



NGH



Pre-construction Water Quality Monitoring Report

Event 9 2022

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1. Introduction

In 2020 Snowy Hydro Limited (Snowy Hydro) obtained approval (application number SSI 9208 and EPBC 2018/8322) to expand the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme), by linking the existing Tantangara and Talbingo reservoirs through a series of underground tunnels and constructing a new underground hydro-electric power station (referred to as 'Snowy 2.0').

To connect Snowy 2.0 to the National Energy Market (NEM), a new transmission connection is required. NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (known as TransGrid and the Proponent) will construct a substation and overhead transmission lines (the Project) to facilitate the connection of Snowy 2.0 to the existing electrical transmission network. The Project location is approximately 27 kilometres (km) east of Tumbarumba, New South Wales (NSW). UGL has been engaged on behalf of the Proponent to undertake the Project.

The purpose of the pre-construction water quality monitoring is to address the requirements of the Environmental Impact Statement (EIS) (Jacobs 2020) that was prepared by the Proponent under Part 5, Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* to assess the environmental impacts of the proposed Project. Subsequently, an Amendment Report (TransGrid 2021b) was submitted with the Response to Submissions (TransGrid 2021a) to the Department of Planning and Environment (DPE) with updated mitigation measures for the Project.

The objective of the pre-construction surface water quality monitoring is to collect baseline data prior to Project construction works. Baseline data will be compared to ANZG (2018) guidelines to characterise the existing surface water quality. The data will be compared to the water quality objectives (WQO) for the Project area.

2. Program and methodology

The Pre-construction Water Quality Monitoring Program and Methodology (the Program) (NGH 2022) has been prepared to detail the WQOs for the Project, the location of the monitoring locations and the methodology for water sampling.

The Project area within Kosciuszko National Park is an area of high conservation value. Therefore, the water quality objectives for physical and chemical stressors includes **no change beyond natural variability** (ANZG 2018). The Default Guideline Values (DGV) for Upland Rivers has been provided for physical and chemical stressors and is detailed in the Program (NGH 2022).

The location of the sampling points in relation to the Project footprint is provided in Figure 2-1.

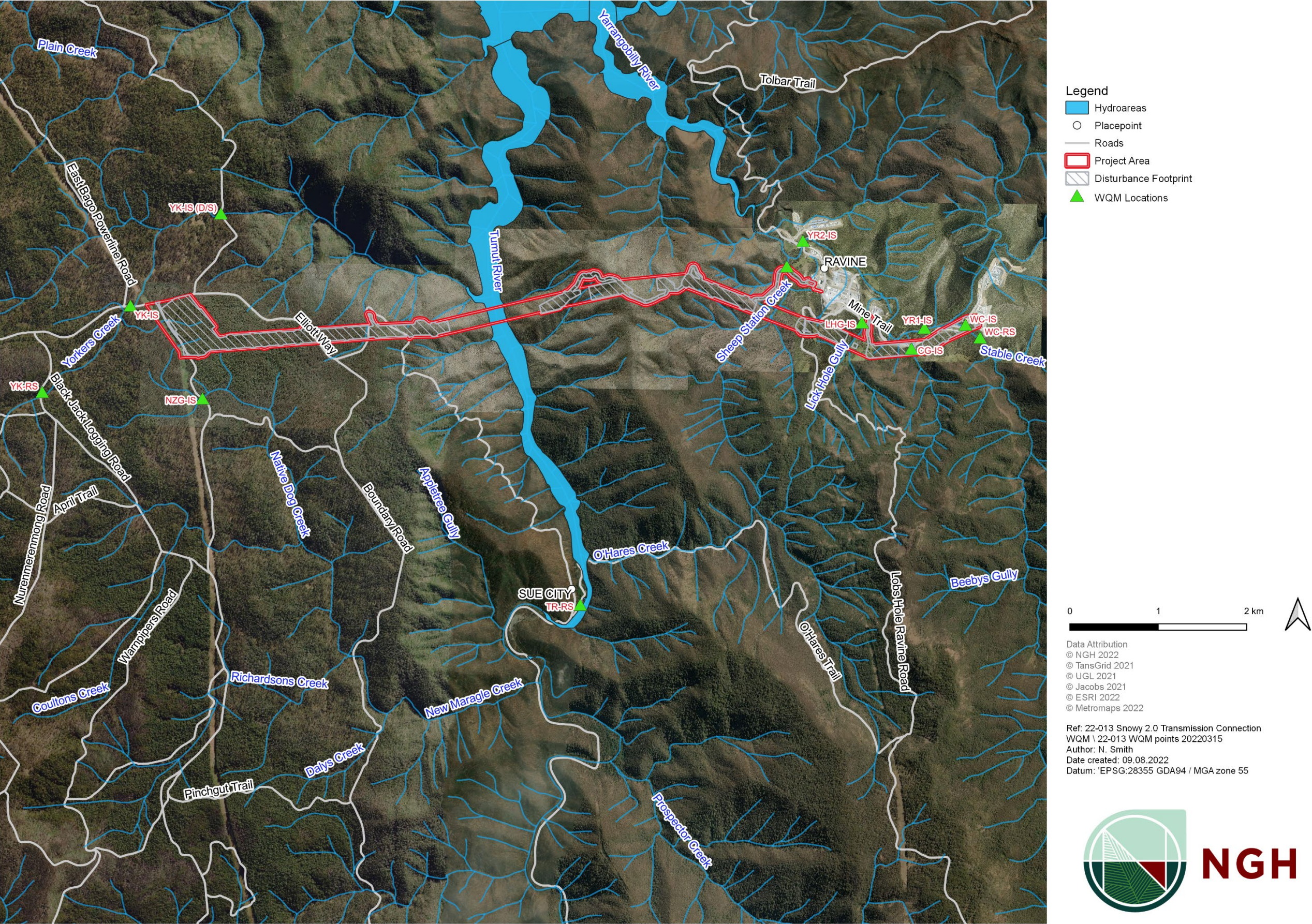


Figure 2-1 WQM locations

3. Monitoring event observations and results

Images for Cave Gully, Lick Hole Gully and Sheep Station Creek are provided as Figure 3-1 to Figure 3-3. Water quality results for each site and are provided in Appendix A. Results are highlighted where they exceed the default guideline value (refer to the Program (NGH 2022)). Table 3-1 identifies exceedances of the DGVs for metals, cyanide and nutrients. Physico-chemical results have been provided in Figure 3-4 to Figure 3-23. Field data and observations are provided in Appendix B.

3.1. Event 9

NGH conducted the first, second and third rounds of sampling in March (Event 1), April (Event 2), May and early June (Event 3), late June (Event 4), July (Event 5), August (Event 6), early October (Event 7) and late October (Event 8) 2022. Reports for each event were prepared following receipt of the laboratory results (NGH 2022a; 2022b; 2022c; 2022d; 2022e, 2022f, 2022g, 2022h). The results of Event 1 through to Event 8 have been compared in this report to the results of Event 9.

NGH Environmental Scientist, Nicola Smith, conducted the monitoring event with a UGL representative on 23 and 24 November 2022, Event 9. The weather was partly cloudy, cool, with a slight breeze. Data from the Cabramurra SMHEA automatic weather station on 23 November 2022 (Station ID 072161) indicates that wind speeds were from the west, with speeds of 39 km/hr in the morning and 24 km/hr in the afternoon. Temperatures on the day included a low of -1.3°C and a high of 8.6°C. Data from the Tumbarumba weather station for 24 November 2022 (Station ID 072043) indicates that the weather was calm, with temperatures ranging from a low of 6.5°C to a high of 22.5°C.

Generally, water flow was observed to be turbid with no hydrocarbon sheen, and no odours were present. The banks of each channel were well vegetated with the vegetation matrix weedier in some locations. Evidence of bank erosion from hooved animals was observed at the New Zealand Gully site, the Yorkers Creek impact site and Yorkers Creek reference site. Flow was observed to have maintained an elevated level compared to Events 1 and 2 in all channels as a result of the wet weather or snow melt.



Figure 3-1 Cave Gully (CG-IS)



Figure 3-2 Lick Hole Gully (LHG-IS)



Figure 3-3 Sheep Station Creek (SSC-IS)

3.1.1. Results

The results indicate that the water quality in the locations where samples were taken generally meets the DGVs for Upland Rivers with a 99% species protection level for toxicants. Locations where a laboratory result was returned for a physical or chemical stressor was above the DGV are provided in Table 3-1.

Table 3-1 Results above the DGV for Upland Rivers with 99% species protection level

Site identification	Analyte	DGV	Result	Comment
YR1-RS	Aluminium mg/L	0.027	0.3	Much higher than other sampling events.
TR-RS	Aluminium mg/L	0.027	0.08	Much higher than other sampling events.
WC-RS	Aluminium mg/L	0.027	0.36	Much higher than other sampling events.
WC-IS	Aluminium mg/L	0.027	0.36	Much higher than other sampling events.
CG-IS	Aluminium mg/L	0.027	0.44	Always returns a high total dissolved solid result. However, results for Event 9 show a decrease in Aluminium, TDS and TSS, when compared with results from Event 8.
	Total Dissolved Solids (TDS)		232	
	Total Suspended Solids (TSS)	0.2	26	
LHG-IS	Aluminium mg/L	0.027	0.18	Always returns a high total dissolved solid result. However, results for Event 9 show a decrease in these Aluminium and TDS when compared with results from Event 8.
	Total Dissolved Solids (TDS)		200	
YR2-RS	Aluminium mg/L	0.027	0.29	Receives flow from CG-IS and LHG-IS.
SSC-IS	Aluminium mg/L	0.027	1.58	Results for Aluminium and Iron have decreased slightly since Event 8.
	Iron mg/L	0.3	0.56	
YK-IS (D/S)	Aluminium mg/L	0.027	0.26	Located within Bago State Forest and adjacent to an unsealed track. Unknown activities within the State Forest upstream. Sample taken upstream of culvert.

Site identification	Analyte	DGV	Result	Comment
NZG-IS	Aluminium mg/L	0.027	0.19	Located within Bago State Forest. Sample taken upstream of timber supported unsealed track bridge. Banks heavily vegetated, shallow channel.
YK-RS	Aluminium mg/L	0.027	0.32	Located within Bago State Forest and adjacent to an unsealed track. Unknown activities within the State Forest upstream. Sample taken downstream of culvert under unsealed track. Flow through culvert is restricted upstream causing a wetland environment.
YK-IS	Aluminium mg/L	0.027	0.28	Located within Bago State Forest and adjacent to Elliott Way (road). Unknown activities within the State Forest upstream.

CG-IS and LHG-IS displayed elevated values for total dissolved solids compared to the other sampling locations. Total suspended solids (TSS) at CG-IS was above the 0.2 mg/L assigned DGV (refer to Figure 3-18). It should be noted that TSS for CG-IS has notably declined since Event 8.

