



## REPORT

# SPOIL REPORT AUGUST 2022 – JANUARY 2023

S2-FGJV-ENV-REP-0072

REV B

OCTOBER 2023

### ABSTRACT



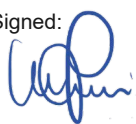
This report provides an overview of the spoil management during the nominated reporting period in accordance with Schedule 3 Condition 7 (f).

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## Document Verification

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## 1. INTRODUCTION

Snowy Hydro Limited (Snowy Hydro) is constructing a pumped hydro-electric expansion of the Snowy Mountains Hydro-electric Scheme (Snowy Scheme), called Snowy 2.0. Snowy 2.0 will be built by the delivery of two projects: Exploratory Works and Snowy 2.0 Main Works (which commenced in October 2020).

Snowy 2.0 is a pumped hydro-electric project that will link the existing Tantangara and Talbingo reservoirs through a series of new underground tunnels and a hydro-electric power station. Most of the project's facilities will be built underground, with approximately 27 kilometres of concrete-lined tunnels constructed to link the two reservoirs and a further 20 kilometres of tunnels required to support the facility. Intake and outlet structures will be built at both Tantangara and Talbingo Reservoirs.

Snowy 2.0 will increase the generation capacity of the Snowy Scheme by an additional 2,000 MW, and at full capacity will provide approximately 350,000 MWh of large-scale energy storage to the National Electricity Market (NEM). This will be enough to ensure the stability and reliability of the NEM, even during prolonged periods of adverse weather conditions.

WeBuild, Clough, and Lane have formed the Future Generation Joint Venture (Future Generation) and were engaged to deliver Stage 2 of Exploratory Works and Snowy 2.0 Main Works.

### 1.1. Purpose and Scope

In accordance with the documentation listed below, this summary is provided to report on Tunnel Boring Machine (TBM) and Drill & Blast (D&B) spoil across the Snowy 2.0 project for the reporting period August 2022 – January 2023.

- Infrastructure Approval CSSI 9687, Schedule 3 Condition 7(f)
  - *The management of spoil on site;*
  - *The implementation of each of the detailed plans, including the effectiveness of the proposed mitigation and contingency measures; and*
  - *Progress against the detailed completion criteria and performance indicators of each permanent spoil emplacement area.*
- S2-FGJV-ENV-PLN-0019, Snowy 2.0 Main Works – Spoil Management Plan.
  - Volume of spoil excavated from tunnelling and intake;
  - Volume placed at each emplacement area (Ravine Bay, GF01, Lobs Hole, Tantangara, and Rock Forest);
  - Brief summary of progress towards final design objective;
  - Volume disposed of off-site (if any);
  - Volume reused elsewhere in Kosciuszko National Park (KNP) (if any);
  - Volume of acid metalliferous drainage (AMD) material treated (if any); and
  - Volume of naturally occurring asbestos (NOA) excavated and placed in encapsulation (if any).

## 2. SPOIL MANAGEMENT

Management of spoil on the Project is outlined in the Spoil Management Plan (S2-FGJV-ENV-PLN-0019). The plan defines the methods to minimise and manage construction impacts during the handling, transport, and emplacement of spoil. The key objectives are to ensure appropriate measures are implemented to avoid or minimise impacts associated with spoil management to the surrounding environment and community. These measures formed the basis for the spoil management strategy.

The Spoil Management Plan is updated regularly based on findings and changes across the Project. Further, the Spoil Management Plan and Project Procedures such as the site-specific Leachate Detections Plans, Operational Material Characterisation and Handling Procedures, and Neutralisation Procedures have been developed and implemented to manage the risks associated with spoil.

### 2.1. Spoil Excavation

During the reporting period between August 2022 and January 2023, spoil was excavated via TBM, and D&B. Material excavated from the Main Access Tunnel (MAT) Portal Cross Passages, Emergency Ventilation and Cable Tunnel (ECVT), and Talbingo Intake has been emplaced in Main Yard and GF01. Spoil excavated from Tantangara Intake and Tantangara Adit is currently stockpiled at the nominated S1 laydown area.

**Table 1 Spoil quantities emplaced in Lobs Hole**

Initial Location	Volume (m3)
Drill and Blast (MAT Portal Cross Passages)	60,000
ECVT	242,100
Talbingo (Intake and TBM)	80,095

**Table 2 Spoil quantities emplaced in GF01**

Initial Location	Volume (m3)
Drill and Blast (MAT Portal Cross Passages)	-
ECVT	800
Talbingo	27,300

**Table 3 Spoil quantities stockpiled at S1 Tantangara**

Initial Location	Volume (m3)
Tantangara (Intake)	136,050
Tantangara (TBM)	1,400

### 2.2. Geochemical Characterisation

A Total of 428 samples were tested during the reporting period. The test results included a range of Net Acid Generation (NAG) pH between 3 to 11.1. Among the total sample tested, 3 were identified as Potentially Acid Forming (PAF).

Non-Acid Forming (NAF) material containing sufficient Acid Neutralising Capacity (ANC) has the potential to neutralise PAF material encountered during tunnelling. Materials extracted

from the tunnel are classified using total sulphur, or Maximum (MPA), and ANC; these parameters are used to calculate the ratios of NAF material to be blended to the PAF material. The following exert is from the Project PAF Neutralization Procedure (S2-GJV-ENV-PRO-0064).

The NPR is defined as:

$$\text{Equation (1)} \quad \text{NPR}_{\text{req}} = \frac{\text{ANC}_T}{\text{MPA}_T}$$

The required amount of NAF material to provide neutralising capacity for 1 ton of PAF material whilst respecting an NPR of 3 is expressed as:

$$\text{Equation (2)} \quad Q_{\text{NAF}} = \frac{(3 \cdot \text{MPA}_{\text{PAF}}) - \text{ANC}_{\text{PAF}}}{\text{ANC}_{\text{NAF}} - (3 \cdot \text{MPA}_{\text{NAF}})}$$

If the NAF material stored for neutralization is to conform to the stated requirements above (TS<0.1%, ANC>50 kgH<sub>2</sub>SO<sub>4</sub>/t) then the equation can be simplified and rounded to:

$$\text{Equation (3)} \quad Q_{\text{NAF}} = \frac{(3 \cdot \text{MPA}_{\text{PAF}}) - \text{ANC}_{\text{PAF}}}{40}$$

Terms and corresponding units are provided in Table 1.

**Table 1: Formula input values**

Term	Value	Units
NPR	Target Neutralisation Potential Ratio (set as 3)	No unit
$Q_{\text{NAF}}$	Quantity of NAF material per tonne of PAF spoil	tonne
MPA	Maximum Potential Acidity: $\text{MPA} = \text{Total S (\%)} \times 30.6$ MPA <sub>T</sub> : MPA of material after blending MPA <sub>PAF</sub> : MPA of PAF material MPA <sub>NAF</sub> : MPA of NAF material	kg H <sub>2</sub> SO <sub>4</sub> /t
ANC	Acid Neutralisation Capacity ANC <sub>T</sub> : ANC of material after blending ANC <sub>PAF</sub> : ANC of PAF material ANC <sub>NAF</sub> : ANC of NAF material	kg H <sub>2</sub> SO <sub>4</sub> /t

Equation 2 should be applied for validation of the blending process.

Equation 3 can be applied in the context of everyday operation, to facilitate the blending of tile material.

