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EXCAVATED MATERIAL MANAGEMENT PLAN

Approval Record			
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ABBREVIATIONS AND DEFINITIONS

Acronym	Definition
AC	Acid consuming
AEP	Annual Exceedance Probability
AFL	Agreement for Lease
AFR	Acid-forming rock
AHD	Australian Height Datum
AMD	Acid metalliferous drainage
ANC	Acid neutralising capacity
Acid Sulfate Soils Manual	*The Acid Sulfate Soils Manual,* NSW Acid Sulfate Soil Management Advisory Committee, 1998
Blue Book	Managing Urban Stormwater: Soils and Construction. Landcom, (4th Edition) March 2004 (reprinted 2006)
CLMP	Contaminated Land Management Plan
CoA	Conditions of Approval for the Snowy 2.0 Exploratory Works project
CLM Act	*Contaminated Land Management Act 1997*
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
EC	Electrical conductivity
EIL	Ecological investigation levels
Exploratory Works EIS	*Environmental Impact Statement Exploratory Works for Snowy 2.0*
EMMP	Excavated Material Management Plan
EMS	Environmental Management Strategy
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
EWAR	Exploratory Works Access Roads
Future Generation	Future Generation Joint Venture
Future Generation-PMS	Project Management System
KNP	Kosciuszko National Park
NAF	Non-acid Conforming
NAPP	Non-acid Producing Potential
NOA	Naturally occurring asbestos
NOAMP	Naturally Occurring Asbestos Management Plan
NPWS	NSW National Parks and Wildlife Service
OEH	NSW Office of Environment and Heritage
OSOM	Oversize and Overmass
PAF	Potential acid forming material
PEP	Project Execution Plan

Acronym	Definition
POEO Act	*Protection of the Environment Operations Act 1997*
POEO General Regulation	*Protection of the Environment Operations (General) Regulation 2009*
POEO Waste Regulation	*Protection of the Environment Operations (Waste) Regulation 2014*
PPE	Personal Protective Equipment
QMP	Quality Management Plan
REMM	Revised environmental management measures
SEP	Site Environmental Plan
SEMP	Subaqueous Emplacement Management Plan
SMHEA	Snowy Mountains Hydro Electric Authority
Submissions Report or RTS	*Response to Submissions Exploratory Works for Snowy 2.0*
TBM	Tunnel Boring Machine
TBMP	Tunnel Blasting Management Plan
VENM	Virgin Excavated Natural Material
WALic	Works Access Licence
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
Waste Classification Guidelines	*Waste Classification Guidelines, NSW Environmental Protection Authority, 2014*

1. INTRODUCTION

Salini Impregilo, Clough and Lane have formed the Future Generation Joint Venture (Future Generation) to provide the Civil Works Package for Snowy Hydro Limited (Snowy Hydro) on the Snowy 2.0 Project (the Project).

The Project is a pumped hydro project that will increase the generation capacity of the Snowy Mountains Scheme by up to 2,000mW and at full capacity will provide approximately 350,000MW/h of energy storage. The project includes all activities associated with the civil works requirements for the Snowy 2.0 Pumped Hydro-electric Scheme.

Intake and outlet structures will be built at both Tantangara and Talbingo Reservoirs, which are in the Kosciuszko National Park (KNP) in southern NSW. Approximately 27km of concrete-lined tunnels will be constructed to link the two reservoirs and a further 20km of tunnels will be required to support the facility. The power station complex will be located almost one-kilometre underground.

The project will deliver one of the largest pumped hydro schemes in the world and underscores the importance of the Snowy Scheme's role in the National Electricity Market.

Future Generation was conceived to deliver an integrated engineering, procurement and construction management service for the project. The joint venture is backed by the combined experience of Salini Impregilo, Clough and Lane, through their experience in the infrastructure, mineral and oil and gas sectors throughout Australia and the world.

1.1. Purpose

This Excavated Material Management Plan (EMMP or Plan) forms part of the Environmental Management Strategy (EMS) for Snowy 2.0 – Exploratory Works – Stage 2 (Exploratory Works – Stage 2). The Exploratory Works is the first phase of Snowy 2.0, a pumped hydro-electric storage and generation project which will increase the hydro-electric capacity within the existing Snowy Mountains Hydro-electric Scheme. The Main Works or second phase, will be subject to a separate Environmental Impact Statement (EIS) in 2019.

This EMMP has been prepared to address the requirements of:

- the Infrastructure Approval (SSI 9208) issued for Snowy 2.0 Exploratory Works on 7 February 2019 and modified on 2 December 2019 and 27 March 2020;
- the *Environmental Impact Statement Exploratory Works for Snowy Hydro 2.0* (Exploratory Works EIS);
- the revised environmental management measures (REMMs) within the *Response to Submissions Exploratory Works for Snowy 2.0* (Submissions Report or RTS);
- the *Modification 1 Assessment Report - Exploratory Works for Snowy 2.0* (Modification 1);
- the REMMs within the *Response to Submissions - Exploratory Works Modification 1* (Submissions Report for Modification 1);
- the *Modification 2 Assessment Report - Exploratory Works for Snowy 2.0* (Modification 2); and
- the REMMs within the *Response to Submissions - Exploratory Works Modification 2* (Submissions Report for Modification 2).

The Exploratory Works for Snowy 2.0 includes, but is not limited to:

- an exploratory tunnel to the site of the underground power station for Snowy 2.0;
- horizontal and test drilling;

- a portal construction pad;
- an accommodation camp;
- road works and upgrades providing access and haulage routes;
- barge access infrastructure and dredge works;
- excavated rock management, including subaqueous placement within Talbingo reservoir;
- services infrastructure; and
- post-construction revegetation and rehabilitation.

Exploratory Works will be delivered in three distinct stages and these stages will be completed by two different contractors. Leed Engineering (Leed) is the contractor who will be carrying out the Snowy 2.0 Stage 1 work on behalf of Snowy Hydro. Future Generation is the contractor who will be delivering the Snowy 2.0 Stage 2 works on behalf of Snowy Hydro.

Works to be completed by Leed on behalf of Snowy Hydro:

- **Stage 1a – Pre-construction Minor Works** – Stage 1a has been approved and commenced in the first quarter of 2019. The scope of pre-construction minor works includes dilapidation studies, survey work, borehole installation, site office establishment, minor access roads, installation of monitoring equipment, installation of erosion and sediment controls, and minor clearing. Works commenced in the quarter two (Q2) of 2019;
- **Stage 1b - Exploratory Works Access Roads (EWAR)** – Stage 1b has been approved and commenced in the second quarter of 2019. The scope includes roadworks and upgrades to enable access and haulage routes during Exploratory Works. This includes upgrades to 26 km of existing roads and creating about 2 km of new roads, two new bridge crossings and two temporary waterway crossings.

Works to be completed by Future Generation on behalf of Snowy Hydro:

- **Stage 2 – Exploratory Works** – Stage 2 has been approved and commenced in quarter three (Q3) of 2019. The scope for Stage 2 Exploratory Works includes:
  - pre-construction minor activities including dilapidation studies, survey, investigations, access etc; and
  - construction works including exploratory tunnel, portal construction pad, accommodation camp, dredging*, barge access infrastructure, excavated rock management and additional geotechnical investigation. This includes subaqueous emplacement within Talbingo Reservoir*.

Note: these activities will not proceed unless the relevant management plans are approved by Department of Planning, Industry and Environment (DPIE).

Further detail on construction activities and staging is presented in Section 1.7 and Figure 1-1.

This Plan identifies the project's environmental management measures in relation to excavated material management for the Exploratory Works – Stage 2.

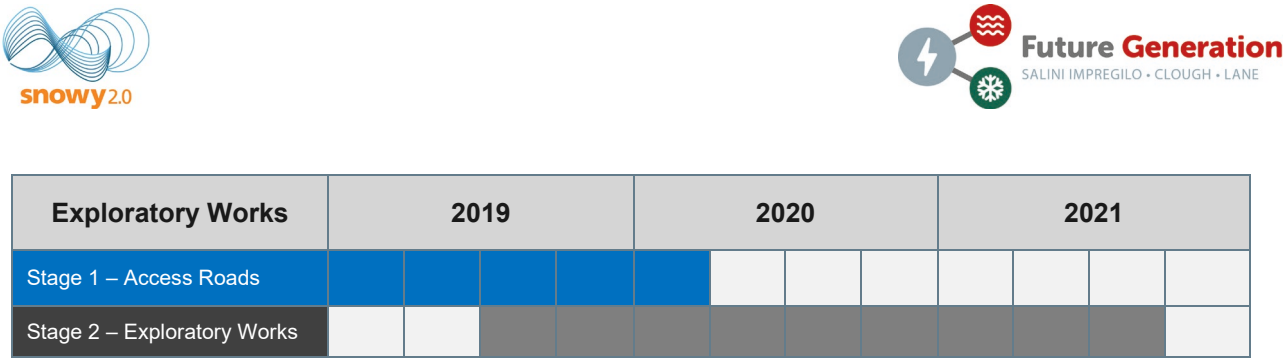


Figure 1-1: Timing of Exploratory Works stages

Stage 2 management plans have been revised from the corresponding Stage 1 management plan, as demonstrated in the document revision section of each Stage 2 plan. The intent of this arrangement is to ensure a consistent approach to managing environmental risk and regulatory requirements for the Exploratory Works project. In the event that both Exploratory Works Stages are undertaken concurrently, and / or in overlapping locations, the Stage 1 management plan will apply to the Stage 1 works, and the Stage 2 management plans will apply to the Stage 2 works. This arrangement would not affect management standards as all relevant measures from each management plan would continue to apply. As the proponent, Snowy Hydro will oversee both Stages of the Exploratory Works project.

The timing of the preparation, consultation, submission and approval of this Plan, along with other management plans required by the Conditions of Approval (CoA), is shown within Table 4-4 and Figure 4-4 of the EMS.

Ongoing revisions to this Plan will occur in accordance with Section 1.6 of the EMS, and as required by condition 4 of schedule 4 of the Infrastructure Approval. Circumstances requiring a review, and if necessary, revision of this Plan include submission of incident reports or audit reports, approval of modifications to the CoA and directions of the Planning Secretary under condition 4 of schedule 2.

Table 1-1 presents the relationship of excavated materials management with respect to this Plan and other management plans being prepared for the Project.

Table 1-1: Relationship to other plans

Activities	Relevant plan	Timing of plan*	
		Stage 1	Stage 2
Road construction – general management of soils	This Plan	P	R
Other earthworks activities – general management of soils	This Plan	P	R
Excavated tunnel rock management and temporary placement	This Plan	P	R
Erosion and sedimentation management	Surface Water Management Plan	P	R

* P – prepare, R - revise

Specific on-site management measures identified in this Plan will be incorporated into site documents. These site-specific documents will be prepared for construction activities and will detail the management measures which are to be implemented on the ground. Construction personnel will be required to undertake works in accordance with the mitigation measures identified in the site-specific documents.

1.2. Background

Snowy Hydro is the proponent of the Project which is a pumped hydro-electric storage and generation project proposed to address increasing demands for renewable energy supplies. Snowy

2.0 involves linking Talbingo and Tantangara reservoirs within the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme) and building an underground power station between the two reservoirs.

Future Generation proposes to carry out the Exploratory Works – Stage 2 prior to the main construction works for the Project, to inform the detailed design and to reduce project risk. Exploratory Works are required to obtain detailed geological data for the location of the underground power station. An exploratory tunnel is to be constructed to gain this information. The Exploratory Works – Stage 2 will predominantly be in the Lobs Hole area of KNP. If the Exploratory Works are not undertaken, risks to the design and construct elements of the power station cavern are significantly increased.

The Exploratory Works EIS was prepared to assess the impact of these works on the environment, including an assessment of excavated material impacts within the following sections:

- Section 2.5 Excavated Rock Management;
- Section 5.3 Land;
- Appendix H Soil and Land Assessment;
- Appendix J Phase 1 Contamination Assessment;
- Appendix K Excavated Rock Emplacement Areas Assessment; and
- Appendix L Barge access infrastructure (including subaqueous excavated rock placement assessment).

The RTS included REMMs within Chapter 8. The management measures from that report have been addressed within this EMMP.

1.2.1. Modification 1

In accordance with section 5.25 of the EP&A Act, the Infrastructure Approval issued for Exploratory Works was modified to:

- provide additional geotechnical information for the detailed design of the Snowy 2.0 power station and power waterway;
- provide a reliable long term source of construction power for the duration of Exploratory Works and will reduce the reliance on diesel generation and associated on-site storage and emissions;
- improve the efficiency of the Exploratory Works construction power;
- optimise the detailed design of construction areas and access roads; and
- improve worker safety during construction.

The Modification 1 Assessment Report was submitted to DPIE in June 2019, and was publicly exhibited between 26 June 2019 and 9 July 2019. A total of nine submissions were received, and following consideration, approval was granted by the Minister for Planning and Public Spaces on 2 December 2019.

Though Modification 1 included several changes, only the geotechnical investigations are relevant to the Stage 2 works and Future Generation's activities for the Exploratory Works project. This EMMP has been revised to address the excavated material management measures from Modification 1 which are relevant to the geotechnical activities.

1.2.2. Modification 2

In accordance with section 5.25 of the EP&A Act, the Infrastructure Approval issued for Exploratory Works was modified to:

- revise the tunnelling method from drill and blast to predominantly tunnel boring machine (TBM);
- provide for road upgrades required to enable the transport and delivery of TBM equipment and materials required for tunnelling;
- include vegetation trimming, and selective tree lopping/removal on Lobs Hole Ravine Road (south) to provide adequate clearance for transport of the TBMs;
- improve access and egress to Lobs Hole via Lobs Hole Ravine Road (north);
- relocate the Middle Bay Barge ramp;
- increase the capacity of the Lobs Hole accommodation camp from 152 personnel to up to 250;
- provide for additional diesel storage capacity for the TBM until the Lobs Hole substation construction power is available;
- provide for the additional diesel generators required to provide power supply to the TBM prior to Lobs Hole substation commissioning; and
- revise the transport strategy to reduce the use of barging for delivery of materials to site.

The Modification 2 Assessment Report was submitted to DPIE in October 2019, and was publicly exhibited between 5 November 2019 and 21 November 2019. A total of twenty-seven submissions were received, and following consideration, approval was granted by the Minister for Planning and Public Spaces.

This EMMP has been revised to address the changes which have occurred as a result of Modification 2.

1.3. Environmental Management System

The overall environmental management system for the Project is described in the Future Generation EMS. This EMMP forms part of Future Generation's environmental management framework for the Project as described in Section 4 of the EMS.

This Plan aims to transfer the relevant requirements of the Approval documents into a management plan which can be practically applied on the Project site.

1.4. Relationship to Project Management System and other Project Plans

It is a requirement of Volume 4 Employer's Requirements – Project Execution to develop and implement a number of project plans for the project. These plans are defined as deliverables. The EMMP is required to support the deliverable plans.

The Environmental Management Strategy (EMS) will form part of the Project Management System (Future Generation-PMS) and will include any requirements specified in the contract documents, where appropriate. All Future Generation-PMS procedures will support, interface or directly relate to the development and execution of the plan.

The Project Execution Plan (PEP) is the overarching document that outlines the minimum requirements for project management on the project. The PEP is not a standalone document and has been prepared with consideration to other project plan requirements. The PEP will also detail the interfaces between other project plans and provide information on the responsibility and management of the interfaces and project works.

All project plans are reviewed by the Quality Manager and/or Systems Manager to ensure consistency with the Quality Management Plan (QMP) and Future Generation-PMS.

1.5. Purpose and Objectives

The purpose of this Plan is to describe how the Project proposes to minimise and manage construction impacts on excavated material during construction of the Project.

The key objective of the EMMP is to describe the management measures that are to be implemented during the construction stage of the Project to ensure that environmental impacts from excavated materials are minimised and within the scope permitted by the CoA. To achieve this, Snowy Hydro and Future Generation will:

- ensure appropriate measures are implemented during construction to avoid or minimise potential impacts from excavated materials on the surrounding environment;
- ensure appropriate measures are implemented to address the relevant CoA and the REMMs listed within the Submissions Report, the Submissions Report for Modification 1 and the Submissions Report for Modification 2, as detailed within Table 2-1 and Table 2-2 of this Plan;
- provide details of the testing, classification, handling, storage requirements, re-use and/or disposal methods of the excavated materials produced during construction;
- identify opportunities for the beneficial reuse of excavated materials produced during construction; and
- establish a monitoring program to assess the effectiveness of the excavated material management controls.

1.6. Consultation and Approval

In accordance with Schedule 3, Condition 29 of the Infrastructure Approval (SSI 9208) dated 7 February 2019, this EMMP is to be prepared in consultation with the NSW Environment Protection Authority (EPA) and to the satisfaction of the Planning Secretary and National Parks and Wildlife Service (NPWS).

On 20 April 2019, the Plan was issued to relevant stakeholders for review and comment. Comments from consultation have been incorporated into this Plan where appropriate. Response to the comments have been provided back to the stakeholders. Comments are summarised in Table 1-2. A separate document has been prepared detailing the consultation process.

Table 1-2: Stage 2 Consultation with stakeholders - summary

Date	Consultation	Outcomes
Stage 2 Consultation		
27 May 2019	Management Plan submitted to EPA, NPWS, DoI Water and DoI Fisheries	-
5 June 2019	Agency briefing meeting held with EPA, NPWS, DoI Fisheries, DoI Water and Snowy Hydro	
11 June 2019	NPWS	Comments received on management plan. Management plan updated to reflect comments.
9 July 2019	EPA	Comments received on management plan. Management plan updated to reflect comments.

Revision 3 of the EMMP (prepared to address changes from Modification 1 and Modification 2 of the Infrastructure Approval), was issued to the following agencies for consultation:

- NPWS on 6 April 2020; and
- EPA on 6 April 2020.

Comments from agency consultation have been incorporated into this EMMP.

1.7. Construction Activities

This Plan relates to Stage 2 works. Stage 2 will include the following:

- pre-construction minor works (not construction activities) including:
  - building/road dilapidation studies;
  - survey works;
  - installing groundwater bores in the Ravine beds on site for water supply;
  - establishing a temporary site office;
  - minor access roads to facilitate the pre-construction minor works;
  - installation of environmental impact mitigation measures, including the installation of monitoring equipment, erosion and sediment controls, and fencing;
  - minor clearing or translocation of native vegetation within the approved disturbance footprint for the pre-construction minor works;
- the exploratory tunnel which is approximately 3.1 km long and will lead to the site of the underground power station. Excavation of the tunnel will occur through a method of both drill and blast and TBM;
- road upgrades for transport and delivery of the TBM and TBM equipment (undertaken by Snowy Hydro);
- a turnaround area on Link Road for transportation of the TBM equipment and materials to the construction areas at Lobs Hole and to facilitate set down and turn-back of oversize and overmass (OSOM) deliveries;
- horizontal and other test drilling, investigations and analysis in situ at the proposed cavern location and associated areas, and around the portal construction pad, access roads and excavated rock management areas all within the disturbance footprint;
- borehole drilling and geophysical surveys for further geotechnical investigation of the Snowy 2.0 power station and power waterway at Marica, Talbingo and Tantangara;
- ongoing groundwater monitoring using existing boreholes and access tracks within KNP;
- ongoing maintenance and rehabilitation of existing access tracks required for groundwater monitoring and geotechnical investigations within KNP;
- additional geotechnical drilling is proposed to enable investigation and detailed design of critical bridge works (Nungar Creek bridge) on Tantangara Road;
- additional laydown areas at Talbingo north for the transfer of plant and materials are proposed within Modification 1 to improve constructability;
- a portal construction pad for the exploratory tunnel. This will provide the entrance structure to the tunnel and an area for infrastructure and equipment needed to support tunnelling activities;

- an accommodation camp for the Exploratory Works construction workforce;
- barge access infrastructure, including one new barge ramp at Middle Bay near Lobs Hole at the southern part of Talbingo Reservoir;
- excavated rock management, including subaqueous placement within Talbingo Reservoir*. Up to 750,000 m3 of excavated rock will need to be tested for its geochemical properties (ie whether the rock is reactive or non-reactive) before being managed by a combination of the following options:
    - re-use – suitable material can be used as construction materials for roads or similar. Some materials will be provided to NPWS for use in road maintenance and upgrades in other areas of KNP;
    - on land placement – material will be placed in one of two on land emplacement areas. The eastern emplacement area has been designed to safely treat reactive material during temporary storage. The western emplacement area will be used for temporary storage of materials for re-use or offsite disposal (*Note: no material is to remain at any emplacement area and must be either subaqueously placed at Talbingo Reservoir or removed to a suitable place outside of KNP within three years of completion of the exploratory works (should Snowy 2.0 Main Works not proceed)*);
    - subaqueous placement within Talbingo Reservoir* - suitable material will be placed at a suitable location within Talbingo Reservoir, subject to a number of water quality controls and monitoring; and
- services infrastructure such as diesel-generated power, water and communication; and
- post-construction revegetation and rehabilitation, management and monitoring.

Note: these activities will not proceed unless the relevant management plans are approved by DPIE.

1.7.1. Works approved through Modification 1

The Exploratory Works - Modification 1 works scope is included in Table 1-3. For clarity this has been divided between Stage 1 and Stage 2 works.

The revised project boundary (disturbance footprint) for the project, as approved through Modification 1 of the Infrastructure Approval, has been included in Appendix E of this plan.

Table 1-3: Exploratory Works - Modification 1 works scope (Stage 1 and Stage 2)

Modification 1 - Stage 1 works	
Activity	**Description**
Lobs Hole Substation	Additional disturbance area required for the construction power connection to an existing transmission line (Line 2) at Lobs Hole for power supply to the Exploratory Works accommodation camp and construction areas. This will provide a reliable and long-term source of construction power and will reduce the reliance on diesel generation and associated on-site storage requirements and emissions. Works in this area will include establishing a substation, connection infrastructure, access roads and ancillary construction areas. This will include: • construction of a 330/33 kV substation within Kosciuszko National Park and adjacent to Line 2, which forms a 330-kV connection between Upper Tumut Switching Station and Yass Substation; • geotechnical investigation works to inform the detailed design of the construction power substation;

	• replacement of one transmission support structure (Structure 54) within the existing transmission easement. This will involve removal of the existing structure and establishment of one new steel lattice tower, approximately 50 m in height; • short overhead 330 kV transmission line connections (approximately 100 m in length) between the substation and the new Structure 54; • 33 kV feeder connection between the substation and the Exploratory Works construction power network. This will be either overhead lines or underground cables; • establishment and upgrade of access tracks and roads to the new substation and transmission line structures; • installation of a fibre optic communication link into the new substation from the approved communication network; and • ancillary activities, including brake and winch sites, crane pads, site compounds and equipment laydown areas. (Illustrated in Appendix E, Figure 1i).
Camps Bridge and Wallaces Creek	Additional disturbance area around Camp Bridge and Wallaces Creek Bridge required for improved constructability of the crossings. Works within these areas will include vegetation clearing, levelling earthwork, erection of falsework, sediment controls, laydown, parking and movement of equipment. (Illustrated in Appendix E, Figures 1h and 1i).
Lobs Hill Ravine Road and Construction Boundary Changes	Minor changes to the project boundary identified through detailed design including: • revised road upgrade for Lobs Hole/Ravine Road to improve access, drainage and safety; • minor additions to construction areas for design optimisation. • removal of dangerous trees on Lobs Hole Ravine Road. This will involve either complete or partial removal of up to 91 trees that have been identified to pose a safety risk to road users on Lobs Hole Ravine Road and Mine Trail Road; (Illustrated in Appendix E, Figures 1b to 1f and Figure 1i).
Operating Hours	Modify operating hours for the use of Upper Lobs Hole Ravine Road from 7 am to 6pm to sunrise to sunset.
Miscellaneous	Continued use of existing communications towers within KNP that were previously approved by the NPWS under a separate review of environmental factors (REF R – Wallaces Creek Geotechnical drilling) environmental impact assessment carried out under the NSW *National Parks and Wildlife Act 1974* (NPW Act) and its regulation for the geotechnical investigation program; and Increase in peak traffic volumes. Additional vehicles will be required to access the site to facilitate construction of Exploratory Works, however no change in impacts to the road network are expected. (The location of the communications towers are illustrated in Appendix E, Figures 1a, 1f and 1l).
Modification 1 - Stage 2 works	
Activity	**Description**
Borehole drilling and geophysical surveys	This includes: • borehole drilling and geophysical surveys for further geotechnical investigation of the Snowy 2.0 power station and power waterway at Marica, Talbingo and Tantangara; • clearing of up to 2.79 hectares (ha) of additional vegetation for access tracks and drilling pads. About 1.33 ha within Smokey Mouse potential habitat; • trimming of overhanging dangerous branches on adjacent trees (these trees will not require removal); • mulching of trees and vegetation; • establishment of an additional 1 km of access tracks (4 m wide), including minor earthworks; • placement of geofabric (as required) and import of stabilised material;

	• establishment of eight drilling pads and boreholes at top of the cavern area, with an area of 900 m2 per pad, including minor earthworks, placement of geofabric (as required) and import of stabilised material (as required); • undertaking geophysical surveys near Talbingo and Tantangara reservoirs; • establishment of two drilling pads and boreholes at both Tantangara and Talbingo with an area of 900 m2 per pad, including approximately 400 m of additional access tracks and minor earthworks (as required); • establishment of in-reservoir boreholes including one in Talbingo Reservoir and two in Tantangara Reservoir; • drilling of additional nested vertical boreholes at each of the drilling pads up to a depth of 1,100 m; • conversion of the investigation boreholes into monitoring bores; • undertaking geophysical surveys; • rehabilitation of the drilling pads and access tracks following completion of works; • ongoing maintenance of existing access tracks required for geotechnical investigations within KNP. (Illustrated in Appendix E, Figures 1j, 1k, 1l, 1m and 1n).
Talbingo Laydown	Outside of KNP, Snowy Hydro is proposing to add four laydown locations to facilitate the construction of the communications cable linking Lobs Hole with the Tumut 3 Power Station. These are proposed on existing hardstand areas along the northern foreshore of Talbingo Reservoir within Snowy Hydro owned land. Additional widening of Spillway Road for accessibility is required. (Illustrated in Appendix E, Figure 1o).
Tantangara Access	Two additional geotechnical boreholes are required to facilitate the detailed design of cuttings, bridge foundations, retaining wall foundations, and drainage structures near Nungar Creek. (Illustrated in Appendix E, Figure 1m).
Operating Hours	Modify operating hours for the use of Upper Lobs Hole Ravine Road from 7 am to 6pm to sunrise to sunset.

1.7.2. Works approved through Modification 2

The Exploratory Works - Modification 2 scope for Stage 2 works is included in Table 1-4.

The revised project boundary (disturbance footprint) for the project, as approved through Modification 2 of the Infrastructure Approval, has been included in Appendix E.

