

Document Number	S2-FGJV-ENV-REP-0094
Revision	A
Objection (Notice)	
SHL DocControl - Snowy Hydro Limited	
Jun 4, 2024, 10:01 AM GMT+10:00	

REPORT

QUARTERLY ENVIRONMENTAL WATER REPORT SEPTEMBER 2023 TO NOVEMBER 2023

S2-FGJV-ENV-REP-0094

REV - A

JANUARY 2024

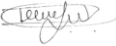
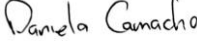


This Report has been prepared to satisfy the reporting requirements in the Main Works – Water Management Plan (WMP) and to meet Condition of Approval (CoA) 31(c)(d) of the Infrastructure Approval Schedule which requires publicly available reporting of the outcomes of the WMP. The Report provides commentary on the performance of the monitoring programs as part of the WMP.

Revision Record

A	13/01/2024	Issued for information	V. Domadiya/ D. Camacho	E. Porter	M. Franceschi
Rev.	Date	Reason for Issue	Responsible	Accountable	Endorsed

Document Verification

RACIE Record

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Revision Tracking

Rev.	Date	Description of Revision
A	13/01/2024	Issued for information

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ABBREVIATIONS AND DEFINITIONS

Acronym	Definition
AWS	Automatic weather stations
BoM	Bureau of Meteorology
CoA	Condition of Approval
ECVT	Emergency Cable and Ventilation Tunnel
EPL	Environmental Protection Licence
Future Generation	Future Generation Joint Venture
MAT	Main Access Tunnel
MDB	Murray Darling Basin
NEM	National Electricity Market
Snowy Hydro	Snowy Hydro Limited
Snowy Scheme	Snowy Mountains Hydro-electric Scheme
SWMP	Surface Water Management Plan
TARP	Trigger Action Response Plan
TBM	Tunnel Boring Machine
WMP	Water Management Plan
WQO	Water Quality Objectives

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 has commenced).

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 2,200 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 have been engaged to deliver both Stage 2 of Exploratory Works and Snowy 2.0 Main Works.

2. PURPOSE

This Environmental Water Report has been prepared to satisfy the reporting requirements in the Main Works – Water Management Plan (WMP) and to meet Infrastructure Approval CSSI 9687 (CoA) Schedule 3, Condition 31(c)(d) which requires publicly available reporting of the outcomes of the WMP. The Environmental Water Report is intended to provide commentary on the performance of the monitoring programs as part of the WMP (identified in Table 2-1).

Table 2-1: Monitoring overview

Aspect	Objective
Surface Water Monitoring Program	
Routine receiving surface water quality monitoring	<ul style="list-style-type: none"> inform and assess the performance of management processes/measures that seek to minimise the Project’s impact on surface water quality help determine source and extent of any water quality changes collect baseline data to characterise water quality and determine site specific values
Event based wet weather overtopping water quality monitoring	
Groundwater Monitoring Program	
Groundwater level monitoring	<ul style="list-style-type: none"> inform and assess the performance of management processes/measures that seek to minimise the Project’s impact on regional and local (including alluvial) aquifers and GDEs
Groundwater quality monitoring	
Water extraction monitoring	<ul style="list-style-type: none"> inform and assess water consumption, site water balance and compliance with water access licences

3. OVERVIEW

3.1. Reporting period

This Environmental Water Report covers the monitoring period from 01 September to 30 November 2023.

3.2. Construction progress

Table 3-1 summarises the key construction activities which have been undertaken during the reporting period.

Table 3-1: Key construction activities for 01 September to 30 November 2023.

