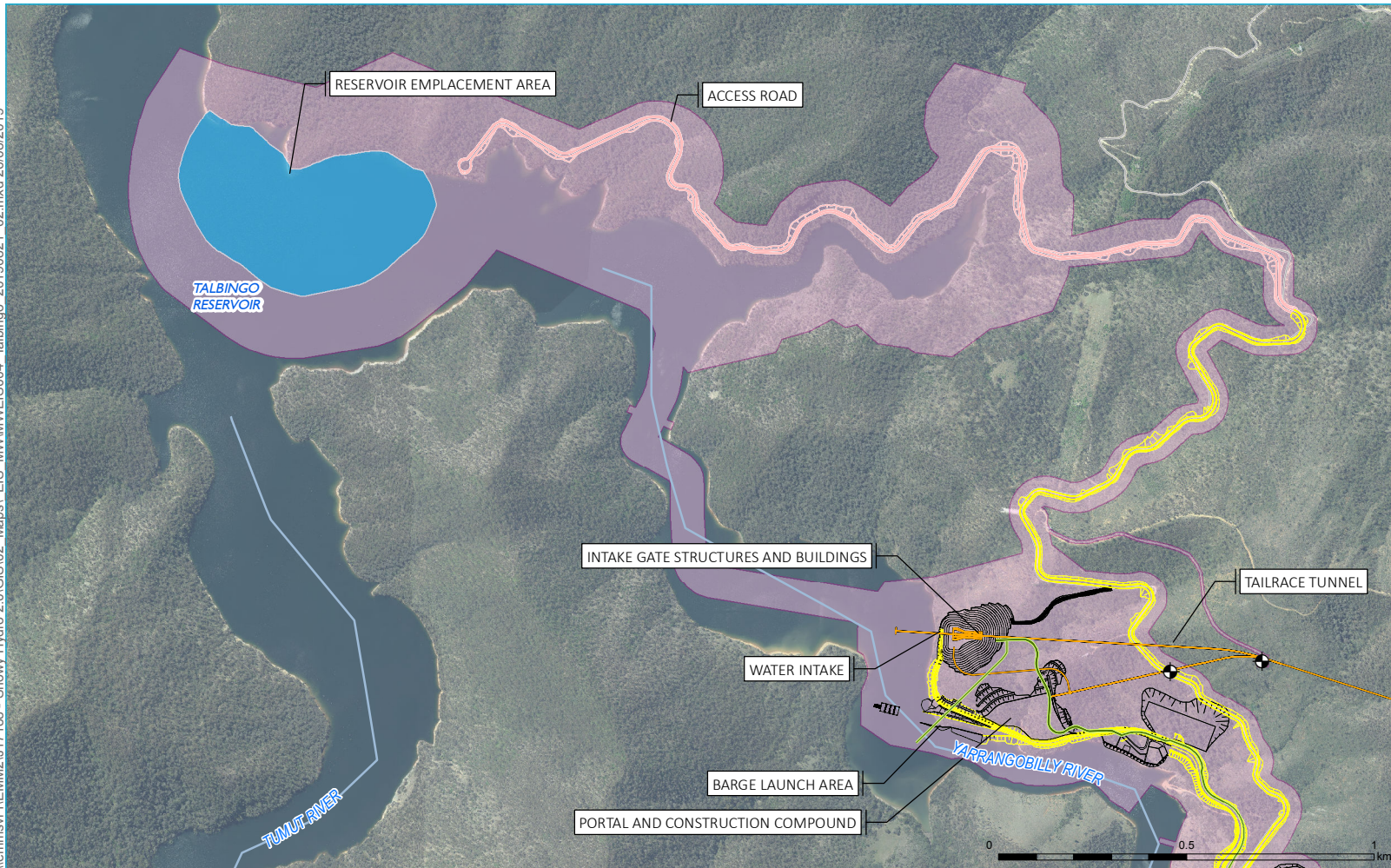
- **Lobs Hole** – this site will be used primarily for construction (including construction of the MAT and ECVT portals and tunnels to the underground power station and the headrace tunnel (and headrace tunnel surge shaft), underground tailrace surge shaft and a temporary accommodation camp) (refer **Figure 5**);
- **Marica** – the site will be used primarily for construction to excavate the ventilation shaft to the underground power station as well as for the excavation and construction of the headrace surge shaft (**Figure 6**);
- **Plateau** – the land area between Snowy Mountains Highway and Tantangara Reservoir is referred to as the Plateau. The Plateau will be used to access and construct a utility corridor and construct a fish weir on Tantangara Creek (**Figure 7**);
- **Tantangara Reservoir** – Tantangara Reservoir will be the upper reservoir for the pumped hydro project and include the headrace tunnel and intake structure. The site will also be used for a temporary construction compound, accommodation camp and other temporary ancillary activities (**Figure 8**); and
- **Rock Forest** – a site to be used temporarily for logistics and staging during construction. It is located beyond the KNP along the Snowy Mountains Highway about 3 km east of Providence Portal (**Figure 9**).

During the construction phase, all work sites will be restricted access and closed to the public. This includes existing road access to Lobs Hole via Lobs Hole Ravine Road. Restrictions to water-based access and activities will also be implemented for public safety and to allow safe construction of the intakes within the reservoirs. Access to Tantangara Reservoir via Tantangara Road will be strictly subject to compliance with the safety requirements established by the contractor.

A key construction element for the project is the excavation and tunnelling for underground infrastructure including the power station, power waterway (headrace and tailrace tunnels) and associated shafts. The primary methods of excavation are shown in **Figure 10** with further detail on construction methods provided at Appendix D of the EIS.



- KEY**
- Existing environment
  - Main road
  - Local road
  - Watercourse
  - Waterbodies
  - Local government area boundary
  - Snowy 2.0 Main Works operational elements
    - Tunnels, portals, intakes, shafts
    - Power station
    - Utilities
    - Permanent road
  - Snowy 2.0 Main Works construction elements
    - Temporary construction compounds and surface works
    - Temporary access road
    - Geotechnical investigation
    - Indicative rock emplacement area
    - Disturbance area\*



Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

## Talbingo Reservoir - project elements, purpose and description

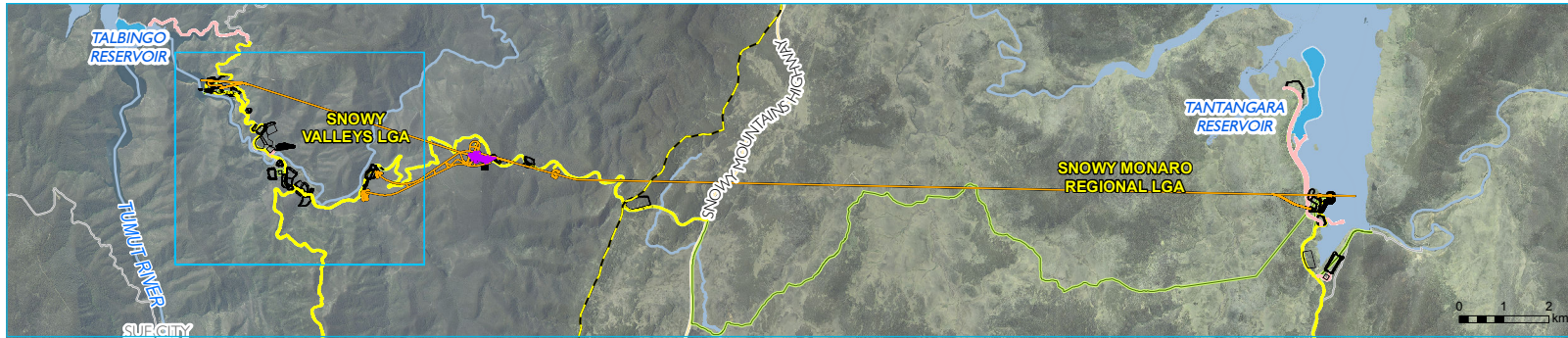
Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 4



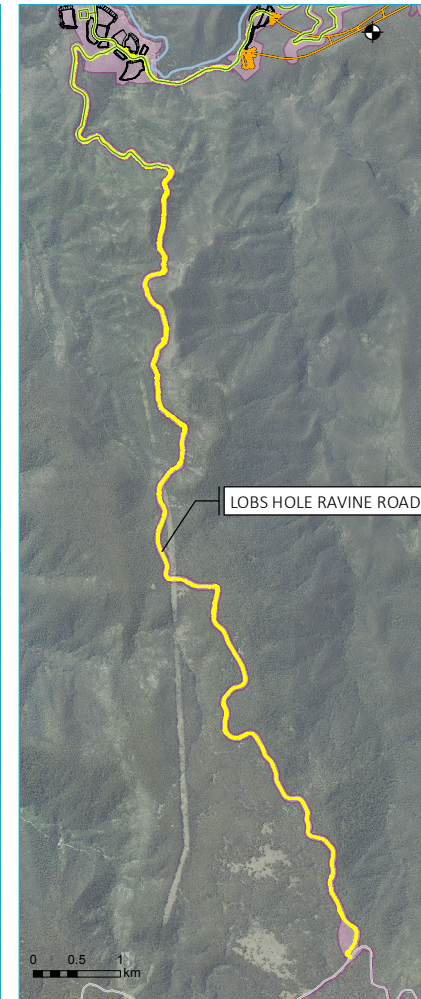
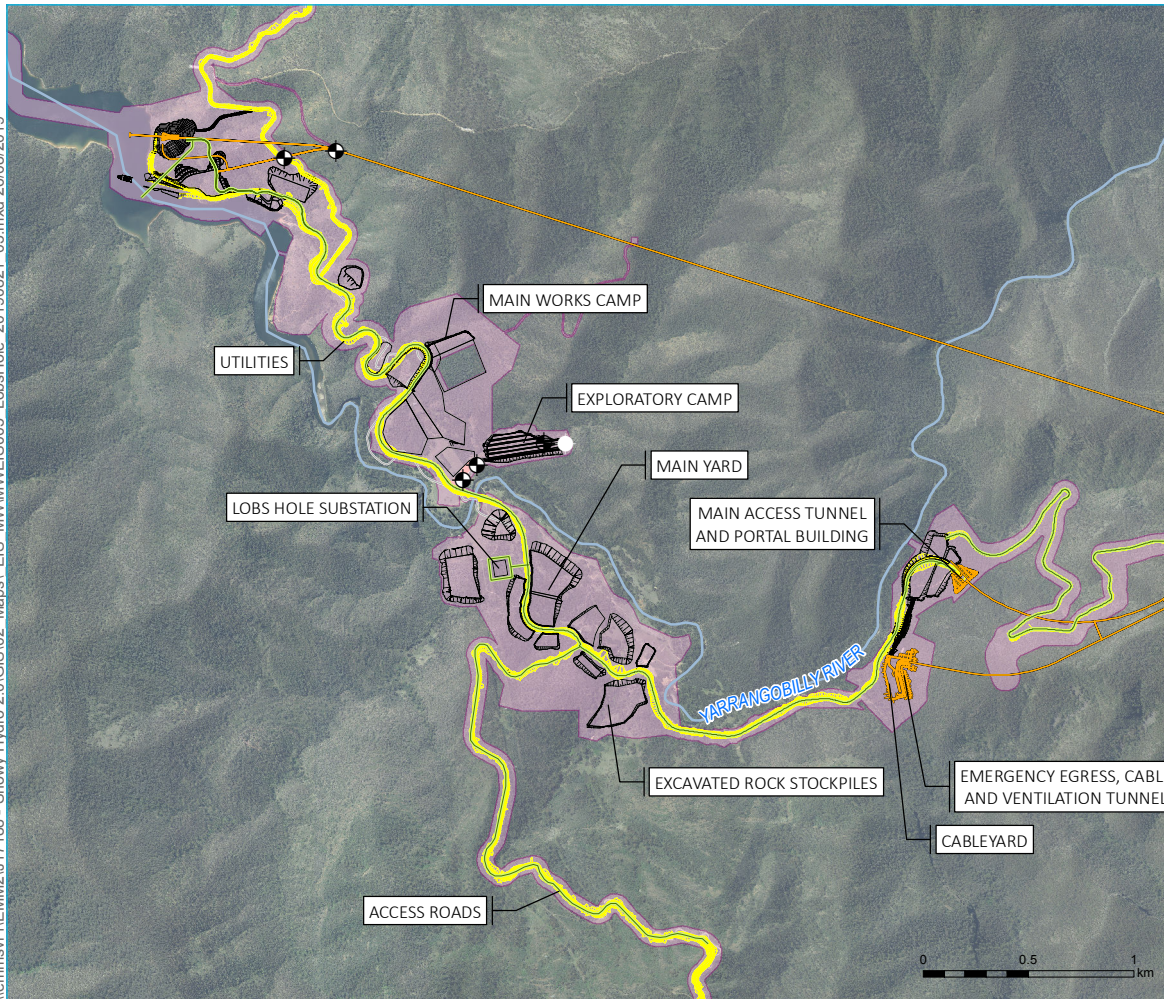
Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)

GDA 1994 MGA Zone 55





- KEY**
- Existing environment
- Main road
  - Local road
  - Watercourse
  - Waterbodies
  - Local government area boundary
- Snowy 2.0 Main Works operational elements
- Tunnels, portals, intakes, shafts
  - Power station
  - Utilities
  - Permanent road
- Snowy 2.0 Main Works construction elements
- Temporary construction compounds and surface works
  - Temporary access road
  - Geotechnical investigation
  - Indicative rock emplacement area
  - Disturbance area\*

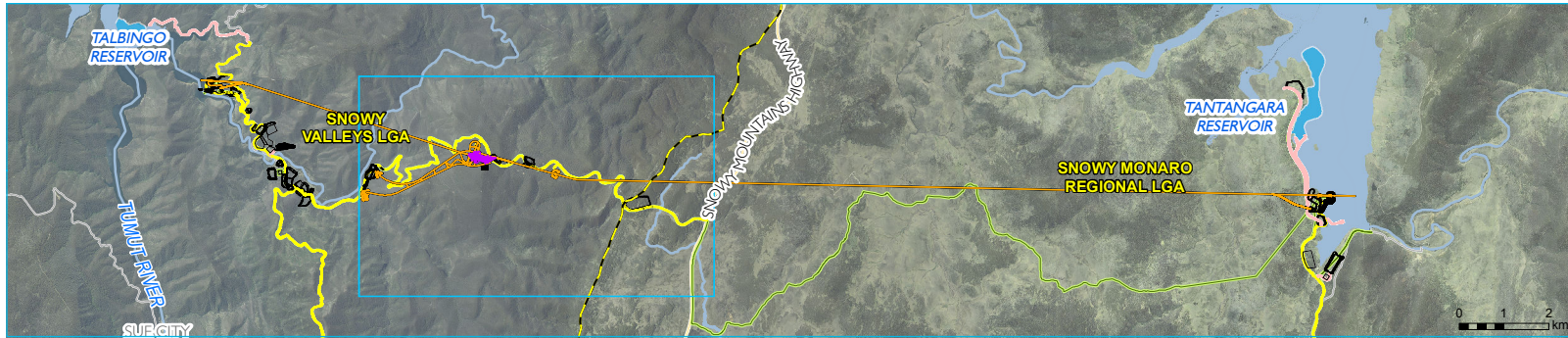


Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

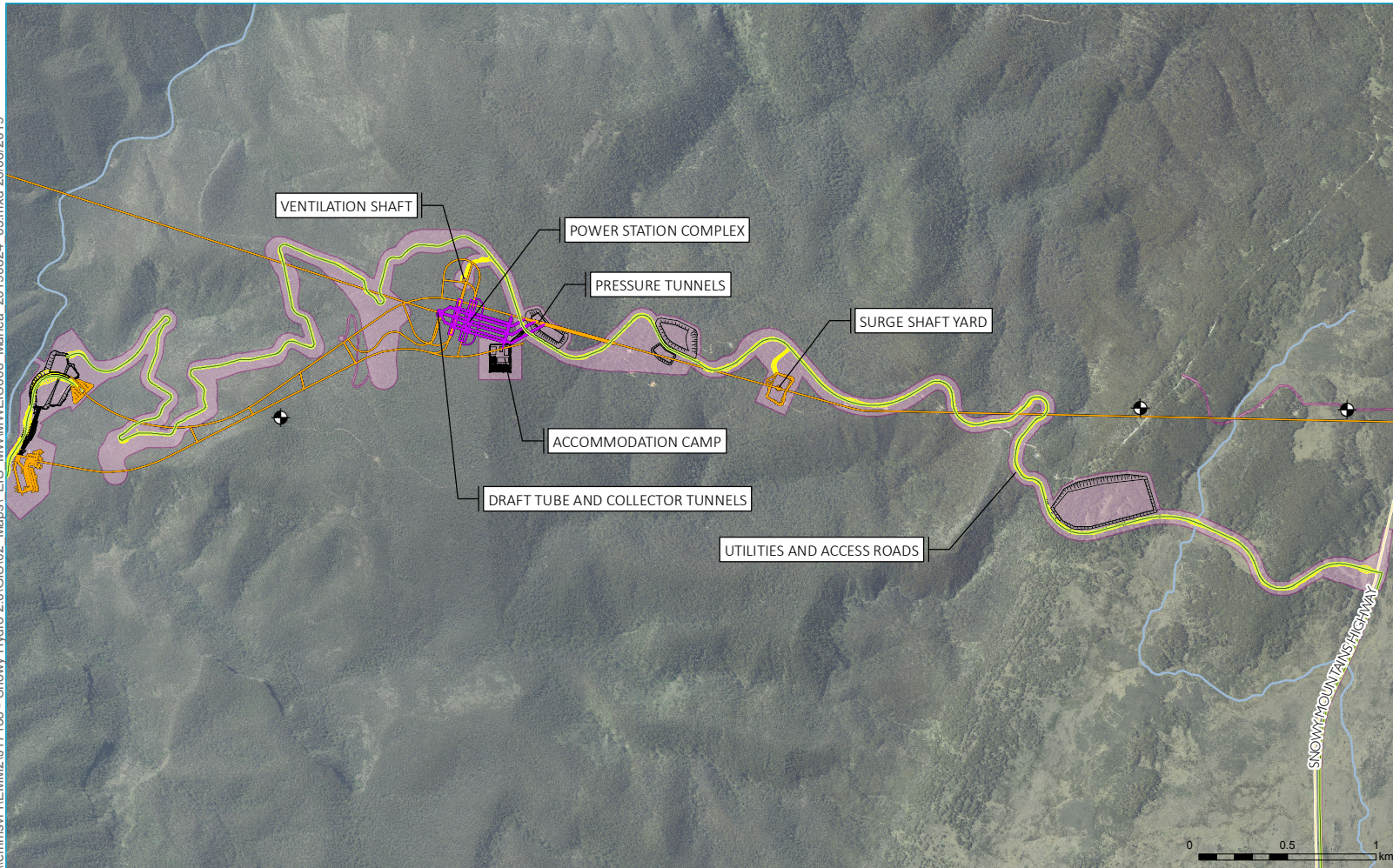
## Lobs Hole - project elements, purpose and description