Table 1-4: Exploratory Works - Modification 2 works scope (Stage 2)

Modification 2 - Stage 2 works	
Activity	**Description**
Tunnelling	The tunnelling methodology has been revised and include the following: • TBM method will used to excavate the exploratory tunnel. The TBMs will be fully equipped to perform the excavation, ventilation, lining, and removal of excavated material; • the TBMs will be engineered to facilitate dismantling operations. This will avoid the need to excavate a preliminary dismantling chamber and allow the TBMs to be retrieved from the tunnel, thereby reducing the amount of excavated rock material; • the TBM will be equipped with devices to perform the following surveys: – geophysical seismic reflection surveys; – geoelectrical surveys; and – systematic probe core retrieval ahead of the advancing tunnel face;

Modification 2 - Stage 2 works	
Activity	**Description**
	• the probing results will also be used to determine the presence of potentially acid forming (PAF) and naturally occurring asbestos (NOA) material; • the TBMs will be equipped with drilling machines to drill drainage holes with pipes to relieve groundwater pressures. If required, pre-excavation grouting will also be used to seal-off groundwater inflow and to improve the stability of the excavation face; • post-excavation grouting from the segmental lining may also be used to further consolidate the surrounding rock and/or prevent water ingress if required. (Illustrated in Appendix E)
Design	Detailed design and geotechnical investigations have been optimised. The project optimisation is expected to reduce the exploratory tunnel length by approximately 600 m and reduce the volume of excavated material by approximately 65,000 m^3. (Illustrated in Appendix E)
Road upgrades (undertaken by Future Generation and Snowy Hydro or their contractors)	Minor road upgrade works will be undertaken to enable transport of TBM equipment and materials required for tunnelling. The road upgrades have been designed to avoid additionally impacting any areas of geodiversity significance including the boulder streams, karst and fossil features on Lobs Hole Ravine Road. (Illustrated in Appendix E)
Vegetation Clearing (undertaken by Future Generation and Snowy Hydro or their contractors)	The additional clearing will include approximately 2.78 ha of vegetation to establish road upgrades on Lobs Hole Ravine Road (south), Lobs Hole Ravine Road (north) and Link Road. (Illustrated in Appendix E)
Transport Strategy	Modification 2 proposes to revise the transport strategy so that materials and equipment required for Exploratory Works will be delivered using Lobs Hole Ravine Road (south) as the primary access road. (Illustrated in Appendix E)
Link Road Turnaround Area (undertaken by Snowy Hydro or their contractors)	A turnaround area will be established on Link Road for safe transportation of the TBM equipment and materials to the construction areas at Lobs Hole. The turnaround area will facilitate set down and turn-back of oversize and overmass deliveries. (Illustrated in Appendix E)
Lobs Hole Ravine Road (south) (undertaken by Snowy Hydro or their contractors)	Minor upgrade works will be undertaken on sections Lobs Hole Ravine Road (south) to enable the transport of the TBM equipment. (Illustrated in Appendix E)
Lobs Hole Ravine Road (north)	Roadworks will be conducted at Lobs Hole Ravine Road (North) to provide improved access and egress to Lobs Hole. Road works will include road upgrade and widening in several sections suitable for passing bays as well as regular maintenance of the existing roadway. (Illustrated in Appendix E)
Middle Bay Barge Ramp	The location of the Middle Bay barge ramp was revised as part of further refinement to the construction methodology. An alternative location for the Middle Bay barge ramp was identified to the west of the approved barge ramp location. A key benefit of the new barge ramp location is that it minimises the requirement for dredging as part of the barge ramp construction. (Illustrated in Appendix E)
Accommodation Camp	Lobs Hole accommodation camp will increase capacity to provide beds for up to 250 personnel. The additional accommodation will be created through an additional storey to the Lobs Hole

Modification 2 - Stage 2 works	
Activity	**Description**
	accommodation camp using modular and stackable accommodation units that will allow the expansion to be entirely within the existing disturbance footprint.
Power Supply	Additional power supply capacity is required to enable TBM tunnelling for Exploratory Works. The Lobs Hole substation proposed under Modification 1 is scheduled to be online from approximately October 2020 and will provide the power supply required for operation of the TBM. It is currently planned to commence tunnelling with the TBM from August 2020. In the period prior to the Lobs Hole substation commissioning the additional power supply required for TBM tunnelling will be provided by additional diesel generator sets. Diesel generator sets with a total capacity of 20 MVa as well as an additional three 65 kL diesel storage tanks will be installed at the portal construction pad. (Illustrated in Appendix E)

2. ENVIRONMENTAL REQUIREMENTS

2.1. Legislation

Legislation relevant to excavated material includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation);
- *Contaminated Land Management Act 1997* (the CLM Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Protection of the Environment Operations (General) Regulation 2009* (POEO General Regulation);
- *Protection of the Environment Operations (Waste) Regulation 2014* (POEO Waste Regulation); and
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A1 of the EMS.

2.2. Conditions of Approval

Table 2-1 details the conditions from the Infrastructure Approval which are relevant to excavated material management.

Table 2-1: Conditions of approval relevant to excavated materials management

Condition	Requirement	Where addressed
Sch 3 Cond 22	The Proponent must: (a) conduct detailed testing of the physical and chemical characteristics of the excavated material;	Section 5.1 of this Plan
	(b) classify, handle, store and/or dispose of this material in accordance with the results of this testing;	Sections 5.1 to 5.5 of this Plan
	(c) not place dredge material in the eastern and western emplacement areas;	Section 5.3 of this Plan
	(d) not place any material obtained from tunnel excavation using the tunnel boring machine in Talbingo Reservoir;	Table 5-2 EM22

Condition	Requirement	Where addressed
	(e) only place excavated material in the western emplacement area that is non-reactive, has low geochemical risk and will be reused;	Section 5.3 of this Plan
	(f) develop and implement suitable procedures for handling, storing and disposing of any material from tunnel excavation: • potentially acid forming material; • asbestiform mineral fibres; • contaminated material; and	Sections 5.1 to 5.5 of this Plan
	(g) avoid and/or minimise the water quality impacts of the emplacement areas.	Sections 5.3 and 5.4 of this Plan and Surface Water Management Plan
Sch 3 Cond 23	Subject to obtaining the further approvals required under this approval, the Proponent may: • provide excavated material to the NPWS for reuse within the Kosciuszko National Park;	Section 5.3 and 5.5.2 of this Plan
	• reuse excavated material in the rehabilitation of the site;	
	• place excavated material in the designated subaqueous emplacement areas; and	Section 5.5.1 of this Plan
	• return the excavated material to the exploratory tunnel.	Section 5.5.2 of this Plan
Sch 3 Cond 24	Within 3 years of the completion of the exploratory tunnel works, unless the Planning Secretary directs otherwise, the Proponent must remove any remaining extractive material from the Kosciuszko National Park. Note: In this condition, the remaining extractive material refers to the extractive material on site that cannot be disposed of under condition 23 above.	Section 5.6 of this Plan
Sch 3 Cond 29	Excavated Material Management Plan Prior to carrying out any excavation under this approval, the Proponent must prepare an Excavated Material Management Plan for the development to the satisfaction of the Planning Secretary/NPWS. This plan must: (a) be prepared in consultation with the EPA;	This Plan Section 1.6 of this Plan
	(b) identify opportunities for the reuse of excavated material in the construction of the development, rehabilitation of the site, or in other parts of the Kosciuszko National Park;	Section 5.5.2 of this Plan
	(c) describe the measures that would be implemented to comply with condition 22 above;	Section 55 of this Plan
	(d) describe the measures that would be implemented during dredging, and construction of barge and other infrastructure in Talbingo Reservoir to: • minimise the water quality impacts; • minimise the aquatic habitat and species impacts; and	Section 4.2.2 of this Plan and the Dredge Management Plan (prepared as part of the Water Management Plan in accordance with CoA 34)

Condition	Requirement	Where addressed
	(e) include a copy of the Subaqueous Emplacement Management Plan (once it has been approved); and	Section 5.5.1. The Subaqueous Emplacement Management Plan will be prepared (and approved) prior to commencement of subaqueous placement of spoil.
	(f) include a program to monitor and review the effectiveness of these measures.	Section 6.1 of this Plan
Sch 3 Cond 30	The Proponent must implement the approved Excavated Material Management Plan for the development.	Section 1.3 and Section 1.4 of this Plan.

2.3. Revised Environmental Management Measures

Environmental safeguards and management measures are included in the EIS in Section 6.3. During preparation of the Submissions Report, REMMs were developed and are included in Section 8 of the Submissions Report.

The REMMs relevant to this Plan are listed in Table 2-2 below. If additional measures are cross-referenced from another section of the EIS or Submissions Report, these measures are also included.

Table 2-2: Management measures from the Submissions Report relevant to excavated material

Impact	Ref #	Environmental management measure	Where addressed
Impacts to soil resources	SOIL01	Soil management procedures (including stripping, stockpiling and application) will be implemented as part of the CEMP. The objectives of soil management will be to: • preserve as much of the topsoil and subsoil as possible; • minimise the risk of contamination; • minimise the risk of any topsoil degradation or compaction during construction and following reinstatement; • ameliorate subsoil where required for use in rehabilitation works; • minimise topsoil mixing with unsuitable soil and spoil materials during stripping and stockpiling; and • ensure reinstatement of soil horizons in the correct order and required depths to allow for rehabilitation.	Table 5-2 and Section 5.2 of this Plan
		Topsoil and subsoil will be stripped, stockpiled and handled during construction to avoid degradation. Management measures that will be implemented include: • the topsoil stripping procedure and stockpiling procedure will be developed and implemented to maximise the salvage of materials and minimise soil degradation; • structural decline of soil will be minimised by using suitable machinery, timing stripping where practicable, using correct stockpile development techniques and minimising handling of topsoil materials; • topsoil and subsoil will be stockpiled, with stockpiles designed and located to minimise contamination, development of anaerobic conditions, and to avoid erosion and dust generation;	Table 5-2 and Section 5.2 of this Plan

Impact	Ref #	Environmental management measure	Where addressed
		• nutrient decline will be minimised by managing stockpile methods and heights; • stockpiles will be regularly inspected for weeds; and • to minimise the risk of loss from wind and water erosion to stockpiled topsoil, a vegetative cover will be established, or the stockpile covered.	
Contaminated land	CON02	An Excavated Rock Management Plan will be prepared prior to the commencement of tunneling. The Plan will include:	This Plan
		• protocols for handling, geochemical testing, classification, storage and disposal/placement of excavated rock will be implemented to ensure that excavated material is appropriately managed; and	Sections 5.1 - 5.7, and 6.1 of this Plan
		• monitoring measures to be included as part of the Surface and Groundwater Monitoring Program, to monitor potential impacts from the placement of excavated rock material.	Surface Water Management Plan and Groundwater Management Plan
		• management measures which include: – stockpile designs will incorporate benching and bunding to avoid mobilisation of sediment and rock; – controls to avoid the risk of acid or metal laden run off into the Yarrangobilly River; – progressive verification of the adequacy of design options; – minimisation of placement footprint where possible; and – minimising the construction footprint and extent to which soil and vegetation within the riparian zone are disturbed.	Section 5.3 and 5.4 of this Plan
	CON03	Excavated material which is classified as contaminated, which is not suitable for reuse on site or on onsite remediation, will be transported to a disposal facility that is legally able to accept the material for reuse or disposal. The material will be classified and disposed of to an appropriately licensed facility in accordance with the Waste Classification Guidelines (NSW EPA 2014).	Section 5.1.7 and 5.5.3 of this Plan
Water quality impacts from rock emplacement areas	WM8.1	The eastern and western rock and soil emplacement areas will be constructed as temporary landforms. The rock will be subject to the subaqueous emplacement program associated with Exploratory Works. Soil will be used for rehabilitation. Should any rock remain at these locations following the conclusion of Exploratory Works, it will be transported to a nominated location outside of Kosciuszko National Park within a timeframe agreed with NPWS.	Sections 5.3 and 5.5 of this Plan
	WM8.2	During establishment, the water management controls for construction areas (WM_2.1 to 2.8) will be applied.	Section 5.7 and Surface Water Management Plan
	WM8.3	The western emplacement area will be used to store cuttings and other material that has a low geochemical risk. This landform will be built in a manner that limits compaction and will be top-soiled and vegetated to stabilise the landform.	Section 5.3 of this Plan
	WM8.4	Any remnant mine workings located within the eastern and western rock and soil emplacement areas will be rehabilitated (if necessary).	Section 5.6 of this Plan

Impact	Ref #	Environmental management measure	Where addressed
	WM8.5	The eastern emplacement area will be used to store any material that has higher geochemical risk. Excavated material will be geochemically characterised prior to placement. If any potentially acid forming material is encountered, it will be placed in a select area of the emplacement. The potential for acid rock drainage will be treated by placing and compacting layers of limestone (or other suitable AC material) between each rock and sediment layer as required. The volume of limestone (or other suitable AC material) in each layer will be determined stoichiometrically so that the maximum potential acidity from the overlying layer of rock and sediment is treated. This approach will neutralise AMD within the stockpile. Once design levels are reached, the landform will be top-soiled and vegetated.	Section 5.3 to 5.7 of this Plan
	WM8.6	Runoff from Lick Hole Gully will be diverted around or through the eastern emplacement area. The diversion works will comprise a dam upstream of the diversion inlet and either a gravity or pump assisted diversion system. The diversion works will have a 1% AEP capacity. The dam upstream of the diversion inlet will be designed as a detention basin and will not permanently hold water. A high-flow diversion drain will be established to convey runoff from Lick Hole Gully around the emplacement area in a controlled manner, avoiding uncontrolled overflows through the emplacement area. This diversion drain will only be engaged if a flood greater than a 1%AEP event occurs.	Section 5.3 and 5.7 of this Plan
	WM8.7	Seepage from the eastern emplacement area will be collected in a water management dam. Collected water will either be irrigated to the emplacement (to promote evaporation) or treated in the process water treatment plant. Discharge of seepage water to the Yarrangobilly River will be avoided.	Section 5.3 and 5.7 of this Plan
	WM8.8	The eastern and western emplacement areas will be rehabilitated following removal of all material. Lick Hole Gully will be resinated as part of the rehabilitation works. Geomorphic and ecological characterisation of Lick Hole Gully will be undertaken prior to disturbance to record the existing conditions and values of Lick Hole Gully. The rehabilitation approach will seek to create a physically stable landform that reinstates or improves the existing values.	Section 5.6 and 5.7 of this Plan
Excavated material management	MOD2 - 005	The Excavated Material Management Plan will be updated and the Subaqueous Emplacement Management Plan will be prepared to provide consideration to the management of excavated material generated by TBM tunnelling.	This Plan Section 4.2.4.2

2.4. Permits and Licences

Environment Protection Licence (EPL) (No 21266) has been issued for the Project for the scheduled activity of extractive activities. The EPL details conditions which must be complied with when undertaking the extractive activities works. This plan is written in accordance with all requirements in the EPL.

Future Generation have obtained an Agreement for Lease (AFL) with NPWS, with an accompanying Works Access Licence in order to carry out the relevant Stage 2 Exploratory Works in accordance with the Exploratory Works EIS, CSSI 9208 and the approved Management Plans.

2.5. Guidelines

The guidelines considered in the development and implementation of this management plan include:

- *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Land* (NSW Gov 2013);
- *Soil and Landscape Issues in Environmental Impact Assessment* (DLWC 2000);
- *Acid Sulfate Soils Assessment Guidelines* (Ahern et al. 1998);
- *The land and soil capability assessment scheme: second approximation* (OEH 2012);
- *Australian soil classification* (Isbell 2016);
- *NSW EPA Guidelines for consultants Reporting on Contaminated Sites* (OEH 2011);
- *Waste Classification Guidelines Part 1: Classifying waste* (NSW EPA 2014);
- *Managing Urban Stormwater: Soils and Construction*. Landcom, (4th Edition) March 2004 (reprinted 2006) (the Blue Book); and
- *Acid Sulfate Soils Manual, NSW Acid Sulfate Soil Management Advisory Committee, 1998.*

3. EXISTING ENVIRONMENT

3.1. Topography and Landscape

The Project area is within a steeply incised ravine, along the western fringe of the Long Plains fault escarpment. Most of the project area is characterised by deep gorges and steep sloping ridges, the product of incision from watercourse flow and glaciations, with localised areas of lower grade, such as ridgelines, saddles, benches, and alluvium beside watercourses.

3.2. Geology

The geology of Exploratory Works area comprises a complex series of metamorphosed Ordovician to Devonian sandstones, shales and volcanic rocks intruded by numerous granite bodies and deformed by four episodes of folding, faulting and uplift.

The Ravine Beds are the primary geological unit to be intercepted by the exploratory tunnel and surface geology is dominated by Devonian to Silurian sedimentary units, comprising younger lava flows along steep escarpments within the Ravine incised area, giving way to older reef sediments within incised valley floors. Minor colluviums are present along the Yarrangobilly River floodplain terrace.

3.3. Surface Soil Characteristics

There are four major soil types within the Exploratory Work disturbance footprint: the major soil orders are Kandosols and Tenosols, with small areas of Dermosols and Vertosols. Kandosols are associated with the lower slopes and flats of Lobs Hole as well as being a transitional soil (between Tenosols and Vertosols) along Mine Trail Road and the portal construction pad area. Large areas of these landscapes have been cleared. Tenosols are associated with mid to upper slopes and crests of undulating hills which contain largely undisturbed native vegetation. Small areas of Vertosols, mapped along a flood plain adjacent to Yarrangobilly River, and a small area of Dermosols have also been identified in the disturbance footprint.

3.4. Existing Soil Contamination

As part of the Exploratory Works EIS soil sample results were compared to the NEPM health investigation and screening levels HIL/HSL B (applicable to residential sites with minimal soil access such as will be the case at the accommodation camp) and HIL/HSL C (applicable to public open spaces) and ecological investigation levels (EILs). Concentrations and analytes analysed were below the applicable human health investigation and screening criteria at all locations however, some exceedances of EILs for copper, nickel, arsenic and zinc were identified. It is inferred that these exceedances are related to former mine workings, and others are likely to be due to natural background levels. The areas of high environmental concern discussed in Section 6.4 and 6.5 of the *EIS Appendix J Phase 1 Contamination Assessment* included the south adit area and the shallow groundwater within the Lobs Hole area.

The *Exploratory Works Existing Contamination* report was prepared by EMM, May 2018, in order to inform the development of the EIS for Exploratory Works. The following potential contaminants of concern across the Exploratory Works site were highlighted within the report:

- mining aspects - metal rich, Acid metalliferous drainage (AMD) producing rock, low/high pH, elevated metal leachate, residues from smelting;
- historic accommodation aspects – demolition waster, fuel storage, waste dumps;
- camping areas aspects – waste disposal; and
- agricultural aspects – application of nutrients and pesticide use.

The *Contamination Investigation Interpretive Report Exploratory Surface Works Roads – Ravine and Mine Trail* was prepared by SMEC, September 2018, in order to assess the potential for disturbing contaminated, AMDs or NOA materials along the road alignment during Exploratory Works road construction. This report identified that the proposed Mine Trail Road alignment passes near to the historic Lobs Hole mine site. Processed copper slag material was observed underlying the current road alignment, and mine fill material was also present close to the mine (between CH100 to CH450, as defined by the SMEC report).

Stage 2 of the Exploratory Works will avoid impacts to identified areas of existing contaminated land associated with Lobs Hole Mine. Given the previous land use of the site (mining and Ravine Township) other areas of contamination may be inadvertently found during construction.

Based on previous investigations by Snowy Hydro and NPWS, there is a risk of encountering pre-existing contaminated soil from previous land use activities at Lobs Hole during Stage 2 works. Measures to manage placement of excavated materials and encountering in-situ contamination in the adit area are described in Section 5.1.

Any contaminated materials encountered during works will be managed in accordance with the Contaminated Land Management Plan. Off-site disposal will occur in accordance with Section 5.5.3 and the Waste Management Plan.

3.5. Naturally Occurring Asbestos (NOA) material

NOA is the natural geological occurrence of asbestos (asbestiform) minerals found in association with geological deposits including rock, sediment or soil (WHS Regulation). The EIS reported that there is potential for naturally occurring asbestos within the Exploratory Works project area. The area of low potential as identified from the Geological Survey of NSW is within the Jackalass Slate Formation, through a 600 m section of Ravine Road and running parallel to the existing transmission lines that traverse the project area. The location of NOA is presented graphically in Appendix C.

3.5.1. Stage 1

The *Contamination Investigation Interpretive Report* was prepared by SMEC, August 2018, in order to assess the potential for disturbing contaminated materials, AMD materials or NOA materials at the Exploratory Works site during road construction. This report assigned an initial classification of “unlikely” to encounter NOA on Lobs Hole Ravine Road and Mine Trail Road.

Furthermore, there was no NOA detected in any of the samples collected from Lobs Hole Ravine Road or Mine Trail Road.

Based on the underlying geology, investigations and samples collected to date it is considered unlikely that NOA will be encountered at other areas of the site disturbed by Stage 1 of Exploratory Works.

3.5.2. Stage 2

The *Naturally Occurring Asbestos and Other Hazardous Mineral Fibres* report was prepared by SMEC, October 2018, and provides preliminary information specifically relevant to Exploratory Works Stage 2. From the testing undertaken during the preparation of the report and the associated risk assessment NOA theoretically has the potential to exist below ground due to the geological conditions and at the surface of the following rock groups:

- Gooandra Volcanics formation;
- Boggy Plain Suite formation;
- Shaw Hill Gabbro formation;
- Boraig Group;
- Boraig Group/Ravine Beds Contact Area;
- Temperance formation; and
- Tumut Ponds Serpentinite.

The Boraig Group/Ravine Beds Contact Area lies in close proximity to the Exploratory Works portal. The boundaries of the Boraig Group/Ravine Beds Contact Area are currently undefined and were only approximate in the SMEC report. The Boraig Group formation may be intercepted by the Exploratory Works tunnel. This formation was determined to have the possibility of containing NOA due only from sample descriptions from investigations by the Snowy Mountains Hydro Electric Authority (SMHEA) in the 1950’s.

Based on the regional geology and previous geological desktop investigations, Snowy Hydro concluded that although possible, it is unlikely that NOA will be encountered during the exploratory works. This finding is summarised in Table 3-1. This finding is also sumarised in Chapter 5.3 of the EIS which states that NOA is present in the vicinity of Exploratory Works (Ravine Beds) but are outside of the project boundary.

Table 3-1: Likelihood of NOA and hazardous mineral fibres relevant to Stage 2

Location	Geology	Likelihood
Accommodation camp	Ravine beds	Unlikely – certain exclusion of rock formation potentially containing asbestiform minerals.
Exploratory tunnel	Ravine beds Byron Range Group	Unlikely – certain exclusion of rock formation potentially containing asbestiform minerals.

3.6. Acid Metalliferous Drainage

Potentially acid forming (PAF) rock is spoil material containing mainly pyrite, potentially forming and releasing acidic and metal rich discharge upon exposure to oxygen and liquid. Whether rock is PAF or non-acid forming (NAF) and/or acid consuming (AC) is determined from the acid-base account.

The EIS identified that some of the tunnel rock may be PAF, requiring suitable management and design techniques for emplacement and disposal.

The *Acid Metalliferous Drainage report* was prepared by SMEC, October 2018, and provides preliminary information specifically relevant to the Main Project tunnel. From the testing undertaken during the preparation of the report and the associated risk assessment AMD has the potential to exist below ground and at the surface of the following rock groups:

- Boraig Group;
- Temperance Formation;
- Ravine Beds;
- Tantangara Formation;
- Shaw Hill Gabbro; and
- Goondara Volcanics.

The Interpreted Geology Longitudinal Section provided within the report identified the anticipated AMD conditions for the Stage 1 Exploratory Works area as “non-acid forming”.

3.6.1. Stage 1

The *Contamination Investigation Interpretive Report* was prepared by SMEC, September 2018, in order to assess the potential for disturbing contaminated materials, AMD materials or NOA materials at the exploratory works site during road construction. This report assigned a classification of “unlikely” to encounter AMD on Lobs Hole Ravine Road. No AMD was detected in any of the samples collected from Lobs Hole Ravine Road.

From CH0 to CH1600 the geology along Mine Trail Road is best described as being the Byron Range Group and a preliminary AMD classification of ‘unlikely’ was assigned in the report. Beyond Wallaces Creek from approximate CH1600 the preliminary AMD classification of ‘confirmed’ was assigned due to the proximity to the Ravine Beds.

3.6.2. Stage 2

The Exploratory Works tunnel would intercept the Ravine Beds and may intercept the Boraig Group. The Ravine Beds underly a section of Mine Trail Road beyond Wallace Creek from approximate chainage 1600 and Lobs Hole/Wharf Road beyond approximate chainage 1300.

Geochemical testing carried out by Snowy Hydro of samples from boreholes indicative of the Exploratory Work tunnel have shown two samples collected at the proposed depth of the exploratory tunnel are PAF with an acid forming potential of between 4.6-6.3 kg H2SO4/t. It should be noted; however, that the other rock samples had excess acid neutralising capacity (ANC) and are classified as AC. As such, there is potential that any acidity produced by PAF rock is consumed by the AC rock. Furthermore, the pH results show that all rock samples are alkaline and the electrical conductivity (EC) results do not indicate a potential salinity risk. Table 3-2 presents the likelihood of encountering AFR during Stage 2 works.

Table 3-2: Likelihood of encountering AFR

Location	Geology	Likelihood
Accommodation camp	Ravine beds	Confirmed – presence of rock formation containing potentially acid metalliferous drainage (AMD) forming rock – potentially AMD forming rock already detected.
Exploratory tunnel	Ravine beds	Confirmed – presence of rock formation containing potentially AMD forming rock – potentially AMD forming rock already detected.

3.7. Acid Sulfate Soils

The EIS determined that the project area is unlikely to contain acid sulfate soils.

4. ENVIRONMENTAL ASPECTS AND IMPACTS

4.1. Environmental Aspects and Impacts

An environmental aspect is an element of an organisation's activities, products, or services that has or may have an impact on the environment (ISO 14001 Environmental management systems). The relationship of aspects and impacts is one of cause and effect.

An environmental risk (aspects and impacts) register has been prepared and is presented in Appendix A3 of the EMS. The register identifies the environmental aspect, the potential impacts and likelihood of occurrence. Key aspects of the Project that could result in environmental impacts from land-based management of excavated materials are identified in Table 4-1. The extent of these impacts will depend on the nature, extent and magnitude of construction activities and their interaction with the natural environment (column 2). This is further exacerbated by environmental factors (column 3).

Risks and impacts associated with subaqueous placement of excavated material will be dealt with in the Subaqueous Emplacement Management Plan.

Table 4-1: Project aspects and impacts relevant to Excavated Material

Environmental Aspects (Key construction activities likely to cause potential impacts from excavated materials)	**Environmental Impacts**	**Environmental Factors** (Conditions)
• Topsoil stripping • Earthworks • Drainage works • Tunnelling works • Establishing areas for the accommodation camp and portal pad • Remediation of contaminated sites • Stockpiling of materials • Transport of materials • Storage of hazardous chemicals	• Generating and/or spreading contaminated waste materials to soil and water. • Sediment runoff. • Excess consumption of resource and energy use. • Excess waste being directed to landfill. • Unlawful disposal of materials. • Permanent and temporary loss of soils, landform and land capability. • Soil degradation – nutrient and structural decline. • Soil erosion – due to exposure of cleared areas and poor stockpile management.	• **Existing site contamination** – suitable materials can be re-used however contaminated materials may require remediation or disposal offsite. • **Soil type** – more erodible soil types have an increased soil erosion potential. • **Soil moisture** – increased soil moisture decreases soil mobilisation. • **Wind speed –** strong winds will increase the potential of soil loss and erosion. • **Rainfall** – heavy rainfall increases soil entrainment. • **Extent of vegetation cover** – vegetation assists in stabilising

	• Loss of structure – due to compaction and double handling of soils. • Loss of nutrients – occurs during stockpiling and impacts ability of area to regenerate after rehabilitation. • Loss of soil – during stripping and as a result of poor handling and management prior to rehabilitation. • Loss of topsoil – through initial clearing and poor management and stockpiling.	soils and reduces the ability for erosion. • **Geology** – Some geological formations are known to contain NOA and AMD.

4.2. Excavated Materials from Exploratory Works

The EIS noted that up to 750,000m^3 of spoil will be generated from by the Project. Future Generation's estimates of the breakdown of spoil, including source and destination of excavated materials, is presented in Table 4-2. The locations are graphically presented in Figure 4-1.

Tunnelling works will occur after the establishment of the accommodation camp and tunnel portal, both of which require significant volumes of spoil imported from elsewhere on the Project for their construction. As such there will not likely be the need to direct spoil to the western or eastern emplacement areas until tunnelling commences. Additionally, there is no immediate demand to commence with subaqueous material placement. Subaqueous placement will be trialled during of construction, following approval of the Subaqueous Placement Management Plan.