During the reporting period, PAF treatment was undertaken on material excavated from Tintangara Intake by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity. Validation testing was performed 6 days after treatment. Results after treatment sampling achieved a NAG pH over 4.5 and Neutralisation Potential Ratio (NPR) results over 3.0.

### 2.3. Spoil Emplacement

Future Generation Joint Venture's (Future Generation's) approach to spoil extraction, reuse and placement minimises the environmental and social impacts associated with the work as far as is reasonably practicable. The strategy for the management of spoil aims to prioritise the reuse and placement of materials, based on its generating source and classification, consistent with the requirements of the Infrastructure Approval and the objectives and

commitments from the Environmental Impact Statement (EIS) and Submission (RTS):

- Beneficial reuse of non-reactive spoil within permanent infrastructure will be maximised.
- Beneficial re-use of non-reactive spoil within temporary infrastructure will be tracked and removed once no longer required. Spoil will be relocated to an approved emplacement area, reused for permanent infrastructure, or disposed of offsite to facilities lawfully permitted to receive it.
- Spoil that cannot be re-used in permanent infrastructure will be directed to the approved emplacement areas at Talbingo (Ravine Bay, GF01, and Lobs Hole), Tantangara Reservoir and outside Kosciusko National Park (KNP) at Rock Forest as a priority:
  - Reactive material will be placed in the aforementioned emplacement areas with prior treatment and / or appropriate engineering controls to manage leaching and reaction both in the short term and long term.
  - NOA material will be placed within designated encapsulation cells above the full supply level (FSL) of the Tantangara Reservoir emplacement area.
  - TBM spoil will not be placed in the active storages or below the FSL of either the Talbingo Reservoir or Tantangara Reservoir without the approval of the Planning Secretary.
  - Spoil from dredging, channel excavation or underwater blasting will not be placed in the Exploratory Works eastern and western emplacement areas, or in the active storages or below the FSL of either the Talbingo Reservoir or Tantangara Reservoir without the approval of the Planning Secretary.
  - It is anticipated that, following completion of construction activities for Snowy 2.0 Main Works, Lobs Hole, Tantangara, and Marica will be re-opened to recreational users. As such surplus materials at these locations will be minimised, through reuse or permanent placement in one of the designated emplacement areas (refer Sections 6.2 and 6.3). Spoil retained at these locations will be limited to the volume required to achieve rehabilitation.
  - Placement of spoil will be carried out 24 hours a day, seven days a week and 365 days a year.
- Non-reactive spoil will be reused for the purposes of rehabilitation of temporary work areas in accordance with the Rehabilitation Management Plan, once approved. The re-use of nonreactive spoil in other parts of the KNP would also be maximised in accordance with Schedule 3 Condition 4 f) of the Infrastructure Approval. It is expected that up to 40,000 m<sup>3</sup> of suitable excavated material will be made available to National Parks and Wildlife Service (NPWS) for use in road maintenance and upgrades.
- Transportation and re-use of materials by NPWS will be subject to a separate approvals process. Unsuitable material will be disposed of offsite to facilities lawfully permitted to receive it.

In accordance with the Spoil Management Plan, unsuitable spoil will be disposed of off-site to a lawful facility. No unsuitable spoil was identified between August 2022 and January 2023.



### 3. IMPLEMENTATION

The following table provides a summary of spoil movements for material excavated via the TBM and D&B (in cubic meters) between August 2022 and January 2023.

Over the reporting period, spoil was excavated from Talbingo Intake, MAT and ECVT to Lobs Hole Main Yard, from Tantangara Head Race Tunnel (HRT) and Tantangara intake to S1 temporary laydown area, and from the Upstream Surge Shaft (USS) to the temporary laydown area.

**Table 4 Excavated spoil quantities between August 2022 and February 2023**

Spoil Management / Location	MAT	ECVT	Talbingo Adit	Talbingo Intake	USS**	Tantangara HRT*	Tantangara Intake*	Cross Passages
Volume of spoil excavated from tunneling	40,360	243,080	-	121,060	9,130	1,390	136,050	19,680
Volume placed at each emplacement area:	-	-	-	-	9,130	-	-	-
• Ravine Bay	-	-	-	-	-	-	-	-
• GF01	-	790	-	27,280	-	-	-	-
• Lobs Hole	40,360	242,290	-	80,100	-	-	-	19,680
• Tantangara	-	-	-	-	-	1,390	136,050	-
• Rock Forest	-	-	-	-	-	-	-	-
Volume beneficially reused in permanent infrastructure	-	-	-	13,690	-	-	-	--
Volume disposed off-site (if any)	-	-	-	-	-	-	-	-
Volume reused elsewhere in KNP (if any)	-	-	-	-	-	-	-	-
Volume of AMD material treated (if any)	-	-	-	-	-	1000	-	-
Volume of NOA excavated and placed in encapsulation (if any)	-	-	-	-	-	-	-	-

\*Please note that even though there has been material excavated from both the HRT and Tantangara Intake, the emplacement area is not ready to receive spoil material. Consequently, the 137,437.50 m<sup>3</sup> excavated has been placed in a temporary area.

\*\*Please note that even though there has been material excavated from the Upstream Surge Shaft (USS), the emplacement area is not ready to receive spoil material. Consequently, the 9,132.7 m<sup>3</sup> excavated has been placed in a temporary area.

Note: Volumes measured in cubic meters  
AMD – Acid Mine Drainage  
ECVT – Emergency Cable and Ventilation Tunnel  
HRT – Headrace Tunnel  
KNP – Kosciuszko National Park  
MAT – Main Access Tunnel  
NOA – Naturally Occurring Asbestos  
USS – Upstream Surge Shaft

### 3.1. Mitigation measures

Mitigation measures implemented are outlined in the overarching Spoil Management Plan. The implementation of these mitigation measures is outlined in the following table.

**Table 5 Spoil Mitigation Measures**

REMM	Measure / Requirement	Implementation
SM01	Training will be provided to all project personnel, including relevant sub-contractors on spoil management practices and the requirements from this plan through inductions, toolboxes and targeted training.	Training has been, and continues to be, provided to all relevant project personnel involved in spoil works.
SM02	Management measures from this plan will be included in relevant site environmental documents including for example, Work Packs and/or Site Environmental Plans (SEPs).	FGJV documents such as ITP-0048, characterisation, and handling procedure reports contain management measurements from the Spoil Management Plan.
SM03	The spoil characterisation program in Appendix A will be implemented. The program will enable adequate assessment of contaminated materials, NOA, acid metalliferous drainage (AMD)/neutral metalliferous drainage (NMD)/saline drainage (SD) material and reduce the risk of material being misclassified as 'benign' and being managed inappropriately.	Spoil characterisation is ongoing across the project. In accordance with Appendix A of the SMP, adequate assessment of materials is facilitated through high sampling frequency, QA/QC testing, and validation testing.
SM04	Targeted investigations will be undertaken prior to construction along the surface disturbance areas using a risk-based approach. The results of these targeted investigations will determine the level of management to be implemented.	Investigations were carried out prior to placement of material at Main Yard to determine the most suitable design and placement methodology.
SM05	Material which has been assessed as not suitable for reuse on land or for subaqueous disposal or cannot be reused will be classified in accordance with the Waste Classification Guidelines (NSW EPA 2014).	During the reporting period, in accordance with all spoil characterisation carried out, excavated spoil material has been deemed suitable for placement, and reuse when required.  Where material has not been suitable for reuse, such as anthropogenically contaminated material resulting from minor spills, it has been classified in accordance with the Waste Classification Guidelines and disposed offsite at an appropriately licenced facility.
SM06	Prior to the importation of any VENM during construction, the VENM source(s) will be identified and assessed against the definition of VENM in the Waste Classification Guidelines (NSW EPA, 2014) and the POEO Act. The VENM source(s) will be assessed by an appropriately qualified contaminated land consultant.	During the reporting period, no VENM was imported to the project.