Location	Key construction activities
Lobs Hole Ravine Road	<ul style="list-style-type: none"> Asphalt laying of Ravine Road is completed. Signs and line marking remains.
Lobs Hole	<ul style="list-style-type: none"> Pad F – Training centre buildings completed. Fill and spoil processing is ongoing from D&B tunnels to GF01. 350mm tunnel dewatering pipeline works along the mine trail road works on hold FGJV working on ERS comments for IFC. Transgrid pad (Pad F7) extension works completed. Main precast shed erection completed, roofing completed and walls ongoing. ECVT- TBM 1 have installed a total of 1,460 permanent, completing ECVT01 tunnel and TBM1 modification works ongoing for IPS construction.
Marica	<ul style="list-style-type: none"> Camp expansion, 3 buildings construction and commissioning completed. Marica Trail widening between CH0 – CH4700 ongoing. Road maintenance works are in progress. Weighbridge commissioning completed. Drain works ongoing at cut 6.
Plateau	<ul style="list-style-type: none"> Along the highway cable pulling is ongoing and Fiber pits installation completed. HDD 01 completed, HDD02 ongoing. Road maintenance completed. Water Quality Monitoring ongoing.
Rock Forest	<ul style="list-style-type: none"> NA – site under operational use as laydown area.
Talbingo	<ul style="list-style-type: none"> Line drilling works are ongoing. Trail blasts completed. Stage 2 bench 1 excavation & ground support is completed. Bench 3 excavation completed. Bench 5 excavation & ground support ongoing. MC81 & MC82 access road excavation and ground support ongoing. TBM 2.2 have installed 151 rings during the period, totaling 476 permanent rings.
Tantangara	<ul style="list-style-type: none"> Camp road, general maintenance works ongoing. Sink hole remediation works completed from Rig 1/Rig 2 and from the surface on top the TBM. Slurry Treatment Plant commissioning completed and ready to use. TBM conversion to closed mode completed and ready for mining. Pre-consolidation from TBM3 and surface completed. Environmental maintenance ongoing.

4. WEATHER CONDITIONS

There are several weather stations along the alignment of the project that report real-time data. These include:

- “Lobs Hole” - which is an Automatic Weather Station managed by Future Generation in Lobs Hole construction site.
- “Cabramurra” - an Automatic Weather Station located near the lookout in the Cabramurra township managed by the Bureau of Meteorology
- “Tantangara” - an Automatic Weather Station managed by Future Generation in Tantangara construction site.

The Tantangara and Cabramurra gauges are in sub-alpine environments, with elevations of approximately 1220 m and 1475 m, respectively. Cabramurra records substantially higher annual rainfall amount than the lower-elevation gauges at Lobs Hole and Tantangara. Tantangara and Lobs Hole weather stations record actual onsite conditions at the respective construction sites, while Cabramurra weather station, at 1470 m is representative of conditions at Marica – which has an elevation of 1480 m and is approximately 15 km north of the Cabramurra Station.

A summary of climate data for the ravine and plateau areas is provided in Table 4.1

Table 4-1: Weather conditions for 01 September 2023 to 30 November 2023.

Parameter	Lobs Hole ¹			Marica (Cabramurra)			Tantangara ²		
	Sep	Oct	Nov	Sep	Oct	Nov	Sep	Oct	Nov
Temperature									
Mean maximum	19.5	20.1	24.5	12.4	12.0	17.0	16.6	16.8	21.7
Mean minimum	3.3	5.3	9.5	4.3	4.1	7.9	-0.04	2.3	6.4
Rainfall									
Monthly	26.4	89.2	121.4	31.4	113.4	141.2	43.8	89.6	129.8
Long Term Average	90.0	95.2	77.0	120.0	109.4	122.9	60.1	67.8	58.9

1. Lobs Hole long term average rainfall is taken from the Tumarumba weather station.

2. Tantangara long term average rainfall is taken from the Adaminaby Alpine Tourist Park weather station.

During the fourth quarter 2023, there was greater than average rainfall for Marica (Cabramurra) and Tantangara with respect to the long- term average for October, and November, and greater than average rainfall for Lobs Hole in November. There was less than average rainfall for Lobs Hole during September and October, and less than average rainfall for September at Marica (Cabramurra) and Tantangara (Table 4.1). La Nina conditions were officially reported to have ended in March 2023, however the seasonal variation contributed to the rainfall at all locations.