Table 4-2: Summary of excavated materials from Exploratory Works

Source Area	Bulk Cut [m^3]	Bulk Fill [m^3]	Bulk Net [m^3]	Spoil Destination
Exploratory Works Roads Package (Stage 1)	**To be confirmed by Snowy Hydro upon Stage 1 handover to Stage 2**			**Main Access Tunnel Portal**
Exploratory Works Camp	150,000	35,000	115,000	Main Access Tunnel Portal
Main Access Tunnel Portal	180,000	450,000	-270,000	Main Access Tunnel Portal
Pipeline Road	70,000	24,000	46,000	Main Access Tunnel Portal
Main Access Tunnel - Drill & Blast	285,000	0	285,000	Lobs Hole Lower Emplacement Areas
			50,000	Subaqueous placement (trial)
TOTAL	**685,000**	**509,000**	**226,000**	

Note – all quantities are bulked.

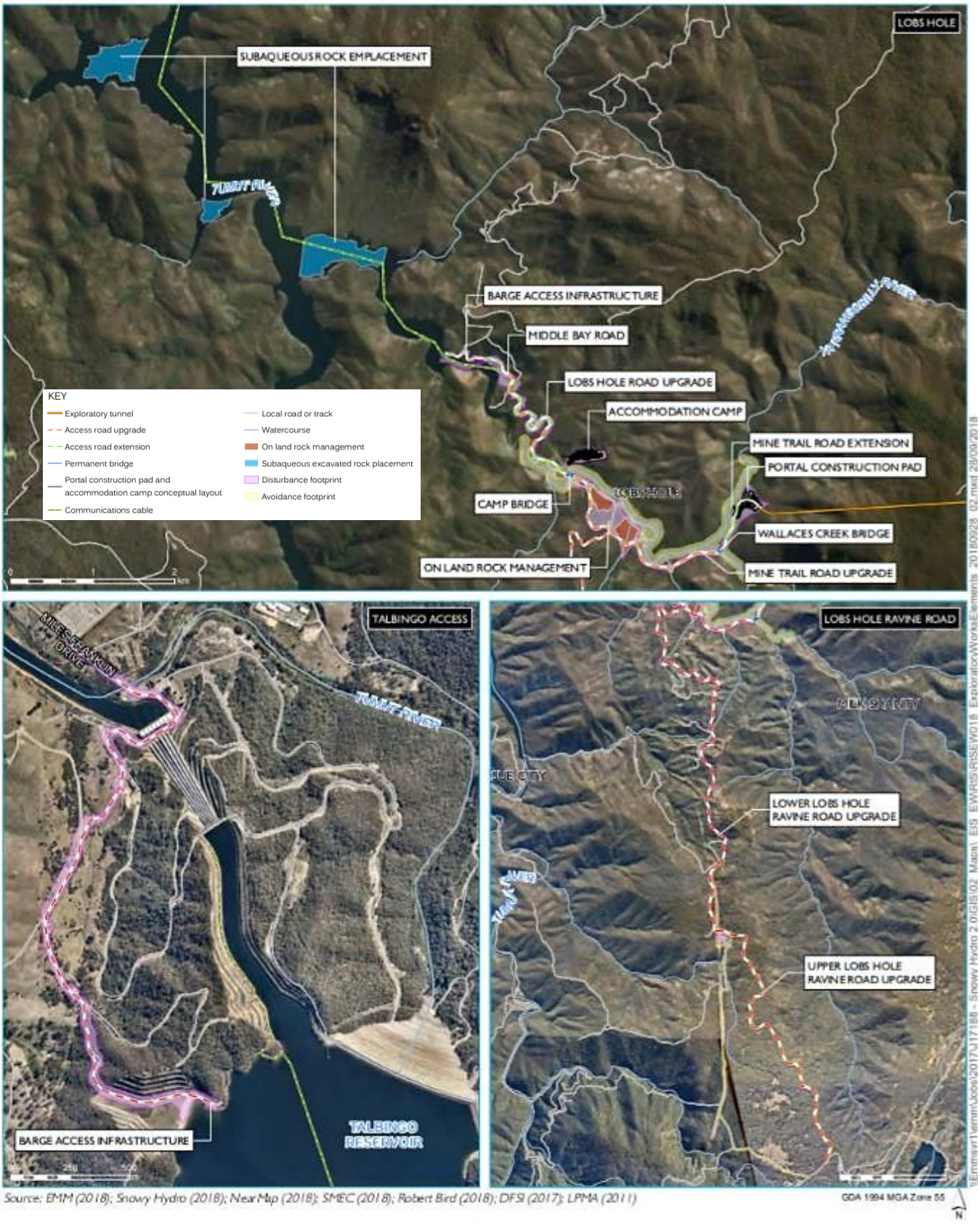


Figure 4-1: Project components (RTS, EMM)

4.2.1. Excavated Materials from Stage 1

Stage 1 of the Project includes upgrades to 26 km of existing roads and creating about 2 km of new roads. These roads are listed as follows:

- Ravine Road (formerly known as the upper section of Lobs Hole Ravine Road);
- Lobs Hole Road (formerly known as the lower section of Lobs Hole Ravine Road);
- Mine Trail Road;
- Wharf Road; and
- Spillway Road.

Stage 1 construction will involve the removal of vegetation, stripping of topsoil, bulk earthworks, drainage, paving and rehabilitation. Protocols for testing, stockpiling, re-use and disposal of the excavated material are discussed with in Section 5.1.

Environmental aspects of note include:

- a moderate risk of disturbance of contaminated materials adjacent to the former Lobs Hole mine along Mine Trail Road exists. Should contaminated materials be encountered during construction then these would be managed in accordance with the Contaminated Land Management Plan. To address this risk it is proposed that further sampling carried out prior to commencement between chainage 50 and 450 of the Mines Trail Road as outlined in Section 5.1;
- a low risk of the disturbance of AMD exists along Mine Trail Road around the former Lobs Hole Mine and beyond Wallace Creek from approximately chainage 1600 and along Lobs Hole Road/Wharf Road beyond approximate chainage 1300; and
- it is considered unlikely that NOA will be encountered during road construction. NOA will be managed in accordance with the Naturally Occurring Asbestos Management Plan for the section of Ravine Road between chainage 5800 and 6800.

4.2.2. Excavated Materials from Stage 2

During Exploratory Works, excavation will include aspects of surface excavation and underground work. Environmental aspects associated with bulk earthworks and tunnelling include:

- a moderate risk of disturbance of contaminated materials adjacent to the former Lobs Hole mine exists. Should contaminated materials be encountered during construction then these would be managed in accordance with the Contaminated Land Management Plan;
- a high risk of the disturbance of AMD exists along Ravine Beds geological unit. Subsurface works for both the accommodation Camp and tunnelling are anticipated to interact with the Ravine Beds unit. AFR will be managed in accordance with this Plan, the Surface Water Management Plan and the Contaminated Land Management Plan as relevant;
- it is considered unlikely that NOA will be encountered during Exploratory Works for both accommodation camp works and those related to tunnelling. NOA will be managed in accordance with the Naturally Occurring Asbestos Management Plan. Any NOA encountered will be temporarily stockpiled in accordance with Health and Safety requirements until rehabilitation occurs at the completion of Exploratory Works. In addition to the purpose and objective of this plan as described in Section 1.5, key outcomes of excavated material management during Stage 2 includes the following management measures to achieve these outcomes are described further in Section 5.

- the reuse of excavated material will be maximised where practicable by balancing the cut and fill volumes;
- where excess material is generated, beneficial reuse opportunities will be explored prior to disposal in consultation with National Parks and Wildlife Services;
- topsoil material will be removed and stockpiled correctly, and the volume of reuse maximised in the rehabilitation works;
- areas of contamination, NOA and AMD risk will be clearly understood and communicated to the workforce;
- contingency will be provided for in the temporary stockpile location for any unexpected contaminated materials. Should large volumes be identified then this will require a re-assessment of this stockpile area to ensure that there is adequate storage and holding space to determine the next steps for this material;
- works will cease in the event of a chance contamination, AMD and NOA find and the investigation and testing requirements confirmed by a suitably qualified contamination expert prior to further disturbance of the suspected material;
- areas of confirmed contamination, NOA and AMD that are to be disturbed during construction will be isolated from stage 2 work areas and remediation measures determined by a suitably qualified contamination expert and in consultation with National Parks and Wildlife Services; and
- materials will be stockpiled in suitable locations and controls installed to minimise the impact on the surrounding environment. These suitable locations include areas outside of clean water diversions and areas susceptible to high flood events where practical. Erosion and sediment controls will be used to minimise potential environmental harm consistent with the *Blue Book* (Landcom 2004). Further details of location suitability is detailed in Section 6 of the Surface Water Management Plan (SWMP).

4.2.3. Bulk Earthworks

Bulk earthworks are required to construct the accommodation camp pad (presented in Figure 4-2) and exploratory tunnel portal (presented in Figure 4-3).

The methods for site preparation and establishment will be similar at the portal construction pad, accommodation camp and laydown areas. The construction methods will involve the steps outlined below:

- delineating and marking vegetation to be cleared;
- clearing designated vegetation, removing topsoil and transporting to dedicated locations to use in rehabilitation;
- levelling and profiling of the works area will be undertaken including surface finishing;
- installing site drainage, soil erosion and other permanent environmental controls;
- compacting works areas and grading and contouring internal roads;
- marking the location of facilities upon completion of the earthworks and, where required, establishing concrete bases;
- assembling pre-fabricated facilities and setting up water utilities;
- levelling and preparing bases and pavements for other amenities;
- establishing and connecting power and communication services to the facilities;

- material retrieved from the cut will be used as general fill for the fill platform. Efforts will be made to minimise the volume of cut/fill (and limiting rock excavation) and reduce the net movement of material around the site; and
- indicative plant and equipment required for bulk earthworks includes: Excavators, dump trucks, bulldozers, graders, truck and dogs, cranes, water carts, light vehicles, compressors, fuel vehicles, piling rigs, agitator trucks, concrete trucks, semi-trailers and rollers.

Figure 4-2: Indicative accommodation camp layout (Future Generation 2019)

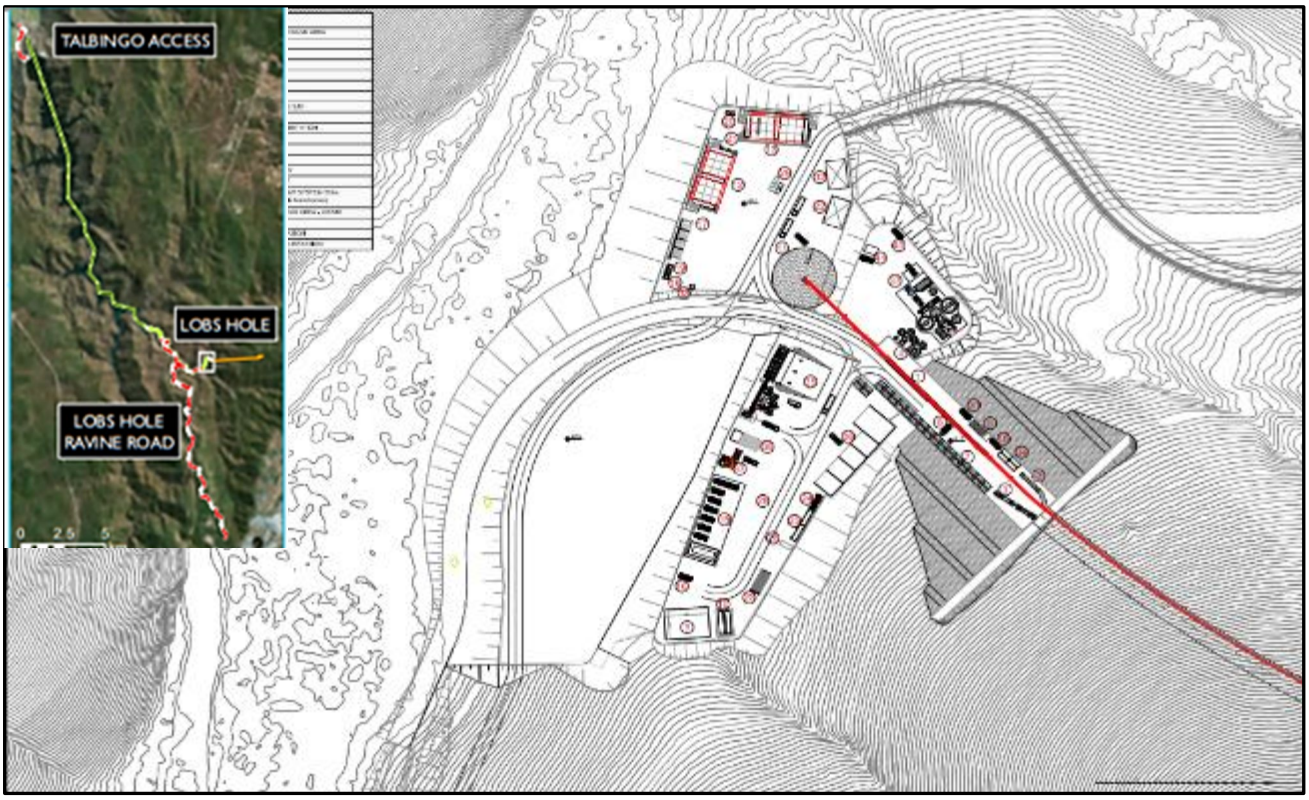


Figure 4-3: Indicative tunnel portal pad layout (Future Generation 2019)

4.2.4. Tunnelling

Excavation and construction of the exploratory tunnel will be carried out from the exploratory tunnel portal. The Exploratory Works tunnel methodology includes drill and blast at the beginning followed by use of the tunnel boring machine for the majority of the tunnel alignment.

4.2.4.1. Drill and Blast

Drill and blast excavation will be performed as a cyclical operation and will involve the following main activities:

- set out pre-support pattern and next advance blast pattern;
- install tunnel pre-support ahead of advancing tunnel face if required;
- drill next advance blast pattern;
- undertake charging and stemming of blast holes;
- conduct blasting;
- inspect blast area to ensure it is free of undetonated explosives;
- excavate blast spoil and scale the blasted zone;
- undertake geotechnical mapping of the tunnel face;
- set out rock bolt pattern and excavation performance monitoring locations where required;
- install tunnel support typically including rock bolts and steel fibre reinforced shotcrete and supplemented by steel ribs and lagging where required;
- install and monitor tunnel excavation performance monitoring instruments if required; and

- progressively repeat above sequence for the development of the exploratory tunnel.

The following supporting activities and methods will also be implemented during exploratory tunnel construction:

- forced ventilation of the tunnel excavation will commence once the tunnel has extended 20–30 m beyond the portal subject to the performance of the tunnel to self-ventilate;
- tunnel drainage systems will be progressively installed as tunnelling advances. This will typically consist of sumps constructed at 250–500 m intervals with the sumps connected to the tunnel portal and a sump at or near the tunnel face. The sump at the tunnel face will be equipped with a submersible pump and flexible discharge hose to feed tunnel water to the closest sump;
- bench excavation will follow as a complementary sequence 20–50 m behind leading work face following a similar drill and blast sequence;
- in-tunnel services such as water supply, power, lighting, air quality monitoring and communications will be progressively advanced around 20 m behind the tunnel face and away from blasting zone; and
- tunnel invert concreting will follow behind the bench development and may include under slab drainage system installation.

Drill and blast patterns will be studied to suit the rock categories and adjusted according to the actual geological conditions. The current plan will involve the use of emulsion explosives for the production holes and emulsion cartridges for the contour holes. This is described in further detail in the Blast Management Plan.

Figure 4-4 presents the particle size distribution of excavated material derived from the drill and blast technique. As shown, the average particles derived from drill and blast will be greater than 100mm in diameter.

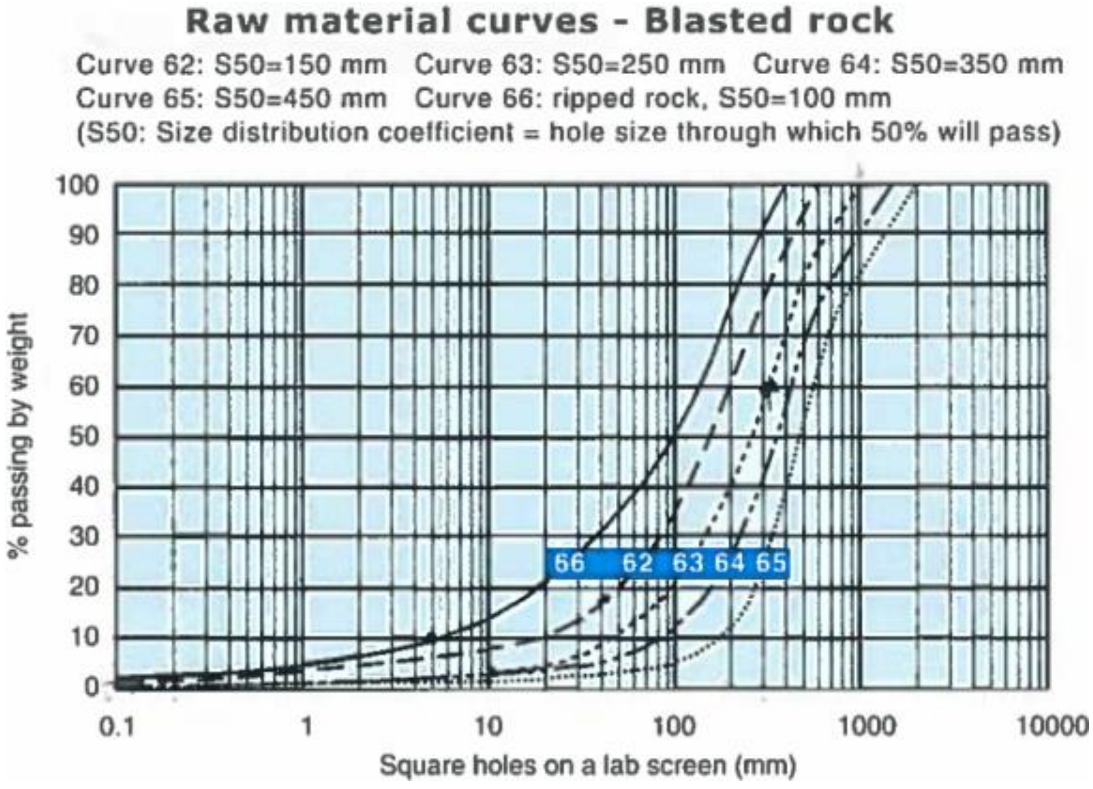


Figure 4-4: Raw material curves for drill and blast (Bellopede R et al 2011)

4.2.4.2. Tunnel Boring Machine

The TBM will be used to excavate some sections of the exploratory tunnel with a circular cross section. The TBM will be equipped with devices to undertake the following surveys:

- geophysical seismic reflection surveys;
- geoelectrical surveys; and
- systematic probe core retrieval ahead of the advancing tunnel face.

An example diagram showing the TBM is provided in Figure 4-5 below.

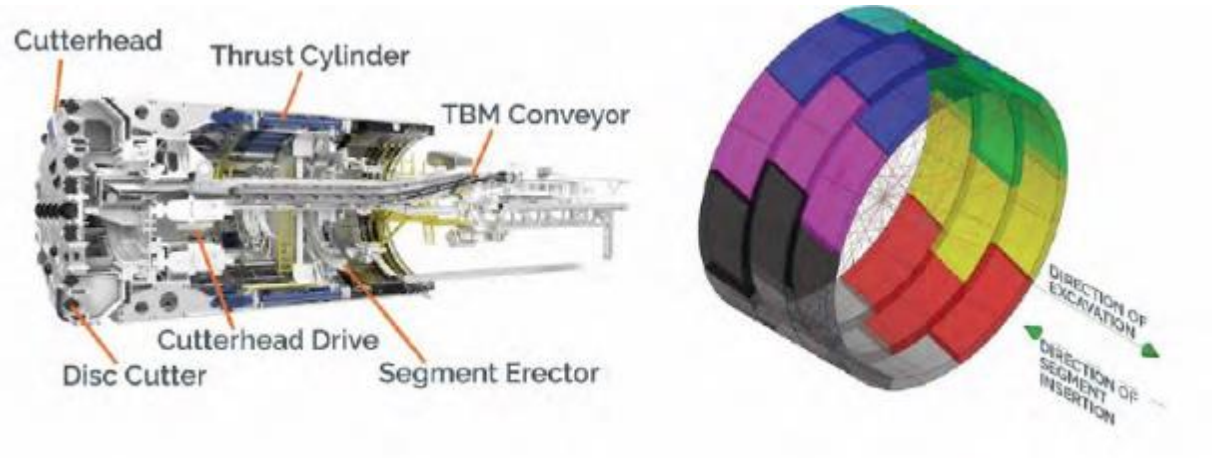


Figure 4-5: Example Tunnel Boring Machine

While the excavated material generated by the TBM tunnelling method will be finer in particle size distribution compared to the drill and blast material, the existing management measures proposed to minimise and mitigate potential impacts are considered suitable, as identified in the Submissions Report for Modification 2 and Section 5 of this Plan.

Indicative plant and equipment required for tunnelling works includes: the TBMs, excavators, dump trucks, bulldozers, rollers, graders, truck and dogs, drilling rigs, grout pumps, agitator trucks, shotcrete pumps, semi-trailers, water carts, light vehicles, compressors, generators, drills, jumbos, boomers, hydraulic breakers, air tracks, explosives transport vehicle, water bowsers, 4WD telescos, stihl saws, forklifts, light towers, compressors, gas monitors, rescue equipment, batteries, ventilation fans, fuel trucks, cement tankers, shotcrete robots, shotcrete pumps, boom lifts and water pumps.

4.2.5. Dredging

Dredging will be required to enable the construction of a new barge ramp at Middle Bay (Middle Bay barge ramp). The Middle Bay barge ramp was relocated as part of the Modification 2 Assessment Report. The location of dredging is presented in Figure **4-6**. Future Generation would also carry out minor excavation for the communications cable to enable placement below the reservoir Minimum Operating Level.

Details on the methodology and management measures are to be provided separately, within the Dredging Management Plan.

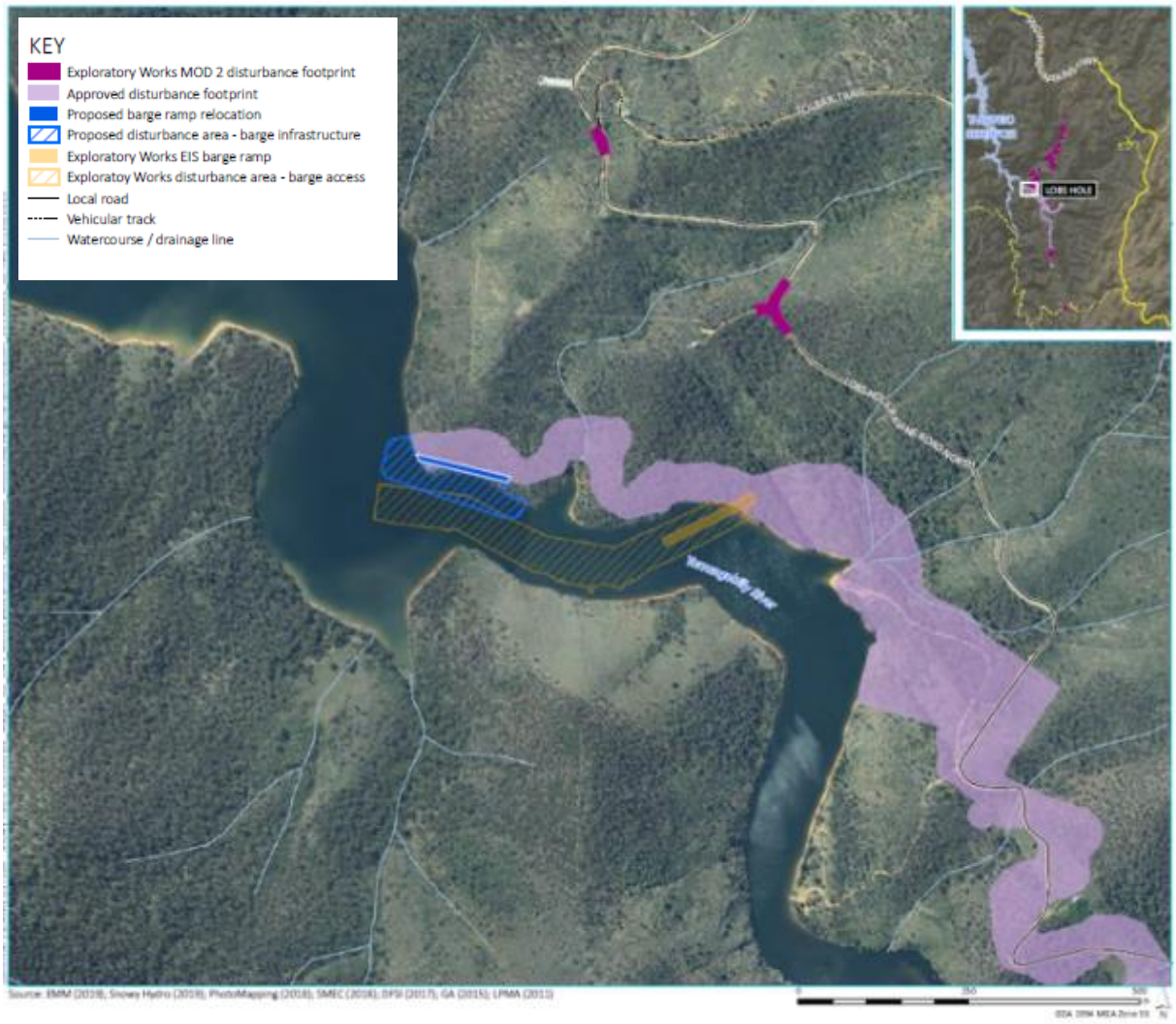


Figure 4-6: Middle bay barge access (Modification 2, EMM 2019)

5. ENVIRONMENTAL MANAGEMENT MEASURES

It is estimated that up to 685,000 m^3 of bulked materials will be excavated, mostly from the exploratory tunnel and portal construction pad with potential additional quantities from road upgrade works. Initial information suggests a small volume of tunnel rock may be potentially acid forming (PAF), requiring suitable management and design techniques for emplacement and disposal. Subject to geochemical testing of the rock material, excavated rock will either be placed on land, placed sub-aqueously within Talbingo Reservoir or re-used within Kosciuszko National Park. No material is to remain at any emplacement area and must be either sub-aqueously placed at Talbingo Reservoir or removed to a suitable place outside of KNP within three years of completion of the exploratory works (should Snowy 2.0 Main Works not proceed).

The flow chart presented in Figure 5-1 presents an overview of the process for excavated material management. As the volumes of materials to be dredged are anticipated to be minimal, they are not shown in the process.

The management of excavated materials is discussed in the following subsections.

