

22 December 2023

WDL 249 Environmental Monitoring Report

22 December 2022- 21 December 2023

First Report

Toms Gully Project Area



Endorsement

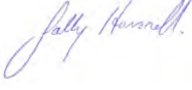
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Photos on front page: Freshwater crab found at MMP monitoring site, entry to Toms Gully with Mount Bunday Creek burst its banks in February 2023, monitoring site MBC01A in February.

Endorsement

Endorsement

	Author	Author	Reviewed by	Approved by
Date	22/12/2023	22/12/2023	22/12/2023	22/12/2023
Name (s)	Sally Horsnell	Jaime Marr	Charles Hastie	Charles Hastie
Signature				

I Charles Hastie, PGO General Manager- Mining and Permitting, have reviewed this report and I confirm that to the best of my knowledge and ability, all information provided in the report is true and accurate.



SIGNATURE:

DATE: Friday 22 December 2022

Environmental Monitoring Report Checklist

Y/N	Page	Requirement	Department's Comment
Y	0	Title Page -Does it include report name, reporting period, submission date, version number, Licence number, Report author and business details	
Y	0	Certification	
Y	1	Executive summary	
Y	3	Monitoring Objective	
Y	12	Monitoring Method	
N/A	-	Where there is an approved monitoring plan – details of approved plan title, version number, date of submission)	
Y	7-25	Where there is no approved monitoring plan – details map, sample locations, site layout, description of receiving environment, description of sampling and analysis methods, factors affecting variability in monitoring results	
Y	26	Monitoring Results	
Y	App A	Has all monitoring data been included?	
Y	App A	Calculations/exceedance of assessment criteria	
Y	26	QAQC	
Y	28	Presentation including graphs against trigger levels/benchmarks.	
Y	32	Discussion analysis and data interpretation against trends included?	
Y	43	Conclusions and proposed actions,	
N/A	44	Have non-conformances been identified?	
N/A	47	Have changes made to monitoring programs been identified and detailed?	
Y	47	Have corrective actions taken and improvements made been detailed?	
Y	49	Incident Reporting: Have environmental incidents been detailed?	
Y	53	Glossary	
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Executive Summary

This Environmental Monitoring Report for the Toms Gully Mine is the first submission under WDL249 to address Primary Gold Limited's performance monitoring and management activities. The reporting period is from 22 December 2022 to 21 December 2023.

No controlled discharge of treated wastewater, by reverse osmosis from Toms Gully Pit occurred from ADP1 to Mount Bunday Creek during the reporting period. Hold ups with the RO plant construction and auxiliary functions meant that commissioning and its first round of testing was done in November 2023. Controlled discharge of treated RO water will commence during the 2023/24 reporting period.

This EMR content includes results and interpretation for each aspect of the monitoring programme (as detailed under Item 11 and Conditions 27-36 of WDL 249) as relevant to the current site care and maintenance activities and in recognition that no authorised discharge had occurred during the reporting period. The evaluation of measured values found at SWTG2 is presented as background information only, comparing short and long terms trends to discharge trigger values.

The first surface water monitoring event was captured at SWTG2 once creek flow had commenced on 17 January 2023. This coincided a large rainfall event in the catchment in December 2022 and January 2023. During the reporting period there were 20 monitoring events undertaken at SWTG2, adding to the extensive 29 monitoring events since 2016.

Water quality parameters at SWTG2 during the 2022- 23 reporting period showed elevated levels of some field parameters including pH and dissolved oxygen. Dissolved metal concentrations including cadmium, cobalt, copper, nickel and zinc outside of TVs and short (2022/23) and long term (2016-2023) data trends followed similar alignments. Dissolved oxygen, temperature, antimony, mercury and silver data was limited to short term data trends analysis as it was recently included into the monitoring schedule.

Water quality at SWTG2 is suspected to be influenced by onsite surface water runoff and sub surface flows interacting with the metalliferous mined domains and contained water storage held at TGM. Elevated metals concentrations were also noted during the biological monitoring programme, suspecting that elevations are possibly related to point sources pollution from mine domains interacting with surface/groundwater and Mount Bunday Creek, and as a result could lead to impairment of aquatic ecosystems downstream of TGM (AES, 2023).

The upstream site short and long term values recorded cadmium, cobalt, copper and nickel below laboratory LoR. Zinc concentrations were also elevated at the two upstream sites, SWTG1 (not part of the WDL249) and SWTG1A (Control site). The potential sources (s) of elevated zinc concentrations is unknown and will require further examination in determining potential anthropogenic or natural source. Overall short term and long term trends of dissolved metals are in greater concentration at sites downstream of TGPA compared to upstream points, in particular SWTG2.

Executive Summary

For the sediments sample results, some dissolved metal concentrations were elevated, with some indication of accumulation particularly for arsenic. However, metals in sediments are not considered to have the potential to be released in concentrations which could be ecotoxic, should waters remain circumneutral at the site, (AES, 2023).

PGO water management goals for TGM whilst under care and maintenance is to reduce the overall poor water quality inventory and ultimately eliminate the threat of uncontrolled discharges from site. With the release of RO water into Mount Bunday Creek system during creek flow, it is anticipated some amelioration of surface water will occur with improvement measured at SWTG2 compliance point and the other monitoring sites as per WDL 249.

1 Introduction

In accordance with sections 39 and 40 of Waste Discharge Licence 249 (the Licence), this Environmental Monitoring Report (EMR) addresses Primary Gold Ltd (PGO) performance monitoring and management activities at Toms Gully Project Area (TGPA) for the 2022/2023 reporting period.

Please note, no controlled discharge of treated wastewater from mine influenced water collected on MLN 1058 (inclusive of Toms Gully Pit) into Mount Bunday creek via the Authorised discharge point (ADP1) occurred during this reporting period.

During the reporting period there were no changes to the Licence. Communications between the Department of Environment, Parks and Water Security (DEPWS) and PGO is recorded in the communications register provided in Appendix B. The Final EMR will be submitted to DEPWS by 22 December 2023 (as per Condition 39 of the Licence).

1.1 Monitoring Objectives

WDL 249 Conditions 39 and 40 outline the monitoring objectives that PGO will address in this EMR during the period from 22 December 2022 to 21 December 2023. The only exception applied for this EMR is for Condition 40.3 with no tabulation of monthly and annual contaminant loads discharged from ADP1 as specified in Item 5 for the preceding 12-month period.

As a minimum, the Monitoring Report will:

- Be drafted in accordance with the 'Guideline for Reporting on Environmental Monitoring';
- Include surface water, sediment, macroinvertebrate monitoring undertaken for WDL 249 as part of the environmental monitoring programme for TGPA;
- Include a tabulation of all monitoring data (provided electronically in Microsoft Excel format);
- Include long term trend analysis of monitoring data (minimum 3 years or part thereof) from the respective monitoring sites; and
- Include all exceedances and investigations undertaken for WDL249.

1.2 Operator Details

The Project proponent is PGO, a Company formed through the union of the listed entity Hydrotech International and the privately-owned Primary Minerals PGO acquisition of several gold assets, including the TGPA, from Crocodile Gold in early 2013. The Company was delisted on the Australian Stock Exchange (ASX) in 2018 after HGM Resources Pty Ltd bought 100% of the shares in April 2018. PGO is now a privately-owned company. PGO's assets are focused on the Northern Territory, which in addition to RRPA, include Toms Gully Mine, Quest 29 Project Area and ~2,000 km² of exploration tenure.

A Summary of operator details is included in Table 1-1.

Table 1-1 Operator Details

Operator Information			
Business Name	Primary Gold Limited (PGO)		
ACN/ABN	ACN: 122 726 283		
Street and Postal Address	Level 26, 140 St Georges Terrace, Perth WA 6000		
Key Contact(s)	Name:	Dr Mark Qiu	Charles Hastie
	Position:	Managing Director	General Manager- Mining and Permitting
	Phone number:	0424 288 016	0419 963 250
	Email:	Mark.Qiu@hanking.com.au	Charles.Hastie@hanking.com.au

1.2.1 Organisational Structure and Responsibility

PGO's overall management/organisational structure is illustrated in Figure 1-1. The organisational structure reflects the relatively new nature of the Company. As operations and development of PGO's assets expand, the organisational structure will develop and be updated to reflect this.

Managing Director and Departmental Managers are responsible for:

- Ensuring compliance with all relevant Statutory Acts and Regulations.
- Ensuring compliance with Safety Management and Emergency Response Plans.
- Ensuring regulatory documents (MMP/EMR) are adhered to;
- Establishing and maintaining environmental and safety performance monitoring; and
- Overall environmental management and compliance at TGPA lies with the Managing Director for PGO, the General Manager- Mining and Permitting and delegated personnel.

Introduction

Managing Director is responsible for:

- Accountable for the overall environmental management and compliance

General Manager and delegated personnel are responsible for:

- Responsible for resourcing and maintaining environmental management as per the Care and Maintenance MMP
- Responsible for defining and communicating relevant environmental responsibilities and accountabilities to employees, consultants, and contractors within their area of responsibility.
- All contractors/consultants contract obligations outline clear environmental and safety performance standards that are regularly assessed by PGO prior to and during their contract work at TGPA.

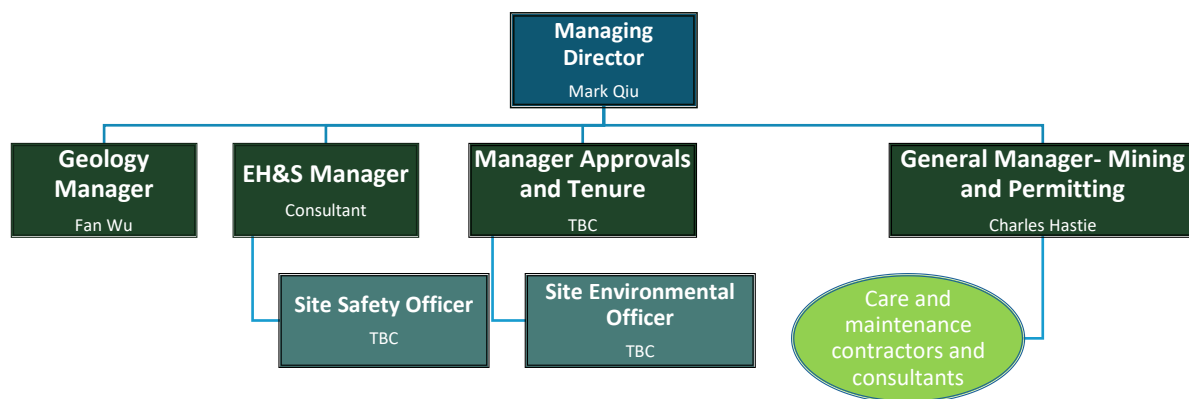


Figure 1-1 Organisation Structure for Care and Maintenance Activities

1.2.2 Workforce

PGO employees fulltime staff for the day-to-day RO treatment plant operations and maintenance. Contractor/consultant workforce is summarised in the following table, Table 1-2.

Table 1-2 TGPA Workforce and Responsibility

Monitoring and Maintenance Tasks	
Contractor/Consultant	Task
Sally Horsnell/Savannah Roots	MMP, EMR Reporting
	WDL Management and Monitoring WDL Management and Monitoring
	Inspections: Dam/pit water heights
	Surface and groundwater sampling and data analysis and reporting
	Quarterly Inspection (weeds, erosion and sediment controls, security, access, fire mapping and reporting)
	Survey heights - Pit water levels pick-ups, bore TOC.
Envirolab (NATA accredited for analysis category)	Laboratory analysis
Mount Bunday Pastoral Lease Holder	Weed spraying
	Fire mitigation
	Water management/transfer – pipe and pump set-up, maintenance
	Access roads/bund maintenance
	Fencing and gate maintenance
	Tenement access and point of contact for safety and security
Cross Solutions	Survey heights as required

1.3 Title Details

All licences for TGM are held in the name of Primary Minerals Pty Ltd, a wholly owned subsidiary of Primary Gold Limited. Tenement information has been provided Table 1-3.

Table 1-3 TGPA Tenement Information

Title Number	Title Holder	%	Expiry Date	Land Tenure
MLN 1058	Primary Minerals Pty Ltd	100	02/08/2039	PPL 1163, NT Portion 4937
MLN 29812	Primary Minerals Pty Ltd	100	05/02/2033	PPL 1163, NT Portion 4937
MLN 29814	Primary Minerals Pty Ltd	100	05/02/2033	PPL 1163, NT Portion 4937

1.4 Location

TG Mine is located approximately 90 km south-east of Darwin (131°34'E and 12°50'S). The TG Mine site including the RO Plant is located on MLN 1058, within Old Mount Bunday Station (PPL 1163, NT Portion 4937), which is an active station used for cattle grazing. Access is restricted by locked gates.

The mine site is directly accessed off the Arnhem Highway via a 2km access track to the south of the highway. The turnoff is approximately 10 km from the rural subdivision of Marrakai and the Corroboree Park Inn and 63 km from services at Humpty Doo. Access is just south of the Mount Bunday Creek which runs parallel to the access road to TGPA.

1.5 Site Activities

1.5.1 Care and Maintenance

TGPA remained in care and maintenance during 2022-2023 reporting period and has been since PGO's purchase of tenements in 2013. No exploration activities occurred at TGPA during this reporting period. The EIS for TGPA was formally approved in 2020 under the *NT Environmental Protection Act 2019*. The Reverse Osmosis (RO) water Treatment Plant received approval from the Department of Infrastructure, Tourism and Trade (DITT) in December 2022 under the *Mining Management Act 2001*. Construction of the plant and auxiliary infrastructure (including reconnection of mains power) occurred during 2023 with commissioning of the RO Plant in October 2023 (Photo 1-1).



September, 2023



September, 2023

Photo 1-1 TGPA Reverse Osmosis Plant and Pump Pontoon

1.5.2 Waste Discharge Licence

DEPWS issued PGO a ten-year WDL on 22 December 2022 (22/12/2022- 22/12/2032) under section 74 of the *Water Act 1992* that authorises for the controlled discharge of treated wastewater from mine influenced water collected on MLN 1058 into Mount Bunday Creek via the ADP1 as per the conditions of the Licence. PGO obtained the License to manage on site water inventories and maintain Toms Gully Pit water levels to a safe freeboard eliminating the risk of uncontrolled flows off tenement.

The source of waste water is captured in Toms Gully main Pit which receives water from runoff/pumping from the adjacent dams/pits. It is then treated through the RO Treatment Plant. Authorised discharge must only occur when there is a natural, continuous, and sufficient flow of water through the authorised compliance point (SWG2) and only include wastewater treated by the RO Plant via the authorised discharge point (ADP1).

1.5.2.1 Authorised Discharge Points and Compliance Points

As per Condition 20 and 21 of The Licence, there is one Authorised Discharge Point (ADP1) situated on tenement and at the entry to the Oxbow Wetlands. The Compliance Point (SWG2) is situated approximately 0.8km downstream of the wetlands discharge point in Mount Bunday Creek. Coordinates are included in Table 1-4 and locations of all WDL249 monitoring sites are included in Figure 1-2.

Table 1-4 WDL 249 Authorised Discharge Points and Compliance Points Coordinates

Creek	Site	Type	Latitude	Longitude
			GDA94	
Mt Bunday Creek	SWG2	Compliance point/ Telemetry Station	-12.8287	131.5742
	ADP1	Authorised Discharge Point	-12.8292	131.5639

Introduction

Photos include ADP1 and the telemetry station setup at the Compliance Site, SWTG2 (Photo 1-2).



August, 2023



September, 2023

Photo 1-2 Authorised Discharge Point 1 and Compliance Point Telemetry Station

Though there was no active discharge of treated water to ADP1 during this reporting period, under typical conditions during discharge, flow data including total discharge volumes to ADP1 is captured and recorded continuously. Continuous logger flow meters are installed at the RO plant and data retrieved as required. Height levels are taken weekly at Toms Gully Pit. The RO Plant and pumps are connected to mains power.

A solar powered telemetry station was installed at the Compliance Point (SWTG2) in November 2022 to monitor compliance against discharged water during creek flow. The telemetry station provide data in real time with continuous hourly recordings of electro- conductivity, pH, turbidity, dissolved oxygen, temperature and water levels. Data is captured via the Xylem Eagle internet portal. Weekly water quality sampling is done as per License conditions.

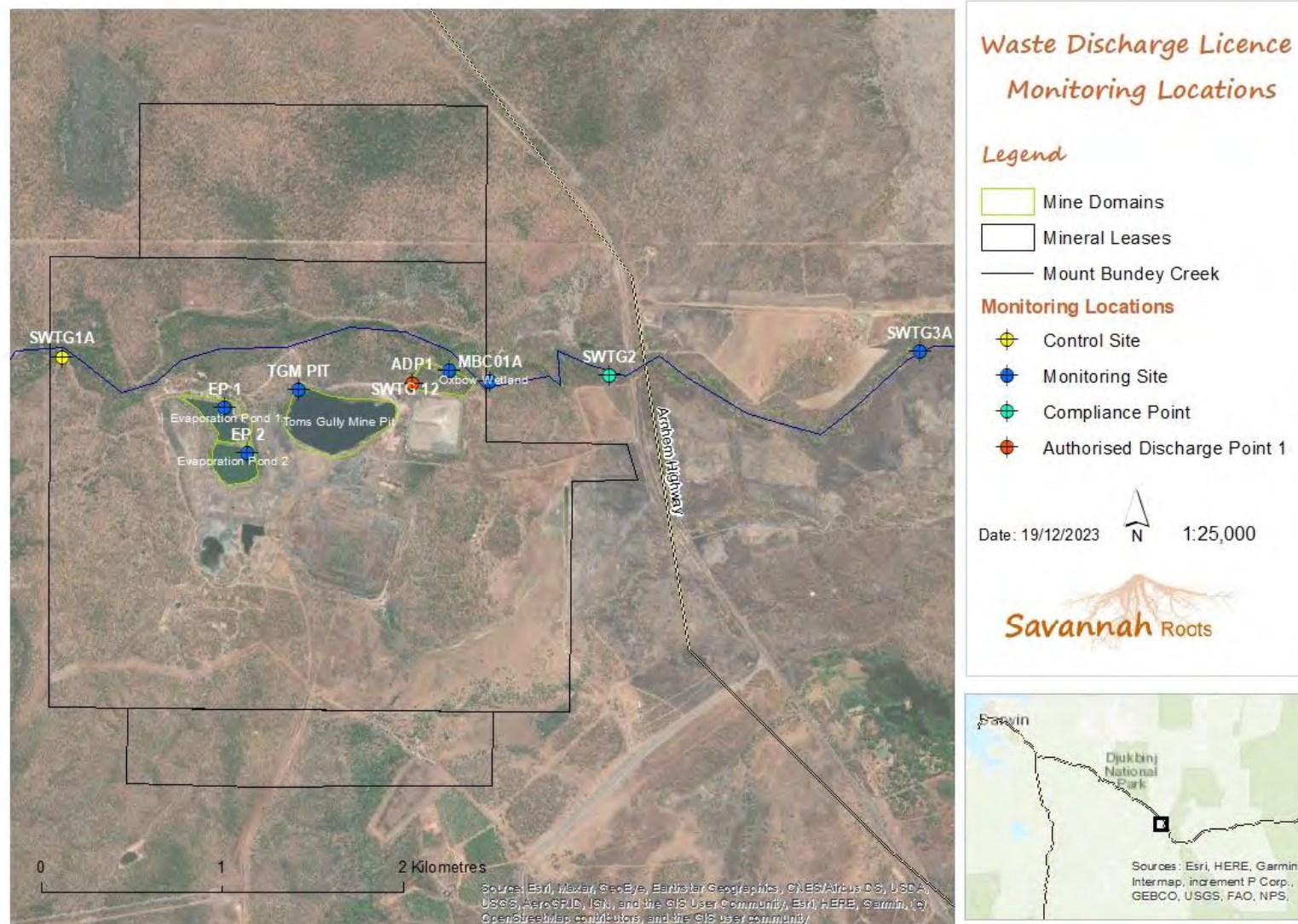


Figure 1-2 WDL249 Monitoring Locations

Introduction

1.5.2.2 Authorised Discharge from Toms Gully Mine Pit (TGM PIT)

No controlled discharge occurred during this reporting period. TGM Pit water levels were recorded weekly during routine monitoring, which is above the Monthly requirement as per Appendix 2 of the Licence. Water levels were recorded using relative levels off a surveyed marker. Figure 1-3 shows levels of the Pit since 22 December 2022. Current levels as of 12 December 2023 have decreased since the commencement of recording levels, to 19.02 mRL.

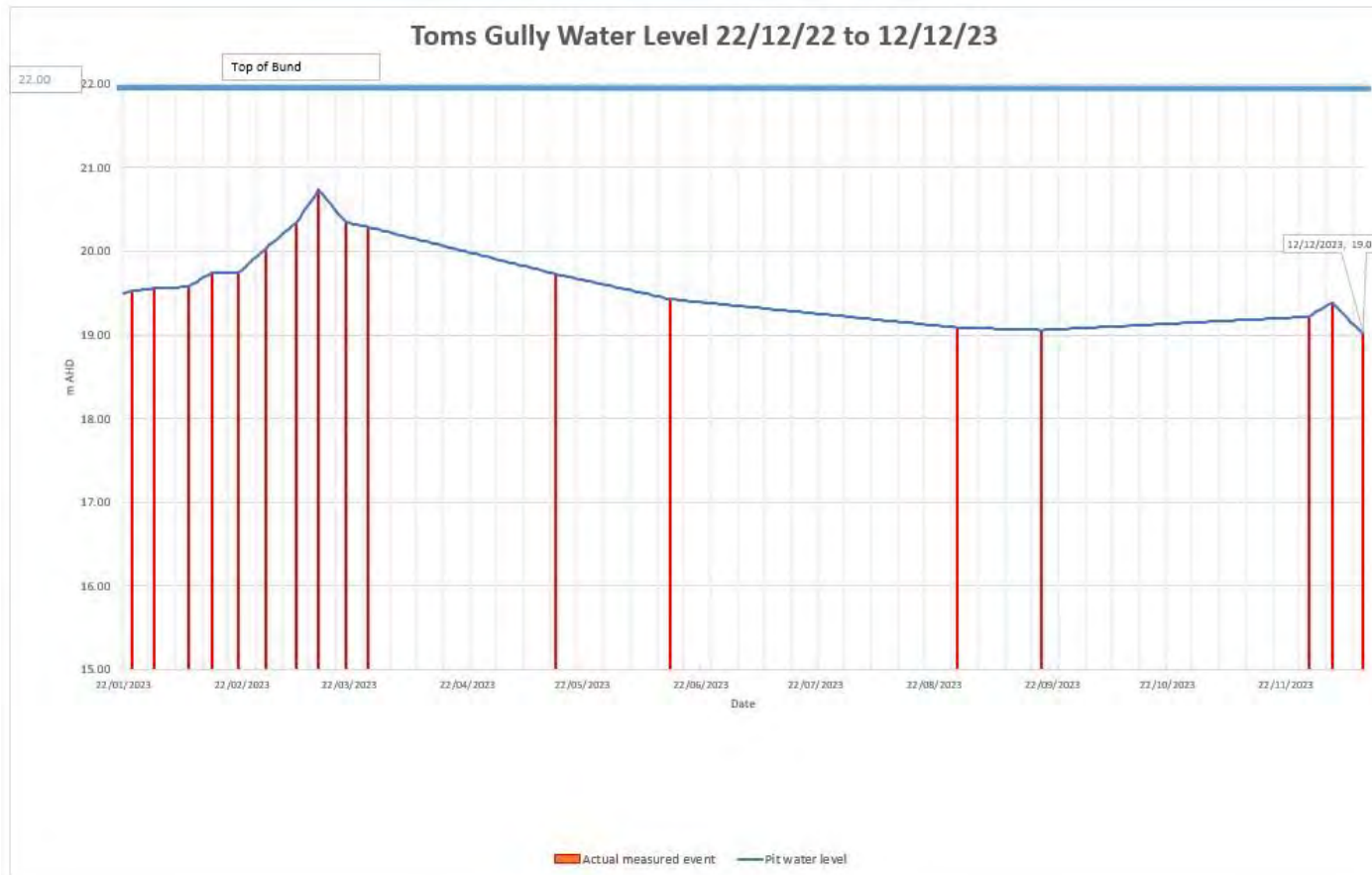


Figure 1-3 Toms Gully Mine Pit Water Level (2022- 23)

2 Monitoring Method

2.1 Receiving Environment

2.1.1 Catchment

The TGPA is positioned primarily over the Mary River Basin with the Mount Bunday Creek draining through the mineral leases from west to east (Figure 2-1). The mineral leases cover an area of 924 ha.

Upstream of the TGPA are two other projects owned and managed by PGO, Rustlers Roost and Quest 29. Whilst also in care and maintenance, these two sites report to head waters of the Mount Bunday Creek and contribute to water quality. Rustlers Roost has an active Licence (WDL247) with Pit water being discharged into Mount Bunday Creek during creek flows. Discharged water reports to the upstream SWTG1A site at Toms Gully.

All of Toms Gully's mining domains are located on MLN 1058 which include a Run of Mine, processing infrastructure and RO treatment plant, Waste Rock Dump, Pit, Tailings Dams, process water dams and wetlands. Water from non-disturbed areas or rehabilitated mining domains flow through a series of wetlands or enter small tributaries of the Mount Bunday Creek, before ultimately reporting to the major creek system.

Mount Bunday reports to the Mary River ~5 km downstream of the TGPA.

Monitoring Method

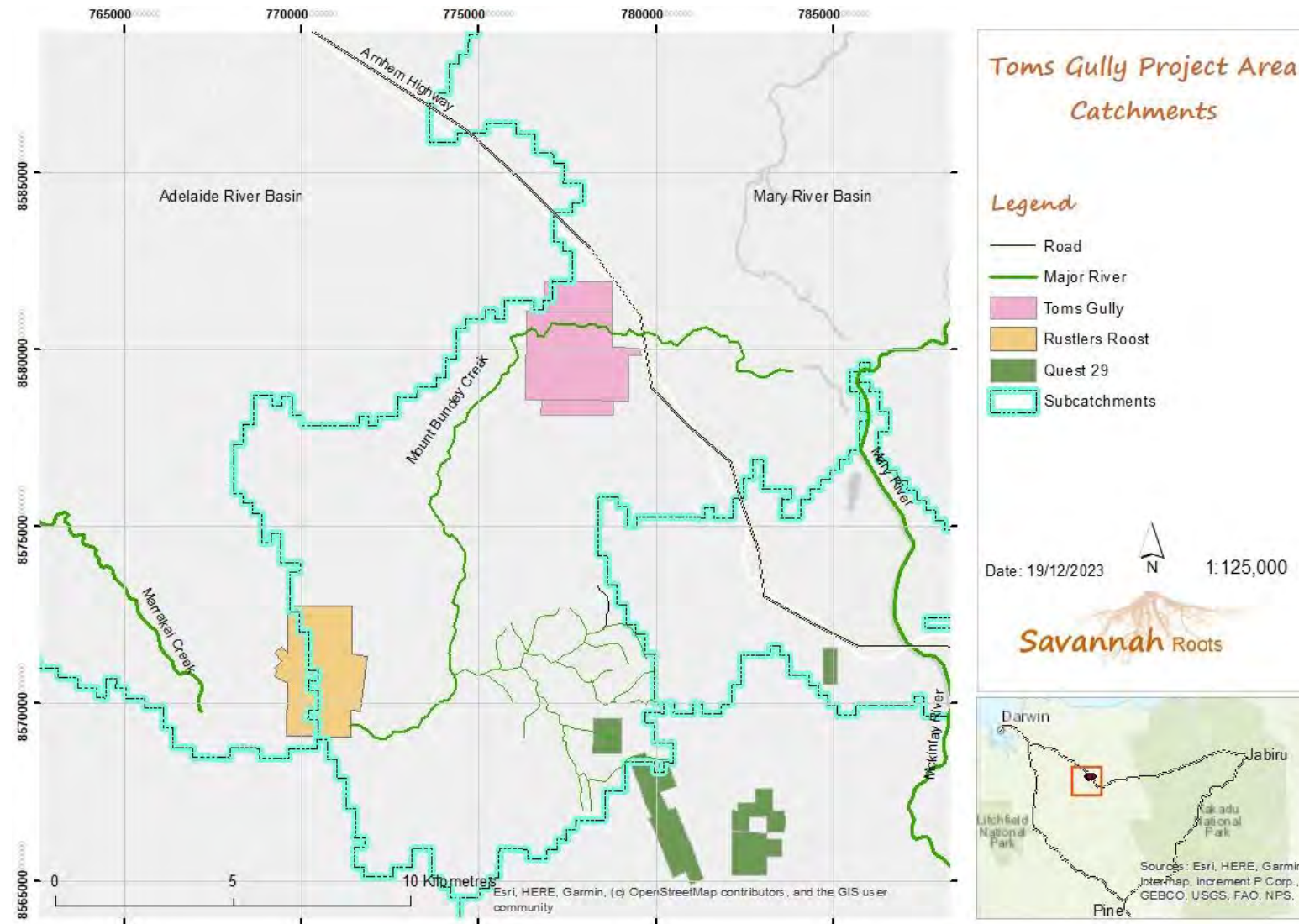


Figure 2-1 Toms Gully Project Area Sub Catchments

2.1.2 Sensitive Receptors

Site runoff and subsurface seepage from the TGPA reports to the Mary River Basin, along the Mount Bunday Creek. The Mary River has beneficial uses for its surface and ground waters. The sub catchment of the Mary River Basin drains through various drains and ephemeral creeks and ultimately enters Mary River system. TGPA is one of many mines situated in Mary River Basin along with quarries, pastoral properties and horticultural activities and recreational areas. Mary River National Park is also situated in its catchment area downstream of TGPA.

The Mary River system includes the Mary River, all its tributaries, lagoons, lakes, swamps, and marshes situated in the catchment of that waterway (Department of Infrastructure, Planning and Environment [DIPE], 2002). The surface waters of the Mary River catchment are declared beneficial use (BUD) for its environmental, riparian, and cultural values. The ground water of the same catchment has environmental, riparian, and agricultural values (DIPE, 2002).

As well as the BUDs, there are several identified conservation areas or national parks in the region or downstream of the site (Figure 2-2), these include:

- Mary River Floodplain System Directory of Important Wetlands (NR Maps, 2023);
- Mar River Coastal Floodplain Sites of Conservations Significance (SoCS 13) located ~2 km east (Department of Natural Resources, Environment, The Arts and Sport [DNRETAS], 2009; Figure 2-2);
- Mary River National Park located 4 km to the east via Mount Bunday Creek (NR Maps, 2023; Figure 2-2); and
- Djukdinj National Park located 15 km to the north (NR Maps, 2023);

Monitoring Method

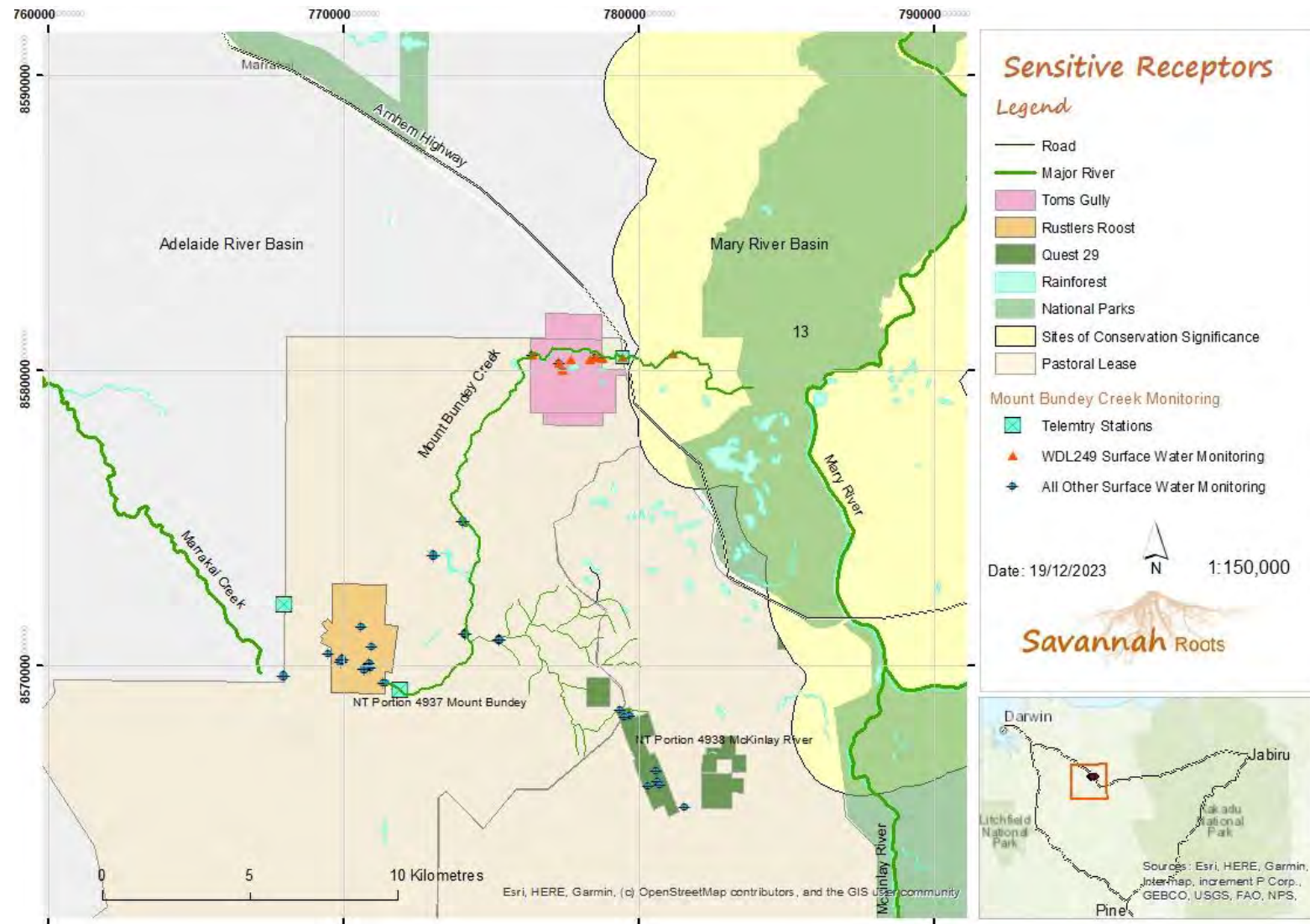


Figure 2-2 Toms Gully Project Area Sensitive Receptors

2.1.3 Rainfall

Three rain gauges have been installed across the Adelaide River and Mary River catchment areas (Figure 2-1). One is located in a cleared area on top of the Toms Gully main WRD and the others are located at Quest 29 and Rustlers Roost. With regards to distance, Toms Gullys rain gauge is located 10.2 km from Quest 29 rain gauge and 11.5 km from Rustlers Roost rain gauge. Rain gauges are monitored as often as weekly over the 2022/ 23 wet season. Rain gauges were installed in October which captured first rainfall events in October to November.