5. SURFACE WATER MONITORING PROGRAM

5.1. Routine surface water quality monitoring

Routine surface water quality monitoring is undertaken in accordance with CoA31 and the Environment Protection Licence No. 21266 (EPL - 21266) to determine if the project is resulting in any impacts to receiving water quality against the Water Quality Objectives (WQO). The WQOs are specified in Table 2-2 of the Main Works – Surface Water Monitoring Program.

Publicly available surface water quality monitoring results undertaken in accordance with EPL - 21266 can be accessed [here](#).

There were several occasions where EPL monitoring results at Rock Forest, Tantangara, Marica and Lobs Hole exceeded the Water Quality Objectives. However, these, exceedances are minor and are generally consistent with the background monitoring of upstream areas of the Snowy 2.0 construction activities. In the surface water samples collected for the reporting period exceedances of metals, nitrogen, nutrients, and turbidity were observed. This is characteristic of water quality collected following rainfall events.

Investigations into the exceedance of some metals such as Iron and Copper have resulted in them being more likely the result of runoff from heavy rainfall and the location of an old Copper mine. Water quality sampling and testing of discharge points around site to find sources of nutrient build up in groundwater has been underway. Corrective actions are being developed and implemented in the interim including training in sampling procedures and treatment. For the reporting period, the quarterly monitoring results demonstrate that the water quality is being managed to ensure there is minimal disturbance from discharge and reuse of water. The current water quality is relatively consistent across multiple EPL monitoring locations with the exceedances not shown to have changed significantly since the onset of the proximal construction of Snowy 2.0.

While water was being discharged to Talbingo and Tantangara reservoirs generally over the reporting period, sampling was conducted at EPL41 and EPL50. During September - November 2023 monitoring round, EPL41 was sampled during a discharge event with in-situ parameters within water quality however, comprehensive results indicated minor exceedances of the WQO, including Nitrogen and Phosphorus. These results are being investigated with the aid of the dewatering team. Further, exceedances of the WQO were identified at the reservoir EPL locations however there is no evidence that the source of exceedances originate from the final discharge points at the RO plants. Samples were taken at other discharge areas around site to determine the location or source of nutrient and metal accumulation.

5.2. Event based monitoring

Event based wet weather overtopping water quality monitoring is undertaken in accordance with the SWMP Trigger Action Response Plan (TARP 2) to monitor stormwater overtopping sediment basin discharges. Sediment basins for the Project have been designed to meet the design rainfalls depths identified in Table 5-1.

Table 5-1: Design rainfall depths (SWMP Section 5.1.1)

Catchment	Description	85 th percentile, 5-day rainfall (mm)	90 th percentile, 5-day rainfall (mm)	95 th percentile, 5-day rainfall (mm)
Yarrangobilly River	Surface works at Lobs Hole and Marica	28.1	35.6	49.0

Catchment	Description	85 th percentile, 5-day rainfall (mm)	90 th percentile, 5-day rainfall (mm)	95 th percentile, 5-day rainfall (mm)
Upper Eucumbene River	Surface works between Marica and the Snowy Mountain Highway	35.2	43.4	56.9
Tantangara construction compound	Surface works adjacent to the southern portion of Tantangara Reservoir	30.5	37.0	51.0
Goorudee Rivulet	Surface works at Rock Forest	20.0	25.7	36.1

During the reporting period, rainfall exceeded the design rainfall criteria four times, including:

- 2-6 October (63.4 mm - Lobs Hole, 57.6 mm – Tantangara, 58.4 mm - Marica)
- 13-17 October (54.4 mm – Tantangara)
- 6-10 November (30.2 mm – Lobs Hole)
- 25-29 November (62.0 mm - Lobs Hole, 56.4 mm – Tantangara, 66.4 mm - Marica)