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 5





- KEY**
- Existing environment
    - Main road
    - Local road
    - Watercourse
    - Waterbodies
  - Local government area boundary
  - Snowy 2.0 Main Works operational elements
    - Tunnels, portals, intakes, shafts
    - Power station
    - Utilities
    - Permanent road
  - Snowy 2.0 Main Works construction elements
    - Temporary construction compounds and surface works
    - Temporary access road
    - Geotechnical investigation
    - Indicative rock emplacement area
    - Disturbance area\*



Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

## Marica - project elements, purpose and description

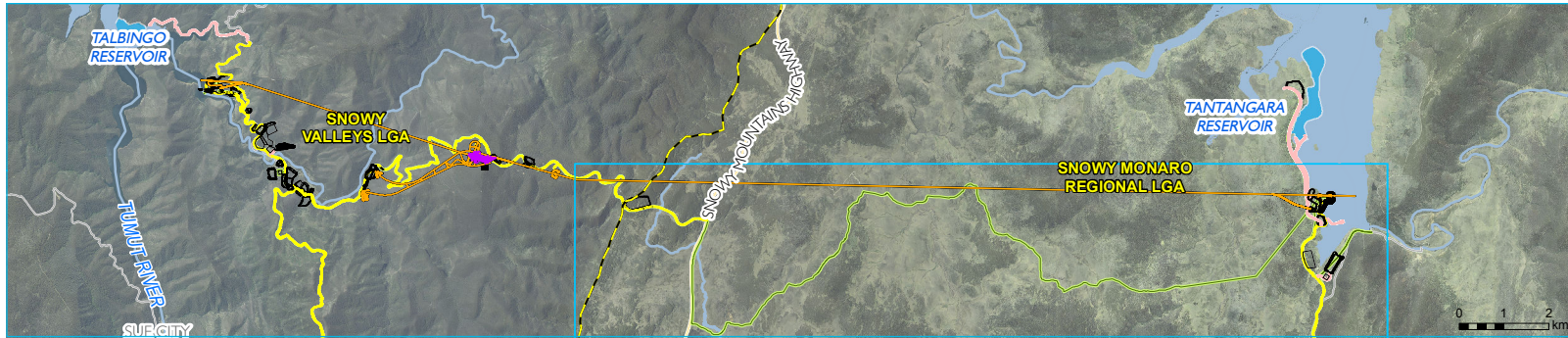
Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 6



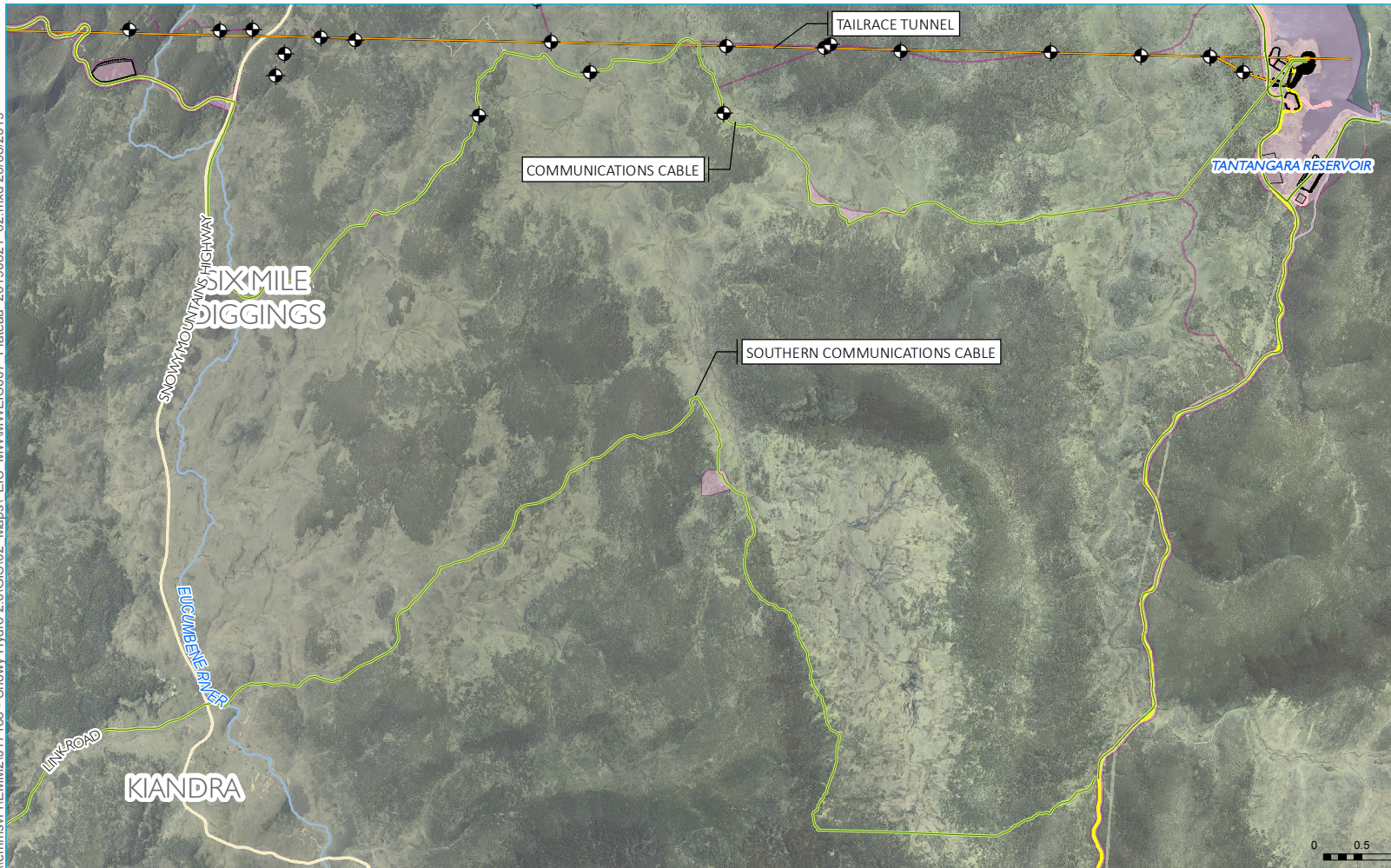
Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)

GDA 1994 MGA Zone 55





- KEY**
- Existing environment
- Main road
  - Local road
  - Watercourse
  - Waterbodies
  - Local government area boundary
- Snowy 2.0 Main Works operational elements
- Tunnels, portals, intakes, shafts
  - Power station
  - Utilities
  - Permanent road
- Snowy 2.0 Main Works construction elements
- Temporary construction compounds and surface works
  - Temporary access road
  - Geotechnical investigation
  - Indicative rock emplacement area
  - Disturbance area\*

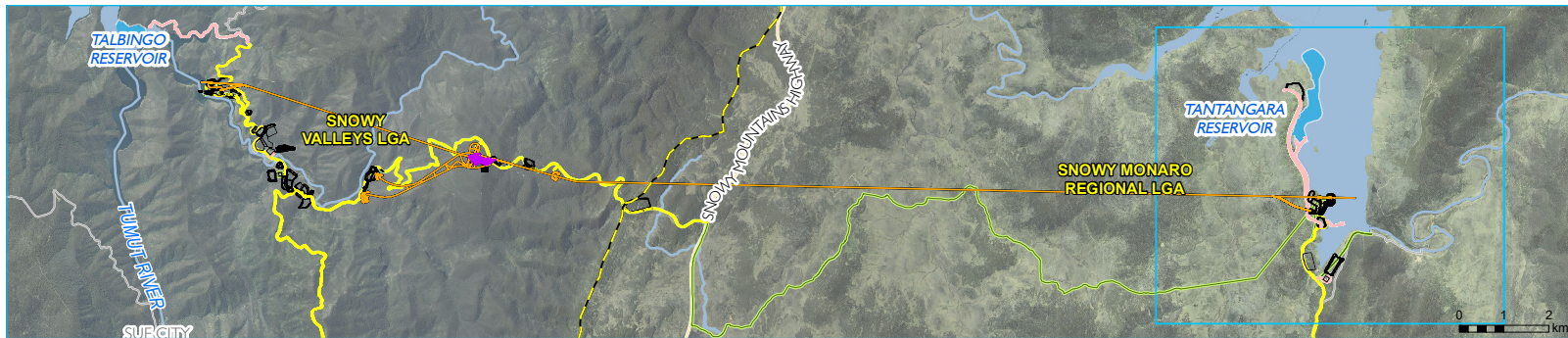


Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

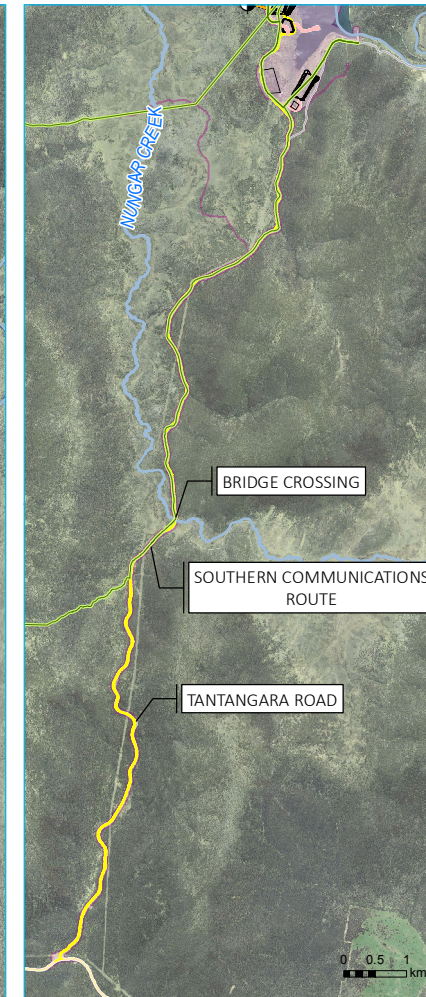
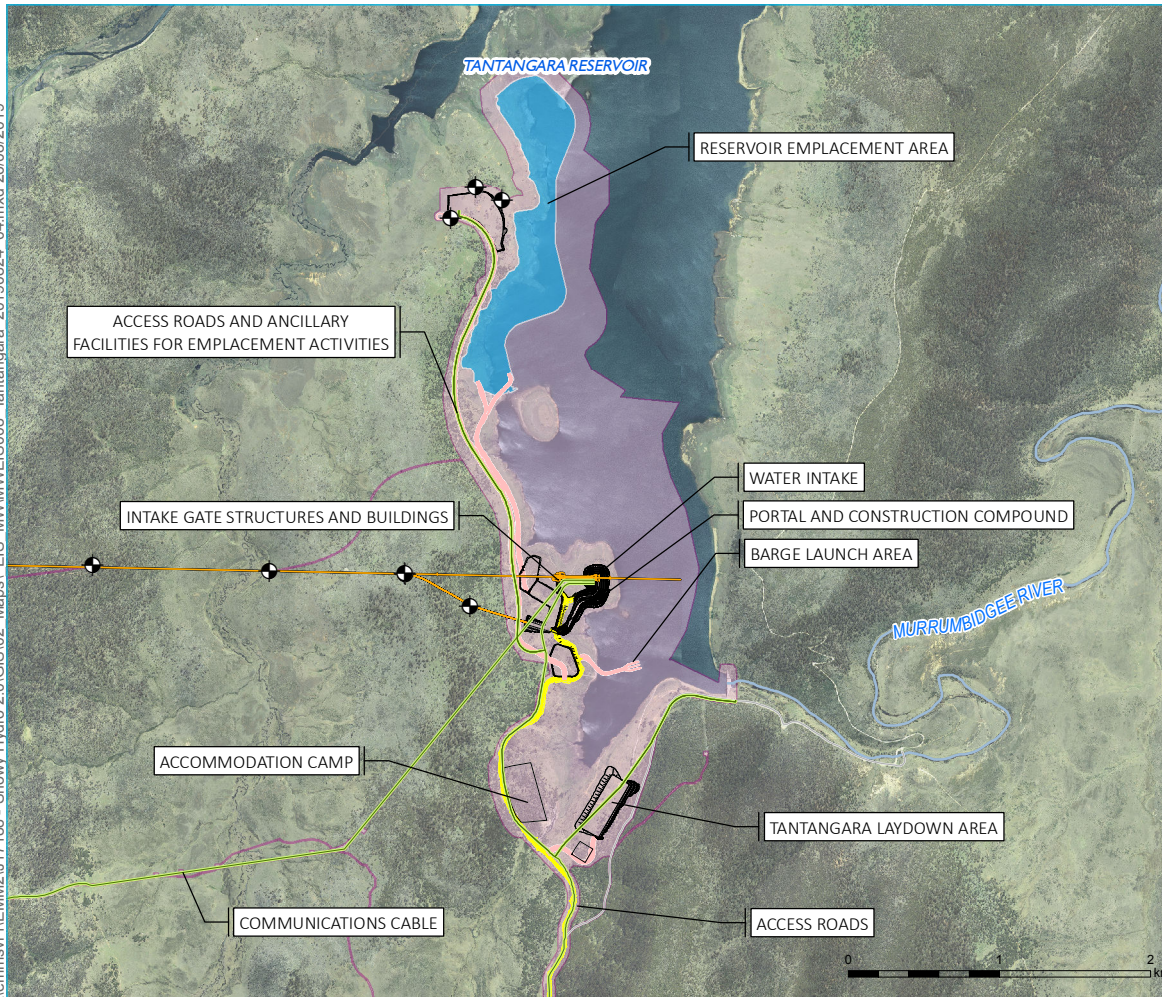
## Plateau - project elements, purpose and description

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 7





- KEY**
- Existing environment
  - Main road
  - Local road
  - Watercourse
  - Waterbodies
  - Local government area boundary
  - Snowy 2.0 Main Works operational elements
  - Tunnels, portals, intakes, shafts
  - Power station
  - Utilities
  - Permanent road
  - Snowy 2.0 Main Works construction elements
  - Temporary construction compounds and surface works
  - Temporary access road
  - Geotechnical investigation
  - Indicative rock emplacement area
  - Disturbance area\*



Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

## Tantangara Reservoir - project elements, purpose and description

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 8



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Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)

GDA 1994 MGA Zone 55



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Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)