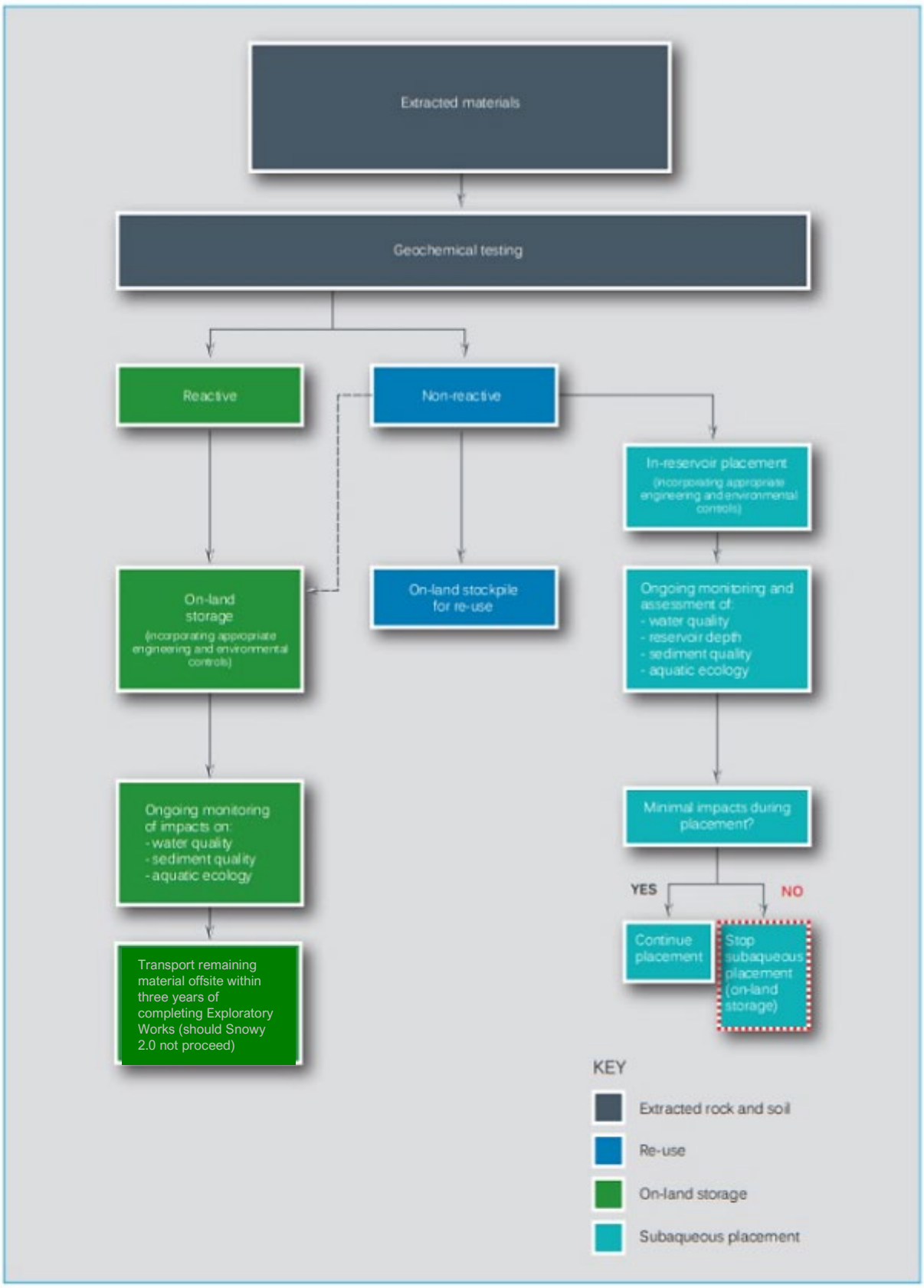


Figure 5-1: Excavated rock management flow chart (RTS, EMM 2018)

5.1. Excavated Material Assessment

5.1.1. Stage 1 Exploratory Works

Stage 1 road construction will involve the removal of vegetation, stripping of topsoil, bulk earthworks, drainage, paving and rehabilitation. The majority of these materials being either natural undisturbed material or topsoil classified as virgin excavated natural material (VENM) or excavated natural material in the Waste Classification Guidelines Part 1: Classifying waste (NSW EPA, 2014).

From a review of the contamination investigation reports the following testing regime is proposed to be implemented prior to disturbance of each of the areas below.

- Ravine Road
  - any unexpected NOA encountered during Stage 1 works will be managed in accordance with the Naturally Occurring Asbestos Management Plan.
  - no further contamination or AMD testing is proposed along Ravine Road unless visual or olfactory evidence indicates contamination.
- Mine Trail Road
  - any unexpected NOA encountered during Stage 1 works will be managed in accordance with the Naturally Occurring Asbestos Management Plan.
  - due to the moderate risk outlined in Section 4.2 targeted testing for AMD and contamination will be carried out between chainage 50 and 450 of the Mines Trail. Should contaminated material be identified in this area the Contaminated Material Management Plan will be implemented.
- Lobs Hole Road and Wharf Road
  - no further contamination, AMD, or NOA testing is proposed along Lobs Hole Road or Wharf Road unless visual or olfactory evidence indicates contamination.
- Spillway Road
  - no further testing is proposed on Spillway Road unless visual or olfactory evidence indicates contamination.

Where practicable contaminated materials or those found to contain NOA will be retained in-situ and avoided. If excavation of contaminated material is required, then these materials will be subject to remediation under the direction of the Geotechnical Engineer or will be disposed of offsite to a licensed facility following the appropriate waste classification. Prior to disturbance the Contractor is to confirm the method of remediation with Snowy Hydro. NOA is not expected to be encountered the Stage 2 Exploratory Works. Any unexpected NOA encountered during Stage 1 works will be managed in accordance with the Naturally Occurring Asbestos Management Plan.

If acid forming materials are encountered suitable storage and placement methods will be determined under the direction of the Geotechnical Engineer such that should acid form it would be naturalised. This will involve mixing the material with limestone or other alternative neutralising agents either during stockpiling or whilst placing the material within earthworks fills. Prior to disturbance the Contractor is to confirm the method of treatment and placement with Snowy Hydro.

Should stockpiling of contaminated materials, AMD or NOA be required the stockpiling locations will be established in accordance with the contractors stockpiling procedure subject to the approval of Snowy Hydro.

Contaminated materials will be stockpiled separately, and sign posted. Upslope surface water flows will be directed around the stockpile sites and the surface water runoff from within the stockpile area will be captured downstream so as to avoid contaminated runoff.

The Stage 1 road works are currently expected to generate a surplus of material which will be stored in a location meeting the requirements of Appendix D or on the northern fringes of the western emplacement area or eastern emplacement areas. On completion of the Stage 1 works the surplus material will be incorporated into the tunnel excavated material following testing to confirm suitability for subaqueous emplacement or other adopted methods of disposal.

5.1.2. Stage 2 Exploratory Works

Stage 2 will involve the removal of vegetation, stripping of topsoil, bulk earthworks, tunnelling, drainage, paving and rehabilitation. The excavated material will be assessed and classified as follows:

- non-reactive excavated material suitable for use or placement within the Project, or elsewhere within Kosciuszko National Park, comprising:
  - use in construction (such as accommodation camp or Main Access Tunnel portal pads or in road construction);
  - on-land temporary storage within the western emplacement areas;
  - subaqueous placement within the Talbingo Reservoir (subject to approval of Subaqueous Placement Management Plan and trial period);
  - use in construction elsewhere in the Kosciuszko National Park (subject to separate approval);
- reactive excavated material suitable for placement within the Project comprising:
  - on-land temporary storage at the eastern emplacement area; or
  - subaqueous placement (subject to approval of the Subaqueous Emplacement Management Plan and trial period, following successful treatment);
- material not suitable for use or placement within the Project due to unacceptable geochemical characteristics which will be disposed of off-site.

Further detail on the proposed uses and destinations is detailed in Sections 5.3-5.5.

The assessment steps to verify appropriate use or placement is detailed in the following sub-sections.

5.1.3. Pre-classification

Geochemical sampling/testing during pre-excavation will be undertaken to provide an initial classification obtained from:

- selected shallow in situ bore holes and / or test pits at relevant portal, camp and construction pad cutting areas (i.e.: surface works) for PAF and NOA determinations as soon as possible and prior to excavation; and
- selected blasting drilling holes and TBM excavated materials for the exploratory tunnel.

Samples will be obtained at regular close intervals throughout and will be tested in the field and submitted to the laboratory for geochemical testing. In-situ pre-classification sampling will be structured so as to contribute to an overall (both in-situ and ex-situ) minimum sample rate of 1 sample per 5000m^3 of excavated material.

Where the geology or previous investigations indicate that PAF/NOA (or other potential contaminants) may be encountered, sampling densities and analytes may be adjusted to better inform the material characteristics. Contamination investigations (i.e.: in-situ investigations in locations known or suspected as having existing contamination such as the adit area in Lobs Hole) will be undertaken by a suitably qualified and experienced person in accordance with guidelines made or approved under the CLM Act.

Probing will be the primary in-situ method used to determine the characteristics of material at the face of tunnel excavations. Probing for drill and blast excavations will be conducted using drilling machines to drill cores to a length of 50 – 100m ahead of the tunnel excavation.

A typical cycle for drill and blast excavations will involve:

- drilling of core holes to a length of 50 – 100m for probing, depending on the bend radius of the tunnel;
- drill and blast excavation advances 10m short of the probe length to ensure an overlap of test boundaries;
- Excavation activities are suspended (as required), and probing is repeated.

A typical cycle for the TBM is simultaneous action of the cutting tools on the cutter head and the pushing force of the thrust cylinders in the shield against the segmental tunnel wall. Instrumentation of the TBM shield cutting tools (reflection seismology, radar, electrical resistivity) makes it possible to monitor changes in the characteristics of the soil encountered.

The results from the probing samples will be used to determine the NOA and PAF classifications and subsequent handling, transportation and disposal methods.

5.1.4. Onsite Laboratory and Geochemical Testing

An onsite material testing laboratory accredited by NATA will be established. Offsite facilities will also be used to supplement the onsite laboratory. Testing will include traditional concrete, soils and aggregate testing, PAF material parameters (e.g. acid-base accounting) and asbestos detection. The laboratory will be set up to test both coarse and fine materials.

The onsite laboratory will ensure effective turnaround of test results and allow timely advanced planning around spoil handling and disposal.

Full laboratory equipment, testing and procedures will be documented by the service provider, separate to this Plan.

Testing procedures and analytes will be quality controlled through Future Generation's Quality system and checked by Snowy Hydro's quality system.

5.1.5. Post-excavation Classification

Material with high variability (such as those in complex geologies) may require further sampling and analyses following excavation to provide confidence in the materials' classification. In these circumstances the material will be temporarily quarantined and stockpiled.

Post-excavation sampling must be undertaken in accordance with Australian Standard 1141 *Methods for sampling and testing aggregates* (or equivalent). The Standard will be applied based on the Inspection and Test Plan quality document and will be relevant depending on each sample's particle sizing. Composite samples shall be obtained from stockpiles at locations and at frequencies that enables confidence in the material classification. Sub-samples (those that make up the composite samples) are to be collected uniformly throughout the stockpile to account for potential variability in soil characteristics. Samples should also be collected at various depths in the

stockpile (not just the surface). Where possible it is recommended that a systematic grid sampling pattern. An example of a sample pattern for stockpiles is presented in Figure 5-2.

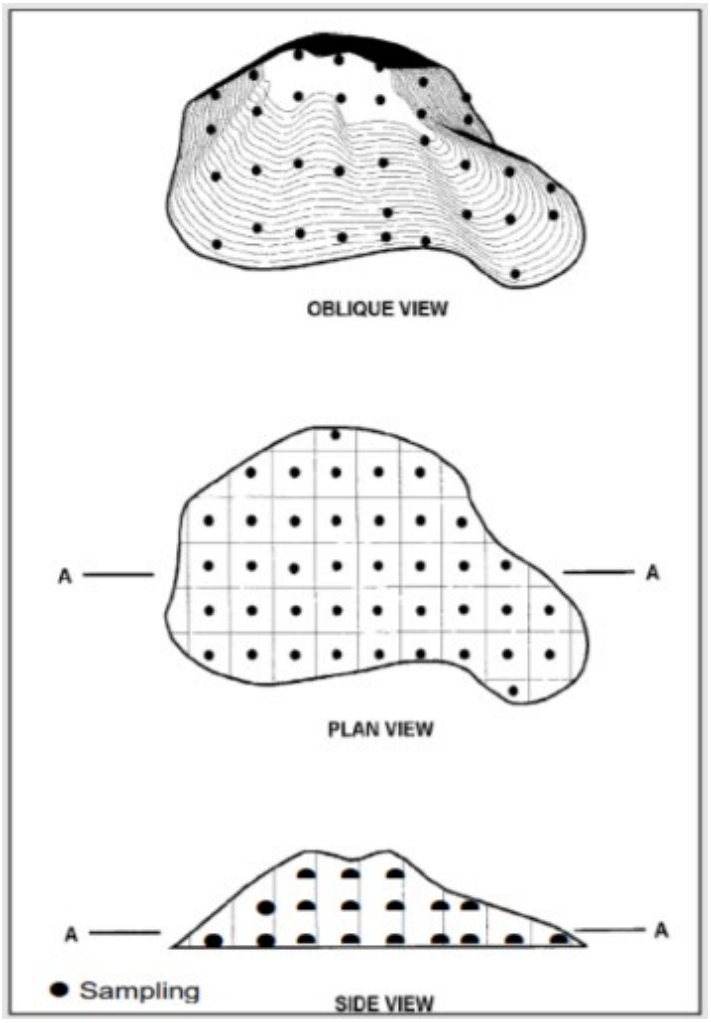


Figure 5-2: Stockpile sample pattern (RMS 2015)

Pre-excavation testing and laboratory testing will record whether the material is non-reactive, reactive or not suitable for placement which will act as the record to track quantities to specific locations. This will assist in confirming that only non-reactive material is placed within the western emplacement. Survey methods such as LiDAR and rovers will be used to survey the stockpiles to inform quantity movements.

Excavated spoil confirmed as containing PAF material will be diverted to the Lobs Hole eastern stockpile where it will be tested and thoroughly blended with acid neutralising rock.

Excavated spoil should be free from anthropogenic inclusions such as residual explosives, detonation chords and other drilling debris. These materials will be screened from excavated material following extraction from the tunnel. It is noted that residual amounts are likely to be present in the excavated spoil from drilling and blasting.

Controls to manage risks associated with PAF at the Lobs Hole eastern stockpile are outlined in Section 5.3.

5.1.6. Potentially Acid Forming Classification

The acid-base account involves laboratory analysis that evaluates the balance between acid generating processes (oxidation of sulfide minerals) and acid neutralising processes. The values arising from the acid base account are referred to as the acid producing potential (APP) and the ANC, which are expressed as kilograms of sulfuric acid per tonne of rock (kg H2SO4/t). The difference between the APP and the ANC is referred to as the non-acid producing potential (NAPP).

The criteria outlined in Table 5-1 below (based on SMECa, October 2018 Acid Metalliferous Drainage) summarises the criteria used to determine the acid forming nature of samples.

Table 5-1: PAF classification criteria (EW EIS App J)

Classification	NAPP (kg H_2SO_4/t)	NAG pH	ANC:MPA Ratio
Potentially acid-forming (PAF)	>10[a]	<4.5	<2
Potentially acid-forming – low capacity (PAF-LC)	0 to 10	<4.5	<2
Uncertain[b]	Positive	≥4.5	<2
	Negative	<4.5	-
Non-acid forming (NAF)	Negative	≥4.5	≥2
Acid consuming material (ACM)	Less than -100	≥4.5	>2

Samples that fall outside of the above criteria are also classified as uncertain (e.g. >1%S)

Samples with 0.1%s or less are classified as barren

Note: Criteria extracted from Appendix J of the EIS

5.1.7. Contaminated Soil

Based on previous investigations by Snowy Hydro and NPWS, there is a risk of encountering pre-existing contaminated soil from previous land use activities at Lobs Hole or from NOA.

There are several other management plans which include management actions in the event of contamination and naturally occurring asbestos finds and the disposal of waste off site. The key actions from these plans are summarised in the following sections.

5.1.7.1. Contaminated Land Management Plan (CLMP)

Key management actions from the CLMP include:

- known contaminated areas located directly beside the project area will be fenced as ‘No go areas’ (Table 6-1 of CLMP);
- site staff and workers will be made aware of likely indicators for contamination such as discolouration or staining of soils, visible signs of plant stress, presence of drums or other waste material, stockpiles or fill material, and odours (Table 6-1 of CLMP);
- work will cease in the event of an unexpected contamination find (Table 6-1 of CLMP);
- contamination investigation will be undertaken by a suitably qualified and experienced person in accordance with guidelines made or approved under the CLM Act (Table 6-1 of CLMP);

- the contamination specialist will determine and undertake the necessary investigation and testing to confirm the extent and type of contamination including making recommendation to Snowy Hydro for the further actions and remediation required (Appendix A Unexpected Finds Procedure for Contaminated Soils of CLMP);
- Snowy Hydro will liaise with the relevant authorities including National Parks and Wildlife Services to determine the appropriate management options and further actions including remediation. Snowy Hydro (in consultation with specialists, authorities and Contractor) will determine the appropriate management measures to be implemented (Appendix A Unexpected Finds Procedure for Contaminated Soils of CLMP);
- excavated material which is classified as contaminated, which is not suitable for reuse on site, will be transported to a treatment or disposal facility that is legally able to accept the material for treatment, reuse or disposal (Table 6-1 and Section 5 of CLMP);
- contaminated material will be stored in designated stockpile locations. These locations will be determined on site in consultation with engineers and construction supervisors, the locations will be included in Sensitive Area Plans. All tunnel material is intended to be transported directly to the emplacement area for stockpiling. Stockpile management including contaminated stockpiles will be undertaken in accordance with the mitigation measures detailed in the Surface Water Management Plan

5.1.7.2. Naturally Occurring Asbestos Management Plan (NOAMP)

Key management actions from the NOAMP include:

- training will be provided to all project personnel, including relevant sub-contractors on naturally occurring asbestos management practices including the unexpected finds procedure and the requirements from this plan through inductions, toolboxes and targeted training (Table 5-1 and Section 6.2 of NOAMP);
- should visual or olfactory evidence indicate the likely presence of NOA additional investigations, assessments and testing will be undertaken prior to disturbance of material within the identified area (Table 5-1 of NOAMP):
    - sampling and laboratory testing to confirm the presence of asbestos to the maximum depth of excavation of will be undertaken;
    - control air monitoring will be undertaken;
- asbestos investigations will be undertaken by a suitably qualified and experienced person in accordance with guidelines made or approved under the CLM Act, *Work Health and Safety Act 2011* and *Workplace Health and Safety Regulations 2017* (Table 5-1 of NOAMP);
- should NOA be confirmed through laboratory testing a site-specific AMP complying with Clause 432 of the *Work Health and Safety Regulations 2017* will be developed and included as part of the work health and safety management plan (Table 5-1 of NOAMP);
- the minimum methods for the safe disturbance, handling, decontamination and monitoring during construction are provided within the NOAMP. These will be further refined within the site specific Asbestos Management Plan (AMP) and in accordance with Safe Work NSW requirements and the Exploratory Works EIS Appendix J; and
- if found NOA material is to be retained onsite, a remediation action plan will be developed for the material encountered in consultation with NPWS (Table 5-1 of NOAMP). If any contaminated material is not suitable for reuse or remediation on site, will be transported to a disposal facility that is legally able to accept the material for reuse or disposal. The material will be classified

and disposed of to an appropriately licensed facility in accordance with the Waste Classification Guidelines (NSW EPA 2014).

- contaminated material including NOA will be stored in a manner that is consistent with the specific AMP and compliant with safety requirements. In addition storage of NOA temporarily will be situated in low environmental sensitivity area (where possible) and controls will be implemented and maintained that minimise environmental harm.

5.1.7.3. Waste Management Plan (WMP)

Key management actions from the WMP include:

- all waste material generated on-site will be dealt with in accordance with the POEO Act and Waste Classification Guidelines Part 1: Classifying Waste (EPA, 2014), or any superseding document;
- spoil, topsoil and mulch are to be stockpiled onsite in allocated areas, where appropriate, and mitigation measures for dust control and surface water management will be implemented;
- hazardous waste will be managed by appropriately qualified and licensed contractors, in accordance with the requirements of the Environmentally Hazardous Chemicals Act 1985 and the EPA waste disposal guidelines;
- a waste register will be maintained, detailing types of waste collected, amounts, date/time and details of disposal;
- waste will be managed and disposed of in accordance with the POEO Act and the WRAPP. Wastes that are unable to be reused or recycled will be disposed of offsite at a licensed waste management facility, or premises lawfully permitted to accept the materials following classification; and
- a section 143 notice under the POEO Act will be obtained should waste be transported to a site which is not licensed under the POEO Act to accept such waste. Sites and / or facilities licensed for receipt of waste under the POEO Act will not require a section 143 notice.

5.2. Topsoil

A topsoil stripping procedure is included in Appendix A. Topsoil will be stripped and retained, as far as is reasonably possible, for future use in rehabilitation activities. The following measures will be implemented to ensure that loss of productive topsoil is minimised:

- environmental avoidance areas will be marked and fenced;
- vehicles, plant and equipment will be inspected for the presence for weeds prior to mobilisation. Any weeds will be removed prior to use on site;
- stripping will be conducted in stages, where possible, to reduce the footprint of exposure to that required by construction;
- prior to stripping, compaction of topsoil layer will be minimised by limiting heavy vehicle movements across the material targeted for retention;
- testing will be carried out prior to stripping to identify potential for cross contamination from underlying layers (where underlying contamination is suspected) and indicate suitability for plant growth on site. Topsoil from contaminated areas, or areas of weeds will not be recovered for rehabilitation works. These materials will be appropriately managed on-site or if there is a potential to spread contamination then the material will be sent off-site to a disposal facility that is lawfully permitted to receive it;

- vegetation communities will be identified to allow segregation of topsoil (once stripped) and stockpiled separately where possible;
- stripping will occur on the A1 and A2 horizons by experienced plant operators using plant suitable for the activity (excavator, front end loader or grader with suitable blades);
- topsoil from different horizons and underlying geologies shall be stockpiled separately;
- all plant and machinery involved in topsoil stripping will be inspected and certified to be free of weed seed and pest plant material prior to mobilisation to site as per section 5.1 of the Weed and Feral Animal Management Plan. Machinery and vehicles working in areas of known weed infestation will be washed down before moving to “clean areas”. All vehicle washdown will be recorded on a Weed and Seed Form. Records of weed hygiene inspections and washdown will be kept in the vehicle and in the project office for auditing and inspection purposes;
- handling of topsoil will be minimised;
- topsoil will be stockpiled, signposted and separated from other materials to prevent cross contamination;
- topsoil stockpiles will have control measures installed to prevent erosion, sedimentation and dust emissions. Stockpiles in place for extended period shall be suitably stabilised;
- topsoil stockpiles shall be established away from watercourses and on land with generally flat relief (away from flow lines) to prevent interaction with water;
- the stockpiles should be accessible to enable weed control to be carried out. Weed management shall be implemented on a routine basis;
- to prevent nutrient decline and anaerobic conditions from forming, stockpiles shall not be compacted. Where practical and where sufficient room is available exceed 2.5m high;
- where possible topsoil will be reused within 18 months of stripping; and
- reuse of the material shall occur as per the rehabilitation management plan.

5.3. Land Based Spoil Management

The NPWS has asked that no permanent stockpiles be left on site following completion of the Project. Excavated materials designated for land-based placement will be placed in one of two temporary rock emplacement areas at Lobs Hole as presented in Figure 5-3. Following completion of Exploratory Works, remaining excavated material stockpiled within the on-land emplacement areas will be disposed of via one of the following options:

- disposal with the Main Project excavated material – should Snowy 2.0 proceed, any excavated material from the on-land emplacement areas will be disposed of with the excavated material from the Snowy 2.0 Main Project. This will involve either subaqueous placement within an existing reservoir or disposal to a suitable location outside the Kosciuszko National Park. The placement of excavated material for Snowy 2.0 Main Works will be subject to further assessment and approvals; and
- disposal outside the KNP – if the main Snowy 2.0 Project does not proceed, any excavated material not able to be re-used will be disposed of to a suitable location outside the KNP within three years of the completion of Exploratory Works, subject to consultation with NPWS and further assessment and approvals.

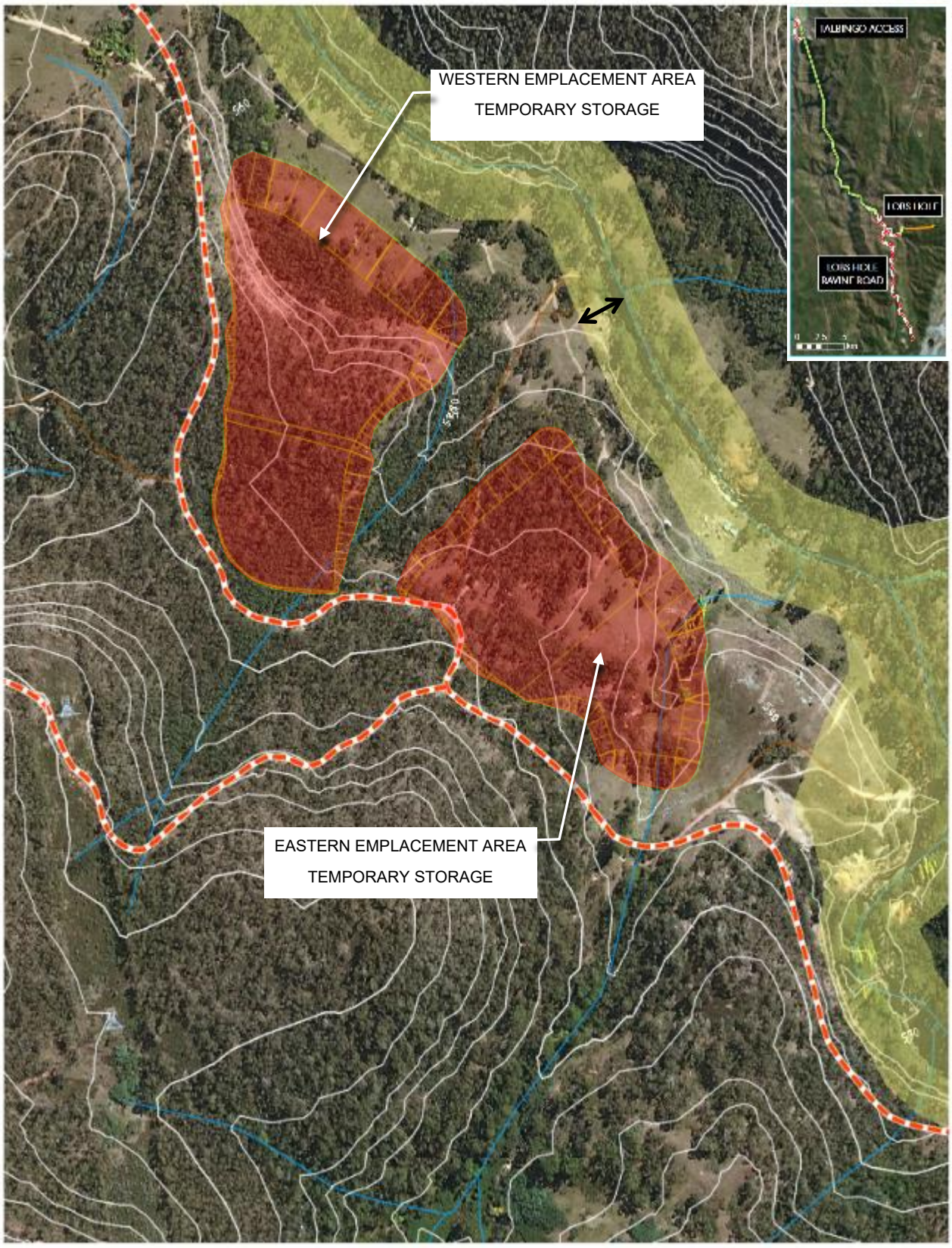


Figure 5-3: Conceptual layout – excavated material emplacement areas (RTS, EMM 2018)

5.3.1. Eastern Emplacement Area – Acid forming rock

Future Generation proposes to use this area as a temporary storage area for PAF material allowing it to be treated separately from the non-contaminated spoil. The controls that will be applied to the eastern emplacement area are listed below. The concept design is presented in Figure 5-4.