REMM	Measure / Requirement	Implementation
SM07	Spoil generation will be minimised through design optimisation and beneficial reuse as set out in Section 6.2 of the Spoil Management Plan.	The design has been optimised to minimise spoil generation and maximise beneficial reuse.
SM08	Spoil is to be only re-used, placed or disposed of in accordance with its classification as set out in Section 6.1 of the Spoil Management Plan.	During the reporting period, in accordance with all spoil characterisation carried out, excavated spoil material has been deemed suitable for placement, and reuse where required.
SM09	<p>Apart from the spoil that is provided to the NPWS for use in other parts of the Kosciuszko National Park, sent off-site, used to construct temporary or permanent infrastructure for the development or used to rehabilitate the site, the Proponent must ensure that all the spoil generated by the development is disposed of in the following emplacement areas:</p> <ul style="list-style-type: none"> <li>• Ravine Bay.</li> <li>• GF01;</li> <li>• Lobs Hole;</li> <li>• Tantangara; or</li> <li>• Rock Forest.</li> </ul>	<p>During the reporting period, spoil excavated from Talbingo Intake, MAT and ECVT was either reused for permanent construction, stockpiled for utilisation during rehabilitation, or taken to the Lobs Hole Main Yard spoil emplacement area.</p> <p>During the reporting period, spoil excavated from Tantangara HRT and Tantangara intake was either reused for permanent construction, stockpiled for utilisation during rehabilitation, or taken to the S1 laydown area.</p>
SM10	TBM spoil must not be placed in the active storages or below the full supply level of either the Talbingo Reservoir or Tantangara Reservoir without the approval of the Planning Secretary.	During the reporting period, TBM spoil was not placed in the active storages or below the fully supply level of Talbingo or Tantangara Reservoir.
SM11	Spoil from dredging, channel excavation or underwater blasting must not be placed in the eastern and western emplacement areas, or in the active storages or below the full supply level of either the Talbingo Reservoir or Tantangara Reservoir without the approval of the Planning Secretary.	During the reporting period, no spoil was generated from dredging, channel excavation, or underwater blasting.
SM12	The beneficial reuse of non-reactive spoil on the project will be maximised where possible.	Spoil reuse has been maximised through utilisation as fill at ECVT and MAT portal pads and roads. Spoil locations and volumes are tracked.
SM13	The beneficial reuse of non-reactive spoil elsewhere in the KNP will be maximised where possible (as requested and approved by NPWS).	During this reporting period, no spoil has been reused elsewhere in the KNP.

REMM	Measure / Requirement	Implementation
SM14	Off-site disposal of spoil will be minimised where possible. Surplus spoil will be directed to the permanent spoil emplacement areas as a priority over off-site disposal.	During the reporting period, all TBM and D&B spoil was classified prior to placement at Lobs Hole Main Yard spoil emplacement area or reuse.
SM15	Spoil left at Lobs Hole, Marica and Tantangara for incorporation into the final landform should be minimised.	Lobs Hole Main Yard was the only active final emplacement area utilised during the reporting period. S1 Laydown Area at Tantangara was utilised for temporary storage of spoil excavated from the Adit.
SM16	The Exploratory Works western emplacement area must only receive non-reactive spoil, which has a low geochemical risk and is suitable for reuse. Reactive spoil must not be directed to the Exploratory Works western emplacement area.	The Exploratory Works western emplacement area has only received material that has a low geochemical risk.
SM17	The Contaminated Land Management Plan (S2-FGJV-ENV-PLN-0049) will be implemented to ensure appropriate management of contaminated material on site.	Spoil has been managed in accordance with the Contaminated Land Management Plan, including management of PAF. No NOA or previous land use contamination consisting of heavy metals was intercepted during the reporting period of August 2022 to January 2023. Spoil contaminated as a result of minor spills during construction was classified in accordance with the Waste Classification Guidelines and disposed off-site at an appropriately licenced facility.
SM18	An unexpected finds procedure is included in the Contaminated Land Management Plan (S2-FGJV-ENV-PLN-0049). Workers will be trained to identify potential contamination that may be encountered during construction	Training has been provided to all relevant project personnel involved in spoil works.
SM19	The Naturally Occurring Asbestos Management Plan (Appendix D of this Plan) will be implemented to ensure appropriate management of Naturally Occurring Asbestos encountered during works.	Naturally Occurring Asbestos has been identified along the headrace tunnel at 7.5 km. During the reporting period, excavation did not occur along the 7.5 km alignment.
SM20	The Acid and Metalliferous Drainage Management Plan (Appendix E of the Spoil Management Plan) will be implemented to ensure appropriate management of AMD material encountered during works.	During the reporting period, the AMD Management Plan was implemented including testing for AMD material, however, there was no confirmed presence of PAF.

REMM	Measure / Requirement	Implementation
SM21	The Waste Management Plan (S2-FGJV-ENV-PLN-0048) will be implemented to ensure appropriate classification, use and disposal of waste from the project.	During the reporting period, all TBM and D&B spoil was classified prior to placement at Lobs Hole Main Yard spoil emplacement area. No TBM or D&B spoil was disposed of off-site.
SM22	Material which is not suitable for reuse or placement or on onsite remediation, will be transported to a facility that is lawfully permitted to receive that material.	During the reporting period, all TBM and D&B spoil was classified prior to placement at Lobs Hole Main Yard spoil emplacement area. No TBM or D&B spoil was disposed of off-site.
SM23	The Stockpile Procedure (Appendix C of the Spoil Management Plan) will be developed to ensure temporary stockpiling is appropriately managed and that any adverse impacts are controlled and rectified.	Stockpiling of material has been carried out in accordance with the Stockpiling Procedure including, but not limited to, the location of stockpiling, erosion and sediment controls, stockpile heights, and management.
SM24	The Surface Water Management Plan (S2-FGJV-ENV-PLN-0011) will be implemented to ensure impacts on surface waters as a result of spoil handling and placement are minimised.	Impacts on surface water have been minimised in accordance with the measures outlined in the Surface Water Management Plan (S2-FGJV-ENV-PLN-0011) including the diversion or clean water and the management of storm water and leachate water.
SM25	Site-based Erosion and Sediment Control Plans (ESCPs) will be prepared by a suitably qualified erosion and sediment control specialist.	All ESCPs have been prepared by SEEC, a qualified erosion and sediment control specialist.
SM26	A non-naturally occurring Asbestos Management Plan (S2-FGJV-HAS-PLN-0010) has been developed and will be implemented to manage Asbestos Containing Materials ACM (ACM), or areas are suspected of containing ACM (such as historical buildings). The AMP addresses unexpected finds of ACM. Specifically, protocols will be stipulated for separation, monitoring, validation and clearance of asbestos	The Asbestos Management Plan has been followed. During the reporting period, no asbestos was intercepted on site.
SM27	An Occupational Hygienist (Hygienist) will be on-site for the duration of the excavation works where ACM has been identified from pre-construction or where unexpected finds of ACM are encountered.	During the reporting period, no ACM was identified on site.