The rain gauges will assist to fill knowledge gaps and provide accurate detail in rainfall input in upper or lower catchments of each river system, more so the Mount Bunday Creek. A comparison of monthly regional rainfall has been provided in Figure 2-3.

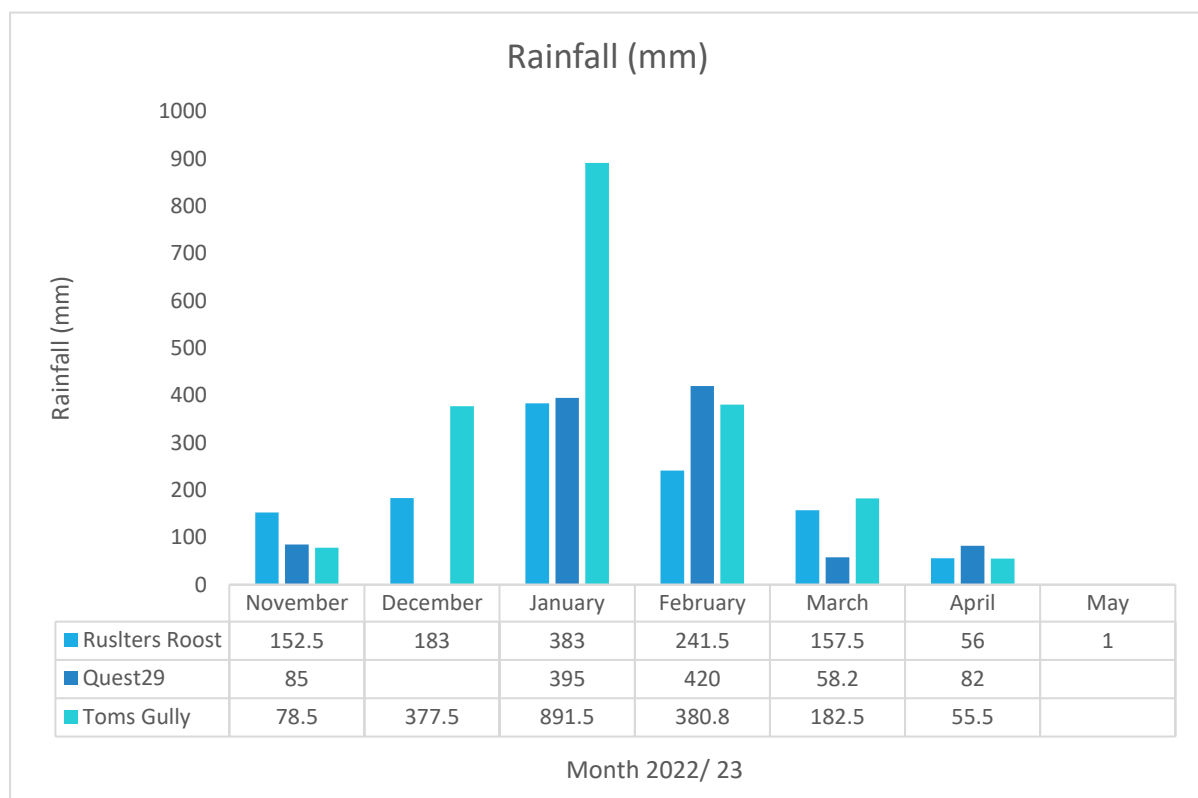


Figure 2-3 Rustlers Roost, Quest 29, Toms Gully Rainfall (mm) for 2022- 23 Wet Season

TGPA total rainfall for the entire 2022- 23 wet season was 1926.3 mm whilst Q29PA recorded 1161.2 mm and Rustlers Roost recorded 1174.5 mm. Quest 29 and Rustlers Roost showed similar total rainfall whilst Toms Gully received greater falls for the 2022/ 23 period.

Toms Gully recorded high rainfall low in the catchment in December and January. The highest monthly record for the region was at Toms Gully, recording 891.5 mm during the month of January, this coincides with creek flow and the first sampling round. April total rainfall contributed to receding creek flows, recording the lowest for the region of 55.5 mm.

2.2 Sampling and Analysis Method

All field sampling was performed as per PGO's water quality monitoring procedure (Appendix C).

An Aquaread AP-2000 Handheld meter was used at all sites to measure insitu field measurements. Measurements include pH, electrical conductivity, dissolved oxygen, temperature and turbidity with all data recorded into an electronic Field sheet using a tablet. This is then transferred into an Excel spreadsheet database. Calibrations using a Quick Cal Solution was performed weekly prior to field activities. Records of calibration have not been kept though field staff have created a template which will be filled in going forward.

No data was collected at ADP1 as there was no active discharge during the reporting period.

Compliance site SWTG2 telemetry station was installed in late November 2022 with real time solar powered data loggers and satellite. Further information is provided in Section 1.5.2.1. Information provided by the logger is invaluable during controlled/no controlled site discharge events to gain a clearer understanding of creek flows and water quality fluctuations particularly when site access was limited.

Water levels at Toms Gully pit were measured weekly during wet season and monthly during dry season using a laser level and measured against surveyed Relative Levels markers.

During each site monitoring event, a record of general observations was maintained in the field handbook and included, fauna siting's, tracks, invasive species presence (i.e. weeds, feral animals), fish, bird life, recent fires, other observed disturbances including anthropological activities (vehicles tracks, rubbish):

All metals/metalloids, general chemistry and nutrients were field sampled as per the routine sampling method in pre labelled and acidified bottles provided by the analytical laboratory (Envirolab NATA accredited for the related analysis). Samples were stored in eskies and kept cool using ice or ice bricks. At the end of each day samples were either moved to a fridge/freezer for overnight holding if field sampling finished after 3pm or delivered to the Darwin Envirolab before 3 pm, repacked with new ice bricks and sent by air to Perth Envirolab laboratory for analysis. To ensure samples were delivered to the lab within the respective holding times and temperature, sampling was performed Monday to Wednesday each week and dispatched same day or next day at the latest.

2.3 Monitoring Locations

PGO has conducted surface water quality monitoring at TGPA since 2013. A water quality database is maintained to store and analyse annual and long-term trends. Monitoring at the site is conducted as per WDL Licence conditions and the Monitoring Program in the TGPA Mine Management Plan (MMP). Sampling Sites as listed in Appendix 2 of the Licence is provided in Table 2-1. This table provides detail of site name, location (Universal Transverse Mercator [UTM]), description of the site, analytes and frequency.

All WDL249 surface water sampling locations have been identified in Figure 1-2 which include seven sampling locations, ADP and one Compliance Point.

Monitoring parameters and analytes have been listed in Table 2-2. Monitoring frequency has been further detailed in Table 2-3.

Appendix E shows images captured of the surface water monitoring sites that were sampled during the reporting period.

Table 2-1 Monitoring Program as per Appendix 2 of the Licence

Catchment	Monitoring Sites	Lat°	Long°	Sampling Site Description	Analyte Type					
		GDA94			0	1	2	3	4	5
Mount Bunday Creek	ADP1	-12.8292	131.5639	Authorised Discharge Point 1 located to the north east of the TGM PIT and at the entrance to Oxbow Wetlands	C	-	M	M	M	M
	SWTG2	-12.8287	131.5742	Compliance Point located on the Mount Bunday Creek, 0.8 km east of the ADP1	W	C	C	W	W	W
	SWTG1A	-12.8279	131.5464	Upstream of the Toms Gully Project Area and downstream of Quest 29 and Rustlers Roost Project Areas. Control site located near tenement boundary for Toms Gully.	-	-	M	M	M	M
	SWTG3A	-12.8253	131.5903	Located ~2.5km downstream of the Toms Gully Project Area on the Mount Bunday Creek. This is the last monitoring point.	-	-	M	M	M	M
	SWTG12	-12.8283	131.5661	Located at an existing constructed weir at the end of the Oxbow Wetlands. Water from the wetlands reports to Mound Bunday Creek, upstream of MBC01A	-	-	W	W	W	W
	MBC01A	-12.8285	131.5683	Located downstream of the Toms Gully Project Area and directly downstream of the Oxbow wetlands.	-	-	W	W	W	W
	TGM PIT	-12.8306	131.5621	Main Pit located on tenement MLN1058. Mine water from the Pit is treated through an RO Plant and discharged through ADP1.	-	M	M	M	M	M
	EP1	-12.8326	131.5558	Evaporation Pond 1 is located on tenement MLN 1058 and to the west of TGM PIT. It is located upstream of MBC01A	-	Q	Q	Q	Q	Q
	EP2	-12.8303	131.5546	Evaporation Pond 1 is located on tenement MLN 1058 and to the west of TGM PIT. It is located upstream of MBC01A	-	Q	Q	Q	Q	Q

Table 2-2 Monitoring Parameters

Type	Analysis	Analysis	Parameter
0	Discharge Monitoring	Flow	Flow kilolitres per day
1	Water Level	SWL	Metres, RL for TGM PIT
2	In field parameters	Field	pH, Electro Conductivity (EC), Dissolved Oxygen (DO), Temperature, Turbidity
3	Total and dissolved metals	Total and dissolved	Aluminum (Al), Antimony (Sb), Arsenic (As), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg)), Nickel (Ni), Silver (Ag), Zinc (Zn).
4	Dissolved major cations and anions	Dissolved	Calcium (Ca), Manganese (Mg), Potassium (K), Sodium (Na), Sulphate (SO_4^{2-}), Chloride (Cl^-)
5	Inorganics	Total and dissolved	Carbonate (CO_3), Bicarbonate (HCO_3), Total Suspended Solids (TSS), Total Dissolved Solids (TDS).

Table 2-3 Monitoring Frequency Descriptions

Key	Frequency	Description
C	Continuous	Continuous during discharge events
W	Weekly	Weekly monitoring
M	Monthly	Monthly monitoring
		Weekly during discharge and at least once per discharge event
		During Discharge event

2.4 Variability of Results

Factors that may affect variability in results are based on site activities and the location of the ML, within a pastoral lease. The following table identifies potential activities that could have influenced the water quality within the TGPA for the 2022- 23 period (Table 2-4).

Table 2-4 Factors That May Affect Variability in Monitoring Results

Site Activities	Activities Affecting Monitoring Results
Care and Maintenance activities	Use of tracks and creek crossings eroding land surface and sedimentation to creeks
Track and creek crossing upgrades	Improvements to tracks and creek crossing access for pastoral and PG eroding land surface and sedimentation of creeks
Pastoral activities	Day to day activities, stock movements over land and through creek lines. Pastoral activities upstream of Mount Budney Creek including clearing and construction of new fence lines and boundaries was done in mid-2022. These upstream activities have the potential to affect water quality (particularly total suspended values) to the WDL249 downstream surface water monitoring. DEPWS officers conducted a site visit in June 2023. Trends in water quality has been provided in Section 4.2.
Invasive species	Feral animals ie pigs, buffalo wallowing near at sample sites

3 QA/QC Evaluation

3.1 Completeness

While there was no discharge of treated water during the monitoring period, surface water sampling at monitoring sites were undertaken during the 2022/ 23 wet season period. Monitoring performance was assessed for completeness as per Appendix 2 of the Licence and tabulated in Appendix A. The table identifies each monitoring event at all monitoring sites during creek flow, 17 January 2023 to 28 March 2023. It identifies in colour whether sampling events, frequency or analytes were complete. It also provides field notes on whether there were limitations during sampling and whether discharge was occurring at the time.

Performance is assessed when there is an opportunity to sample, such as creek flow. In summary, all monitoring occasions were partially met. Restrictions meeting the monitoring frequency include:

- Flooding events of the Mount Bunday Creek and tracks at SWTG1A
- Unauthorised access to SWTG3A without permission from pastoral manager
- Croc threat, flooding and other feral animals that hide in low lying and weed infested areas at MBC01A.

As this is the first year of meeting conditions of the Licence and accessing these sites in the wet season, PGO plan to improve and obtain approval for access to sites that were restricted during the 2022- 23 wet season. This is discussed further in Section 5.4.

These issues were brought to the attention of DEWS Officers during a site visit in September 2023 in which these were addressed and resolved.

3.2 Quality Control

Sampling method was consistent for all water sampling events in accordance with the sampling method detailed in Section 2.2. Qualified and experienced environmental consultants undertook the field monitoring since the commencement of the Licence.

All metals/metalloids, general chemistry and nutrients were field sampled as per the routine sampling method in pre labelled and acidified bottles provided by the analytical laboratory (Envirolab NATA accredited for the related analysis).

Calibration of field equipment was undertaken as per the manufacturer's recommendations for telemetry and data loggers. Field handheld equipment was calibrated prior to each weekly sampling event for pH and EC using buffer and quick Cal solutions. Dissolved Oxygen was also undertaken frequently. A record will be maintained for the upcoming 2023/ 24 reporting period.

4 Monitoring Results 2022- 23

4.1 Presentation and Discussion

Water quality results for the WDL249 monitoring sites have been included in the following tables. Water quality data has been divided into two sections - field physical parameters and general chemistry (Table 4-1) and dissolved metals (Table 4-2). All raw water quality data has been presented in Appendix A.

Each table includes:

- Current results;
- Unit of measure;
- WDL249 Discharge Trigger Value (TV) for the Compliance Point;
- Median results for the Compliance Point; and
- Short and long term medians for all other monitoring sites.

As per Item 7 of the Licence, Discharge TVs have been used for each monitoring event at the Compliance Point, although no discharge occurred for the 2022- 23 period. Each monitoring event (Appendix A) was assessed against Discharge TV, in which values outside of Discharge TV have been highlighted.

All other data has been included for comparison purposes and to report water quality at each of the Sample Locations listed in the Licence. For all other monitoring sites, short term (2022- 23) and long term (2016- 23) median values were used, instead of averages, to assess water quality trends across TGPA. Using medians was chosen to avoid data outliers which would otherwise skew average values. Median values were calculated using three or more data points. If insufficient data points were available, the median cell was left blank (-). Median values with parameters below Laboratory Limits of Reporting (LoR) have been represented as 'N/A'. Minimum and Maximums were also included for the reporting period (2016- 23) to identify anomalies.

Some sites have been monitored as part of the TGPA MMP ultimately accumulating long term data, with seven years of water quality data collected. New sites introduced with the Licence have been monitored since the commencement of the Licence in 2022 or less in which only three to six monitoring events may have been captured.

It should be noted some sites that maintain long term data have no record of dissolved oxygen, antimony, mercury and silver, it is only recently that these parameters have been monitored. Furthermore, long term trends for turbidity have been obtained from the laboratory whilst short term trends have been undertaken in the field.

4.1.1 Field Physical Parameters and Major Chemistry

Field parameter and major chemistry results from 2022-23 monitoring period are shown in Table 4-1.

Table 4-1 Surface Water Field Parameters and Major Chemistry Results

Site	Date/ Range	DO	EC	pH	Turbidity	TDS	TSS	SO ₄ ²⁻
		%	µS/cm	Units	NTU	mg/L	mg/L	mg/L
RR WDL249 Discharge TV		85-120	250	5.8-8.0	87	-	54	295
WDL249 Compliance Site SWTG2								
Median (2022- 23)		87.6	59.1	5.46	22.4	33	14	9.1
Long term median (2016- 23)		-	49.5	6.02	25	-	20	6
All Other Sampling Locations								
SWTG1A	Med (2022- 23)	-	-	-	-	-	-	-
SWTG1A	Long term median (2016- 23)	-	36	6.75	63	-	47.5	1.3
TGM PIT	Med (2022- 23)	74	2093	3.22	0.79	1950	N/A	1400
TGM PIT	Long term median (2016- 23)	74	2100	3.3	0.5	1900	17	1300
EP1	Med (2022- 23)	-	-	-	-	-	-	-
EP1	Long term median (2016- 23)	-	5200	3.4	1.15	-	10	5600
EP2	Med (2022- 23)	-	-	-	-	-	-	-
EP2	Long term median (2016- 23)	-	3870	3.2	1.2	-	14	6100
SWTG12	Med (2022- 23)	62.5	544.8	3.76	0.88	430	N/A	265
SWTG12	Long term median (2016- 23)	-	338.1	4.08	0.85	385	N/A	160
MBC01A	Med (2023)	-	-	-	-	35	14	12
SWTG3	Med (2022-23)	97.2	55	7.3	52.3	88	220	22
SWTG3	Long term median (2016-20)	64	-	6.5	42	-	58	15

There were no triggers of water quality for field parameters or general chemistry at SWTG2 (Table 4-1) as specified in Item 7 and Item 10 of the WDL 249 during the reporting period. Whilst there were some field parameters and general chemistry that were elevated above the Discharge TV, the elevations were not related to discharge activities, and instead to background fluctuations in Mount Bunday Creek. Results for the reporting period show:

- DO and pH were outside of the Discharge TV range at Compliance Point SWTG2 on several consecutive monitoring occasions (Appendix A).
- DO recorded concentrations both lower and greater than the Discharge TVs on six of the ten monitoring occasions (Appendix A).
- The lowest recording of DO during the reporting period was 60.6 % on 6 February 2023 (Appendix A)
- The highest recording of DO during the reporting period was two weeks prior of 191.9 % on 24 January 2023 (Appendix A).
- pH levels were lower than the Discharge TV on eight of the ten monitoring occasions (Appendix A).
- The lowest pH level recorded during the reporting period was 5.32 pH on 14 February 2023 (Appendix A).
- All other parameters and general chemistry remained within Discharge TV
- Other monitoring sites with long term data for DO, TGM PIT and SWTG12, recorded median concentrations of 74 % and 62.5 % respectively.
- Other monitoring sites that recorded the lowest long term median of pH included TGM PIT, EP1 and EP2 recording less than 3.4 pH.

4.1.2 Dissolved Metals

Dissolved metal results from 2022-23 monitoring period are shown in Table 4-2.

Table 4-2 Surface Water Dissolved Metals Results

Site	Date	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
		µg/L													
RR WDL249 Discharge TV		295	9	13	0.2	1	1.4	1.4	2700	3.4	1900	0.6	11	0.05	8
WDL249 Compliance Site SWTG2															
Median (2022- 23)		40	N/A	N/A	0.26	N/A	2.6	2.5	160	N/A	110	N/A	4.7	N/A	22
Long term median (2016- 23)		53	-	2	0.27	N/A	2.6	3	195	N/A	65	-	4	-	19
All Other Sampling Sites															
SWTG1A	Med (2022- 23)	55	N/A	N/A	N/A	N/A	N/A	N/A	230	N/A	14	N/A	1.3	N/A	7.9
SWTG1A	Long term median (2016- 23)	134	-	1	0.07	0.2	0.09	1.38	280	0.22	13.5	-	0.86	-	7.95
TGM PIT	Med (2022- 23)	24000	N/A	6.7	51	2.05	305	290	1050	7.55	10000	N/A	1200	N/A	6250
TGM PIT	Long term median (2016- 23)	21500	-	5	50.5	1.4	275	215	1250	7	10500	-	1100	-	6300
EP1	Med (2022- 23)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP1	Long term median (2016- 23)	420000	-	18.5	460	41	2700	4100	5800	2	35000	-	13500	-	37000
EP2	Med (2022- 23)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP2	Long term median (2016- 23)	530000	-	17.5	468	76	2800	6500	8650	5	30000	-	16000	-	28000
SWTG12	Med (2022- 23)	4200	1.4	5.45	8	N/A	120	77	670	4.6	2850	N/A	295	N/A	1200
SWTG12	Long term median (2016- 23)	1650	-	4.3	4.25	N/A	68.5	39	320	2	1700	-	150	-	640
MBC01A	Med (2023)	71	N/A	N/A	1.3	N/A	15	4.7	240	N/A	610	N/A	43	N/A	170
SWTG3	Med (2022-23)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG3	Long term median (2016-20)	40	-	N/A	0.1	N/A	N/A	3.3	208	N/A	28	-	2.5	-	31

There were no triggers of water quality for dissolved metals at SWTG2 (Table 4 1) as specified in Item 7 and Item 10 of the WDL 249 during the reporting period. Whilst there were some field parameters and general chemistry that were elevated above the Discharge TV, the elevations were not related to discharge activities, and instead to background fluctuations in Mount Bunday Creek. Results for the reporting period show:

- Cd, Co, Cu, Ni and Zn were above the Discharge TV at Compliance Point SWTG2 on several consecutive monitoring occasions (Appendix A)
- Cd recorded concentrations above the Discharge TV (0.2 µg/L) on 50 % of the monitoring occasions, with the highest recording of 1.4 µg/L on 13 March 2023 (Appendix A).
- Co recorded concentrations above the Discharge TV (1.4 µg/L) on seven of the ten monitoring occasions, with the highest recording of 14 µg/L on 28 March 2023 (Appendix A).
- Co recorded elevated levels consecutively since 14 February 2023 to 28 March 2023 (Appendix A).
- Cu recorded concentrations above the Discharge TV (1.4 µg/L) on all monitoring occasions, with the highest recording of 5.1 µg/L on 13 March 2023 (Appendix A).
- Ni recorded concentrations above the Discharge TV (11 µg/L) on three consecutive monitoring occasions, with the highest recording of 40 µg/L on 28 March 2023 (Appendix A).
- Zn recorded concentrations above the Discharge TV (8 µg/L) on all monitoring occasions, with the highest recording of 170 µg/L on 13 March 2023 (Appendix A).
- Short term median trends for analytes above the Discharge TV at SWTG2 remained within or close to long term median trends.
- Cd, Co, and Cu short term medians remained slightly below long term median trends at SWTG2. Whilst short term trends for Ni and Zn were slightly above long term medians (Table 4-2).
- All other monitoring sites with the exception of SWTG1A, recorded elevated short or long term median values for the same analytes, Cd, Co, Cu, Ni and Zn.
- The highest concentration and long term trend for dissolved metals within the mineral lease are found at EP1 and EP2
- MBC01A recorded higher median trends for the 2023 period for all dissolved metals than downstream site SWTG2.

4.2 Spatial and Temporal Trends and Analysis

Several analytes were recorded elevated at SWTG2 throughout the 2022- 23 reporting period however there were no reportable elevations as there was no controlled discharge from ADP1. Analytes in elevation of Discharge TVs have been included in the following graphs (Figure 4-1- Figure 4-6) to indicate trends at the Compliance Points where available, trends spatially throughout the Mount Bundey Creek or whether trends relate to temporal variations. Analytes found in elevation to SWTG2 Discharge TV include pH, dissolved oxygen, cadmium, cobalt, copper, nickel and zinc.

For analytical purposes, levels below Laboratory LoR were changed to numerical values. For instance, where analytes are <1, then the numerical value is 0.5.

MBC01A has been monitored in 2022- 23 wet season and does not have long term data.

4.2.1 Field Parameters

TGSW2 has been monitored since November 2016 with over 44 field monitoring occasions captured, though most of these only include electrical conductivity and pH. Dissolved oxygen and temperature were not included into the monitoring schedule until 2022.

Field parameters captured have been included in the following graphs. It shows temporal and spatial trends at all creek sites. It should be noted however, only the Compliance Point SWTG2 has been compared to TV which apply to the site (Figure 4-1; Figure 4-3; Figure 4-5). All other creek sites have been included in separate graphs (Figure 4-2; Figure 4-4; Figure 4-6).

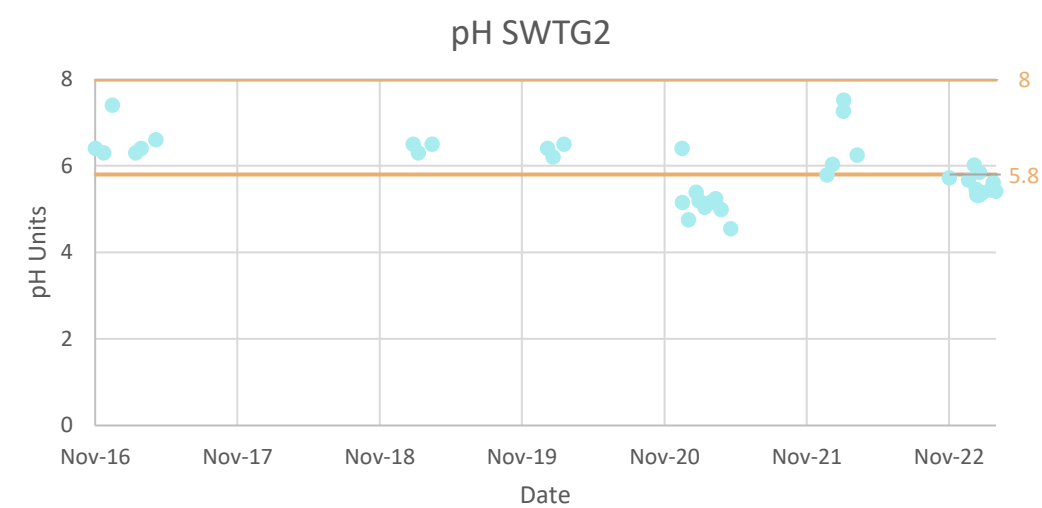


Figure 4-1 Trend Analysis for pH at Compliance Point SWTG2

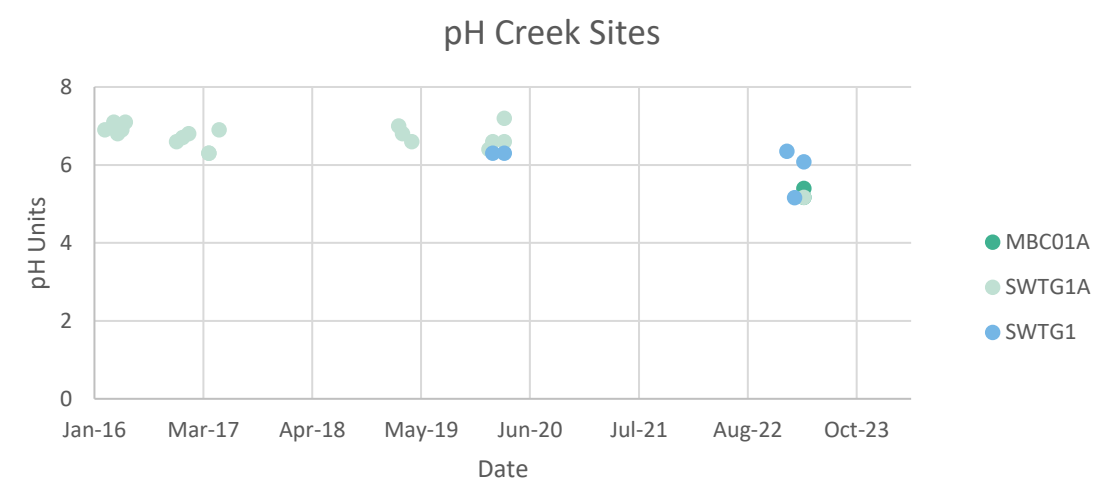


Figure 4-2 Trend Analysis for pH at Upstream Creek Sites

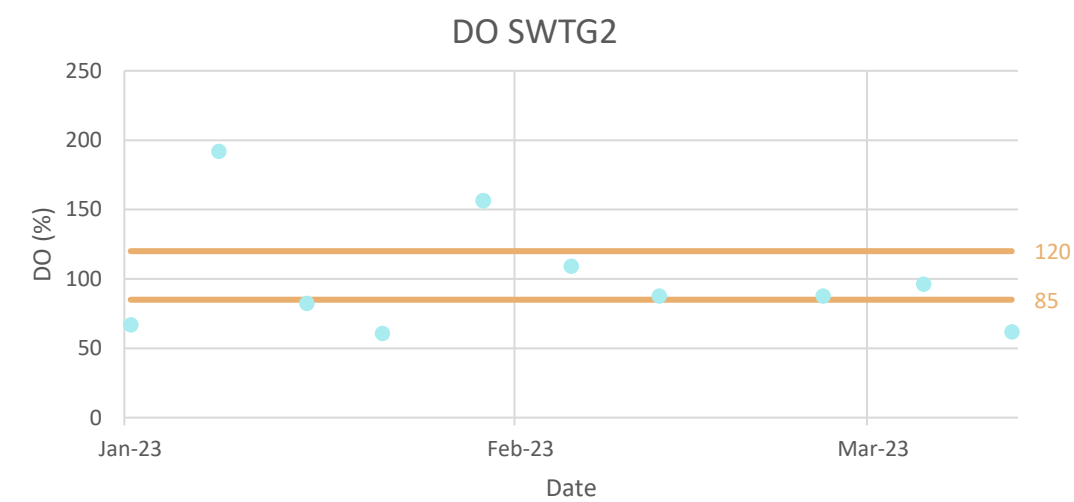


Figure 4-3 Trend Analysis for DO at Compliance Point SWTG2

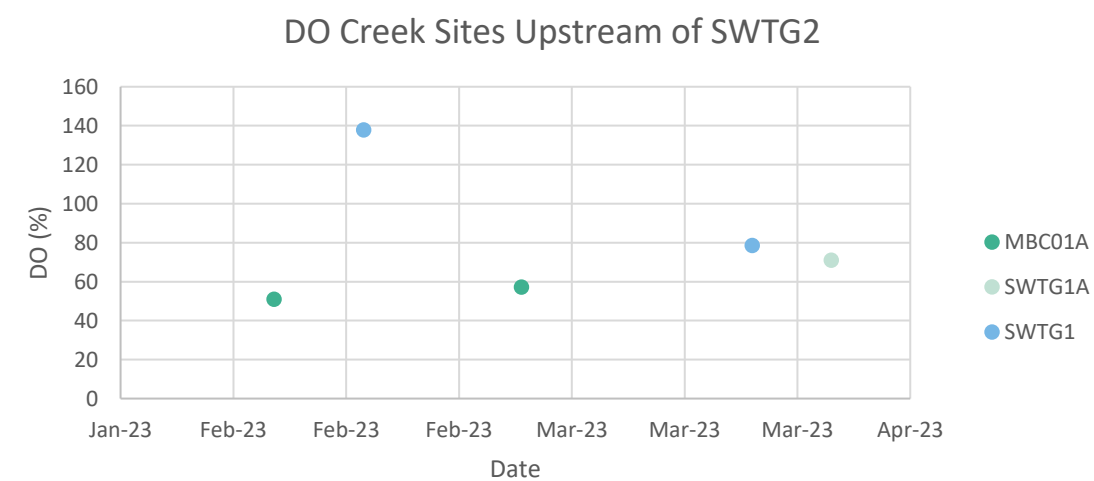


Figure 4-4 Trend Analysis for DO at Upstream Creek Sites

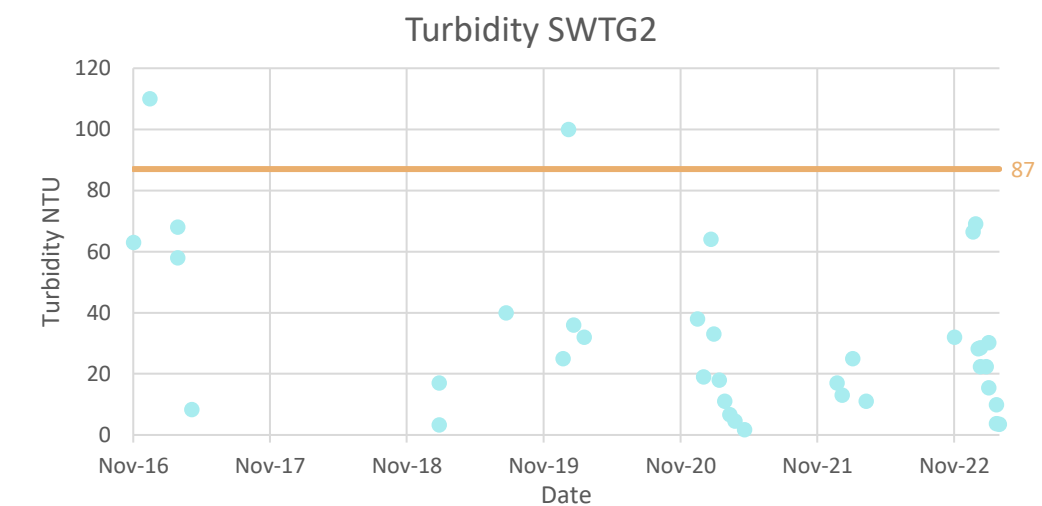


Figure 4-5 Trend Analysis for Turbidity at Compliance Point SWTG2

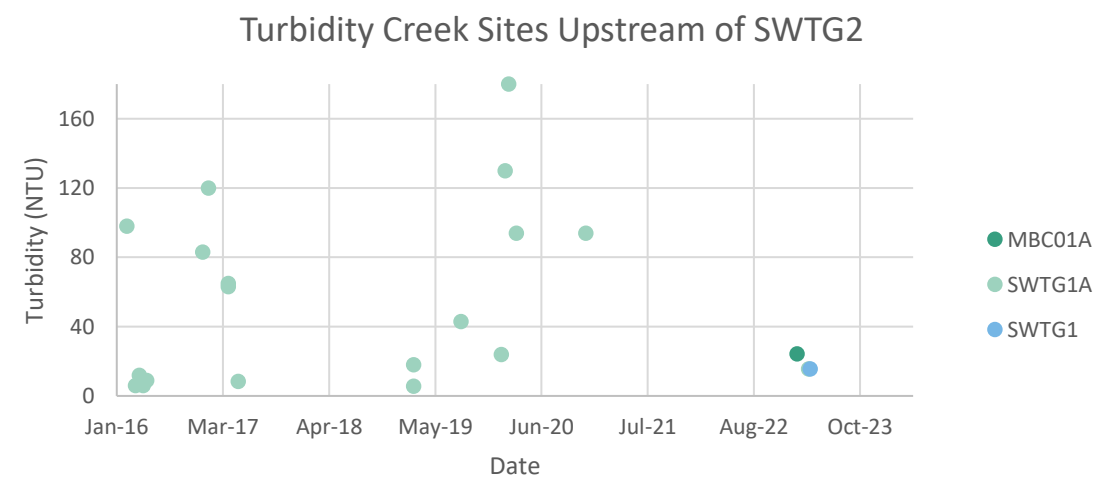


Figure 4-6 Trend Analysis for Turbidity at Upstream Creek Sites

Figure 4-1 to Figure 4-6 show field parameters at compliance point SWTG2 and all other Mount Bunday Creek Sites. SWTG1 is not part of the WDL monitoring schedule, however has been included for comparison of data. SWTG2 shows long term trends in low levels of pH, ranging from 4 pH- 7 pH for most monitoring events (Figure 4-1). The cluster of monitoring undertaken in 2023 shows consistency throughout the reporting period and shows levels are consistent with long term trends. Upstream site SWTG1 shows lower pH than other upstream creek sites (Figure 4-2).

