Waste Discharge Licence 174-11

Monitoring Report

1 May 2020 to 30 April 2021

MCARTHUR RIVER MINE

McArthur River Mining Pty Ltd

DOCUMENT PROPERTIES

Date	31 August 2021
Department	Environment
Prepared by	McArthur River Mining Pty Ltd
Licence Expiry Date	25 May 2023 (WDL 174-12)

Executive Summary

Pursuant to Section 74 of the *Water Act, 1992* (Northern Territory [NT]), McArthur River Mining Pty Ltd (MRM) was granted a renewed Waste Discharge Licence (WDL) 174-12 on 25 May 2021. Preceding this, WDL 174-11 was granted for the period 28 April 2019 to 28 April 2021. Both WDLs authorised conditional discharge of waste water at specified locations, including from the Mine Levee Discharge Points into the old McArthur River, from the South-East Levee 1 Discharge Point into Barney Creek; and the Bing Bong Dredge Spoil Drain into marine waters at the Bing Bong Loading Facility (BBLF).

In addition, pursuant to the *Mining Management Act, 2001* (NT) in the Variation of Authorisation 0059, MRM are authorised for managed releases of waste water at the Water Management Dam into the Little Barney Creek via the Water Management Dam Release Point.

MRM's WDL and Variation of Authorisation enable the selective discharge of water from the McArthur River Mine (the Mine) to the McArthur River. Strict environmental conditions are in place to protect the beneficial uses and community values of the McArthur River and downstream users. The WDL identifies the downstream compliance point as SW11, which is appropriately located to identify any potential for impact on the receiving environment downstream of the operations.

This Monitoring Report has been submitted in accordance with Condition 43 of WDL 174-12, and covers the reporting period 1 May 2020 to 30 April 2021. The previous WDL 174-11 was in effect during the reporting period, and this Monitoring Report has been written pursuant to conditions thereof.

Site-specific Trigger Values (SSTVs) are listed in the WDL for SW11. The SSTVs are compared to water quality monitoring results for SW11. Where results were triggered pursuant to Condition 39 of WDL 174-11, an investigation report was documented by MRM and submitted to the NT Department of Environment, Parks and Water Security (DEPWS). During the reporting period, there were no triggering results investigated which could be attributed to mining activities.

Subsequent to the end of the reporting period, an application to amend WDL 174-12 was submitted to the NT DEPWS by MRM on 3 August 2021. The amendment was principally sought in relation to the following requested changes:

- the addition of two new discharge points for the Mine to align with discharge points approved under the *Mining Management Act, 2001* (NT);
- an update to condition wording to provide clarity regarding licence non-compliances as they relate to water quality exceedances;
- an update to SSTVs in response to results from an ecotoxicology research program and a review of water quality guideline values for the McArthur River. The research program was undertaken in accordance with Recommendation 14 of the Northern Territory Environment Protection Authority *Assessment Report 86*; and
- an update to the surface water monitoring program to modify sampling requirements during discharge.

Climate Influences at the Mine

The McArthur River catchment experiences a monsoonal climate regime, which is strongly seasonal with distinct wet and dry seasons. Climatic conditions are known to significantly influence the natural environment in the vicinity of the Mine, in particular the McArthur River and its tributaries. The total rainfall over the 12-month reporting period was 877.4 millimetres (mm). The highest daily rainfall (77.6 mm) during the period was recorded on 21 March 2021. The wet season was characterised by an early onset with 60 mm in October 2020 and the highest monthly rainfall recorded in December 2020 (245.4 mm).

Barney, Surprise and Emu Creeks are ephemeral (fleeting) waterways, only flowing during the wet season following large episodic rainfall. Surface water flow in these creeks typically ceases annually early in the dry season. The cease to flow conditions and eventual drying of the waterways influence water quality through the evapo-concentration of major solutes. Additionally, as the waterways near cease to flow conditions, the influence of baseflow from mine derived sources or zones of natural mineralisation becomes more pronounced.

Notably, during the reporting period, the compliance monitoring point SW11 (on the McArthur River) experienced cease to flow conditions during the dry season between September 2020 and December 2020.

Downstream McArthur River Water Quality

During the reporting period, poor quality water generated at the Mine was treated with hydrated lime in the South-East Perimeter Runoff Dam. In total, 764 tonnes of hydrated lime were used to treat approximately 2,913 megalitres (ML) of poor quality water. Of this, approximately 2,695 ML of treated water was transferred to the Water Management Dam for storage and potential managed release.

During the reporting period, 10 discharge events occurred between 20 December 2020 and 29 March 2021. Approximately 711.3 ML, 18.0 ML and 1,308.4 ML (total of 2,037.7 ML) of water was released to the McArthur River via the Mine Levee Discharge Point, the South-East Levee 1 Discharge Point and the Water Management Dam Release Point, respectively.

In the McArthur River, a circa neutral to alkaline pH was reported across all the monitoring locations, with results generally consistent between monitoring locations upstream and downstream of the Mine. There were no elevated electrical conductivity, sulphate or total petroleum hydrocarbon results beyond SSTVs at the compliance point SW11 over the reporting period.

Filtered metal concentrations in the McArthur River were consistently reported at low values over the reporting period, especially for key WDL metals/metalloids of concern (cadmium, copper, lead, nickel and zinc). Influences from upstream catchments, both the McArthur River and Glyde River, were highlighted in the monitoring data consistent with previous years monitoring results.