- a 50m clearance with the Yarrangobilly River will be in place at all times. The overall footprint will be minimised where possible;
- the location of the eastern emplacement is intrinsically set based on the topography and limiting the 50m clearance zone to the Yarrangobilly River;
- dredge material will not be placed in the eastern emplacement area;
- the final design of the rock emplacement areas will consider potential contamination at the adit south. Suitable ground strategies will be developed and implemented prior to emplacement of any rock over the adit to restrict the pathways to ecological receptors. These works will include backfilling and trackroll of the adit prior to construction. Once this completed, the remaining eastern rock emplacement area would be stripped of its soil and vegetation to a depth of approximately 0.5 m below ground level. Once the soil has been stripped, the base of Lick Hole Gully will be lined to:
  - separate flow in Lick Hole Gully from the eastern rock emplacement under low flow conditions; and
  - passively treat impacted drainage from Lobs Hole Mine by encouraging the formation of metal hydroxides i.e.: the metals would precipitate, reducing their concentrations in discharge entering the Yarrangobilly River.
- runoff from upstream areas of Lick Hole Gully will be diverted around or through the eastern emplacement area. A dam will be constructed upstream of the eastern emplacement area and then water diverted from it using either gravity or pump assisted diversion system. The diversion works will have a 1% AEP capacity. The dam upstream of the eastern emplacement area will be designed as a detention basin and will not permanently hold water;
- a larger high-flow diversion drain will be established to convey runoff from upstream areas of Lick Hole Gully around the emplacement area in a controlled manner, avoiding uncontrolled overflows through the emplacement area. This larger diversion drain will only be engaged if a flood greater than a 1% AEP event occurs;
- seepage from the eastern emplacement area will be collected in a sediment basin downstream of the emplacement area and pumped out on a regular basis to prevent overflow and before overflow rainfall events. Collected water will either be irrigated to the emplacement (to promote evaporation) or treated in the process water treatment plant. Discharge of seepage water to the Yarrangobilly River will be avoided. This sizing of the basin is subject to final design. Basin sizing is usually dependent on the maximum disturbed ground extent and the utilisation of other erosion and sediment controls. The basin and all erosion and sediment controls will be designed and operated in compliance with mitigation measures in Table 5-1 of the SWMP;
- if PAF material is discovered, it will be diverted to the eastern stockpile, where it will be tested and thoroughly blended with ANC material to create a neutral spoil mass. The volume of ANC material in each layer will be determined stoichiometrically so that the maximum potential acidity from the overlying layer of spoil and sediment is treated. This approach will neutralise AMD within the stockpile. The ANC material will be sourced from other excavations on site if such material is encountered, otherwise it will need to be imported. The ANC material (potentially hydrated lime in bulk containers) will be brought to site on an as needs basis, to attempt to limit to total quantity stored on-site at any one time. Temporary ANC material may either be stored

within containers or when being used, stockpile(s) will be located in a low environmental sensitivity locations likely within the vicinity of the emplacement area. The specific locations will be progressively updated and displayed on the Sensitive Area Maps (SAPs). Stockpile controls will be applied to ensure that no environmental harm occurs as a result of storage;

- the stockpile area for the PAF material will be lined with an impermeable geofabric and water flows will be diverted to avoid contaminating the local environment;
- all personnel involved with the handling, transportation and disposal of PAF material will wear appropriate personal protective equipment (PPE) to prevent skin contact. This includes, as a minimum, chemical safety goggles, face shields, chemical resistant gloves and overalls; and
- neutralised PAF material can, once validated, be safely disposed of subaqueously, just like any other spoil. Neutralisation will be undertaken, sampled and monitored in accordance with industry standards including but not limited to Acid Sulfate Soils Manual (ASSAMC, 1998).

The efficacy of the measures outlined above will be subject to ongoing verification through inspections and monitoring, as set out in Section 6.1.

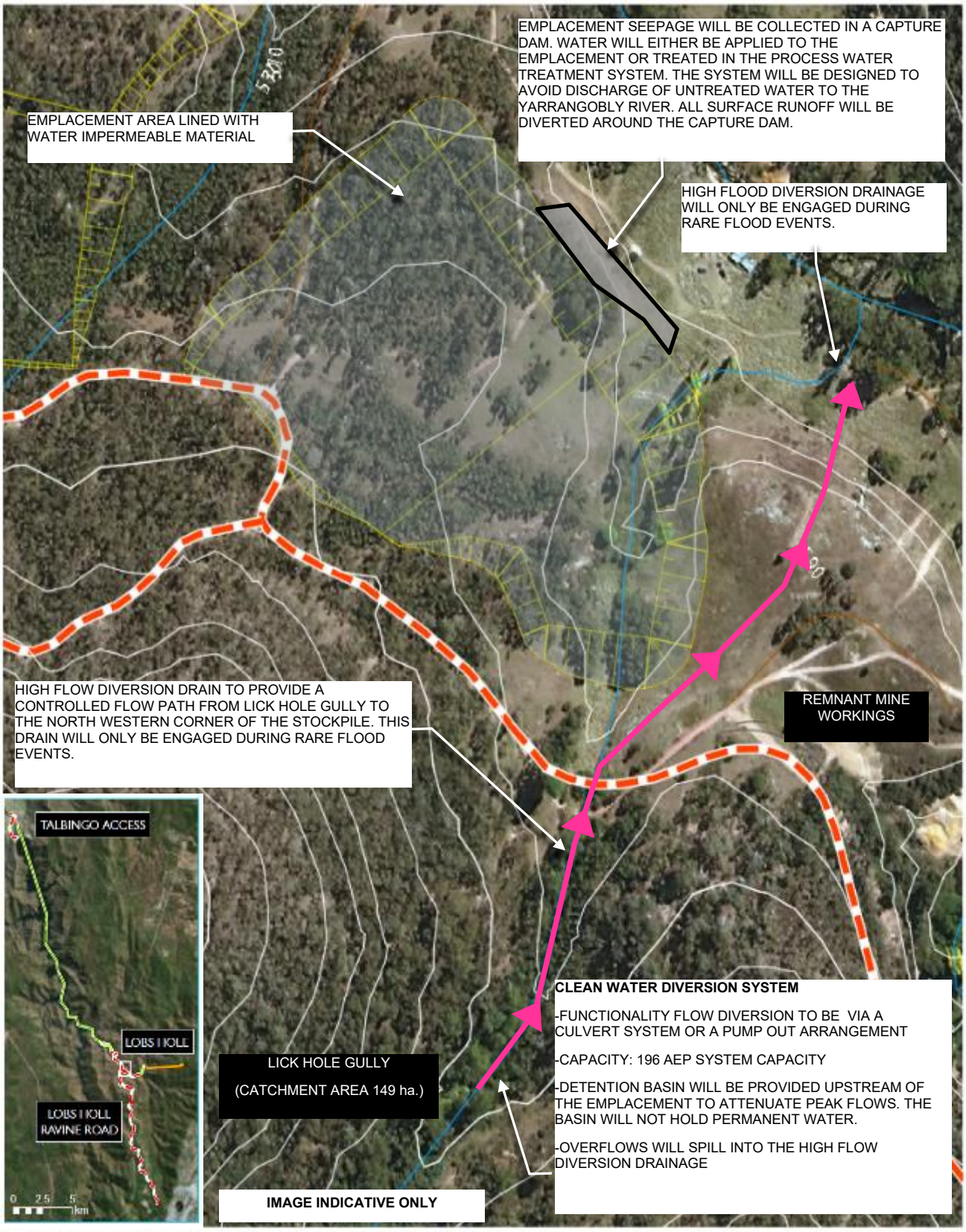


Figure 5-4: Conceptual layout – eastern emplacement area (RTS, EMM 2018)

5.3.2. Western Emplacement Area

The western emplacement area will be used to store cuttings and other material that is non-reactive, has a low geochemical risk and that can be re-used. Dredge material will not be placed in the western emplacement area.

The western emplacement area does not require diversions or drop drains; however, it will be designed to prevent the risk of being entrained in flood waters during a 0.2% annual exceedance probability (AEP) event. This will be achieved by a flood protection berm or rock armouring along the northern toe.

5.3.3. Short Term Stockpiles for Post-excavation Classification

As detailed in Section 5.1, some material may undergo ex-situ testing to provide confidence in its classification. In these instances, further testing will be carried out and the material temporarily quarantined and stockpiled. Short term stockpiles for this purpose would occur within the approved disturbance footprints at the Main Access Tunnel or accommodation camp pads and would be in place for a maximum of two days at a time (subject to the on-site laboratory turnaround times).

5.4. Stockpile Management

In addition to the specific measures set out in Section 5.3, all stockpiles of excavated material will be designed and managed implementing principles of erosion and sediment control. This includes the preparation of a specific ESCP for each stockpile area, in accordance with the Soil Management Plan and Surface Water Management Plan and implementation of those controls on site. The ESCPs will consider:

- considered planning (e.g. preparation of a series of progressive plans and environmental work method statements);
- minimum disturbance to existing vegetation (e.g. 'no go' barriers);
- good topsoil management for revegetation/rehabilitation (e.g. stripping and stockpiling);
- runoff control (e.g. onto, through/around and off the sites; separation of 'clean' and 'dirty' flows);
- erosion control (i.e. retaining soil at its place of origin) including application of geofabric and or polymers;
- sediment control (i.e. final line of defence such as sediment basins, fences and traps); and
- progressive revegetation/rehabilitation (e.g. temporary on some stockpiles).

Further detail is presented in the stockpiling procedure in Appendix B.

5.5. Permanent Placement, Re-use and Disposal

5.5.1. Subaqueous Excavated Rock Placement

A Subaqueous Emplacement Management Plan will be prepared in accordance with Schedule 3, condition 25 of the Approval prior to subaqueous disposal of excavated material.

5.5.2. Re-use Opportunities

Where excavated material testing demonstrates that the material is suitable for re-use, the opportunity will be maximised as far as practicable. Opportunities include:

- re-use of topsoil material in the site rehabilitation;

- re-use in tunnel infrastructure or elsewhere within the disturbance footprint (such the accommodation camp or Main Access Tunnel portal pads, or internal roadways);
- re-use of soil materials as backfill earthworks where practicable; or
- processing of selected rock material (where suitable materials exist) for use in pavements.

Opportunities for re-use of excavated materials in other parts of Kosciuszko National Park (e.g.: for use in road and track upgrades) are continuing to be explored in consultation with NPWS. Re-use opportunities elsewhere will continue to be explored throughout construction.

Suitability would be determined through geochemical testing and particle size. Transportation and re-use of materials by NPWS will be subject to a separate approvals process.

5.5.3. Offsite Disposal

All material proposed to be sent off site will be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (NSW EPA, 2014). Existing contaminated material (e.g. from Lobs Hole Mining residues or from unexpected finds), or materials not able to be placed subaqueously or used elsewhere will be disposed of off-site to:

- facilities or developments lawfully permitted to receive the material as fill (or similar); or
- licensed disposal or resource recovery facilities.

A licensed controlled waste operator will be contracted to remove the material and dispose of appropriately in an approved and licensed controlled waste facility.

Further details on assessment and disposal of waste are provided in the Waste Management Plan.

5.6. Rehabilitation and Remediation

Geomorphic and ecological characterisation of Lick Hole Gully will be undertaken prior to disturbance to record the existing conditions and values of Lick Hole Gully. The rehabilitation approach will be progressive and will seek to create a physically stable landform that restores land capability to pre-development use and to the satisfaction of NPWS. Any remnant mine workings located within the eastern and western rock and soil emplacement areas will be rehabilitated (if necessary) in accordance with the Rehabilitation Management Plan.

As outlined in Section 5.3, no permanent stockpiles will remain following completion of the Project. Within 3 years of the completion of the exploratory tunnel works, unless the Planning Secretary directs otherwise, any remaining extractive material will be removed.

Should the Main Project not proceed, the western stockpile will be rehabilitated with the stockpiled material potentially used for the rehabilitation of the exploratory tunnel, or possibly disposed into the Talbingo Reservoir pending a successful, approved trial. The eastern spoil stockpile will be removed, and the area will be landscaped to fit with the surrounding landform.

The decommissioning, land-forming and landscaping proposed for each rock placement location would be described in the Rehabilitation Management Plan. Random backfill, as defined and tested in accordance with RMS Specification R44, obtained on site may be used for rehabilitating the works. Material used for backfilling for remediation will be free from stumps, roots, rubbish, topsoil and other unsuitable material. Exposed areas will be progressively rehabilitated. Methods will include permanent revegetation, or temporary protection with spray mulching or cover crops.

5.7. Environmental Management Measures

A range of environmental requirements and control measures are identified in the EIS, Submissions Report and the conditions of approval. Safeguards and management measures will be implemented to avoid, minimise or manage impacts from excavated material on the surrounding environment.

Specific safeguards and management measures to address the potential impacts of excavated material during Stage 2 are identified in Table 5-2. The measures relevant to Stage 1 have also been included for completeness.

Table 5-2: Excavated material management measures

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
General					
EM01	Training will be provided to all project personnel, including relevant sub-contractors on excavated material management practices and the requirements from this plan through inductions, toolboxes and targeted training	Stage 1 Stage 2	Pre-construction and construction	Contractor	Good practice
EM02	Excavated material management measures from this plan will be included in relevant site environmental documents including for example, Work Method Statements (WMS) and/or Site Environmental Plans (SEPs).	Stage 1 Stage 2	Pre-construction and construction	Contractor	Good practice
Procedures and plans					
EM03	The management of existing contamination will be in accordance with the Contaminated Land Management Plan (CLMP) included as an appendix to the EMS. It provides details of the process to be followed in the event of contamination finds. This includes requirements for additional investigation, testing, and remediation or disposal in the event of finds. If naturally occurring asbestos is found to be present on-site it will be managed in accordance with the Naturally Occurring Asbestos Management Plan (NOAMP) included as an Appendix to the EMS. It provides details of the process to be followed in the event of unexpected NOA finds and those to be followed in areas considered to have a low to high potential to occur as defined by the Geological Survey of NSW. This includes requirements for additional investigation, testing, safe handling and remediation in the event of finds.	Stage 1 Stage 2	Construction	Contractor	REMM CON03
EM04	Waste materials identified for disposal offsite will be tested and classified in accordance with the Waste Classification Guidelines (NSW EPA 2014) and the Waste Management Plan.	Stage 1 Stage 2	Construction	Contractor	Schedule 3 Condition 22 Schedule 3 Condition 55 REMM CON03
EM05	Final landscaping and rehabilitation will be undertaken in accordance with the Rehabilitation Management Plan to be developed 6 months from commencing any development.	Stage 2	Construction	Contractor	REMM SOIL03 REMM SOIL04 WM 8.4 and 8.8 Schedule 3 Condition 57

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
EM06	Spills and emergency response will be managed in accordance with the Emergency spill response procedure included in Appendix E of the Surface Water Management Plan.	Stage 1 Stage 2	Construction	Contractor	REMM WAT11
EM07	The Subaqueous Emplacement Management Plan will be developed prior to emplacement of excavated materials subaqueously and will be appended to the Excavated Material Management Plan.	Stage 2	Construction	Contractor	Schedule 3 Condition 25, 26, 27 and 28
Excavated material assessment					
EM08	Prior to disturbance of each area further assessment will be carried out as described in Section 5.1. Areas of potential contamination, NOA and AMD risk will be communicated to the workforce including visual and olfactory identifiers. Materials to be re-used or disposed of offsite will be classified in accordance with the *Waste Classification Guidelines* (NSW EPA 2014) and the Waste Management Plan.	Stage 1 Stage 2	Pre-construction and Construction	Contractor	Schedule 3 Condition 22
EM09	Protocols for testing, handling, storing and disposal of excavated tunnel material (as set out in Section 5.1 of this Plan) will be implemented during tunnelling.	Stage 2	Construction	Contractor	Schedule 3 Condition 22
EM10	The reuse of onsite topsoil will be maximised during construction. A quantity record of soil stripped will be prepared, so that if any significant deficit is identified, additional material can be sourced and imported to site prior to rehabilitation. Only weed free materials are to be imported to site.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL03
EM11	A topsoil stripping procedure will be prepared prior to commencing stripping and stockpiling..	Stage 1 Stage 2	Construction	Contractor	REMM SOIL01
EM12	To minimise the structural decline of soil, the amount of compaction of soils during stripping and stockpiling will be minimised. This will be achieved by using suitable machinery, timing stripping where possible, adopting correct stockpile development techniques and minimising handling of topsoil material.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL 01
EM13	Topsoil and subsoil will be stockpiled, with stockpiles designed and located to minimise contamination, development of anaerobic conditions, and to avoid erosion and dust generation.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL 01
EM14	The mixing of topsoil with subsoils, unsuitable material and contaminated materials during construction will be avoided where possible.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL 01

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
EM15	Opportunities for re-use of excavated material in other parts of Kosciuszko National Park will be explored during construction in consultation with NPWS.	Stage 1 Stage 2	Construction	Contractor	Schedule 3 Condition 23 and 29
EM16	Dredging activities and impacts to water quality, aquatic habitat and aquatic species will be managed in accordance with the Dredge Management Plan.	Stage 2	Construction	Contractor	Schedule 3 Condition 29
Stockpile Management - General					
EM17	Erosion management will be implemented during construction activities in accordance with the Surface Water Management Plan. Erosion and sediment control measures will be constructed and implemented in accordance with the guideline Managing Urban Stormwater, Volumes 1 and 2.	Stage 1 Stage 2	Construction	Contractor	Schedule 3 Condition 22 REMM SOIL02 WM 2.1, 8.2 and 8.7
EM18	Stockpiles will be located where they are not exposed to concentrated or flood flow. Flood flow is defined as the 20% AEP flood extent.	Stage 1 Stage 2	Construction	Contractor	REM WM_2.3
EM19	Nutrient decline will be minimised by managing topsoil stockpile methods and heights.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL01
EM20	To minimise the risk of loss from wind and water erosion to stockpiled topsoil, a vegetative cover will be established, or the stockpile stabilised by other means. Monitoring for dispersion and erosion of soil stockpiles will be undertaken, particularly on moderately dispersive soils. Addition of ameliorants, such as gypsum and organic matter for dispersive soils will be undertaken as needed.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL01 REMM WM_2.3
EM21	Stockpiles will be regularly inspected for weeds in accordance with the Weed and Feral Animal Management Plan.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL01
EM22	Tunnel Boring Machine spoil material shall not be placed subaqueously within Talbingo Reservoir	Stage 2	Construction	Contractor	Schedule 3 Condition 22
Stockpile Management – Eastern and Western Emplacement Areas					
EM23	Dredge material will not be placed in the eastern and western emplacement areas.	Stage 2	Construction	Contractor	Schedule 3 Condition 22
EM24	Stockpile designs for the emplacement areas will incorporate benching and bunding to avoid mobilisation of sediment and rock.	Stage 2	Pre-construction and construction	Contractor	REMM CON02
EM25	Progressive verification of the adequacy of design options will occur.	Stage 2	Pre-construction	Contractor	REMM CON02

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
EM26	The placement footprint of the eastern and western emplacement areas will be minimised where possible.	Stage 2	Construction	Contractor	REMM CON02
EM27	The construction footprint and extent to which soil and vegetation within the riparian zone are disturbed will be minimised at the eastern and western emplacement areas.	Stage 2	Construction	Contractor	REMM CON02
EM28	The western emplacement area will be used to store cuttings and other material that is non-reactive, has a low geochemical risk and will be re-used.	Stage 2	Construction	Contractor	Schedule 3 Condition 22 REMM WM8.3
EM29	The eastern emplacement area will be used to store any material that that has higher geochemical risk. Excavated material will be geochemically characterised prior to placement. If any potentially acid forming material is encountered, it will be placed in a select area of the emplacement. The potential for acid rock drainage will be treated by placing and compacting layers of limestone (or other suitable AC material) between each rock and sediment layer as required. The volume of limestone (or other suitable AC material) in each layer will be determined stoichiometrically so that the maximum potential acidity from the overlying layer of rock and sediment is treated. This approach will neutralise AMD within the stockpile.	Stage 2	Construction	Contractor	Schedule 3 Condition 22 REMM WM8.5 REMM CON02
EM30	Runoff from upstream areas of Lick Hole Gully will be diverted around or through the eastern emplacement area. A dam will be constructed upstream of the eastern emplacement area and then water diverted from it using either gravity or pump assisted diversion system. The diversion works will have a 1% AEP capacity. The dam upstream of the eastern emplacement area will be designed as a detention basin and will not permanently hold water. A larger high-flow diversion drain will be established to convey runoff from upstream areas of Lick Hole Gully around the emplacement area in a controlled manner, avoiding uncontrolled overflows through the emplacement area. This larger diversion drain will only be engaged if a flood greater than a 1% AEP event occurs.	Stage 2	Construction	Contractor	Schedule 3 Condition 22 REMM WM8.6
EM31	Seepage from the eastern emplacement area will be collected in a sediment basin downstream of the emplacement area. Collected water will either be irrigated to the emplacement (to promote evaporation) or treated in the process water treatment plant. Discharge of seepage water to the Yarrangobilly River will be avoided.	Stage 2	Construction	Contractor	Schedule 3 Condition 22 REMM WM8.7

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
Measures to prevent soil contamination					
EM32	In the event of unexpected contamination, whether from known or unexpected sources, work within the areas will cease until a contamination assessment is prepared to advise the need for further investigation or a remediation strategy were appropriate. The investigation will determine the extent, magnitude, and type of contaminants. The unexpected find procedure included within the Contaminated Land Management Plan will be followed in these circumstances.	Stage 1 Stage 2	Construction	Contractor	REMM CON01
EM33	Hydrocarbon management practices will be implemented to minimise hydrocarbon spills during construction activities (e.g. re-fuelling, maintenance, hydrocarbon storage) and spill containment materials will be available to clean-up spills if they occurred.	Stage 1 Stage 2	Construction	Contractor	REMM WAT01
EM34	Fuels and chemicals will be stored in bunded areas to prevent chemical spills or leakages. Areas to be used for long-term storage and handling of hydrocarbons and chemicals will be enclosed with concrete bunds.	Stage 1 Stage 2	Construction	Contractor	REMM WAT01
Rehabilitation					
EM35	Any remnant mine workings located within the eastern and western rock and soil emplacement areas will be rehabilitated (if necessary) in accordance with the Rehabilitation Management Plan.	Stage 2	Construction	Contractor	REMM 8.2
EM36	The eastern and western emplacement areas will be rehabilitated following removal of all material. Lick Hole Gully will be resinated as part of the rehabilitation works. Geomorphic and ecological characterisation of Lick Hole Gully will be undertaken prior to disturbance to record the existing conditions and values of Lick Hole Gully. The rehabilitation approach will seek to create a physically stable landform that reinstates or improves the existing values.	Stage 2	Construction	Contractor	REMM WM8.8 REMM WM8.1
EM37	Exposed areas will be progressively rehabilitated. Methods will include permanent revegetation, or temporary protection with spray mulching or cover crops. Wherever possible, permanent landscaping and revegetation works will take place progressively in accordance with the Rehabilitation Management Plan.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL03
EM38	Soils horizons will be reinstated in the correct order and depth to allow for rehabilitation.	Stage 1 Stage 2	Construction	Contractor	REMM SOIL01
EM39	Soil nutrient decline will be amended at the time of rehabilitation by utilising fertilisers and amendment techniques (e.g. gypsum, organic matter or lime application).	Stage 1 Stage 2	Construction	Contractor	REMM SOIL03

ID	Measure / Requirement	Applicable stage	When to implement	Responsibility	Source document
EM40	Within 3 years of the completion of the exploratory tunnel works, unless the Planning Secretary directs otherwise, the Proponent will remove any remaining extractive material from the Kosciuszko National Park.	Stage 2	Post Construction	Snowy Hydro	Schedule 3 Condition 24

6. COMPLIANCE MANAGEMENT

6.1. Monitoring and Inspection

The excavated material inspection and monitoring regime is summarised in Table 6-1 and described below. Monitoring records and inspection reports will be internally recorded, the findings and outcomes will be reported to the relevant agencies in accordance with the compliance tracking reporting requirements stated in Section 6.4 of this Plan.

Table 6-1: Environmental monitoring summary

Activity	Frequency	Responsibility	Record	Timing
Road, bridge and drainage construction excavation	Weekly inspection of stockpile areas	Contractor	Inspection report	Stage 1
Tunnel excavated soil and rock	Daily workplace inspections	Contractor	None – observation only	Stage 2
	TBM probing for contaminants and hazardous materials during tunnelling	Contractor	Inspection report Laboratory test report	Stage 2
	Weekly inspection of the emplacement areas. Laboratory testing of soil and rock sampled and tested at the frequency described in Section 5.1.4	Contractor	Inspection report Laboratory test report	Stage 2
Groundwater	*Refer Groundwater Management Plan*			All
Surface Water	*Refer Surface Water Management Plan*			All
Subaqueous emplacement	*Refer Subaqueous Emplacement Management Plan*			During subaqueous emplacement
Dredge spoil placement	*Refer Dredging Management Plan*			Stage 2

6.1.1. Workplace Inspections

Future Generation has developed a program of environmental inspections for the Project. Scheduled and regular workplace inspections will be carried out across the site, including in stockpile and spoil management locations, by Supervisors and environmental staff. Details are provided in Section 8 of the EMS.

6.1.2. Erosion

Monitoring of erosion and sediment controls is documented in the Surface Water Management Plan, including erosion and sediment control measures. The monitoring of all stockpiles will include:

- regular monitoring and maintenance of surface water diversion structures, drainage structures and erosion control measures implemented through the construction stage;
- in addition, inspection of these areas will be done prior to expected rainfall and after significant rainfall (assessed when there is a greater than 80% potential for 10mm or greater rainfall);

- an appropriately qualified person will undertake inspections of water diversion and water management measures around Lick Hole Gully and the eastern stockpile area will be inspected to ensure they are performing appropriately post rainfall events consistent with Section 9.1 of the EMS;
- routine inspections of all temporary sediment and erosion controls will be done every month during the rehabilitation of the eastern excavated rock emplacement until such time that the landform is accepted as stable; and
- erosion and sediment controls including sediment basins will be designed in accordance with the *Blue Book* (Landcom, 2004) and all relevant mitigation measures in Section 6 of the SWMP. This includes determining appropriate sizing of sediment sizings and ground stabilisation measures to reduce catchment sizes from disturbed areas.

6.1.3. Surface water

Surface water monitoring will occur within the Yarrangobilly River as part of the Future Generation Surface Water Management Plan. This will include fortnightly samples during construction.

In addition, specific water quality monitoring of the eastern stockpile due to it's contaminated contents will be carried out within the stormwater drain upstream and downstream of the stockpile in accordance with the Surface Water Management Plan.

Trigger Action Response Program (TARP) monitoring will be undertaken upstream of both the western and eastern emplacement areas in the event that the monitoring location immediately downstream of the emplacement area shows elevated levels of the required analytes. Refer to Section 7 of the Surface Water Management Plan for further details.

6.1.4. Groundwater

Groundwater monitoring will occur across the site in accordance with the Groundwater Management Plan. In addition to this monitoring, where they have not already been installed by Snowy Hydro, up to three groundwater wells will be installed around the eastern rock emplacement area prior to construction commencing. It is noted that these wells may be impacted by pre-existing contamination from the Lobs Hole Mine activities.

6.2. Training

All site personnel will undergo site induction training relating to excavated material management issues. The induction training will also address elements related to waste management (which is subject to a separate plan to this EMMP) including:

- existence and requirements of this EMMP;
- relevant legislation;
- roles and responsibilities for excavated material management;
- visual indicators for acid forming materials, asbestiform materials and contaminated materials; and
- other specific responsibilities for waste, re-use management and resource management.

Targeted training in the form of toolbox talks or pre-start briefs will also be provided to personnel with a key role in excavated material management and waste management.

Further details regarding the staff induction and training are outlined in Section 5 of the EMS.

6.3. Auditing

Audits will be undertaken to assess the effectiveness of excavated material management measures, compliance with this EMMP, the conditions of approval, EIS, Submissions Reports and other relevant approvals, licences and guidelines. Auditing will be undertaken as per Independent Environmental Audit Schedule 4 Condition 9 of the CoA. Audit requirements and the response processed for finding actions are detailed in Section 8.3 of the EMS.

6.4. Reporting

Reporting requirements are set out in Sections 8.4 of the EMS. Reporting will include monthly internal project reports and six-monthly external compliance reports as required by the CoA. The six-monthly reports will track compliance against CoA and REMMs, including those relevant to excavated materials. These compliance reports will be submitted to relevant agencies.

APPENDIX A – TOPSOIL STRIPPING PROCEDURE

Purpose

This procedure for topsoil stripping includes soil handling measures to assist with minimising soil degradation and compaction, thus retaining its value for revegetation and rehabilitation purposes.

Rehabilitation Principles

As the Exploratory Works is a large infrastructure project within KNP, a fragile environment diverse with flora and fauna, key rehabilitation principles have been established to rehabilitate disturbed areas from impacts of Exploratory Works and its potential changes to the park's character and habitats.