Dissolved oxygen was included into the monitoring program in 2023, with only 10 monitoring events captured at SWTG2. Dissolved oxygen fluctuated through out the reporting period with only four monitoring events remaining within the TV range (Figure 4-3). This coincides with the upstream sites which were also varied in the five monitoring events captured (Figure 4-4). For the 2023 period, dissolved oxygen ranged from 138 % at SWTG1 to 51 % at MBC01A.

Whilst there was no turbidity in elevation since the commencement of the Licence, the graphs display variation within the Mount Bunday Creek System. The graphs show lower levels of turbidity at SWTG2 than at some upstream sites, in particular SWTG1A (Figure 4-5; Figure 4-6). The highest levels recorded at the upstream site was 180 NTU in February 2020.

4.2.2 Dissolved Metals

TGSW2 has been monitored since 2016 with over 44 sampling occasions captured. Dissolved metals including antimony, mercury and silver have short term data only as these analytes did not previously form the Toms Gully MMP monitoring suite. All other dissolved metals have been included in previous monitoring events.

Data captured at SWTG2 during March 2016 to November 2016 is distinctively different from the rest of the database. With the extent of data captured at this site, there is an evident range of concentrations that are not representative of the site. It is unknown where this data originated, though it has been excluded from all analysis at SWTG2 though it remains and highlighted in the database.

The following graphs show each monitoring event at Compliance Point SWTG2 and all upstream sites within the Mount Bunday Creek system. The graphs show temporal and spatial trends at all creek sites. Only SWTG2 has been compared to TV which apply to the site.

Figure 4-8 to Figure 4-15 show dissolved metals that were in elevation at SWTG2 against the TV. Figure 4-7 shows spatial analysis of water quality along the Mount Bunday Creek, with all upstream creek sites included.

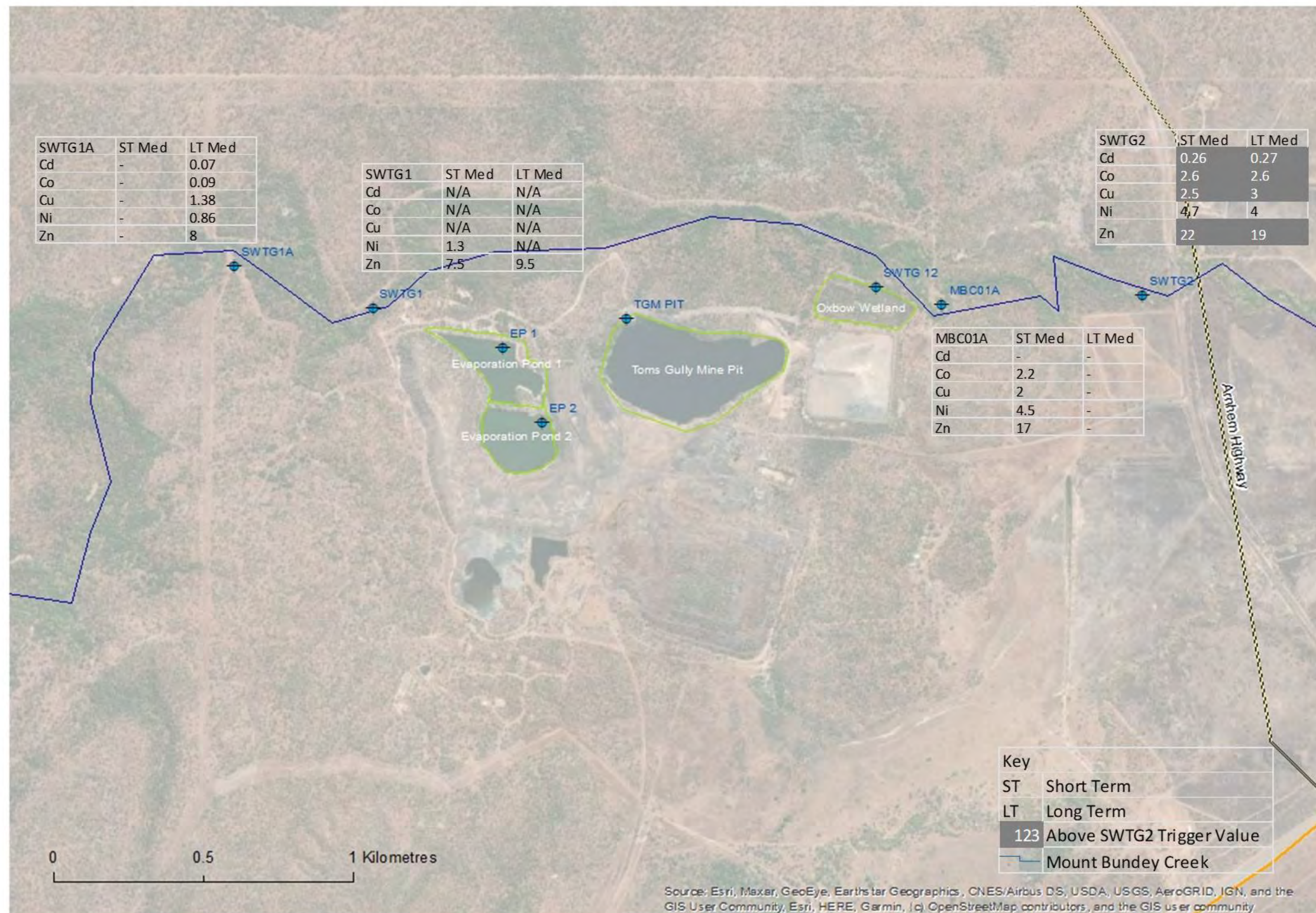


Figure 4-7 Spatial Trend Analysis for Dissolved Metals Medians

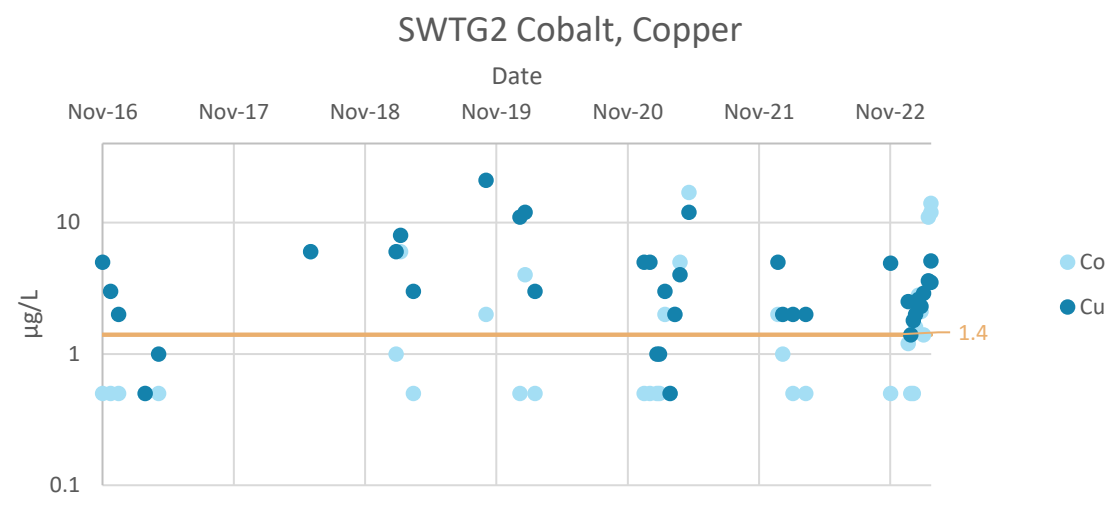


Figure 4-8 Trend Analysis for Dissolved Co and Cu at Compliance Point SWTG2

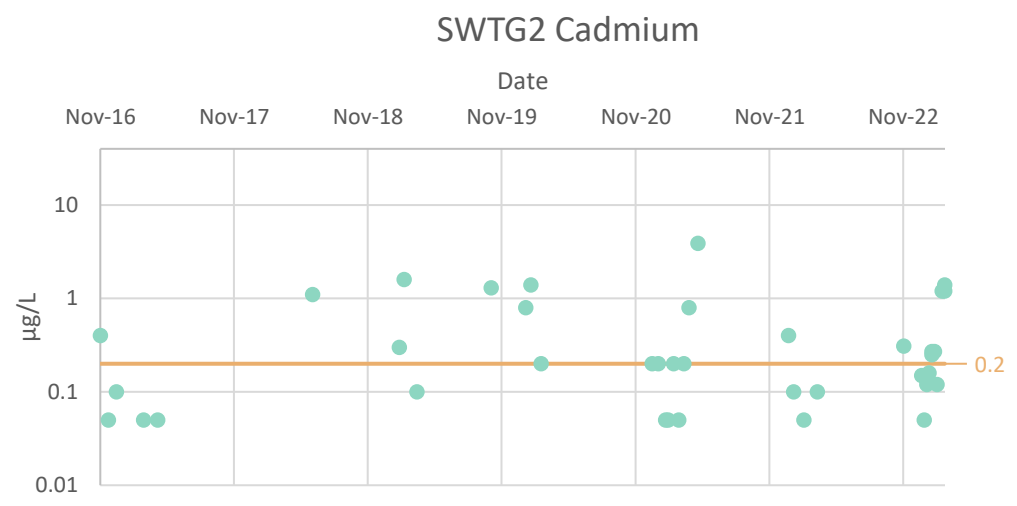


Figure 4-9 Trend Analysis for Dissolved Cd at Compliance Point SWTG2

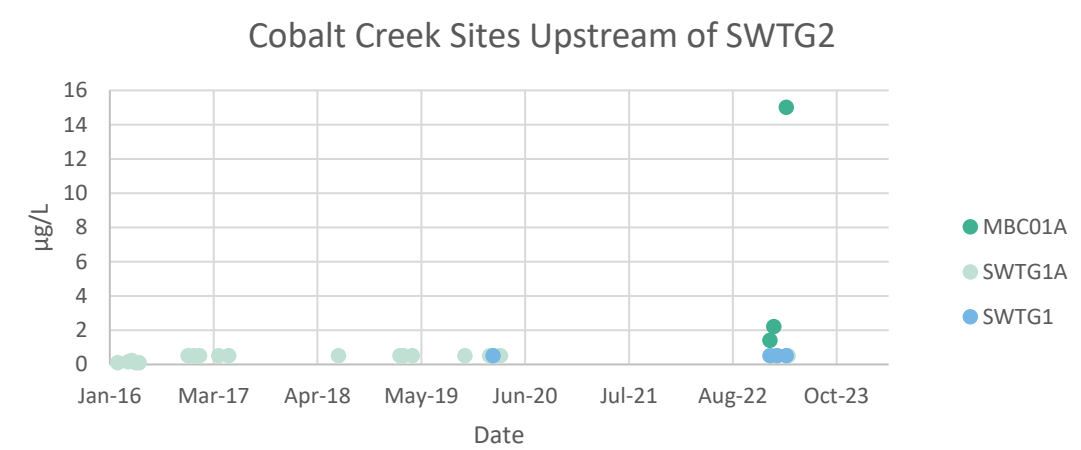


Figure 4-10 Trend Analysis for Dissolved Co at Creek Sites

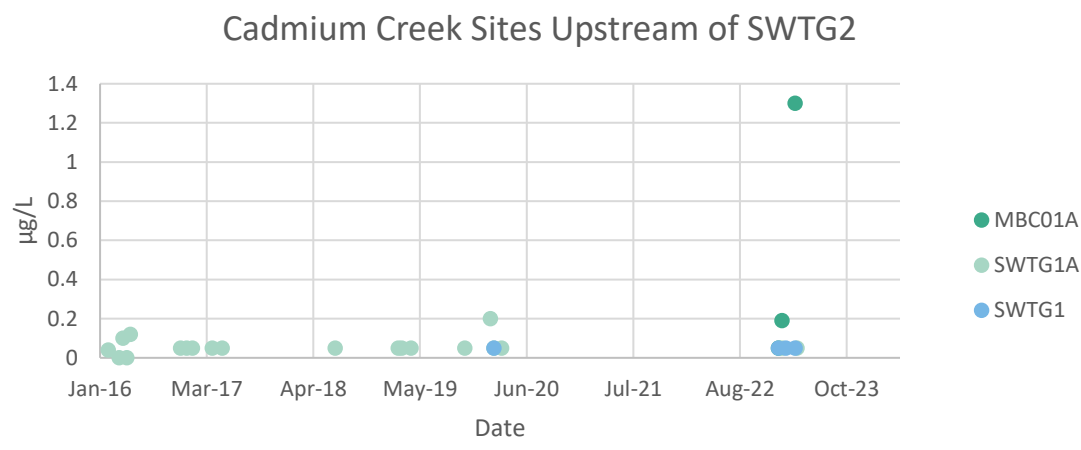


Figure 4-11 Trend Analysis for Dissolved Cd at Creek Sites

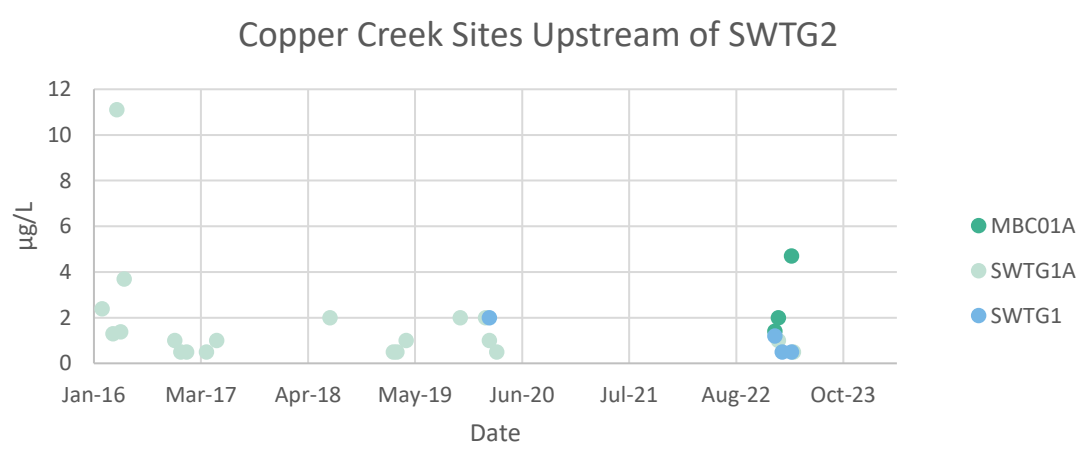


Figure 4-12 Trend Analysis Dissolved Cu at Creek Sites

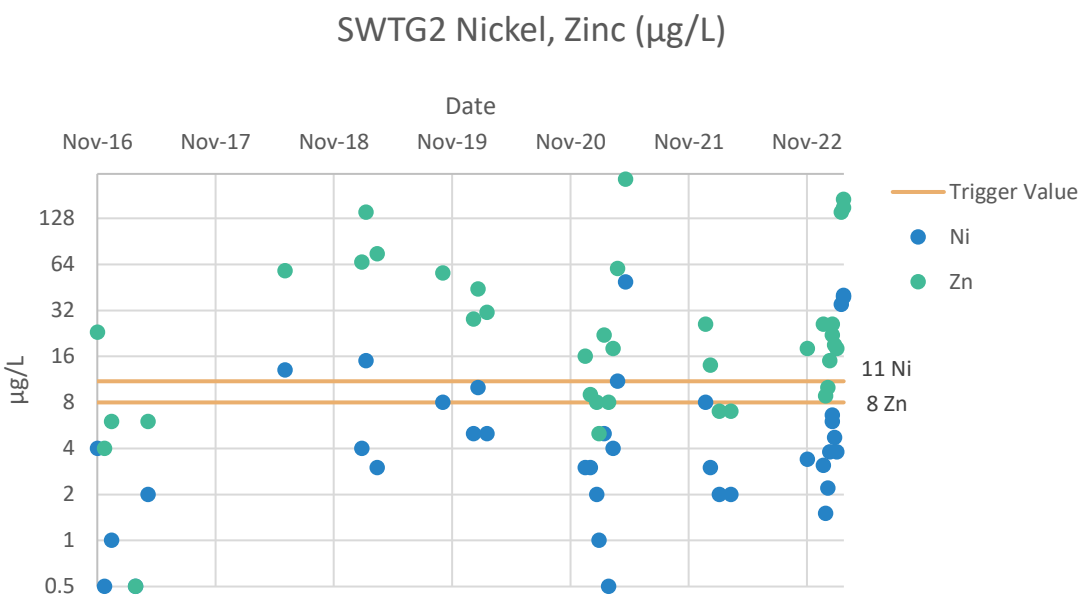


Figure 4-13 Trend Analysis for Dissolved Ni and Zn at Compliance Point SWTG2

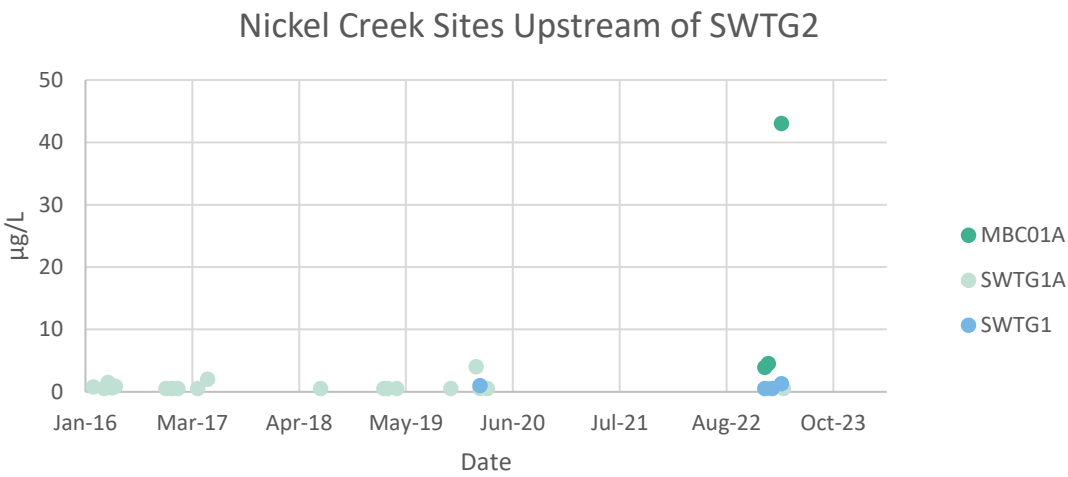


Figure 4-14 Trend Analysis for Dissolved Ni at Upstream Creek Sites

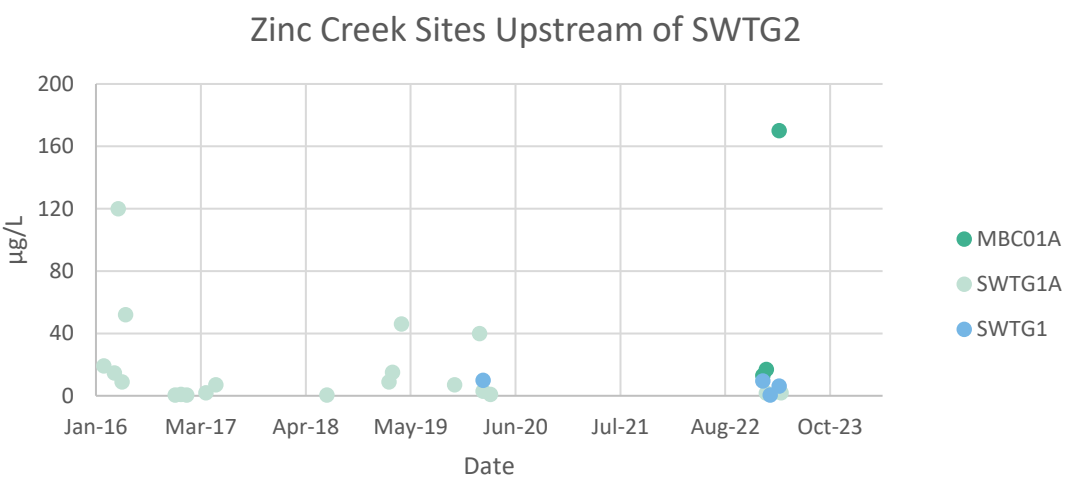


Figure 4-15 Trend Analysis for Dissolved Zn at Upstream Creek Sites

Figure 4-7 shows the spatial range along the Mount Bundey Creek system of dissolved metals that were found elevated at SWTG2. It shows two upstream sites of the TGPA and two downstream sites, including Compliance Point SWTG2. Short and long term values were used to show trends over time. Both SWTG1 recorded Cd, Co, Cu and Ni below laboratory LoR. At both upstream sites of the TGPA, zinc recorded long term trends of 8 µg/L and 9.5 µg/L.

Short term median values were greater at SWTG2 for most analytes than found at MBC01A. This may be from few data points collected at MBC01A during the 2022- 23 reporting period due to safe site access issues. Overall the figure shows that short term and long term trends of dissolved metals are in greater concentration at sites downstream of the TGPA, in particular SWTG2.

Figure 4-8 shows long term trends of copper above the Discharge TV of 1.4 µg/L with only four monitoring occasions where concentrations were recorded below this value. Dissolved copper is quite variable in its range since November 2016 although remaining above the Discharge TV on most monitoring events. On one monitoring occasion, MBC01A recorded dissolved copper concentration of 15 µg/L in March 2023 (Figure 4-10) though reduced to 3.6 µg/L by SWTG2 in the same monitoring event.

Similarly, cobalt at SWTG2 showed short term and long term variation in results with long term trends remaining below the TV of 1.4 µg/L then becoming elevated above on various occasions. Cobalt is in greater elevation at SWTG2 than at all upstream sites, including MBC01A.

Copper recorded above 2 µg/L at control site SWTG1A on several monitoring occasions since monitoring in 2016, reaching as great as 11.1 µg/L. Both upstream sites of the TGPA recorded cobalt below 0.5 µg/L on all monitoring occasions.

Cadmium at SWTG2 shows short term and long term trends variations in concentration above the Discharge TV of 0.2 µg/L. Since monitoring commenced in November 2016, cadmium has been recorded both below the laboratory LoR and above the Discharge TV on numerous monitoring occasions. The highest concentrations was recorded in May 2020 of 3.9 µg/L. which may be attributed to a reduced creek flow/ pooling sampling event and evapo-concentration. However, there are no field notes to confirm this other than the date it was sampled which is an indicator.

On one monitoring occasion, MBC01A recorded dissolved cadmium concentration of 1.3 µg/L in March 2023 (Figure 4-11) though reduced slightly to 1.2 µg/L by SWTG2 in the same monitoring event. Cadmium trends at SWTG1A and SWTG1 recorded below 0.2 µg/L on all monitoring occasions.

Figure 4-13 shows long term trends of nickel at SWTG2 to be below the Discharge TV on most occasions, with only several spikes in concentrations since 2017. Of all 44 monitoring occasions, 9 recorded above the Discharge TV with the highest recording in 2020 of 60 µg/L. At upstream site MBC01A, nickel was recorded at concentrations of 43 µg/L in March 2023 though reduced slightly to 40 µg/L at SWTG2 on the same monitoring event. SWTG1 and SWTG1A recorded nickel below 4 µg/L on all monitoring occasions.

Dissolved zinc has remained elevated above the Discharge TV at SWTG2 for most monitoring occasions since 2017. Long term trends in zinc show elevated levels consistently throughout each monitoring event, reaching highest concentrations in 2020 of 230 µg/L. Of all 45 monitoring occasions, six were below the Discharge TV at SWTG2. Zinc levels at upstream control site was also considerably elevated for long term trends. There were some spikes in concentrations of zinc at control site SWTG1 reaching 120 µg/L in 2016 and 46 µg/L in 2019.

4.3 Discussion of Exceedances

As there was no controlled discharge of treated water to Mount Budney Creek, this EMR includes the evaluation of measured values presented as background information only, comparing short and long terms trends to discharge trigger values currently held at SWTG2 for discharge water. No exceedances were reported for the reporting period.

4.4 Discussion of Anomalous

Anomalous have been detected in data results at several monitoring sites. Using long term trend graphs, some sites have highlighted anomalies rather than spikes in water quality. SWTG2 in particular shows anomalies in data during the March to November 2016 monitoring period. Results for each analyte, in particular the dissolved metal concentrations are skewed with the inclusion of these data points. As such they have been left out of analysis though included into the database and highlighted.

It was not till later in analysis that SWTG1A also shows the same data type for the same monitoring period. Unfortunately, this data has been included in analysis though it can be identified during long term trend analysis.

Furthermore, it has been identified that monitoring at some creek sites has been undertaken potentially during pooled events. SWTG2 was noted to be monitored in May, in which it would be expected pooling and evapo-transpiration to occur this late in the season.

A review of the database is required to remove such anomalies, in particular sites that have been monitored since the 2016 period.

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4.5 Discussion of Results and Conclusions

In conclusion, there were no triggers of water quality parameters at SWTG2 during the 2022- 23 reporting period as per Item 7 and Item 10 of the Licence. There were however elevated levels of some field parameters, and dissolved metals at SWTG2 outside of TVs, though no controlled discharge occurred during the reporting period.

The first monitoring event was captured at SWTG2 once creek flow had commenced on 17 January 2023. This coincides with high onsite rainfall in December 2022 and January 2023. During the reporting period there were 20 monitoring events captured which adds to the extensive 24 monitoring events since 2016 for the site. It has been highlighted throughout Section 4 that there were some analytes such as dissolved oxygen, temperature, antimony, mercury and silver that have short term data trends. Anomalies were also identified at SWTG2 and SWTG1A for monitoring undertaken in 2016, this has been discussed further in Section 4.4.

Whilst there was no discharge during the reporting period due to delays in construction of the RO Plant, there were however elevated analytes at SWTG2 outside the WDL249 Discharge TV range. Dissolved oxygen, pH, cadmium, cobalt, copper, nickel and zinc all recorded concentrations outside of the Discharge TV.

Surface water quality at SWTG2 Mount Budney Creek is suspected to be influenced by onsite surface water runoff and sub surface flows interacting with metalliferous mined domains and the existing poor quality water storage held at Toms Gully Mine. These elevated metals concentrations were also noted during the biological monitoring program, from a set of single events samples, suspecting that elevations are possibly related to point sources pollution from mine domains interacting with surface/groundwater and Mount Bundey Creek and that it could lead to impairment of aquatic ecosystems downstream of TGM.

Surface water quality trends at SWTG2 during the reporting period are generally similar to their long term trends with some analytes (cadmium, cobalt, copper, nickel and zinc) elevated above their respective Discharge TV, during the reporting period and consistent with long term trends (2016-2023) for these metal concentrations.

Zinc is a dissolved metal that seems to stay in concentration longest compared to other dissolved metals. Zinc is prominent and elevated above the Discharge TV for most monitoring occasions at SWTG2 with only six of the 44 monitoring events below this value. SWTG1A also recorded long term trends with spikes in zinc concentrations. It is suspected that this influence are originating from other sources and potentially adding to concentrations at downstream sites.

Whilst some dissolved metals concentrations were elevated, sediment results indicate some accumulation of metals particularly for arsenic. Metals in sediments are not considered to have the potential to be released in concentrations which could be ecotoxic, should waters remain circumneutral at the site. Further detail is discussed in Section 6.

Two upstream sites were included in analysis and interpretation, SWTG1 (not part of WDL249) and SWTG1A (control site). SWTG1 was included to compare against the WDL249 control site however has only four data points since 2020. Both of these sites recorded elevated zinc levels although upstream of the TGPA. It is suspected to be of background levels or influenced by other sources.

5 Conclusions and Proposed Actions

5.1 Compliance with Assessment Criteria

Compliance with WDL249 assessment criteria has been included in Table 5-1. Yellow coloured dots indicate the specified Condition of the Licence has been met. Yellow coloured dots mean the Condition was partially met and explanatory notes provided. Red coloured dots mean the Condition has not been met.

No wastewater discharge occurred at ADP1 into the Mount Bunday Creek throughout the 2022/23 wet season and therefore compliance completeness is against the surface waste monitoring sites events, sediment and macroinvertebrate sampling.

Notification by email to waste@nt.gov.au was provided on 20/02/2023 to notify that no controlled discharge has occurred as a result of RO plant construction delays. No acknowledgement from DEPWS was received. A further email was sent to waste@nt.gov.au on 18/06/2023 confirming that no waste water was discharged and a request as to whether an EMR is required. An email acknowledgment from DEPWS was received on the 19 June 2023.

Table 5-1 Compliance Against Assessment Criteria

WDL 249 Monitoring Conditions													
Mount Bunday Creek	Monitoring locations		C27	C28	C29 (29.1-29.2)	C30	C31	C32	C33	C34 (34.1- 34.3	C35 (35.1-35.6)	C36 (36.1)	C36 (36.2)
	SWG1A	Upstream	●	N/A	N/A	●	●	●	●	●	●	●	●
	MBC01A	Upstream (Downstream of Oxbow Wetlands)	●	N/A	N/A	●	●	●	●	●	●	●	●
	SWG2	Compliance Point	●	N/A	N/A	●	●	●	●	●	●	●	●
	SWG3A	Downstream	●	N/A	N/A	●	●	●	●	●	●	●	●
	ADP1	Authorised Discharge Point	●	N/A	N/A	●	●	●	●	●	●	●	●
	SWG12	Onsite- Oxbow Wetland	●	N/A	N/A	●	●	●	●	●	●	●	●
	EP1	Evaporation Pond 1	●	N/A	N/A	●	●	●	●	●	●	●	●
	EP2	Evaporation Pond 2	●	N/A	N/A	●	●	●	●	●	●	●	●
	TGM PIT	Toms Gully Pit	●	N/A	N/A	●	●	●	●	●	●	●	●

WDL 249 Monitoring Conditions											
Explanatory Notes	No discharge event occurred during the reporting period. Samples were collected as per the monitoring programme timeframe where access was permissible and flow occurring.	No discharge event occurred during the reporting period -	Sampling order limited by access track flooding.	No discharge event occurred during the reporting period. Sampling order limited by access track flooding at SWTG1A, unauthorized access through pastoral gate at SWTG3A and croc threat and flooding at MBC01A.	SWTG3 data utilised for downstream information	-	-	-	-	-	Safe access to SWTG1A limited to track flooding, locked gates to SWTG3A and croc threat and flooding at MBC01A. Croc spotter was utilized during each monitoring event.

5.2 Potential Environmental Harm

Under the Water Act 1992, Environmental harm as defined in the as:

‘ Any harm to or adverse effect on, or potential harm to or adverse effect on, the environment’.

During the Licence reporting period 22 December 2022 to 21 December 2023 there was no controlled discharge of treated water to Mount Bunday Creek. Therefore assessing the potential environmental harm as a result of this activity can not be determined. However, it is acknowledged that Toms Gully Mine is an old metalliferous site that contains a large inventory of poor water quality. PGO intends to reduce the overall site inventory improve water quality whilst the site is in care and maintenance

The future for TGM is to rehabilitate existing old mine domains that continue to contribute to poor water quality onsite during operational activities.

5.3 Major assumptions or uncertainties

5.3.1 Assumptions

In order to meet the WDL 249 monitoring objectives the following set of assumptions were followed:

- No treated wastewater discharge occurred at ADP1 into the Mount Bunday Creek
- Sample method bias was minimised by having the same consultants conducting the field programme throughout the entire season.
- Field meters and other equipment maintained and calibrated to PGO water sampling programme procedure.
- Field instrumentation (including handheld meters, telemetry equipment and in situ probes) and maintained in accordance with retailers’ instrumentation specification and maintenance documents.
- Sampling techniques, as per PGO water sampling programme and guidance with the AS/NZS 5667 and ANZECC/ARMCANZ).
- Sample containers, preservation techniques, holding times compliant with lab specifications.
- The statistical analysis method applied was median values for short- and long-term trend analysis.
- To obtain a representative surface water sample to compare against guideline values and avoid high variability, creek sampling occurred only when creeks at the first flush, in full and recessional flows (not pooled areas), during daylight hours and in the same location where safe to do so.

5.3.2 Uncertainties

Uncertainties for the reporting period were primarily the construction and completion of the RO treatment Plant and auxiliary function to allow opportunity for discharge. Initial testing of RO treated water quality showed uncertainty of meeting guideline values though with time water quality results have improved and now meet 95% species protection.

Following this report and analysis of water quality data, there are uncertainties that RO treated water will meet discharge TV at the Compliance Site in the 2023- 24 reporting period due to existing water quality. This will ultimately reduce discharge opportunity. Though it is expected the treated water will assist to ameliorate water quality found at SWTG2.

Uncertainties for the TGM is weather conditions with unpredicted rainfall in upper or lower catchments impacting fluctuations in the Mount Bunday Creek system. This ultimately prevents opportunity for discharge or conversely constrains onsite inventory.

5.4 Proposed Changes and Actions

There are no proposed changes for the upcoming reporting period however following assessment of compliance, improvements are planned for sampling site access. The following table (Table 5-2) highlights issues that arose during the 2022- 23 reporting period with regards to monitoring and analysis of existing data and proposes actions to address these.

Table 5-2 Proposed Actions for 2023- 24

Proposed New Actions 2023- 24	Rationale	Timeline
A croc spotter will accompany Officers to monitor MBC03A site and weeds along access tracks maintained.	The site was difficult to access due to weed infestations, low visibility of access walking track and potential for crocodile or other feral animal presence. The site is a ~100 m walk through dense overgrown weeds that make visibility poor.	Ongoing during wet season
Commence monitoring at SWTG3A	Approval was not obtained by the pastoral manager for access to SWTG3A. numerous phone calls were made and messages left. Contact has been made and approval granted as long as notification is given prior to accessing the Station.	Ongoing during wet season
Review of the database to take out outliers	Several anomalies were identified during analysis of long term data. The database needs to be reviewed and anomalies such as these are to be reviewed	May, following wet season
Access to SWTG1A	Whilst no improvements are being proposed, the site will be accessed during periods of lower rainfall and with attendance of a crocodile spotter	Ongoing during wet season

6 Sediment and Macroinvertebrate Monitoring

Aquatic Ecology Services conducted biological monitoring in accordance with Item 11 (Condition 27) of the WDL 249 in April 2023 involving sediment and macroinvertebrate sample, analysis and reporting. The Biological Monitoring Report is provided in Appendix D.

The 2023 TGPA WDL 249 biological monitoring programme was conducted successfully where access, sufficient water and safety allowed. Results demonstrate all fish captured were found to be in good health, regardless of their position relative to TGM, however fewer species and a lower abundance of fish were found downstream on Mount Bunday Creek compared to upstream than in previous years.

All macroinvertebrate community data should be viewed in the context of historical data to allow for variation of wet season rainfall and the influences operational activities may cause. While there were similar habitats characteristics across all sites there was a difference in macroinvertebrate metrics indicating impairment of aquatic system health in Mount Bunday Creek downstream of activities likely due to poorer water quality.

Sediment results indicate some accumulation of metals particularly for arsenic (lower guideline value at SWTG2). Metals in sediments are not considered to have the potential to be released in concentrations which could be ecotoxic, should waters remain circumneutral at the site.