Water temperatures ranged from 9.5 degrees Celsius at TR-RS to 14.2 degrees Celsius at SSC-IS.

Many of the results are recorded as below (<) the limit of detection. To enable calculation of the statistics, the *Limit of Detection Divided by Two (LOD/2) Method* (Cohen and Ryan 1989) has been applied. This data is provided in Appendix A.

The following time series, Figure 3-4 to Figure 3-23, display physico-chemical water quality through time for monitoring Event 1 (March), Event 2 (April), Event 3 (May/June), Event 4 (June), Event 5 (July), Event 6 (August), Event 7 (early October), Event 8 (late October) and Event 9 (November). Where a DGV is available, these values are shown on the graph and have been included for dissolved oxygen (%), conductivity, pH and turbidity.

Temperatures within the Talbingo Reservoir catchment have decreased since Event 7 and Event 8, refer to Figure 3-4. TR-RS registered the most significant drop in temperature, falling from 16.1°C during Event 8 to 9.5°C during Event 9. Temperatures increased at YK-RS, within the Yorkers Creek catchment, refer to Figure 3-5. However, temperatures at the other three sites have decreased, when compared to Event 8.

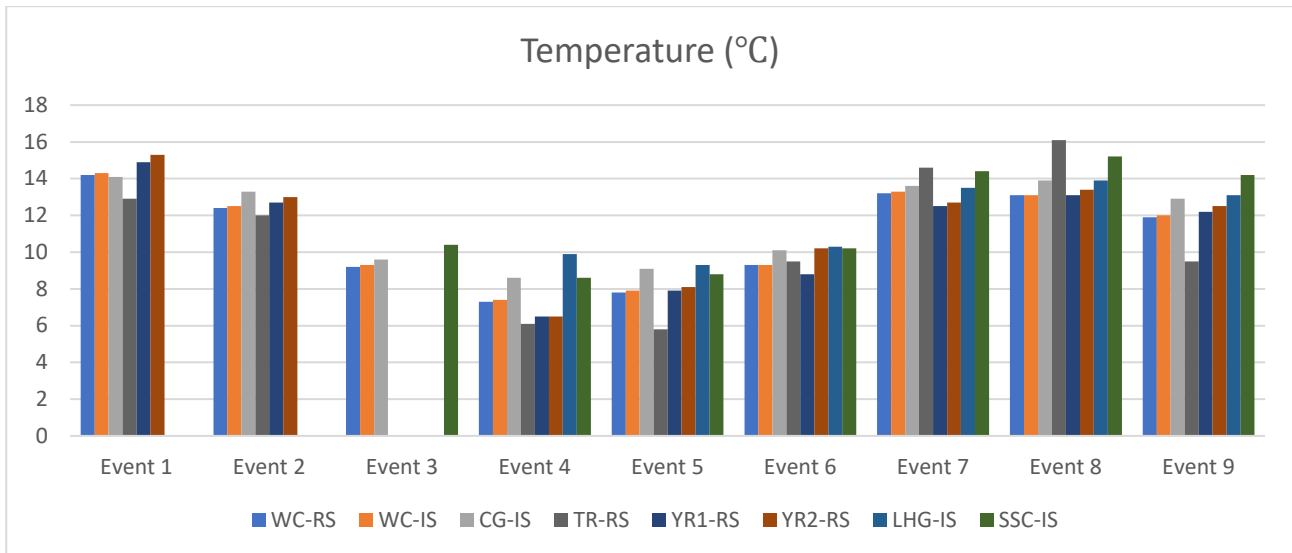


Figure 3-4 Temperature for Talbingo Reservoir catchment

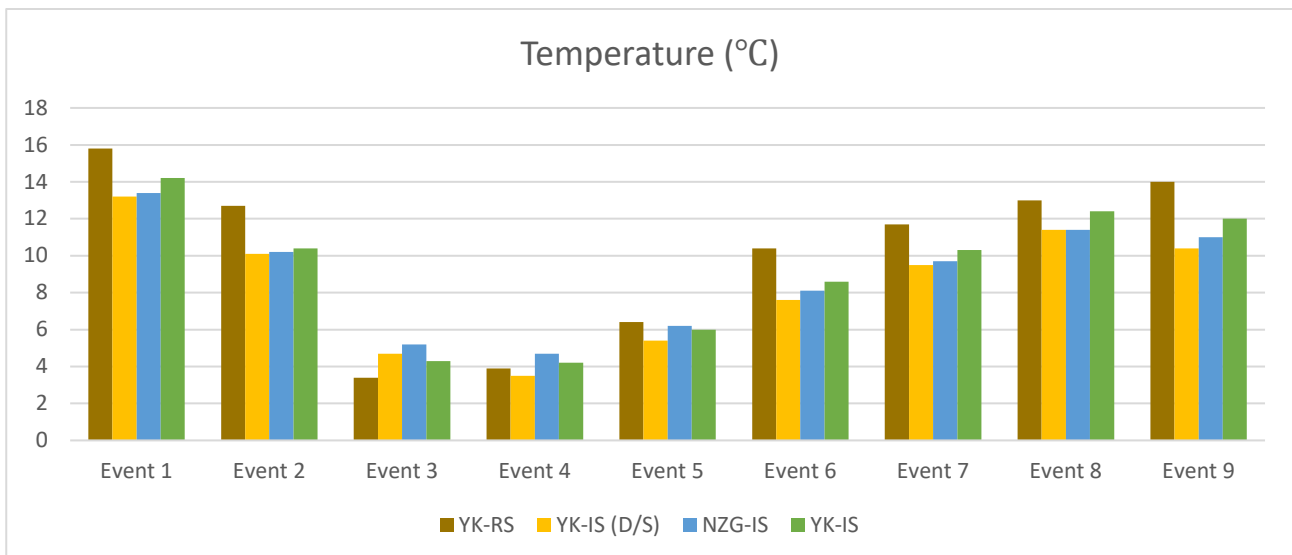


Figure 3-5 Temperature for Yorkers Creek catchment

All DO (%) results for Event 9, except for TR-RS (111%) were below the DGV range (90-110%), refer to Figure 3-6 and Figure 3-7. Results for both catchments were elevated compared to Event 7 and Event 8.

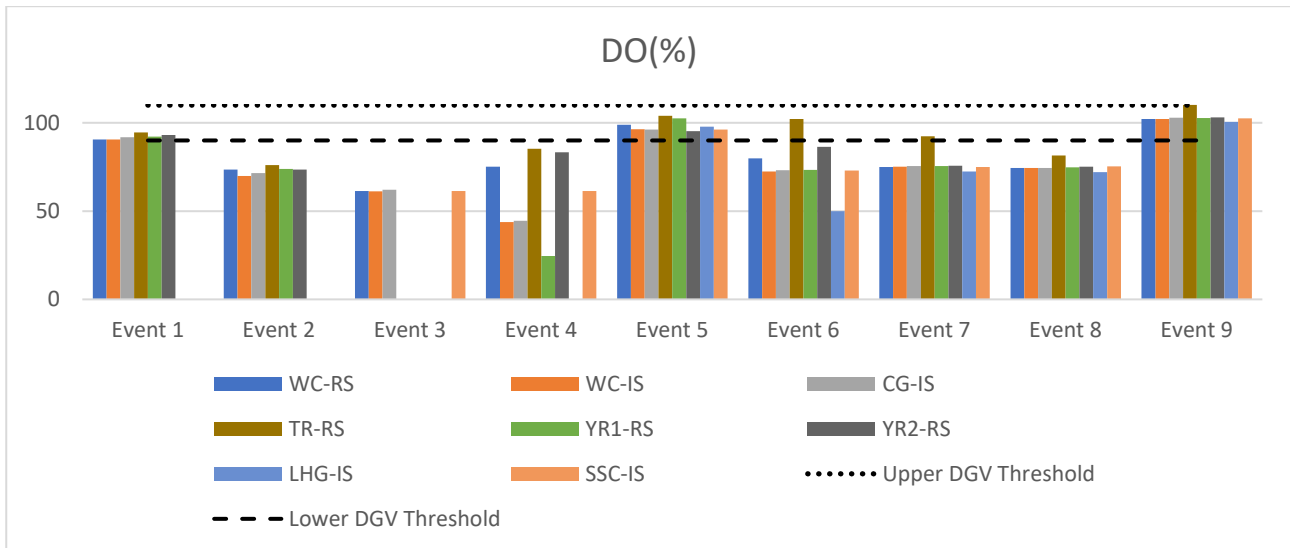


Figure 3-6 Dissolved oxygen (DO%) for Talbingo Reservoir catchment

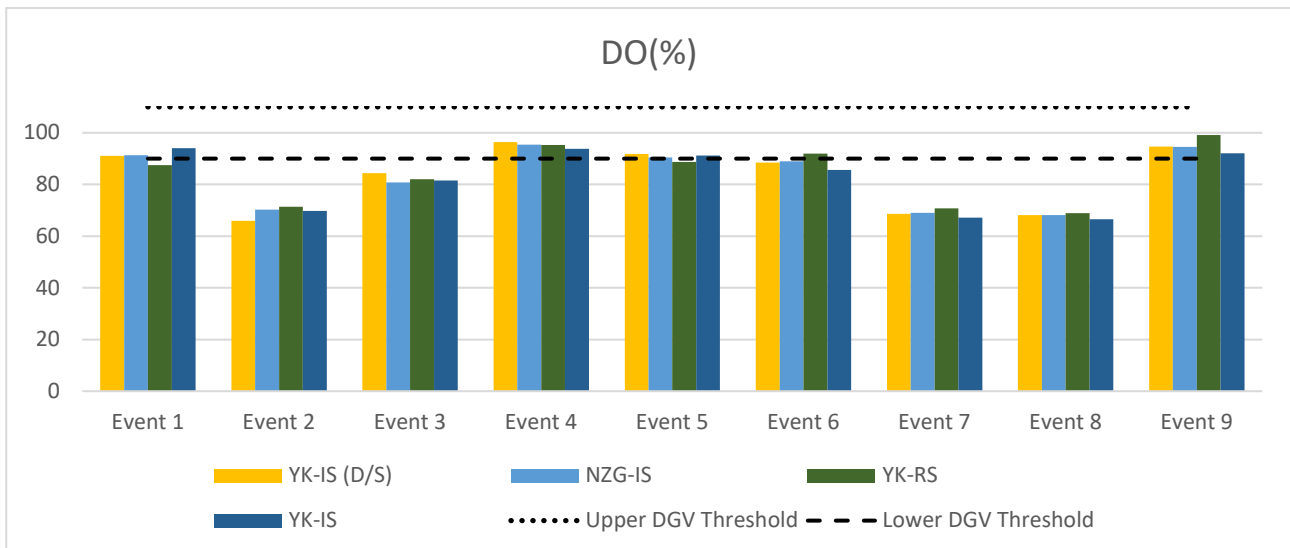


Figure 3-7 Dissolved oxygen (DO%) for Yorkers Creek catchment

The results for DO (ppm) for both catchments show an increase when compared to Event 7 and Event 8, refer to Figure 3-8 and Figure 3-9. The highest reading of DO (ppm) was recorded within the Talbingo catchment at TR-RS (12.67 ppm). The highest reading of DO (ppm) for the Yorkers Creek catchment was at YK-IS (D/S), with a reading of 10.2 ppm.