## KEY

Existing environment

Main road

Local road

Watercourse

Snowy 2.0 operational elements

Tunnels, portals, intakes, shafts

Utilities

Permanent road

Snowy 2.0 construction elements

Temporary construction compounds and surface works

Temporary access road

Geotechnical investigation

Disturbance area\*

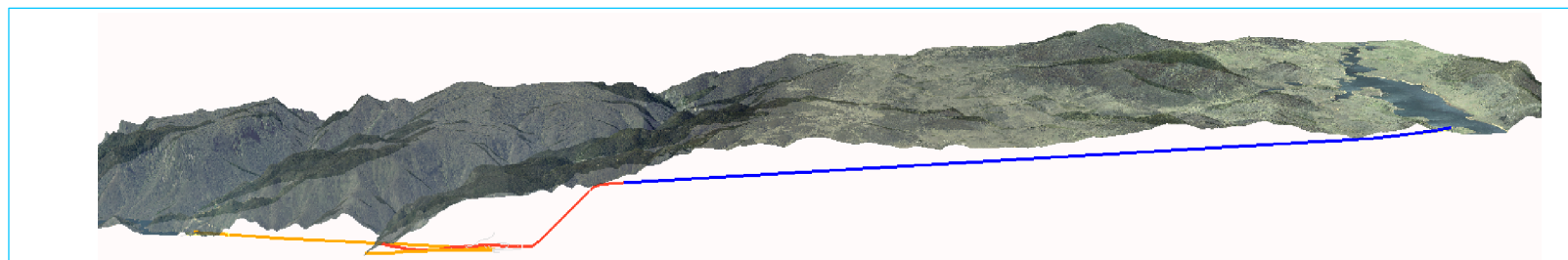
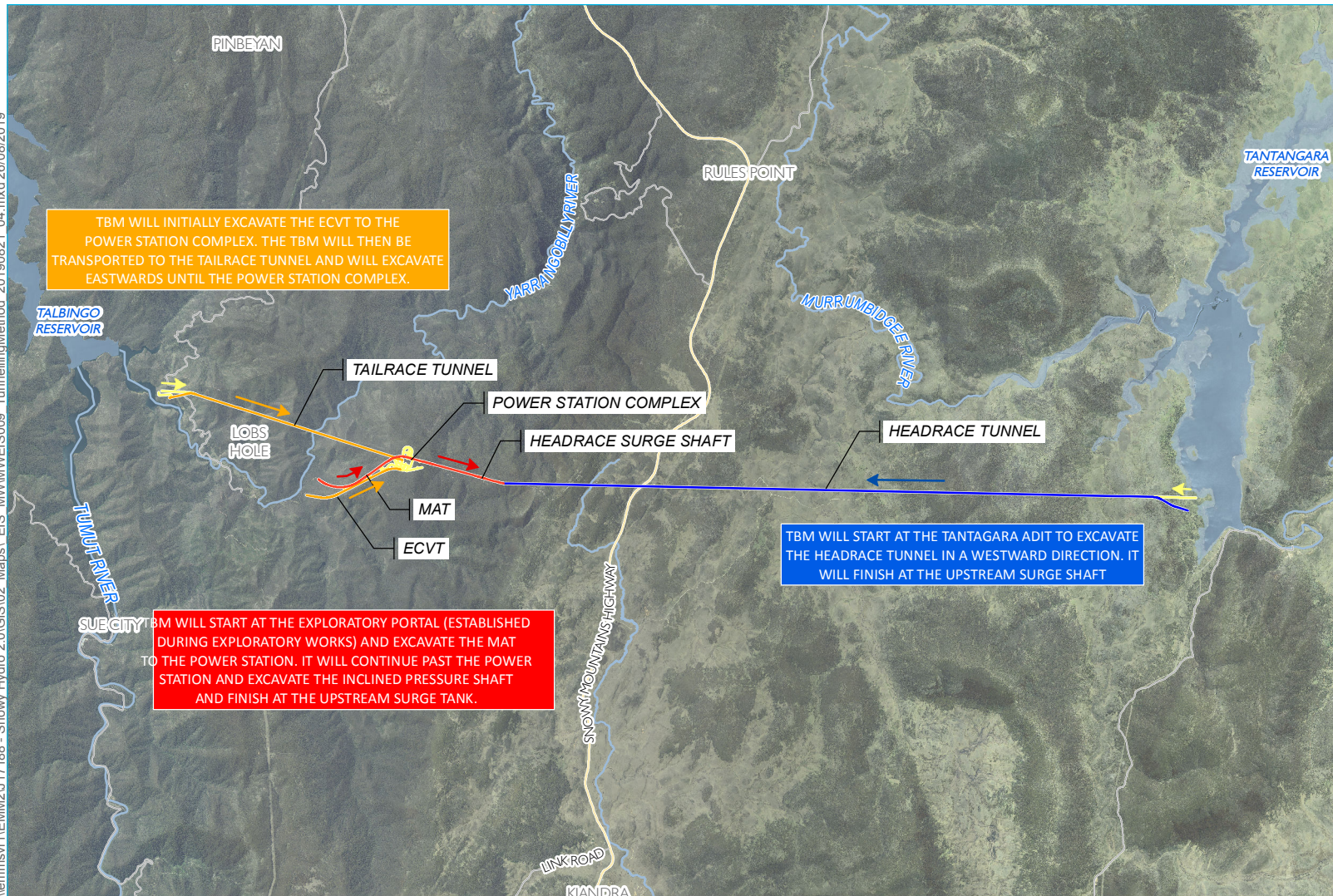
Note: the disturbance area is the extent of construction works required to build Snowy 2.0. It has been identified to allow an assessment of impacts for the EIS, and represents a defined maximum extent where construction works will be carried out. The area will be minimised as much as possible during detailed design.

## Rock Forest - project elements, purpose and description

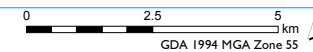
Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 9



\\emmsvr1\EMM2\J17188 - Snowy Hydro 2.0\GIS\02 Maps\ EIS M\MMWEIS009 TunnelingMethod 20190821 04.mxd 26/08/2019



Source: EMM (2019); Snowy Hydro (2019); DFSI (2017); LPMA (2011)



Primary excavation methods – drill and blast and tunnel boring machine

Snowy 2.0  
Rehabilitation strategy  
Main Works  
Figure 10



## 2.3 Operation of Snowy 2.0

### 2.3.1 Scheme operation and reservoir management

Snowy 2.0 would operate within the northern Snowy-Tumut Development, connecting the existing Tantangara and Talbingo reservoirs.

Tantangara Reservoir currently has the following operational functions within the Snowy Scheme:

- collects releases from the Murrumbidgee River and the Goodradigbee River Aqueduct,
- provides a means for storage and diversion of water to Lake Eucumbene via the Murrumbidgee-Eucumbene Tunnel, and
- provides environmental releases through the Tantangara Reservoir river outlet gates to the Murrumbidgee River.

Talbingo Reservoir currently has the following operational functions:

- collects releases from Tumut 2 power station,
- collects releases from the Yarrangobilly and Tumut rivers,
- acts as head storage for water pumped up from Jounama Pondage, and
- acts as head storage for generation at Tumut 3 power station.

Due to its historic relationship to both the upstream Tumut 2 power station and downstream Tumut 3 power station, Talbingo Reservoir has had more operational functions than Tantangara Reservoir in the current Snowy Scheme.

Following the commencement of the operation of Snowy 2.0, both Tantangara and Talbingo reservoirs will have increased operational functions. Tantangara Reservoir will have the additional operational functions of acting as a head storage for generation from the Snowy 2.0 power station and also acting as a storage for water pumped up from Talbingo Reservoir. Talbingo Reservoir will have the additional operational function of acting as a tail storage from Snowy 2.0 generation.

As a result of the operation of Snowy 2.0, the water level in Tantangara Reservoir will be more variable than historically. Notwithstanding this, operations will not affect release obligations under the Snowy Water Licence nor will it involve any change to the currently imposed Full Supply Levels (FSLs). No additional land will be affected by virtue of the inundation of the reservoirs through Snowy 2.0 operations. Water storages will continue to be held wholly within the footprint of the existing FSLs.

### 2.3.2 Permanent access

Permanent access to Snowy 2.0 infrastructure is required. During operation, a number of service roads established during construction will be used to access surface infrastructure including the power station's ventilation shaft, water intake structures and gates, and the headrace tunnel surge shaft. Permanent access tunnels (the MAT and ECVT) will be used to enter and exit the power station. For some roads, permanent access by Snowy Hydro will require restricted public access arrangements.

### 2.3.3 Maintenance requirements

Maintenance activities required for Snowy 2.0 will be integrated with the maintenance of the existing Snowy Scheme. Maintenance activities that will be required include:

- maintenance of equipment and systems within the power station complex, intake structures, gates and control buildings;
- maintenance of access roads (vegetation clearing, pavement works, snow clearing);
- dewatering of the tailrace and headrace tunnel (estimated at once every 15 to 50 years, or as required); and
- maintenance of electricity infrastructure (cables, cable yard, cable tunnel).

## 3 Final Land Use

### 3.1 Proposed Final Land Use

It is proposed that all areas not retained for permanent infrastructure will be revegetated and rehabilitated. At Lobs Hole, final landform design and planning has been undertaken to identify opportunities for the reuse of excavated material in rehabilitation to provide landforms which complement the surrounding topography in the KNP.

Given that most of Snowy 2.0 Main Works is within the boundaries of the KNP, Snowy Hydro will liaise closely with NPWS to determine the extent of decommissioning of temporary construction facilities and rehabilitation activities to be undertaken following the construction of Snowy 2.0 Main Works.

Most disturbed areas, not retained by Main Works will be returned to land uses generally consistent with their pre-disturbance use, subject to ongoing consultation with NPWS.

The following surface infrastructure areas will be required and retained for the operation of Snowy 2.0:

- Water intake structures and gate houses at the Tantangara and Talbingo reservoirs;
- Permanent access tunnel portals and associated infrastructure including:
  - Main access tunnel (MAT);
  - Emergency Cable and Ventilation Tunnel (ECVT) portal;
- Ventilation shaft and head race tunnel surge shaft at Marica area
- Permanent access roads;
- Tantangara and Talbingo barge launch areas;
- Transmission cableyard at the ECVT portal; and
- Lobs Hole Substation.

Following Main Works, the Talbingo and Tantangara Reservoirs will continue to be used for boating and fishing, however safety exclusion zones will be put in place in the vicinity of the intakes. The extent of safety exclusion zones is unknown at this stage and will be determined during the detailed design. Remote camping areas will be retained in the Lobs Hole and Tantangara areas for recreational use. These areas will either be retained or they will be recreated during rehabilitation if they are disturbed during construction activities.

Following the construction of Snowy 2.0, temporary construction pads, accommodation camps, rock emplacements and some access roads, will be rehabilitated to land uses generally consistent with their pre-construction use, subject to ongoing consultation with NPWS.

Two areas in Lobs Hole will be landformed mounds. All other temporary construction pad areas will be rehabilitated to native vegetation or an agreed recreational user camping area as agreed with NPWS. Detailed design will follow the principles and concepts in this strategy to achieve stable non-polluting landforms and recreational areas consistent with the final land use domains.

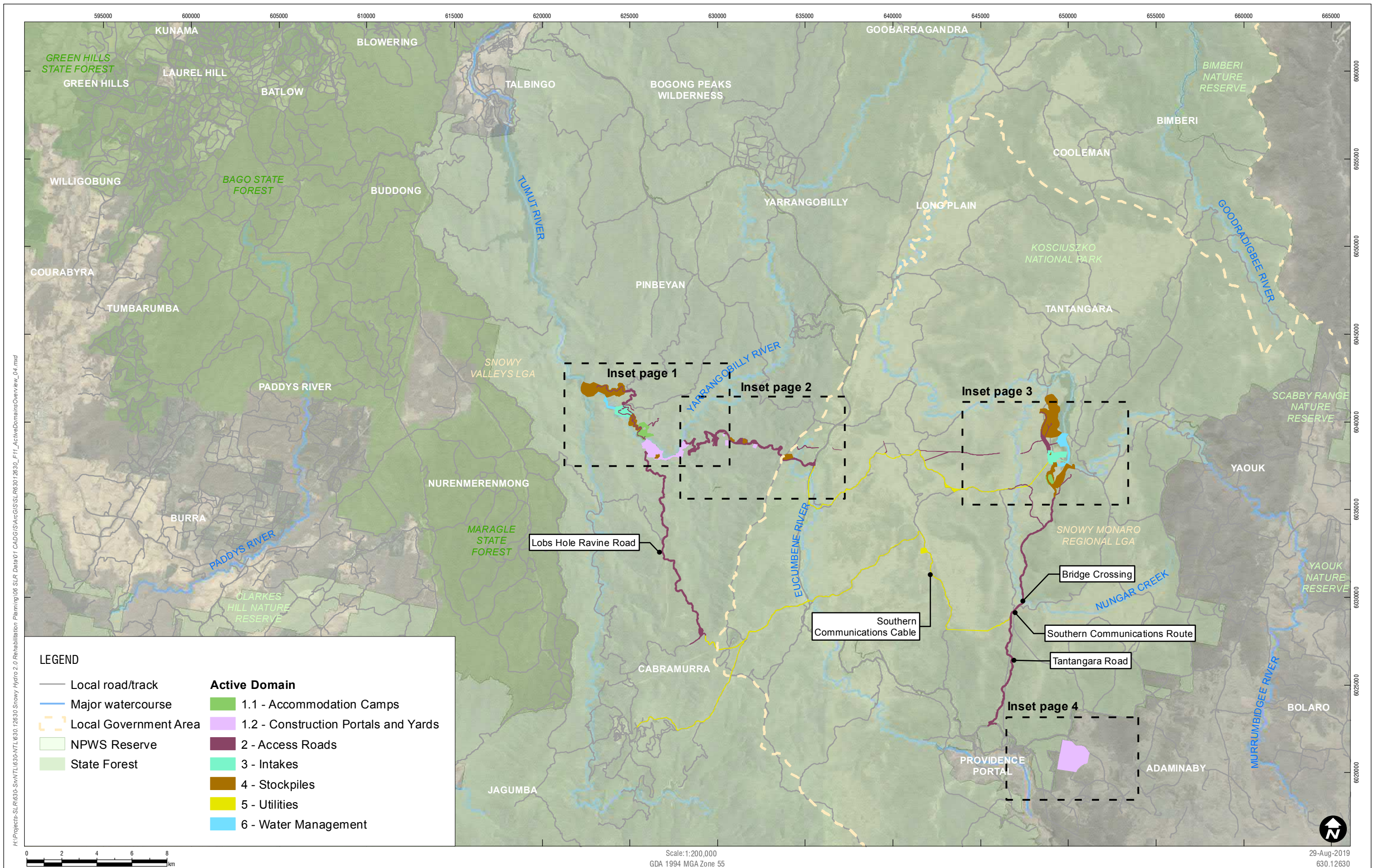
The overall aim of rehabilitation works undertaken will be to leave a legacy that enables the Project to co-exist within KNP and maintain its values.

## 3.2 Active Domains

Active domains identify the footprint of areas disturbed for project related activities. For the purpose of this Rehabilitation Strategy, active domains have been defined as the set of discrete areas that have a particular operational or functional purpose, therefore having similar geophysical and geochemical characteristics that will have similar rehabilitation requirements. Indicative active domains have been determined based on the EIS project disturbance area and project design. The indicative footprint of each active domain is shown on **Figure 11** and described in **Table 4**.

**Table 4 Active Domains**

Code	Active Domain	Description
1	Infrastructure	Infrastructure will be split into sub-domains 1.1 and 1.2 as follows:
1.1	Accommodation Camps	This domain will include the accommodation camps at Lobs Hole and Tantangara. Accommodation camps will provide accommodation and supporting services for the construction workforce.
1.2	Construction Portals and pads	This will include the construction pads on which construction facilities will be placed. Construction pads will typically be in the vicinity of construction portals where tunnelling is taking place.
2	Access Roads	This will include all access roads associated with the project. The number of utilised and upgraded access roads will increase as the project progresses. Stabilisation of disturbance associated with access roads will occur as soon as possible following disturbance.
3	Intakes	This domain will include the proposed permanent intake structures situated on the banks of the reservoirs. The following intake structures are proposed: <ul style="list-style-type: none"> <li>- Talbingo intake and gatehouse; and</li> <li>- Tantangara intake and gatehouse.</li> </ul>
4	Stockpiles	This domain includes the on land emplacement areas (stockpiles) utilised for excavated material management.
5	Utilities	This domain will include disturbance corridors associated with the installation of the supporting utilities to service the project. This will include: <ul style="list-style-type: none"> <li>- Power;</li> <li>- Water;</li> <li>- Sewage and process water treatment facilities; and</li> <li>- Communications.</li> </ul> It is noted that a number of utilities will be installed within existing access road corridors; in this case these areas are included in Domain 2.
6	Water Management	This domain will include the disturbance areas for the Talbingo and Middle Bay barge ramps and associated Middle Bay navigation channel. Works in these areas will include the construction of barge infrastructure and dredging to establish the navigation channel.



### 3.3 Final Land Use Domains

Final land use domains are defined as land management units characterised by similar final land use objectives. Each final land use domain will require specific decommissioning and rehabilitation methods. The conceptual final land use domains for Snowy 2.0 are presented in **Table 5** and shown on **Figure 12**.