REMM	Measure / Requirement	Implementation
SM28	The process Water Treatment Plants will receive all tunnel drainage, including tunnel drainage containing AMD components for excavations in Possible, Likely and Confirmed AMD hazard areas. The water will be reused in the tunnelling process following treatment. Any discharge to the environment will only occur where the water is treated so as to comply with the criteria in EPL 21266.	During the reporting period, process water treatment plants were commissioned at Tantangara. During the previous reporting period, the Talbingo process water treatment plants were commissioned. All treated process water was either reused in accordance with the Water Reuse Procedure e.g., for tunnelling and dust suppression, or discharged at the nominated EPL discharge point in Talbingo or Tantangara Reservoir.
SM29	The Topsoil Strategy (Appendix B of the Spoil Management Plan S2-FGJV-ENV-PLN-0019) will be implemented to ensure the surface of the emplacement areas will be suitable to sustain the target PCTs in the long term.	Measures have been implemented in accordance with the topsoil strategy, including, but not limited to: <ul style="list-style-type: none"> <li>• Stockpiled, signposted and separated from other materials.</li> <li>• Height will not exceed 2.5m to minimise the risk of compaction and to maintain the viability of the soil.</li> <li>• Stockpiles monitored and managed for weeds</li> </ul>
SM30	A hold point process will be established and implemented requiring approval by the Future Generation Environment Manager or Construction Manager prior to the placement of material generated from dredging, channel excavation or underwater blasting. This hold point process will note that this material cannot be placed in the Exploratory Works eastern and western emplacement areas without the approval of the Planning Secretary.	During the reporting period, spoil was not generated as a result of dredging, channel excavation or underwater blasting.
SM31	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. To note, the Exploratory Works western emplacement area will be filled during Main Works for the purposes of constructing the Main Yard. Nevertheless only non-reactive spoil will be placed at this location.	The western emplacement area has only received material that has a low geochemical risk.
SM32	Any remnant mine workings located within the eastern and western rock and soil emplacement areas will be rehabilitated (if necessary).	During the reporting period, no works were required on the remanent mine workings.

REMM	Measure / Requirement	Implementation
SM33	<p>The eastern emplacement area will be used to store any material generated during Exploratory Works 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. To note, the Exploratory Works eastern emplacement area will be filled during Main Works for the purposes of constructing the Main Yard. PAF material will be managed as set out in Appendix E of the Spoil Management Plan (S2-FGJV-ENV-PLN-0019).</p>	<p>During the reporting period, spoil characterisation was carried out in accordance with Appendix A of the Spoil Management Plan. PAF treatment was undertaken on material excavated from Tantangara Intake by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity.</p>
SM34	<p>Runoff from Lick Hole Gully during Exploratory Works 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. To note, the Exploratory Works eastern emplacement area will be filled during Main Works for the purposes of constructing the Main Yard and the final Lobs Hole emplacement area. Final design of the Lobs Hole emplacement area will be addressed in accordance with the staging specified in Section 1.6 and the Rehabilitation Management Plan. Operational controls that require ongoing management following completion of construction would be of no impost the NPWS.</p>	<p>The Lick Hole Gully clean water diversion drain has been designed with a 1% AEP capacity.</p>



REMM	Measure / Requirement	Implementation
SM35	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. To note, the Exploratory Works eastern emplacement area will be filled during Main Works for the purposes of constructing the Main Yard and the final Lobs Hole emplacement area. Final design of the Lobs Hole emplacement area will be addressed in accordance with the staging specified in Section 1.6 and the Rehabilitation Management Plan. Operational controls that require ongoing management following completion of construction would be of no impost the NPWS.	<p>A clean water diversion drain was constructed to convey Lick Hole Gully around the emplacement area.</p> <p>Lobs Hole Main Yard emplacement area has been approved under a staged approach and final design of Lobs Hole Main Yard emplacement will be prepared at a later date but prior to land forming and rehabilitation.</p>
SM36	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. To note, the Exploratory Works eastern emplacement area will be filled during Main Works for the purposes of constructing the Main Yard and the final Lobs Hole emplacement area. Final design of the Lobs Hole emplacement area will be addressed in accordance with the staging specified in Section 1.6 and the Rehabilitation Management Plan.	<p>A water management basin was constructed at the base of the eastern emplacement area. Water from the basin is being irrigated back over the emplacement area or taken to the water treatment plant in accordance with the Spoil Management Plan (S2-FGJV-ENV-PLN-0019).</p> <p>Final design of Lobs Hole Main Yard emplacement will be prepared prior to final land forming and rehabilitation.</p>
SM37	The western emplacement will be designed to prevent the risk of emplacement material being entrained in flood waters during a 1 in 5000-year flood event. To note, the Exploratory Works eastern emplacement area will be filled during Main Works for the purposes of constructing the Main Yard and the final Lobs Hole emplacement area. Final design of the Lobs Hole emplacement area will be addressed in accordance with the staging specified in Section 1.6 and the Rehabilitation Management Plan.	<p>Lobs Hole Main Yard emplacement area has been approved under a staged approach and final design of Lobs Hole Main Yard emplacement will be prepared at a later date but prior to land forming and rehabilitation.</p>

REMM	Measure / Requirement	Implementation
SM38	<p>The monitoring in Section 9 of this Plan will be implemented to identify and track the performance of:</p> <ul style="list-style-type: none"> <li>the management of spoil on site;</li> <li>the implementation of each of the detailed plans, including the effectiveness of the proposed mitigation and contingency measures; and</li> <li>progress against the detailed completion criteria and performance indicators of each permanent spoil emplacement area.</li> </ul>	<p>This report addresses this management measure.</p>
SM39	<p>Monitoring measures to be included as part of the Surface and Groundwater Monitoring Program, to monitor potential impacts from the placement of spoil.</p>	<p>Monitoring and mitigation measures relating to spoil management are included in the Surface Water Management Plan (S2-FGJV-ENV-PLN-0011) and Groundwater Management Plan (S2-FGJV-ENV-PLN-0012).</p>
SM40	<p>The permanent spoil emplacement areas will be designed to comply with the design objectives in Table 2 (of the COA entitled Design Objectives for Permanent Spoil Emplacement Areas).</p>	<p>The Lobs Hole Main Yard design is currently for the temporary phase of works. Design of the Lobs Hole permanent emplacement area (final design) will be developed at a later stage so as to comply with Design Objectives in schedule 3 condition 6 of the Infrastructure Approval.</p> <p>Spoil excavated from Tantangara Adit and Tantangara Intake is temporarily stockpiled at S1 Laydown. The permanent spoil emplacement design for Tantangara is currently being finalised during this reporting period.</p> <p>GF01 has been designed to comply with the design objectives in Table 2 (of the COA entitled Design Objectives for Permanent Spoil Emplacement Areas) as is discussed in Appendix G of the Spoil Management Plan (S2-FGJV-ENV-PLN-0019).</p>

REMM	Measure / Requirement	Implementation
SM41	<p>New landforms will:</p> <ul style="list-style-type: none"> <li>• be safe, stable and non-polluting.</li> <li>• maximise surface drainage to the natural environment.</li> </ul>	<p>The Lobs Hole Main Yard design is currently for the temporary phase of works. A geotechnical review has been carried out and incorporated into the Main Yard design and construction methodology.</p> <p>Surface drainage has been installed that directs any surface water run-off away from the slope area and into a controlled drainage system. Surfaces of placed material have been sloped to provide drainage towards basins /collection points.</p> <p>GF01 has had a geotechnical review and is constructed in accordance with the appropriate and construction methodology.</p> <p>Tantangara Permanent Spoil Emplacement design is currently being finalised during this reporting period.</p> <p>Tantangara Permanent Spoil Emplacement design is currently being finalised during this reporting period.</p>