The surface water samples taken during the biological monitoring identified Trigger Values exceedances possibly related to point sources pollution from mine domains interacting with surface/groundwater and Mount Bunday Creek. However while this data is limited by single events and should be viewed over multiple events in time, these exceedances could lead to impairment of aquatic ecosystems downstream of TGM.

The continuance of an uninterrupted data set (collected annually since 2015) is the most robust way to analyse conditions in the receiving environment surrounding Toms Gully Mine and an invaluable set of data for baseline prior to commencement of operations (AES, 2023). It is recommended to continue the biological monitoring programme in 2024 and review access to downstream site SWTG3 or MBC03, to further understand the extent of ecosystem impairment downstream of Toms Gully site.

7 Incident Reporting

7.1 Incident Response

Under a care and maintenance regime, typical environmental incidents that may occur at TGPA include:

- Waste Discharge Licence non compliance;
- Uncontrolled discharge of wastewater from pipe;
- Hydrocarbon spills and leaks from vehicles/machinery/pumps/generators;
- Disturbance/destruction to or contravene the AAPA Certificate, heritage site;
- Destruction to Pastoral Lease holder property (i.e., cattle, fencing, gates, designated access tracks);
- Unauthorised access;
- Wildfires destroying assets (property, pumps, fencing, cattle);
- Breach of Pit water; and
- Noise and dust complaints.

7.2 Incidents Recorded/ Reported During the Reporting Period

Nil environmental incidents related to activities under WDL 247 occurred at the RRPA during 2022/2023 reporting period. PGO Environment Incident Reporting and Response flowchart is detailed in Table 7-1 and Figure 7-1.

Incident Reporting

Table 7-1 Incident Reporting Contact Details

Cause/incident event	Department	Notification/ Inform	Timeline	Contact
Environmental/ community relations and cultural heritage incidents occurring on and off tenement. An Incident which causes or is threatening or may threaten to cause pollution resulting in material environmental harm or serious harm	NT Department of Industry Tourism and Transport (DITT) Mines Branch- (08) 8999 6528 Emergency outside business hours (8am-7pm ACST)- 0419 036 035	Environmental Incident Report Form (in accordance with Section 29 <i>Mining Management Act</i> 2001) https://nt.gov.au/industry/mining/mining-operations/report-a-mining-environmental-incident	Notification within 24 hours.	e-mail to: mineralinfo.itt@nt.gov.au GPO Box 4550 Darwin NT 0801
Interference, damage, /destruction of a sacred site or unauthorised activity/entry in a restricted work area/ sacred site	Aboriginal Areas Protection Authority- (08) 8999 4365 or 08 8951 5023	Provide the following information (site name, location, type of damage, who discovered damage, who caused damage, witnesses, actions taken to prevent damage, ongoing threats to site) <i>NT Aboriginal Sacred Sites Act</i> 1989 https://www.aapant.org.au/our-services/register-sacred-site#reporting	Notification as soon as possible after first becoming aware of incident.	e-mail to: enquiries.aapa@nt.gov.au GPO Box 1890, Darwin NT 0801

Incident Reporting

Cause/incident event	Department	Notification/ Inform	Timeline	Contact
Interference, damage, removal, destruction, not inform of discovery of Aboriginal or Macassan archaeological objects/places with heritage value.	NT Dept of Territory Families, Housing and Communities (TFHC), Heritage Branch- (08) 8999 5039	Provide the following information to the Heritage Council CEO including the description, location of the Aboriginal or Macassan archaeological object/place, person name and address, owner or occupier of the place, if known. <i>NT Heritage Act 2011</i> <i>https://tfhc.nt.gov.au/heritage,-libraries-and-archives/heritage-council-members</i>	A report to the CEO within 7 days of discovery of Aboriginal or Macassan archaeological objects/places.	e-mail to: heritagecouncil@nt.gov.au PO Box 4198 Darwin NT 0801
For all mining work- related injury, illness or dangerous incident occurring on and off tenement. Incidents including: - Serious injury or illness; - dangerous incident; - death of a person	NT Work Safe on 1800 019 115 fax (08) 8999 5141 and report a notifiable incident/event. Contact NT police, fire, and emergency services for life-threatening situation on 000 .	Section 35 to 39 Incident Notification form (in accordance the <i>Work Health and Safety (National Uniform Act 2011)</i> of a 'notifiable incident'. <i>https://worksafe.nt.gov.au/forms-and-resources/bulletins/work-health-and-safety-incident-notification</i>	Notification as soon as reasonably practical. And if required by the regulator provide a written notice of the incident within 48 hours of that requirement being made.	e-mail to: NTWorkSafe@nt.gov.au GPO Box 1722 Darwin NT 0801

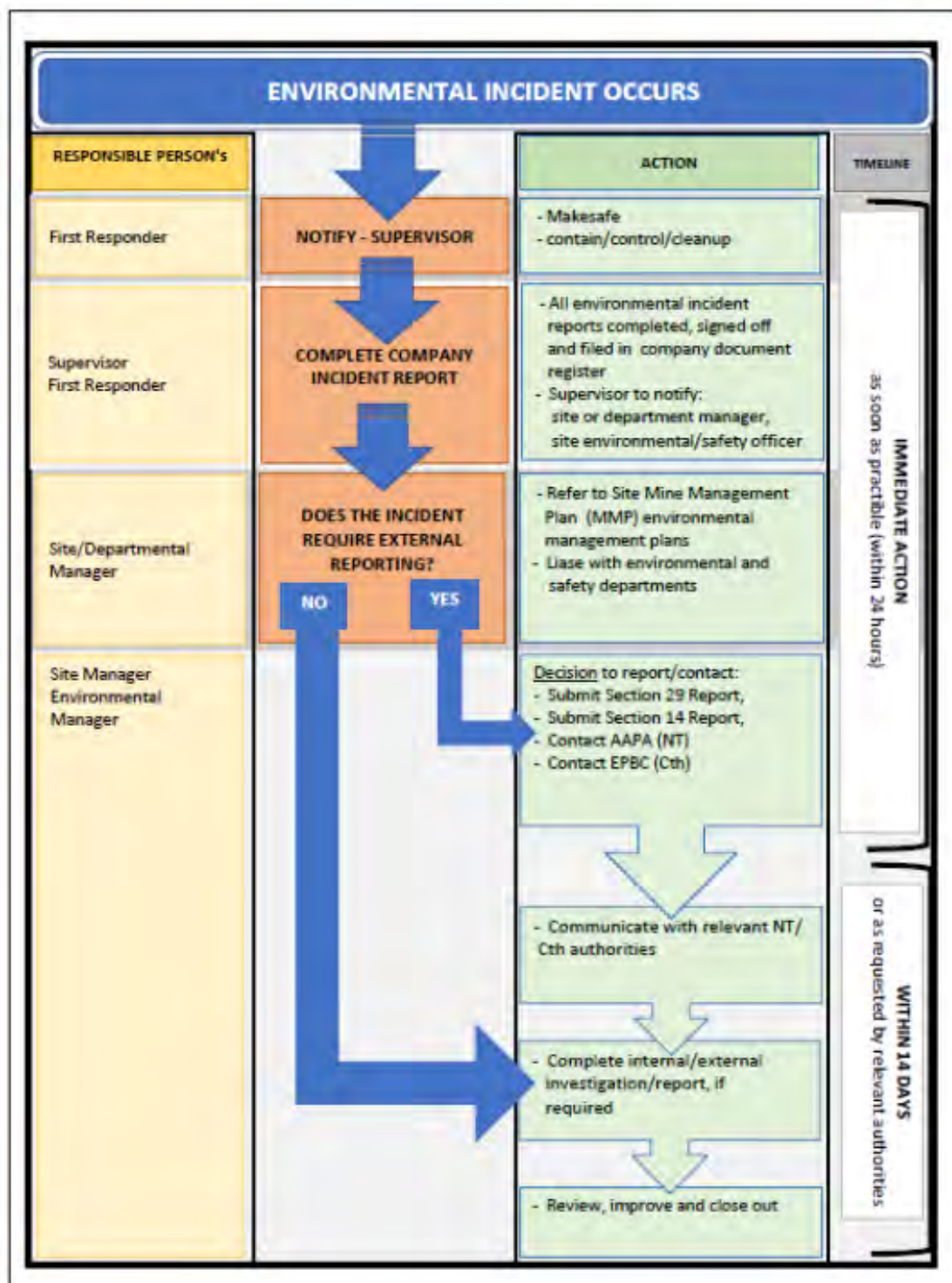


Figure 7-1 Environmental Incident Flowchart

8 Glossary

Abbreviations	Definitions
ADP	Authorised Discharge Point
BUD	Beneficial Use Declaration
DEPWS	Department of Environment, Parks, and Water Security
DITT	Department of Industry, Tourism and Trade
DNRETAS	Department of Natural Resources, Environment, The Arts and Sport
EA Act	<i>Environmental Assessment Act 1982 (NT)</i> Please note - This instrument has been Repealed by the Environment Protection Act 2019, NO. 31 which commenced on the 28/06/2020.
EP Act	<i>Environment Protection Act 2019 (NT)</i> In force as of 29/06/2020
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
KL	Kilolitre
KL/Sec	Kilolitre per second
Km	Kilometre
LoR	Limits of Reporting
ML	Megalitre
mm	Millimetre
N/A	Not Applicable
NATA	National Association of Testing Authorities
NT EPA	Northern Territory Environment Protection Authority
PL	Pastoral Lease
PGO	Primary Gold Limited
PPL	Perpetual Pastoral Lease
RoM	Run of Mine
RRPA	Rustlers Roost Project Area
SoCs	Sites of Conservations Significance
TGM	Toms Gully Mine
TGPA	Toms Gully Project Area
TV	Trigger Values
WA	<i>Water Act 1999</i>
WRD	Waste Rock Dump

9 References

1. Aquatic Ecology Services. 2023. *Toms Gully Mine Aquatic Ecology Baseline Studies*. Report prepared for Primary Gold Limited.
2. Department of Environment, Parks and Water Security. 2023. *NR Maps*. Northern Territory Government. Viewed on 12 December 2023, retrieved from <https://nrmaps.nt.gov.au/nrmaps.html>
3. Department of Natural Resources, Environment, The Arts and Sport. 2009. *Sites of Conservation Significance; Mary River Coastal Floodplain*. Northern Territory Government, Darwin.
4. Department of Infrastructure, Planning and Environment. 2002. *Declaration of Beneficial Uses and Objectives of Water May River Surface Water*. Northern Territory Government, Darwin.
5. Northern Territory Environment Protection Authority. 2022. *Waste Discharge Licence; WDL249*. Northern Territory Government, Issued to Primary Gold Limited.
6. Northern Territory Environment Protection Authority. 2016. *Guideline for Reporting on Environmental Monitoring; Version 1.0*. Northern Territory Government, Darwin.
7. Schultz, T. D. (2002). Water quality monitoring in the Mary River Catchment, Technical Report 42/2002. Department of Infrastructure, Planning and Environment.
8. *Water Act 1999*

10 Appendices

Appendix A. Water Quality Data

Site	Date/ Time	Time	Sample	Field Parameters							Lab Inorganics			Alkalinity as CaCO3			Anions Dissolved		Cations Dissolved					Al	Sb	As
				SWL	Flow	Temp	DO	EC	pH	Turbidity	TDS	TSS	Turbidity	HCO ₃	CO ₃	Total	Cl ⁻	SO ₄ ²⁻	Ca	Mg	K	Na				
				mRL	m/ Sec	°C	%	µS/cm	Units	NTU	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				
				Laboratory Levels of Reporting							5	5	0.1	5	5	5	1	1	0.5	0.5	0.5	0.5	10			
WDL-249 Discharge Trigger Values SWTG2							85-120	250	5.8-8.0	87	-	54	-	-	-	-	295	-	-	-	-	295	9	13		
EP1	11/04/2016			-	-	-	-	4020	3.5	-	-	40	9	<1	<1	<1	4.8	3600	87.6	486	0.8	3.2	257000	-	56	
EP1	20/12/2016			-	-	-	-	2700	3.6	-	-	-	57	<5	<5	<5	4	2100	58	300	0.7	2.4	170000	-	20	
EP1	26/03/2017			-	-	-	-	2600	3.3	-	-	<5	0.3	<5	<5	<5	4	1800	63	240	1.4	2.9	140000	-	10	
EP1	30/06/2018			-	-	-	-	5200	3.4	-	-	<5	0.6	<5	<5	<5	6	5000	100	640	1.7	4.7	400000	-	19	
EP1	22/02/2019			-	-	-	-	5800	3.4	-	-	<5	0.5	<5	<5	<5	6	5800	120	720	1.9	5.5	420000	-	19	
EP1	22/02/2019			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	730	1.9	5.6	-	-	-	
EP1	20/08/2019	Sample taken		-	-	-	-	6600	3.4	-	-	10	0.1	<5	<5	<5	<10	6500	140	910	2.1	6.6	570000	-	<1	
EP1	20/08/2019			-	-	-	-	6600	3.4	-	-	9	-	<5	<5	<5	<10	6500	-	-	-	-	-	-	-	
EP1	30/10/2019	Sample taken		-	-	-	-	8400	3.3	-	-	10	1.4	<5	<5	<5	11	8000	170	1100	2.5	8.3	570000	-	<1	
EP1	30/10/2019	Sample taken		-	-	-	-	8400	3.3	-	-	11	1.4	<5	<5	<5	-	-	-	-	-	570000	-	<1		
EP1	2/12/2020	Sample taken		-	-	-	-	-	-	-	-	6	0.5	<5	<5	<5	10	7800	160	1100	2.7	8.7	630000	-	19	
EP1	12/01/2021	Sample taken		-	-	-	-	396.3	3.42	-	-	4	4	6	<5	6	8	5800	120	730	3.1	6.5	420000	-	19	
EP1	11/03/2021	Sample taken		-	-	-	-	4190	3.57	-	-	<5	1.1	<5	<5	<5	5	3100	53	350	1.7	3.4	250000	-	13	
EP1	17/05/2021	Sample taken		-	-	-	-	5662	3.64	-	-	18	1.7	<5	<5	<5	7	4900	100	610	2.1	5.5	380000	-	16	
EP1	15/09/2021	Sample taken		-	-	-	-	6300	3.1	-	-	23	1.2	<5	<5	<5	13	5600	130	780	2.1	6.5	520000	-	18	
EP1	8/12/2021	Sample taken		-	-	35	-	330	2.82	-	-	13	0.8	<5	<5	<5	14	7400	150	850	2.4	7.8	520000	-	19	
EP1	7/04/2022	Sample taken		-	-	32.4	-	3850	3.56	-	6800	5	0.8	<5	<5	<5	9	5000	110	5.7	2.2	640	370000	-	17	
EP1	29/11/2022	Sample taken		-	-	29.93	-	6254	2.97	-	-	9	1.2	<5	<5	<5	<1	11000	140	870	2.6	8	500000	-	15	
EP1	21/03/2023	11:40:00 AM Sample taken		-	-	32.4	75.3	3745	3.64	1.4	2500	<5	-	<5	<5	<5	9	3500	77	420	2.1	4.5	250000	1.4	15	
EP1	12/12/2023	10:54:00 AM Sample taken		-	-	33.7	52.5	6536		5.12																
Minimum						29.93	-	330	2.82	-	2500	5	0.1	N/A	N/A	N/A	4	1800	53	5.7	0.7	2.4	140000	-	10	
Maximum						35	75.3	8400	3.64	-	6800	40	57	6	N/A	6	14	11000	170	1100	3.1	640	630000	1.4	56	
Short term median						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Long term median						32.4	-	5200	3.4	-	-	10	1.15	N/A	N/A	N/A	7.5	5600	120	720	2.1	5.6	420000	-	18.5	
EP2	11/04/2016			-	-	-	-	3170	3.2	-	-	<10	2	<1	<1	<1	4.3	2640	52.8	327	0.4	1.9	210000	-	12.5	
EP2	20/12/2016			-	-	-	-	3200	3.2	-	-	<5	3	<5	<5	<5	6	2600	69	330	0.6	2.2	230000	-	19	
EP2	26/03/2017			-	-	-	-	2900	3.3	-	-	14	0.5	<5	<5	<5	5	2200	47	270	0.9	2.8	190000	-	12	
EP2	30/06/2018			-	-	-	-	6800	3.2	-	-	9	0.8	<5	<5	<5	9	7200	100	840	1.4	4.3	660000	-	21	
EP2	22/02/2019	Sample taken		-	-	-	-	6800	3.2	-	-	<5	0.5	<5	<5	<5	9	7300	110	850	1.5	5.3	620000	-	22	
EP2	20/08/2019	Sample taken		-	-	-	-	8900	3.1	-	-	9	2.3	<5	<5	<5	14	9800	160	1200	1.9	7.7	940000	-	<1	
EP2	30/10/2019	Sample taken		-	-	-	-	16000	3	-	-	30	4.3	<5	<5	<5	28	20000	300	2400	3.3	15	1600000	-	<1	
EP2	2/12/2020	Sample taken		-	-	-	-	400	3.36	-	-	<5	0.6	<5	<5	<5	14	8300	120	960	2	7.2	740000	-	25	
EP2	12/01/2021	Sample taken		-	-	-	-	400	3.36	-	-	<5	0.8	<5	<5	<5	2	51	25	1.9	3.8	550	-	7		
EP2	11/03/2021	Sample taken		-	-	-	-	3363	3.5	-	-	<5	0.6	<5	<5	<5	6	4000	86	510	2.3	4.8	300000	-	16	
EP2	17/05/2021	Sample taken		-	-	-	-	4966	3.49	-	-	31	1.2	<5	<5	<5	8	4600	75	520	1.6	4.3	410000	-	13	
EP2	15/09/2021	Sample taken		-	-	-	-	7800	2.89	-	-	38	1.5	<5	<5	<5	16	6900	120	960	1.8	6.2	770000	-	22	
EP2	8/12/2021	Sample taken		-	-	33.2	-	331.9	2.62	-	-	7	0.8	<5	<5	<5	13	10000	140	1000	2.1	7.6	830000	-	27	
EP2	3/03/2022	Sample taken		-	-	38.1	-	3740	3.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
EP2	7/04/2022	Sample taken		-	-	32	-	4000	3.19	-	7600	11	1.2	<5	<5	<5	11	5300	86	5.4	1.7	610	440000	-	15	
EP2	29/11/2022	Sample taken		-	-	32	-	7852	2.86	-	-	18	1.7	<5	<5	<5	14	17000	140	1100	2.2	8.6	800000	-	25	
EP2	21/03/2023	11:25:00 AM Sample taken		-	-	32.8	70	3728	3.51	1.71	2500	<5	-	<5	<5	<5	9	3600	69	400	2	5	270000	<1	13	
EP2	12/12/2023	11:06:00 AM Sample taken		-	-	33.5	39.8	7112		5.45				<5	<5	<5	<5									
Minimum						32	-	331.9	2.62	-	2500	N/A	0.5	N/A	N/A	N/A	2	51	2.5	5.4	0.4	1.9	550	-	7	
Maximum						38.1	70	16000	3.51	1.71	7600	38	4.3	N/A	N/A	N/A	28	20000	300	2400	3.3	610	1600000	N/A	27	
Short term median						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Long term median						32.8	-	3870	3.2	-	-	14	1.2	N/A	N/A	N/A	9	6100	93	680	1.9	5.2	530000	-	17.5	
TGM PIT	11/04/2016	Sample taken		-	-	-	-	2260	3.2	-	-	20	2	<1	<1	<1	7.4	1420	211	161	8.2	22	24200	-	4.35	
TGM PIT	20/12/2016	Sample taken		-	-	-	-	1500	3.3	-	-	19	15	<5	<5	<5	5	800	130	96	5.4	13	18000	-	11	
TGM PIT	26/03/2017	Sample taken		-	-	-	-	1900	3.3	-	-	<5	6.9	<5	<5	<5	6	1100	170	120	6.5	19	18000	-	5	
TGM PIT	30/06/2018	Sample taken		-	-	-	-	2100	3.2	-	-	<5	0.5	<5	<5	<5	6	1300	200	150	7.6	21	23000	-	7	
TGM PIT	22/02/2019	Sample taken		-	-	-	-	2200	3.3	-	-	<5	0.4	<5	<5	<5	6	1300	190	140	7.3	21	21000	-	3	
TGM PIT	20/08/2019	Sample taken		-	-	-	-																			

Site	Date/ Time	Time	Sample	Metals Dissolved												Metals Total											
				Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.1	1	1	1	10	1	1	0.05	1	0.05	1	10	1	1	0.1	1	1	1	10	1	1	0.05	1	0.05
WDL-249 Discharge Trigger Values SWTG2				0.2	1	1.4	1.4	2700	3.4	1900	0.6	11	0.05	8	-	-	-	-	-	-	-	-	-	-	-	-	
EP1	11/04/2016			474	25.2	2010	4550	3080	2.02	22700	-	8160	-	26600	260000	-	68	482	23.6	1990	4500	3380	4.96	22900	-	8100	-
EP1	20/12/2016			230	10	1300	2600	1100	15000	5400	-	<1	-	16000	190000	-	30	240	12	1500	2800	1800	16000	5800	-	3	-
EP1	26/03/2017			160	18	710	2200	1300	3	9300	-	4000	-	14000	180000	-	40	170	22	820	2800	1600	4	11000	-	49000	-
EP1	30/06/2018			460	42	2400	4100	5800	2	30000	-	12000	-	31000	400000	-	20	480	42	2500	4100	5600	2	32000	-	12000	-
EP1	22/02/2019			480	40	2700	4200	5500	1	35000	-	13000	-	37000	420000	-	19	480	41	2800	4400	5900	1	34000	-	12000	-
EP1	22/02/2019			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP1	20/08/2019		Sample taken	590	43	3100	4700	5100	2	44000	-	15000	-	45000	510000	-	<1	580	44	3200	5000	5200	2	41000	-	14000	-
EP1	20/08/2019			-	-	-	-	-	-	-	-	-	-	-	-	-	<1	570	45	3200	4900	5400	2	42000	-	15000	-
EP1	30/10/2019		Sample taken	720	49	3700	5600	6200	1	53000	-	19000	-	56000	630000	-	<1	720	48	3800	5900	6700	1	54000	-	18000	-
EP1	30/10/2019		Sample taken	720	49	3700	5600	6400	1	54000	-	19000	-	57000	640000	-	<1	700	48	3800	5900	6900	1	53000	-	19000	-
EP1	2/12/2020		Sample taken	600	48	3800	4600	7600	2	53000	-	16000	-	48000	640000	-	20	600	47	3800	4800	7500	2	52000	-	17000	-
EP1	12/01/2021		Sample taken	460	37	2900	3600	7300	2	36000	-	14000	-	42000	410000	-	18	440	36	2900	3500	7700	1	3600	-	14000	-
EP1	11/03/2021		Sample taken	230	32	1500	3300	3000	3	15000	-	7000	-	15000	260000	-	13	240	33	1500	3400	3100	3	15000	-	7200	-
EP1	17/05/2021		Sample taken	380	34	2400	3100	5300	2	30000	-	9800	-	33000	390000	-	17	390	35	2500	3200	5800	2	32000	-	10000	-
EP1	15/09/2021		Sample taken	500	47	3300	4400	6000	<1	41000	-	14000	-	38000	450000	-	18	520	47	3300	4400	6500	2	37000	-	14000	-
EP1	8/12/2021		Sample taken	530	48	3600	4300	8400	2	41000	-	15000	-	44000	500000	-	18	490	44	3300	3900	7500	2	42000	-	17000	-
EP1	7/04/2022		Sample taken	390	41	2700	3500	6000	2	28000	-	10000	-	29000	370000	-	19	420	45	2900	4000	6500	2	32000	-	14000	-
EP1	29/11/2022		Sample taken	430	48	3500	3500	7100	2.1	40000	-	15000	-	41000	530000	-	18	480	55	3800	3800	7300	2.9	42000	-	17000	-
EP1	21/03/2023	11:40:00 AM	Sample taken	230	23	1700	1800	3300	3.6	20000	<0.05	7300	<0.50	21000	250000	<1	12	210	23	1600	1800	3300	3.1	18000	<0.05	7000	<0.50
EP1	12/12/2023	10:54:00 AM	Sample taken																								
Minimum				160	10	710	1800	1100	1	5400	-	4000	-	14000	180000	-	12	170	12	820	1800	1600	1	3600	-	3	-
Maximum				720	49	3800	5600	8400	15000	54000	N/A	19000	N/A	57000	640000	N/A	68	720	55	3800	5900	7700	16000	54000	N/A	19000	N/A
Short term median				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Long term median				460	41	2700	4100	5800	2	35000	-	13500	-	37000	410000	-	18.5	480	43	2900	4050	5850	2	33000	-	14000	-
EP2	11/04/2016			416	32.8	1280	5010	3230	3.25	13700	-	5870	-	14300	213000	-	15	429	32.9	1320	5090	3370	3.37	13900	-	5960	-
EP2	20/12/2016			240	24	1400	3900	1700	14000	6400	-	<1	-	13000	220000	-	19	240	24	1400	3800	1700	14000	6300	-	<1	-
EP2	26/03/2017			180	25	860	3100	1800	3	11000	-	5000	-	11000	190000	-	13	180	26	890	3100	1800	3	11000	-	5300	-
EP2	30/06/2018			570	90	3100	11000	11000	5	34000	-	16000	-	30000	680000	-	23	590	91	3200	10000	11000	5	37000	-	17000	-
EP2	22/02/2019		Sample taken	520	76	3000	6700	13000	2	35000	-	16000	-	31000	630000	-	24	530	83	3300	7300	15000	2	36000	-	16000	-
EP2	20/08/2019		Sample taken	720	96	4000	8200	11000	6	52000	-	22000	-	44000	890000	-	<1	670	100	4200	8600	12000	6	49000	-	21000	-
EP2	30/10/2019		Sample taken	1400	1800	10000	21000	25000	5	100000	-	46000	-	88000	1800000	-	<1	1300	170	9900	20000	27000	5	100000	-	47000	-
EP2	2/12/2020		Sample taken	530	82	3500	6600	9000	2	44000	-	17000	-	32000	750000	-	26	530	86	3800	7100	9100	2	44000	-	17000	-
EP2	12/01/2021		Sample taken	0.6	<1	36	15	820	2	450	-	100	-	350	530	-	8	0.6	<1	37	16	1000	2	450	-	3	-
EP2	11/03/2021		Sample taken	360	26	2100	3100	3100	1	26000	-	9400	-	26000	290000	-	17	350	26	2100	3100	3000	1	25000	-	9300	-
EP2	17/05/2021		Sample taken	340	55	2100	4700	5900	4	20000	-	8900	-	19000	430000	-	13	350	56	2200	4900	6100	4	20000	-	9200	-
EP2	15/09/2021		Sample taken	620	110	4100	9800	11000	6	43000	-	18000	-	34000	770000	-	22	670	120	4200	9900	12000	5	40000	-	19000	-
EP2	8/12/2021		Sample taken	690	110	4400	9900	18000	5	44000	-	20000	-	40000	900000	-	29	700	120	4500	10000	18000	4	51000	-	26000	-
EP2	3/03/2022		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP2	7/04/2022		Sample taken	390	70	2600	6400	8300	7	24000	-	11000	-	22000	440000	-	17	440	78	2900	7400	9100	7	27000	-	14000	-
EP2	29/11/2022		Sample taken	670	110	4500	11000	15000	5.6	44000	-	20000	-	39000	790000	-	25	780	130	4700	1100	15000	5.9	45000	-	21000	-
EP2	21/03/2023	11:25:00 AM	Sample taken	250	32	1600	3300	4200	14	17000	<0.05	7300	<0.50	16000	280000	<1	9.2	220	32	1600	3400	4200	14	16000	<0.05	7200	<0.50
EP2	12/12/2023	11:06:00 AM	Sample taken																								
Minimum				0.6	24	36	15	820	1	450	-	100	-	350	530	-	8	0.6	24	37	16	1000	1	450	-	3	-
Maximum				1400	180	10000	21000	25000	14000	100000	N/A	46000	N/A	88000	1800000	N/A	29	1300	170	9900	20000	27000	14000	100000	N/A	47000	N/A

Site	Date/ Time	Time	Sample	Zn	Field comments
				µg/L	
				1	
WDL-249 Discharge Trigger Values SWTG2				-	
EP1	11/04/2016			26700	30cm from bottom of height guage
EP1	20/12/2016			18000	-
EP1	26/03/2017			14000	-
EP1	30/06/2018			33000	-
EP1	22/02/2019			36000	-
EP1	22/02/2019			-	-
EP1	20/08/2019		Sample taken	43000	-
EP1	20/08/2019			44000	-
EP1	30/10/2019		Sample taken	54000	-
EP1	30/10/2019		Sample taken	55000	-
EP1	2/12/2020		Sample taken	48000	-
EP1	12/01/2021		Sample taken	41000	Short walk. Sunny location. Very high water level. No flow. Clear water.
EP1	11/03/2021		Sample taken	15000	High water level.
EP1	17/05/2021		Sample taken	35000	High water level.
EP1	15/09/2021		Sample taken	40000	-
EP1	8/12/2021		Sample taken	48000	Murky green, still water
EP1	7/04/2022		Sample taken	38000	Green, still, slightly turbid.
EP1	29/11/2022		Sample taken	45000	Turbid, green, still.
EP1	21/03/2023	11:40:00 AM	Sample taken	20000	1 Filter, fluorescent green coloured water, water level at overflow point though not overflowing,
EP1	12/12/2023	10:54:00 AM	Sample taken		1 filter, swl low
Minimum				14000	
Maximum				55000	
Short term median				-	
Long term median				39000	
EP2	11/04/2016			14300	1m up height guage
EP2	20/12/2016			13000	-
EP2	26/03/2017			12000	-
EP2	30/06/2018			32000	-
EP2	22/02/2019		Sample taken	31000	-
EP2	20/08/2019		Sample taken	42000	-
EP2	30/10/2019		Sample taken	86000	-
EP2	2/12/2020		Sample taken	32000	-
EP2	12/01/2021		Sample taken	340	Car access. Very high water level. No flow. Clear water.
EP2	11/03/2021		Sample taken	26000	High water level.
EP2	17/05/2021		Sample taken	19000	High water level.
EP2	15/09/2021		Sample taken	37000	-
EP2	8/12/2021		Sample taken	49000	Murky green, still water.
EP2	3/03/2022		-	-	Still, turbid, green.
EP2	7/04/2022		Sample taken	25000	Green, still, turbid.
EP2	29/11/2022		Sample taken	42000	Green, murky, still.
EP2	21/03/2023	11:25:00 AM	Sample taken	15000	1 Filter, clear to 1m, pump not on, 1.5m from top of dam wall
EP2	12/12/2023	11:06:00 AM	Sample taken		2 filters
Minimum				340	
Maximum				86000	
Short term median				-	
Long term median				28500	
TGM PIT	11/04/2016		Sample taken	7690	Clear, slowly rising
TGM PIT	20/12/2016		Sample taken	5000	-
TGM PIT	26/03/2017		Sample taken	5700	-
TGM PIT	30/06/2018		Sample taken	6200	-
TGM PIT	22/02/2019		Sample taken	6400	-
TGM PIT	20/08/2019		Sample taken	6500	-
TGM PIT	30/10/2019		Sample taken	6600	-
TGM PIT	2/12/2020		Sample taken	6700	-
TGM PIT	13/01/2021		Sample taken	6600	Sampled in the north-west locations where water collection is possible. Clear water.
TGM PIT	11/03/2021		Sample taken	7200	High water level.
TGM PIT	17/05/2021		Sample taken	6300	High water level.
TGM PIT	15/09/2021		Sample taken	5900	-
TGM PIT	8/12/2021		Sample taken	7400	Clear, no insect life, still water
TGM PIT	7/04/2022		Sample taken	13000	Still, clear, green/blue.
TGM PIT	9/08/2022		Sample taken	6300	Salts on rocks from higher water level mark, blue/ green, fresh cattle dung, clear to 1m
TGM PIT	29/11/2022		Sample taken	6400	Clear, grey/green, still.
TGMPIT	9/01/2023	9:15:00 AM	Sample taken	6200	-
TGM PIT	14/02/2023	11:25:00 AM	Sample taken	6100	1 Filter, Pit height 8.63m, water level has risen, clear, blue, new pole installed at 12m
TGM PIT	21/03/2023	10:15:00 AM	Sample taken	5900	1 Filter, clear, water fleas, water beate in water, water level high
TGM PIT DUPLICATE	21/03/2023	10:15:00 AM	Sample taken	5500	-
TGM PIT	17/04/2023	8:30:00 AM	No sample taken	-	-
TGM PIT	15/05/2023	1:40:00 PM	Sample taken	6400	1 Filter, clear, lower water level, slight odour of sulphur
TGM PIT	29/11/2023	8:30:00 AM	Sample taken	6400	Fields taken in Lab
TGM PIT	4/12/2023	2:10:00 PM	SWL only	-	-
TGM PIT	11/12/2023	3:30:00 PM	SWL only	-	-
TGM PIT	12/12/2023	10:40:00 AM	Sample taken		
TGM PIT	12/12/2023	10:40:00 AM	Sample taken		height taken 60cm from pole 3 filters,duplicate
Minimum				5000	
Maximum				13000	
Short term median				6150	
Long term median				6400	