**Table 5 Final Land Use Domains**

Code	Final Land Use Domain	Description
A	Retained Infrastructure	The following infrastructure areas will be retained as a final land use: <ul style="list-style-type: none"> <li>- Water intake structures and gate houses at the Tantangara and Talbingo reservoirs;</li> <li>- Permanent access tunnel portals and associated infrastructure;</li> <li>- Ventilation shaft and HRT surge shaft pads;</li> <li>- Transmission cableyard; and</li> <li>- Lobs Hole substation.</li> </ul>
B	Roads	Some new access roads or those which are upgraded, widened and sealed will be retained with agreement from NPWS. Most retained roads will remain open to the public post construction and will enable access to locations previously only accessible by four-wheel drive; however some will be utilised exclusively by Snowy Hydro for access to operational areas.
C	Recreation Sites	It is intended that Lobs Hole and Tantangara areas will be retained as remote campsites. During detailed design a masterplan will be developed for recreational areas in consultation with NPWS.
D	Native Vegetation	Areas in this final land use domain will be revegetated and returned to a native vegetation final land use. The species used for each area will be commensurate with that present prior to disturbance as per the Plant Community Type (PCT) mapped for the area. Areas to be rehabilitated to native vegetation will include rehabilitated access roads.
E	Water Management	The Talbingo and Tantangara dams will remain as water storages that may permit fishing and boating. Appropriate safety exclusion zones will be put in place in the vicinity of the intake structures.

### 3.4 Final Landform Design

Final landform design and planning has been undertaken to identify opportunities for the reuse of excavated material in rehabilitation and in the construction of final landforms which complement the surrounding topography in the KNP. In consultation with NPWS, it is proposed that the final landform will be constructed from excavated material to create a safe and stable landform, commensurate with the surrounding topography of the area.

Reuse of the excavated material in the final landform will be subject to geochemical testing to confirm it is suitable to remain in situ. Any unsuitable materials will be remediated and removed from the areas to be rehabilitated.

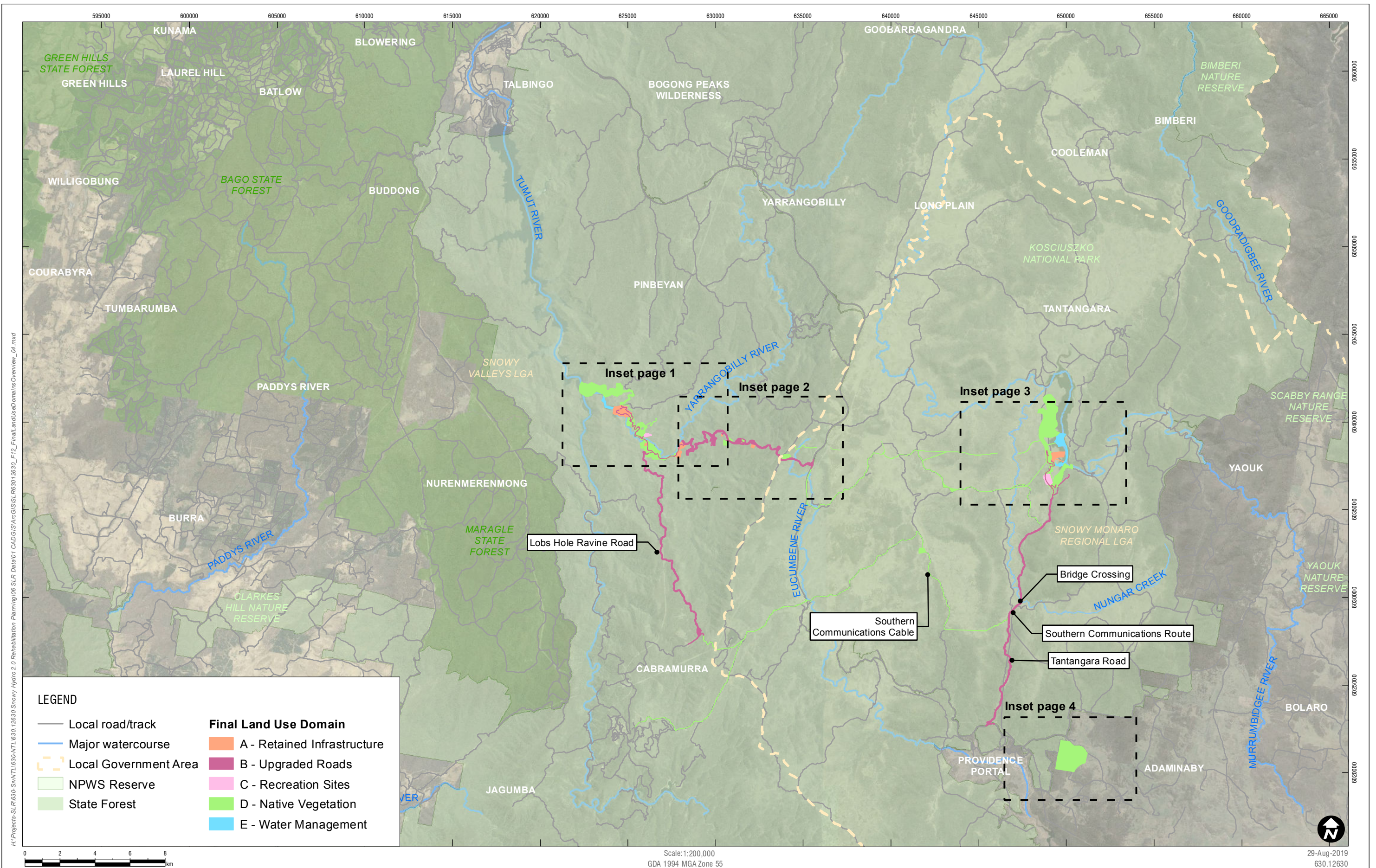
The indicative final landform design and cross sections following completion of all construction activities associated with Snowy 2.0 is presented in **Appendix A**. Artists' impressions of the Final Landform Visual Design are presented in **Appendix B** and **Appendix C** for Talbingo and Tantangara, respectively. The final landform design will be optimised during detailed design stage.

### 3.5 Stakeholder Consultation

Snowy Hydro has developed a stakeholder engagement strategy which will be applicable to all phases of Snowy 2.0. During the preparation of the EIS, Snowy Hydro consulted with government agencies, industry and environmental groups, business and the community. Snowy Hydro has also been working closely with the NPWS to ensure the long term management objectives for KNP are considered in the project development.

Consultation during the execution of Main Works will continue to be undertaken by Snowy Hydro in accordance with the stakeholder engagement strategy.

A Rehabilitation Management Plan for Main Works will be prepared during detailed design in consultation with any relevant government agencies or stakeholders as required by the final conditions of consent following approval. The Rehabilitation Strategy provides the overarching standard for decision making in terms of rehabilitated landscape and complements the post approval Rehabilitation Management Plan which provides further specific details for implementation, management and monitoring of all aspects rehabilitation and decommissioning.



## 4 Rehabilitation Planning

### 4.1 Rehabilitation Objectives

The primary rehabilitation objective for Snowy 2.0 is to provide a landform that is safe, hydraulically and geotechnically stable and non-polluting. The final landform will be designed and constructed to be similar to the pre-development landform and topography and commensurate with the surrounding ecosystems.

In consideration of the proposed final land use, Snowy Hydro have established key rehabilitation principles to restore the park following impacts of the Project and potential changes to parts of the park's character and habitats. Rehabilitation objectives for the project include:

- Preserve the KNP's natural assets and values;
- Agree on future land use and consider long-term site management;
- Establish processes prior to construction works to enable organic matter to be used in revegetation and ongoing rehabilitation during the construction works phase;
- Establish appropriate treatments for minimisation of runoff into waterways;
- Protect existing native fauna and their habitats including the Smoky Mouse and Booroolong Frog, critically endangered under Commonwealth legislation, respectively;
- Where reasonable and feasible, rehabilitate disturbed areas to their pre-existing or improved state at completion of construction activity in consultation with NPWS; and
- Minimise visual impact of construction works from significant public viewpoints.

### 4.2 Rehabilitation Phases

The ultimate rehabilitation objective for Project is to create safe, stable and sustainable landforms and allow the achievement of the agreed final land uses. This will be achieved by demonstrating completion of a series of conceptual phases of rehabilitation which are described in **Table 6**.

**Table 6 Rehabilitation Phases**

Phase	Description
1	<b>Active</b> – activities undertaken during (or prior to) construction and operations to enhance rehabilitation, such as salvaging and managing soil resources, salvaging habitat resources and native seed collection. Temporary stabilisation of batters and construction of appropriate erosion and sediment control devices.
2	<b>Decommissioning</b> – removal of all temporary construction and accommodation infrastructure, hardstands, plant, equipment, buildings and other structures and all contaminated and hazardous materials. Removal of temporary stockpiles.
3	<b>Landform Establishment</b> – the process of forming the final landform. This phase includes all earthworks required to construct the final landform into the desired surface profile. It includes the construction of permanent surface water management/drainage structures.
4	<b>Growth Medium Development</b> - establishing and enhancing the physical structure, chemical properties and biological properties of growth media suitable for the desired vegetation community. This includes placing and spreading soil and applying ameliorants.

Phase	Description
5	<b>Ecosystem and Land Use Establishment</b> – this phase includes the process of establishing the final land use following the construction of the final landform. For vegetated areas this will consist of seeding, planting and transplanting plant species. It incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities and habitat augmentation.
6	<b>Ecosystem and Land Use Development</b> - applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post construction land use outcome. Incorporates features such as species reproduction, nutrient recycling and community structure.
7	<b>Rehabilitation Completion</b> - completion criteria for rehabilitation are met and the land is determined to be suitable for the intended final land use and the rehabilitated areas can be returned to NPWS.

### 4.3 Completion Criteria

Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.) which can be measured against to demonstrate progress and the ultimate success of rehabilitation. As such, they provide a defined end point at which time rehabilitation can be deemed successful.

Detailed completion criteria, performance measures and associated indicators will be developed for the project in accordance with the relevant project approvals. These criteria will be developed for each phase of the rehabilitation so that the rehabilitation success can be quantitatively tracked throughout the life of the project.

The performance measures and associated indicators will be designed to provide an appropriate benchmark or guide against which to assess the management of project lands and the resulting improvements.

Indicative completion criteria and responsibilities are presented in **Table 7**.

**Table 7 Indicative Completion Criteria**

Objective	Performance Indicator	Completion Criteria
<b>Phase 1 - Active</b>		
Minimise risk of injury to people and animals	Risk assessment completed and actioned	Appropriate security measures implemented (where required) prior to commencing works.
Minimise the impact of vegetation clearance activities on flora and fauna	Preclearance records	Appropriate measures have been implemented (where required) to minimise the impact on flora and fauna
Erosion will be managed	Site records and reports	Erosion and sediment control structures have been progressively installed and maintained during disturbance.
Topsoils will be appropriately stripped and managed	Topsoil inventory	Topsoil has been stripped and stockpiled in accordance with requirements.
Seeds, sods or cuttings have been collected from appropriate PCTs for use in final rehabilitation	Site records and reports	Appropriate seeds, sods or cuttings have been collected from appropriate PCTs for use in final rehabilitation and established in a site nursery as required.
<b>Phase 2 - Decommissioning</b>		
Infrastructure is removed to ensure the site is safe	Site records and reports	All surface infrastructure that is not required for the final land use dismantled and removed from the site.

Objective	Performance Indicator	Completion Criteria
and free of hazardous materials	Demolition records	All demolition work carried out in accordance with <u>AS2601-2001: The Demolition of Structures</u> or its latest version.
Disconnection of redundant Services	Site records and reports	All services, including power, water, data and telephone, that are not required for final land use have been safely isolated, disconnected and terminated.
Contaminated areas are identified and remediated, removed or otherwise managed	Certificates of testing, disposal and/or validation testing	Contaminated soils presenting constraints to final land use have been identified and remediated or removed from the areas to be rehabilitated or appropriately managed (in accordance with legislation).
All surface entries and tunnels have been closed and sealed	Engineered design and final construction reports, Concreting records	All surface entries and tunnels not required for operational access have been closed and sealed to prevent public access.
All Potential Acid Forming (PAF) materials are identified and remediated, removed or otherwise managed	Geochemical test results and/or remediation and verification, rehabilitation, or disposal records	PAF material tested to confirm it is suitable to remain in situ and any hostile materials remediated, removed from the areas to be rehabilitated, or appropriately managed. Subject to a positive result the material may be disposed of sub aqueously.
<b>Phase 3 – Landform Establishment</b>		
Landform is safe, stable and non-polluting	Detailed design / visual inspection / assessment records	Landform survey verifies constructed landform safe and stable and is generally in accordance with the approved landform detailed design.
	Detailed design / visual inspection / assessment records	Rehabilitated slopes are free draining with appropriate drainage in place so that water will not undermine the structure in the long term.
	Rehabilitation records	Final landform drainage structures including drains, banks, drop structures and dams constructed in accordance with best practice erosion and sediment control requirements (as per the Blue Book), where required.
<b>Phase 4 – Growth Medium Development</b>		
Growing media appropriate for the intended final land use is reinstated at all rehabilitation areas.	Rehabilitation records	Topsoil or suitable alternative is spread uniformly in designated areas at the specified depth appropriate to the final land use.
	Rehabilitation records	Areas of benign excavated material utilised for targeted native vegetation establishment have leaf litter accumulated.
Growth media characterised and ameliorated for final land use as required	Rehabilitation records	Soil ameliorants (e.g. gypsum, mulch, biosolids, composts) are applied where necessary at the recommended application rate based on soil analysis.
<b>Phase 5 – Ecosystem and Land Use Establishment</b>		
Ground cover comparable to reference vegetation communities.	Planting records	Rehabilitation plantings have been planted at the agreed density (plants/ha) to provide sufficient ground coverage once established.
Community structure/species composition	Planting records	A mixture of native trees, shrubs and grasses generally commensurate with that in the appropriate PCT(s) has been planted in accordance with specifications.

Objective	Performance Indicator	Completion Criteria
Erosion does not present a safety hazard or compromise the post construction land capability.	Rehabilitation monitoring records	No active erosion features (greater than 500 mm depth) that compromise land capability or the final post construction land use.
Weeds and feral animals do not present a risk to rehabilitation	Weed presence in rehabilitation monitoring and site inspection records	No significant weed infestations, and noxious or other weeds do not comprise a significant proportion of the species in any stratum resulting in a risk to rehabilitation area establishment
	Planting records	Plantings have been installed with appropriate vegetation protection implemented.
<b>Phase 6 – Ecosystem and Land Use Development</b>		
Rehabilitation areas are healthy, sustainable and comparable with surrounding vegetation community	Rehabilitation monitoring – vegetation health	Ground cover (vegetation, leaf litter, mulch) is at least 70% and healthy (health assessed to be similar to analogue/reference sites).
	Rehabilitation monitoring – community composition	Community composition within each stratum (canopy, mid storey and ground cover) provides for a range of structural features (e.g. trees, shrubs, ground cover, developing litter layer etc.).
	Rehabilitation monitoring – regeneration	Second generation seedlings are present or likely to be, based on monitoring of comparable older rehabilitation sites and trends in recent rehabilitation.
	Rehabilitation monitoring – shade and canopy cover	Shade and canopy closure is occurring at least in part of a rehabilitation site.
Species diversity (fauna)	Rehabilitation monitoring reports	There is evidence of invertebrate use and activity such as ants, saw fly, wasps etc.
Erosion does not present a safety hazard or compromise the landform.	Rehabilitation monitoring records	No significant and active erosion that compromises the landform or proposed final land use.
Weeds and feral animals do not present a risk to rehabilitation	Weed presence in rehabilitation monitoring and site inspection records	No significant weed infestations, and noxious or other weeds do not comprise a significant proportion of the species in any stratum resulting in a risk to rehabilitation area establishment
	Land management and rehabilitation monitoring records	Pest animal presence does not pose a risk to the sustainability of rehabilitation areas.
<b>Phase 7 – Rehabilitation Completion</b>		
Rehabilitation areas are capable of supporting and maintaining the designated final land use	Authority / landowner signoff	All relevant completion criteria for the land proposed for handover are acknowledged to be met by NPWS.

## 5 Rehabilitation Implementation

### 5.1 Rehabilitation Phases and General Methodologies

#### 5.1.1 Phase 1 - Active

A number of activities will be undertaken during or prior to construction works associated with the project to enhance rehabilitation outcomes. Activities undertaken in this regard are summarised below for context.

