

REPORT

QUARTERLY ENVIRONMENTAL WATER REPORT MARCH 2023 TO MAY 2023

S2-FGJV-ENV-REP-0081

AUGUST 2023




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.

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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 2,000 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 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 March to 31 May 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 March to 31 May 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"> Improved traffic segregation construction ongoing. Fill and spoil processing ongoing from Talbingo Intake and D&B tunnels. Tunnel dewatering pipeline works along the mine trail road is ongoing. ECVT and Trandgrid pad works ongoing. Main Yard - Fill and materials processing ongoing from TBMs spoil, Ravine Road and Talbingo intake works. Ongoing spoil emplacement at GF01 from Talbingo Intake and D&B from the cross passages.
Marica	<ul style="list-style-type: none"> Camp expansion works ongoing. Marica Trail widening between CH0 – CH2100 ongoing. Road maintenance works is in progress. Culverts installation is completed.
Plateau	<ul style="list-style-type: none"> Trenching along the alignment ongoing. Site rehabilitation is progressing. Water Quality Monitoring ongoing. Under-boring ongoing.
Rock Forest	<ul style="list-style-type: none"> NA – site under operational use as laydown area.
Talbingo	<ul style="list-style-type: none"> TBM assembly is ongoing. Construction water treatment plant installation is completed. Audit portal office installation completed. Grout plant installation is ongoing. TBM tail skin welding completed. TBM cutterhead welding is ongoing. TBM main shield assembly is ongoing. Vertical stacker belt assembly completed. Laydown area preparation for TBM gantries is ongoing. . . .
Tantangara	<ul style="list-style-type: none"> Camp road, general maintenance works ongoing. . Sink hole remedial measures ongoing where possible. Modification process ongoing. Bore holes drilling for geotechnical investigations completed. Slurry treatment plant installation ongoing. Gate shaft works ongoing. . 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 March 2023 to 31 May2023.

Parameter	Lobs Hole ¹			Marica (Cabramurra)			Tantangara ²		
	March	April	May	March	April	May	March	April	May
Temperature									
Mean maximum	21.7	19.1	13.6	17.5	12.9	8.5	21.7	16.26	10.9
Mean minimum	7.98	6.5	2.1	5.8	5.8	2.8	7.98	2.89	-2.39
Rainfall									
Monthly	86.2	78.8	60.8	119.2	92.8	119.8	48.6	55.2	36.2
Long Term Average	66.3	66.2	82.3	86.9	76.4	94.2	56.3	78.8	47.3

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

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

During the second quarter 2023, there was greater than average rainfall for Marica (Cabramurra) with respect to the long-term average for March, April, and May, and greater than average rainfall for Lobs Hole in March and April. There was less than average rainfall for Lobs Hole during May, and less than average rainfall for March, April, and May months at 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](#).

During the monitoring period, there were several occasions where EPL monitoring results at Rock Forest, Tantangara, Marica and Lobs Hole exceeded the Water Quality Objectives. These exceedances, however, were relatively 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 and nutrients were observed. In addition, heavy rainfall events during May attributed to exceedances in turbidity and dissolved oxygen in both upstream and downstream EPL locations.

Exceedances of oil and grease were reported at numerous EPL locations, both upstream and downstream of the works though no hydrocarbons sheens were evident during collection. An investigation was undertaken, including potential on site sources and duplicate samples being sent to different NATA accredited laboratories. No onsite sources were located, and no influences upstream were observed. It was identified that the results were due to ongoing issues with the NATA laboratory. This was reported to the laboratory and the samples have been sent to a different laboratory from April 2023 onwards.

Investigations into the exceedance of some metals such as Iron and Copper have determined that results are likely the result of runoff from heavy rainfall and the location of an old Copper mine. Water quality sampling and testing of discharge points has been undertaken to find the source of nutrient build up in groundwater. 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.

During the reporting period, sampling was conducted at EPL 41 and EPL 50 during discharge events. . During May 2023 monitoring round, EPL41 was sampled during a discharge event with in-situ parameters being within water quality criteria. Comprehensive results during May 2023, indicated minor exceedances of the WQO, including ammonia (440 µg/L) and nitrogen (2800 µg/L). There was also exceedances of Aluminium and Zinc during March and April at EPL41, and Arsenic during April discharge at EPL 41. A self-imposed cease discharge was implemented while these results are being investigated with the aid of the de-watering 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 exceedances.

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
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 five times, including:

- 26-30 March 2023 (64 mm – Lobs Hole, 72 mm – Tantangara, 88.4 mm – Marica)
- 7-11 April 2023 (31.6 mm – Marica)
- 26-30 April 2023 (31.8 mm – Lobs Hole)
- 1-5 May 2023 (43 mm – Marica)
- 27-31 May 2023 (33.2 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. The majority of 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 rainfall events that resulted in basin overtopping there were some turbidity exceedances downstream. There was also high DO upstream and downstream. However, most results 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](#).

During the reporting period groundwater samples were collected at the GF01 spoil emplacement area in accordance with the Leachate Detection Procedure. Groundwater samples collected at EPL56 had exceedances which were likely due to a fault during an installation process. The well at

EPL56 was purged and monitored weekly with in situ parameters. The additional pruging of the well did not appear to affect the results therefore the well is to be decommissioned in accordance with relevant guidelines and redrilled. EPL57 had not been completed and therefore samples couldn't not be taken for the monitoring period.

Metals exceedances at EPL2 and EPL25 were found to be representative of natural conditions as these metals occur naturally within the project area. The iron exceedance at EPL25 remains consistent with previous quarterly results. Wells (EPL1, 2 and 25) 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. Nutrient exceedances at EPL 52, 55 and 58 triggered a TARP, and will be investigated to find the source of elevated nitrogen levels.

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:

- March 32.49 ML
- April 26.69 ML
- May 17.38 ML

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

March 12.93 ML



- April 15.78 ML
- May 15.95 ML

Groundwater inflows in March, April and May were less than those in the previous quarter which is likely a result of reduced tunnelling activities occurring, particularly in MAT Portal as the TBM has ceased tunnelling.

7. 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 have been consistent exceedances for oil and grease in many of the EPL locations. Due to a lack of visible evidence of oil and grease on site during sampling, an investigation was undertaken, including potential on site sources and duplicate samples being sent to different NATA accredited laboratories. No onsite sources were located, and no influences upstream were observed. It was identified that the results were due to ongoing issues with the NATA laboratory. This was reported to the laboratory and the samples have been sent to a different laboratory from April 2023 onwards.

Across the sites, water quality results displayed elevated 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.

Exceedances of nitrogen and ammonia were observed at the discharge location at Talbingo Reservoir and led to a self-imposed cease discharge being implemented while these results were being investigated with the aid of the de-watering team. Exceedances of the WQO were also 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.

Groundwater results from the four wells in Lobs Hole (EPL1, EPL2, EPL4, EPL25) 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 displayed consistently high levels of nitrogen which has resulted in a TARP. An investigation into the source of nitrogen is being undertaken which will remediation methods as well as potential methods of treatment if required. This will be reported on in the next reporting period.

Harm to health or safety of human beings or the environment that is not trivial has not occurred in Q2 2023.