Site	Date/ Time	Time	Sample	Field Parameters							Lab Inorganics			Alkalinity as CaCO3			Anions Dissolved		Cations Dissolved				Al	Sb	As	
				SWL	Flow	Temp	DO	EC	pH	Turbidity	TDS	TSS	Turbidity	HCO ₃	CO ₃	Total	Cl ⁻	SO ₄ ²⁻	Ca	Mg	K	Na				
				mRL	m/ Sec	°C	%	µS/cm	Units	NTU	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L				
				Laboratory Levels of Reporting							5	5	0.1	5	5	5	1	1	0.5	0.5	0.5	0.5				10
WDL-249 Discharge Trigger Values SWTG2							85-120	250	5.8-8.0	87	-	54	-	-	-	-	295	-	-	-	-	295	9	13		
SWTG12	9/03/2016			-	-	-	-	223	5	-	-	10	1	1	<1	1	1.3	92.6	13.7	12.6	2	2.9	436	-	7.35	
SWTG12	11/04/2016			-	-	-	-	224	5.5	-	-	<10	1	1	<1	1	1.5	91.1	13.6	12.7	2.3	3.5	132	-	9.2	
SWTG12	10/05/2016			-	-	-	-	109	6.1	-	-	30	23	4	<1	4	3.4	32.7	6.6	4.2	3.9	2.2	191	-	3.95	
SWTG12	28/11/2016			-	-	-	-	47	30	-	-	24	38	<5	<5	<5	2	48	8.3	5.4	3.2	1.6	200	-	37	
SWTG12	20/12/2016			-	-	-	-	340	3.7	-	-	-	95	<5	<5	<5	3	110	20	14	4.5	3	340	-	9	
SWTG12	11/01/2017			-	-	-	-	250	4.9	-	-	8	3.2	<5	<5	<5	100	3	18	13	3.5	4	300	-	5	
SWTG12	26/03/2017			-	-	-	-	190	4.5	-	-	<5	15	<5	<5	<5	2	70	8.2	9.1	1.6	2.2	1200	-	2	
SWTG12	11/04/2019		Sample taken	-	-	-	-	240	4.2	-	-	6	0.7	<5	<5	<5	<5	2	94	12	12	2.4	2.8	630	-	3
SWTG12	16/02/2020		Sample taken	-	-	-	-	210	4.2	-	-	<5	0.8	<5	<5	<5	<5	2	80	11	10	1.7	2.7	250	-	5
SWTG12	15/03/2020		Sample taken	-	-	-	-	380	3.9	-	-	<5	0.6	<5	<5	<5	<5	2	160	15	21	2.5	3	3000	-	4
SWTG12	12/01/2021		Sample taken	-	-	-	-	166.1	4.5	-	-	<5	0.9	<5	<5	<5	<5	1	1400	14	47	<0.5	0.7	86000	-	7400
SWTG12	27/01/2021		Sample taken	-	-	-	-	289.5	5.14	-	-	<5	0.4	2	<5	<5	<5	110	16	16	2.5	3.5	420	-	3	
SWTG12	16/02/2021		Sample taken	-	-	-	-	180.7	6.17	-	-	8	9	<5	<5	<5	<5	1	72	7.1	11	2.2	1.9	1300	-	4
SWTG12	24/02/2021		Sample taken	-	-	-	-	336.2	4.31	-	-	8	4.5	<5	<5	<5	<5	2	130	13	20	4	3.1	3900	-	4
SWTG12	10/03/2021		Sample taken	-	-	-	-	474	3.97	-	-	5	0.3	<5	<5	<5	<5	2	200	22	25	3.3	4.8	2600	-	4
SWTG12	25/03/2021		Sample taken	-	-	-	-	448.6	4.06	-	-	<5	0.8	<5	<5	<5	<5	4	580	49	72	5.5	8.9	5300	-	140
SWTG12	8/04/2021		Sample taken	-	-	-	-	553	3.96	-	-	<5	0.6	<5	<5	<5	<5	2	230	33	30	3.3	7.8	2100	-	4
SWTG12	22/04/2021		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	17/05/2021		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	19/01/2022		Sample taken	-	-	29.2	-	138.1	4.2	-	-	<5	1.5	<5	<5	<5	<5	2	100	9.9	13	2.2	2.6	1400	-	4
SWTG12 QA1	19/01/2022		Sample taken	-	-	-	-	-	-	-	-	<5	1.4	<5	<5	<5	<5	2	100	9.8	13	2.3	2.6	1300	-	4
SWTG12	2/02/2022		Sample taken	-	-	27.3	-	285.7	3.91	-	-	18	0.8	<5	<5	<5	<5	2	130	12	16	3.2	3.8	1600	-	4
SWTG12	17/02/2022		Sample taken	-	-	33.9	-	320.6	3.54	-	-	<5	0.7	<5	<5	<5	<5	2	130	15	17	3.2	4	1700	-	7
SWTG12 QA1	17/02/2022		Sample taken	-	-	-	-	-	-	-	-	<5	1	-	-	-	-	-	15	17	3.2	4	1700	-	7	
SWTG12	2/03/2022		Sample taken	-	-	31.9	-	237	4.55	-	-	<5	3.5	<5	<5	<5	<5	2	98	12	13	2.2	3.2	1300	-	3
SWTG12 QA1	2/03/2022		Sample taken	-	-	-	-	-	-	-	-	<5	4	<5	<5	<5	<5	2	98	12	13	2.2	3.1	1300	-	3
SWTG12	16/03/2022		Sample taken	-	-	31.1	-	507.4	3.65	-	-	<5	0.7	<5	<5	<5	<5	2	210	22	26	3.4	5.2	2900	-	6
SWTG12 QA1	16/03/2022		Sample taken	-	-	-	-	-	-	-	-	<5	0.4	<5	<5	<5	<5	2	210	21	26	3.4	5.2	2900	-	6
SWTG12	6/04/2022		Sample taken	-	-	33	-	511.4	3.73	-	380	<5	0.5	<5	<5	<5	<5	2	220	26	27	3	6.1	1700	-	4
SWTG12 QA2	6/04/2022		Sample taken	-	-	-	-	-	-	-	410	<5	0.4	<5	<5	<5	<5	2	220	26	26	3.1	6.1	1600	-	4
SWTG12	5/05/2022		Sample taken	-	-	30	-	573.3	4.05	-	380	<5	0.6	<5	<5	<5	<5	2	190	28	28	3.8	7	1200	-	4
SWTG12 QA1	5/05/2022		Sample taken	-	-	-	-	-	-	-	330	<5	0.4	<5	<5	<5	<5	2	190	29	28	3.7	7	1200	-	4
SWTG12	29/11/2022		No sample taken	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	17/01/2023	12:06:00 PM	Sample taken	-	-	30.1	50.3	463	4.67	-	330	<5	-	<5	<5	<5	<5	2.3	190	18	24	3.6	4.4	3400	<1	6.2
SWTG12	24/01/2023	10:20:00 AM	Sample taken	-	-	29.9	33.9	411.8	4.32	0.42	250	<5	-	<5	<5	<5	<5	1.9	160	17	21	2.6	4.6	2100	1.4	5.3
SWTG12	1/02/2023	1:40:00 PM	Sample taken	-	-	29.5	35.6	229.8	4.09	6.52	120	6	-	<5	<5	<5	<5	1.4	98	8.9	10	2	2.4	1200	<1	3.4
SWTG12	6/02/2023	1:45:00 PM	Sample taken	-	-	29.7	38	475.6	3.73	1.12	390	<5	-	<5	<5	<5	<5	2.4	210	18	25	3.6	4.5	3200	<1	4.7
SWTG12	14/02/2023	10:55:00 AM	Not sampled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	21/02/2023	12:30:00 PM	Sample taken	-	-	30.2	83.1	614	3.34	0.64	470	<5	-	<5	<5	<5	<5	4.1	410	28	33	3	5.5	4400	<1	5.6
SWTG12	28/02/2023	12:25:00 PM	Sample taken	-	0.7	28.1	68.8	403.6	3.6	4.3	260	5	-	<5	<5	<5	<5	2.2	180	16	22	3.5	3.8	4000	<1	4.4
SWTG12	8/03/2023	3:10:00 PM	Sample taken	-	-	31.8	91.6	733	3.9	-	570	<5	-	<5	<5	<5	<5	2.9	320	29	37	3.6	5.9	7200	<1	4.2
SWTG12	14/03/2023	11:03:00 AM	Sample taken	-	1.2	30.8	67	738	3.78	1.43	700	<5	-	<5	<5	<5	<5	5.4	350	31	39	3.3	5.4	6900	<1	6.1
SWTG12	21/03/2023	1:55:00 PM	Sample taken	-	-	31.4	69.2	878	3.72	0.34	500	<5	-	<5	<5	<5	<5	3	420	48	47	3.6	7.8	6900	<1	6.4
SWTG12	28/03/2023	9:40:00 AM	Sample taken	-	-	30.4	58	959	2.78	0.47	750	6	-	<5	<5	<5	<5	2.5	390	48	52	3.8	8.8	5100	<1	5.7
Minimum						27.3	33.9	109	2.78	0.34	120	5	0.3	1	<5	<5	1	1	3	6.6	4.2	1.6	0.7	132	1.4	2
Maximum						33.9	91.6	959	6.17	6.52	750	30	95	72	<5	<5	10	100	1400	49	72	5.5	8.9	86000	1.4	7400
Short term median						30.2	62.5	545	3.76	0.88	430	N/A	-	N/A	N/A	N/A	2.45	265	23	29	3.55	5	4200	1.4	5.5	
Long term median						30.2	-	338	4.08	-	385	N/A	0.85	N/A	N/A	N/A	2	160	16	20.5	3.2	3.9	1650	-	4.3	
MBQD1A	29/01/2023	10:40:00 AM	Sample taken	-	-	-	-	-	-	-	35	41	-	8.1	<5	8.1	2.4	12	2	2.6	0.71	2	48	<1	<1	
MBQD1A	6/02/2023	11:20:00 AM	Sample taken	-	-	28.5	50.9	44.3	5.4	24.2	25	12	-	8.9	<5	8.9	2.5	6.2	1.7	1.6	0.72	2.6	46	<1	<1	
MBQD1A	28/03/2023	10:15:00 AM	Sample taken	-	-	29.3	57.2	160.3	5.17	-	120	14	-	9.4	<5	9.4	2.8	55	8.9	8	1.3	4.2	71	<1	<1	
Minimum						28.5	50.9	44.3	5.17	-	25	12	-	8.1	N/A	8.1	2.4	6.2	1.7	1.6	0.71	2	46	N/A	N/A	
Maximum						29.3	57.2	160.3	5.4	24.2	120	41	-	9.4	N/A	9.4	2.8	55	8.9	8	1.3	4.2	71	N/A	N/A	
Short term median						-	-	-	-	-	35	14	-	8.9	N/A	8.9	2.5	12	2	2.6	0.72	2.6	48	N/A	N/A	
Long term median						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Site	Date/ Time	Time	Sample	Metals Dissolved												Metals Total											
				Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.1	1	1	1	10	1	1	0.05	1	0.05	1	10	1	1	0.1	1	1	1	10	1	1	0.05	1	0.05
WDL-249 Discharge Trigger Values SWTG2				0.2	1	1.4	1.4	2700	3.4	1900	0.6	11	0.05	8	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	9/03/2016			1.94	0	35.5	9.09	60	0.15	953	-	83	-	284	430	-	7.8	1.9	0	36.5	9.3	156	0.32	960	-	85.8	-
SWTG12	11/04/2016			0.56	0	8.9	3.09	54	0.05	471	-	41.2	-	109	166	-	11	0.62	0.1	9.28	3.68	202	0.16	478	-	41.6	-
SWTG12	10/05/2016			0.1	0.2	0.26	4.44	178	0.09	12.4	-	9.83	-	24.9	681	-	6.85	0.22	0.8	2.19	6.49	1010	0.59	96.6	-	11.3	-
SWTG12	28/11/2016			4.9	<1	23	8	50	<1	500	-	46	-	420	340	-	64	4.7	<1	23	11	520	4	46	-	46	-
SWTG12	20/12/2016			13	<1	57	18	60	1100	120	-	1	-	1300	600	-	17	14	<1	59	19	500	1100	130	-	2	-
SWTG12	11/01/2017			7.5	<1	47	9	30	<1	1200	-	97	-	760	230	-	5	7.2	<1	48	10	100	<1	1200	-	100	-
SWTG12	26/03/2017			2.3	<1	36	20	40	<1	760	-	89	-	370	1500	-	2	2.1	<1	39	22	130	<1	830	-	95	-
SWTG12	11/04/2019		Sample taken	3	<1	34	13	130	<1	980	-	72	-	310	580	-	5	2.7	<1	34	13	340	<1	920	-	71	-
SWTG12	16/02/2020		Sample taken	2.5	<1	31	7	90	<1	740	-	62	-	300	250	-	6	2.6	<1	33	7	290	<1	760	-	66	-
SWTG12	15/03/2020		Sample taken	6.3	<1	100	79	240	2	1800	-	260	-	1000	2900	-	4	6.3	<1	100	75	320	2	1800	-	270	-
SWTG12	12/01/2021		Sample taken	320	160	160	1800	210000	16	780	-	530	-	5000	81000	-	7400	300	150	150	1700	730	18	730	-	17	-
SWTG12	27/01/2021		Sample taken	4.2	<1	48	6	70	<1	1200	-	98	-	490	390	-	4	4	<1	51	6	160	<1	1200	-	100	-
SWTG12	16/02/2021		Sample taken	4.3	<1	47	49	170	1	770	-	110	-	520	1700	-	7	4.5	<1	52	60	570	1	840	-	130	-
SWTG12	24/02/2021		Sample taken	8.1	<1	96	130	320	4	1600	-	250	-	1000	4300	-	7	8.6	<1	94	140	900	4	1600	-	250	-
SWTG12	10/03/2021		Sample taken	5.9	<1	100	66	150	2	2700	-	260	-	940	2700	-	4	5.9	<1	110	70	180	2	2800	-	280	-
SWTG12	25/03/2021		Sample taken	7.9	2	180	28	12000	3	5400	-	260	-	1100	6200	-	170	7.9	2	190	30	13000	3	5500	-	290	-
SWTG12	8/04/2021		Sample taken	2.9	<1	77	30	340	2	3000	-	170	-	530	1800	-	4	2.7	<1	73	28	400	2	3100	-	170	-
SWTG12	22/04/2021		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	17/05/2021		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	19/01/2022		Sample taken	5.5	<1	59	42	220	<1	1200	-	140	-	660	1300	-	5	5.3	<1	63	46	540	<1	1100	-	140	-
SWTG12 QA1	19/01/2022		Sample taken	5.3	<1	58	42	210	<1	1100	-	140	-	650	1300	-	5	5.1	<1	61	45	520	<1	1100	-	140	-
SWTG12	2/02/2022		Sample taken	4	<1	67	36	160	<1	1400	-	150	-	630	1700	-	4	4	<1	69	37	300	<1	1500	-	150	-
SWTG12	17/02/2022		Sample taken	3.8	<1	69	39	330	1	1700	-	170	-	620	1800	-	7	3.9	<1	75	43	440	1	1800	-	180	-
SWTG12 QA1	17/02/2022		Sample taken	3.9	<1	68	39	330	1	1700	-	160	-	610	1700	-	7	3.9	<1	74	43	430	1	1800	-	180	-
SWTG12 QA1	2/03/2022		Sample taken	3.7	<1	46	41	100	<1	1200	-	110	-	480	1300	-	4	3.4	<1	50	45	510	<1	1300	-	120	-
SWTG12	2/03/2022		Sample taken	3.6	<1	46	41	100	<1	1200	-	110	-	480	1300	-	4	3.4	<1	49	45	510	<1	1200	-	120	-
SWTG12	16/03/2022		Sample taken	3.5	<1	96	39	480	2	2500	-	220	-	710	2500	-	6	3.5	<1	96	39	480	2	2400	-	220	-
SWTG12 QA1	16/03/2022		Sample taken	3.6	<1	97	40	480	2	2600	-	230	-	720	2500	-	6	3.4	<1	95	40	500	2	2400	-	230	-
SWTG12	6/04/2022		Sample taken	2.6	<1	76	17	320	1	2900	-	150	-	470	1600	-	4	2.6	<1	74	18	370	1	2900	-	150	-
SWTG12 QA2	6/04/2022		Sample taken	2.4	<1	73	18	320	1	2800	-	140	-	450	1600	-	4	2.5	<1	76	18	330	1	2900	-	150	-
SWTG12	5/05/2022		Sample taken	1.7	<1	56	6	420	<1	3500	-	98	-	290	1200	-	9	1.6	<1	59	6	940	<1	3400	-	99	-
SWTG12 QA1	5/05/2022		Sample taken	1.6	<1	58	7	430	<1	3600	-	100	-	300	1200	-	9	1.7	<1	59	6	810	<1	3100	-	97	-
SWTG12	29/11/2022		No sample taken	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	17/01/2023	12:06:00 PM	Sample taken	9.4	<1	120	88	680	2.6	2400	<0.05	290	<1	1300	3200	<1	6.4	9.1	<1	120	81	670	4.4	2300	<0.05	270	<1
SWTG12	24/01/2023	10:20:00 AM	Sample taken	6.2	<1	90	56	600	1.6	2200	<0.05	200	<1	870	2300	<1	5.4	6	<1	89	59	690	1.8	1900	<0.05	200	<1
SWTG12	1/02/2023	1:40:00 PM	Sample taken	3.1	<1	50	27	260	<1	1200	<0.05	110	<1	510	1200	<1	4.4	3	<1	49	28	610	<1	1200	<0.05	110	<1
SWTG12	6/02/2023	1:45:00 PM	Sample taken	6.2	<1	100	57	660	2.2	2400	<0.05	240	<1	980	3100	<1	4.8	6	<1	110	59	770	2	2300	<0.05	250	<1
SWTG12	14/02/2023	10:55:00 AM	Not sampled	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG12	21/02/2023	12:30:00 PM	Sample taken	7.3	<1	120	66	680	2.6	3300	<0.05	300	<0.1	1100	3600	<1	5.9	7.3	<1	120	66	710	2.5	3500	<0.05	280	<0.1
SWTG12	28/02/2023	12:25:00 PM	Sample taken	8.6	<1	95	140	600	4.6	2100	<0.05	240	<0.05	1000	3700	<1	6.4	8.8	<1	95	140	820	4.6	1900	<0.05	240	<0.05
SWTG12	8/03/2023	3:10:00 PM	Sample taken	12	<1	150	160	590	5.1	3600	<0.05	390	<0.05	1600	6000	<1	4.1	11	<1	140	130	590	4.4	4000	<0.05	350	<0.05
SWTG12	14/03/2023	11:03:00 AM	Sample taken	13	<1	160	160	840	5.4	3900	<0.05	430	<0.05	1700	7800	<1	6.9	14	<1	160	170	990	5.5	3800	<0.05	410	<0.05
SWTG12	21/03/2023	1:55:00 PM	Sample taken	9.4	<1	160	98	800	6.1	5200	<0.05	400	<0.25	1500	6100	<1	4.8	8.5	<1	150	88	750	4.7	4500	<0.05	390	<0.25
SWTG12	28/03/2023	9:40:00 AM	Sample taken	7.4	<1	140	54	1200	5.4	5000	<0.05	330	<0.05	1300	5300	<1	5	6.6	<1	130	54	1200	4.4	4600	<0.05	360	0.19
Minimum				0.1	0	0.26	3.09	30	0.05	12.4	N/A	1	N/A	24.9	166	N/A	2	0.22	0	2.19	3.68	100	0.16	96.6	N/A	2	N/A
Maximum				320	160	180	1800	210000	1100	5400	N/A	530	N/A	5000	81000	N/A	7400	300	150	190	1700	13000	1100	5500	N/A	410	0.19
Short term median				8	N/A	120	77	670	4.6	2850	N/A	295	N/A	1200	3650	N/A	5.2	7.9	N/A	120	73.5	730	4.4	2900	N/A	275	N/A
Long term median				4.25	N/A	69	39</																				

Site	Date/ Time	Time	Sample	Zn	Field comments
				µg/L	
				1	
WDL-249 Discharge Trigger Values SWTG2				-	
SWTG12	9/03/2016			287	No field observations
SWTG12	11/04/2016			108	Small trickle through boards
SWTG12	10/05/2016			32.8	Very small pool
SWTG12	28/11/2016			390	
SWTG12	20/12/2016			1300	
SWTG12	11/01/2017			690	
SWTG12	26/03/2017			340	
SWTG12	11/04/2019		Sample taken	290	
SWTG12	16/02/2020		Sample taken	310	
SWTG12	15/03/2020		Sample taken	980	
SWTG12	12/01/2021		Sample taken	4600	Car access. Shaded location. Medium water level. Stagnant water. Brown turbid.
SWTG12	27/01/2021		Sample taken	470	Car access. Shaded location. Medium water level. Stagnant water. Brown turbid.
SWTG12	16/02/2021		Sample taken	560	Medium water level.
SWTG12	24/02/2021		Sample taken	1000	Medium water level.
SWTG12	10/03/2021		Sample taken	960	Water level dropped from last sampling. Very slight flow.
SWTG12	25/03/2021		Sample taken	1100	Medium water level. Flow.
SWTG12	8/04/2021		Sample taken	500	Low water level. Low flow.
SWTG12	22/04/2021		-	-	Dry.
SWTG12	17/05/2021		-	-	Dry.
SWTG12	19/01/2022		Sample taken	670	Clear, brown water. Still
SWTG12 QA1	19/01/2022		Sample taken	650	-
SWTG12	2/02/2022		Sample taken	640	Clear, brown, still, lots of leaf litter
SWTG12	17/02/2022		Sample taken	650	No flow, brown, clear, lots of leaf litter.
SWTG12 QA1	17/02/2022		Sample taken	640	-
SWTG12	2/03/2022		Sample taken	490	Still, clear, orange.
SWTG12 QA1	2/03/2022		Sample taken	480	-
SWTG12	16/03/2022		Sample taken	670	Brown, clear, no flow, leaf litter.
SWTG12 QA1	16/03/2022		Sample taken	680	-
SWTG12	6/04/2022		Sample taken	450	Still, clear, lots of leaf litter.
SWTG12 QA2	6/04/2022		Sample taken	450	-
SWTG12	5/05/2022		Sample taken	290	Grey, still, turbid.
SWTG12 QA1	5/05/2022		Sample taken	290	-
SWTG12	29/11/2022		No sample taken	-	Dry - no sample collected.
SWTG12	17/01/2023	12:06:00 PM	Sample taken	1200	1 Filter, flowing over weir boards, clear, no discharge
SWTG12	24/01/2023	10:20:00 AM	Sample taken	900	Smell of ammonia, discharging from weir, flow rate 0.2m/sec, clear, spiders on water surface
SWTG12	1/02/2023	1:40:00 PM	Sample taken	470	Overflowing weir, clear to bottom, leaf litter, smell of ammonia, visible turbidity
SWTG12	6/02/2023	1:45:00 PM	Sample taken	970	1 Filter, overflowing at weir, sliik on water surface, leaf litter
SWTG12	14/02/2023	10:55:00 AM	Not sampled	-	-
SWTG12	21/02/2023	12:30:00 PM	Sample taken	1000	2 Filters, clear to bottom, water smells stagnant, overflowing weir, leaf litter on surface
SWTG12	28/02/2023	12:25:00 PM	Sample taken	910	1 Filter, fast flow, recent rain, really pungent smell around monitoring site, clear, slightly murky
SWTG12	8/03/2023	3:10:00 PM	Sample taken	1400	Very clear, algae present in wet lands upstream, overflowing
SWTG12	14/03/2023	11:03:00 AM	Sample taken	1600	1 Filter, clear to bottom, leaf litter on surface, water level not above weir boards though flowing through bottom board
SWTG12	21/03/2023	1:55:00 PM	Sample taken	1400	1 Filter, clear in some areas, not overflowing though going through weir boards, lots of organic matter in surface, slight
SWTG12	28/03/2023	9:40:00 AM	Sample taken	1300	1 Filter, flowing through weir boards, organic debris on water surface, ammonia smell, clear in areas.
Minimum				32.8	
Maximum				4600	
Short term median				1100	
Long term median				650	
MBC01A	29/01/2023	10:40:00 AM	Sample taken	17	-
MBC01A	6/02/2023	11:20:00 AM	Sample taken	19	4 filters, fast flow, evidence of higher flow, turbid
MBC01A	28/03/2023	10:15:00 AM	Sample taken	170	3 Filters, flowing, grey/ brown, recent oig rooting in bank, difficult and unsafe access, access track covered with calopo
Minimum				17	
Maximum				170	
Short term median				19	
Long term median				-	

Site	Date/ Time	Time	Sample	Field Parameters							Lab Inorganics			Alkalinity as CaCO3			Anions Dissolved		Cations Dissolved						
				SWL	Flow	Temp	DO	EC	pH	Turbidity	TDS	TSS	Turbidity	HCO ₃	CO ₃	Total	Cl ⁻	SO ₄ ²⁻	Ca	Mg	K	Na	Al	Sb	As
				mRL	m/ Sec	°C	%	µS/cm	Units	NTU	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L
				Laboratory Levels of Reporting							5	5	0.1	5	5	5	1	1	0.5	0.5	0.5	0.5	10	1	1
WDL-249 Discharge Trigger Values SWTG2							85-120	250	5.8-8.0	87	-	54	-	-	-	-	295	-	-	-	-	295	9	13	
SWTG2	9/03/2016			-	-	-	-	38	7	-	-	30	53	5	<1	5	1.7	6.3	1.7	1.2	1.7	2.1	157	-	0.75
SWTG2	11/04/2016			-	-	-	-	191	6.1	-	-	20	14	5	<1	5	3.3	69.4	13.4	8.3	2.1	5.8	45.9	-	0.5
SWTG2	25/04/2016			-	-	-	-	337	5.2	-	-	50	66	1	<1	1	3.2	148	26.2	16.4	2.9	7.8	202	-	0.85
SWTG2	10/05/2016			-	-	-	-	385	5.2	-	-	<10	7	<1	<1	<1	3	175	30.4	19.5	3.1	7.9	407	-	0.45
SWTG2	23/05/2016			-	-	-	-	323	6.3	-	-	<10	6	3	<1	3	5.3	126	22.1	14.5	4.1	8.1	25.8	-	0.6
SWTG2	28/11/2016			-	-	-	-	36	6.4	-	-	24	63	9	<5	9	1	5	2.3	1.3	2.1	1.1	6400	-	<1
SWTG2	20/12/2016			-	-	-	-	30	6.3	-	-	-	840	<5	<5	<5	2	2	1.8	0.9	1.9	1.3	140	-	<1
SWTG2	11/01/2017			-	-	-	-	37	7.4	-	-	42	110	16	<5	16	2	2	1.3	1	1	2.5	170	-	<1
SWTG2	12/03/2017			-	-	-	-	11	6.3	-	-	48	58	<5	<5	<5	<1	<1	0.5	<0.5	0.8	0.6	190	-	1
SWTG2	26/03/2017			-	-	-	-	25	6.4	-	-	74	68	8	<5	5	2	2	1.2	0.9	0.7	1.7	180	-	<1
SWTG2	3/05/2017			-	-	-	-	110	6.6	-	-	<5	8.3	17	<5	17	3	28	5.5	3.4	1.8	4.3	40	-	<1
SWTG2	22/02/2019	Sample taken		-	-	-	-	56	6.5	-	-	12	17	12	<5	12	2	6	2.6	1.9	1.4	3.5	30	-	<1
SWTG2	7/03/2019	Sample taken		-	-	-	-	130	6.3	-	-	24	3.3	10	<5	10	2	36	8.1	5.3	1.8	4.2	<10	-	<1
SWTG2	11/04/2019	Sample taken		-	-	-	-	39	6.5	-	-	23	40	9	<5	9	3	3	1.5	1.2	1.5	2.9	790	-	<1
SWTG2	19/01/2020	Sample taken		-	-	-	-	68	6.4	-	-	19	25	15	<5	15	3	8	4.1	2.5	3.2	2.2	860	-	12
SWTG2	2/02/2020	Sample taken		-	-	-	-	57	6.4	-	-	47	100	10	<5	10	3	9	3	2	2	2.9	70	-	3
SWTG2	16/02/2020	Sample taken		-	-	-	-	82	6.2	-	-	20	36	12	<5	12	3	19	5.2	3.3	1.1	2.9	50	-	3
SWTG2	16/02/2020	Sample taken		-	-	-	-	98	6.8	-	-	17	23	37	<5	37	5	6	4.8	0.9	1	1.4	20	-	7
SWTG2	16/02/2020	Sample taken		-	-	-	-	43	6.4	-	-	28	52	17	<5	17	3	<1	1.7	1.7	1.3	3.7	80	-	2
SWTG2	15/03/2020	Sample taken		-	-	-	-	49	6.5	-	-	65	32	14	<5	14	3	6	2.6	1.9	1	3.3	30	-	1
SWTG2	13/01/2021	Sample taken		-	-	-	-	159.9	5.15	-	-	46	38	9	<5	9	2	3	1.6	1.2	0.9	2.4	80	-	2
SWTG2	28/01/2021	Sample taken		-	-	-	-	70.7	4.75	-	-	11	19	3	<3.6	<5	11	10	1.7	1.4	0.9	3	50	-	<1
SWTG2	17/02/2021	Sample taken		-	-	-	-	19.7	5.39	-	-	53	64	6	<5	6	<1	2	0.7	0.7	0.7	0.98	100	-	<1
SWTG2	24/02/2021	Sample taken		-	-	-	-	23.7	5.19	-	-	47	33	7	<5	7	1	1	0.8	0.8	1.3	1.7	90	-	<1
SWTG2	11/03/2021	Sample taken		-	-	-	-	103.5	5.04	-	-	11	18	<5	<5	11	3	8	2.7	2.1	1.1	3.6	30	-	1
SWTG2	25/03/2021	Sample taken		-	-	-	-	42.4	5.15	-	-	27	11	11	<5	11	2	<1	1.1	0.9	1.3	2.8	20	-	<1
SWTG2	8/04/2021	Sample taken		-	-	-	-	49.5	5.24	-	-	<5	6.6	13	<5	13	2	9	2.9	2	0.9	3.6	20	-	<1
SWTG2	22/04/2021	Sample taken		-	-	-	-	101.6	4.99	-	-	9	4.6	12	<5	12	2	22	5.6	4.3	1.4	3.9	10	-	1
SWTG2	17/05/2021	Sample taken		-	-	-	-	362.9	4.55	-	-	20	1.7	5	<5	5	11	98	17	12	2	9.4	70	-	3
SWTG2	19/01/2022	Sample taken		-	-	28.6	-	60.6	5.79	-	-	<5	17	10	<5	10	4	7	2.2	1.9	1	5.3	50	-	1
SWTG2	3/02/2022	Sample taken		-	-	28.2	-	30.1	6.03	-	-	11	13	9	<5	9	3	3	1.3	1.2	0.6	2.4	60	-	<1
SWTG2	3/03/2022	-		-	-	36.3	-	49.7	7.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	16/03/2022	Sample taken		-	-	35.2	-	39.1	7.52	-	-	28	25	23	<5	23	2	4	1.3	1.2	1.2	2.8	70	-	1
SWTG2	7/04/2022	Sample taken		-	-	35.4	-	45.3	6.25	-	24	13	11	<5	<5	10	3	4	1.8	3.2	1.3	1.3	50	-	2
SWTG2	29/11/2022	Sample taken		-	-	35.3	-	44	5.72	-	-	6	32	8.4	<5	8.4	5	6.1	1.8	1.4	2.4	1.5	130	-	3.9
SWTG2	17/01/2023	9:10:00 AM Sample taken		4.3	-	28.9	66.7	31	8.73	66.4	34	41	-	7.4	<5	7.4	1.7	3	1.3	1.1	0.84	2	120	<1	<1
SWTG2	24/01/2023	11:20:00 AM Sample taken		4.1	-	28.2	191.9	24.6	5.67	69.1	57	38	-	7.4	<5	7.4	1.6	1.6	0.87	0.86	0.85	2	40	<1	<1
SWTG2	31/01/2023	12:25:00 PM Sample taken		4.4	0.3	29.2	82.2	33.1	6.02	28.2	20	13	-	8.5	<5	8.5	1.9	3.8	1.2	0.99	0.63	2.1	53	<1	<1
SWTG2	6/02/2023	12:00:00 PM Sample taken		-	-	29.6	60.6	41.3	5.46	28.5	24	14	-	9.2	<5	9.2	4.3	5.4	1.6	1.5	0.8	2.8	60	<1	<1
SWTG2	7/02/2023	9:30:00 AM SWL only		4.82	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	14/02/2023	2:15:00 PM Sample taken		4.68	0.3	29.6	156.3	59.1	5.32	22.4	31	7	-	9.2	<5	9.2	2.2	9.1	2.5	2.1	0.74	2.8	38	<1	<1
SWTG2 DUPLICATE	14/02/2023	2:15:00 PM Sample taken		-	-	29.6	156.3	59.1	5.32	22.4	31	13	-	9.1	<5	9.1	2.3	9.4	2.6	2.1	0.77	2.9	33	<1	<1
SWTG2	21/02/2023	11:25:00 AM Sample taken		4.9	-	28.3	109	60	5.85	15.4	33	<5	-	11	<5	11	2.6	9.2	2.8	2.2	0.89	3.1	37	<1	<1
SWTG2	28/02/2023	12:55:00 PM Sample taken		3.66	0.2	28.6	87.6	37	5.38	30.2	19	14	-	7.3	<5	7.3	2	5.1	1.5	1.3	0.88	2.8	94	<1	<1
SWTG2	8/03/2023	2:40:00 PM SWL Only		4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	13/03/2023	12:45:00 PM Sample taken		4.66	-	29.7	87.6	139	5.44	9.94	120	15	-	6.8	<5	6.8	2.5	43	6.3	5.9	1	3.7	45	<1	<1
SWTG2	21/03/2023	1:20:00 PM Sample taken		4.88	-	30.2	96	132.3	5.61	3.75	100	<5	-	7.1	<5	7.1	2.5	46	6.7	6.3	0.98	3.7	37	<1	<1
SWTG2	28/03/2023	12:40:00 PM Sample taken		5.1	-	30.3	61.8	154.9	5.41	3.5	120	5	-	7.7	<5	7.7	2.5	46	8.2	7.5	1.2	4.1	34	<1	1
SWTG2	14/04/2023	11:00:00 AM SWL only		5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Minimum						28.2	60.6	11	4.55	-	19	5	1.7	3	<3.6	5	1	1	0.5	0.7	0.6	0.6	10	0	1
Maximum						36.3	191.9	362.9	8.73	-	120	74	840	37	N/A	37	11	98	17	12	3.2	14	6400	0	12
Short term median						29.6	87.6	59.1	5.46	22.4	33	14	-	7.7	N/A	7.7	2.3	9.1	2.5	2.1	0.85	2.8	40	N/A	N/A
Long term median						29.6	-	49.5	6.02	-	-	20	25	9.15	N/A	9.2	2.5	6	2	1.7	1	2.85	53	-	2
Mean						30.7	105.1	89.5	6	27.3	51.1	26.6	56.3	10.2	N/A	10.3	3	24.2	4.8	3.5	1.4	3.5	257	N/A	2.3
Standard Deviation						2.8	41.9	59.9	0.8	21.1	37.4	17.5	149.7	5.8	0	5.7	2.1	18.8	3	2.2	0.5	2.3	1009.6	N/A	2.8