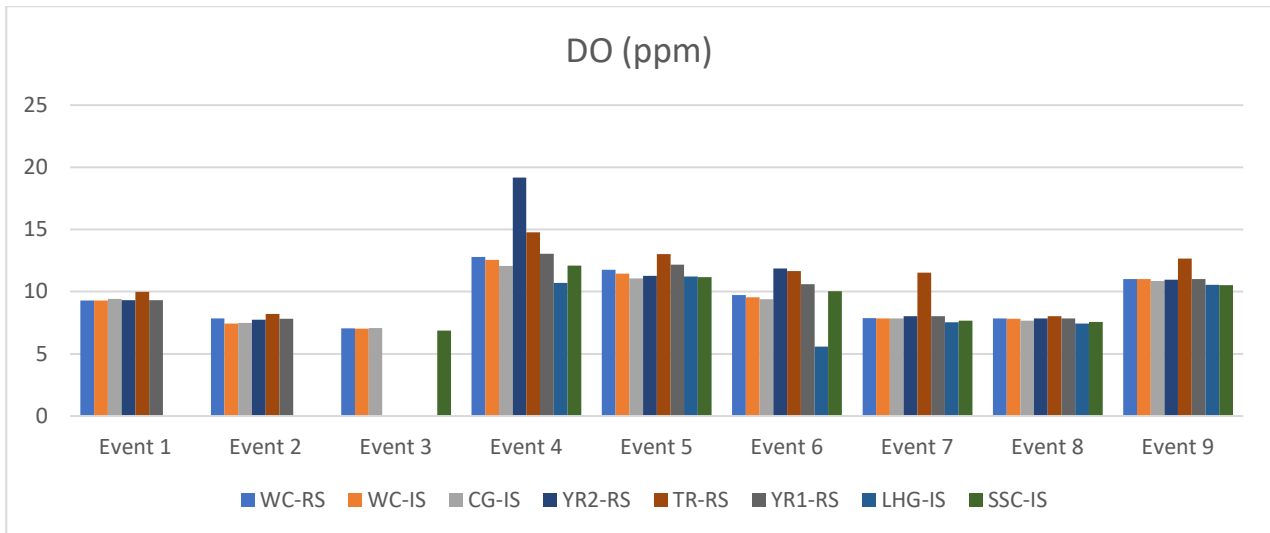


Figure 3-8 Dissolved Oxygen (ppm) for Talbingo Reservoir catchment

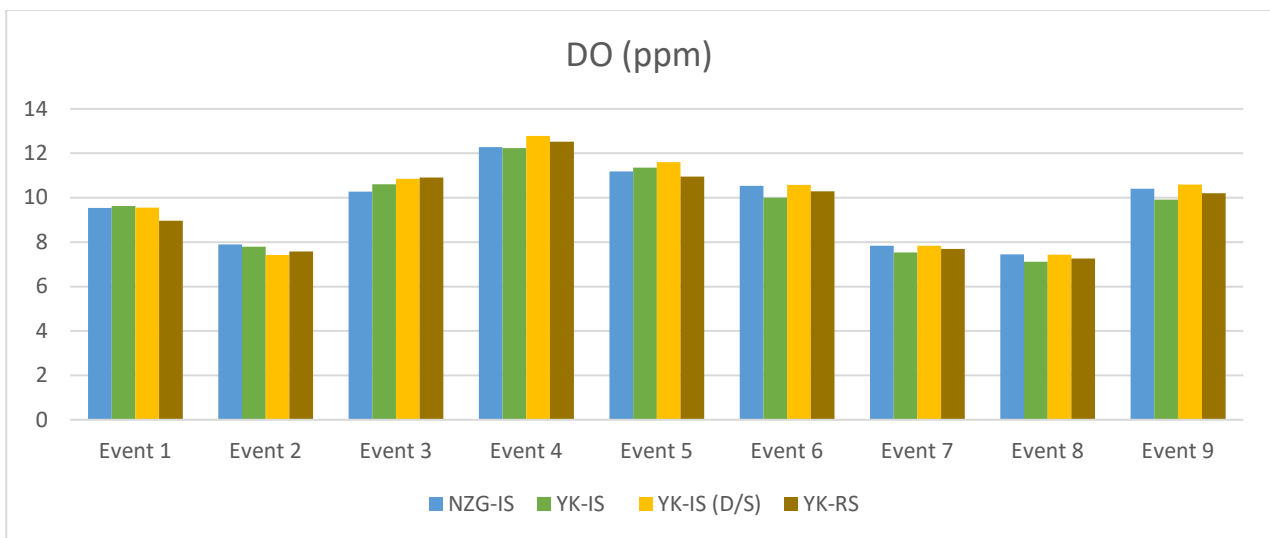
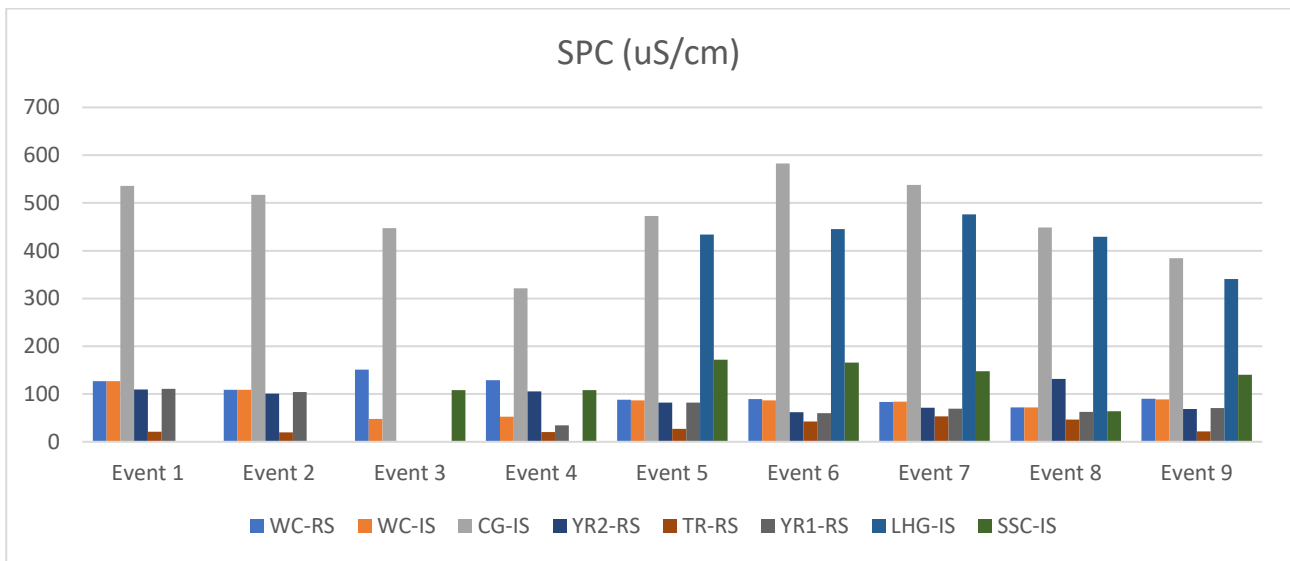
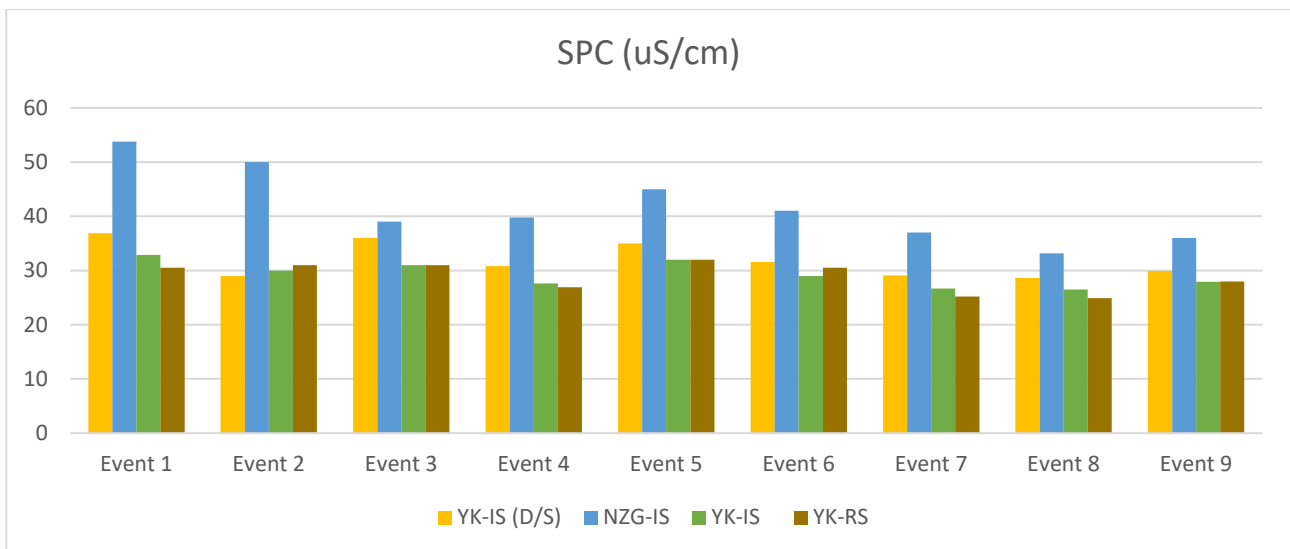


Figure 3-9 Dissolved Oxygen (ppm) for Yorkers Creek catchment

The pattern of specific conductance between sites remains similar between Event 6, Event 7, Event 8 and Event 9. CG-IS returned a result of 384 $\mu\text{S}/\text{cm}$ for Event 9, which represents a consistent decrease in specific conductance since its peak during Event 6 (583 $\mu\text{S}/\text{cm}$). LHG-IS also returned a reading of 340.6 $\mu\text{S}/\text{cm}$ for Event 8, showing a consistent decrease since its peak during Event 7 (476.2 $\mu\text{S}/\text{cm}$), refer to Figure 3-10. Specific conductance for Event 9 within the Yorkers Creek catchment shows a slight increase in specific conductance at all sites when compared with Event 8, refer to Figure 3-11.