These include:

- preserve the KNP's natural assets and values;
- agree on future land use and consider long-term site management;
- minimise construction impacts wherever possible through planning of access areas and no-go zones;
- establish processes prior to construction works to enable organic matter to be used in revegetation and ongoing rehabilitation during the construction works Stage;
- 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 and endangered under Commonwealth legislation, respectively;
- rehabilitate disturbed areas to their pre-existing state at completion of construction activity in consultation with NPWS; and
- minimise visual impact of construction works from significant public viewpoints.

Topsoil Stripping

Topsoil will be stripped progressively and in a staged manner.

Suitable topsoil should be identified through the following steps:

- identify soil resources and stripping guidelines;
- screen or sort the topsoil to remove stumps, roots, clay lumps or stones greater than 50 mm in size.

The following steps are recommended during topsoil stripping:

- undertake preparation of the site and installation of control measures as required by the EMS and other subplans. In particular, erosion and sediment control measures will be installed and further planned for where progressive installation is required;
- the area to be stripped will be clearly identified to avoid overstripping and / or entering areas beyond the disturbance footprint. The target depths of topsoil and subsoil to be stripped for each location will be clearly communicated to machinery operators and supervisors;
- soil stockpile locations will be identified during planning and will be stripped of topsoil before they are used for stockpiling of subsoils. Topsoil stockpile locations will not require stripping of topsoil;

- to minimise soil exposure duration, stripping will commence as soon as practicable prior to bulk earthworks;
- all machinery brought onto the site for soil stripping will be cleaned and inspected in accordance with the Weed and Feral Animals Management Plan;
- any trees present will be cleared and grubbed before topsoil salvage;
- machinery haulage circuits will be located to minimise the compaction of the stockpiled soil;
- topsoil and subsoil will be stripped to the required depths and then stockpiled where not immediately required in the works. Subsoil will be stripped and stockpiled separately to topsoil where identified as suitable for re-use. Depending on compaction and recovery rates, deep ripping may be required to maximise topsoil recovery. Where soils are shallower, topsoil and subsoils will be stripped and stockpiled together;
- handling and rehandling of stripped topsoil will be minimised as far as practicable by progressively stripping vegetation and soil only as needed for development activities;
- soil stripping in wet conditions will be avoided where possible because of the risk of compaction and nutrient deterioration. However, when practicable, soils will be stripped when they are slightly moist, which will help in their removal and retain their structure; and
- to avoid dust hazards, soil will not be stripped during particularly dry conditions. Alternatively, water trucks can be used as a control mechanism during dry conditions. Refer to the Air Quality Management Plan for further information.

Soil Stripping Depth

The indicative topsoil stripping depths for each specific soil type subject to surface disturbance are presented in Table A-1. It also shows the overall depth of soil (topsoil plus subsoil) which indicates areas that may be suitable for salvaging extra soil material in order to achieve a volume which would allow replacement of the profile to as close as possible to pre-disturbance conditions.

It is important to note that these stripping depths are provided based on the assumption that acidic soils will be ameliorated with lime to reduce aluminium availability and provide a more suitable growth medium. This will also have the benefit of helping stabilise any moderately dispersive horizons through the addition of calcium to the soil exchange sites.

The depths are indicative only and will be confirmed progressively during topsoil stripping operations.

Table A-1 - Indicative Depths of topsoil and subsoil available for stripping

ASC soil type	Exploratory Works element	Depth to strip		
		Topsoil (m)	Subsoil (m)	Total soil depth (m)
Basic Lithic Brown-Orthic Tenosol	Small area near juncture of Lobs Hole Ravine and Lobs Hole Road	0.1	0	0.1
Basic Lithic Brown-Orthic Tenosol	Lower end of portal construction pad	0.15	0.28	0.4
Basic Lithic Brown-Orthic Tenosol	Accommodation camp and the portal construction pad	0	0	0
Haplic Mesotrophic Red Dermosol	Lobs Hole Road	0.14	0.56	0.7
Haplic Eutrophic Red Kandosol (includes bleached variant)	Lobs Hole, Middle Bay Road, Middle Bay barge ramp, western rock emplacement area	0.3	0.68	1
Haplic Eutrophic Brown Kandosol (Basalt variant)	Lobs Hole Road	0.25	0.75	1
Haplic Eutrophic Brown Kandosol (Limestone and shale variant)	Lobs Hole Road	0.3	0	0.3
Haplic/Bleached Eutrophic Grey Kandosol	Mine Trail Road	0.2	-	0.2
Haplic/Bleached Eutrophic Grey Kandosol (includes humose variant)	Lobs Hole	0.41	0.69	1.1
Haplic Epipedal Black Vertosol	Lobs Hole, eastern rock emplacement area	0.15	0.95	1.1
Acidic Mesotrophic Red Dermosol	Lobs Hole, eastern rock emplacement area	0	0	0

Notes: 1. Estimated using soil depths recorded in EMM soil survey.

2. Excess soil available for stripping to make up any soil volume shortfall.

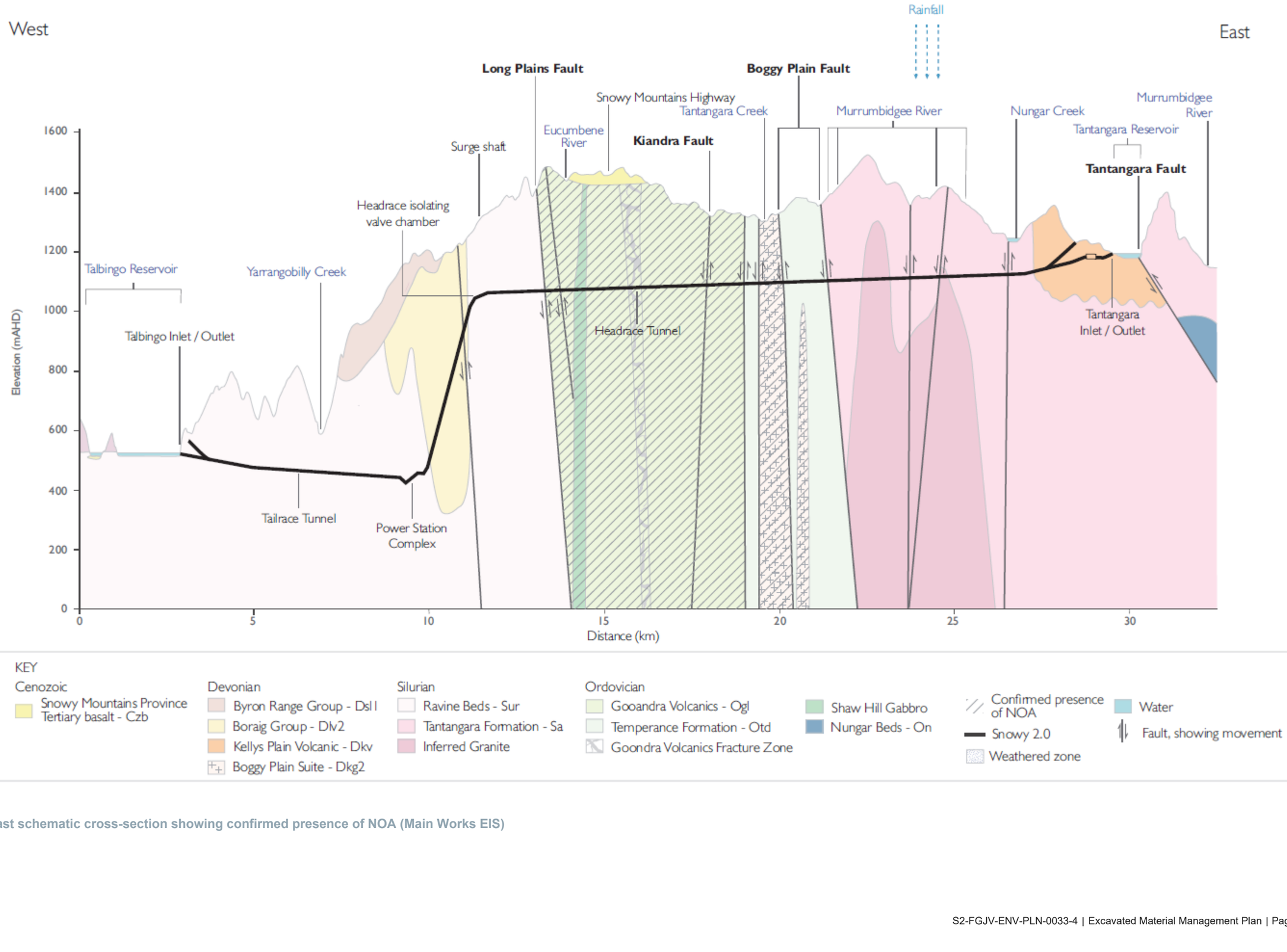
APPENDIX B – STOCKPILING PROCEDURE

The following techniques will be applied to topsoil stockpiles to minimise degradation to topsoil and subsoil and potential impacts on the surrounding environment:

Stockpiling

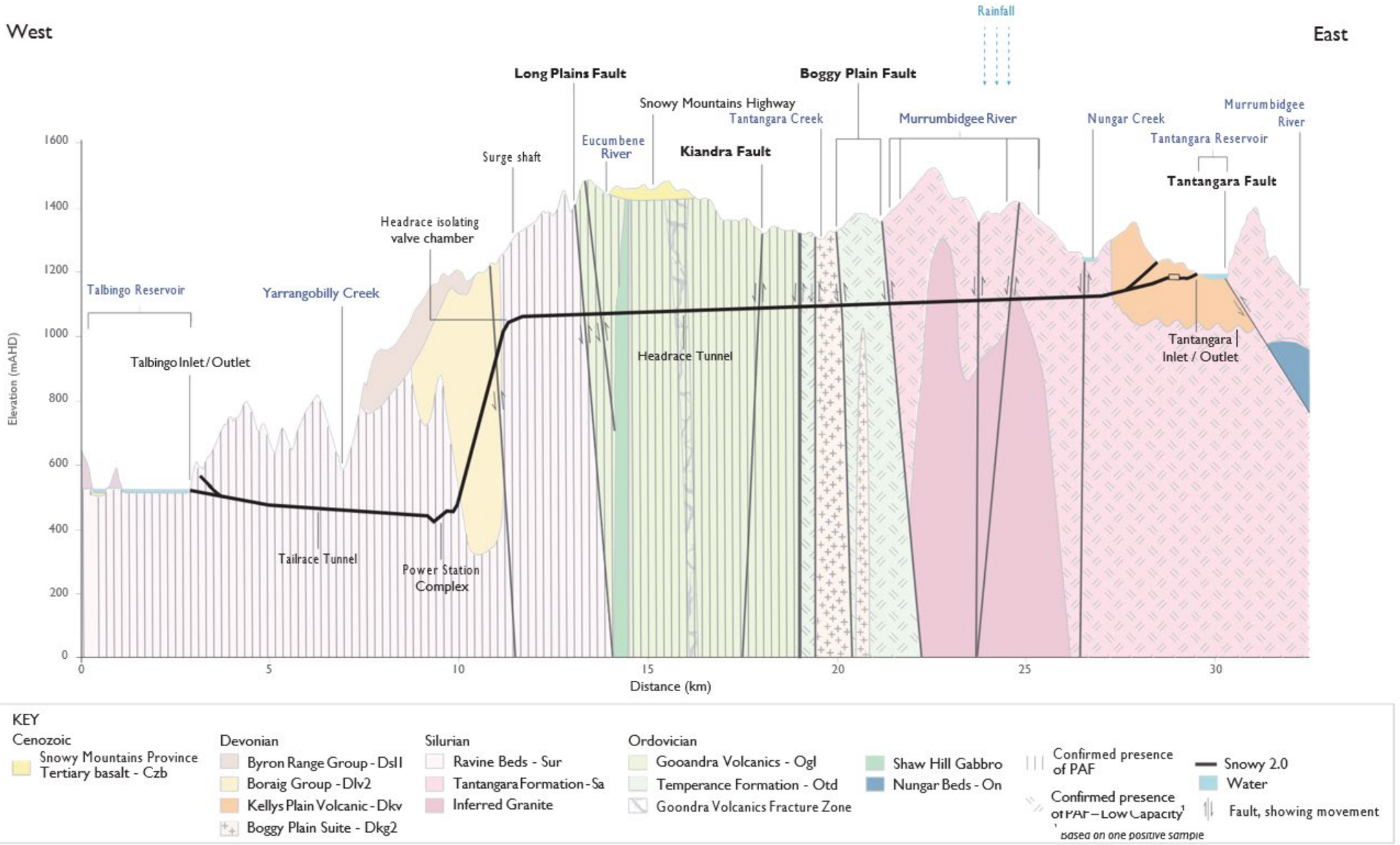
- The location of stockpiles will be planned in advance of topsoil stripping and bulk earthwork. Stockpile locations will be selected such that they are:
  - away from areas of retained vegetation and outside of the tree protection zone;
  - not exposed to concentrated flows;
  - at least 50m from rivers and creeks;
  - located above the 20% AEP flood event where possible to avoid flood flows;
  - where practicable located on slopes less than 10%. If required to be placed on slopes greater than 10% additional erosion and sediment controls shall be implemented;
  - located outside weed infested areas; and
  - positioned such that erosion of the stockpile and surrounding area is minimised;
- clean water diversions will be installed upslope of stockpiles and sediment controls installed downslope;
- stripped topsoil will be stockpiled separately from woody material, subsoil stockpiles and weed infested areas/stockpiles;
- where possible, topsoil stockpile heights will not exceed 2m, to minimise the risk of compaction and to maintain the viability of the soil seed bank;
- topsoil and subsoil will be stockpiled using methods and machinery that limit the amount of compaction so as to avoid structural decline.
- if stockpiles are to be maintained for an extended period of time (20 days or more) they will be stabilised to minimise the risk of erosion and to help reduce the risk or weed growth;
- stockpiles will be monitored for weed growth and treated as required in accordance with the weed and feral animal management plan;
- topsoil stockpiles will be clearly signposted to distinguish them from other materials and to avoid mixing or contamination;
- where required, lime will be deep ripped into stockpiles to ameliorate soil acidity and elevated exchangeable aluminium. This will also help stabilise any dispersive soils by providing calcium to soil exchange sites; and
- monitoring for erosion of topsoil stockpiles will be undertaken and appropriate ameliorants and/or erosion and sediment controls implemented to minimise the risk of soil degradation or offsite impacts.

APPENDIX C – NATURALLY OCCURRING ASBESTOS RISK MAP

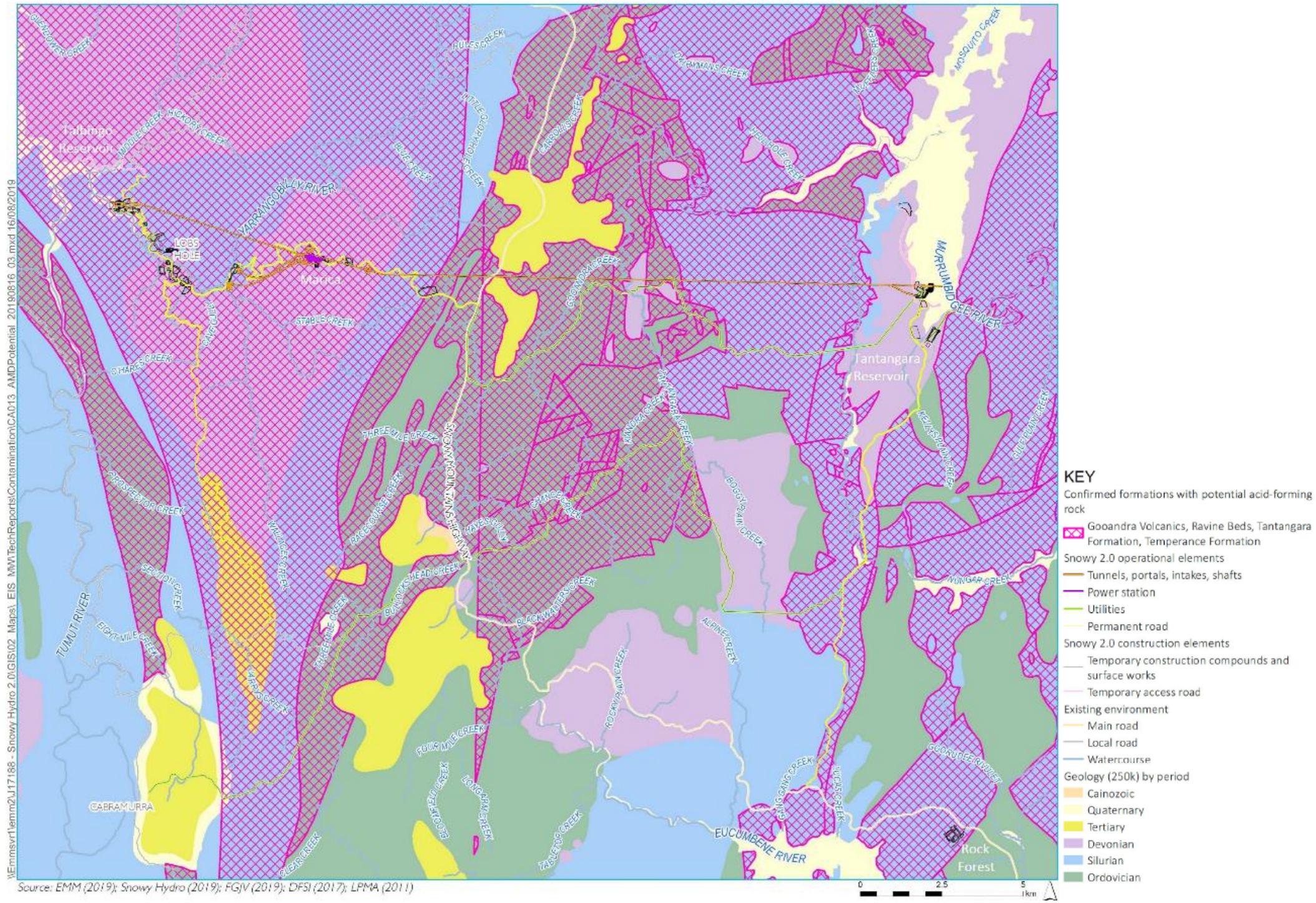


West-east schematic cross-section showing confirmed presence of NOA (Main Works EIS)

APPENDIX D – ACID METALLIFEROUS DRAINAGE RISK MAP



West-east schematic cross-section showing confirmed presence of PAF (Main Works EIS)



\\Emmsvr1\emm2\J17188 - Snowy Hydro 2.0\GIS\02 Maps\ EIS MWTechReports\Contamination\CA013 AMDPotential 20190816 03.mxd 16/08/2019

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

AMD Potential at the Surface (Main Works EIS)