Site	Date/ Time	Time	Sample	Metals Dissolved												Metals Total											
				Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.1	1	1	1	10	1	1	0.05	1	0.05	1	10	1	1	0.1	1	1	1	10	1	1	0.05	1	0.05
WDL-249 Discharge Trigger Values SWTG2				0.2	1	1.4	1.4	2700	3.4	1900	0.6	11	0.05	8	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG2	9/03/2016			0.24	0.3	1.1	5.01	178	0.23	54.5	-	3.86	-	31.5	1760	-	2.05	0.32	1.9	1.73	6.87	1650	2.58	72.5	-	4.63	-
SWTG2	11/04/2016			3.7	0.1	13.8	12.2	42	0.03	922	-	35.2	-	199	543	-	0.85	3.94	0.7	13.8	16.8	710	0.48	901	-	35	-
SWTG2	25/04/2016			8.18	0	33	17.3	14	0.17	2610	-	86.3	-	367	2860	-	2.25	8.28	2.2	34.7	27.6	2300	2.24	2710	-	90.7	-
SWTG2	10/05/2016			8.3	0	52.6	35.9	6	0.06	3620	-	95.6	-	366	606	-	0.8	8.24	0.3	53.7	38.7	798	0.33	3770	-	97.3	-
SWTG2	23/05/2016			2.58	0	26.5	6.62	18	0.01	2600	-	42.3	-	176	154	-	1	2.72	0.3	26.7	8.31	586	0.36	2650	-	42.7	-
SWTG2	28/11/2016			0.4	1	<1	5	170	<1	16	-	4	-	23	500	-	1	0.6	<1	<1	7	550	1	49	-	4	-
SWTG2	20/12/2016			<0.1	<1	<1	3	200	<1	1	-	<1	-	4	3200	-	5	1.1	6	9	21	6900	460	9	-	9	-
SWTG2	11/01/2017			0.1	<1	<1	2	200	<1	10	-	1	-	6	620	-	1	0.3	1	2	4	1400	2	99	-	2	-
SWTG2	12/03/2017			<0.1	<1	<1	<1	160	<1	<5	-	<1	-	<1	560	-	30	<0.1	<1	<1	2	820	4	16	-	<1	-
SWTG2	26/03/2017			<0.1	<1	<1	1	180	<1	<5	-	2	-	6	240	-	1	<0.1	<1	<1	2	410	<1	28	-	3	-
SWTG2	3/05/2017			1.1	<1	6	6	140	<1	320	-	13	-	58	150	-	1	1.1	<1	6	9	790	<1	310	-	13	-
SWTG2	22/02/2019		Sample taken	0.3	<1	1	6	220	<1	74	-	4	-	66	300	-	2	0.5	<1	2	10	1700	1	120	-	5	-
SWTG2	7/03/2019		Sample taken	1.6	<1	8	6	10	<1	460	-	15	-	140	140	-	2	1.7	<1	7	950	1	460	-	16	-	
SWTG2	11/04/2019		Sample taken	0.1	<1	<1	3	490	<1	8	-	3	-	75	550	-	<1	0.2	<1	1	4	860	1	56	-	3	-
SWTG2	19/01/2020		Sample taken	1.3	<1	2	21	810	<1	150	-	8	-	56	530	-	150	1.7	1	3	27	1400	4	290	-	8	-
SWTG2	2/02/2020		Sample taken	0.8	<1	<1	11	190	<1	79	-	5	-	28	1200	-	12	1.1	2	3	19	2300	2	160	-	7	-
SWTG2	16/02/2020		Sample taken	1.4	<1	4	12	210	<1	300	-	10	-	44	630	-	6	1.6	<1	6	23	2000	2	350	-	12	-
SWTG2	16/02/2020		Sample taken	<0.1	<1	3	2	330	<1	84	-	1	-	14	270	-	25	<0.1	2	4	3	2600	<1	110	-	2	-
SWTG2	16/02/2020		Sample taken	<0.1	<1	<1	1	500	<1	<5	-	<1	-	2	690	-	3	0.3	1	2	2	3700	2	160	-	1	-
SWTG2	15/03/2020		Sample taken	0.2	<1	<1	3	220	<1	21	-	5	-	31	360	-	6	<0.1	<1	2	5	1500	1	95	-	6	-
SWTG2	13/01/2021		Sample taken	0.2	<1	<1	5	220	<1	26	-	3	-	16	570	-	8	0.3	1	1	7	1400	1	62	-	<1	-
SWTG2	28/01/2021		Sample taken	0.2	<1	<1	5	230	<1	48	-	3	-	9	340	-	5	0.3	<1	2	10	1300	<1	90	-	6	-
SWTG2	17/02/2021		Sample taken	<0.1	<1	<1	1	170	<1	19	-	2	-	8	650	-	1	<0.1	<1	1	3	960	1	38	-	3	-
SWTG2	24/02/2021		Sample taken	<0.1	<1	<1	1	210	<1	6	-	1	-	5	620	-	1	<0.1	<1	<1	2	970	1	33	-	2	-
SWTG2	11/03/2021		Sample taken	0.2	<1	2	3	130	<1	110	-	5	-	22	420	-	2	0.3	<1	2	5	1100	<1	110	-	5	-
SWTG2	25/03/2021		Sample taken	<0.1	<1	<1	<1	150	<1	9	-	<1	-	8	250	-	1	<0.1	<1	<1	1	930	<1	31	-	<1	-
SWTG2	8/04/2021		Sample taken	0.2	<1	2	2	150	<1	100	-	4	-	18	130	-	2	0.2	<1	2	4	1200	<1	110	-	4	-
SWTG2	22/04/2021		Sample taken	0.8	<1	5	4	20	<1	310	-	11	-	60	140	-	2	0.7	<1	5	8	920	<1	300	-	11	-
SWTG2	17/05/2021		Sample taken	3.9	<1	17	12	160	<1	1200	-	49	-	230	90	-	5	3.7	<1	16	13	300	<1	1200	-	48	-
SWTG2	19/01/2022		Sample taken	0.4	<1	2	5	230	<1	88	-	8	-	26	340	-	1	0.4	<1	2	6	1200	1	88	-	5	-
SWTG2	3/02/2022		Sample taken	0.1	<1	1	2	230	<1	49	-	3	-	14	290	-	1	0.1	<1	1	3	930	<1	60	-	3	-
SWTG2	3/03/2022		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	16/03/2022		Sample taken	<0.1	<1	<1	2	320	<1	38	-	2	-	7	70	-	1	<0.1	<1	<1	2	510	<1	33	-	2	-
SWTG2	7/04/2022		Sample taken	0.1	<1	<1	2	230	<1	47	-	2	-	7	300	-	2	0.2	<1	1	4	980	<1	61	-	3	-
SWTG2	29/11/2022		Sample taken	0.31	<1	<1	4.9	270	<1	65	-	3.4	-	18	540	-	4.9	0.44	1.1	1.4	9.3	870	<1	86	-	4.9	-
SWTG2	17/01/2023	9:10:00 AM	Sample taken	0.15	<1	1.2	2.5	250	<1	44	<0.05	3.1	<1	26	610	<1	1	0.18	1.1	1.3	1.7	950	1.7	58	<0.05	3.2	<1
SWTG2	24/01/2023	11:20:00 AM	Sample taken	<0.1	<1	<1	1.4	210	<1	21	<0.05	1.5	<1	8.8	860	<1	1.3	<0.1	1.5	1.1	2.4	1300	1.8	43	<0.05	2	<1
SWTG2	31/01/2023	12:25:00 PM	Sample taken	0.12	<1	<1	1.8	180	<1	50	<0.05	2.2	<1	10	420	<1	1.2	0.14	1.1	1.4	2.7	1100	<1	65	<0.05	2.5	<1
SWTG2	6/02/2023	12:00:00 PM	Sample taken	0.16	<1	1.6	2	230	<1	65	<0.05	3.8	<1	15	360	<1	1.7	0.19	1.1	2	3.3	1300	<1	85	<0.05	5	<1
SWTG2	7/02/2023	9:30:00 AM	SWL only	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	14/02/2023	2:15:00 PM	Sample taken	0.25	<1	2.6	2.4	160	<1	110	<0.05	6	<0.05	22	300	<1	1.4	0.26	<1	2.9	3.7	1100	<1	120	<0.05	6.6	<0.1
SWTG2 DUPLICATE	14/02/2023	2:15:00 PM	Sample taken	0.27	<1	2.8	2.6	140	<1	110	<0.05	6.6	<0.05	26	290	<1	1.5	0.28	<1	3	3.9	1100	<1	120	<0.05	6.8	<0.1
SWTG2	21/02/2023	11:25:00 AM	Sample taken	0.27	<1	2.1	2.3	150	<1	110	<0.05	4.7	<0.1	19	250	<1	1.5	0.31	<1	2.5	4.1	1300	<1	110	<0.05	5.4	<0.1
SWTG2	28/02/2023	12:55:00 PM	Sample taken	0.12	<1	1.4	2.9	190	<1	52	<0.05	3.8	<0.05	18	420	<1	1.1	0.21	<1	2.1	3.4	950	1.1	70	<0.05	4.5	<0.05
SWTG2	8/03/2023	2:40:00 PM	SWL Only	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SWTG2	13/03/2023	12:45:00 PM	Sample taken	1.4	<1	12	5.1	120	<1	390	<0.05	39	<0.05	170	270	<1	1.1	1.5	<1	12	7.7	420	<1	350	<0.05	39	<0.05
SWTG2	21/03/2023	1:20:00 PM	Sample taken	1.2	<1	11	3.6	110	<1	410	<0.05	35	<0.05	140	190	<1	1.1	1.1	<1	11	5.6	390	<1	460	<0.05	37	<0.05
SWTG2	28/03/2023	12:40:00 PM	Sample taken	1.2	<1	14	3.5	160	<1	560	<0.05	40	<0.05	150	140	<1	1.3	1.1	<1	13	5	390	<1	590			

Site	Date/ Time	Time	Sample	Zn	Field comments
				µg/L	
				1	
WDL-249 Discharge Trigger Values SWTG2				-	
SWTG2	9/03/2016			37	No field observations
SWTG2	11/04/2016			198	Really low flow, approx 1m deep.
SWTG2	25/04/2016			383	Water just flowing
SWTG2	10/05/2016			379	Very low flow, 2m deep
SWTG2	23/05/2016			180	Clear, very low flow
SWTG2	28/11/2016			28	
SWTG2	20/12/2016			47	
SWTG2	11/01/2017			12	
SWTG2	12/03/2017			3	
SWTG2	26/03/2017			12	
SWTG2	3/05/2017			61	
SWTG2	22/02/2019		Sample taken	93	
SWTG2	7/03/2019		Sample taken	140	
SWTG2	11/04/2019		Sample taken	93	
SWTG2	19/01/2020		Sample taken	64	
SWTG2	2/02/2020		Sample taken	44	
SWTG2	16/02/2020		Sample taken	67	
SWTG2	16/02/2020		Sample taken	19	
SWTG2	16/02/2020		Sample taken	6	
SWTG2	15/03/2020		Sample taken	48	
SWTG2	13/01/2021		Sample taken	19	Car access. Sunny location, very hot. High flow. Brown turbid water.
SWTG2	28/01/2021		Sample taken	23	Car access. Sunny day. Lots of weed. High flow. Brown turbid water.
SWTG2	17/02/2021		Sample taken	11	Very high water level and high flow.
SWTG2	24/02/2021		Sample taken	7	Very high water level and high flow.
SWTG2	11/03/2021		Sample taken	29	Medium water level. High flow.
SWTG2	25/03/2021		Sample taken	12	High water level. High flow.
SWTG2	8/04/2021		Sample taken	20	Medium water level. High flow.
SWTG2	22/04/2021		Sample taken	58	Medium water level. Medium flow.
SWTG2	17/05/2021		Sample taken	220	Low water level. Very low flow.
SWTG2	19/01/2022		Sample taken	28	Van Dorn used to sample from bridge. Brown, turbid. Approx. 0.33m/s flow rate
SWTG2	3/02/2022		Sample taken	15	Sample taken by Van Dorn from bridge, grey, turbid, high flow.
SWTG2	3/03/2022	-	-	-	Brown, turbid, sample taken by Van Dorn from bridge. Approx. 0.5 m/s flow rate.
SWTG2	16/03/2022		Sample taken	9	Taken with Van Dorn, fast flowing, brown, turbid.
SWTG2	7/04/2022		Sample taken	13	Brown, turbid, sampled with Van Dorn, approx. 0.5 m/s flow rate.
SWTG2	29/11/2022		Sample taken	28	Brown, still, turbid.
SWTG2	17/01/2023	9:10:00 AM	Sample taken	30	6 Filters, brown, turbid, indication of recent higher flows, telemetry set up and online
SWTG2	24/01/2023	11:20:00 AM	Sample taken	8.6	Flowing, turbid, flow 0.2m/sec
SWTG2	31/01/2023	12:25:00 PM	Sample taken	13	5 Filters, flowing, water level broke banks yesterday >4m, turbid, archer fish at surface, 0.3m/sec
SWTG2	6/02/2023	12:00:00 PM	Sample taken	32	6 Filters, Sampled at bridge, flowing, turbid
SWTG2	7/02/2023	9:30:00 AM	SWL only	-	-
SWTG2	14/02/2023	2:15:00 PM	Sample taken	27	5 Filters, murky, foam on surface, flowing, dropped flow meter pole in water, retrieved.
SWTG2 DUPLICATE	14/02/2023	2:15:00 PM	Sample taken	32	5 Filters,
SWTG2	21/02/2023	11:25:00 AM	Sample taken	25	4 Filters, flowing, turbid brown, leaf litter, archer fish at sampling site, water level too shallow to measure flow,
SWTG2	28/02/2023	12:55:00 PM	Sample taken	20	5 Filters, Fast flow, turbid brown
SWTG2	8/03/2023	2:40:00 PM	SWL Only	-	No sample taken, no discharge, too low for flow measurement
SWTG2	13/03/2023	12:45:00 PM	Sample taken	160	2 Filters, grey, murky. clear to bottom, good flow, no flow measurement taken as waterlevel too low
SWTG2	21/03/2023	1:20:00 PM	Sample taken	140	2 Filters, low level, sampled from bridge, clear to bottom, slightly grey,
SWTG2	28/03/2023	12:40:00 PM	Sample taken	160	2 Filters, flowing, clear to bottom, perch undertrees, low water level
SWTG2	14/04/2023	11:00:00 AM	SWL only	-	-
Minimum				3	
Maximum				220	
Short term median				30	
Long term median				28	
Mean				67.9	
Standard Deviation				50.3	

Site	Date/ Time	Time	Sample	Field Parameters							Lab Inorganics			Alkalinity as CaCO3			Anions Dissolved		Cations Dissolved						
				SWL	Flow	Temp	DO	EC	pH	Turbidity	TDS	TSS	Turbidity	HCO ₃	CO ₃	Total	Cl-	SO ₄ ²⁻	Ca	Mg	K	Na	Al	Sb	As
				mRL	m/ Sec	°C	%	µS/cm	Units	NTU	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L
				Laboratory Levels of Reporting							5	5	0.1	5	5	5	1	1	0.5	0.5	0.5	0.5	10	1	1
WDL-249 Discharge Trigger Values SWTG2							85-120	250	5.8-8.0	87	-	54	-	-	-	-	295	-	-	-	-	295	9	13	
SWTG3A	31/01/2023	8:30:00 AM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG3A	28/02/2023	12:00:00 PM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG3A	28/03/2023	12:00:00 PM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG3	9/03/2016		Sample taken	-	-	-	-	43	7.2	-	30	43	7	<1	7	1.7	6.4	2.1	1.5	1.5	2.2	148	-	0.75	
SWTG3	22/02/2019		Sample taken	-	-	-	-	72	6.6	-	20	21	12	<5	12	3	10	3.5	2.5	1.7	3.9	20	-	<1	
SWTG3	7/03/2019		Sample taken	-	-	-	-	110	6.5	-	12	5.7	16	<5	16	3	22	6.4	4.6	2	4.3	<10	-	<1	
SWTG3	11/04/2019		Sample taken	-	-	-	-	45	6.5	-	85	40	9	<5	9	4	5	2	1.5	2.2	3.4	830	-	<1	
SWTG3	16/02/2020		Sample taken	-	-	-	-	80	6.5	-	200	74	16	<5	16	3	15	5.1	3.5	1.7	3.6	30	-	2	
SWTG3	15/03/2020		Sample taken	-	-	-	-	56	6.4	-	1700	1600	14	<5	14	3	8	2.6	2.2	1.3	3.1	40	-	<1	
SWTG3	29/01/2023	9:45:00 AM	Sample taken	-	-	28.6	92.6	53	7.3	52.3	62	43	7	<1	7	2	18	2.3	1.7	1.5	2.2	70	<1	1.2	
SWTG3	6/02/2023	11:05:00 AM	Sample taken	-	-	29.7	112	55	6.6	21.2	45	220	74	13	<5	14	2	15	5.1	3.5	2	3.6	30	<1	2
SWTG3	28/03/2023	3:40:00 PM	Sample taken	-	-	30.2	97.2	46	6.5	6.2	88	13	16	16	<5	16	3	22	6.4	4.6	2	4.3	<10	<1	<1
Minimum								43	6.4	-	12	5.7	7	N/A	7	1.7	5	2	1.5	1.3	2.2	N/A	N/A	0.75	
Maximum								110	7.3	-	1700	1600	16	N/A	16	4	22	6.4	4.6	2.2	4.3	830	-	2	
Short term median						29.7	97.2	55	7.3	52.3	88	220	74	16	N/A	16	3	22	6.4	4.6	2	4.3	70	N/A	2
Long term median								55	6.5	-	30	43	13	N/A	14	3	15	3.5	2.5	1.7	3.6	40	-	1.6	
SWTG1A	9/03/2016		Sample taken	-	-	-	-	21	6.9	-	80	98	4	<1	4	1.5	1.1	0.6	0.5	1.6	1.5	167	-	0.65	
SWTG1A	11/04/2016		Sample taken	-	-	-	-	43	7.1	-	<10	6	14	<1	14	2.5	1.3	1.9	1.5	1	3.8	114	-	1.1	
SWTG1A	25/04/2016		Sample taken	-	-	-	-	70	6.8	-	30	12	17	<1	17	6.9	1.3	2.4	1.7	3.3	6.6	144	-	0.85	
SWTG1A	10/05/2016		Sample taken	-	-	-	-	50	6.9	-	<10	6	18	<1	18	3.3	1.2	2	1.7	1.4	3.7	134	-	1.15	
SWTG1A	23/05/2016		Sample taken	-	-	-	-	53	7.1	-	<10	9	14	<1	14	3.8	1.2	1.9	1.7	1.7	3.8	154	-	0.8	
SWTG1A	28/11/2016		Sample taken	-	-	-	-	28	6.6	-	110	310	12	<5	12	1	1	1.4	0.9	2.7	1.3	450	-	<1	
SWTG1A	20/12/2016		Sample taken	-	-	-	-	26	6.7	-	-	83	<5	<5	2	<1	1.5	0.8	1.8	1.3	150	-	<1		
SWTG1A	11/01/2017		Sample taken	-	-	-	-	24	6.8	-	51	120	10	<5	10	<1	2	1.1	0.9	1	2.6	200	-	<1	
SWTG1A	12/03/2017		Sample taken	-	-	-	-	11	6.3	-	44	65	<5	<5	<5	<1	0.5	<0.5	0.7	0.7	210	-	<1		
SWTG1A	26/03/2017		Sample taken	-	-	-	-	27	6.3	-	84	63	9	<5	6	2	3	1.5	1	0.8	1.8	170	-	<1	
SWTG1A	3/05/2017		Sample taken	-	-	-	-	47	6.9	-	<5	8.4	21	<5	21	3	3	1.5	1.2	1.7	4.4	80	-	2	
SWTG1A	22/02/2019		Sample taken	-	-	-	-	36	7	-	9	18	13	<5	13	2	1	1.3	1.2	1.2	3.3	40	-	<1	
SWTG1A	7/03/2019		Sample taken	-	-	-	-	37	6.8	-	9	5.7	15	<5	15	2	<1	1.7	1.4	1.2	3.3	20	-	<1	
SWTG1A	11/04/2019		Sample taken	-	-	-	-	32	6.6	-	28	43	9	<5	9	3	<1	0.9	0.8	1.4	2.8	650	-	<1	
SWTG1A	19/01/2020		Sample taken	-	-	-	-	41	6.4	-	9	24	13	<5	13	3	<1	1.9	1.4	2.1	720	-	2		
SWTG1A	2/02/2020		Sample taken	-	-	-	-	38	6.6	-	78	130	10	<5	10	2	3	1.8	2	2.3	5.5	100	-	3	
SWTG1A	16/02/2020		Sample taken	-	-	-	-	36	6.6	-	21	180	13	<5	13	3	<1	1.8	1.3	1	2.6	90	-	1	
SWTG1A	15/03/2020		Sample taken	-	-	-	-	32	7.2	-	130	94	15	<5	15	2	<1	1.2	1	0.8	3.2	40	-	1	
SWTG1A	15/03/2020		Sample taken	-	-	-	-	34	6.6	-	140	94	14	<5	14	3	<1	1.2	1	0.9	3.2	40	-	1	
SWTG1A	29/01/2023	10:40:00 AM	Sample taken	-	-	-	-	-	-	-	18	55	-	11	<5	11	1.8	<1	1.2	0.91	0.7	1.7	98	<1	<1
SWTG1A	14/02/2023	8:30:00 AM	No sample taken	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG1A	28/03/2023	12:00:00 PM	Sample taken	-	-	29.6	70.9	41.3	5.17	15.7	25	9	-	15	<5	15	1.5	<1	1.8	1.5	0.93	3.4	43	<1	<1
Minimum						29.6	70.9	11	5.17	-	18	9	5.7	4	N/A	4	1	1	0.5	0.5	0.7	0.7	20	-	0.65
Maximum						29.6	70.9	70	7.2	-	25	140	310	21	N/A	21	6.9	3	2.4	2	3.3	6.6	720	N/A	3
Short term median						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Long term median						-	-	36	6.75	-	-	47.5	63	13	N/A	13	2	1.3	1.5	1.2	1.2	3.2	134	-	1
SWTG1	16/02/2020		Sample taken	-	-	-	-	220	6.3	-	9	12	25	<5	25	7	66	10	7.1	3	20	<10	-	4	
SWTG1	16/02/2020		Sample taken	-	-	-	-	220	6.3	-	9	12	24	<5	24	7	65	9.7	6.8	3	19	-	-	-	
SWTG1	17/01/2023		Sample taken	-	-	28.9	72.2	27.3	6.35	-	14	38	-	8.1	2.1	<1	0.89	0.74	0.79	2.2	73	<1	<1	<1	
SWTG1	14/02/2023		Sample taken	-	-	27.8	137.7	29.4	5.16	22	17	8	-	9.8	<5	9.8	2.3	1.1	1.2	0.97	0.68	2.9	55	<1	<1
SWTG1	21/03/2023	12:10:00 PM	Sample taken	-	-	30	78.4	41.6	6.08	23.9	22	<5	-	12	<5	12	2.4	1.6	1.2	1.3	0.8	3.3	49	<1	<1
Minimum						27.8	72.2	27.3	5.16	22	14	8	-	8.1	N/A	8.1	2.1	1.1	0.89	0.74	0.68	2.2	49	N/A	N/A
Maximum						30	137.7	220	6.35	23.9	22	38	-	25	N/A	25	7	66	10	7.1	3	20	73	N/A	4
Short term median						28.9	78.4	29.4	6.08	-	17	23	-	9.8	N/A	9.8	2.3	1.35	1.2	0.97	0.79	2.9	55	N/A	N/A
Long term median						28.9	78.4	41.6	6.3	-	17	9	-	12	N/A	12	2.4	33.3	1.2	1.3	0.8	3.3	55	N/A	N/A
TripBlank	22/12/2022		Sample taken	-	-	-	-	-	-	-	-	<5	0.4	<5	<5	<5	<1	<1	<0.50	<0.50	<0.50	<0.50	<10	-	<1
FB	22/12/2022		Sample taken	-	-	-	-	-	-	-	-	<5	0.19	<5	<5	<5	<1	<1	<0.50	<0.50	<0.50	<0.50	<10	-	<1

Site	Date/ Time	Time	Sample	Metals Dissolved												Metals Total												
				Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn	Al	Sb	As	Cd	Cr	Co	Cu	Fe	Pb	Mn	Hg	Ni	Ag	
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.1	1	1	1	10	1	1	0.05	1	0.05	1	10	1	1	0.1	1	1	1	10	1	1	0.05	1	0.05	
WDL-249 Discharge Trigger Values SWTG2				0.2	1	1.4	1.4	2700	3.4	1900	0.6	11	0.05	8	-	-	-	-	-	-	-	-	-	-	-	-		
SWTG3A	31/01/2023	8:30:00 AM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SWTG3A	28/02/2023	12:00:00 PM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SWTG3A	28/03/2023	12:00:00 PM	No access gained	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
SWTG3	9/03/2016		Sample taken	0.1	0.3	0.3	2.68	216	0.2	27.9	-	2.02	-	13	1320	-	1.25	0.14	1.4	0.79	4.95	1450	1.64	45	-	2.98	-	
SWTG3	22/02/2019		Sample taken	0.1	<1	<1	5	160	<1	28	-	3	-	87	270	-	2	0.2	<1	1	8	1400	1	78	-	4	-	
SWTG3	7/03/2019		Sample taken	<0.1	<1	<1	2	50	<1	65	-	2	-	43	80	-	2	0.1	<1	1	4	1200	<1	180	-	3	-	
SWTG3	11/04/2019		Sample taken	0.1	<1	<1	4	560	<1	9	-	3	-	170	850	-	1	0.2	<1	2	6	950	1	83	-	4	-	
SWTG3	16/02/2020		Sample taken	0.1	<1	<1	6	260	<1	31	-	4	-	18	1500	-	17	0.4	3	5	14	4200	6	270	-	8	-	
SWTG3	15/03/2020		Sample taken	<0.1	<1	<1	2	200	<1	<5	-	2	-	6	2200	-	3	0.6	3	5	14	3000	13	330	-	8	-	
SWTG3	29/01/2023	9:45:00 AM	Sample taken	0.1	<1	<1	3	220	<1	33	<0.05	2	<0.05	15	1330	<1	2	0.2	1.2	1	5	1800	2	72	<0.05	4	<0.05	
SWTG3	6/02/2023	11:05:00 AM	Sample taken	0.1	<1	<1	4	250	<1	31	<0.05	4	<0.05	20	1400	<1	12	0.3	3	3	10	1100	3	220	<0.05	5	<0.05	
SWTG3	28/03/2023	3:40:00 PM	Sample taken	<0.1	<1	<1	2	50	<1	65	<0.05	2	<0.05	43	80	<1	2	0.1	<1	1	4	1200	<1	180	<0.05	3	<0.05	
Minimum				N/A	0.3	0.3	2	50	N/A	N/A	N/A	2	N/A	6	80	N/A	1	0.1	N/A	0.79	4	950	N/A	45	N/A	2.98	N/A	
Maximum				0.1	N/A	0.3	6	560	0.2	65	-	4	-	170	2200	-	17	0.6	3	5	14	4200	13	330	-	8	-	
Short term median				0.1	N/A	0	4	250	N/A	65	N/A	4	N/A	43	1400	N/A	12	0.3	3	3	10	1800	3	220	N/A	5	N/A	
Long term median				0.1	N/A	0.3	3	216	N/A	31	-	2.02	-	20	1320	-	2	0.2	3	1	6	1400	2	180	-	4	-	
SWTG1A	9/03/2016		Sample taken	0.04	0.2	0.09	2.39	164	0.22	5.94	-	0.76	-	19.2	2860	-	1.4	0.08	2.8	0.96	5.16	2400	3.81	30.6	-	2.31	-	
SWTG1A	11/04/2016		Sample taken	0	0.2	0.14	1.3	406	0.22	17.7	-	0.54	-	14.6	393	-	1.75	0.02	0.4	0.3	1.95	720	0.44	30.9	-	0.81	-	
SWTG1A	25/04/2016		Sample taken	0.1	0.4	0.22	11.1	256	0.31	39.1	-	1.48	-	120	228	-	1.15	0.14	0.6	0.39	13	494	0.83	56.8	-	1.69	-	
SWTG1A	10/05/2016		Sample taken	0	0.2	0.09	1.38	292	0.18	3.4	-	0.62	-	8.9	260	-	1.4	0.06	0.5	0.27	1.74	466	0.44	69.9	-	0.68	-	
SWTG1A	23/05/2016		Sample taken	0.12	0.2	0.09	3.69	230	0.22	18.4	-	0.86	-	52.1	414	-	1.1	0.14	0.6	0.34	4.87	458	0.69	48.8	-	1.22	-	
SWTG1A	28/11/2016		Sample taken	<0.1	<1	<1	1	320	<1	7	-	<1	-	<1	2900	-	2	<0.1	3	1	4	2900	5	61	-	2	-	
SWTG1A	20/12/2016		Sample taken	<0.1	<1	<1	<1	210	<1	<5	-	<1	-	1	440	-	1	<0.1	<1	<1	3	770	65	2	-	1	-	
SWTG1A	11/01/2017		Sample taken	<0.1	<1	<1	<1	210	<1	<5	-	<1	-	<1	620	-	1	<0.1	1	<1	2	1200	2	32	-	<1	-	
SWTG1A	12/03/2017		Sample taken	<0.1	<1	<1	<1	170	<1	<5	-	<1	-	2	520	-	1	<0.1	<1	<1	2	850	2	23	-	<1	-	
SWTG1A	26/03/2017		Sample taken	<0.1	<1	<1	1	190	<1	6	-	2	-	7	440	-	1	<0.1	<1	<1	2	740	1	64	-	3	-	
SWTG1A	3/05/2017		Sample taken	<0.1	<1	<1	2	340	<1	<5	-	<1	-	<1	70	-	2	<0.1	<1	<1	3	550	<1	19	-	<1	-	
SWTG1A	22/02/2019		Sample taken	<0.1	<1	<1	<1	290	<1	<5	-	<1	-	9	200	-	2	<0.1	<1	<1	<1	1400	<1	18	-	<1	-	
SWTG1A	7/03/2019		Sample taken	<0.1	<1	<1	<1	180	<1	<5	-	<1	-	15	80	-	1	<0.1	<1	<1	<1	750	<1	30	-	<1	-	
SWTG1A	11/04/2019		Sample taken	<0.1	<1	<1	1	420	<1	<5	-	<1	-	46	470	-	<1	<0.1	<1	<1	2	970	<1	21	-	<1	-	
SWTG1A	19/01/2020		Sample taken	<0.1	<1	<1	2	550	<1	28	-	<1	-	7	380	-	2	<0.1	<1	<1	2	710	<1	88	-	<1	-	
SWTG1A	2/02/2020		Sample taken	0.2	<1	<1	2	220	<1	<5	-	4	-	40	1400	-	43	0.4	2	2	4	2500	5	70	-	6	-	
SWTG1A	16/02/2020		Sample taken	<0.1	<1	<1	1	310	<1	<5	-	<1	-	3	410	-	1	<0.1	<1	<1	2	1400	<1	26	-	<1	-	
SWTG1A	15/03/2020		Sample taken	<0.1	<1	<1	<1	290	<1	<5	-	<1	-	1	750	-	3	<0.1	1	<1	2	2200	2	51	-	1	-	
SWTG1A	15/03/2020		Sample taken	<0.1	<1	<1	<1	280	<1	<5	-	<1	-	1	710	-	3	<0.1	1	<1	2	2200	2	51	-	1	-	
SWTG1A	29/01/2023	10:40:00 AM	Sample taken	<0.1	<1	<1	1	200	<1	9.3	<0.05	<1	<1	1.7	610	<1	<1	<0.1	1.2	<1	2.2	1000	1.4	38	<0.05	<1	<1	
SWTG1A	14/02/2023	8:30:00 AM	No sample taken	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
SWTG1A	28/03/2023	12:00:00 PM	Sample taken	<0.1	<1	<1	<1	380	<1	21	<0.05	<1	<0.05	1.9	180	<1	1.7	<0.1	1.1	<1	<1	1300	<1	31	<0.05	<1	1.7	
Minimum				0	0.2	0.09	1	164	0.18	3.4	-	0.54	-	1	70	-	1	0.02	0.4	0.27	1.74	458	0.44	2	-	0.68	N/A	
Maximum				0.2	0.4	0.22	11.1	550	0.31	39.1	N/A	4	N/A	120	2900	N/A	43	0.4	3	2	13	2900	65	88	N/A	6	1.7	
Short term median				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Long term median				0.07	0.2	0.09	1.38	280	0.22	13.5	-	0.86	-	8.0	440	-	1.4	0.11	1	0.68	2	970	2	32	-	1.22	-	
SWTG1	16/02/2020		Sample taken	<0.1	<1	2	2	20	<1	250	-	1	-	10	150	-	11	<0.1	<1	3	2	1700	2	350	-	1	-	
SWTG1	16/02/2020		Sample taken	-	-	-	-	-	-	-	-	-	-	-	110	-	10	<0.1	<1	3	2	1600	2	320	-	1	-	
SWTG1	17/01/2023		Sample taken	<0.1	<1	<1	1.2	220	<1	14	<0.05	<1	<1	9.5	540	<1	1.1	<0.1	1.1	<1	2.3	1000	1.7	72	<0.05	<1	<1	
SWTG1	14/02/2023		Sample taken	<0.1	<1	<1	<1	230	<1	13	<0.05	<1	<0.05	<1	240	<1	1.1	<0.1	<1	<1	<1	1000	<1	24	<0.05	<1	<0.1	
SWTG1	21/03/2023	12:10:00 PM	Sample taken	<0.1	<1	<1	<1	330	<1	17	<0.05	1.3	<0.05	6.3	260	<1	1.6	<0.1	<1	<1	1.2	1300	<1	26	<0.05	1.8	0.078	
Minimum				N/A	N/A	N/A	1.2	20	N/A	13	N/A	1	N/A	6.3	110	N/A	1.1	N/A	N/A	N/A	1.2	1000	1.7	24	N/A	1	N/A	
Maximum				N/A	N/A	2	2	330	N/A	250	N/A	1.3	N/A	10	540	N/A	11	N/A	1.1	3	2.3	1700	2	350	N/A	1.8	0.078	
Short term median				N/A	N/A	N/A	N/A	230	N/A	14	N/A	1.3	N/A	7.9	260	N/A	1.1	N/A	1.1	N/A	1.75	1000	N/A	26	N/A	N/A	N/A	
Long term median																												