Figure 3-10 Specific Conductance (SPC $\mu\text{S}/\text{cm}$) for Talbingo Reservoir catchmentFigure 3-11 Specific Conductance (SPC $\mu\text{S}/\text{cm}$) for Yorkers Creek catchment

Conductivity at CG-IS for Event 9, has decreased from 420.8 $\mu\text{S}/\text{cm}$ in Event 7 to 294.9 $\mu\text{S}/\text{cm}$, refer to Figure 3-12. Similarly, LHG-IS has a reading of 263.3 $\mu\text{S}/\text{cm}$ for Event 9, which is down from 338.3 $\mu\text{S}/\text{cm}$ during Event 8. In comparison, results for the Yorkers Creek catchment continue to return relatively low conductivity readings, refer to Figure 3-13. This is considered likely a result of the geology upstream. The pattern between sites is mostly reflective of the pattern for specific conductance.

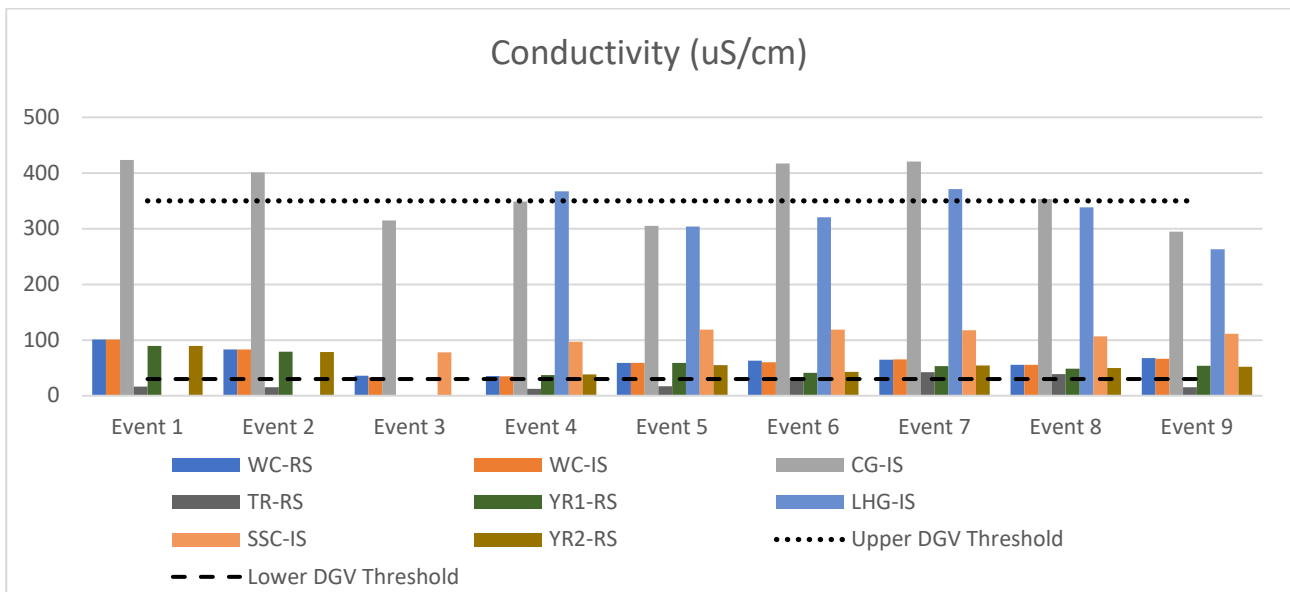


Figure 3-12 Conductivity (uS/cm) for Talbingo Reservoir catchment

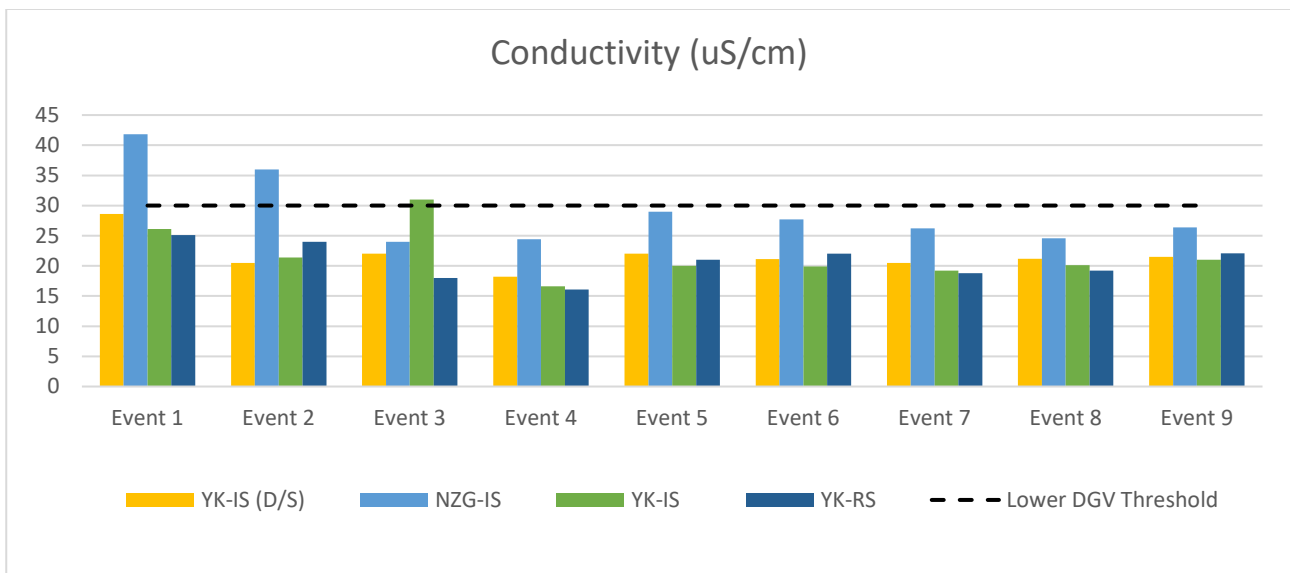


Figure 3-13 Conductivity (uS/cm) for Yorkers Creek catchment

Turbidity values were above the DGV threshold (25 NTU) at SSC-IS (43.88 NTU) and CG-IS (32.04 NTU), during Event 9. Turbidity readings within the Talbingo Reservoir catchment have notably decreased since Event 8, refer to Figure 3-14 and Figure 3-15. Turbidity readings within the Yorkers Creek showed a slight decrease, with the exception of YK-RS, which increased slightly to 8.25 NTU, refer to Figure 3-16. The lowest value for Event 9 was 0 NTU at TR-RS.

Note that the results for CG-IS have been provided in Figure 3-15 in this report to more accurately display the other sampling locations in the Talbingo reservoir catchment.