##### 5.1.1.1 Site Preparation and Establishment

All temporary construction pads and accommodation camps will be temporary and will be decommissioned and rehabilitated at the completion of construction. As such, these areas will be planned, established and managed with consideration to the final decommissioning and rehabilitation of the site. Key activities which will be considered in this regard are as follows:

- collection and storage of indigenous/native seed and alpine sods for propagation in accordance with a seed collection and propagation program (to be developed);
- commissioning suitable local indigenous/native plant nurseries to establish tubestock for revegetation;
- reviewing detailed design and construction methodologies to minimise clearing then conducting pre-clearance surveys to minimise the impact of vegetation clearance activities on flora and fauna;
- minimising access to, and disturbance of, watercourses and aquatic habitats by construction plant;
- establishing stockpiles and construction material compounds in locations where they will not impact watercourses;
- progressively installing appropriate best practice erosion and sediment control devices. Erosion and sediment control devices should be designed and installed in accordance with the specifications contained in *Managing Urban Stormwater – Soils and Construction, Volume 1, 4<sup>th</sup> edition* (Landcom, 2004), *Volume 2A Installation of Services* (DECC, 2008a) and *Volume 2C Unsealed Roads* (DECC, 2008b) or equivalent.
- collecting and stockpiling organic matter from construction cuts and clearances, including topsoil, woodchip and mulch for use in rehabilitation;
- installing appropriate hazardous materials controls prior to any hazardous materials being brought to the site to minimise the risk of contamination during the project. This may include temporary bunding, sealed and banded storage facilities and spill kits; and
- implementing appropriate waste management protocols to ensure that construction materials are removed from the site once they are no longer required.

##### 5.1.1.2 Vegetation Removal and Topsoil Stripping

Stripping and stockpiling of topsoil and mulching vegetation will allow the reconstruction of growth media and will be a key rehabilitation management measure.

## Vegetation Removal

Native trees and other features (e.g. trunks, logs, large rocks, branches, small stumps and roots) will be salvaged during vegetation clearance activities and stockpiled for relocation to areas undergoing rehabilitation. These features may be used to assist with erosion and sediment control measures and will potentially provide habitat resources for a range of invertebrate and ground dwelling fauna.

Other native trees removed during vegetation clearance activities will be mulched and stockpiled for use during landscape planting. The ground-layer vegetation and low shrubs can be incorporated into the topsoil when it is stripped. This will enhance the soil seed bank on the rehabilitation.

## Topsoil Stripping and Handling

The following management and mitigation strategies are recommended to reduce the potential for soil degradation:

- Strip soil to a specified depth, subject to field investigations;
- Soil should preferably be stripped in a slightly moist condition. Material should not be stripped in either an excessively dry or wet condition;
- Wherever practicable, stripped material should be placed directly onto areas to be rehabilitated and spread immediately (if construction sequences and weather conditions permit) to avoid the requirement for stockpiling (for example during utilities installation);
- The surface of topsoil stockpiles should be left in as coarsely structured a condition as possible in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming;
- Topsoil should be stockpiled to a maximum height of 2.5m;
- Topsoil stockpiles should be located away from drainage channels and watercourses and arranged to minimise damage to native vegetation;
- Where long-term stockpiling is planned (i.e. greater than 12 months), seed and fertilise stockpiles as soon as possible. An annual cover crop species that produce sterile florets or seeds should be sown (or hydromulched/hydroseeded). The sterile pasture species will not persist in the rehabilitation areas but will provide sufficient competition for emerging weed species and enhance the desirable micro-organism activity in the soil; and
- An inventory of available soil will be maintained to identify if adequate topsoil materials are available for planned rehabilitation activities.

### 5.1.1.3 Stabilisation

Areas disturbed as part of the project will be temporarily stabilised and vegetated within a short time period of construction works to minimise dust generation, soil erosion and weed incursion until the area can be permanently rehabilitated. These works will include:

- Stabilisation of slopes and preparation of sites for revegetation including placement of organic matter and jute matting if required;
- Mitigation of sediment runoff from rock emplacement areas, soil/mulch stockpiles and construction works including planting within swales and use of coir logs for sediment traps;

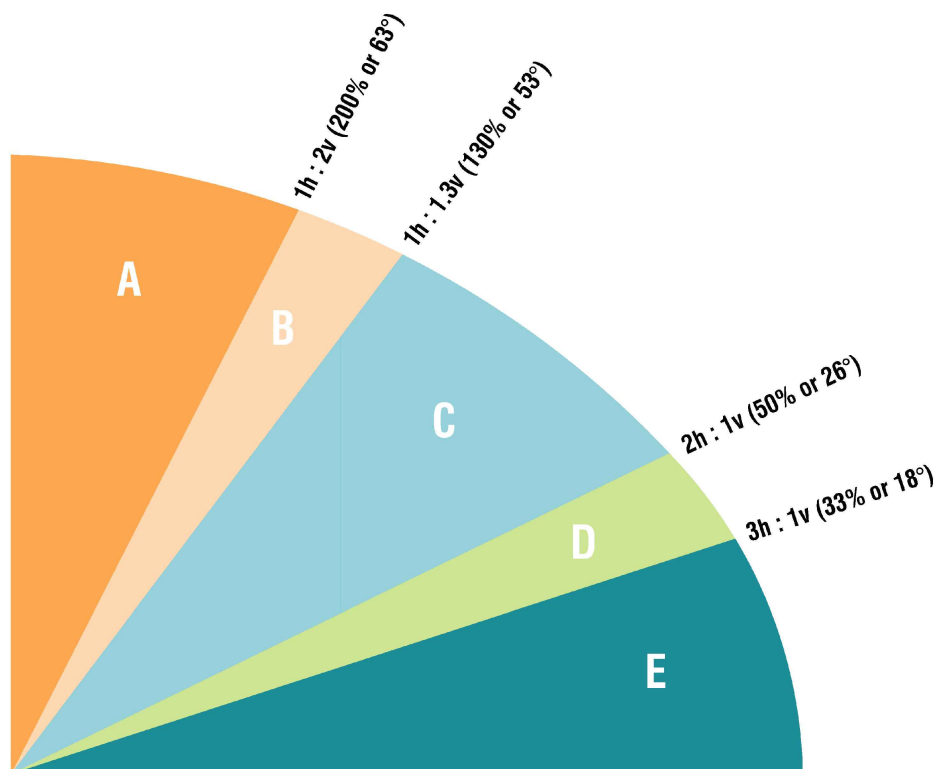
- Hydroseeding/hydromulching of slopes to assist stabilisation;
- Planting of higher risk slopes (ie steeper slopes) during appropriate planting seasons for plant survival; and
- Erosion and sediment control structures will remain in place and be maintained until the new vegetation is established and provides sufficient ground cover.

Required temporary stabilisation and permanent revegetation methodology will be determined based on the decision making tool presented in **Figure 13**. Batter Types A to E in **Figure 13** are categorised according to slope gradient. The accompanying table in **Figure 13** provides temporary and permanent revegetation options for each Batter Type.

Temporary stabilisation will be undertaken within the indicative timeframes specified in **Table 8**.

**Table 8 Temporary stabilisation timing**

Batter Slope and Condition	Indicative / recommended timing of revegetation of exposed earthworks
Vegetation of slopes flatter than 5H:1V (Type B to E)	14 days of construction
Vegetation of slopes steeper than or equal to 5H:1V (Type A) and over 1 Ha. in area	7 days of construction
Open drains/swales	7 days of construction
Note - All temporary erosion control measures must remain secured in place until the vegetation has established.	



**BATTER TYPE**

Snowy 2.0 Revegetation Decision Making Tool			
Batter Type	Temporary Revegetation Options *	Permanent Revegetation	Permanent Revegetation Description
A	N/A	Structural reinforcement	Reinforcement measures may include terramesh, gabion walls, shotcreting, rock bolting and soil nails
B	N/A	Geo mesh and grassing	Geo mat is required to provide rock dowels to retain soil containing grass seed
C	<ul style="list-style-type: none"> <li>Soil binder</li> </ul>	Jute mesh + planting & hydromulching	Jute mesh is required to hold soil while vegetation is established
D	<ul style="list-style-type: none"> <li>Soil binder</li> <li>Hydromulching</li> </ul>	Planting & hydromulching	Tubestock planting density (1 plant / 2m <sup>2</sup> ) with hydromulch applied to the remainder of the area
E	<ul style="list-style-type: none"> <li>Direct seeding</li> <li>Mulched timber</li> <li>Soil binder</li> <li>Hydroseeding</li> <li>Hydromulching</li> <li>Straw mulching</li> </ul>	Planting & hydromulching Direct seeding	Tubestock planting density (1 plant / 2m <sup>2</sup> ) with hydromulch applied to the remainder of the area
*temporary revegetation method depends on temporal span and / or proximity to sensitive receptors			

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#### 5.1.1.4 Excavated Material Management

##### Reuse and disposal of extracted rock

It is estimated that approximately 9,000,000 m<sup>3</sup> banked volume (between 12,900,000 m<sup>3</sup> and 14,600,000 m<sup>3</sup> bulked volume) of rock and soil will be excavated associated with the construction of the tunnel excavations, power station complex caverns and intakes. Excavated rock will be systematically tested and a determination made as to its suitability for:

- re-use as a construction material for the project as aggregate, manufactured sand or pad construction;
- placement within Tantangara and Talbingo reservoirs;
- re-use as construction material for the project as aggregate, manufactured sand or pad construction; and
- use for the construction of the agreed final landform within the KNP.

Until the suitability of its use is determined, extracted material may need to be temporarily stored on land within KNP. The location for temporary storage of excavated rock within KNP will be determined and agreed in consultation with NPWS. Similarly, any reuse options identified by NPWS will be determined through consultation.

##### Placement within Reservoirs

Placement of excavated material is proposed for locations within Talbingo and Tantangara reservoirs. Details of the locations and methods are still being developed by the construction contractor as part of the design process.

At this stage it is proposed that representative samples of extracted material will be tested following excavation, primarily for its geochemical and leachability properties. Any rock assessed as unsuitable for placement within the reservoirs will instead be reused or stockpiled, or potentially removed from the project area if suitable disposal locations are identified.

Suitable material will be transported to the placement areas to be progressively filled from the shore to the reservoir, up to 1 m above full supply level (FSL) and rehabilitated above both materials stockpiles.

The shore-based placement method aims to improve efficiency of placement, minimise barging activities on both reservoirs and improves the ability to manage impacts at Tantangara by placing material above the water level (ie placing in the dry). Placement areas and methods for Talbingo and Tantangara reservoirs are subject to ongoing investigations to ensure minimal environmental impacts, and subject to ongoing consultation with relevant stakeholders and government agencies.

#### 5.1.2 Phase 2 - Decommissioning

At the completion of the construction of Snowy 2.0, all surface infrastructure not required for the final land use will be decommissioned and removed. In general, decommissioning and demolition activities will involve the following key activities:

- Disconnecting and terminating services including power and water;
- Removal of all accommodation facilities;

- Removal of all construction infrastructure;
- Removal of road surface gravel from any temporary access roads not to be retained;
- Identifying and removing (or remediating in situ) all hazardous and contaminated materials;
- Identifying and removing any remaining temporary stockpile materials not used in the construction of the final landform;
- Demolishing and removing all fixed plant and buildings from the site;
- Removing all mobile equipment from the site;
- Removal of all construction fencing;
- Breaking up and removing any concrete footings, pads and pavements; and
- Closure, backfilling and sealing of construction portals.

It is anticipated that new access roads or those which are upgraded, widened and sealed will be retained with agreement from NPWS. Some of the retained access roads will remain open to the public post construction and will enable access to locations previously only accessible by four-wheel drive; however, some will be utilised exclusively by Snowy Hydro for access to operational areas..

### 5.1.3 Phase 3 - Landform Establishment

Landform establishment incorporates shaping the final landform to a safe, stable and non-polluting landform that is appropriate for the desired final land use and consistent with the surrounding landscape. During the landform establishment phase, activities will include slope stabilisation and the construction of long-term water management and erosion and sediment controls.

#### 5.1.3.1 Slope Stabilisation

The design of all slope batters will consider long-term stabilisation with minimal monitoring and maintenance requirements. As outlined in **Section 6.1.1.3** and **Figure 13**, slope stabilisation techniques will depend upon the grade of the batter. Batter Types A to E in **Figure 13** are categorised according to slope gradient. The accompanying table in **Figure 13** provides temporary and permanent revegetation options for each Batter Type.

#### 5.1.3.2 Erosion and Sediment Control

Long-term erosion and sediment controls will be designed and installed in accordance with the specifications contained in *Managing Urban Stormwater – Soils and Construction, Volume 1, 4<sup>th</sup> edition* (Landcom, 2004), *Volume 2A Installation of Services* (DECC, 2008a) and *Volume 2C Unsealed Roads* (DECC, 2008b) or equivalent. Local alpine conditions and guidelines will be considered where applicable.

#### 5.1.3.3 Excavated Rock Management

As outlined in **Section 5.1.1.4**, excavated material may be reused to form the agreed final landform. Where excavated materials are used in the final landform they will be shaped to merge into the natural topography of the area. The final landform will be designed to incorporate micro-relief and undulations to create a natural looking landform similar to the pre-development landform.

To ensure long term stability and sustainability, reshaping will ensure that final slopes are stabilised as outlined in **Section 5.1.1.3**. Appropriate water management and erosion and sediment control structures will be constructed to ensure effective surface drainage to the natural environment.

#### **5.1.4 Phase 4 - Growth Medium Development**

Growth Medium Development will incorporate the processes involved to achieve growing media which are capable of supporting a sustainable vegetation community. It includes consideration of the chemical, physical and biological properties of the media.

##### **5.1.4.1 Topsoil Respreading**

Where available, topsoil will be respread to designated areas at a depth to be specified in the final design following determination of available volumes.

Sampling and analysis of topsoil and subsoil resources, whether stockpiled or in-situ, will be conducted prior to respreading. This will assist in ensuring that soil quality is consistent with proposed land use objectives. Understanding soil characteristics will also assist in estimating required rates of fertiliser or ameliorants (i.e. gypsum or lime) and may also assist in blending specific soil types to achieve enhanced outcomes.

Prior to re-spreading stockpiled topsoil, an assessment of weed infestation on stockpiles will be undertaken to determine if stockpiles require herbicide application and / or “scalping” of weed species prior to topsoil spreading.

Topsoil will be spread, treated with fertiliser and seeded in an integrated operation. This strategy will allow mitigation of the potential for topsoil loss to wind and water erosion. Appropriate earthmoving equipment will be used to avoid the compaction of the growth media.

Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation. Topsoiled areas will be contour ripped, where practicable, to create a “key” between the topsoil and the subsoil. All topsoiled areas will, as far as practical, maintain surface roughness to reduce run-off, increase infiltration and support seed establishment.

Where topsoil is limited, an appropriate topsoil substitute material may be used (e.g. bio-solids), and in some areas, where excavated material is benign and favourable for the establishment of native trees and shrubs, direct vegetation establishment may be utilised.

#### **5.1.5 Phase 5 - Ecosystem and Land Use Establishment**

The Ecosystem and Land Use Establishment phase constitutes activities associated with establishing the desired post disturbance vegetation communities including seeding and land management activities such as weed control. Conceptual ecosystem and land use establishment strategies are summarised below.

#### 5.1.5.1 Revegetation

Revegetation will be undertaken in the correct season to optimise plant growth in fall weather conditions. Revegetation will generally be undertaken from mid-October to mid-April. Revegetation will, as far as practicable, be scheduled to occur promptly following the completion of growth medium development activities. Where rehabilitated areas become available out of season, a temporary sterile cover crop will be sown to stabilize the site until the primary vegetation cover can be established. The construction and rehabilitation schedule will be developed with consideration to the required timing of revegetation.

Species selection for areas to be rehabilitated to native vegetation will be undertaken using species specific to the Plant Community Type (PCT) commensurate with the surrounding native vegetation of the disturbed area.

Revegetation techniques will include direct seeding, tubestock planting and hydromulching/hydroseeding.

#### 5.1.5.2 Vegetation Protection

Feral and pest animals can have significant detrimental impacts on emerging vegetation in rehabilitated areas and reduce the likelihood of revegetation success due to damage to juvenile vegetation from grazing, spreading weed seeds and erosion.

A vegetation protection programme will be developed and implemented during planting, if required.

#### 5.1.5.3 Weed Control

A program for the control of weeds on the site will be developed and implemented in consultation with NPWS and in accordance with the KNP Plan of Management (NPWS, 2006). Early control of weeds will minimise competition and maximise early growth and survival of desired rehabilitation species. This can be achieved by physical removal or by chemical control where appropriate. Weed management will be a component of rehabilitation and management activities and will comprise:

- Regular inspections of the site (particularly rehabilitated areas) to identify potential weed infestations; and
- Identifying, removing and/or spraying weed populations, where appropriate.

The spread of declared noxious weeds will be prevented by using the measures above. Weed control, if required, will be undertaken in a manner that will minimise soil disturbance. Herbicides will be used in accordance with regulatory requirements. Records will be maintained of identified weed infestations and control programs will be implemented according to best management practices for the weed species of concern.