REMM	Measure / Requirement	Implementation
SM42	<p>Detailed plans for each of the permanent spoil emplacement areas that have been prepared using both analogue and erosional-based methods will be developed for approval prior to commencement of construction of the applicable placement area. The plans will:</p> <ul style="list-style-type: none"> <li>describe how the development of each emplacement area would be co-ordinated with the rehabilitation of the site in accordance with the approved Rehabilitation Management Plan;</li> <li>describe the measures that would be implemented to comply with the spoil management requirements in condition 4 and the design objectives in Table 2 of the COA;</li> <li>include a topsoil strategy outlining measures the measures that would be implemented to ensure the surface pf the emplacement areas will be suitable to sustain the target PCTs in the long term, having regard to the approved strategy in the Rehabilitation Management Plan;</li> <li>identify the key risks for the successful completion of each emplacement area and the contingency measures that would be implemented to address these risks; and</li> <li>include detailed completion criteria and performance indicators for each emplacement area, including criteria for triggering remedial action (if necessary)</li> </ul>	<p>The Lobs Hole Main Yard design is currently for the temporary phase of works. Design of the Lobs Hole permanent emplacement area (final design) will be developed at a later stage so as to comply with Design Objectives in schedule 3 condition 6 of the Infrastructure Approval.</p> <p>GF01 has been designed with specific details relating to the points mentioned discussed in the approved Appendix G of the Spoil Management Plan (S2-FGJV-ENV-PLN-0019), relating specifically to GF01 emplacement area.</p> <p>Tantangara Adit and Intake spoil is currently stockpiled temporarily at S1 Laydown. Tantangara Permanent Spoil Emplacement design is currently being finalised during this reporting period.</p>
SM43	The Rehabilitation Management Plan (S2-FGJV-ENV-PLN-0023) will be implemented (once approved) for the new landforms at Tantangara Reservoir, Lobs Hole and Talbingo Reservoir.	The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan will be implemented once approved.
SM44	Mitigations will be included in the Rehabilitation Management Plan to minimise impacts to Alpine humus soils and peat bogs/fens.	The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management of impacts to Alpine humus soils and peat bogs/fens. The plan will be implemented once approved.

REMM	Measure / Requirement	Implementation
SM45	<p>The Rehabilitation Management Plan (refer to REHAB01) will be implemented and will include measures to minimise:</p> <ul style="list-style-type: none"> <li>• loss of soil;</li> <li>• loss of organic matter and nutrient decline;</li> <li>• soil structural decline; and</li> <li>• compaction.</li> </ul>	<p>The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management measures to minimise loss of soil, organic matter, nutrient decline, soil structural decline and compaction. The plan will be implemented once approved.</p>
SM46	<p>Regular rehabilitation monitoring will be undertaken to identify any defects, such as slumping, erosion or poor vegetation establishment. Identified defects will be rectified.</p>	<p>The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management measures involving monitoring to ensure any slumping, erosion or poor vegetation establishment will be promptly identified and rectified. The plan will be implemented once approved.</p>

## 3.2. Contingency measures

### 3.2.1. Lobs Hole

The key risks and contingency measures relevant to the placement of spoil at Lobe Hole Main Yard are identified in Table 6.

**Table 6 Lobs Hole Main Yard PSE - Contingency Measures**

Risk	Contingency	Implementation
<p>The timing of construction stages prevents adequate spoil volume or spoil quality being available for development of the final landform</p>	<p>The Main Yard will be progressively decommissioned as areas within the facility are no longer required to support construction.</p> <p>In the unlikely event that material is no longer available direct from tunnelling or other nearby surface works, spoil can be sourced from GF01 or Ravine Bay emplacement areas (or both) if required.</p>	<p>Spoil placement at Main Yard PSE is ongoing. A surplus of material is being stored in Main Yard to provide sufficient quantities of spoil to complete the final landform of the Main Yard PSE.</p>

Risk	Contingency	Implementation
The timing of construction stages results in excess spoil needing to be retained at the Lobs Hole emplacement areas, contrary to the requirement of schedule 3, condition 6 of the Infrastructure Approval	<p>The Main Yard will be progressively decommissioned as areas within the facility are no longer required to support construction. Material can be drawn down progressively and diverted to GF01 or Ravine Bay (or both).</p> <p>Ravine Bay emplacement area has approximately 2 million m3 spare capacity. Excess material can be directed to Ravine Bay if required.</p>	Spoil placement at Main Yard PSE is ongoing. Ravine Bay PSE retains spare capacity in the unlikely circumstance there is excess spoil.
Contamination caused by development or operation of Main Yard construction pads	Respond to incidents and execute remediation where required. Retain records to demonstrate either: no residual risk from contamination; or residual risk from contamination is not unacceptable.	Only minor spills have occurred within the Main Yard construction pads. All spills cleaned up removing any potential source of contamination. Impacted spoil is disposed of appropriately offsite after classification.
Temporary foreign or unsuitable objects prevent effective filling and / or compaction	<p>Upon completion of use of area for purposes of supporting construction remove all foreign / unsuitable objects that are not proposed to form part of the Lobs Hole emplacement area final design.</p> <p>Undertake inspection of each area within the Main Yard facility that is being decommissioned. Retain records.</p>	Spoil placement at Main Yard PSE is ongoing. Use of Main Yard for construction pads is ongoing. An update will be provided regarding an inspection of the area for foreign objects prior to final land forming.
Soil and water impacts during removal of controls supporting Main Yard as a construction compound and development of the site for emplacement	<p>Develop and maintain specific erosion and sediment control plans based on risk for each transition (e.g.: removal of hardstand, removal of basins, regrading).</p> <p>Implement and maintain the controls as specified by the erosion and sediment control plans.</p>	<p>Specific ERSED plans have been prepared for spoil placement. Spoil placement at Main Yard PSE is ongoing. Use of Main Yard for construction pads is ongoing.</p> <p>Prior to commencing decommissioning of the construction pads, the ERSED plans will be updated to address specific risks for each transition stage.</p> <p>An update will be provided regarding updated ERSED plans and decommissioning works at a later stage.</p>

Risk	Contingency	Implementation
The Main Yard temporary works design and execution are unable to be modified upon completion and result in risk for landform's future intended use.	<p>Include check of Main Yard temporary works against criteria and objectives in the design for final emplacement area, the Rehabilitation Management Plan and the Recreation Management Plan.</p> <p>Ensure work with potential to undermine the proposed outcomes from the final works are avoided.</p>	Once the Rehabilitation, and the Recreation Management Plans have been approved, they will be reviewed against the Main Yard temporary works to mitigate the potential for the undermining of proposed outcomes from the final works.

The key risks and contingency measures relevant to the placement of spoil at Lobe Hole GF01 are identified in Table 7. The following contingency measures are outlined in Section 4 of Appendix G of the SMP.