Across the sites, water quality results of upstream and downstream were generally consistent following significant rainfall events where turbidity, electrical conductivity, dissolved oxygen, and pH frequently exceeded the WQO. However, most other water quality parameters were within the WQO. It is identified in the Surface Water Management Plan that during periods of wet weather, the WQO are frequently exceeded. Water samples were collected for comprehensive water testing and the EPA were notified of the releases in accordance with R4.1 of EPL 21266. During discharge there were some turbidity exceedances downstream. There was also high DO upstream and downstream. However, most were within the WQO parameters.

6. GROUNDWATER MONITORING PROGRAM

6.1. Groundwater quality

Groundwater quality monitoring is undertaken in accordance with EPL - 21266 to determine if the project is resulting in any impacts to groundwater. Groundwater quality trigger levels for the Project are outlined in Table C-1 of the Main Works – Groundwater Monitoring Program.

Publicly available groundwater quality monitoring results undertaken in accordance with EPL - 21266 can be accessed [here](#).

In this reporting period there were further groundwater sample collected at the GF01 spoil emplacement area and Main Yard area in accordance with the Leachate Detection Procedure. Groundwater samples were collected at 16 locations across the Project. Elevated concentrations of nutrients and metal concentrations were observed in groundwater. However, sampling results were consistent with background conditions. This well has been purged and monitored weekly with insitu parameters. The current well will be redrilled and old well decommissioned.

The metals exceedances for EPL1, EPL2, EPL4, and EPL25 are representative of natural conditions as these metals occur naturally within the Project area. The iron exceedance at EPL25 remains consistent with previous quarterly results. The wells measuring the shallow aquifer are more likely to see higher nutrient exceedances as nutrients likely leach through the soil into the aquifer during

rainfall. The nutrient exceedances fall within standard variation for these wells with no evidence of impacts to Yarrangobilly River. The GF01 groundwater bores were sampled throughout reporting period from September to November 2023, to collect baseline information on the wells water quality to monitor any impact from the spoil emplacement.

6.2. Groundwater levels

Groundwater level monitoring is undertaken in accordance with the Groundwater monitoring program to determine groundwater drawdown as a result from the Project.

Site specific groundwater level triggers as outlined in Attachment B of the Main Works – Groundwater Monitoring Program have been established to monitor whether observed drawdown is greater than construction related predicted drawdown.

Due to technical issues, groundwater data for this quarter is currently unavailable. This report will be updated once the groundwater data is available.

6.3. Groundwater inflows

Groundwater inflow into the tunnels is monitored during construction and compared to predicted inflows. This data is required to monitor the volume of extracted groundwater against water access licence limits (Table 6-1).

Table 6-1: Water access licence

Water Access Licence	Project	Water Source	Share (ML)
WAL42407 – Specific Purpose Access Licence	Exploratory Works	Upper Tumut water source	227
WAL42408 – Groundwater Licence	Exploratory Works	Lachlan Fold Belt MDB	0
WAL42960 – Groundwater Licence	Exploratory Works	Lachlan Fold Belt MDB	354
RO13-19-093 – via Controlled Allocation	Main Works	Lachlan Fold Belt MDB	3,375
RO1-19-092 – via Controlled Allocation	Main Works	Lachlan Fold Belt South Coast	1,722
Specific Purpose Access Licence	Main Works	Tantangara Water Source	532

The monthly inflows for the Construction Water Treatment Plant (CWTP) at the Main Access Tunnel (MAT) Portal are as follows:

- September 22.06 ML
- October 21.40 ML
- November 20.75 ML

The monthly inflows for the Construction Water Treatment Plant (CWTP) at Tantangara are as follows:

- September 15.80 ML
- October 09.63 ML
- November 16.31 ML

Groundwater inflows in September, October, and November 2023 were similar to those in the previous quarter. The inflows at the MAT portal have increased marginally likely due to the volume of Drill and Blast works occurring. Shotcreting of these tunnels after blasting to minimise inflows is undertaken in accordance with relevant procedures.