#### 5.1.6 Phase 6 - Ecosystem and Land Use Development

Activities associated with the ecosystem sustainability phase of rehabilitation are generally ongoing maintenance and land management activities and rehabilitation monitoring. Maintenance of rehabilitated areas to be undertaken will include, but not be limited to:

- Weeds and pest animal control;
- Managing bushfire risks;

- Minor earthworks to remediate any significant erosion features, including contour banks and diversion channels;
- Infill planting and/or seeding to meet vegetation community requirements; and
- Maintaining erosion and sediment controls.

Rehabilitation monitoring will be undertaken until it can be demonstrated that rehabilitation areas have met all conditions for Rehabilitation Completion. Rehabilitation monitoring is discussed in **Section 7**.

## 6 Rehabilitation Quality Assurance Process

A Rehabilitation Quality Assurance Process (RQAP) will be developed and implemented throughout the project. The RQAP will include details of inspections, monitoring and record keeping which will be required to ensure that:

- Rehabilitation is being implemented in accordance with the nominated methodologies; and
- Identified risks to rehabilitation are being adequately addressed at each phase of rehabilitation.

## 7 Rehabilitation Monitoring Program

A dedicated monitoring system is critical to assessing the effectiveness of rehabilitation implementation measures as well as to identify the need for corrective action as soon as required.

A rehabilitation monitoring program will be established to track the progress of rehabilitated areas towards completion. The program will incorporate the most appropriate indicators and methods that:

- Provide a measure of completion criteria to be assessed in accordance with the defined rehabilitation objectives;
- Are reproducible;
- Utilise scientific recognised techniques; and
- Are cost-effective.

As part of the monitoring program, analogue/reference sites will be established to allow for a comparison of the development and success of the rehabilitation against a control. Analogue sites will be selected based on the following general criteria:

- Contain vegetation types similar to the rehabilitation sites;
- Secure from future disturbance; and
- Contain vegetation and conditions suitable as a basis for rehabilitation performance criteria.

Data from analogue rehabilitation sites is an integral part of the monitoring procedure throughout the monitoring process, so that varying seasonal conditions ultimately result in a “band” of values that act as the long-term target for rehabilitation.

Monitoring will be conducted as required by approval conditions by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Monitoring results, any required maintenance activities and any refinements of rehabilitation techniques will be reported as required by approval conditions.

## 8 Intervention and Adaptive Management

### 8.1 Threats to Rehabilitation

Where rehabilitation performance is not trending to the nominated completion criteria this may indicate that there is a threat to long term rehabilitation success. Threats to rehabilitation may include events such as periods of drought, bushfire events, or pressures from weeds and feral animals.

**Table 9** provides indicative key threats to rehabilitation for the project. Where the RQAP or monitoring indicates that there is a significant threat to rehabilitation, adaptive management will be undertaken in accordance with a Rehabilitation Trigger Action Response Plan (TARP). A Conceptual TARP is described in **Section 8.2**.

**Table 9 Indicative Key Threats to Rehabilitation**

Threat	Caused by
Erosion and Sediment Control	<ul style="list-style-type: none"> <li>- Rainfall events.</li> <li>- Lack of appropriate vegetation cover.</li> <li>- Failure of water management structures.</li> </ul>
Soil Type(s) and Suitability	<ul style="list-style-type: none"> <li>- Inadequate topsoil available.</li> <li>- Poor topsoil quality.</li> <li>- Weed infested topsoil.</li> <li>- Poor recovery of topsoil from currently rehabilitated areas.</li> </ul>
Spontaneous Combustion	<ul style="list-style-type: none"> <li>- Poor management of stockpiled materials with propensity for spontaneous combustion.</li> </ul>
Flora	<ul style="list-style-type: none"> <li>- Not considering requirements in rehabilitation planning.</li> <li>- Not collecting and propagating sufficient native seed stock.</li> <li>- Failure to manage weeds.</li> <li>- Pest species / grazing pressures (kangaroos, deer etc.).</li> <li>- Drought.</li> <li>- Climate change.</li> </ul>
Geotechnical	<ul style="list-style-type: none"> <li>- Geotechnical slope failure.</li> </ul>
Geology and Geochemistry	<ul style="list-style-type: none"> <li>- Poor knowledge of material and its geochemistry.</li> <li>- Poor management of potentially acid forming material (PAF)</li> <li>- Inappropriate placement of materials.</li> </ul>
Contaminated Land	<ul style="list-style-type: none"> <li>- Spills, leaks etc.</li> </ul>
Bushfire	<ul style="list-style-type: none"> <li>- Location within KNP</li> <li>- Regional fire.</li> <li>- Lightning strike.</li> </ul>

### 8.2 Trigger Action Response Plan

A TARP for rehabilitation will be developed to identify required management actions and contingency strategies in the event of unexpected impacts to rehabilitation, or where rehabilitation outcomes are not achieved in an acceptable timeframe. A Conceptual TARP is provided as **Table 10**.

**Table 10 Conceptual Trigger Action Response Plan**

Aspect / Category	Key Element	Element Number	Trigger / Response	First Level Trigger	Second Level Trigger
Landform stability	Erosion control	1	Trigger	Minor erosion present.	Major erosion present which is compromising landform stability.
			Response	An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to install (or augment existing) water management infrastructure to address erosion. Remediate as appropriate.	Engage a consultant to assist with the management of erosion and sedimentation at the site and provide recommendations to appropriately remediate the erosion. Remediate as soon as practicable.
Growth media	Topsoil quantity	2	Trigger	Topsoil balance indicates a deficiency in topsoil available for rehabilitation.	Deficiency significant and alternate not available such that it will delay rehabilitation progression and the likelihood of rehabilitation success is low.
			Response	Investigate options and alternatives to be able to meet future topsoil requirements.	Source and budget for purchasing topsoil for use in rehabilitation, Investigate use of alternatives such as organic material.
	Topsoil quality	3	Trigger	Properties of soil are inconsistent with analogue sites but are capable of sustaining selected vegetation species.	Properties of soil are inconsistent with analogue sites and the area is not able to sustain selected vegetation species.
			Response	Investigate application of additional soil, and/or use of appropriate soil ameliorants or management options to address soil quality if deemed necessary.	Consultant to be engaged to assist with recommendations to appropriately remediate soil quality and depth. Remediate as soon as practicable.
Vegetation	Ground cover	4	Trigger	Bare patches are > 15% and < 30 % (excluding rocks and logs).	Bare patches are > 30% (excluding rocks and logs).
			Response	Investigate likely causes of unsatisfactory germination rates. Reseed areas with unsatisfactory cover. Review seeding procedures including seasonal mixes, timing and seed rate per hectare.	Undertake analytical soil testing and evaluation, where appropriate implement recommendations for amelioration. Implement appropriate management actions including revising rehabilitation procedures if required.
	Vegetation Health	5	Trigger	Vegetation health index not in the range of analogue sites.	Long term declining trend in vegetation health index.
			Response	Investigate likely causes of vegetation sickness and / or mortality rates. Reseed or replant areas with high sickness or mortality rates. Review seeding and / or planting procedures.	Engage a suitably qualified specialist to investigate causes for vegetation sickness and mortality. Implement appropriate management actions including revising rehabilitation procedures if required.

Aspect / Category	Key Element	Element Number	Trigger / Response	First Level Trigger	Second Level Trigger
	Species Composition	6	Trigger	Species composition is not consistent with the sewn seed mix and or, analogue sites.	Ongoing decline in species composition away from analogue site composition.
			Response	Investigate the likely causes of unsatisfactory germination and or, growth rates. Reseed areas with unsatisfactory cover. Review seeding procedures including seasonal mixes, timing and seed rate per hectare.	Undertake analytical soil testing and evaluation. Where appropriate implement recommendations for amelioration. Implement appropriate management actions including revising rehabilitation procedures if required.
	Weeds	7	Trigger	Monitoring indicates the density of weeds in rehabilitation areas exceeds analogue sites.	Monitoring indicates substantial weed infestations.
			Response	Undertake weed management to remove / spray introduced weed species. Treatment of infestations as appropriate to the species.	Undertake weed management to remove introduced weed species. Investigate management measures to reduce weeds including additional soil amelioration, establishment and retention of cover crops until weed presence is at acceptable levels. Implement recommendations as appropriate.
	Pest animals	8	Trigger	Pest animal species are causing damage to rehabilitation.	Continued damage to rehabilitation from pests after tree guards and fencing has been installed.
			Response	Consult with relevant government agencies to recommend and implement appropriate pest animal control campaign.	Liaise with government agencies and consider appropriate options in accordance with NPWS guidelines regulations.

## 9 Review and Implementation

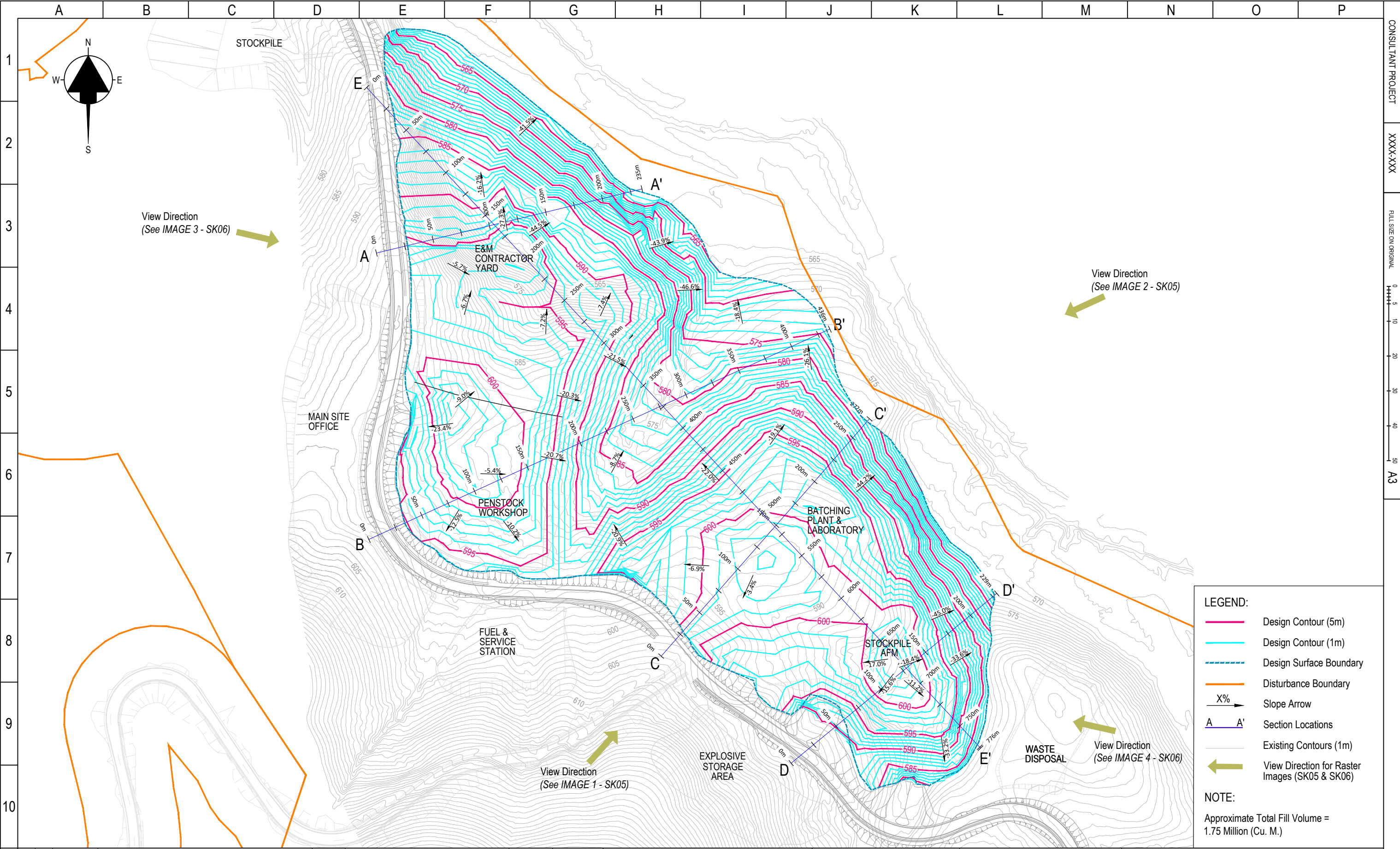
This Rehabilitation Strategy has been prepared as a high level conceptual document to outline the framework and proposed approach to decommissioning and rehabilitation activities associated with the Main Works phase of Snowy 2.0. The Rehabilitation Strategy provides the overarching standard for decision making in terms of rehabilitated landscape and complements the post approval Rehabilitation Management Plan which provides further specific details for implementation, management and monitoring of all aspects rehabilitation and decommissioning.

Following approval, a Detailed Rehabilitation Management Plan will be prepared for the project in accordance with relevant approval conditions, guidelines and in consultation with relevant authorities and stakeholders including NPWS.





# APPENDIX A

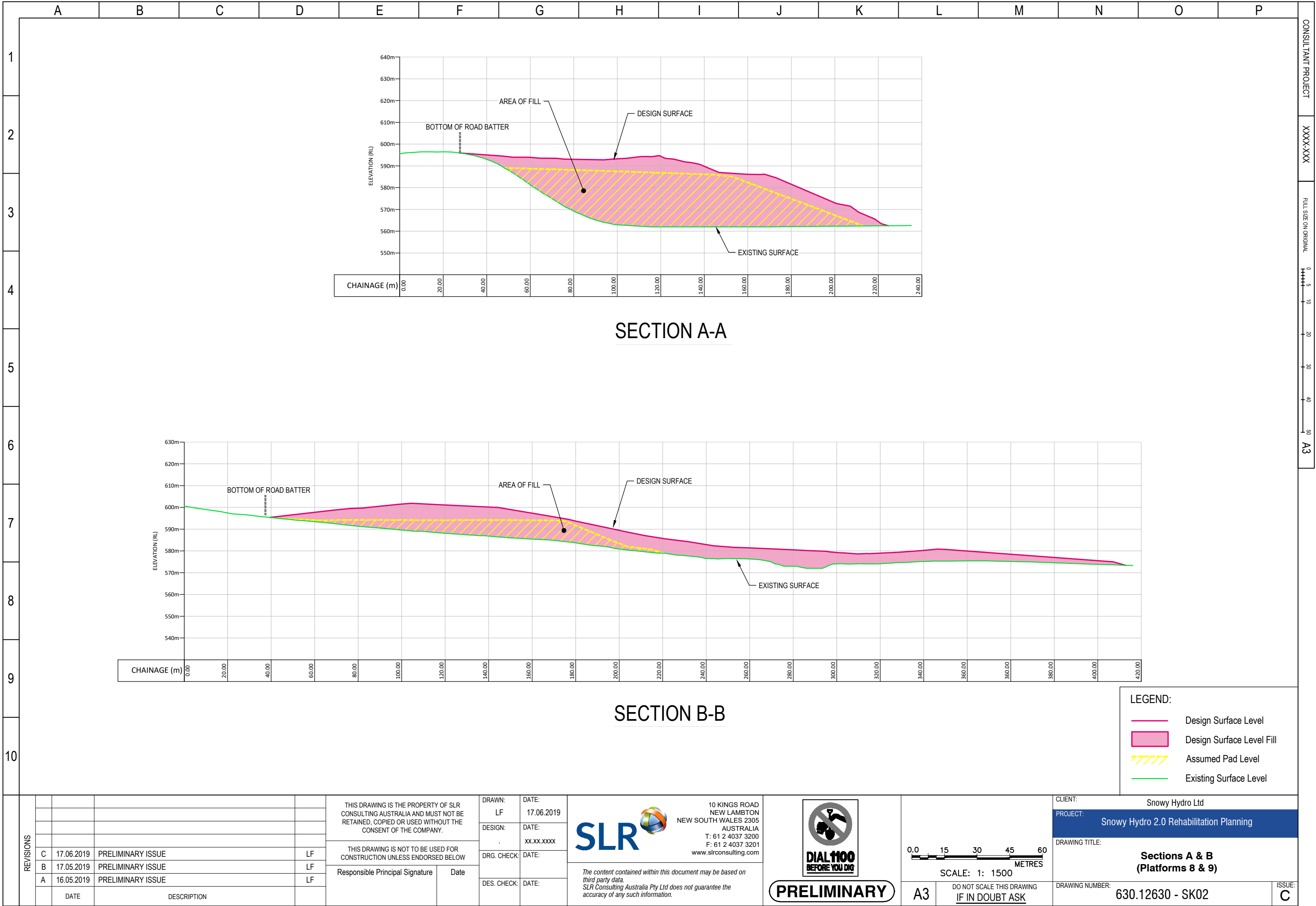
Proposed Final Landform Design Drawings and Cross Sections