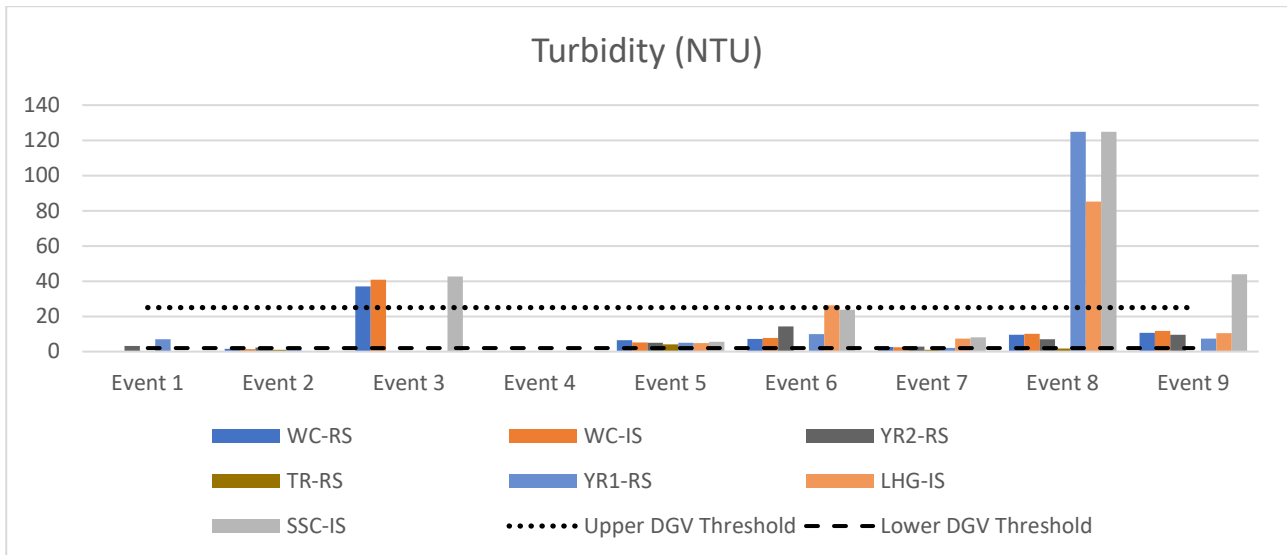


Figure 3-14 Turbidity (NTU) for the Talbingo Reservoir catchment

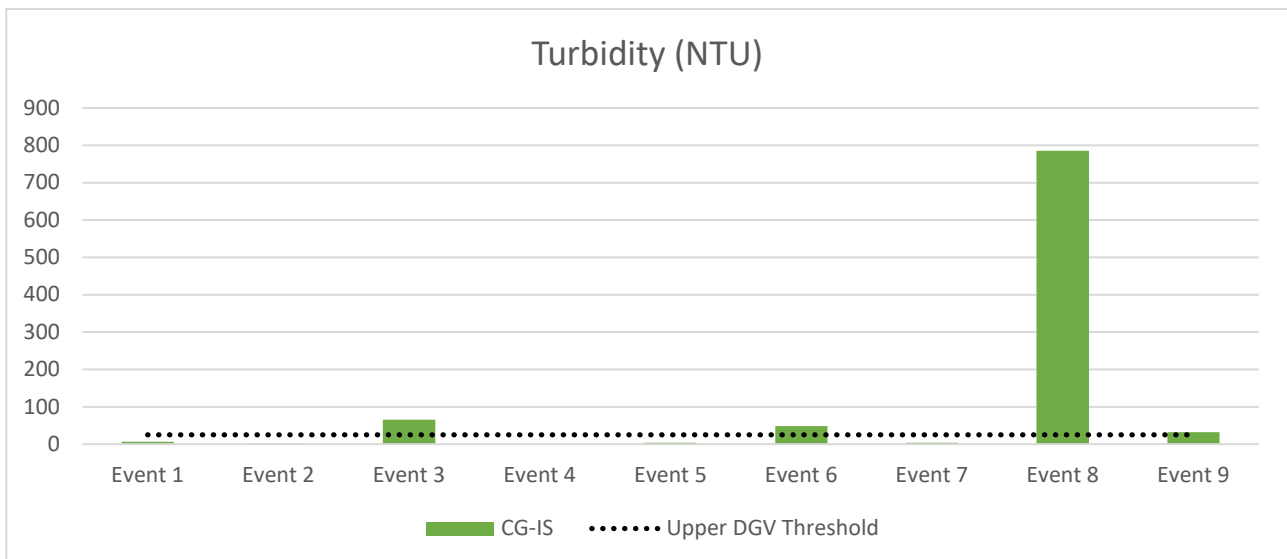


Figure 3-15 Turbidity (NTU) for CG-IS, within the Talbingo Reservoir catchment

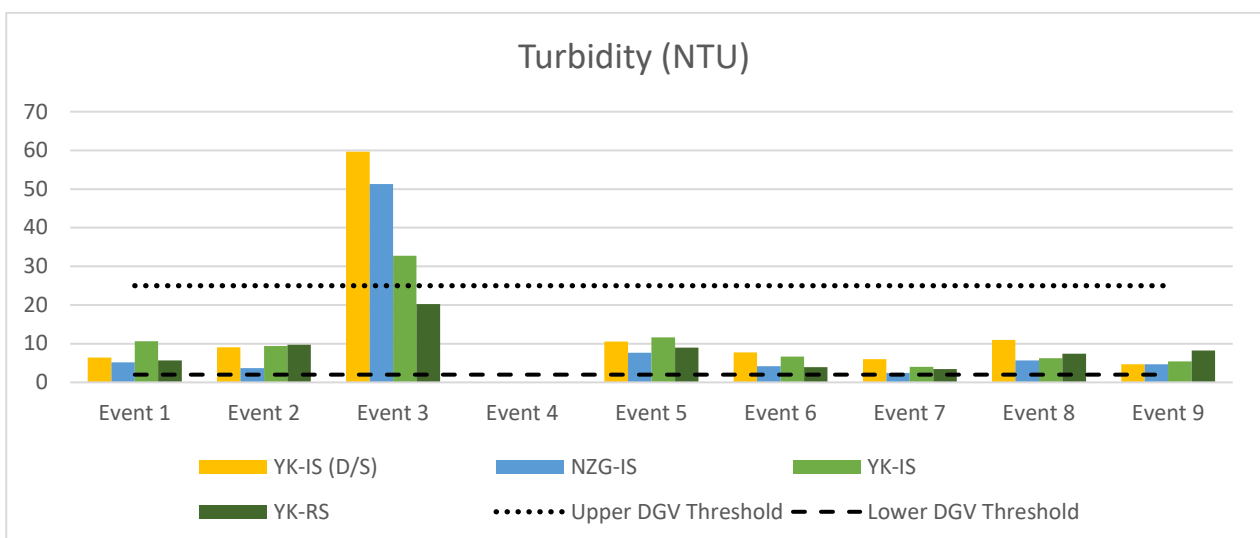


Figure 3-16 Turbidity (NTU) for the Yorkers Creek catchment

Total suspended solids notably declined during Event 9, when compared with Event 8, refer to Figure 3-17, Figure 3-18 and Figure 3-19. CG-IS (26 mg/L) registered the highest recording, down from 450 mg/L during Event 8. This is consistent with the turbidity results mentioned above.

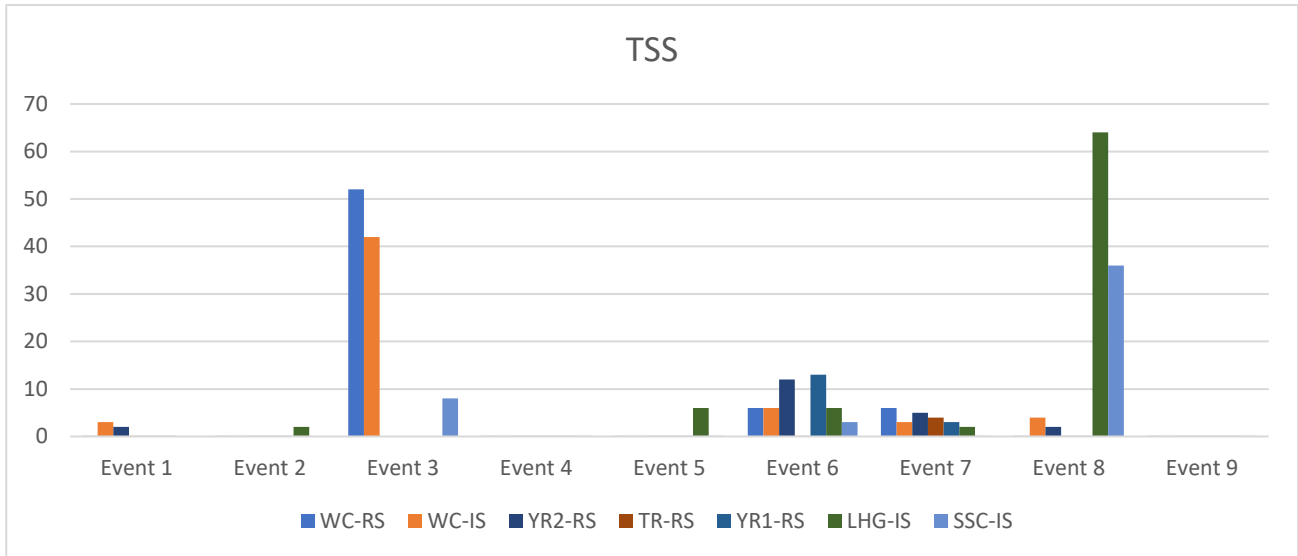


Figure 3-17 Total Suspended Solids for the Talbingo Reservoir catchment

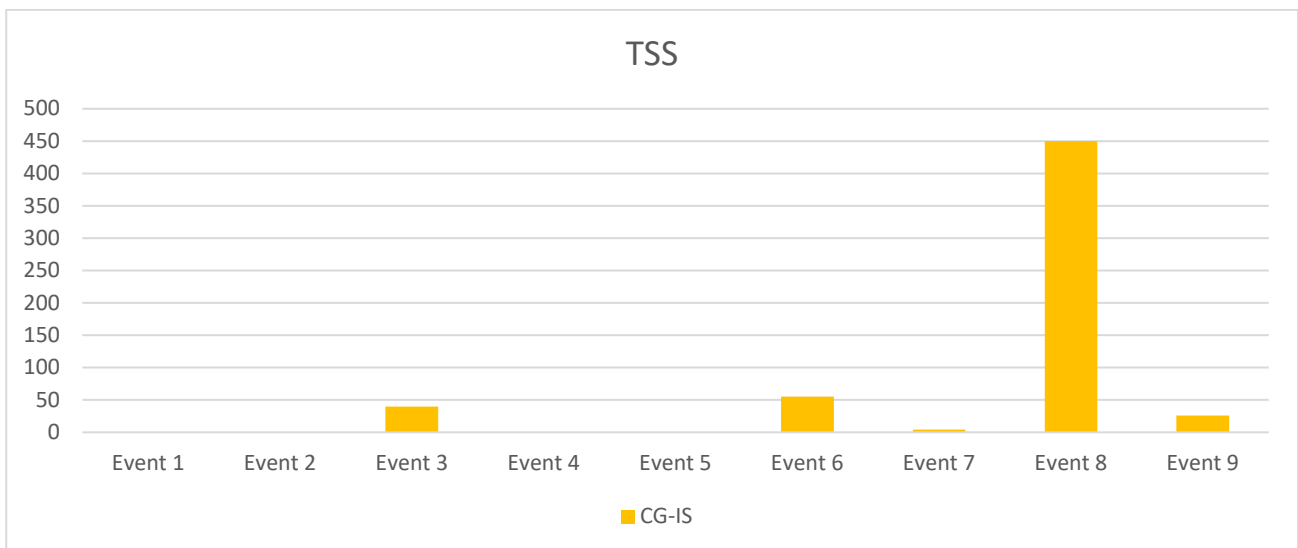


Figure 3-18 Total Suspended Solids for CG-IS, within the Talbingo Reservoir catchment

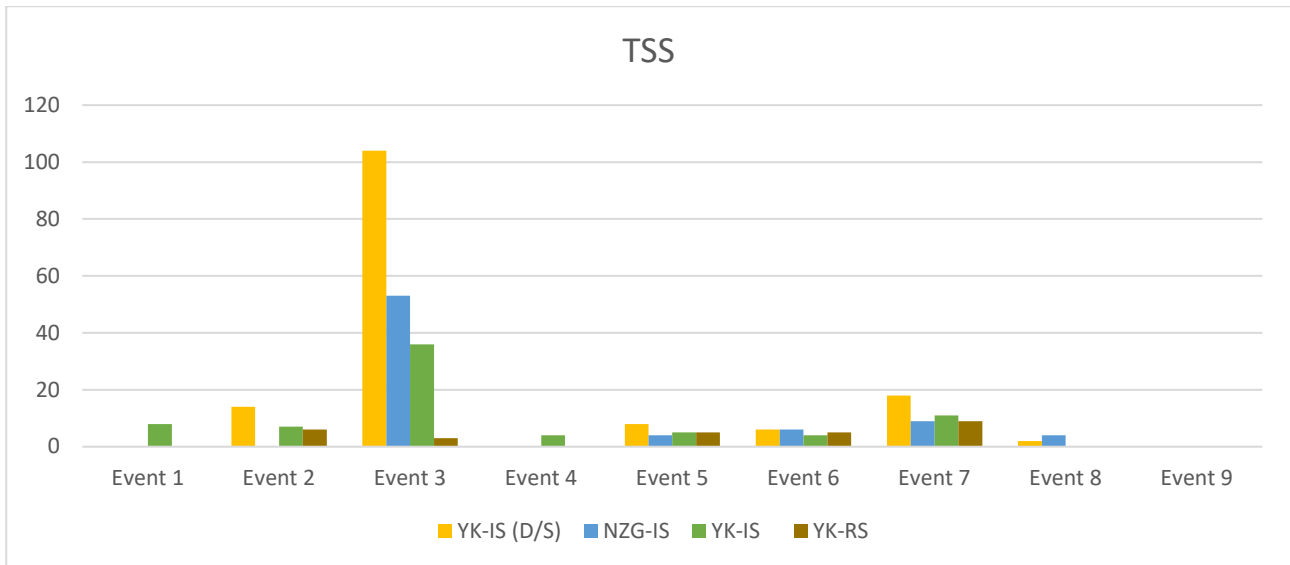


Figure 3-19 Total Suspended Solids for the Yorkers Creek catchment

Values of pH for the Talbingo Reservoir catchment have remained relatively consistent with Event 7 and Event 8. All of the sites had values of pH that fell within the DGV range of 6.5 to 8 pH units, refer to Figure 3-20.

Values of pH for the Yorkers Creek catchment indicate that there has been a consistent reduction in pH since Event 6, refer to Figure 3-21. Two sites within the catchment, YK-IS (6.24) and YK-RS (6.38) fell below the lower DGV value of 6.5 pH units.