APPENDIX E – EXPLORATORY WORKS – PROJECT BOUNDARY FIGURES

APPENDIX 2 – SITE LAYOUT

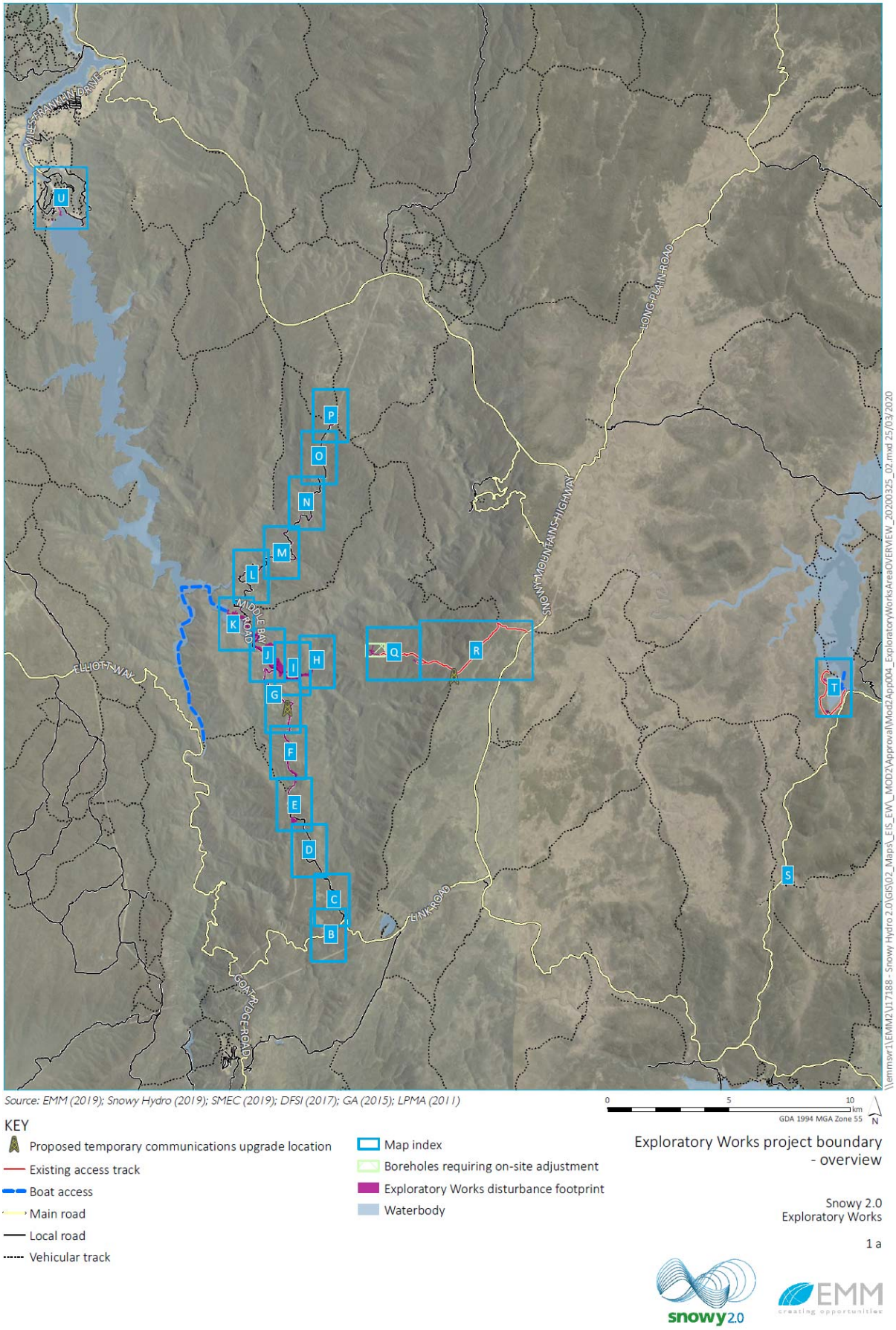


Figure 2-1: Project *Boundary – Overview*

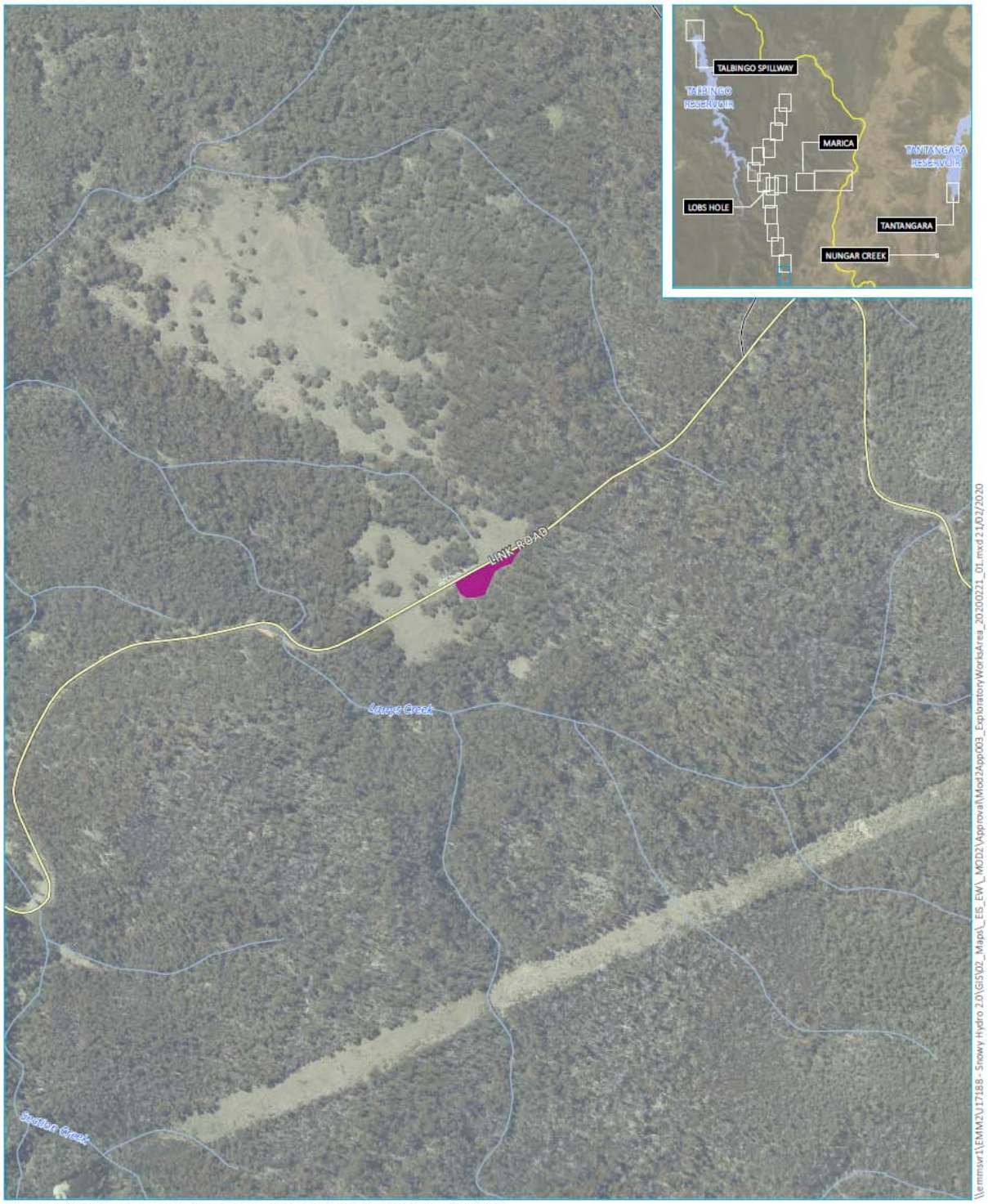


Figure 2-2: *Project Boundary – Link Road turnaround area*

Figure 2-3: *Project Boundary – Lobs Hole Ravine Road (Upper) 1*

Figure 2-4: *Project Boundary – Lobs Hole Ravine Road (Upper) 2*

Figure 2-5: *Project Boundary – Lobs Hole Ravine Road (Upper) 3*

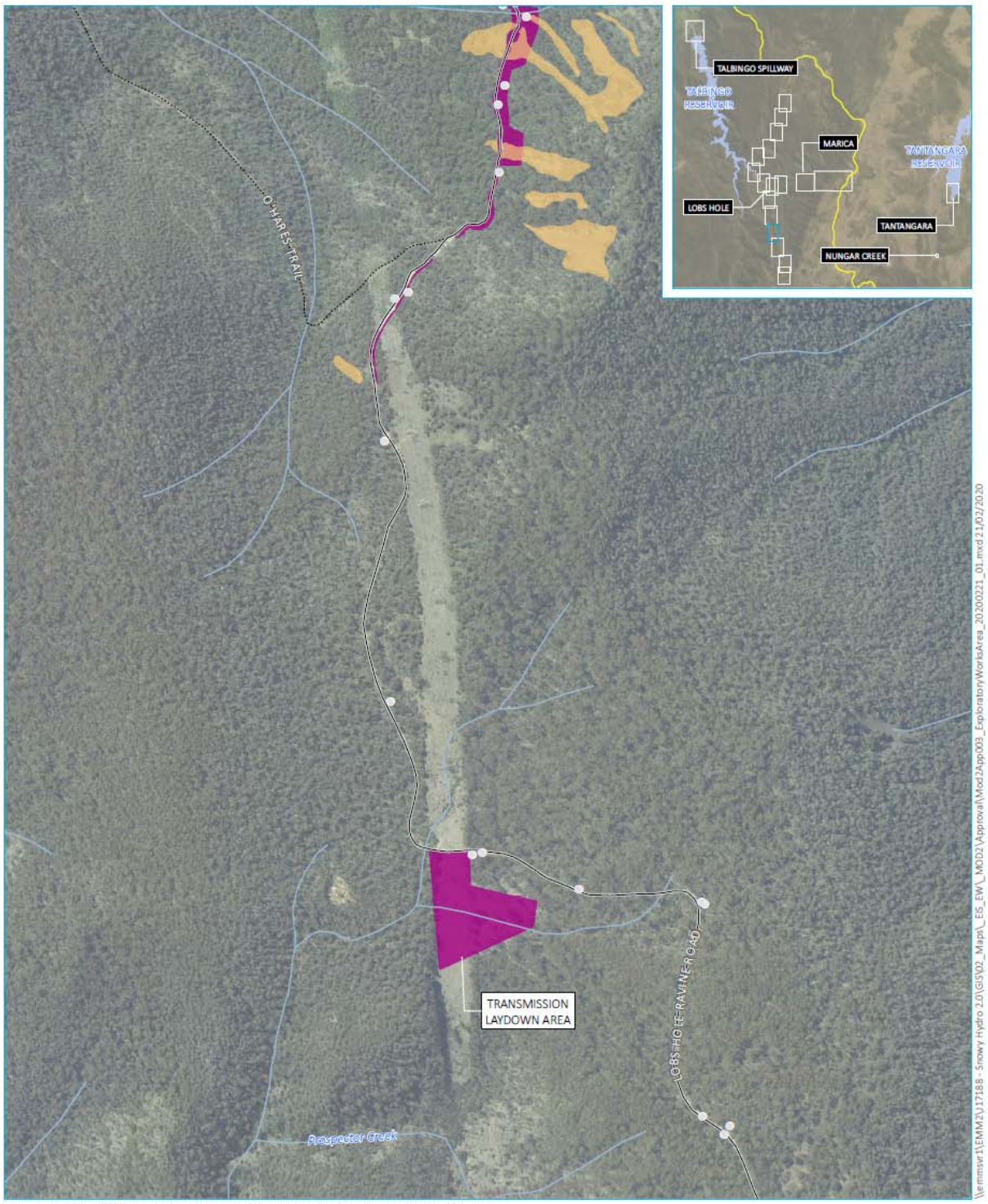


Figure 2-6: *Project Boundary – Lobs Hole Ravine Road (Upper) 3*

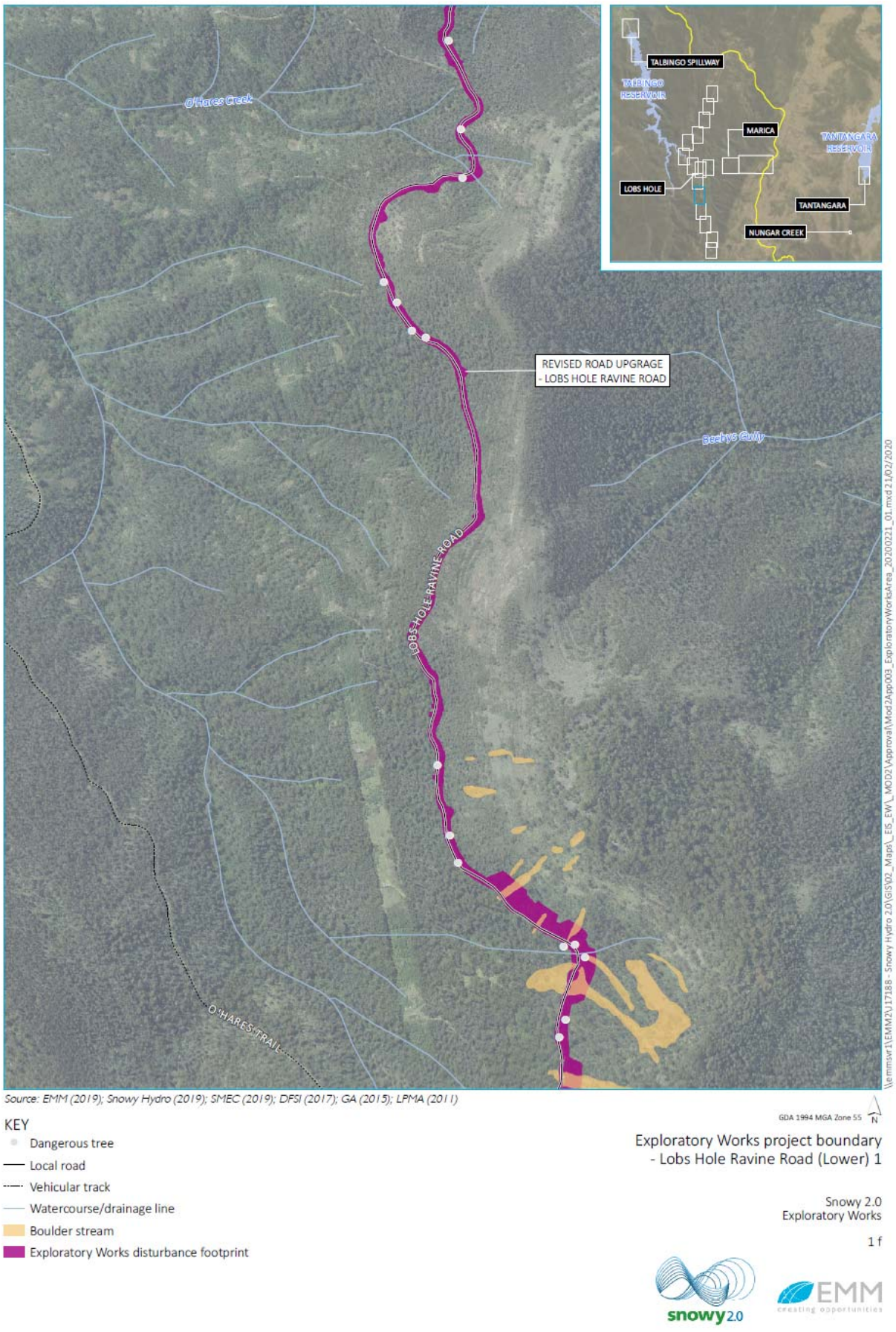


Figure 2-7: *Project Boundary – Lobs Hole Ravine Road (Lower) 1*

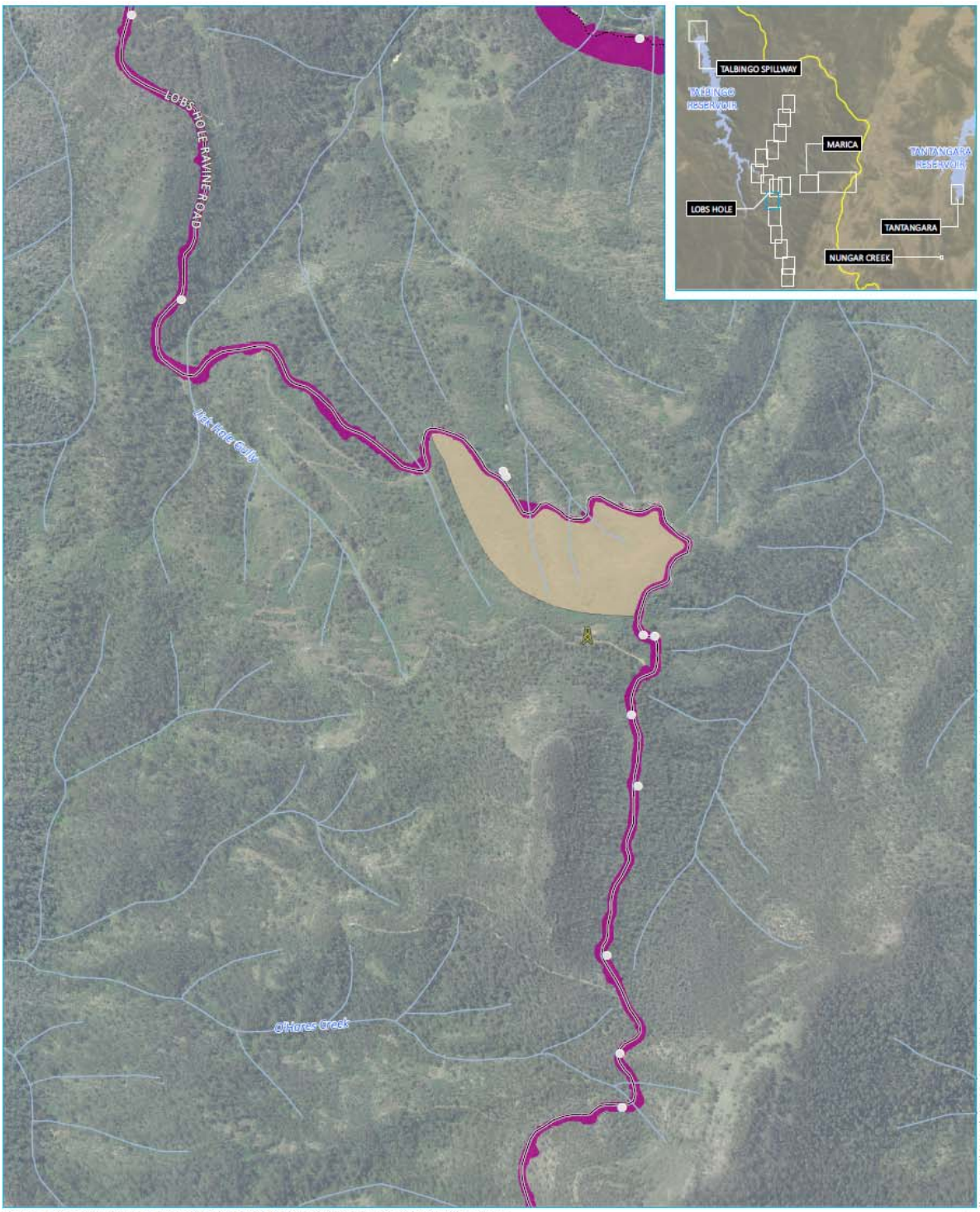


Figure 2-8: *Project Boundary – Lobs Hole Ravine Road (Lower) 2*

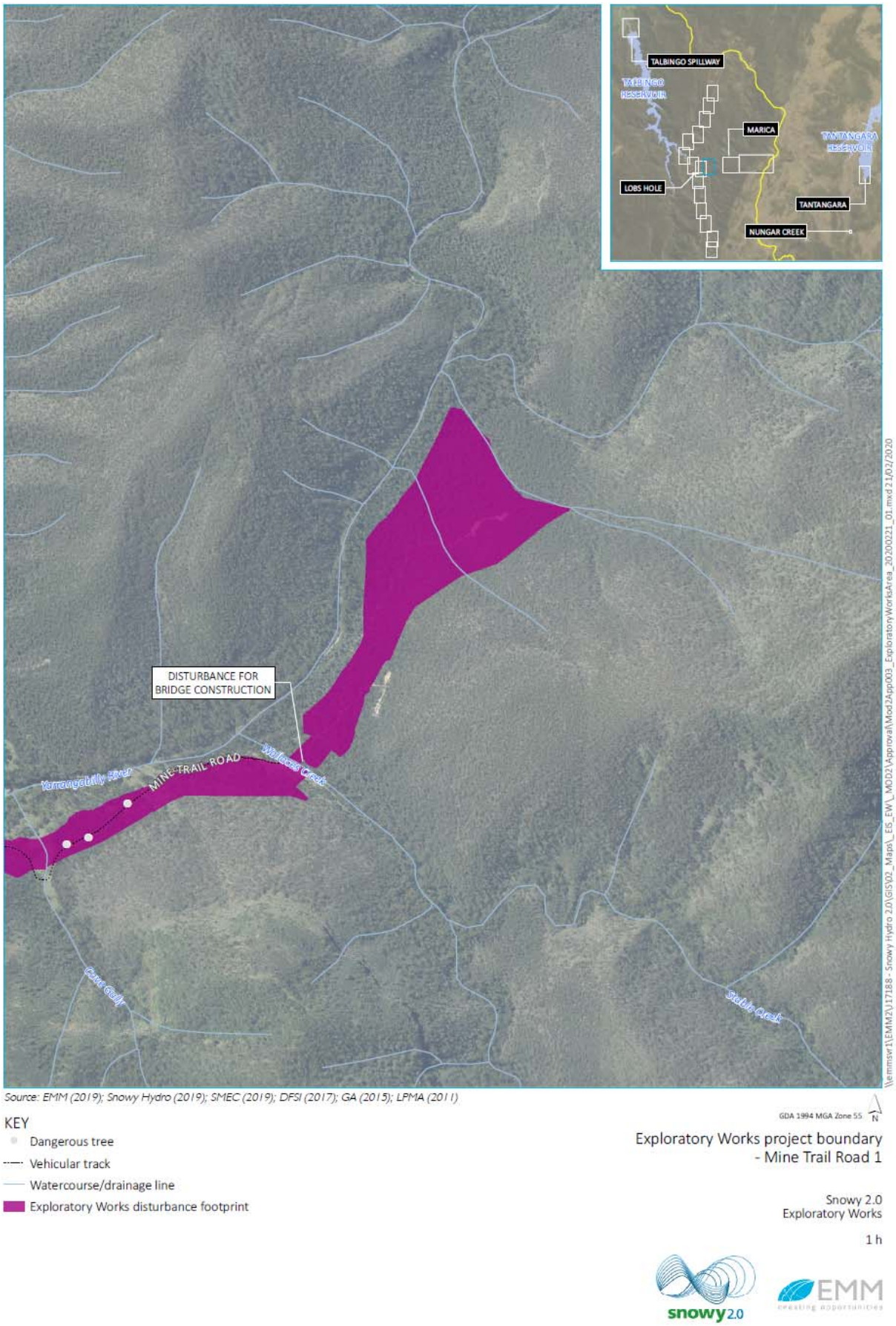


Figure 2-9: *Project Boundary – Mine Trail Road 1*

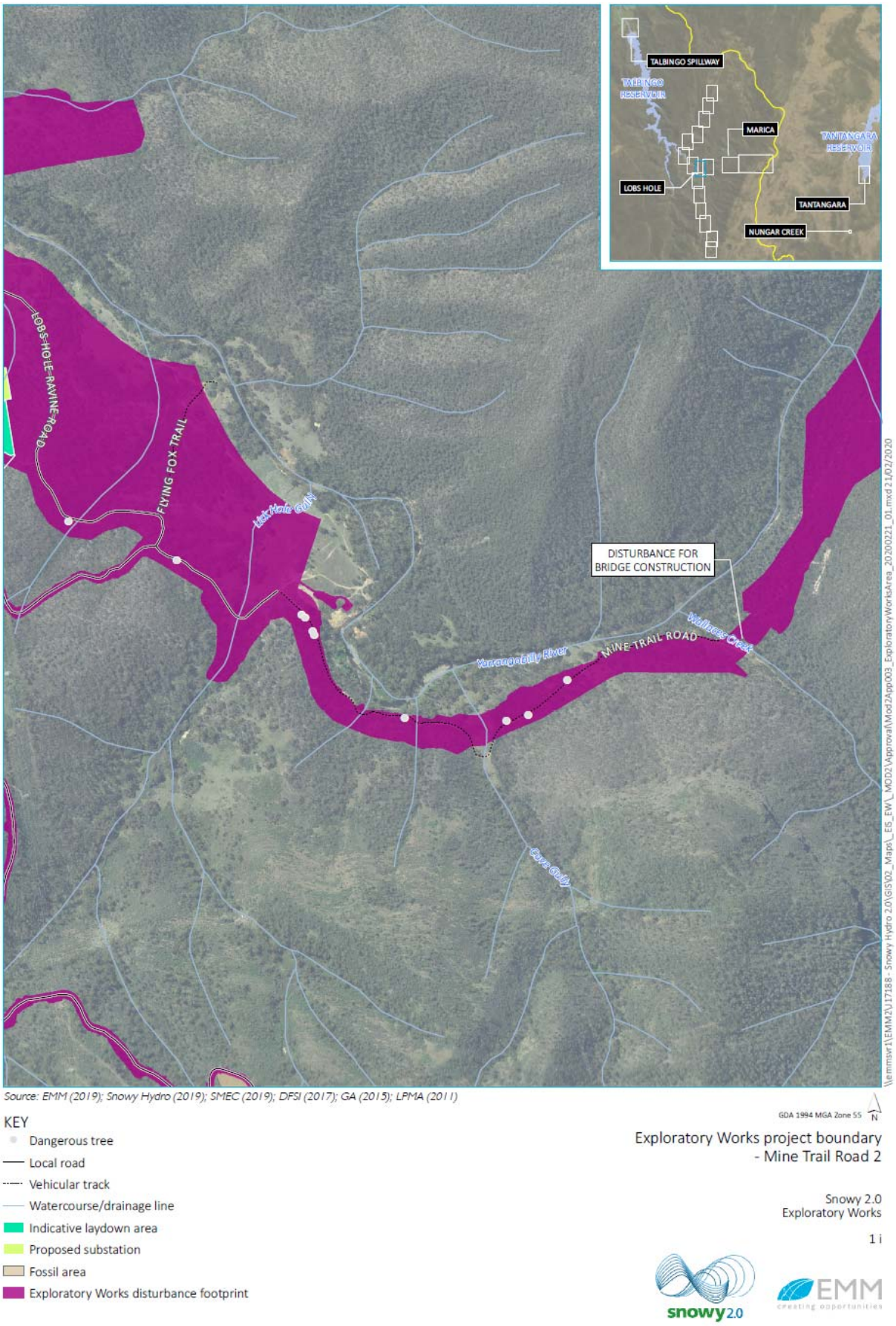


Figure 2-10: *Project Boundary – Mine Trail Road 2*

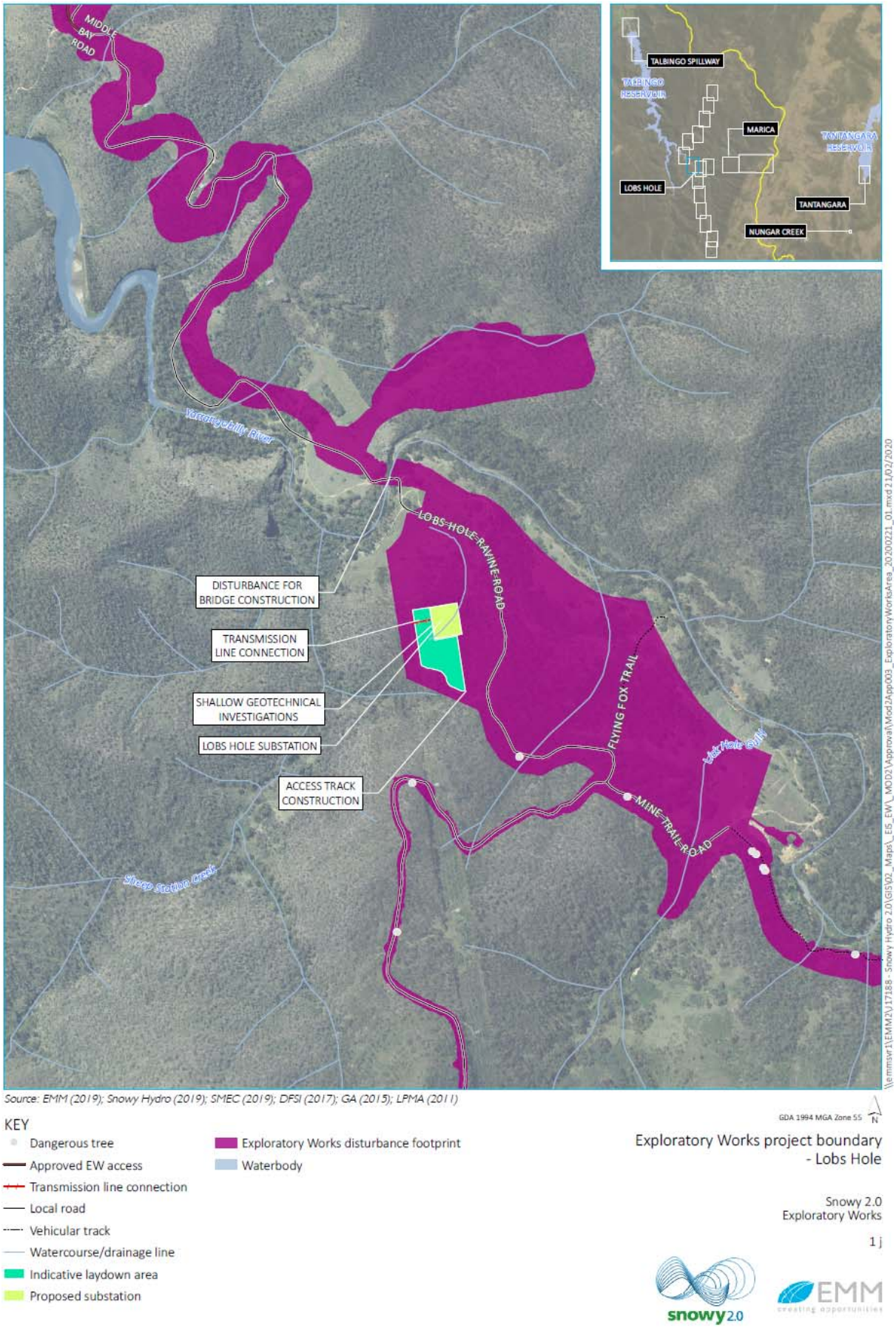


Figure 2-11: *Project Boundary – Lobs Hole*