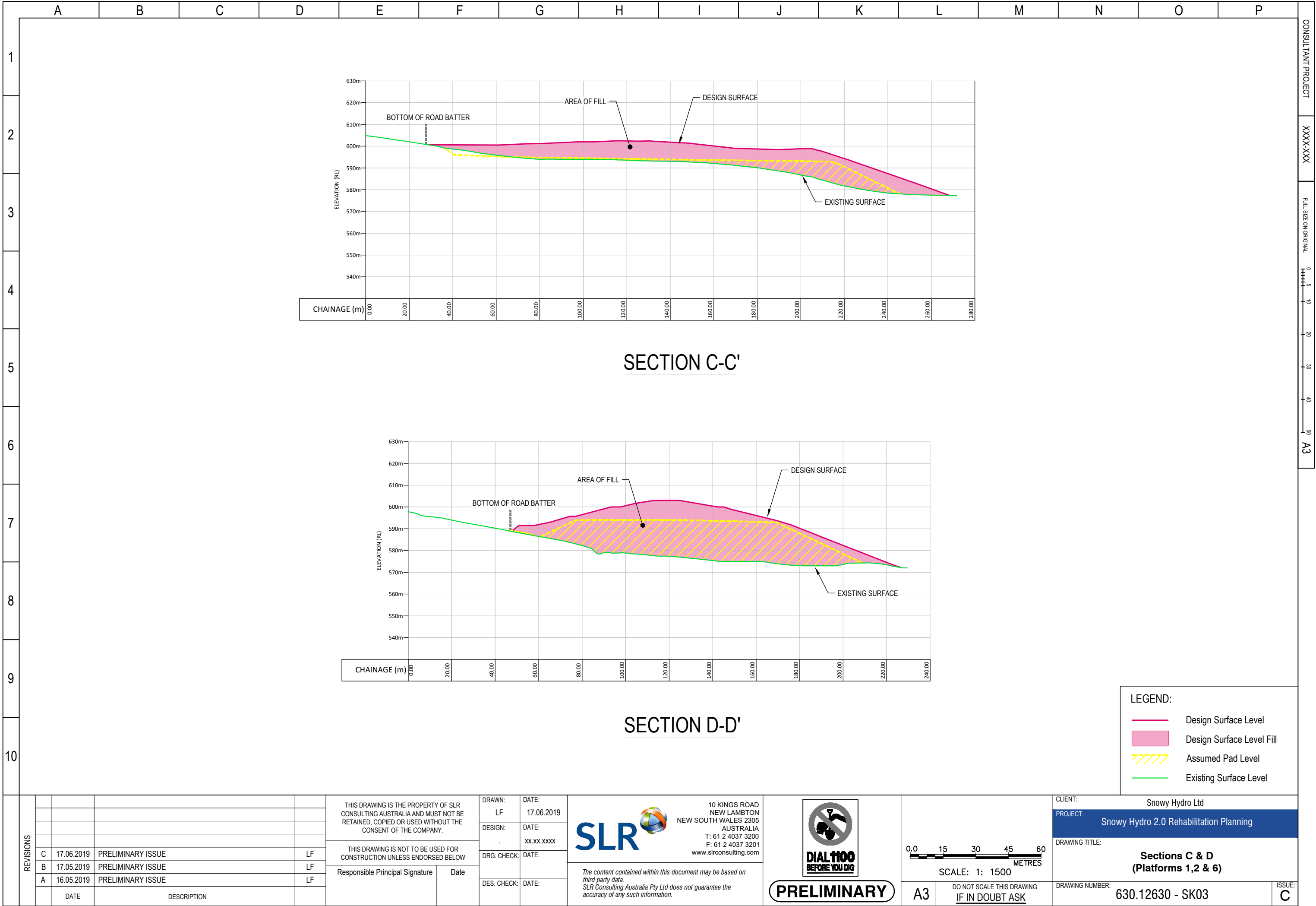


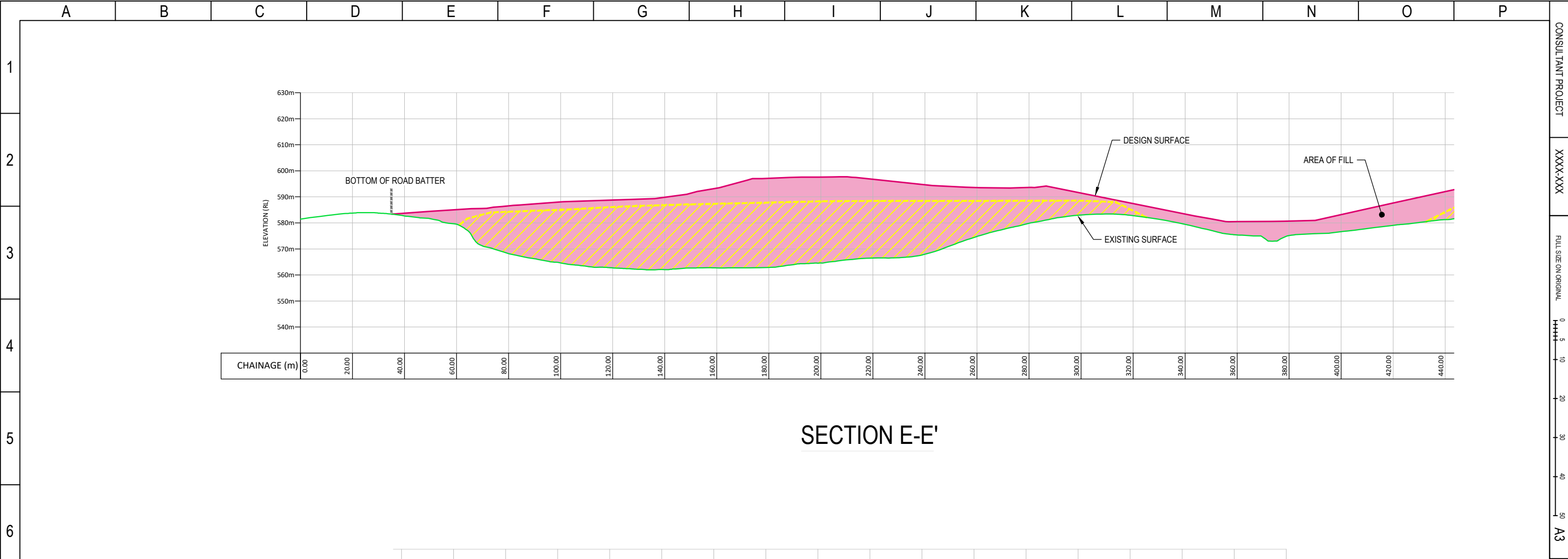


- LEGEND:**
- Design Contour (5m)
  - Design Contour (1m)
  - Design Surface Boundary
  - Disturbance Boundary
  - Slope Arrow
  - Section Locations
  - Existing Contours (1m)
  - View Direction for Raster Images (SK05 & SK06)
- NOTE:**
- Approximate Total Fill Volume = 1.75 Million (Cu. M.)

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												PROJECT: Snowy Hydro 2.0 Rehabilitation Planning	
	D	30.07.2019	PRELIMINARY ISSUE	LF									DRAWING TITLE: General Arrangement (Platforms 1,2,5,6,8,9,10 & 11)
	C	17.06.2019	PRELIMINARY ISSUE	LF									
B	17.05.2019	PRELIMINARY ISSUE	LF										
B	16.05.2019	PRELIMINARY ISSUE	LF										
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Responsible Principal Signature

Date

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DATE: 17.05.2019

DATE: xx.xx.xxxx

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0.0 15 30 45 60 METRES

SCALE: 1: 1500

A3

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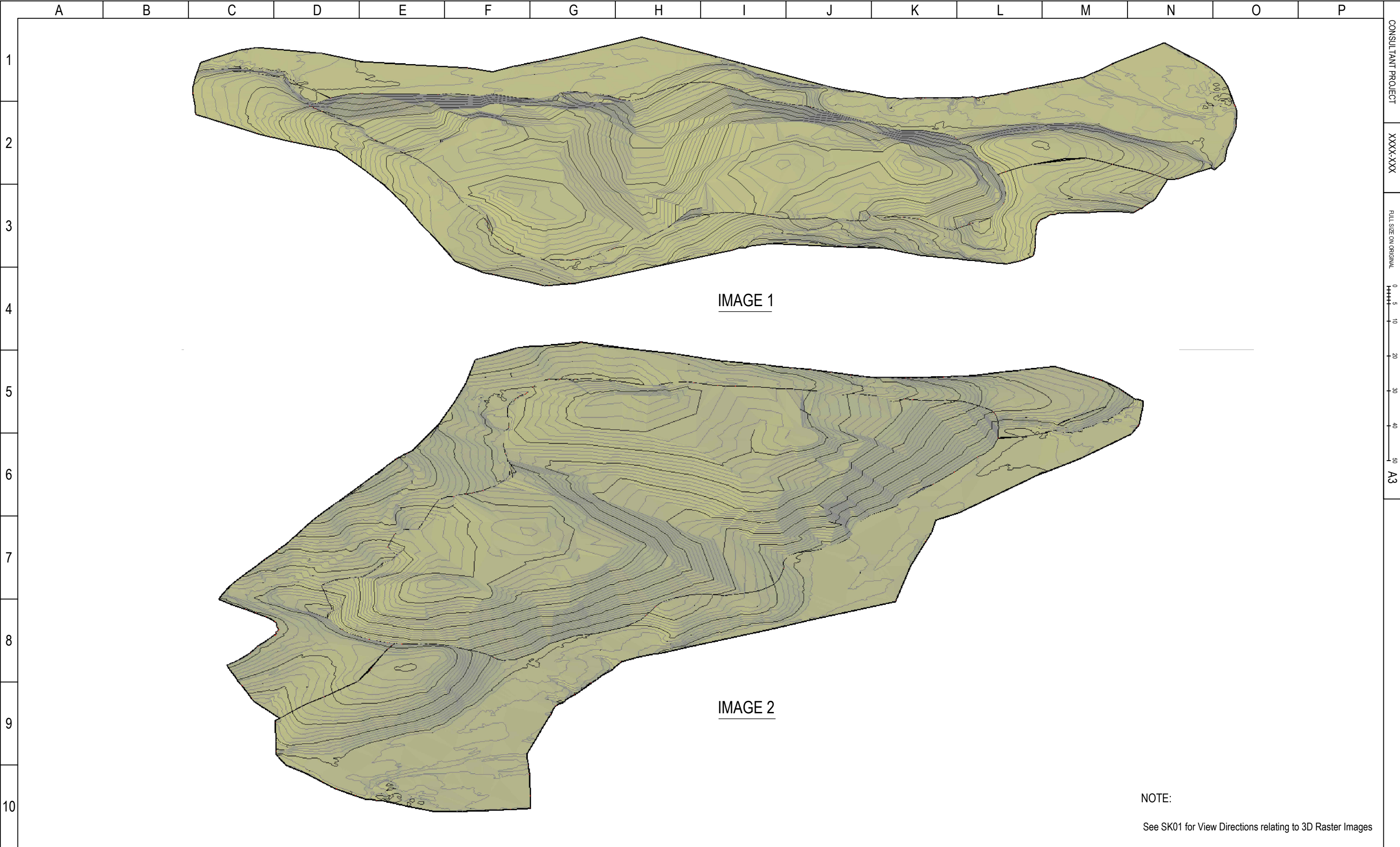
CLIENT: Snowy Hydro Ltd

PROJECT: Snowy Hydro 2.0 Rehabilitation Planning

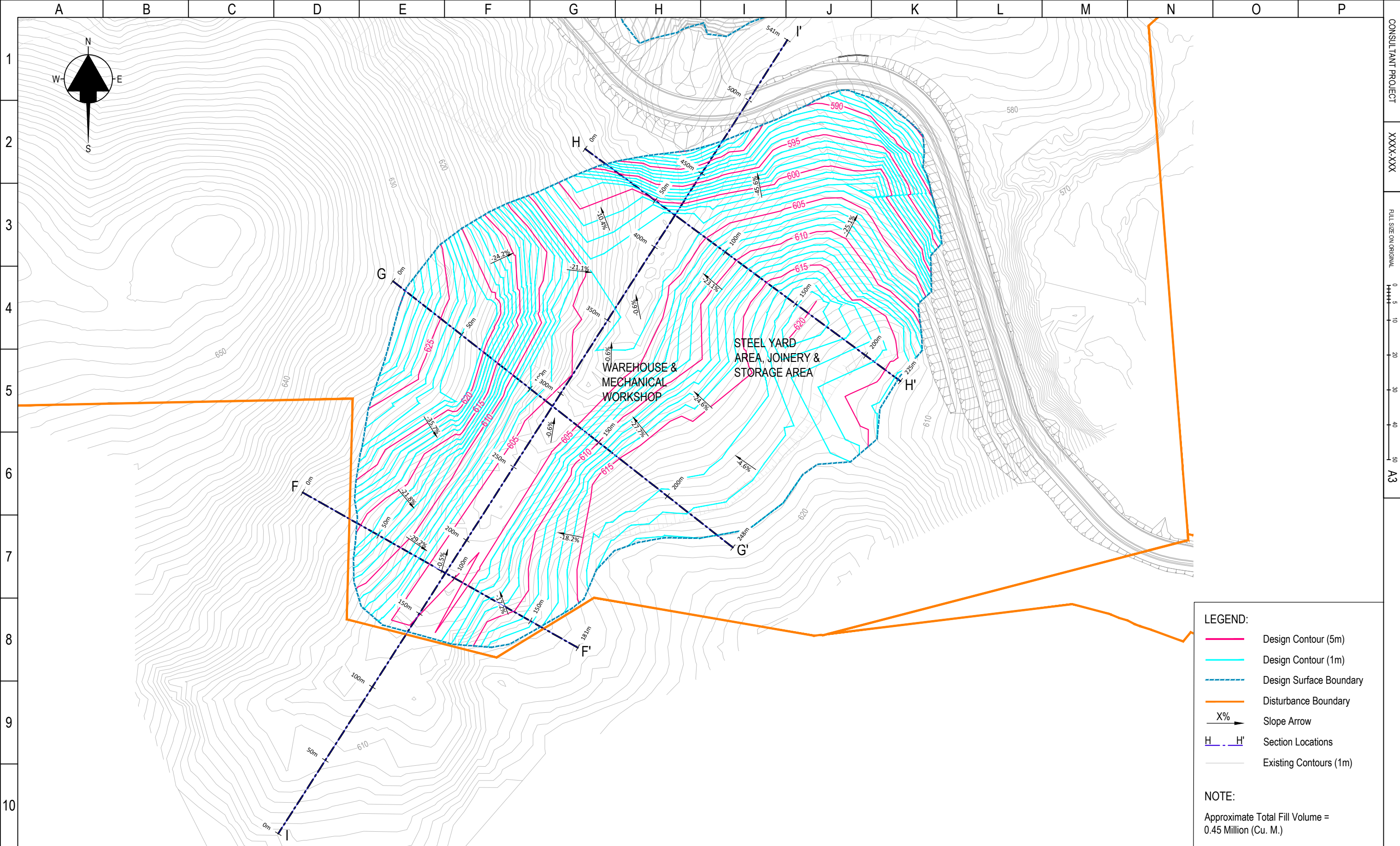
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DRAWING NUMBER: 630.12630 - SK04