Site	Date/ Time	Time	Sample	Zn		Field comments
				µg/L		
				1		
WDL-249 Discharge Trigger Values SWTG2				-		
SWTG3A	31/01/2023	8:30:00 AM	No access gained	-	-	
SWTG3A	28/02/2023	12:00:00 PM	No access gained	-	-	
SWTG3A	28/03/2023	12:00:00 PM	No access gained	-	-	
SWTG3	9/03/2016		Sample taken	16.2		
SWTG3	22/02/2019		Sample taken	110		
SWTG3	7/03/2019		Sample taken	63		
SWTG3	11/04/2019		Sample taken	160		
SWTG3	16/02/2020		Sample taken	46		
SWTG3	15/03/2020		Sample taken	42		
SWTG3	29/01/2023	9:45:00 AM	Sample taken	22		3 Filters, fast flow, turbid brown, eery
SWTG3	6/02/2023	11:05:00 AM	Sample taken	56		4 Filters, flowing, bamboo along edge, monitor spotted on way in, turbid
SWTG3	28/03/2023	3:40:00 PM	Sample taken	63		2 Filters, slow flow, brown, small fish, debris caught on branch upstream
Minimum				16.2		
Maximum				160		
Short term median				63		
Long term median				56		
SWTG1A	9/03/2016		Sample taken	34.2		No field observations
SWTG1A	11/04/2016		Sample taken	23.8		1m w, 0.1m d, 0.01m/s f, clear
SWTG1A	25/04/2016		Sample taken	131		Small pool, not running, clear
SWTG1A	10/05/2016		Sample taken	20.4		Pooled water, 0.5m deep, not running
SWTG1A	23/05/2016		Sample taken	88.3		Clear, very low flow
SWTG1A	28/11/2016		Sample taken	5	-	
SWTG1A	20/12/2016		Sample taken	4	-	
SWTG1A	11/01/2017		Sample taken	3	-	
SWTG1A	12/03/2017		Sample taken	1	-	
SWTG1A	26/03/2017		Sample taken	11	-	
SWTG1A	3/05/2017		Sample taken	<1	-	
SWTG1A	22/02/2019		Sample taken	2	-	
SWTG1A	7/03/2019		Sample taken	5	-	
SWTG1A	11/04/2019		Sample taken	62	-	
SWTG1A	19/01/2020		Sample taken	6	-	
SWTG1A	2/02/2020		Sample taken	73	-	
SWTG1A	16/02/2020		Sample taken	6	-	
SWTG1A	15/03/2020		Sample taken	19	-	
SWTG1A	15/03/2020		Sample taken	19	-	
SWTG1A	29/01/2023	10:40:00 AM	Sample taken	3.2	-	
SWTG1A	14/02/2023	8:30:00 AM	No sample taken	-	-	
SWTG1A	28/03/2023	12:00:00 PM	Sample taken	4.8		3 Filters, flowing, murky, slightly turbid
Minimum				1		
Maximum				131		
Short term median				-		
Long term median				8.5		
SWTG1	16/02/2020		Sample taken	13	-	
SWTG1	16/02/2020		Sample taken	13	-	
SWTG1	17/01/2023		Sample taken	16		6 Filters, brown, flowing, 6m wide
SWTG1	14/02/2023		Sample taken	2.5		5 Filters, good flow, turbid, brown, shaded, bamboo, large trees along bank, station probe out of water
SWTG1	21/03/2023	12:10:00 PM	Sample taken	9.3		4 Filters, brown turbid, low flow, probe end out of water, seen a wave wake from a swimming crocodile head downstr
Minimum				2.5	-	
Maximum				16	-	
Short term median				9.3	-	
Long term median				13	-	
TripBlank	22/12/2022		Sample taken	1.4		No field data
FB	22/12/2022		Sample taken	<1		No field data

Appendix B. Regulatory Communication's Register

Communication Type/Date/ref	Direction	Feedback	Action/response and reference in EMR
20/02/2023 Email Communications	PGO to NT EPA	Notification and update of WDL 249 that a delay to the RO plant construction has delayed operational discharge to March 2023.	No response
13/06/2023 Email Communications	PGO to NTEPA	Notification that no controlled discharge of treated water occurred under WDL 249. Does the DEPWS still require an Annual Return and EMR submitted given that there is no data to report under the WDL 249 programme.	Response to email (19/06/2023) confirming that some monitoring is required regardless of discharge, including sediment and macroinvertebrate monitoring and water quality at the compliance point. That means we will need both of those reports to be submitted
21/08/2023 Email Communications	NTEPA to PGO	Confirmation that Sally Horsnell has authority to speak on behalf for Primary Gold, Toms Gully Mine	Response email from Charles Hastie to confirm Sally Horsnell has authority to speak on behalf of PGO, Toms Gully Mine
24/8/2023 Email Communications	PGO to NTEPA	Confirming reporting requirements for Toms Gully WDL given there was no wastewater discharge.	Response email from Ranid May and Jane Orr 24/08/2023 confirming reporting requirements to WDL 249
25/08/2023 Email Communications	NTEPA to PGO	Ranid May please confirm Toms Gully monitoring version that is be conducted	Response email form Sally Horsnell (29/08/2023) proving an update of the approved Toms Gully water monitoring programme
28/08/2022 Email Communications	NTEPA to PGO	Ranid May please clarify the WDL discharge point provide the correct water monitoring programme to ensure the correct one is used.	Response email form Sally Horsnell providing an update of the approved Toms Gully water monitoring programme
30/08/2023 Email Communications	NTEPA to PGO	Ranid May, request change of site visit to the 20/09/2023	Response email from Sally Horsnell confirming change of date for site visit
08/09/2023 Phone call Communications	NTEPA to PGO	PG's address on Facebook and on the PGO.ASX website is different to what we have on the WDL249 address which is: Suite 23, 513 Hay St, Subiaco, WA 6008. The address on the WDL249 is: Level 26, 140 St Georges Terrace, Perth, WA 6000. Which is the correct/up to date address?	Response email from Charels Hastie. Our office address is Level 26, 140 St Georges Terrace, Perth WA 6000. The other address is PGO old address before we bought them in 2018. We have not ever used Facebook thus the Facebook stuff is from the previous owner. We are a private Australian company and we don't have much of a footprint on the internet. We are not reliant on the stock market and don't have to do public reporting etc. If you are interested our Parent Company is a Hong Kong public company. Their name is China Hanking Holdings. If you google it you will find an internet page. It is in Chinese and English. It has announcements etc. https://www.hankingmining.com/en/finance/
20/09/2023 Site Visit to Toms Gully	NTEPA	Jane Orr and Ranid May from DEPWS were present to conduct a site visit at Toms Gully Mine	Site Visit
04/09/2023 Email Correspondence	PGO to NTEPA	Follow-up email sent to NT EPA in June 2023 for the WDL249 amendment to send good quality water to the Pastoralist from the RO plant .	Response from NTEPA formal letter on 27/09/2023 for WDL 249 Toms Gully reuse of treated effluent.

Communication Type/Date/ref	Direction	Feedback	Action/response and reference in EMR
08/12/2023 Email Correspondence	PGO to NTEPA	Confirming that the EMR is required and whether any changes to structure and content.	Response for Ranid May 08/1/2023 confirming an EMR is required and that no changes to EMR structure and content.
22/12/2023 Email Document Submission	PGO to NTEPA	Submission of Tom Gully WDL 249 EMR and Annual Return	

PRIMARY GOLD PROJECTS WATER QUALITY PRIMARY GOLD PROJECTS WATER MONITORING PROCEDURE

1.1 Purpose

To ensure all surface water sampling is consistent, representative, undertaken in a safe manner and follows best-practice procedures in accordance with relevant standards.

1.2 Scope

This procedure applies to all surface water sampling undertaken at the Primary Gold mining leases located on the Arnhem Highway, approximately 100 km south-east of Darwin. Primary Gold undertake routine water monitoring of surface water bodies upstream, within and downstream of their mining leases. This procedure applies to all water monitoring including the measurement of water quality parameters in the field, and the collection of water samples for subsequent laboratory analysis.

1.3 Standards and other requirements

To ensure the quality and accuracy of the measurements, sampling procedures have been developed in accordance with the following standards and guidelines:

1. Australian Standard on Water Quality Sampling - *Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998);
2. Australian Standard on Water Quality Sampling - *Part 4: Guidance on sampling from lakes, natural and man-made* (AS/NZS 5667.4:1998);
3. Australian Standard on Water Quality Sampling - *Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998);
4. Australian Standard on Water Quality Sampling - *Part 10: Guidance on sampling of waste waters* (AN/NZS 5667.10:1998)
5. ANZECC & ARMCANZ 2000, *Australian Guidelines for Water Quality Monitoring and Reporting*, National Water Quality Management Strategy Paper No 7, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.
6. ANZECC & ARMCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, National Water Quality Management Strategy Paper No 4, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

1.4 Equipment

The following equipment is required when undertaking surface water sampling at all Primary Gold mine leases:

- **Map** showing monitoring sites
- **GPS** with coordinates uploaded for locating sites
- **Folder/clipboard** and waterproof notebook
- **Stationary:** Pens / pencils, permanent markers for completing sample bottle labelling

- **Sample bottles** obtained from Envirolab, ensuring that specific bottles are obtained for each parameter to be tested and appropriate pre-treatment is undertaken (e.g. preservatives). Remember also to prepare a full set of sample bottles for duplicate samples. Also take some spares, especially the glass bottle types.
- **Eskies** with ice or frozen ice bricks
- **Field meters** (pH, temperature, EC, DO, ORP); calibrated on the day of sampling
- **Calibration solutions** in case of issue with field meters (refer to manufacturers calibration instructions)
- **Camera**
- **Sample pole and Jug**
- **Deionised water** to clean equipment between sample sites
- **Syringes and filters** (for dissolved metals)
- **Powder-free gloves**
- **Spare batteries** for camera, GPS and field test meters
- **Chain of Custody (COC) forms** for Envirolab
- **Plastic sleeves** (snap-lock bags) to protect COC forms inside the eskies
- **Consignment (Con) Notes** for freighting samples to Envirolab
- **Tape and security seal** for eskies; also stickers such as address label, fragile, keep chilled etc.
- **Communications equipment** (e.g. mobile/satellite phone, radio, EPIRB)
- **Personal Protective Equipment (PPE)**
- **Garbage bag** for used filters, syringes, gloves and any other waste generated during sampling.

1.5 Procedure

Preparation

1. Gather all equipment listed in Section 0.
2. Bottles may need to be ordered from Envirolab. Contact the laboratory for advice on what bottles are required (certain analytes require particular bottles and preservatives).
3. Put together a package of sample bottles for each site (i.e. in a large snap-lock bag), including bottles for duplicates.
4. Label each bottle with the site name (or duplicate).
5. For metals, tick the box on the bottle label for either filtered or total, depending on whether samples for metals analysis will be filtered in the field.
6. Calibrate the field test meters (e.g. pH, EC, DO, ORP) according to the manufacturer's instructions.
7. Ensure camera and GPS (if required) are fully charged and have sufficient memory.
8. Depending on the number of sites being sampled, prepare a sufficient volume de-ionised water to use for cleaning sampling equipment in the field.
9. Print out required number of blank Field Data Sheets, COC forms and maps.
10. Ensure that ice bricks have been put in the freezer, or sufficient ice is available to chill samples as they are collected.

Field observations and in-situ parameters

1. Record on field sheets the date, time, site name/number, sampler's name, and field observations such as weather conditions, water colour, clarity, water depth, flow rate, any obvious pollution (e.g. rubbish, odours, surface films etc.), flora/fauna, and any other issues that may affect the samples.
 2. Put on gloves.
-

3. Ideally, in-situ readings (e.g. pH, EC, DO, temperature and ORP) are collected directly from the water body being sampled by immersing the meters in the area to be sampled. However, if safety and/or logistical issues preclude this, field readings may need to be taken from the sampling jug.
4. Record the in-situ parameters just below the water surface (between 0.2 and 0.5 m depth), depending on water depth. Alternatively, if collecting samples from various depths (e.g. depth profiling), ensure the field meter is lowered to the desired depth.
5. If collecting field readings from the sampling jug, collect a representative water sample using the jug mounted on a sampling pole. Ensure that the jug/sampler is fully immersed and rinsed at least three times, tipping the rinse water away from (e.g. on the bank), or downstream of, where the sample is to be collected.
6. If sampling flowing waters, ensure that you are standing downstream of where you are sampling so as not to contaminate the sample.
7. Record all the readings on the Field Data Sheet; one sheet to be filled out per site.

Laboratory sample collection

1. Ensure gloves are on.
2. Take out the snap-lock bag full of sample bottles for the site and fill in any remaining information on the labels with the permanent marker (e.g. time, date, and name of sampler.)
3. Unscrew the cap, making sure not to touch the opening of the bottle with your fingers to avoid contaminating the sample. Put the cap upside-down on a clean surface where it won't pick up any contaminants.
4. If safe to do so (i.e. crocodiles), fill the bottles directly from the water body being sampled; otherwise use the jug on the end of the pole to collect a water sample representative of the site.
5. Fully immerse the sample bottle or jug in the water and rinse at least three times before filling. For sample bottles containing preservatives (e.g. nutrients), do not rinse before filling, use the jug to fill these sample bottles. Bottles should be filled from below the water surface (10-20 cm depending on water depth).
6. Make sure that you are standing downstream of where you are sampling so as not to contaminate the sample.
7. If using the jug, pour the water into each sample bottle.
8. Fill each bottle to the top leaving no headspace and screw on the cap.
9. For samples requiring field filtering (e.g. dissolved metals), draw some water into a syringe, put a filter on the end of the syringe, rinse the filter by pushing a few drops of the sample through onto the ground, then fill the bottle leaving no headspace. Depending on the size of the syringe, it may be necessary to draw several syringes-full of water to fill the sample bottle.
10. Put all the sample bottles back in the snap-lock bag and immediately place them in the esky on ice.

Collection of duplicates

1. For duplicate samples, repeat all the above steps outlined above at the site(s) chosen for these samples (generally at least 1 in 10 sample sites, or one per monitoring event). Label the bottles 'Duplicate' as appropriate. Ensure to note which site these samples were collected at on the Field Data Sheet.

Cleaning of field equipment

1. After sampling each site, rinse all sampling equipment (e.g. jugs) with the deionised water.

2. Dispose of used filters, syringes, and gloves appropriately. Consumables are one use only and fresh gloves, syringes and filters are required at each site.

Sample dispatch

1. Once sampling is completed, pack the samples securely in an esky with ice bricks – note that freight companies generally will not allow ice. Ensure that samples have sufficient contact with the ice bricks to stay as cool as possible.
2. Fill out the COC, put in a plastic sleeve (snap-lock bag) and place inside the esky.
3. Tape up the esky and put on address label and stickers as appropriate (e.g. fragile, keep chilled).
4. Fill out consignment note and stick on esky.
5. Deliver samples direct to freight company or organise pick-up, ensuring that samples will be dispatched in time to meet laboratory holding times (usually by 16:00 on day of sampling for overnight priority service).
6. Note that sample dispatch on Friday and Saturday is not acceptable as samples will not be delivered to labs until Monday morning. Therefore, samples with short holding times (i.e. nutrients) cannot be collected on Friday or Saturday. Other parameters with longer holding times can be kept in fridge until dispatch on Sunday or Monday.

Data management

7. All field sheets should be scanned and saved for future reference, and all photographs are to be saved and labelled according to the relevant site name.
1. Field data and site observations are to be recorded in the Water Quality Database immediately following monitoring.
2. Upon receipt of laboratory results, enter data into the Water Quality Database. All laboratory documents (e.g. results, sample receipt notices, certificate of analysis and QA/QC information) should be grouped and saved in the same folder as the database.
3. Data should be compared to guideline values in the database. Any exceedances of guideline values are to be highlighted in red.
4. Data is analysed annually for reporting in the MMP.

1.6 Monitoring program

All Primary Gold mining leases use the following key for water quality analysis.

Appendix D. Macroinvertebrate and Sediment Sampling Report
(AES, 2023)

Toms Gully Aquatic Ecology Baseline Studies

Final Report



This report has been prepared for Hanking as a technical document to continue baseline data collection and assist with future impact assessment.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. As a result, not all relevant site features and conditions may have been identified in this report.

Rainfall data were obtained from external sources. Aquatic Ecology Services has made the assumption that all data has been validated and is correct.

Version	Prepared by	Reviewed by	Review Date
Draft 1.0	T Steele	C Hastie	11/09/2023
Final 2.0	T Steele		

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1. Introduction

1.1 Background

Toms Gully Mine, located near Marrakai in the Northern Territory, has been in operation intermittently since 1988. The project area has operated under the ownership of several different operators, most recently Crocodile Gold until 2013; then after a period of Care and Maintenance, it was divested to Primary Gold. Primary Gold was acquired by Hanking and gained environmental approvals for an underground mining operation at the site in 2020.

Aquatic ecology monitoring has been undertaken at Toms Gully Mine in 2015, and 2017-2022. The surveys to date have gathered data on fish and macroinvertebrate communities as well as habitat information and water quality for Mount Bunday and Coulter Creeks. This resulted in a body of data that was used for the assessment of the impact of a proposed treated mine water release regime. Aquatic ecology monitoring has continued at the site to provide a continuous and robust data set. Data gathered during the baseline monitoring phase will assist in understanding aquatic ecosystem health changes that may result from operations at the Toms Gully Mine Site.

1.2 Catchment

The Toms Gully Mine is located adjacent to Mount Bunday Creek, which flows into Hardies Creek, a tributary of the Mary River Floodplain. The Mary River Coastal Floodplain is unusual in Northern Australia as it is lacking a single major river channel through the floodplain to the ocean. As a result, the floodplain is poorly drained and the inflow channel diffuses into vast seasonal swamps before reaching the sea through a number of tidal channels. The Mary River crossing at the Arnhem Highway is a convenient delineation between the upper (southern) catchment and the floodplains of the lower (northern) catchment. The crossing marks the approximate change in patterns of wet season river flow from channel to sheet flow (Schultz *et al.* 2002).

Coulter Creek is a low order stream, and a tributary of Mount Bunday Creek. The confluence of the two creeks is located approximately 4km downstream of the Arnhem Highway. The Creek originates upstream on the Old Mount Bunday Station, and previous studies have observed impacts at sites on Coulter Creek as a result of cattle access. The riparian zone along Coulter Creek is not continuous, and the greater catchment area has also been cleared for grazing. Mount Bunday Creek is a higher order stream, draining north to Hardies Creek and on to the Mary River. The Riparian zone of Mount Bunday Creek is more intact than Coulter Creek, and clearing of land beyond the riparian zone is more intensive surrounding Toms Gully Mine and downstream than in the upstream area that has been monitored. Although during sampling events there were observable breaks in surface water, where dry sand was present in the creek bed, surface water flow was recorded at most sites. Alluvial groundwater and surface water interact along Mount Bunday Creek, and there is likely an extended period of sub-surface flow in the dry season through the sandy substrates.

1.3 Scope

Aquatic Ecology Services was engaged by Hanking to undertake baseline surveys at the Toms Gully Mine to characterise the existing aquatic health and condition of the receiving environment. The survey included:

- A study design that incorporates locations upstream, within and downstream of the Toms Gully Mine Lease (ML), and as a minimum, assessment of Primary sites SWTG1 (control site) and SWTG2 (potential impact site downstream of Toms Gully Mine).
- Macroinvertebrate sampling and aquatic habitat assessment carried out in accordance with the NT AUSRIVAS Darwin-Daly Region Manual (Lamche 2007)
- Fish community sampling
- Water and sediment quality sampling

This report presents the results of the above monitoring conducted in May 2023.

2. Study design

2.1 Sampling Sites

Aquatic ecology monitoring was undertaken at seven sites in May 2023 (Table 1, Figure 1). Five sites were sampled on Mount Bundey Creek, consisting of three sites upstream of the mine and two sites downstream of the mine. A site downstream of Toms Gully (SWTG3), which has been sampled on a number of occasions previously could not be safely accessed in 2023 and so was not sampled. Two sites were sampled on the reference system Coulter Creek.

Table 1 – Sample site locations visited in May 2023

Site	Site Type	Location	Easting	Northing
SWTG1A	Upstream	Mount Bundey Creek upstream of mine at lease boundary	776351	8580503
SWTG1	Upstream	Mount Bundey Creek at confluence of tributary adjacent to EP1 and EP2	776825	8580290
MBC0	Adjacent	Mount Bundey Creek upstream of tributary draining EP1 and EP2, downstream of WRD	777606	8580736
MBC01A	Downstream	Mount Bundey Creek downstream of wetland oxbow and Toms Gully Mine Tailings Dam 2 (TSF2).	778787	8580437
SWTG2	Downstream	Compliance monitoring point at Arnhem Highway Crossing	779453	8580428
CC02	Reference	Coulter Creek. Approx. 2 km upstream from CK7	778299	8578355
CK7	Reference	Coulter Creek. Existing monitoring site located at highway crossing	779807	8579538

2.2 Survey timing

Sampling has routinely been conducted in the post-wet season during the recessional flow period, to capture data representative of the time of year when compliance monitoring would be undertaken. In 2023, sampling was undertaken in mid-May to target adequate water availability at all sites.



Toms Gully Aquatic Ecology Baseline Studies

Figure 1 - Study sites sampled, May 2023

Data source: ESRI Imagery 2023

Aquatic Ecology Sites

● Upstream

● Adjacent

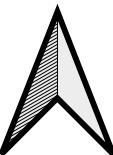
● Downstream

● Reference

0

0.5

1 km



3. Methods

3.1 Habitat assessment

At each site, descriptions of habitat characteristics were recorded following the criteria listed in the Northern Territory AUSRIVAS "Darwin-Daly Region Model" field sheets (Lamche, 2007). Habitat assessments were undertaken in consideration of the whole reach sampled, including:

- Site description
- Water quality
- Instream physical characteristics (flow velocity and depth, instream habitat characteristics, bank height, riparian zone width)
- Riparian vegetation characteristics (types, %cover, exotic species, erosion, land use)
- Water quality observations (clarity, odour, oils, foam/scum, plumes etc.)
- Sketches of the site, including a cross - section of the reach

The information recorded was used to assist interpretation of biological data and to provide input data for the Northern Territory AUSRIVAS model. Data recorded is also used in conjunction with the biological community information as the basis of the overall health assessment.

Photos were taken of upstream and downstream portions of the reach sampled, as well as bank habitat and other key habitat features. This further characterises the habitat conditions at each site, serving as a pictorial record of site conditions that can be tracked over time using photos taken from the same photo points.

3.2 Water and sediment quality sampling

3.2.1 *In situ water quality*

The physico-chemical parameters of the water at each site was measured using a calibrated multi-parameter water quality meter. The following parameters were recorded:

- Water temperature (°C)
- Dissolved oxygen (DO) concentrations (mg/L and % saturation)
- pH
- Electrical conductivity (EC) (µS/cm)
- Turbidity

3.2.2 Water and sediment grab sampling

Water and sediment sampling methods utilised at each site were in accordance with those outlined in ANZECC (2000) and Simpson and Batley (2016) and involved:

- Collection of water samples from below the water surface in the centre of the creek where possible
- The collection of multiple sub-samples of sediment using a spade of inert material and sieving of samples to collect the $\leq 2\text{mm}$ fraction.
- Compositing the sediment sub-samples into a receptacle (also composed of inert material) and mixing the contents.
- The collection of one QA/QC duplicate sample per project area to validate results.
- Collecting a sediment sub-sample from the mixture and placing it into a laboratory-supplied container, labelled with site and sample details.
- Keeping samples in chilled eskies for onward delivery to a NATA accredited laboratory for testing.

Analyses performed on surface waters are detailed in Table 2. Bioavailable metals data (from 1M HCl dilute acid digestion analysis) were analysed for the parameters shown in Table 3.

Table 2 - Testing parameters for water collected at Toms Gully

Suite	Analytes
Physico-chemical	Total dissolved solids (TDS), total suspended solids (TSS), turbidity
Major anions	Alkalinity, chloride, sulfate
Major cations	Calcium, magnesium, sodium, potassium
Metals (dissolved and total)	Aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, uranium, zinc
Cyanide	Free cyanide, weak acid dissociable (WAD) cyanide, total cyanide

Table 3 – Testing parameters for sediments collected at Toms Gully

Lab Analyses	Analytes
1M HCl extractable metals	Aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, uranium, zinc.
Total recoverable metals	Mercury
Cyanide	Free cyanide, weak acid dissociable (WAD) cyanide, total cyanide
Other parameters	Particle size distribution (PSD), total organic carbon (TOC), moisture content.

Updated guideline values are not yet available for the Timor Sea Drainage Division (ANZG 2018). Therefore, *in situ* results were compared against ANZECC (2000) Tropical Australia guideline values for slightly-

moderately disturbed ecosystems (95% species protection). This aligns with the recommendations made by the NT EPA in the Assessment Report (NT EPA 2020).

3.3 Macroinvertebrates

3.3.1 *Field sampling*

Macroinvertebrate sampling and processing followed procedures outlined in the Northern Territory AUSRIVAS Manual for the Darwin-Daly Region (Lamche, 2007). Sampling involved one field team member scraping submerged root matter associated with the lower bank to agitate and remove macroinvertebrates into the water column, while the other field team member swept a dip net through the water column downstream of the edge habitat, to collect the dislodged animals. Areas of riffle or fast flowing habitat, Pandanus roots and severe bank undercuts were avoided when collecting edge habitat samples.

Once collected, the samples were washed through 10 mm and 250 µm mesh sieves. The coarse mesh sieve was examined for large, conspicuous taxa, and these were placed in the labelled sample container. The sample collected in the fine mesh sieve was also placed in the labelled sample container and filled with 70% ethanol. All samples were sent to the macroinvertebrate laboratory for further processing and identification.

3.3.2 *Laboratory processing*

Samples were washed through a series of sieves (10 mm, 500 µm and 250 µm mesh sizes). Any large, conspicuous taxa identified in the 10 mm mesh sieve were added to the contents of the large mesh fraction retained in the field. The contents of the 500 µm mesh sieve were retained for macroinvertebrate identification and enumeration, while the 250 µm fraction was retained as sample residue for quality assurance purposes. The contents of the 500 µm mesh fraction was poured into a Marchant sub-sampler (Marchant, 1989) and extractions made randomly from cells (aliquots) in this apparatus. These extractions were placed under a microscope and the taxa identified and counted. This process continued until either all aliquots were examined, or a total of 200 individuals had been counted and identified. The number of aliquots required to be processed to obtain a minimum 200 individual sub-sample was recorded in order to be able to calculate abundance. A Leica stereo-dissection microscope was used to examine specimens.

Taxa were identified to family level where possible, with the exception of key taxa identified in Lamche (2007), requiring identification to order level (e.g. Conchostraca). Quality assurance processes were followed as per Lamche (2007). Five percent of samples were sent to an external laboratory and checked for correct identification by an AUSRIVAS accredited Senior Taxonomist.

3.3.3 *Data presentation*

Prior to 2021, biological monitoring programs commonly utilised the NT AUSRIVAS Darwin-Daly Early (dry season) Family level Edge habitat model. New guidance on the use of these models in the NT to understand impacts of point source pollution have been published (ANZG 2021). The updated guidance states that the models are not useful in understanding aquatic ecosystem health outside of the large rivers where

macroinvertebrates have been collected, and therefore the use of AUSRIVAS modelling has not taken place on the data collected for this project from 2021.

Macroinvertebrate community indices were calculated for each sample at each site. A summary of the univariate macroinvertebrate indices assessed as part of this study are provided below:

- Taxa richness – Total number of taxa present at the site used as a measure of diversity.
- PET richness – total number of families from orders Plecoptera, Ephemeroptera and Trichoptera. PET taxa are generally more sensitive to disturbance.
- SIGNAL-2 – a biotic index that allocates a value to each macroinvertebrate family based on their sensitivity to pollution. The metric is calculated by averaging the index of all families collected. Lamche (2007) cautions against the use of the SIGNAL-2 index for assessing the status of Northern Territory macroinvertebrate communities. This measure is however, considered appropriate for this study as the number of pollution-sensitive versus pollution-tolerant families does provide some insight to the level of stress that the macroinvertebrate community is experiencing.

In addition to univariate analysis of metrics, an assessment of differences in the macroinvertebrate community composition will be undertaken. NMDS Ordination provides a representation of the relative similarity of entities (i.e. samples) based on their attributes (i.e. macroinvertebrate community composition) within a reduced dimensional space. This process was completed for samples collected on Mount Bunday Creek in 2022.

3.4 Fish Community

Fish sampling was carried out primarily using backpack electrofishing. Electrofishing is a proven technique capable of capturing the majority of taxa present, as it is not size or species specific (as compared to gill nets for instance). Further, it is a nonlethal means of sampling when applied properly and can be used in a way that can provide quantitative data where required. However, at some sites electrofishing was not possible due to safety concerns regarding steep banks, deep pool habitat and the potential presence of estuarine crocodiles. Wherever instances such as these occurred, the field team recorded visual observations (to the best of their ability) regarding fish species present.

Where electrofishing was completed, a single pass from downstream to upstream was completed. All caught fish were identified in the field using appropriate keys (Allen et al. 2003) and counts for each species captured were recorded. The total number of fish captured at each site was derived from that information. All macrocrustaceans (Palaemonidae and Atyidae) caught at a site were also counted. Notes were also taken of any evidence of external lesions, parasites or deformities among the fish specimens collected at each of the study sites.

4. Results and Discussion

The majority of sites were accessible in May 2022, and Table 4 details sampling carried out at each site. A single site downstream of Toms Gully Mine (SWG3) was considered too dangerous to sample for macroinvertebrates, and so a sediment and water quality sample were collected. The site acts as a downstream recovery site, and capturing data on sediment and water quality is important in demonstrating the spatial impact of any passive or active discharges from Toms Gully Mine.

Table 4 – Sampling completed at each site in May 2023

Site	Macroinvertebrate sampling	Fish sampling	Habitat assessment	Water/ Sediment quality
SWG1A	✓		✓	✓
SWG1	✓	✓	✓	✓
MBC0	✓	✓	✓	✓
MBC01A				✓
SWG2	✓	✓	✓	✓
CC02	✓		✓	✓
CK7	✓		✓	✓

4.1 Site Conditions

4.1.1 Climate

Rainfall recorded from a rain gauge located on site at Toms Gully is presented in Figure 2. Rainfall data was recorded on each visit to the TGPA, and therefore each measurement is the total recorded in the period between that date and the last measurement. A total of 1926mm of rain was recorded in 2022/2023, with the highest rainfall recorded in early January. More consistent rainfall was recorded across the remainder of the wet season.

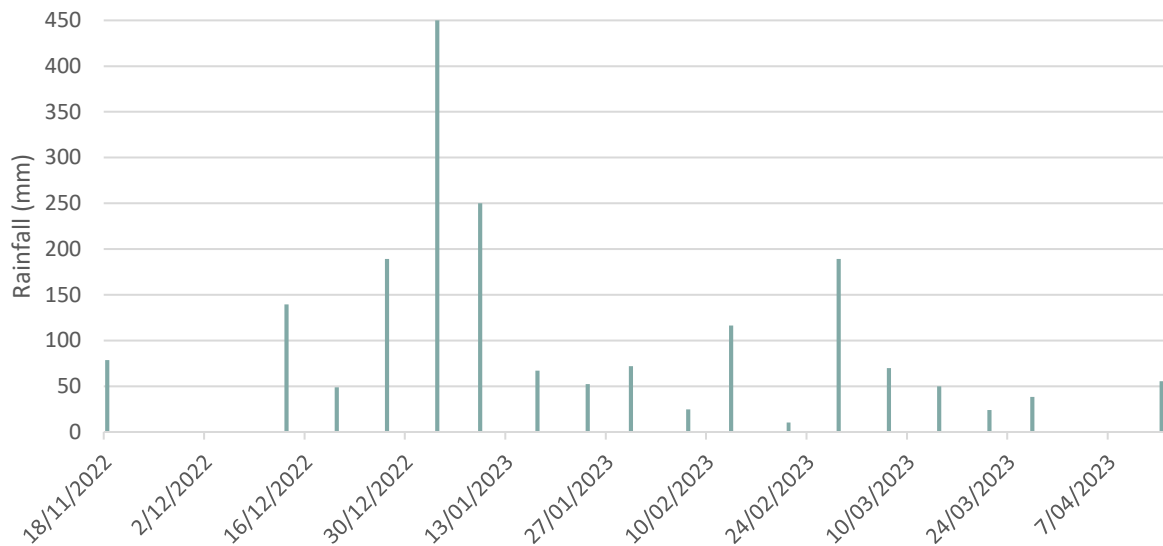


Figure 2 – Monthly Rainfall recorded at Toms Gully November 2022 – April 2023

4.1.2 Catchment flow

The height of Mount Bunday Creek at site SWTG2 is presented below in Figure 3. Spikes in creek height were short and sharp in January, and coincided with rainfall records. Higher and more sustained flow recorded towards the end of February and into March, which didn't match rainfall records well, but it is acknowledged that the TGPA is located low in the Mount Bunday Creek catchment, and is subject to rainfall from a large catchment upstream and active discharge from Rustlers Roost Mine (RRPA). The sustained flow remained steady at SWTG2 from April onwards, particularly for the month leading up to sampling.

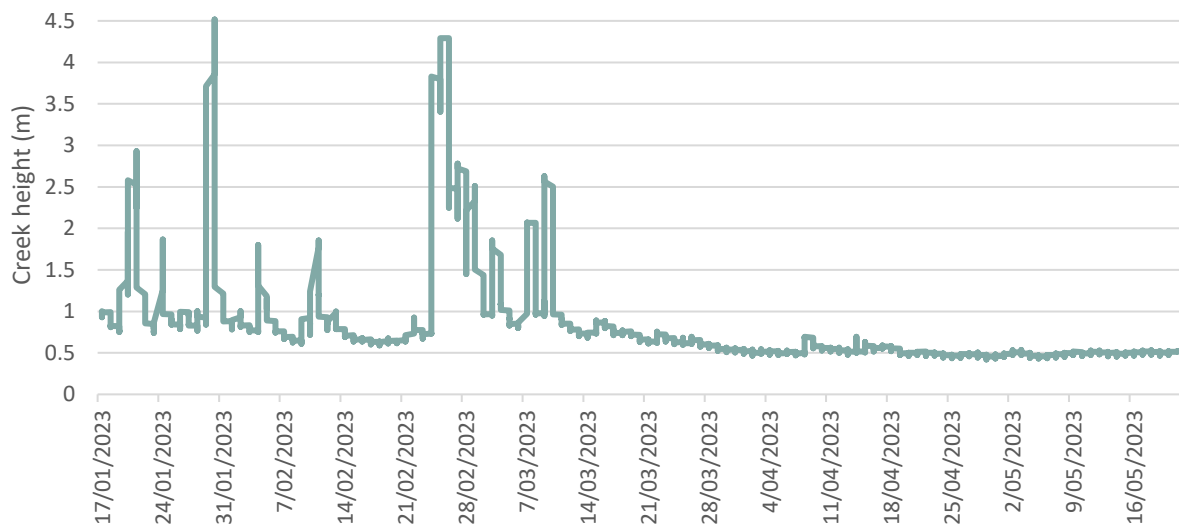


Figure 3 – Creek height at SWTG2 November 2022- April 2023

4.1.3 Site descriptions

A description of habitat characteristics associated with monitoring sites sampled in May 2023 are presented in Table 5 and Table 6, along with site photographs taken at the time of sampling.