**Table 7 GF01 PSE - Contingency Measures**

Risk	Contingency	Implementation
The works deviate from the design criteria specified.	The design criteria form the Basis of Design (BoD) and these will be used to ensure the achievement of the objectives. Measurement tools are in place to ensure the construction does not deviate from these design criteria. This will be managed through the FGJV technical team design review process. Where concept design changes or deviation from the design criteria is expected, agencies will be consulted.	<p>Placement of spoil in GF01 is ongoing but is monitored and surveyed to ensure construction is implemented in accordance with the approved design.</p> <p>Not deviations from the design were recorded in the reporting period.</p>
The timing of construction stages results in insufficient or excessive spoil volume being available for development of the final landform.	GF01 is to be utilised for on-land material placement before there is access to the other emplacement areas. Should less material be placed into GF01 than expected, the landform can be constructed to a lower level or with flatter slopes.	Placement of spoil in GF01 is going.
Material placed into GF01 contains contamination (other than PAF and NOA material).	Respond to incidents as per the Unexpected Finds Protocol and Section 6.6 of the Spoil Management Plan.	No contamination other than UC PAF was recorded at GF01.

Risk	Contingency	Implementation
Temporary foreign or unsuitable objects prevent effective filling and / or compaction	Ensure only spoil is placed in the area. Undertake inspections of spoil being laid and compacted. Retain records. These are considered “business as usual” controls.	Spoil relating to TMB, and D&B is placed in GF01. Regular inspections are undertaken of the emplacement area and any material not suitable for placement will be disposed of, offsite at a suitable facility. This was not required during the reporting period.
Soil and water impact(s) during construction	Develop and maintain specific erosion and sediment control plans throughout construction based on risk for each of the spoil layers. Implement and maintain the controls as specified by the erosion and sediment control plans.	Specific ERSED plans have been prepared and implemented for the spoil emplacement area.
GF01 design is modified, and this results in changes to the landform's future intended use, or approved form.	Check any changes to the GF01 design against criteria and objectives in the design for the final emplacement area, the Rehabilitation Management Plan and the Recreation Management Plan. Any changes required need to align with the currently proposed outcomes.	Not deviations from the design were recorded in the reporting period.
Rehabilitation is inadequate and does not achieve the required outcomes	Ensure that the Rehabilitation Management Plan is followed, including requirements for topsoil placement and surface finishing prior to rehabilitation, ensuring a successful handover.	The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management measures to minimise loss of soil, organic matter, nutrient decline, soil structural decline and compaction. The plan will be implemented once approved.
Volumes of topsoil are inadequate	Topsoil volume requirements will be calculated and if there is not enough topsoil within the site that can be reused, topsoil and other required materials may be ordered from an external source to meet the demand.	Topsoil was removed from GF01 prior to spoil emplacement and has been appropriately stockpiled in a location recorded in a register. This topsoil will be used during rehabilitation.  If there is an insufficient quantity of topsoil in accordance with the Main Works Rehabilitation Management Plan, further topsoil will be sourced.
Material placed has a higher risk of erosion than expected.	Although an outer topsoil layer will be placed over the excavated tunnel material, there is the risk that the TBM material will be highly erodible due to the possible	Placement of spoil at GF01 is ongoing and erodibility of TBM material will be monitored throughout the placement process.



Risk	Contingency	Implementation
	percentage of silt sized particles. It may be necessary to place a layer of coarser D&B material over the final surface before topsoiling. The surface will then be ripped to increase infiltration and form a coarser final surface.	
PAF presence	To be treated as per characterisation program (Appendix A of the SMP) and the Lobs Hole Material Characterisation Procedure outlined in Attachment A of this plan. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed and workshopped with the NSW EPA to ensure effective site management and will be monitored under the Project EPL.	<p>During the reporting period, spoil characterisation was carried out in accordance with Appendix A of the Spoil Management Plan.</p> <p>PAF and uncertain PAF treatment was undertaken on material by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity. Validation testing undertaken 6 days following treatment.</p> <p>Results after treatment sampling achieved a NAG pH over 4.5 and Neutralisation Potential Ratio (NPR) results over 3.0.</p>
Rock drainage lines not constructed correctly or rock too small and experiences erosion.	Ensure robust rock sizing for drainage lines, use of suitable rock with the correct grading, and proper construction controls. Implement and maintain the controls as specified by the erosion and sediment control plans.	<p>Drainage lines installed for construction purposes have been constructed from suitable sized rock to minimise erosion.</p> <p>This is monitored regularly.</p>
Soil and water impact(s) during removal of controls	The basin can remain in place until rehabilitation is completed, and an acceptable water quality achieved.	The basin has been constructed and will remain in place until rehabilitation is complete.
Long term stability not demonstrated	Undertake LEM to confirm long term stability and address any areas of higher erosion risk.	LEM was not undertaken during in the reporting period.

### 3.2.2. Tantangara

The key risks and contingency measures relevant to the placement of spoil at Tantangara are identified in Table 8.

**Table 8 Tantangara PSE - Contingency Measures**

Risk	Contingency	Implementation
Clearing and grubbing outside approved area.	Disturbance boundaries are set out on site with no-go areas demarcated.	Spoil is currently temporarily stockpiled at the S1 laydown area. Disturbance boundaries will be installed prior to carrying out clearing and grubbing works.
The works deviate from the design criteria specified.	The design criteria form the Basis of Design (BoD) and these will be used to ensure the achievement of the objectives. Measurement tools are in place to ensure the construction does not deviate from these design criteria. This will be managed through the FGJV technical team design review process. Where concept design changes or deviation from the design criteria is expected, agencies will be consulted.	Placement of spoil in the approved Tantangara PSE has not yet commence.
The timing of construction stages results in insufficient or excessive spoil volume being available for development of the final landform.	Sequencing is not relevant to Tantangara, and there is flexibility around landform volumes which can be increased or decreased fairly significantly by changing the slopes and adjusting the footprint.	Placement of spoil at Tantangara PSE has not yet commenced. This section will be updated once placement of spoil has commenced.
Material placed into Tantangara contains contamination (other than the PAF and NOA material).	Respond to incidents as per the Unexpected Finds Protocol and Section 6.6 of the Spoil Management Plan.	Spoil from Tantangara Adit and Tantangara Intake is currently being placed at S1 temporary laydown. The unexpected finds protocol is being followed for temporary stockpiling at S1 and will continue to be followed for permanent spoil placement. No unexpected finds have been made to date.
Temporary foreign or unsuitable objects prevent effective filling and / or compaction	Ensure only spoil is placed in the area. Undertake inspections of spoil being laid and compacted. Retain records. These are considered “business as usual” controls.	Spoil from Tantangara Adit and Tantangara Intake is currently being placed at S1 temporary laydown. An update will be provided regarding an inspection of the area for foreign objects prior to final land forming.