7. TRENDS

The Mann-Kendall statistical analysis test has been chosen to assess trends within surface water monitoring data. Mann-Kendall is a non-parametric test that assesses monotonic trends over time; identified as increasing, decreasing, or showing no significant trend. This test has been selected because it does not assume a specific distribution of the data and is robust against outliers, making it suitable for environmental datasets that may exhibit non-normal behaviour.

In instances where the Mann-Kendall analysis has been inconclusive due to insufficient data, a comparison of key general statistics has been undertaken, including an evaluation of mean, standard deviation, minimum, and maximum values. This comparative analysis has allowed for an assessment of construction monitoring data and whether it falls within the ranges identified in pre-project, baseline data. When calculating the mean value, non-detects have been considered as the detection limit value, rather than half the detection limit value, for a conservative output and thus the mean results in this Report are biased to a higher value.

Detailed Mann-Kendall trend analysis and metric summaries are provided in Appendix A. For each monitoring location, a summary of trends, mean, minimum, maximum and standard deviation is provided.

Surface water

The following decreasing trends were identified:

- Aluminium – EPL 10, 11, 12, 14, 15, 16, 26, 27, 28, 29, 30, 31, 32, 34, 35, 38, 39, 40, and 41
- Arsenic – EPL 41, 50 and 51
- Chromium III + IV – EPL 41, 50, 51, 52 and 55
- Copper – EPL 52
- Iron – EPL 10, 12, 14, 16, 24, 29, 30, 32, 33, 35, 36, 41, 50, 52
- Manganese – EPL 5, 6, 8, 9, 12, 14, 15, 16, 33, 34, 35, 36, 37, 41, 50, 52 and 55
- Nickel – EPL 36, 37, 41, 50, 51, 52 and 55
- Lead – EPL 41, 50, 51, 52 and 55
- Silver - EPL 41, 50, 51, 52 and 55
- Zinc – EPL 51, 52 and 55
- Ammonia – 37, 41, 52 and 55
- Cyanide – EPL 41
- Kjeldahl Nitrogen – EPL 41 and 52
- Nitrate + Nitrite – EPL 41, 50 and 52
- Nitrogen – EPL 41 and 52
- Total Phosphorus – EPL 8, 9, 41, 52 and 55
- Hardness – EPL 28
- Total suspended solids – EPL 5, 8, 9, 10, 11, 12, 14, 16 and 31
- Oil and Grease – EPL 10, 11, 12, 14, 16, 24, 31, 33, 35, 36, 37, 41, 50, 51, 52 and 55

The following increasing trends were identified:

- Arsenic – EPL 5, 6, 8, 9, 26, 27, 28, 30, 31, 36, 52 and 55
- Chromium III + IV – EPL 5, 6, 8, 9, 10, 11, 12, 15, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37 and 38
- Copper – EPL 6, 26, 27, 28, 29, 30 and 32
- Iron – EPL 51
- Manganese – EPL 40
- Nickel – EPL 5, 6, 8, 9, 11, 12, 14, 16, 26, 27, 28, 29, 30, 31, 32, 34 and 38
- Lead – EPL 5, 6, 8, 9, 10, 11, 12, 15, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38 and 41
- Silver – EPL 5, 6, 8, 9, 10, 11, 12, 15, 24, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36 and 38
- Zinc – EPL 5, 6, 8, 9, 11, 12, 15, 24, 26, 27, 28, 29, 30, 32, 34, 36 and 37
- Ammonia – EPL 27 and 51
- Kjeldahl Nitrogen – EPL 27 and 51
- Nitrate + Nitrite – EPL 10, 11, 24, 26, 28, 29, 30, 31, 32, 34, 36, 37, 38, 39 and 40
- Nitrogen – EPL 12, 24, 27, 39 and 51
- Total Phosphorus – EPL 31, 35 and 40
- Reactive Phosphorus – EPL 29, 32, 39 and 51
- Hardness – EPL 6, 12, 14, 15, 16, 24, 30 and 41
- Total suspended solids – EPL 36 and 37