Table 5 – Aquatic ecology sampling site descriptions on Mount Bunday Creek, May 2023

Site description	Site photo
SWG1A - Upstream The site was made up of two large pools connected by a shallow run. The creek was lined by a closed canopy of riparian vegetation and shading was high. The left bank was steep, and a mixture of consolidated clay and gravel with sections of bedrock, while the right bank was a gentle slope and consisted of cobbles and pebbles. Bed material was majority pebbles and sand.	
SWG1 – Upstream The site is made up of two large, deep pools, connected by a run. The substrate of both pools was made up of sand and gravel, and the connecting run has substrate made up of pebbles, cobbles and sand. Both banks of the pool are lined by continuous riparian vegetation providing shade and exposed roots. Undercut banks were prevalent, along with leaf packs and small log jams.	
MBC0 – Adjacent The site is located approximately 100m upstream of the confluence between a small, unnamed tributary that drains passive discharge from mining infrastructure. The site was well shaded due to a continuous riparian zone, and presence of trees along banks allowed for exposed roots, large woody debris and leaf packs to be common through the site. The majority of substrate at the site was made up of sand and pebbles. Long gliding pools were connected by shallow runs. And riffles	

Site description	Site photo
SWG2 - Downstream The site is made up two gliding pools connected by runs, and is intersected by a stock crossing. The stock crossing has undergone significant upgrades, which have resulted in erosion and a change in flow through the site from previous years. Downstream of the crossing, the site was a wide, shallow pool. Substrate along the entire reach was a mixture of cobbles, pebbles and sand, with clay banks covered by a film of iron-producing bacteria.	

Table 6 - Aquatic ecology sampling site descriptions on Coulter Creek, May 2023

Site description	Site photo
CC02 - Reference The site is intersected by a ford made of, cobbles and clay. Upstream of the ford was a large, deep pool. Downstream of the ford was a series of pools connected by shallow runs. The creek was shaded by a dense, 5 m wide, native riparian strip on both banks. Beyond the riparian zone was cleared and the land used for grazing and horticulture (mango plantation).	
CK7 - Reference The site is located downstream of the Arnhem Highway and is a routine water quality monitoring location. The surrounding area is made up of cropping and grazing land. The riparian zone and creek itself were in relatively good condition, and included undercut banks, high shading and leaf litter. Algae was observed in shallow areas, which suggests some nutrient enrichment.	

4.2 Water and sediment quality

4.2.1 *In situ water quality*

In situ water quality data is compiled and presented in Table 7, with comparisons made to ANZECC (2000) guideline values. The following observations about the results can be made:

- Temperatures were very similar between sites and ranged between 21.7 and 24.2°C
- Sites on Mount Bunday Creek downstream of influences from evaporation ponds and the oxbow wetland returned lower pH results that were below the guideline range, particularly at MBC01A. All other pH results were within the guideline value range and were circumneutral.
- Dissolved oxygen varied, but was mostly low. High shading within both creeks is likely the cause of lower dissolved oxygen than the guideline range at sites on both creeks. Site CK7, which had far less shading than other sites was within the guideline range.
- Electrical conductivity was above the guideline value range at sites where pH exceeded guidelines on Mount Bunday Creek, as well as at CC02. Conductivity had reduces downstream on Coulter Creek at CK07
- Water clarity was high at all sites, and turbidity was below the guideline value at all sites.

Table 7 – *In situ water quality data collected at aquatic ecology sites in 2023. Guideline exceedances shaded grey*

Site Code	Time	Temp (°C)	pH	DO (%)	DO (mg/L)	EC (µS/cm)	Turbidity (NTU)
Guideline Value (ANZECC 2000)		-	6 – 8	85 – 110		20 – 250	50
SWTG1A	8:52	22.4	6.84	41.59	3.63	33.23	1.72
SWTG1	11:00	23.3	6.74	79.79	6.82	38.47	4.66
MBC0	13:51	23.9	6.21	54.92	4.63	28.97	0.50
MBC01A	8:35	21.8	4.2	62.71	5.53	574.13	22.05
SWTG2	10:00	21.7	5.15	75.72	6.69	417.36	0.70
CC02	15:44	22.6	7.3	54.64	4.72	295.83	6.13
CK07	16:49	24.2	7.42	103.24	8.68	206.83	48.00

4.2.2 Laboratory water quality

Results of laboratory analysis of water quality grab samples from Mount Bunday Creek are presented in Table 8. The following observations are made about the results:

- No exceedances of the GVs for physico-chemical stressors or toxicants were observed at the upstream/adjacent sites (SWG1A, SWG1, and MBC0). Water at these sites had circumneutral pH, was relatively dilute, had low turbidity, and the major ions were dominated by sodium and bicarbonate alkalinity.
- In contrast, multiple exceedances of GVs were observed at downstream sites MBC01A and SWG2. Results were indicative of the influence of acid mine drainage influences:
 - o EC exceeded the DGV at both sites, with some dilution evident at SWG2
 - o pH was below the DGV range at both sites
 - o Turbidity did not exceed the DGV range, though was higher at MBC01A. This was likely related to suspended iron, which has precipitated by SWG2. This is supported by the observed total iron concentrations.
 - o The dominant major ions at MBC01A and SWG2 were calcium/magnesium and sulfate
 - o The DGVs for the following metals were exceeded at both MBC01A and SWG2: Aluminium, Cadmium, Cobalt, Copper, Manganese, Nickel, and Zinc. Cadmium, Nickel, and zinc concentrations also exceeded the Hardness Modified Guideline Values (HMGVs) based on the observed water hardness at each site.
- It is likely that during the wet season, rainfall/runoff and discharges occurring to Mount Bunday Creek upstream had combined to ameliorate poor water quality that may be present as a result of passive discharge from Toms Gully Mine infrastructure. For this reason, the results of this sampling event must be reviewed in the context of previous results from the wet season. The results of this sampling are consistent with previous sampling events, which have shown poor water quality downstream of Toms Gully Mine during the recessional flow period.

Results of laboratory analysis of water quality grab samples from Coulter Creek are presented in Table 9. Results from both sites indicate a potential mining infrastructure and pastoral activity in the headwaters of the Coulter Creek catchment. Dominant major ions at these sites were calcium/magnesium and sulfate and the DGV for copper was exceeded at CK7.

Table 8 – Laboratory derived water quality results from sites within Mount Bunday Creek, guideline exceedances highlighted in blue

Analyte	Units	LOR	Upstream		Adjacent	Downstream		Default Guideline Value
			SWG1A	SWG1	MBC0	MBC01A	SWG2	
Physicochemical parameters								
TSS	mg/L	5	<5	<5	<5	7	<5	NA
TDS	mg/L	5	24	31	20	460	310	NA
Major ions								
Bicarbonate alkalinity	mg/L	5	14	17	7	<5	<5	NA
Carbonate alkalinity	mg/L	5	<5	<5	<5	<5	<5	NA
Total alkalinity as CaCO ₃	mg/L	5	14	17	7	<5	<5	NA
Sulfate as SO ₄	mg/L	1	<1	<1	4	390	320	210
Chloride	mg/L	1	3	2	3	4	4	NA
Calcium	mg/L	0.5	1.4	1.6	2.1	8.5	10	NA
Potassium	mg/L	0.5	0.7	1	<0.5	3	2	NA
Sodium	mg/L	0.5	3	4	2	8.3	7	NA
Magnesium	mg/L	0.5	1	2	1	35	25	NA
Dissolved metals								
Aluminium	µg/L	0.5	<10	<10	10	2300	1000	pH<6.5: 0.8* pH>6.5: 55
Arsenic	µg/L	1	<1	<1	1	4	14	13
Cadmium	µg/L	0.1	<0.1	<0.1	<0.1	7.3	4.9	0.2
Cobalt	µg/L	1	2	<1	<1	100	67	1.4*
Copper	µg/L	1	<1	1	<1	90	37	1.4
Iron	µg/L	2	50	180	150	150	340	-
Manganese	µg/L	0.5	370	42	71	5000	3400	1900
Nickel	µg/L	1	1	<1	<1	210	140	11
Zinc	µg/L	1	3	2	1	670	450	8

*Level of species protection unknown

Table 9 – Laboratory derived water quality results from sites within Coulter Creek, guideline exceedances highlighted in blue

Analyte	Units	LOR	CC02	CK7	Default Guideline Value
Physicochemical parameters					
TSS	mg/L	5	170	130	NA
TDS	mg/L	5	130	110	NA
Major ions					
Bicarbonate alkalinity	mg/L	5	80	34	NA
Carbonate alkalinity	mg/L	5	<5	<5	NA
Total alkalinity as CaCO ₃	mg/L	5	80	34	NA
Sulfate as SO ₄	mg/L	1	88	140	210
Chloride	mg/L	1	7	6	NA
Calcium	mg/L	0.5	21	11	NA
Magnesium	mg/L	0.5	18	11	NA
Potassium	mg/L	0.5	5	3	NA
Sodium	mg/L	0.5	11	8.6	NA
Dissolved metals					
Aluminium	µg/L	10	<10	60	pH>6.5: 55
Arsenic	µg/L	1	<1	1	13
Cadmium	µg/L	0.1	<0.1	<0.1	0.2
Cobalt	µg/L	1	<1	<1	1.4
Copper	µg/L	1	<1	2	1.4
Iron	µg/L	2	20	60	-
Manganese	µg/L	0.5	780	65	1900
Nickel	µg/L	1	3	2	11
Zinc	µg/L	1	1	3	8

4.2.3 Sediment quality

Laboratory derived sediment quality results are presented in Table 10. Given the higher concentration of dissolved metals at sites downstream, it was expected that some accumulation in sediments of those contaminants might be seen, but this did not materialise for the majority of metals.

A single exceedance of the arsenic SQGV-low was recorded in sediments at SWTG2. Acid-extractible arsenic at the site has been elevated previously (Figure 4). The pH result from SWTG2 was acidic and therefore the risk of bioavailability of metals from sediments is raised.

There were no exceedances of guideline values on Coulter Creek, but a number of acid-extractible metals were at higher concentrations at the downstream site.

Table 10 – Sediment quality results from aquatic ecology monitoring sites, May 2023. All results presented in mg/kg

Sample	LOR	SWTG1A	SWTG1	MBC0	MBC01A	SWTG2	CC02	CK7	GV-low	GV-high
Total Organic Carbon (mg/kg)	100	10000	8000	1900	7800	2400	1600	2100	-	-
Total Organic Carbon (%)	-	1	0.8	0.19	0.78	0.24	0.16	0.21	-	-
Aluminium	2	430	100	43	1200	270	160	250	-	-
Arsenic	4	<4	<4	<4	<4	35	<4	<4	20	70
Cadmium	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	10
Cobalt	1	<1	<1	<1	4.8	3.2	1.8	2.7	-	-
Chromium	1	<1	<1	<1	1	<1	<1	<1	80	370
Copper	1	4	1	<1	10	6	<1	2	65	270
Iron	2	1600	590	330	3700	780	590	820	-	-
Lead	2	7	3	2	9	3	10	16	50	220
Manganese	1	38	46	15	130	81	150	160	-	-
Nickel	1	<1	<1	<1	4	2	<1	<1	21	52
Zinc	1	1	2	1	39	20	6	3	200	410

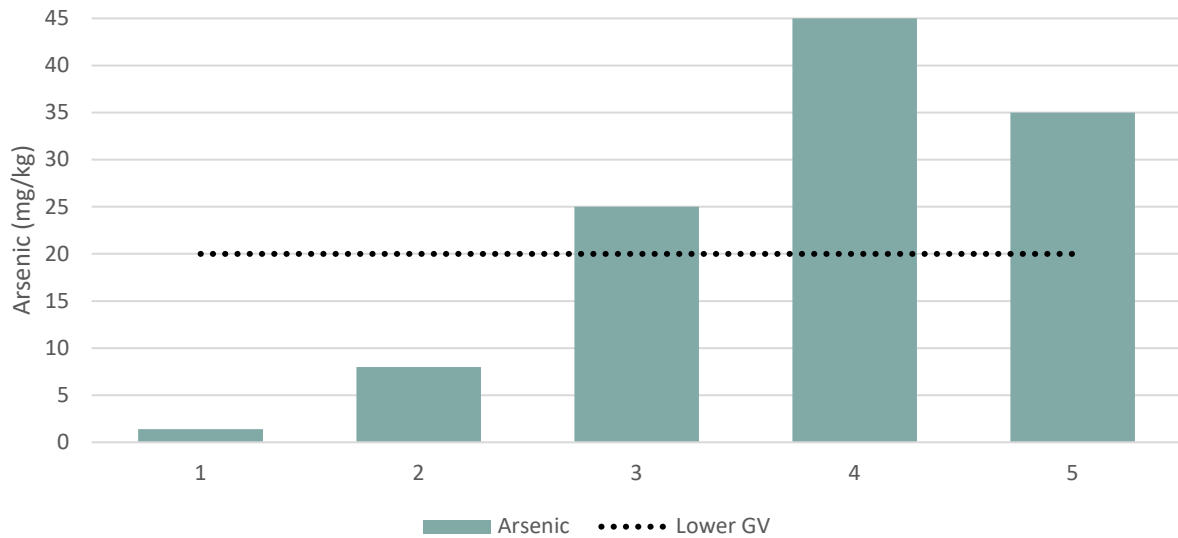


Figure 4 – Acid-extractible arsenic concentrations in sediments at SWTG2 2019-2023

4.3 Macroinvertebrates

4.3.1 Relative abundance

Relative abundance results for all sites sampled in May 2023 are presented below in Figure 5. In general, numbers increased with distance downstream on Mount Bunday Creek, but dropped significantly downstream of mine influences. Control sites showed similar relative abundance at both sites, and downstream samples contained a slightly higher number of taxa.

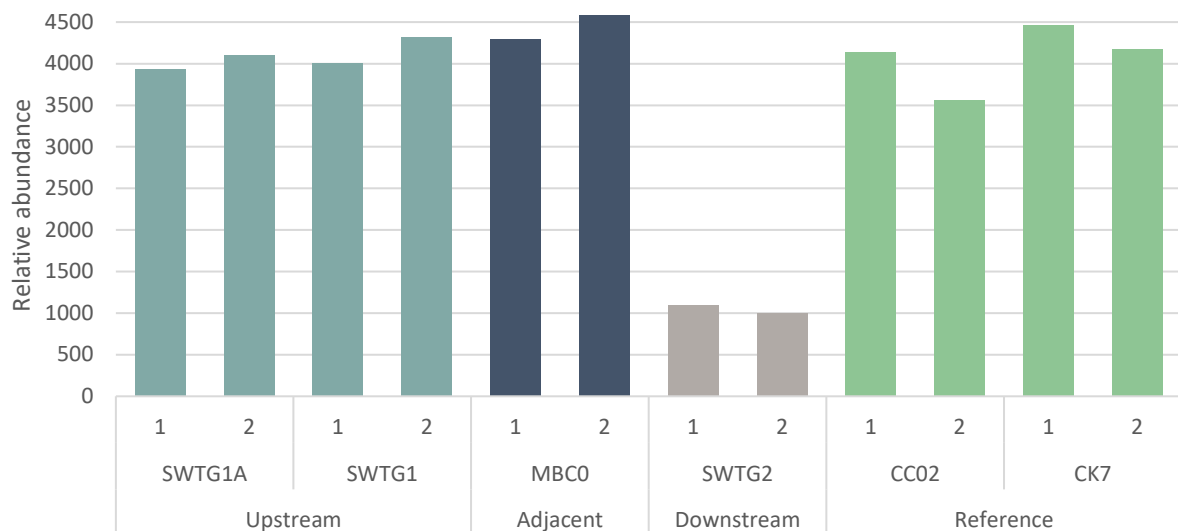


Figure 5 – Relative abundance at sites sampled in May 2023

4.3.2 Taxa richness

Taxa richness results from all sites sampled are presented in Figure 6. Family diversity was highest at MBC0, which matched relative abundance results, and the number of taxa was almost halved downstream at SWTG2. Taxa richness was similar at sites on Coulter Creek.

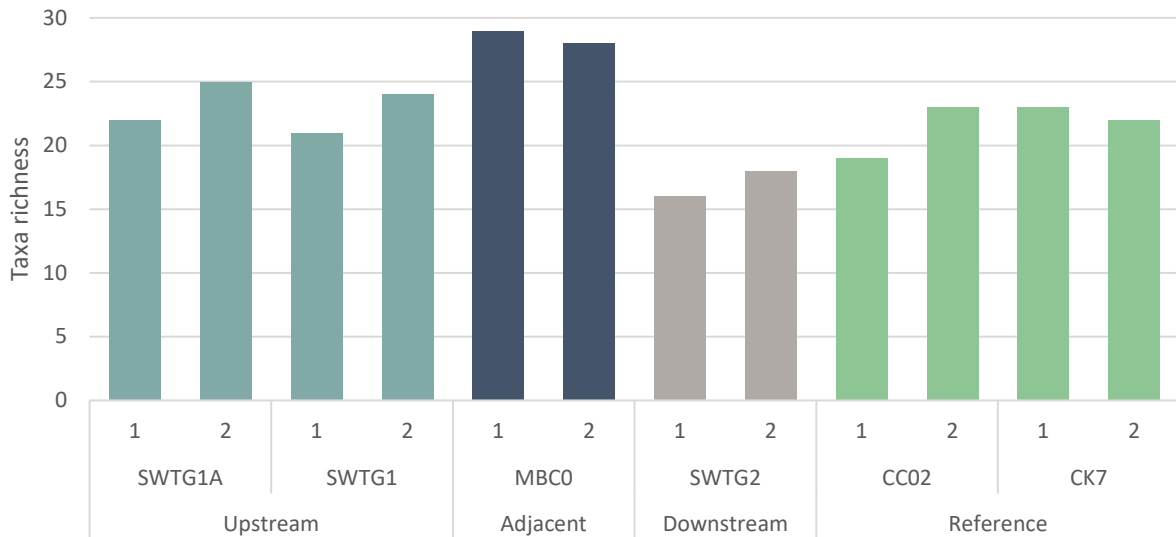


Figure 6 – Taxa richness results at sites sampled in May 2023

4.3.3 PET richness

The PET richness results for all sites sampled in May 2023 are presented below in Figure 7. PET richness was similar upstream, highest adjacent on Mount Bunday Creek, and lower downstream. PET taxa richness was similar at sites on Coulter Creek, with an additional taxon found downstream at CK7.

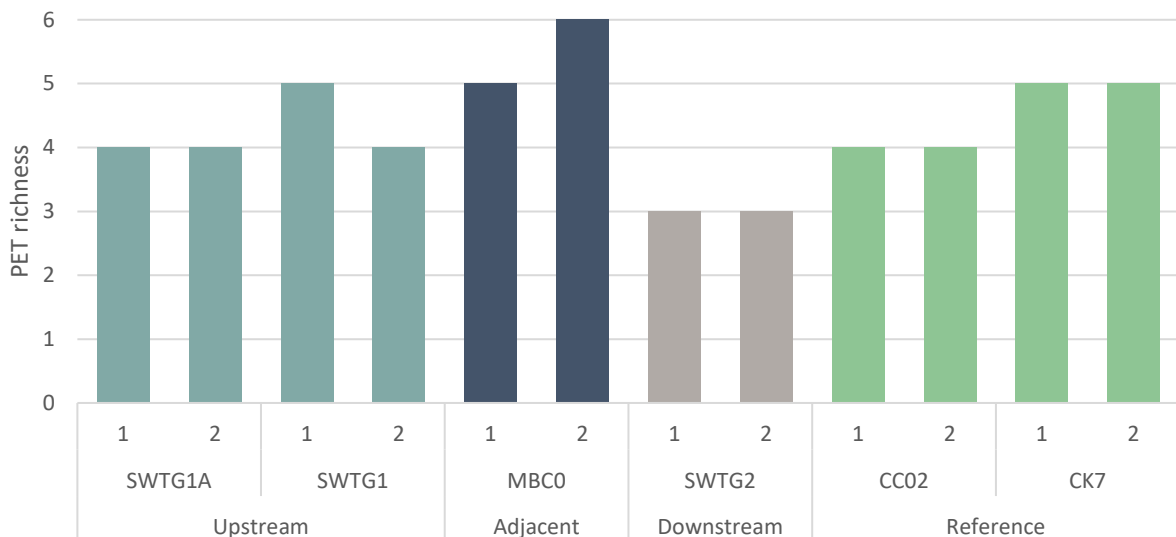


Figure 7 – PET richness at sites sampled in May 2023

4.3.4 SIGNAL-2

SIGNAL-2 scores for all samples collected in May 2023 are presented in Figure 8. There was very little variation in SIGNAL-2 scores between site types on Mount Bunday Creek (3.38-3.84). There was no major differences in pollution sensitivity of taxa, but there was a weak trend of decreasing downstream on Mount Bunday Creek. Coulter Creek also showed very little variability in SIGNAL-2 scores. The SIGNAL score range at the sites are well within the pollution tolerant end of the scale (Marshall *et al.* 2001). The macroinvertebrate community surrounding Toms Gully Mine is made up of a community tolerant of intermittent flows and poorer water quality, which is in line with previous findings (AES 2022).

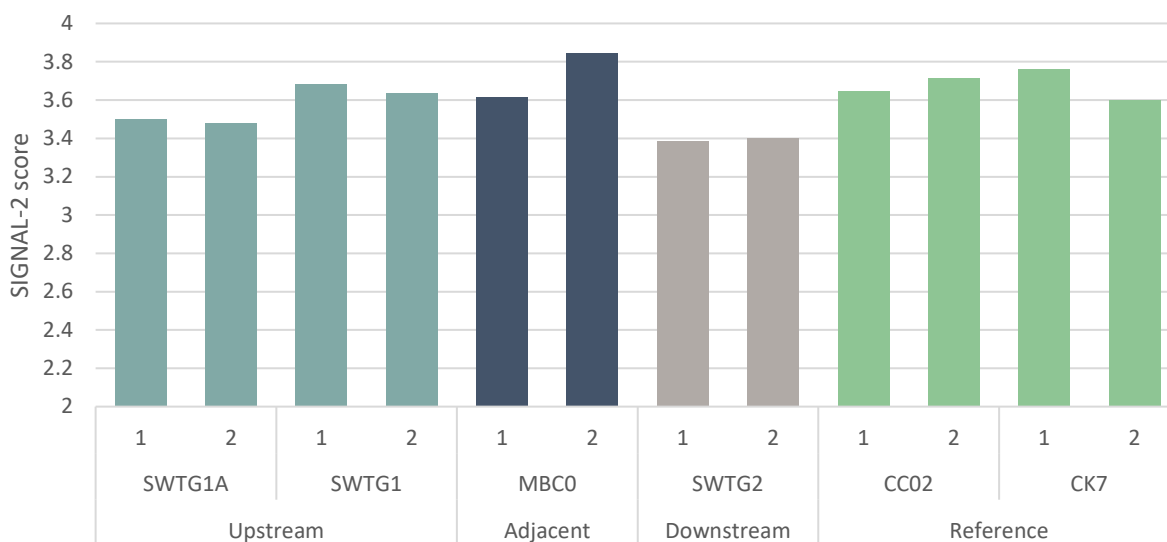


Figure 8 – SIGNAL-2 scores at all aquatic ecology sites visited in May 2023

4.3.5 Community composition

The non-metric MDS plot displayed in Figure 9 provides an indication of the relative similarity in the macroinvertebrate community composition between samples collected on Mount Bunday Creek. There was at least 60% similarity between all sites on Mount Bunday Creek in 2023, and at least 80% similarity between sites upstream and adjacent to Toms Gully Mine.

Similarities between each site in terms of habitat availability is noted in Section 4.1.3 are likely to be driving the similarity in community composition across all sites. Lower abundances at SWTG2, along with a number of taxa present at upstream and adjacent sites that were not collected downstream being demonstrated in the difference between the site and others.

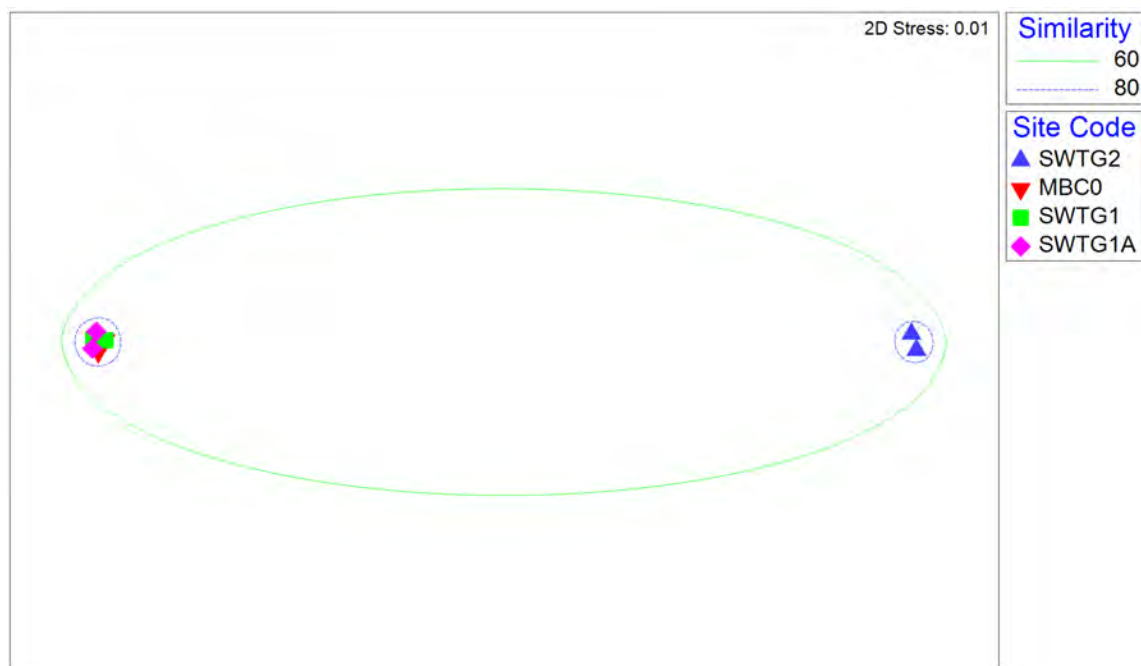


Figure 9 - N-MDS demonstrating relative similarity of macroinvertebrate communities in samples collected on Mount Bunday Creek in May 2023

4.4 Fish community

Fish sampling was possible at key sites on Mount Bunday in 2023, and the results of electrofishing at each site are presented below in Table 11. A total of 171 fish were captured across three sites on Mount Bunday Creek. Nine species were recorded, and the highest abundance of fish were captured at MBC0, with a similar diversity of fish captured at SWTG1. Far fewer fish and fewer species were collected at SWTG2. Although previous studies have found fish in poor health (lesions etc.) downstream of Toms Gully Mine, there were no visible injuries or illness recorded in fish at any site in 2023.

Table 11 – Fish sampling results for all sites on Coulter and Mount Bunday Creek, May 2023

Species Name	Common name	SWG1	MBC0	SWG2
<i>Ambassis sp.</i>	Northwest Glassfish	4	17	2
<i>Hepaphagus fuliginensis</i>	Sooty Grunter	0	1	0
<i>Leiopatheron unicolor</i>	Spangled Perch	1	6	0
<i>Melanotaenia splendida inornata</i>	Chequered Rainbowfish	27	31	0
<i>Mogurnda mogurnda</i>	Northern Purple-spotted Gudgeon	0	73	3
<i>Neosilurus hyrtlii</i>	Hyrtls Tandan	1	0	1
<i>Neosilurus ater</i>	Black Catfish	0	1	0
<i>Oxyleotris lineolata</i>	Sleepy Cod	1	0	0
<i>Oxyleotris selheimi</i>	Giant Gudgeon	1	1	0
Diversity		6	7	3
Abundance		35	130	6

5. Conclusions

5.1 Overview

Aquatic ecology surveys were successfully completed at Toms Gully Mine in 2023. All components were completed at sites where access, sufficient water and safety allowed. The following conclusions are made in regards to 2023 monitoring:

- Surface water quality sampling identified potential point source pollution related to surface/groundwater interactions between infrastructure at Toms Gully and Mount Bunday Creek. Exceedances of the GVs indicate ecotoxic conditions that have likely resulted in an impairment of aquatic ecosystems downstream of Toms Gully Mine.
- Exceedances of the dissolved metal guideline values have been recorded during previously downstream of influences of Toms Gully Mine. These results present a single sample in time, and should be viewed in the context of historical water quality monitoring, including results of sampling over the 2022-2023 wet season.
- There was some accumulation of metals in sediments, and a repeated exceedance of the lower guideline value for arsenic at SWTG2. Metals in sediments are not considered to have the potential to be released in concentrations which could be ecotoxic, should waters remain circumneutral at the site. The exceedance of surface water guideline values, but not sediment guideline values at MBC01 is possibly due to low pH allowing metals to remain dissolved in surface waters close to the TSF.
- Given that similar habitat characteristics were found across all sites, differences in macroinvertebrate metrics indicate impairment of aquatic ecosystem health in Mount Bunday Creek downstream of Toms Gully. The impairment is likely related to poor water quality results found at SWTG2. The macroinvertebrate community on Coulter Creek was disturbed by ongoing cattle grazing, this did not appear to cause any major variability in the macroinvertebrate community across both sites.
- All macroinvertebrate community data should be viewed in the context of historical data when operations begin at Toms Gully Mine. Historical context will allow for environmental influences (such as wet season rainfall variability) to be considered when interpreting impacts associated with mining operations.
- Although previous surveys have recorded poor fish health which may have been associated with poor water quality, this did not occur in 2023. All fish captured were found to be in good health, regardless of their position in the catchment relative to Toms Gully Mine. It should be acknowledged that far fewer species and a lower abundance of fish were found downstream on Mount Bunday Creek than upstream than in previous years.

5.2 Recommendations

An uninterrupted data set is the most robust way to analyse conditions in the receiving environment surrounding Toms Gully Mine should operations commence. Therefore, aquatic ecology monitoring should

continue in 2024. Access to downstream site SWTG3 or previously sampled site MBC03 should be explored, as it is difficult to ascertain the extent of ecosystem impairment downstream of Toms Gully.

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Appendix A. Certificates of Analysis

Appendix B. Raw Macroinvertebrate Data

Order	Lowest Taxon	SWG2	SWG2	SWG1C	SWG1C	MBC0	MBC0	SWG1	SWG1	CC02	CC02	CK7	CK7
Replicate		1	2	1	2	1	2	1	2	1	2	1	2
Acarina	Acarina	317	171	200	180	217	200	1350	1100	83	60	425	433
Coleoptera	Dytiscidae	33	14	0	20	0	0	100	50	17	20	0	0
Coleoptera	Elmidae	17	14	120	40	33	20	50	50	33	0	25	0
Coleoptera	Gyrinidae	0	0	20	0	0	0	0	0	0	20	0	0
Coleoptera	Hydraenidae	17	29	0	0	0	20	50	50	0	20	25	67
Coleoptera	Hydrochidae	17	29	0	0	0	20	0	0	0	0	0	0
Coleoptera	Hydrophilidae	33	14	0	0	17	0	100	50	17	20	0	33
Decapoda	Atyidae	17	0	0	0	17	20	250	100	17	20	100	67
Decapoda	Palaemonidae	0	14	20	20	33	20	0	50	17	0	0	0
Decapoda	Parathelphusidae	17	14	0	0	17	0	50	50	17	20	0	0
Diptera	Ceratopogonidae	50	14	260	200	150	300	750	700	817	820	100	33
Diptera	Chironominae	983	871	1880	1760	567	540	3100	2750	1450	1840	275	667
Diptera	Culicidae	0	14	0	0	33	20	0	0	50	40	0	0
Diptera	Orthoclaadiinae	33	0	140	300	117	180	100	500	17	0	150	267
Diptera	Tabanidae	0	14	0	0	0	0	0	0	0	0	0	0
Diptera	Tanypodinae	417	314	140	320	250	240	400	100	350	400	450	767
Diptera	Tipulidae	17	0	0	0	17	0	0	0	0	0	25	0
Ephemeroptera	Baetidae	100	71	20	40	233	160	500	250	33	120	250	433

Order	Lowest Taxon	SWTG2	SWTG2	SWTG1C	SWTG1C	MBC0	MBC0	SWTG1	SWTG1	CC02	CC02	CK7	CK7
Ephemeroptera	Caenidae	983	857	920	780	1550	1760	2750	3350	267	240	2125	2567
Ephemeroptera	Leptophlebiidae	0	0	60	40	17	20	0	0	0	0	25	33
Gastropoda	Planorbidae	0	0	0	20	0	0	0	0	33	20	150	267
Hemiptera	Gerridae	17	0	0	0	50	60	0	100	0	0	25	33
Hemiptera	Mesoveliidae	17	14	20	0	17	40	0	0	0	0	0	0
Hemiptera	Micronectidae	33	29	20	40	0	20	100	150	67	100	50	100
Hemiptera	Nepidae	0	0	0	0	0	0	0	50	0	0	0	33
Hemiptera	Pleidae	0	0	0	0	0	0	0	0	0	0	25	0
Hemiptera	Veliidae	0	29	0	0	0	20	50	50	0	0	0	33
Arhynchobdellida	Arhynchobdellida	0	0	0	0	17	0	0	0	0	0	0	0
Hydrazoa	Hydridae	17	14	0	20	0	0	0	0	0	0	0	0
Nematoda	Nematoda	0	0	240	240	0	0	200	100	17	20	25	0
Odonata	Coenagrionidae	0	0	0	0	0	0	0	0	0	0	50	33
Odonata	Gomphidae	17	29	0	0	0	0	0	0	0	20	0	33
Odonata	Libellulidae	0	14	0	20	17	40	0	0	50	20	25	33
Oligochaeta	Oligochaeta	300	214	160	200	50	100	200	150	200	160	475	400
Trichoptera	Calamoceratidae	0	0	0	0	0	0	0	0	0	0	50	33
Trichoptera	Hydroptilidae	17	14	0	0	0	0	100	50	33	20	0	33
Trichoptera	Leptoceridae	167	114	20	20	267	240	650	450	83	80	250	267
Turbellaria	Dugesiiidae	17	14	0	0	0	0	0	50	0	0	25	33



Good science at a fair price

Appendix E. WDL249 Surface Water Monitoring Locations 2023

WDL249 Surface Water Monitoring Locations 2023

TGM Pit Sample Site - Toms Gully open cut pit receives site ponds and tailing dams water for RO treatment



TGM Pit - January 2023



TGM Pit – February 2023



TGM Pit - March 2023



TGM Pit -April 2023



TGM Pit - April 2023



TGM Pit May 2023

Evaporation Pond 1 Onsite pond receiving mine water that will be pumped to Toms Gully Pit



EP1 - December 2022

Evaporation Pond 2 Onsite pond receiving mine water that will be pumped to Toms Gully Pit



EP2 - December 2022

SWG1A Sample Site- Mount Bundey Creek, upstream of TGM and its influences



SWG1A - February 2023

SWTG12 Sample Site- Weir gate at Wetland Oxbow standing on bund



SWTG12 - January 2023



SWTG12 – February 2023



SWTG12 - March 2023



SWTG12 - April

MBC01A- Mount Bunday Creek site previous created for biological monitoring and located downstream of Oxbow wetlands and TSF 2 and upstream of compliance point



MBC01A – January 2023



MBC01A – March 2023

SWG2 – Compliance Point on Mount Bunday Creek



SWG2 – January 2023



SWG2 – February 2023

MBTG3A – New site created for WDL 249 and located 1.6km downstream of compliance point



MBTG3A – December 2022