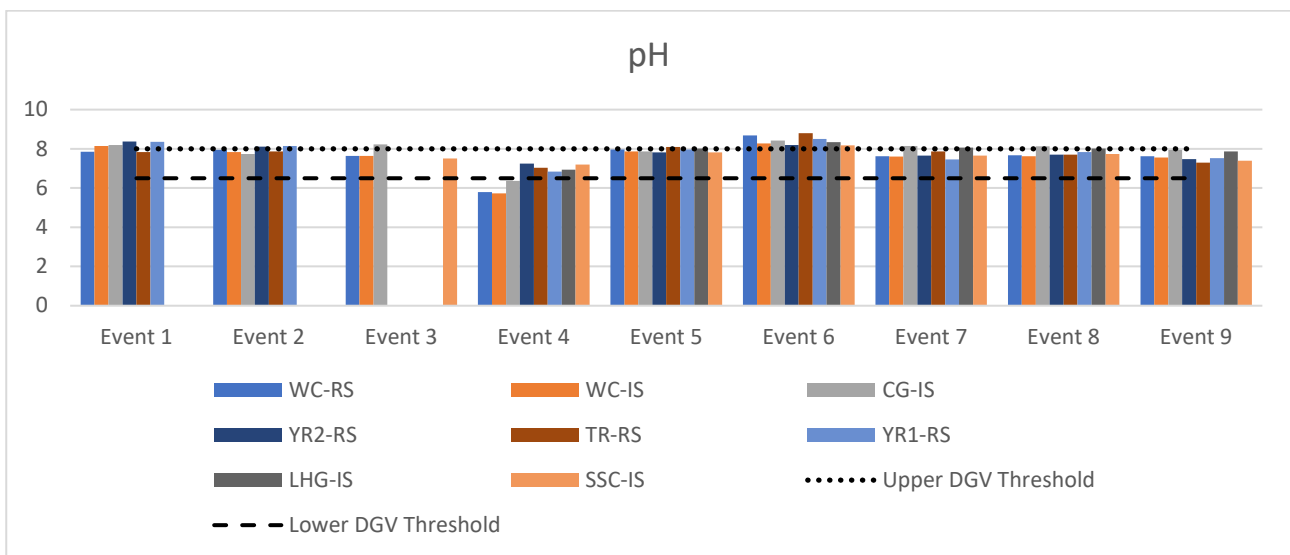


Figure 3-20 Potential of Hydrogen (pH) for Talbingo Reservoir catchment

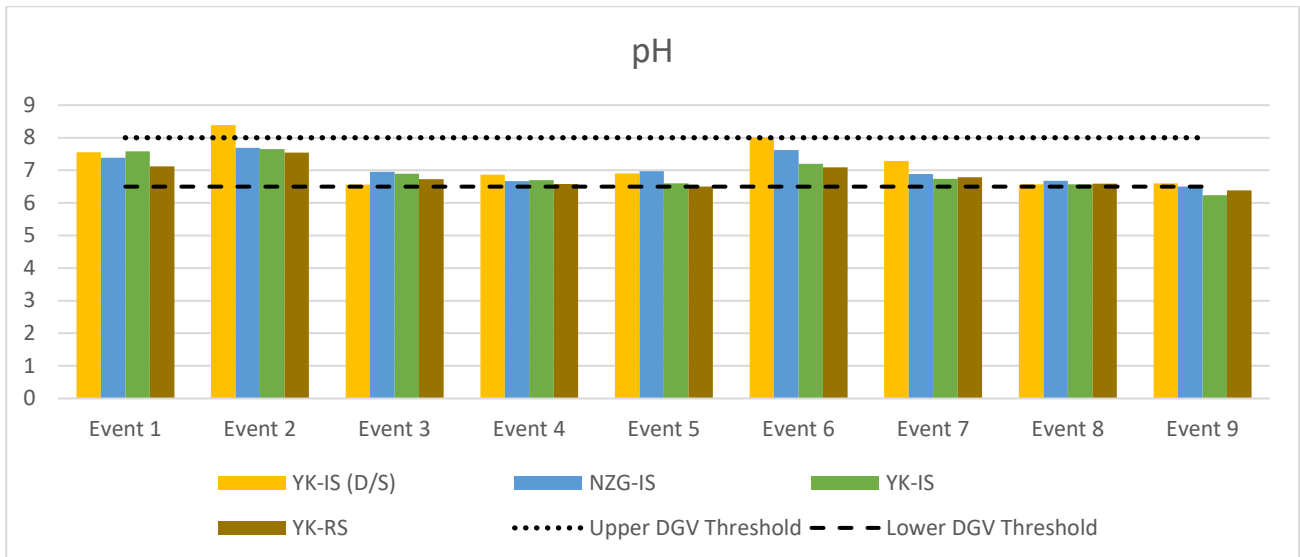


Figure 3-21 Potential of Hydrogen (pH) for Yorkers Creek catchment

The values for the oxygen redox potential during Event 9 have increased at all sites within the Talbingo and Yorkers Creek catchments, when compared with results from Event 8, refer to Figure 3-22 and Figure 3-23. TR-RS recorded the largest increase from 95.7mV during Event 8 to 190.8mV during Event 9.

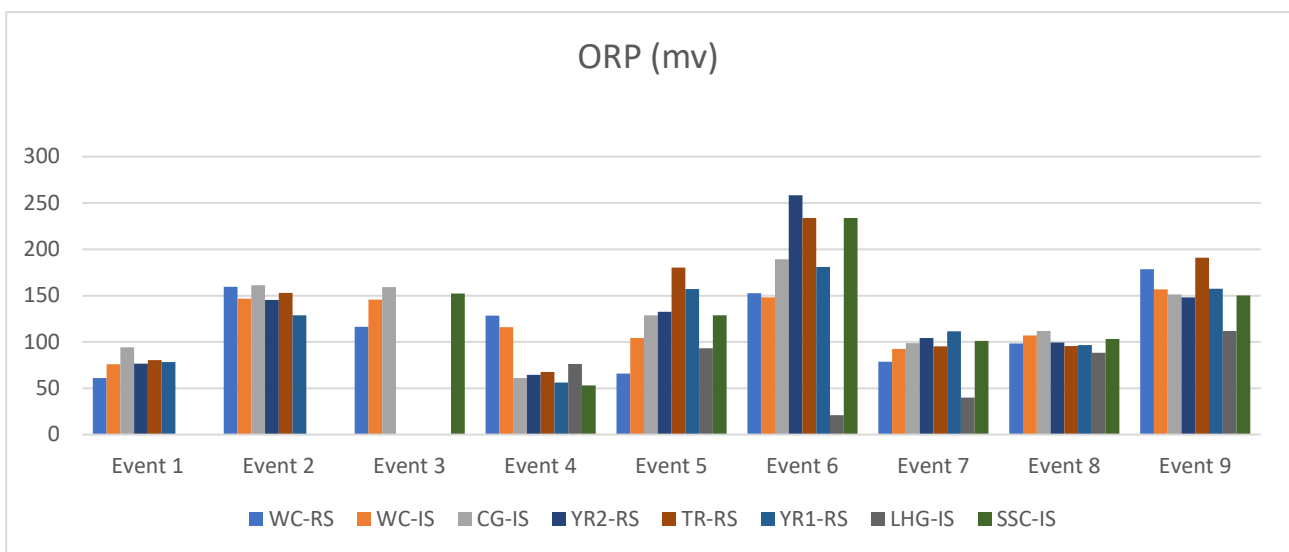


Figure 3-22 Oxygen Redox Potential (ORP) for Talbingo Reservoir catchment

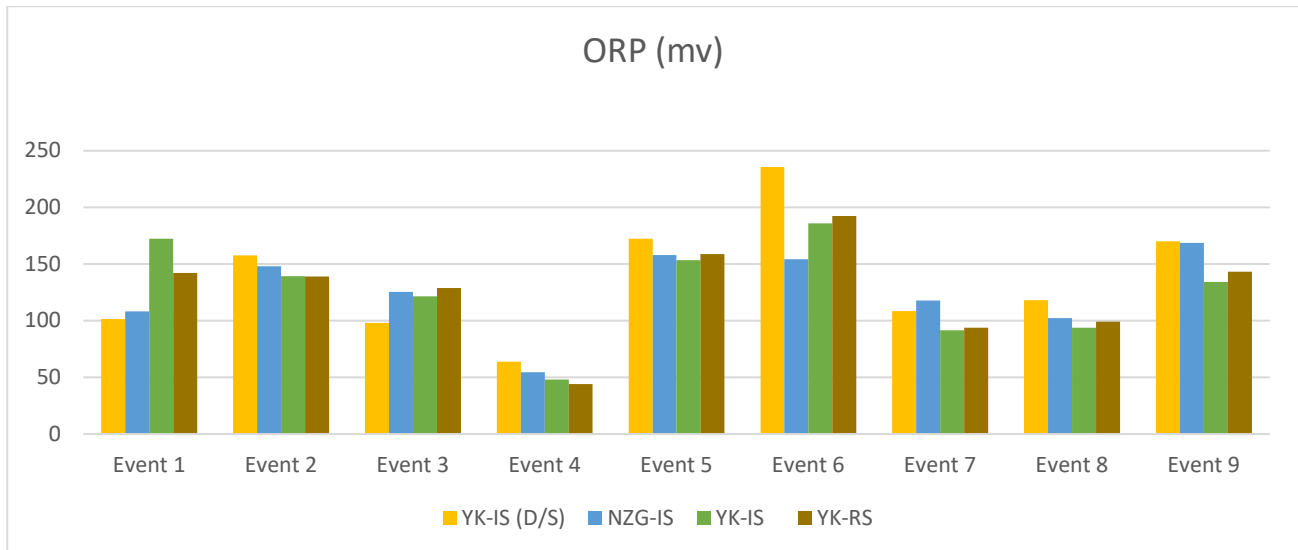


Figure 3-23 Oxygen Redox Potential (ORP) for Yorkers Creek catchment

3.1.2. Quality Assurance / Quality Control

A Quality Assurance and Quality Control (QA/QC) program was undertaken as part of this investigation including:

- A field duplicate sample, at a rate of one per 20 samples, was taken (DUP01) from the WQM site WC-RS on 23 November 2022. DUP01 was analysed for metals and metalloids. The duplicate sample has been compared against the SSC-IS sample by Relative Percentage Difference (RPD) and has returned within an acceptable range or less than 30% for inorganic or less than 5 times the laboratory limit of reporting (LOR).
- A water blank was supplied by the laboratory. The water blank sample was analysed for metals and metalloids. There were no exceedances of the sample results above the LORs.

NGH consider the QA/QC program to have been effective and the data reliable and representative to achieve the objectives of the investigation.

Refer to Appendix C for the laboratory analysis certificate, Appendix D for the RPD Table and Appendix E for the calibration certificates.