Risk	Contingency	Implementation
Soil and water impact(s) during construction	Develop and maintain specific erosion and sediment control plans throughout construction based on risk for each of the spoil layers.  Implement and maintain the controls as specified by the erosion and sediment control plans.	Spoil from Tantangara Adit and Tantangara Intake is currently being placed at S1 temporary laydown. Specific erosion and sediment control plans will be prepared prior to placement of spoil.
Tantangara design is modified, and this results in changes to the landform's future intended use, or approved form.	Check any changes to the Tantangara design against criteria and objectives in the design for the final emplacement area, the Rehabilitation Management Plan, and the Recreation Management Plan.  Any changes required need to align with the currently proposed outcomes.	Placement of spoil in the approved Tantangara PSE has not yet commence.
Rehabilitation is inadequate and does not achieve the required outcomes	Ensure that the Rehabilitation Management Plan is followed, including requirements for topsoil placement and surface finishing prior to rehabilitation, ensuring a successful handover.	The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management measures to minimise loss of soil, organic matter, nutrient decline, soil structural decline and compaction. The plan will be implemented once approved.
Volumes of topsoil are inadequate	Topsoil volumes requirements will be calculated and if there is not enough topsoil within the site that can be reused, topsoil and other required materials may be ordered from an external source to meet the demand.	Placement of spoil at Tantangara PSE has not yet commenced.  Topsoil will be removed prior to spoil emplacement and will be appropriately stockpiled in a location recorded in a register. This topsoil will be used during rehabilitation.  If there is an insufficient quantity of topsoil in accordance with the Main Works Rehabilitation Management Plan, further topsoil will be sourced.
Material placed has a higher risk of erosion than expected.	Although an outer topsoil layer will be placed over the excavated tunnel material, there is the risk that the TBM material will be highly erodible due to the possible percentage of silt sized particles. It may be necessary to place a layer of coarser D&B material over the final surface before topsoiling. The surface will then be ripped to increase infiltration and form a coarser final surface.	Placement of spoil at Tantangara PSE has not yet commenced however, erodibility of TBM material will be monitored throughout the placement process.

Risk	Contingency	Implementation
PAF presence to be managed	To be treated and placed in accordance with Appendices A and E of the SMP and the Tantangara Material Characterisation Procedure outlined in Attachment A of this plan. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed and workshopped with the NSW EPA to ensure effective site management and will be monitored under the Project EPL.	Material excavated from Tantangara Intake and Tantangara Adit has been tested in accordance with spoil characterisation procedure. PAF treatment was undertaken on material by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity. All material is currently being temporarily stockpiled at S1 laydown.
NOA presence to be managed	To be treated and placed in accordance with Appendices A and D of the SMP and the Tantangara Material Characterisation Procedure outlined in Attachment A of this plan.	Material excavated from Tantangara Intake and Tantangara Adit has been tested in accordance with spoil characterisation procedure. No confirmed presence of NOA during this reporting period. All material is currently being temporarily stockpiled at S1 laydown.
Rock drainage lines not constructed correctly or rock too small and experiences erosion.	Ensure robust rock sizing for drainage lines, use of suitable rock with the correct grading, and proper construction controls. Implement and maintain the controls as specified by the erosion and sediment control plans.	The design for Tantangara PSE is currently being finalised. Placement of spoil at Tantangara PSE has not yet commenced. This section will be updated once the design is complete, placement of spoil has commenced and potential risks of erosion beyond the design are identified.
Soil and water impact(s) during removal of controls	The basins can remain in place until rehabilitation is completed, and an acceptable water quality achieved.	Construction of the Tantangara PSE has not yet commenced. This section will be updated once the design is complete, placement of spoil has commenced and potential risks of erosion beyond the design are identified.
Long term stability not demonstrated	Undertake LEM to confirm long term stability and address any areas of higher erosion risk.	Place of spoil at Tantangara has not yet commenced. LEM will be undertaken once spoil placement begins.
Final dozing occurs towards water	Final dozing will be undertaken either when water levels are suitably low to limit the risk of entering water, or a bench will be left between the water level and the area to be dozed to ensure the equipment cannot enter the water.	Placement of spoil at Tantangara PSE has not yet commenced. This section will be updated once the design is complete, and placement of spoil has commenced.

Risk	Contingency	Implementation
Post construction recreational use changes or is not achieved	The landform has been sloped to meet targets that are similar to natural slopes in the general area and should allow easy access. Rock has also been limited to ensure that passage on to the surface is easily achieved, although subject to confirmation by the wave action modelling.	Placement of spoil at Tantangara PSE has not yet commenced. This section will be updated once the design is complete, and placement of spoil has commenced.
The varying water level causes scour through wave action	Modelling of the wave action and erosion risk will be included in the detailed design. The use of appropriate vegetation in this zone and / or some rock if required will be considered as part of the design.  Appropriate sediment controls will be implemented during periods of low reservoir levels to limit placement of D&B material directly into water and reduce sediment loading during placement.  D&B benches below FSL will be dozed down as placed to ensure a low gradient is achieved.	The approved design for Tantangara PSE incorporates the requirement for D&B material below FSL.
Water rising (flooding) the area	Basins and surface water will be monitored regularly during routine site inspections, particularly prior to any shutdowns.	Construction of the Tantangara PSE has not yet commenced. However, basins in the area of the temporary PSE are being monitored and water transferred to the water treatment plant.
Public risks associated with the reservoir	Ensure appropriate exclusion zones and notifications to the community have been undertaken appropriately.	Community notifications regarding the exclusion zones in Tantangara have been issued, are posted at the boat ramp at Tantangara Reservoir and a Maritime Exclusion Zone notice is available at: <a href="https://www.nsw.gov.au/topics/using-waterways/restrictions-and-closures/marine-notices/so2281-tantangara">https://www.nsw.gov.au/topics/using-waterways/restrictions-and-closures/marine-notices/so2281-tantangara</a>
Climate change changing the occurrence of extreme events	Design, including rock armouring, accounts for the 1% Annual Exceedance Probability (AEP) risk, or a 1 in 100-year Average Recurrence Interval (ARI) storm event. Gradients have been flattened to 1V:7H and 1V:8H below Full Supply Level (FSL) and rock drainage included to manage erosion risks.	The approved design for Tantangara PSE incorporates these design requirements as detailed in Appendix I of the Spoil Management Plan (S2-FGJV-ENV-PLN-0019).

Risk	Contingency	Implementation
Leachate from the spoil emplacement	A spoil characterisation program has been prepared involving XRF, NAG suite analysis, pH and EC screening and validation testing by a NATA accredited laboratory (Appendix A of the SMP) to ensure material is neutralised prior to placement. A leachate basin will be constructed on site and tested for potential contamination prior to reuse on the stockpile. Attachment A – Tantangara Material characterisation program outlines the steps to ensure material neutralisation and actions in the circumstance contamination is detected. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed and workshopped with the NSW EPA to ensure effective site management and will be monitored under the Project EPL.	<p>Material excavated from Tantangara Intake and Tantangara Adit has been tested in accordance with spoil characterisation procedure.</p> <p>PAF treatment was undertaken on material by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity.</p> <p>All material is currently being temporarily stockpiled at S1 laydown.</p> <p>Placement of spoil at Tantangara PSE has not yet commenced.</p>
Neutral mine drainage	Kinetic testing has been carried out to understand the reactivity of the excavated rock. The outcomes will be used to better understand the reactivity of sulphides in excavated rocks, the release rates of contaminants, and the water quality evolution in response to long-term oxidation and weathering that may affect the design of the final landforms and the quality of surface and groundwater. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed and workshopped with the NSW EPA to ensure effective site management and will be monitored under the Project EPL.	Preliminary results from the Kinetic testing are positive with little reaction taking place over a 12-month period. This report will be finalised and reviewed to ensure improvements to controls are implemented where required.

### 3.2.3. Marica

The key risks and contingency measures relevant to the placement of spoil at Marica are identified in Table 9.