Groundwater

The following decreasing trends were identified:

- Aluminium – EPL 56, 57 and 58
- Arsenic – EPL 56
- Chromium III + IV – EPL 56, 57 and 58
- Copper – EPL 56, 57 and 58
- Iron – EPL 1, 56, 57 and 58
- Lead – EPL 56, and 57
- Manganese – EPL 1, 56 and 57
- Nickel – EPL 25, 56 and 57
- Silver – EPL 58
- Zinc – EPL 57 and 58
- Ammonia – EPL 56, 57 and 58
- Kjeldahl Nitrogen – EPL 56 and 67
- Nitrate + Nitrite – EPL 56

- Nitrogen – EPL 56 and 57
- Total Phosphorus – EPL 56, 57 and 58
- Hardness – EPL 58
- Total Suspended solids – EPL 57

The following increasing trends were identified:

- Copper – EPL 2
- Lead – EPL 2
- Manganese – EPL 58
- Silver – EPL 1 and 2
- Zinc – EPL 2 and 4
- Nitrogen – EPL 2 and 4

8. CONCLUSION

EPL monitoring results that exceeded the WQO are consistent with natural events such as rainfall and changes in seasonal weather. Background monitoring in the previous quarter has similar readings that display exceedances of particular analytes. Exceedances of the water quality objectives for nutrients and metals are likely due to high rainfall, and naturally occurring concentrations in soils leaching into the waterways. The SWMP, outlines background studies that indicate frequent exceedances of the WQO occurring within all surface waters across the project. There has also been exceedances of nitrogen and Iron, that have been investigated to find sources and find a way to lower levels. Updates will be provided in the next quarterly report and corrective actions are being developed and implemented in the interim. As Q4 2023 displayed no significant exceedances outside of historical variation, it is considered that the cause of the elevated concentrations of analytes in the surface water monitoring are not a result of construction works of Snowy 2.0.

Across the sites, water quality results display increasing turbidity from overtopping downstream. However, this is a natural and common occurrence found in basin overtopping due to rainfall. Other analyte readings such as electrical conductivity and pH were consistent with naturally occurring conditions during wet weather, as outlined in the SWMP.

Groundwater results from the wells across project had exceedances in Iron and Nitrogen. Shallower wells (EPL1 and EPL25) are more likely to see higher nutrient exceedances and are likely a result of natural influences from historical sources such as decomposing plant material. The nutrient exceedances fall within standard variation for these wells with no evidence of impacts to Yarrangobilly River. Results of the GF01 groundwater Displayed high metal levels of zinc, copper, and chromium. GF01 and Main Yard displayed consistently high levels of nitrogen which has resulted in a TARP. An investigation into the source of nitrogen increase will help to find a method or solution to better treat any.

Harm to health or safety of human beings or the environment that is not trivial has not occurred in Q4 2023. Therefore, exceedances are not considered to be caused or added to by the ongoing construction works of the Snowy 2.0 project.



APPENDIX A – TREND ANALYSIS SUMMARY

Main data table with columns for Location, Site ID, and various chemical parameters (Arsenic, Barium, Boron, etc.) grouped by element type (Trace Metals, Major Metals, etc.).

Summary table for heavy metals: Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Nickel, Silver, Zinc. Includes Mean, Min, Max, Sltd, and M/Trend values.

Insufficient Insufficient data to identify whether a significant trend exists
Increasing Statistically significant evidence of an increasing trend
Decreasing Statistically significant evidence of a decreasing trend

Not enough reported values to undertake Mann-Whitney analysis
Decreasing* Decreasing limit is attributed to detection limit being adjusted/reduced during the same period.