4. Conclusion

Water temperatures had generally decreased across the sites compared to the water temperatures for Event 8. Water quality monitoring results for Event 9 generally showed an increase in water quality parameters, compared to the results of Event 8. However, results for Event 9 also showed a decrease in pH at most sites, when compared to the results for Event 8.

Laboratory results for Event 9 were generally consistent with the results of the previous monitoring events with the majority of analytes reported below the Limit of Reporting. Results exceeded the DGV for total suspended solids (0.2 mg/L) at CG-IS. Iron was above the DGV at SSC-IS. Aluminium was above the DGV at most sites (YR1-RS, WC-RS, TR-RS, WC-IS, CG-IS, LHG-IS, YR2-RS, SSC-IS, YK-IS (D/S), NZG-IS, YK-RS, YK-IS). Total dissolved solids were elevated at CG-IS and LHG-IS, which is a pattern that has carried through all events.

All results and statistics are provided in Appendix A.

5. References

- Jacobs Pty Ltd. 2020. *Snowy 2.0 Transmission Connection Project EIS*.
- NGH Pty Ltd. 2022. *Pre-construction Water Quality Monitoring Program and Methodology*.
- NGH Pty Ltd. 2022a. *Pre-construction Water Quality Monitoring Report: Event 1 April 2022*.
- NGH Pty Ltd. 2022b. *Pre-construction Water Quality Monitoring Report: Event 2 April 2022*.
- NGH Pty Ltd. 2022c. *Pre-construction Water Quality Monitoring Report: Event 3 May and June 2022*.
- NGH Pty Ltd. 2022d. *Pre-construction Water Quality Monitoring Report: Event 4 June 2022*.
- NGH Pty Ltd. 2022e. *Pre-construction Water Quality Monitoring Report: Event 5 July 2022*.
- NGH Pty Ltd. 2022f. *Pre-construction Water Quality Monitoring Report: Event 6 August 2022*.
- NGH Pty Ltd. 2022g. *Pre-construction Water Quality Monitoring Report: Event 7 October 2022*.
- NGH Pty Ltd. 2022h. *Pre-construction Water Quality Monitoring Report: Event 8 October 2022*.
- TransGrid. 2021a. *Snowy 2.0 Transmission Connection Project Submissions Report*.
- TransGrid. 2021b. *Snowy 2.0 Transmission Connection Project Amendment Report*.

APPENDIX A EVENT DATA TABLE

		Sheen/ oil/ grease	Temp. (°C)	Dissolve d Oxygen (DO %)	DO (ppm)	Specific EC (SPC uS/cm)	EC (uS/cm)	pH	Redox (mV)	Turbidity (NTU)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Cyanide (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Ni (mg/L)	TN (mg/L)	TP (mg/L)	Ag (mg/L)	TDS (mg/L)	TSS (mg/L)	Zn (mg/L)
22-013 Pre-construction WQM DGV (Default Guideline Value)		No	-	90-110	7-12	0.0001-0.0005	20-350	6.5-8.5	-	2.25	0.027	0.0008	0.00006	0.00001	0.001	0.004	0.3	0.001	1.2	0.00006	0.008	0.25	0.02	0.00002	-	0.2	0.0024
WC-RS	Event 1	No	14.2	90.5	9.28	126.8	100.7	7.85	81.2	0.37	0.01	0.00015	0.00001	0.000005	0.0001	0.001	0.03	0.0005	0.011	0.000015	0.0005	3	0.005	0.00001	12	0.1	0.001
	Event 2	No but on sediment	12.4	73.5	7.84	109	83.1	7.95	159.4	1.49	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.001	0.000015	0.0005	0.1	0.005	0.00001	1	0.1	0.001
	Event 3	No	9.2	81.3	7.05	151	36	7.64	116.3	36.96	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	50	82	0.001
	Event 4	No	7.3	75.1	12.78	128.9	35.3	5.8	128.4		0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	19	0.1	0.001
	Event 5	No	7.8	98.9	11.76	88	59	7.96	65.8	6.45	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	56	0.1	0.001
	Event 6	No	9.3	79.36	9.74	89.6	62.7	8.68	152.6	7.15	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	44	8	0.001
	Event 7	No	13.2	74.9	7.87	83.5	64.8	7.62	78.7	2.62	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	53	6	0.001
	Event 8	No	13.1	74.5	7.84	71.8	55.4	7.67	98.4	9.52	0.079	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0002	0.000015	0.0005	0.1	0.08	0.00001	39	0.1	0.001
	Event 9	No	11.9	102.1	11.02	90	67.5	7.62	178.4	10.72	0.36	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0004	0.000015	0.0005	0.1	0.02	0.00001	24	0.1	0.001
	Min		7.30	61.30	7.05	71.80	35.30	5.80	61.20	0.37	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00	1.00	0.10	0.00
WC-IS	Event 1	No	14.3	90.6	9.28	126.7	100.8	8.14	76	0.32	0.01	0.00015	0.00001	0.000005	0.0001	0.001	0.03	0.0005	0.011	0.000015	0.0005	0.1	0.005	0.00001	80	3	0.001
	Event 2	No	12.5	69.9	7.44	109	83.3	7.84	146.8	1.39	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0002	0.000015	0.0005	0.8	0.005	0.00001	63	0.1	0.001
	Event 3	No	9.3	81.2	7.03	48	33	7.64	145.8	40.77	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.02	0.00001	41	42	0.001
	Event 4	No	7.4	43.7	12.55	52.3	35	5.73	115.9		0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.02	0.00001	27	0.1	0.001
	Event 5	No	7.9	98.4	11.45	87	59	7.96	104.3	5.24	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	48	0.1	0.001
	Event 6	No	9.3	72.36	9.55	86.6	60.3	8.28	148	7.78	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	47	6	0.001
	Event 7	No	13.3	75.1	7.86	83.8	65.1	7.61	92.6	2.41	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	4	3	0.001
	Event 8	No	13.1	74.4	7.82	71.7	55.4	7.62	107.1	10.1	0.076	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0001	0.000015	0.0005	0.1	0.01	0.00001	1	4	0.001
	Event 9	No	12	102.2	11.02	88.7	66.6	7.55	156.8	11.79	0.36	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0003	0.000015	0.0005	0.1	0.02	0.00001	6	0.01	0.001
	Min		7.40	43.70	7.03	48.00	33.00	5.73	76.00	0.32	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00	1.00	0.10	0.00
CG-IS	Event 1	No	14.1	91.8	9.43	536	423.8	8.19	84.3	6.47	0.01	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0002	0.000015	0.0005	0.1	0.005	0.00001	317	0.1	0.001
	Event 2	No	13.3	71.8	7.48	517	401.2	7.73	161.4	1.36	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	293	0.1	0.001
	Event 3	No	9.6	82.1	7.07	447	315	8.22	159.2	65.1	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	270	40	0.001
	Event 4	No	8.6	44.57	12.06	321.3	349	6.37	61.1		0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.05	0.00001	266	0.1	0.001
	Event 5	No	9.1	96.1	11.07	473	305	7.86	128.7	4.22	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	293	0.1	0.001
	Event 6	No	10.1	73.2	9.4	583	417.2	8.42	189.2	48.5	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	293	55	0.001
	Event 7	No	13.6	75.5	7.84	538	420.8	8.15	88.8	3.75	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	243	4	0.002
	Event 8	No	13.9	74.5	7.86	448.3	353.6	8.13	111.3	785.48	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.1	0.005	0.00001	277	450	0.002
	Event 9	No	12.9	102.9	10.86	384	294.9	7.95	151.2	32.04	0.44	0.00015	0.00001	0.000005	0.0001	0.001	0.009	0.0005	0.0002	0.000015	0.0005	0.1	0.02	0.00001	232	26	0.001
	Min		8.60	44.57	7.07	321.30	294.90	6.37	61.10	1.36	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00	232.00	0.10	0.00
YR1-RS	Event 1	No	14.9	92.2	9.31	110.7	89.3	8.15	78.3	6.94	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0003	0.000015	0.0005	0.1	0.005	0.00001	69	0.1	0.001
	Event 2	No	12.7	73.8	7.83	104	79.2	8.15	128.8	1.85	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0001	0.000015	0.0005	0.1	0.005	0.00001	50	0.1	0.001
	Event 3	No sample									0.01	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0001	0.000015							

APPENDIX B OBSERVATIONS AND FIELD DATA

Event 9.

23rd - partly cloudy,
cool, slight breeze.

22-013 Pre-construction WQM		Grease/oil/sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
WC-RS	Month	No	17.4	102.1	11.02	90.0	67.5	7.62	178.4	10.72
	Comment	<u>DuPont</u> 11.9 Fast flowing.								
WC-IS	Month	No	12.0	102.2	11.02	88.7	66.6	7.95 7.55	156.8	11.79
	Comment	Fast flowing - gravel bar left bank.								
CG-IS	Month	No	12.9	102.9	10.86	384.0	53.5 294.9	7.53 7.95	151.2 151.2	32.04 32.04
	Comment	Doesn't seem to have eroded much more. turbid water, fast flowing NTU ~ 32.88 → less than EG.								
YR1-RS	Month	No	12.2	102.7	11.02	70.8	168.3 53.5	7.86 7.53	157.4 157.4	7.30 7.30
	Comment	High H ₂ O level as boulders covered. Fast flowing. Veg really growing along bank. NTU less than Wallaces Creek.								

24/11/22 - partly cloudy, slight breeze.

22-013 Pre-construction WQM		Grease/oil/sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
LHG-IS	Month	No	13.1	100.5	10.55	340.6	243.3	7.86	111.7	10.46
	Comment	Clear, flowing. Aquatic weeds plants. NTU ~ 10 - 7 much less than 18.								
YR2-RS	Month	No	12.5	103.0	10.97	68.4	52.1	7.47	148.1	9.56
	Comment	Fast flowing, Rock bar covered with water. Higher NTU than YR1-RS @ 10.34 NTU								
SSC-IS	Month	No	14.2	102.6	10.52	140.1	111.2	7.40	150.1	43.88
	Comment	Cloudy/milky appearance to flow. 44 NTU - highest of all channels. (23/11)								
TR-RS	Month	No.	9.5	111.0	12.67	21.5	15.1	7.30	190.8	0.00
	Comment	Very clear, bank eddy, cool. 0 NTU.								
YK-IS (D/S)	Month	No	9.5 10.4	94.7	10.59	29.9	21.5	6.60	170.0	4.67
	Comment	Clear, fast flowing, ~ 45 NTU.								

22-013 Pre-construction WQM		Grease/oil/sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
NZG-IS	Month	No	10.4 11.0	94.7 94.5	10.41	36.0	26.4	6.50	168.8	4.70
	Comment	Clear, flowing, deeper than usual, but still quite shallow, horses have used area.								
YK-IS	Month	No	11.0 12.0	91.8 92.0	9.92	27.9	21.0	6.24	134.2	5.39
	Comment	Fast flowing ~ 7 NTU.								
YK-RS	Month	No.	12.0 14.0	92.0 99.1	10.20	28.0	22.1	6.38	143.2	8.25
	Comment	fast flowing ~ 10 NTU. Horse used area.								