**Table 9 Marica PSE - Contingency Measures**

Risk	Contingency	Implementation
The works deviate from the design criteria specified.	The design criteria form the Basis of Design (BoD) and these will be used to ensure the achievement of the objectives. Measurement tools are in place to ensure the construction does not deviate from these design criteria. This will be managed through the FGJV technical team design review process. Where concept design changes or deviation from the design criteria is expected, SHL will be consulted.	The temporarily stockpiled spoil at Marica will be used to support the Surge Shaft structure once constructed. Surplus spoil will be taken to Rock Forest emplacement area. The Rock Forest design is being developed in accordance with the design criteria.
Material placed into Marica contains contamination (other than PAF and NOA material).	Respond to incidents as per the Unexpected Finds Protocol and Section 6.6 of the Spoil Management Plan.	Spoil from Upstream Surge Shaft (USS) is currently being placed at the temporary laydown. The unexpected finds protocol is being followed for temporary stockpiling and will continue to be followed for permanent spoil placement. No unexpected finds have been made to date.
Temporary foreign or unsuitable objects prevent effective filling and / or compaction	Ensure only spoil is placed in the area. Undertake inspections of spoil being laid and compacted. Retain records. These are considered “business as usual” controls.	Spoil placement at the temporary spoil laydown area is ongoing with regular inspections of the area.  Spoil impacted with anthropogenic material resulting from minor spills or the use of poly fibres, was classified in accordance with the Waste Classification Guidelines and disposed offsite at an appropriately licenced facility.
Soil and water impact(s) during construction	Develop and maintain specific erosion and sediment control plans throughout construction based on risk for each of the spoil layers. Implement and maintain the controls as specified by the erosion and sediment control plans.	Specific ERSER plans have been prepared for the temporary spoil laydown.
Marica design is modified, and this results in changes to the landform's future intended use, or approved form.	Check any changes to the Marica design against criteria and objectives in the design for the final emplacement area, the Rehabilitation Management Plan and the Recreation Management Plan. Any changes required need to align with the currently proposed outcomes.	No deviations from the design were recorded in the reporting period.



Risk	Contingency	Implementation
Rehabilitation is inadequate and does not achieve the required outcomes	Ensure that the Rehabilitation Management Plan is followed, including requirements for topsoil placement and surface finishing prior to rehabilitation, ensuring a successful handover.	The Main Works Rehabilitation Management Plan is undergoing the approval process. The plan includes management measures to minimise loss of soil, organic matter, nutrient decline, soil structural decline and compaction. The plan will be implemented once approved.
Volumes of topsoil are inadequate	Topsoil volume requirements will be calculated and if there is not enough topsoil within the site that can be reused, topsoil and other required materials may be ordered from an external source to meet the demand.	Topsoil has been removed from the temporary emplacement area prior to spoil emplacement and has been appropriately stockpiled in a location recorded in a register. This topsoil will be used during rehabilitation.  If there is an insufficient quantity of topsoil in accordance with the Main Works Rehabilitation Management Plan, further topsoil will be sourced
PAF presence	To be treated as per characterisation program (Appendix A of the SMP) and the Material Characterisation Procedure outlined in Attachment A of this plan. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed to ensure effective site management and will be monitored.	Material excavated from USS has been tested in accordance with spoil characterisation procedure. PAF presence was confirmed on the test reports, but no PAF material was excavated during this reporting period.
Laboratory turnaround time does not meet rate of excavation and placement	Material will be stockpiled at the temporary spoil area until laboratory results are received	PAF material will be stockpiled in a designated area within the temporary spoil laydown until laboratory results are received.
Rock drainage lines not constructed correctly or rock too small and experiences erosion.	Ensure robust rock sizing for drainage lines, use of suitable rock with the correct grading, and proper construction controls. Implement and maintain the controls as specified by the erosion and sediment control plans.	Drainage lines installed for construction purposes have been constructed from suitable sized rock to minimise erosion.
Soil and water impact(s) during removal of controls	The basin can remain in place until rehabilitation is completed, and an acceptable water quality achieved.	The basin will be constructed and will remain in place until works in the area have been completed.



Risk	Contingency	Implementation
Long term stability not demonstrated	Undertake risk assessment based on the Einstein-Brown equation computed in Geographic Information Systems (GIS) to confirm long term stability and address any areas of higher erosion risk.	LEM was not undertaken during in the reporting period.
Climate change changing the occurrence of extreme events	Design, accounts for the 1% Annual Exceedance Probability (AEP) risk, or a 1 in 100-year Average Recurrence Interval (ARI) storm event.	<p>The temporary spoil emplacement area has been designed to account for a 1 in 100-year Average Recurrence Interval (ARI) storm event.</p> <p>Placement of spoil is ongoing but is monitored and surveyed to ensure construction is implemented in accordance with the design.</p>
Leachate from the spoil emplacement	<p>A spoil characterisation program has been prepared involving XRF, NAG suite analysis, pH and EC screening and validation testing by a NATA accredited laboratory (Appendix A of the SMP) to ensure material is neutralised prior to placement. A leachate basin will be constructed on site and tested for potential contamination prior to reuse on the stockpile. The basin will be sized to be over 85th and 5 day and will include no spill way, to maximise containment. If water quality in the leachate basin shows compounds of concerns, testing on the spoil emplacement will be carried out to determine the source of the compounds of concern e.g. test pits / bore holes. Once the source has been determined, the material will be treated to ensure neutralisation. I.e. excavate and treat with lime, or inject a lime slurry. Kinetic testing, as it becomes available will be used to ascertain the rate of reactivity of the spoil material and the appropriate treatment measures. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed and to ensure effective site management and will be monitored.</p>	<p>Material excavated from Marica USS has been tested and tested in accordance with the spoil characterisation procedure.</p> <p>No PAF incidence identified during reporting period. PAF and uncertain PAF treatment will be undertaken on material by way of mixing with NAF material from the respective sites that had a suitable neutralising capacity. Validation testing undertaken 6 days following treatment.</p> <p>Results after treatment sampling will achieve a NAG pH over 4.5 and Neutralisation Potential Ratio (NPR) results over 3.0.</p> <p>The water from the basin of the temporary PSE is being transferred to the water treatment plant.</p>

Risk	Contingency	Implementation
Neutral mine drainage	Kinetic testing has been carried out to understand the reactivity of the excavated rock. The outcomes will be used to better understand the reactivity of sulphides in excavated rocks, the release rates of contaminants, and the water quality evolution in response to long-term oxidation and weathering that may affect the design of the final landforms and the quality of surface and groundwater. Site specific controls including compaction rates, water quality controls and erosion and sediment controls will be developed to ensure effective site management and will be monitored.	Preliminary results from the Kinetic testing are positive with little reaction taking place over a 12-month period. This report will be finalised and reviewed to ensure improvements to controls are implemented where required.

## 4. Completion Criteria and Performance Indicators

### 4.1. Lobs Hole Main Yard

During the reporting period, spoil was excavated from Talbingo intake, MAT and ECVT only and taken to Lobs Hole Main Yard and GF01. In accordance with the Main Yard Spoil Management Plan, the Main Yard is being developed to establish safe working construction pads and does not have completion criteria or performance indicators relevant to it being a permanent emplacement area at this stage. These metrics will be developed prior to commencing final emplacement works.

### 4.2. Tantangara Emplacement Area

During the reporting period, spoil excavated from Tantangara Adit and Tantangara Intake was taken to the S1 temporary laydown. The permanent spoil emplacement design for Tantangara is currently being finalized during this reporting period.

### 4.3. Marica Emplacement Area

During the reporting period, spoil excavated from Upstream Surge Shaft was taken to the temporary laydown. Spoil from the Upstream Surge Shaft is proposed to be reused as support of in the final shaft design. Surplus spoil will be transported to Rock Forest for permanent emplacement.