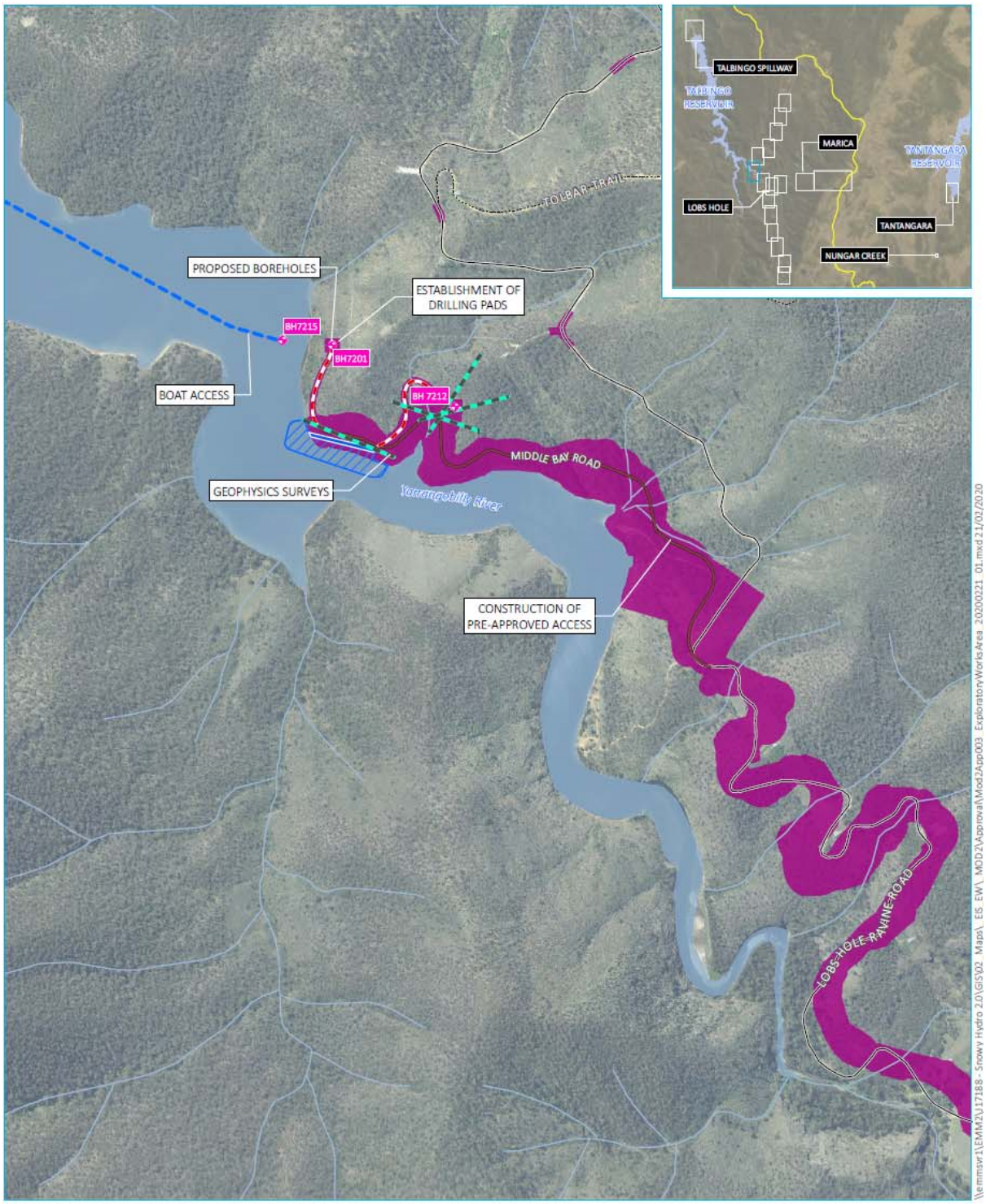


Figure 2-12: *Project boundary – Lobs Hole Ravine Road*

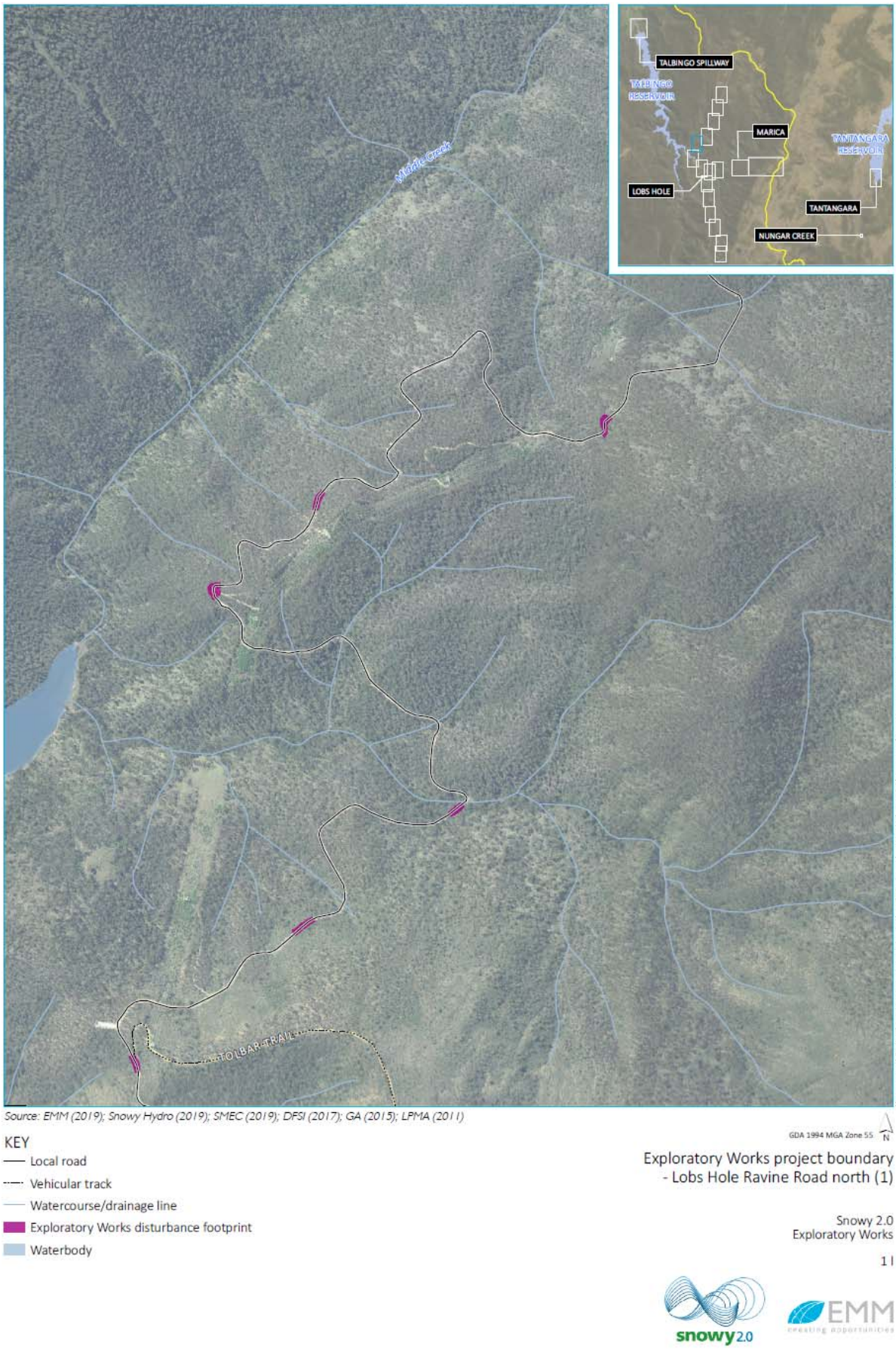


Figure 2-13: *Project boundary – Lobs Hole Ravine Road north (1)*

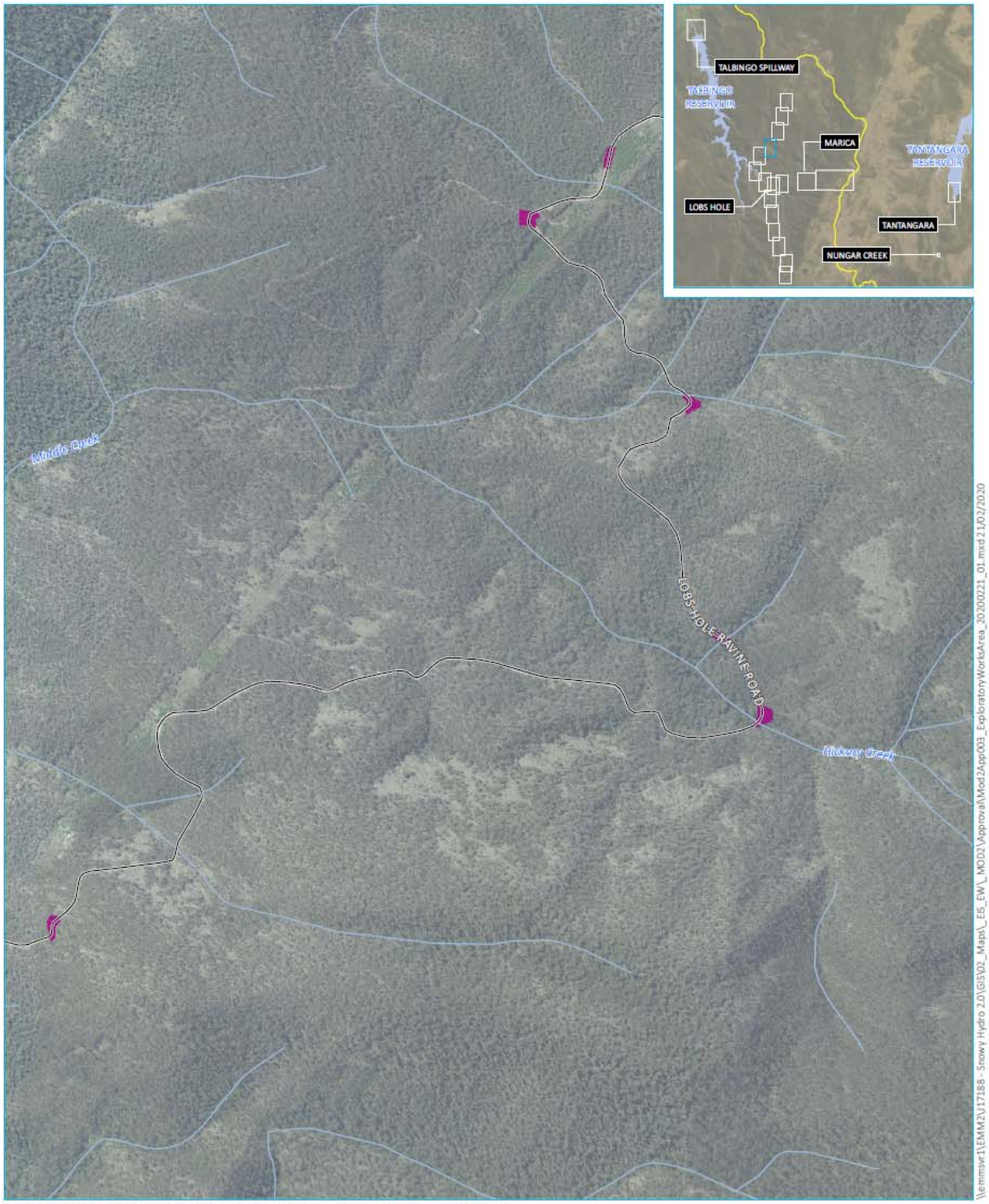


Figure 2-14: *Project boundary – Lobs Hole Ravine Road north (2)*

Figure 2-15: *Project boundary – Lobs Hole Ravine Road north (3)*

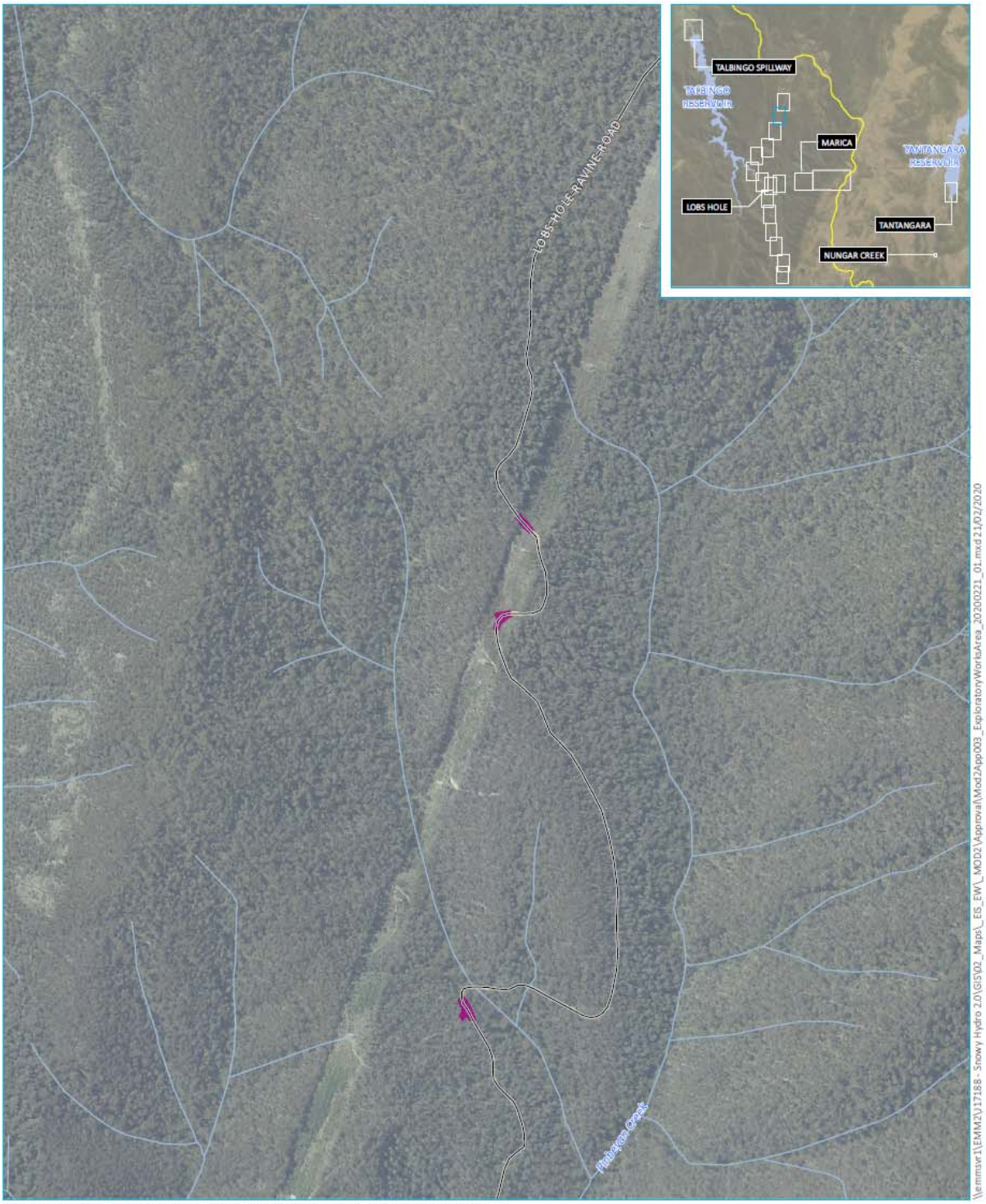


Figure 2-16: *Project boundary – Lobs Hole Ravine Road north (4)*

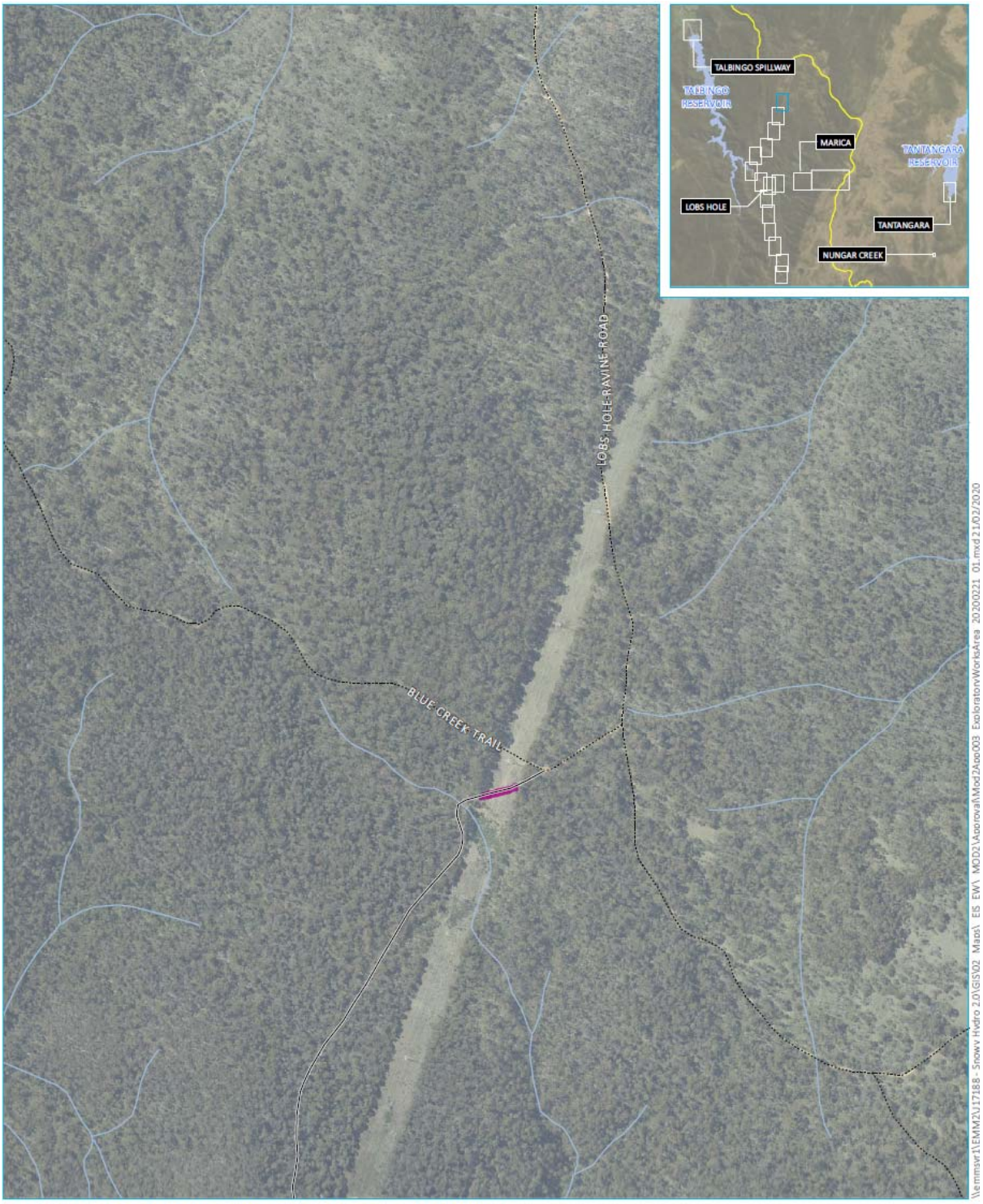


Figure 2-17: *Project boundary – Lobs Hole Ravine Road north (5)*

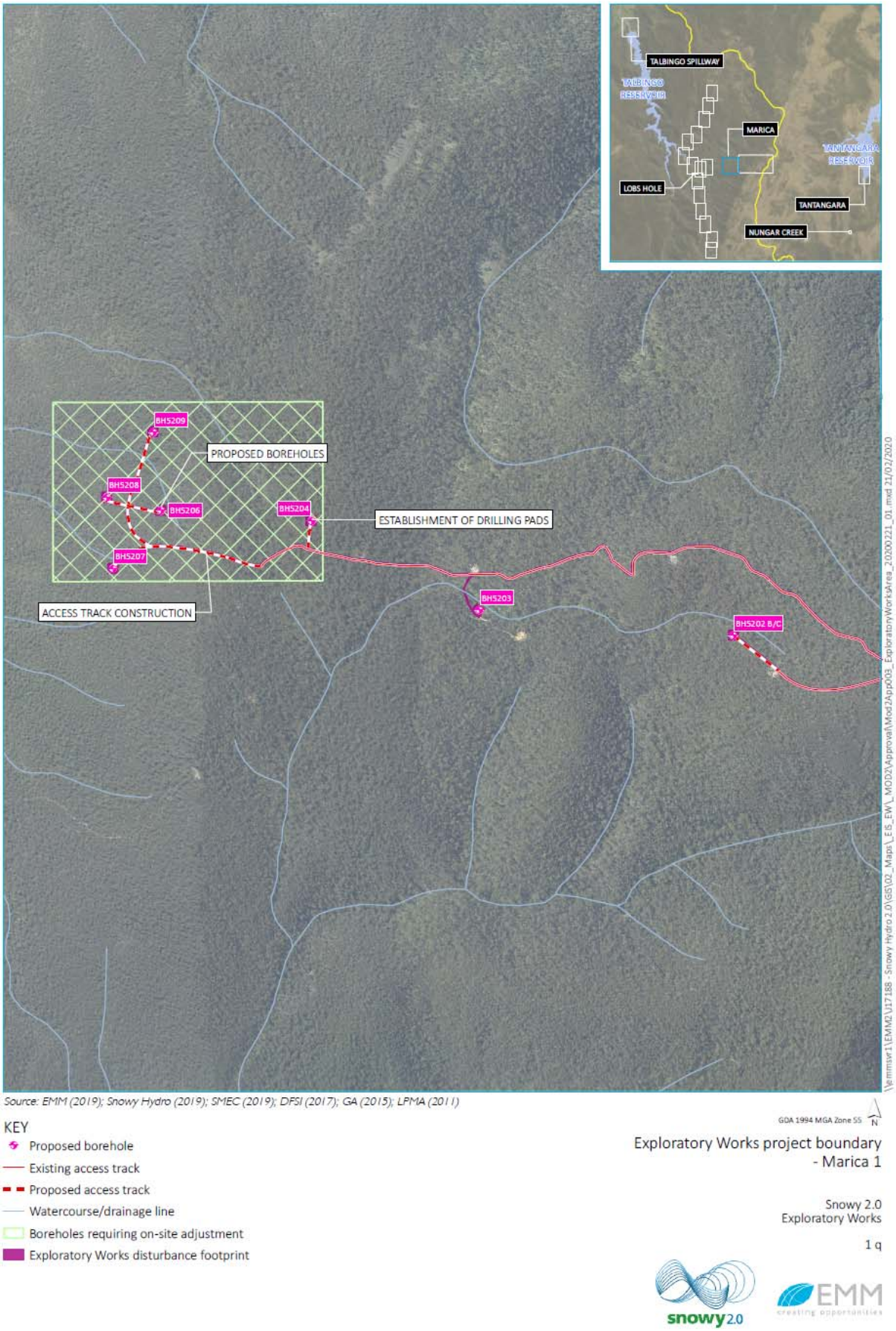


Figure 2-18: *Project boundary – Marica 1*

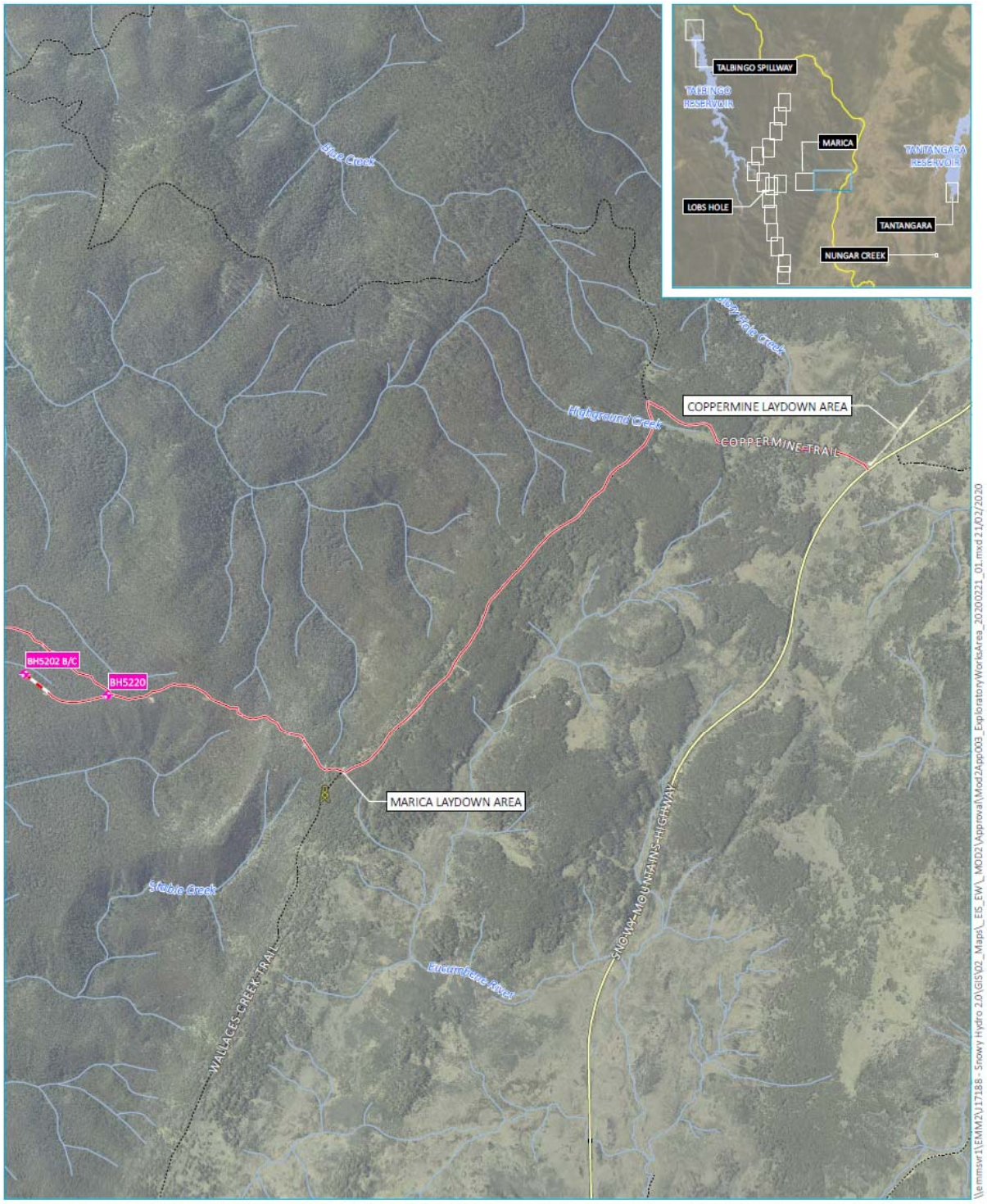


Figure 2-19: *Project boundary – Marica 2*

Figure 2-20: *Project boundary – Nungar Creek*

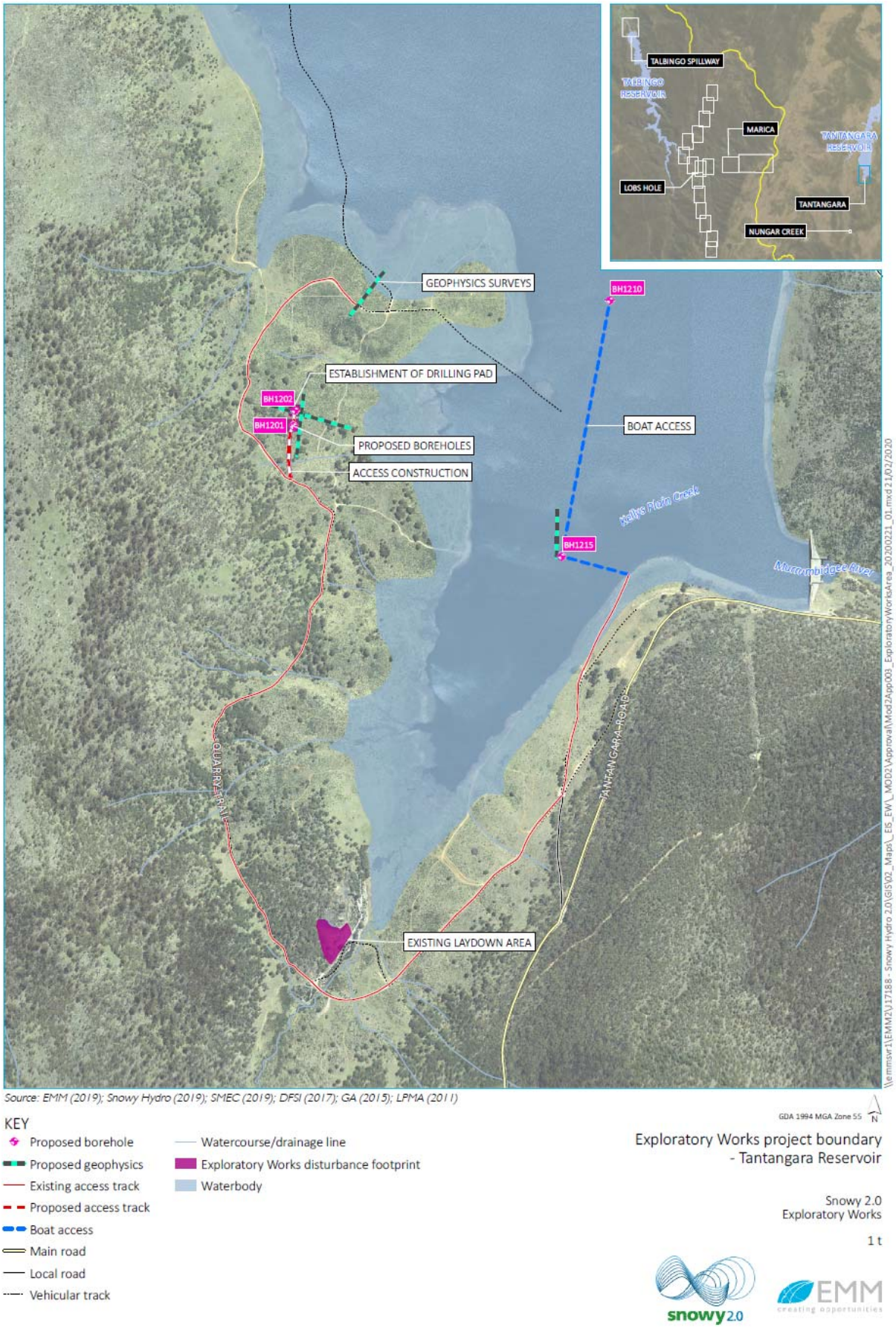


Figure 2-21: *Project boundary – Tantangara Reservoir*

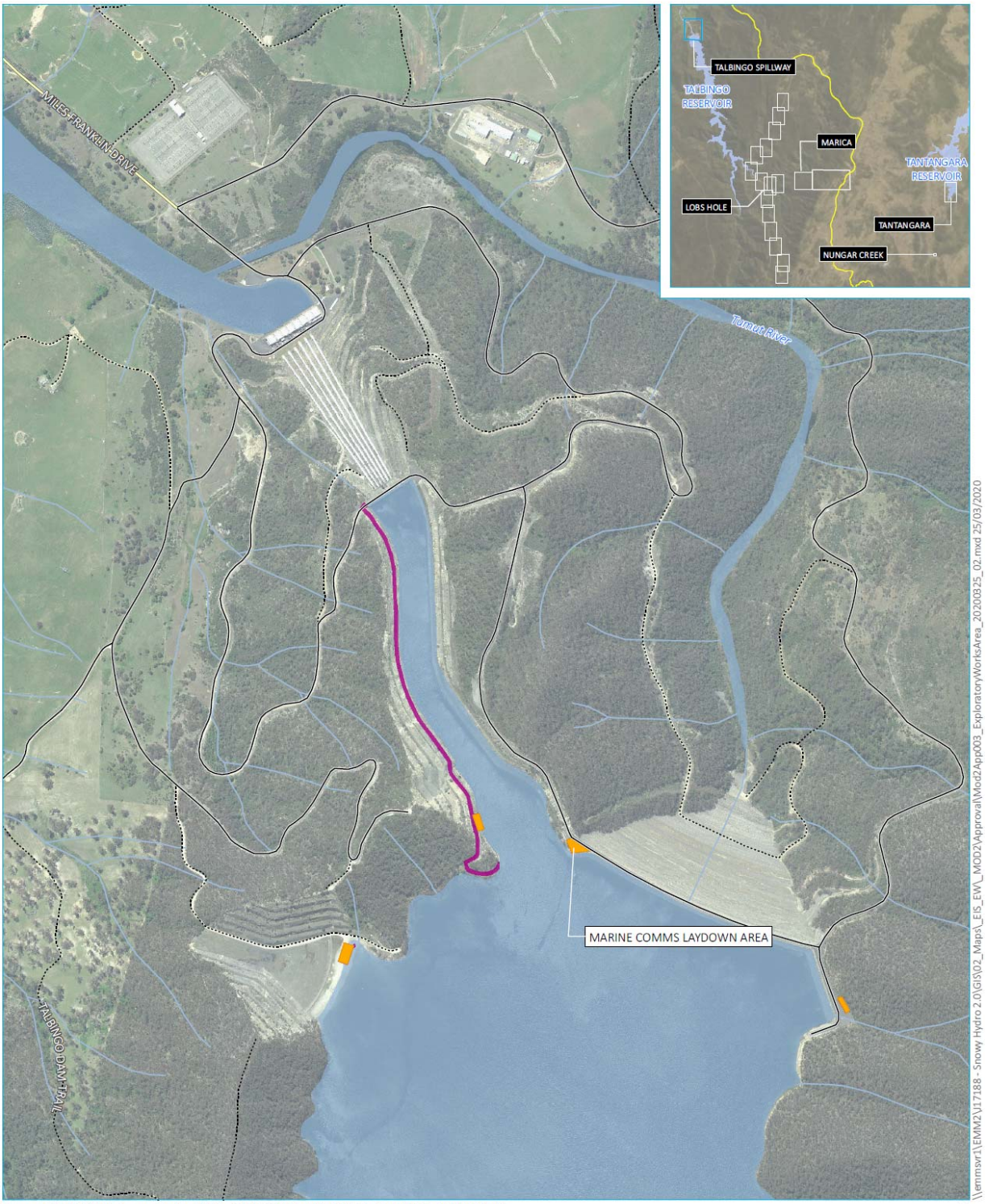


Figure 2-22: *Project boundary – Talbingo spillway*

2-24: Road Upgrades Sharp Street/Bombala Street and Sharp Street/Vale Street Roundabouts