APPENDIX C LABORATORY CERTIFICATES

NGH Environmental
Suite 1/39 Fitzmaurice Street
Wagga Wagga NSW 2650
Attention: Nicole Isles

Wednesday, December 14, 2022



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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0209	WC-RS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.36 mg/L	APHA 3030 B/3120 B	0.03
		Cadmium (dissolved)	<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Chromium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	<0.002 mg/L	* APHA 4500-CN E	0.002
		Lead (dissolved)	0.08 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Mercury	0.004 mg/L	APHA 3030 B/3120 B	0.001
		Nickel (dissolved)	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nitrogen, total	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrate/Nitrite as N	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Phosphorus, Total	<0.1 mg/L	LTM-W-014	0.1
		Silver (dissolved)	0.02 mg/L	LTM-W-030	0.01
		Total Dissolved Solids	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Kjeldahl Nitrogen	24 mg/L	LTM-W-035	2
		Total Suspended Solids	<0.2 mg/L	LTM-W-034	2
		Zinc (dissolved)	<0.2 mg/L	APHA 2540 D	0.2
			<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0210 WC-IS
23.11.22

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0210	WC-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.36 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.08 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.02 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	6 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002
22Nov-0211	CG-IS 23.11.22				

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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0211	CG-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.44 mg/L	APHA 3030 B/3120 B	0.03
		Cadmium (dissolved)	<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Chromium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	<0.002 mg/L	* APHA 4500-CN E	0.002
		Lead (dissolved)	0.09 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Mercury	0.002 mg/L	APHA 3030 B/3120 B	0.001
		Nickel (dissolved)	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nitrogen, total	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrate/Nitrite as N	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Phosphorus, Total	<0.1 mg/L	LTM-W-014	0.1
		Silver (dissolved)	0.02 mg/L	LTM-W-030	0.01
		Total Dissolved Solids	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Kjeldahl Nitrogen	232 mg/L	LTM-W-035	2
		Total Suspended Solids	<0.2 mg/L	LTM-W-034	2
		Zinc (dissolved)	26 mg/L	APHA 2540 D	0.2
			<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0212 YR1-IS
23.11.22

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0212	YR1-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.30 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.07 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.002 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	30 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0213 LHG-IS
23.11.22

NGH Environmental
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Wagga Wagga NSW 2650
Attention: Nicole Isles

Wednesday, December 14, 2022



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<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0213	LHG-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.18 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	<0.01 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.02 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	200 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0214 YR2-IS
23.11.22

NGH Environmental
Suite 1/39 Fitzmaurice Street
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Attention: Nicole Isles

Wednesday, December 14, 2022



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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0214	YR2-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.29 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.08 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	<0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	22 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0215 SSC-IS
23.11.22

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0215	SSC-IS 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	1.58 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.56 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.019 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	47 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002
22Nov-0216	TR-RS 24.11.22				

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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0216	TR-RS 24.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.08 mg/L	APHA 3030 B/3120 B	0.03
		Cadmium (dissolved)	<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Chromium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	<0.002 mg/L	* APHA 4500-CN E	0.002
		Lead (dissolved)	<0.01 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Mercury	0.001 mg/L	APHA 3030 B/3120 B	0.001
		Nickel (dissolved)	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nitrogen, total	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrate/Nitrite as N	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Phosphorus, Total	<0.1 mg/L	LTM-W-014	0.1
		Silver (dissolved)	<0.01 mg/L	LTM-W-030	0.01
		Total Dissolved Solids	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Kjeldahl Nitrogen	<2 mg/L	LTM-W-035	2
		Total Suspended Solids	<0.2 mg/L	LTM-W-034	2
		Zinc (dissolved)	<0.2 mg/L	APHA 2540 D	0.2
			<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0217 YK-IS (d/s)
24.11.22

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0217	YK-IS (d/s) 24.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.26 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.10 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.002 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	<2 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002
22Nov-0218	NZG-IS 24.11.22				

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0218	NZG-IS 24.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.19 mg/L	APHA 3030 B/3120 B	0.03
		Cadmium (dissolved)	<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Chromium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	<0.002 mg/L	* APHA 4500-CN E	0.002
		Lead (dissolved)	0.05 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Mercury	0.002 mg/L	APHA 3030 B/3120 B	0.001
		Nickel (dissolved)	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nitrogen, total	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrate/Nitrite as N	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Phosphorus, Total	<0.1 mg/L	LTM-W-014	0.1
		Silver (dissolved)	0.01 mg/L	LTM-W-030	0.01
		Total Dissolved Solids	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Kjeldahl Nitrogen	13 mg/L	LTM-W-035	2
		Total Suspended Solids	<0.2 mg/L	LTM-W-034	2
		Zinc (dissolved)	<0.2 mg/L	APHA 2540 D	0.2
			<0.002 mg/L	APHA 3030 B/3120 B	0.002
22Nov-0219	YK-IS 24.11.22				

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0219	YK-IS 24.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.28 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.12 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	<0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	<2 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002
22Nov-0220	YK-RS 24.11.22				

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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0220	YK-RS 24.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.32 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	0.16 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	0.02 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	<2 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0221 DUP01
23.11.22

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Facility:	Order #	Date Analysis Commenced
		25-November-2022

Sample Type	Collected By	Date Received
Water	N. Smith	25-November-2022

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting
22Nov-0221	DUP01 23.11.22				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	0.35 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	0.06 mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	0.003 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

22Nov-0222	Water Blank				
		Aluminium (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	
		Arsenic	<0.03 mg/L	APHA 3030 B/3120 B	0.03
			<0.0003 mg/L	Analysis by Melbourne (acc no: 992)	
		Cadmium (dissolved)	<0.00002 mg/L	APHA 3030 B/3120 B	0.002
		Chromium (dissolved)	<0.00001 mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002 mg/L	* APHA 4500-CN E	0.002
		Iron (dissolved)	<0.01 mg/L	APHA 3030 B/3120 B	0.01

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		25-November-2022
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>
Water	N. Smith	25-November-2022

<u>EAL ID</u>	<u>Client ID.</u> Date/Time sample taken	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
22Nov-0222	Water Blank				
		Lead (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Manganese (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.001
		Mercury	<0.00003 mg/L	Analysis by ALS Melbourne (acc no: 992)	
		Nickel (dissolved)	<0.001 mg/L	APHA 3030 B/3120 B	0.01
		Nitrogen, total	<0.2 mg/L	* APHA 4500-Norg B + 4110 B	2
		Nitrate/Nitrite as N	<0.1 mg/L	LTM-W-014	0.1
		Phosphorus, Total	<0.01 mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002 mg/L	* APHA 3030 E/3120 B	0.002
		Total Dissolved Solids	<2 mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2 mg/L	LTM-W-034	2
		Total Suspended Solids	<0.2 mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002 mg/L	APHA 3030 B/3120 B	0.002

Note:

* NATA Accreditation does not cover the performance of this service.

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		25-November-2022			
<u>Sample Type</u>	<u>Collected By</u>	<u>Date Received</u>			
Water	N. Smith	25-November-2022			
<u>EAL ID</u>	<u>Client ID.</u>	<u>Test</u>	<u>Result (units)</u>	<u>Method Reference</u>	<u>Limit of Reporting</u>
	Date/Time sample taken				

Signed Michael Glazier, Laboratory Manager.

All samples analysed as received.
All soil results are reported on a dry basis.
The EAL takes no responsibility for the end use of results within this report.
This report shall not be reproduced except in full.
This report replaces any previously issued report

APPENDIX D RPD TABLE

			Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Cyanide (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Ni (mg/L)				Ag (mg/L)				Zn (mg/L)
DUP01	Event 1	DUP01	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005				0.00001				0.001
		YR1-IS	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 2	DUP01	<0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.001	0.000015	0.0005				0.00001				0.001
		WC-IS	<0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.002	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range except Mn	0%	0%	0%	0%	0%	0%	0%	0%	67%	0%	0%				0%				0%
	Event 3	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		Yk-IS (D/S)	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
		DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 4	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 5	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 6	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 7	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				0%				0%
	Event 8	DUP01	1.79	0.00015	0.00001	0.000005	0.0001	0.001	0.73	0.0005	0.011	0.000015	0.0005				0.00001				0.002
		SSC-IS	1.73	0.00015	0.00001	0.000005	0.0001	0.001	0.69	0.0005	0.011	0.000015	0.0005				0.00001				0.002
		RPD% - Acceptable Range	3.4090909	0%	0%	0%	0%	0%	5.6338028	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 9	DUP01	0.35	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005				0.00001				0.001
		WC-RS	0.36	0.00015	0.00001	0.000005	0.0001	0.001	0.08	0.0005	0.004	0.000015	0.0005				0.00001				0.001
		RPD% - Acceptable Range	2.82	0%	0%	0%	0%	0%	28.57	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Water Blank	Event 1	Nothing above LOR	<0.02	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 2	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 3	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 4	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 5	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 6	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 7	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 8	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002
	Event 9	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001				<0.00002				<0.002

RPD % $\frac{|(X_2 - X_1)|}{((X_2 + X_1)/2)}$

How to calculate the Relative Percent Difference (RPD)

The basic equation for RPD is $RPD = \frac{|R1 - R2|}{\left(\frac{R1 + R2}{2}\right)} \times 100$,

where
R1 is sample 1, and
R2 is sample 2.

R1 and R2 are your sample and duplicate values. Basically, this equation has you calculate the RPD by dividing the difference between the sample and duplicate by the average of the two. Using absolute value signs ensures the RPD doesn't end up as a negative percentage, which wouldn't make sense when looking for a percent difference.

The equation you plug into Excel looks like this:

=ABS((B3-C3)/AVERAGE(B3:C3)*100)

ABS stands for Absolute Value. Using the cell labels in the equation, as seen above (B3, C3), allows you to use the equation down for all your sample/duplicate pairs so you don't have to write a new equation each time. You can do this by clicking on the cell with the equation in it, then click and drag the bottom right corner of the cell down for the rest of your samples.

APPENDIX E CALIBRATION CERTIFICATES

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K104040**



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.76mS		385789	2.742 mS
2. Temp		21.1°C		Testo	22.3°C
3. pH 4		pH 4.00		394432	pH 4.04
4. pH 7		pH 7.00		386467	pH 7.00
6. DO		0.00%		12110	0.1%
7. Turbidity		100NTU		395515	100.59NTU
8. mV		234.94mV		390802/387771	235.2 mV

Calibrated by:

Lebelle Chee

Calibration date:

15/11/2022

Next calibration due:

15/12/2022