ISSUE: C

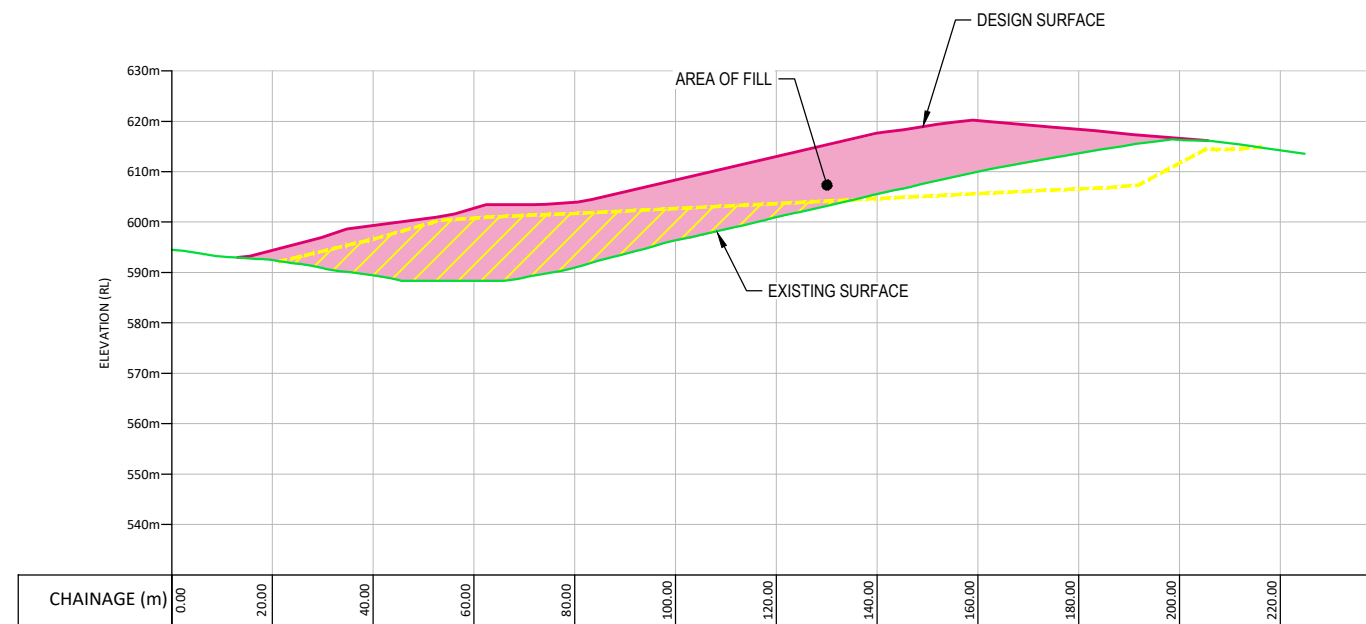




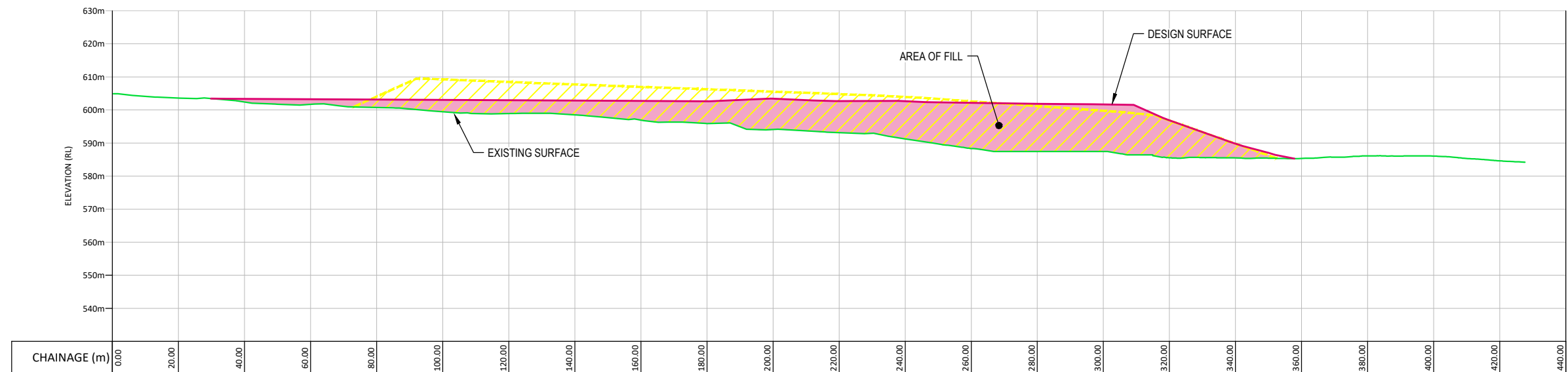


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	B	12.06.2019	PRELIMINARY ISSUE	LF	Responsible Principal Signature	Date	DRG. CHECK:	DATE:	SCALE: 1:2000						
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SECTION H-H'

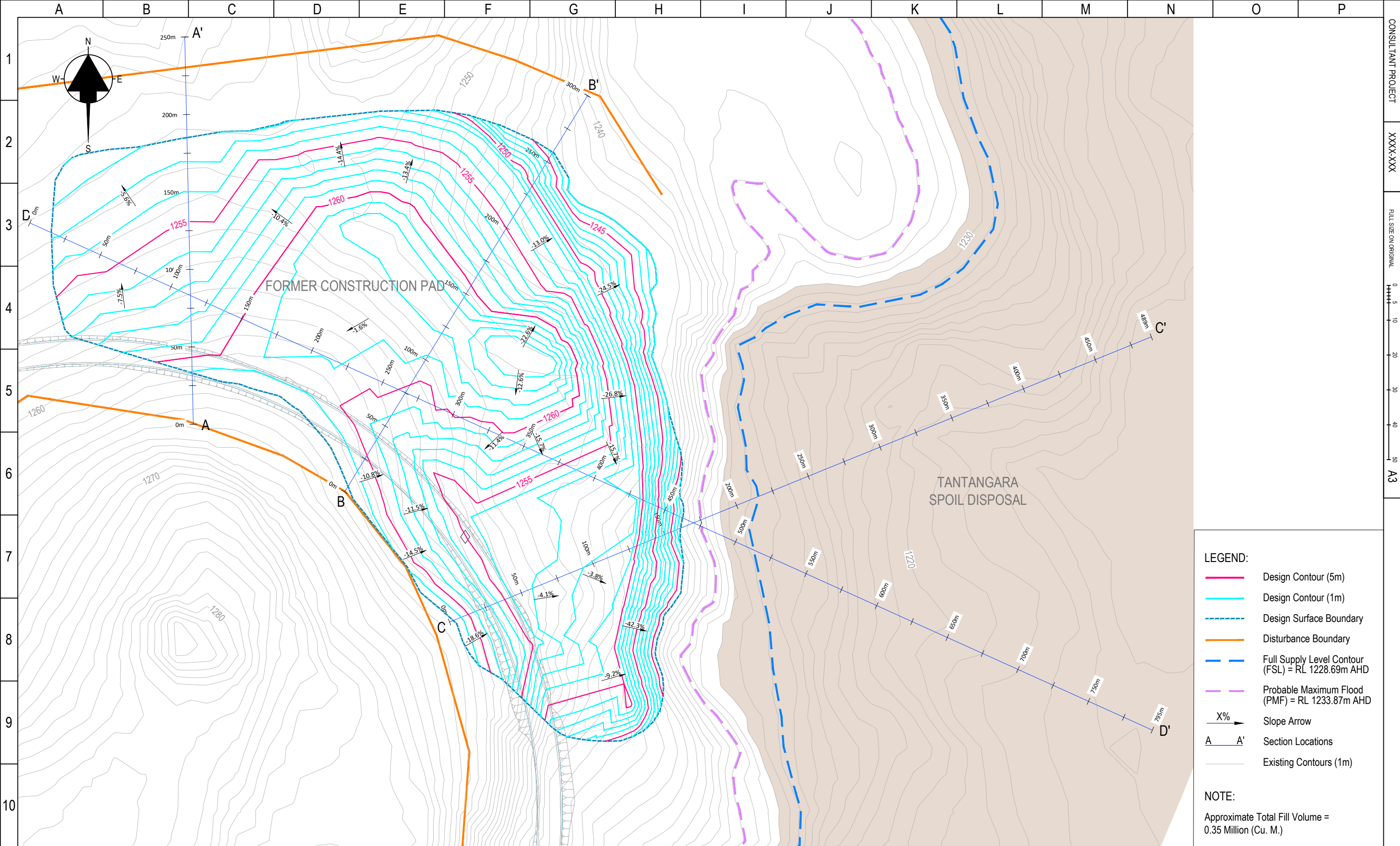


SECTION I-I'

LEGEND:

-  Design Surface Level  
 Design Surface Level Fill  
 Assumed Pad Level  
 Existing Surface Level

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						DRG. CHECK:	DATE:			DRAWING TITLE:		
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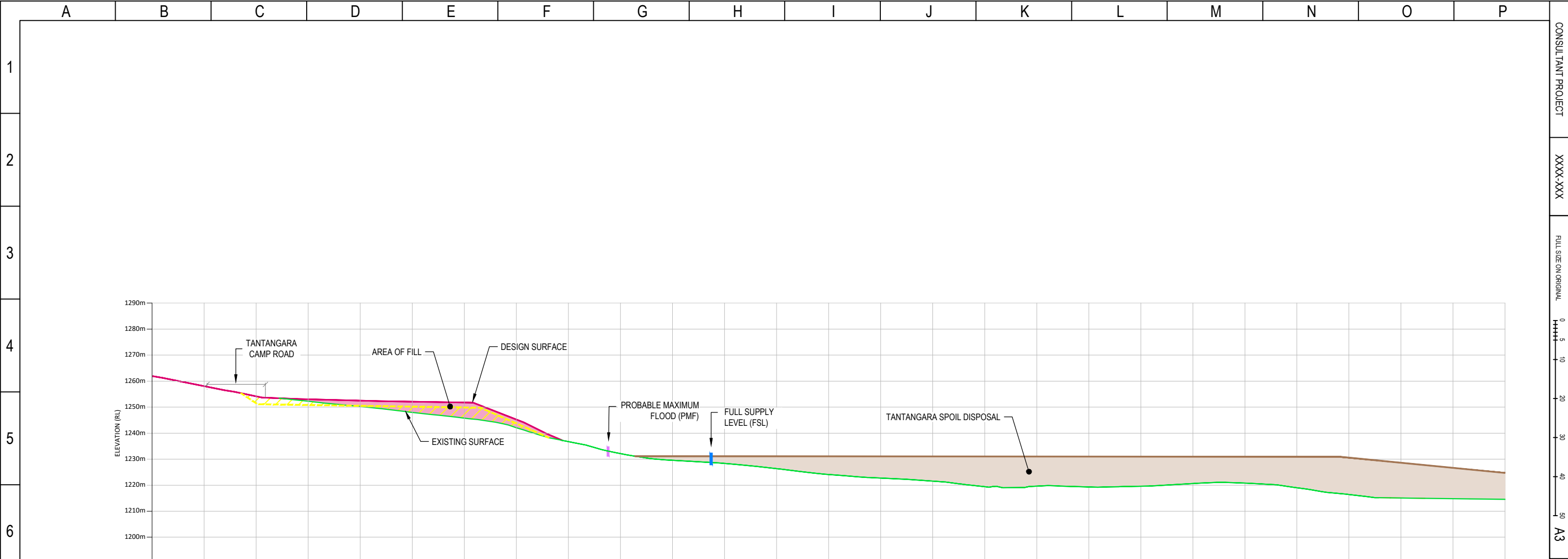
- LEGEND:**
- Design Contour (5m)
  - Design Contour (1m)
  - Design Surface Boundary
  - Disturbance Boundary
  - Full Supply Level Contour (FSL) = RL 1228.69m AHD
  - Probable Maximum Flood (PMF) = RL 1233.87m AHD
  - X% Slope Arrow
  - A-A' Section Locations
  - Existing Contours (1m)

**NOTE:**

Approximate Total Fill Volume = 0.35 Million (Cu. M.)

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	D	30.07.2019	PRELIMINARY ISSUE	LF	THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS ENDORSED BELOW	DRG. CHECK:	DATE:	<div>The content contained within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of any such information.</div>	<div>PRELIMINARY</div>	A3	DO NOT SCALE THIS DRAWING IF IN DOUBT ASK	DRAWING TITLE:	
	C	17.06.2019	PRELIMINARY ISSUE	LF		Responsible Principal Signature						Date	General Arrangement (Tantangara Former Construction Pad)
	B	05.06.2019	PRELIMINARY ISSUE	LF	Responsible Principal Signature	Date	DES. CHECK:	DATE:	DRAWING NUMBER: 630.12630 - SK10	ISSUE: E			
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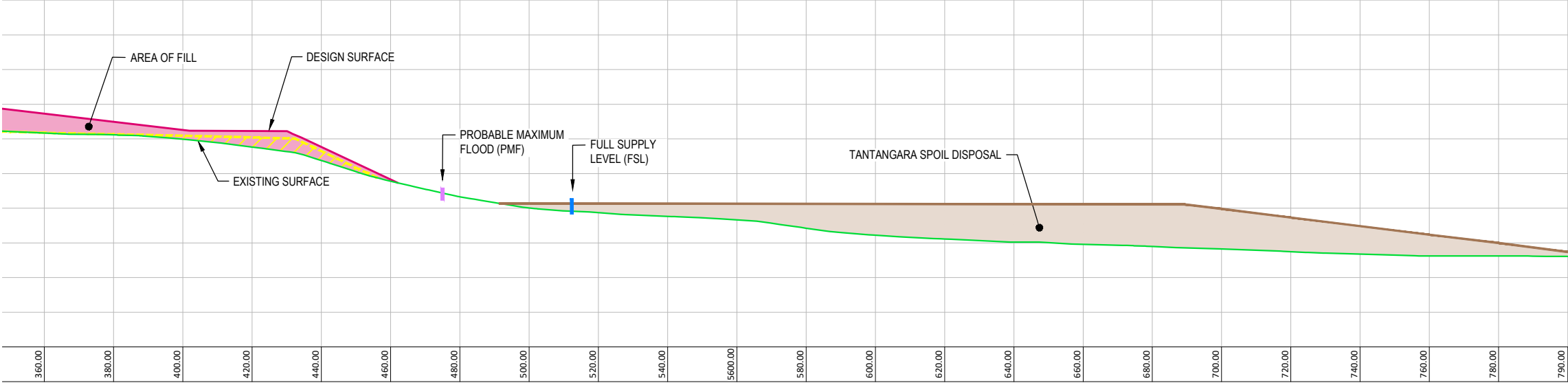
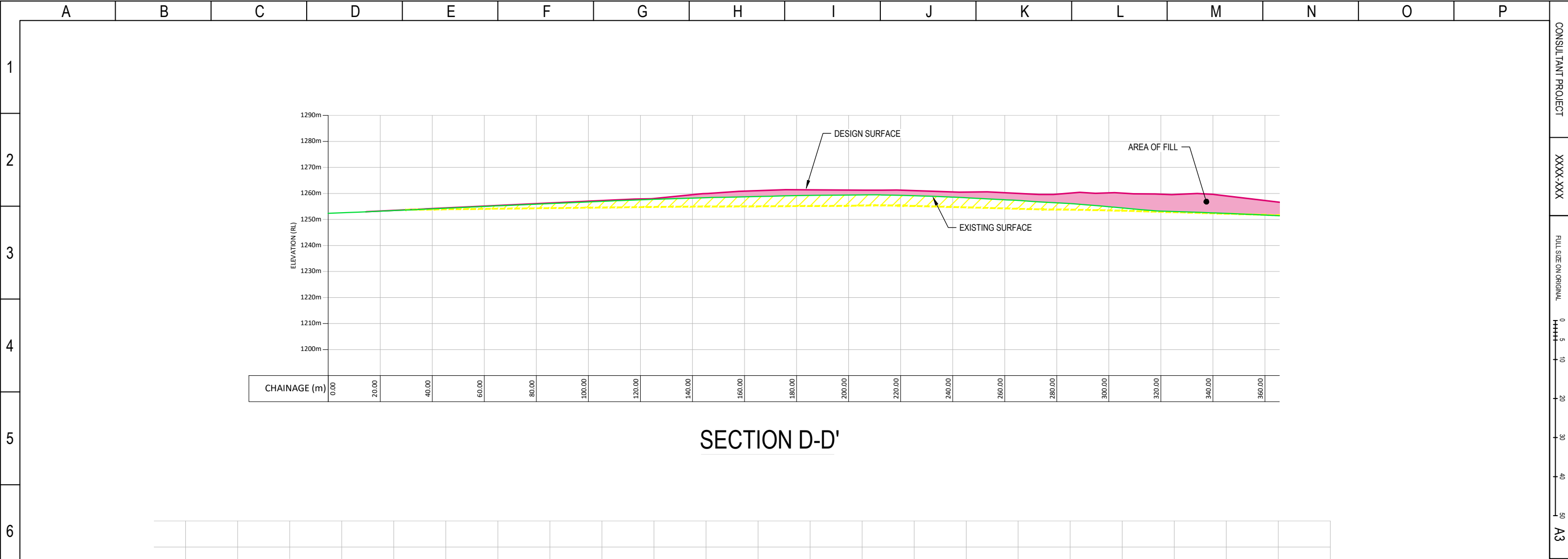


LEGEND:

Design Surface Level

Design Surface Level Fill

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	D	29.08.2019	PRELIMINARY ISSUE	LF	THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS ENDORSED BELOW							Section C (Tantangara Former Construction Pad)	DRAWING NUMBER: 630.12630 - SK12	ISSUE: D
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	DATE	DESCRIPTION							The content contained within this document may be based on third party data. SLR Consulting Australia Pty Ltd does not guarantee the accuracy of any such information.		PRELIMINARY	A3	DO NOT SCALE THIS DRAWING IF IN DOUBT ASK	



- LEGEND:
- Design Surface Level
  - Design Surface Level Fill
  - Assumed Pad Level
  - Existing Surface Level

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	PROJECT: Snowy Hydro 2.0 Rehabilitation Planning											
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B	05.06.2019	PRELIMINARY ISSUE			LF							
A	31.05.2019	PRELIMINARY ISSUE			LF							

## APPENDIX B

### Artists Impression Final Landform Visual Design - Talbingo





## APPENDIX C

### Artists Impression Final Landform Visual Design - Tantangara



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### DARWIN

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