In the reporting period, there were two investigation reports related to elevated results beyond SSTVs at SW11 submitted to the NT DEPWS, as required by WDL 174-11. The investigation reports related to the SSTVs for filtered aluminium and nitrate water quality parameters.

A summary of the results triggering investigations are as follows:

- Filtered aluminium results were beyond the SSTV on seven occasions during the reporting period, with only one triggering an investigation report due to a value exceeding three-times the SSTV. The sources of the aluminium are considered to be outside of the influence of the Mine, including the upstream McArthur River catchment and the Glyde River catchment and therefore are considered unrelated to mining activity.
- Nitrate monitoring results were beyond the SSTV on four occasions during the reporting period, three of which occurring in a row, triggering an investigation report. The Glyde River has historically accounted for elevated nitrate results at SW11 and review of data from the reporting period confirmed that this catchment continued to heavily influence nitrate at SW11.

Additionally, there were nine instances of elevated results for dissolved oxygen and one instance of filtered iron outside the SSTV, however, these did not trigger investigation in accordance with conditions of WDL 174-11. Dissolved oxygen concentrations below 85% were frequently recorded for many McArthur River monitoring sites during the middle and late stages of the dry season, including upstream monitoring sites unaffected by mining activities. The data indicated that dissolved oxygen concentrations below the SSTV were likely caused by natural catchment variation. The elevated result for filtered iron was found to be influenced by catchment inflows from upstream of the Mine.

Downstream Dredge Spoil Perimeter Drain Water Quality

No dredge spoil was actively emplaced at the BBLF over the reporting period. Accordingly, there was no managed release from the dredge spoil emplacement area. Additionally, there was no observed passive discharge via the dredge spoil drain over the reporting period and therefore no natural surface water quality for consideration against the SSTVs for the Bing Bong Dredge Discharge Point.

Conclusion

Based on the review of surface water quality monitoring data between 1 May 2020 and 30 April 2021, WRM Water & Environment Pty Ltd concluded that:

> *MRM continue to implement effective controls to minimise the risk of environmental harm of downstream receiving waters due to Mine operations. The review concluded that the beneficial uses and community values of the McArthur River continue to be protected from potential mining derived impacts.*
>
> *There were no mine derived SSTV exceedances or non-compliances recorded at the SW11 compliance point in the McArthur River during the reporting period. The SSTV exceedances recorded at SW11 during the reporting period were unrelated to mine activities and were a result of natural river processes and contributions from sources upstream of the Mine.*

WRM Water & Environment Pty Ltd also reviewed the mine derived analyte loads for the period between 1 May 2020 and 30 April 2021. Based on the estimated managed release loads, the total zinc and lead loads released during the 2020/21 reporting period were less than the annual baseline limit defined by the 2017/18 managed release loads. This is consistent with recommendation 3 of the Northern Territory Environment Protection Authority *Assessment Report 86.*

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Attachment 3 Surface Water Monitoring Report 2020/21 – McArthur River Mine and Bing Bong Loading Facility
Attachment 4 2020/21 Mine Derived Analyte Loads Assessment

1 Introduction

The McArthur River Mine (the Mine) is an Open Pit zinc, lead and silver mining operation in the Northern Territory (NT) located approximately 700 kilometres (km) south-east of Darwin, and approximately 45 km south-west of the township of Borroloola (Figure 1).

In addition to mining activities, the operations include an on-site concentrator and processing plant, and the Bing Bong Loading Facility (BBLF) located on the Gulf of Carpentaria approximately 95 km north-northeast of the Mine (Figure 1). McArthur River Mining Pty Ltd (MRM) is the operator of the Mine, and is a wholly owned subsidiary of Glencore. MRM is the world's largest producer of zinc in bulk concentrate form.

MRM operates consistent with its approved *Mining Management Plan* (2020) and associated amendments. On-site mining and processing activities are conducted within Mineral Lease (MLN) 1121, MLN 1122, MLN 1123, MLN 1124 and MLN 1125 (Figure 2).

The BBLF is located within MLN 1126 (Figure 3). Adjacent to the Bing Bong MLN is the Bing Bong Dredge Spoil Emplacement Area, located on the former Non-Pastoral Land Use Approval NP033. It is noted no dredging or dredge spoil emplacement has been undertaken by MRM since 2013.

MRM was granted a renewed Waste Discharge Licence (WDL) 174-12 on 25 May 2021. Preceding this, WDL 174-11 was granted for the period 28 April 2019 to 28 April 2021. Both WDLs authorised conditional discharge of waste water at specified locations, including from the Mine Levee Discharge Points into the old McArthur River and from the South-East Levee 1 Discharge Point into Barney Creek; and the Bing Bong Dredge Spoil Drain into marine waters at the BBLF.

1.1 Monitoring Report

This Monitoring Report has been submitted in accordance with Condition 43 of WDL 174-12, and covers the reporting period 1 May 2020 to 30 April 2021. The previous WDL 174-11 was in effect during the reporting period, and this Monitoring Report has been written pursuant to conditions thereof. WDL 174-11 and 174-12 are provided in Attachment 1.

Condition 45 of WDL 174-11 outlines the requirements of this Monitoring Report and has been reproduced in Table 1, along with a reconciliation of the reporting requirements with this Monitoring Report and its Attachments.

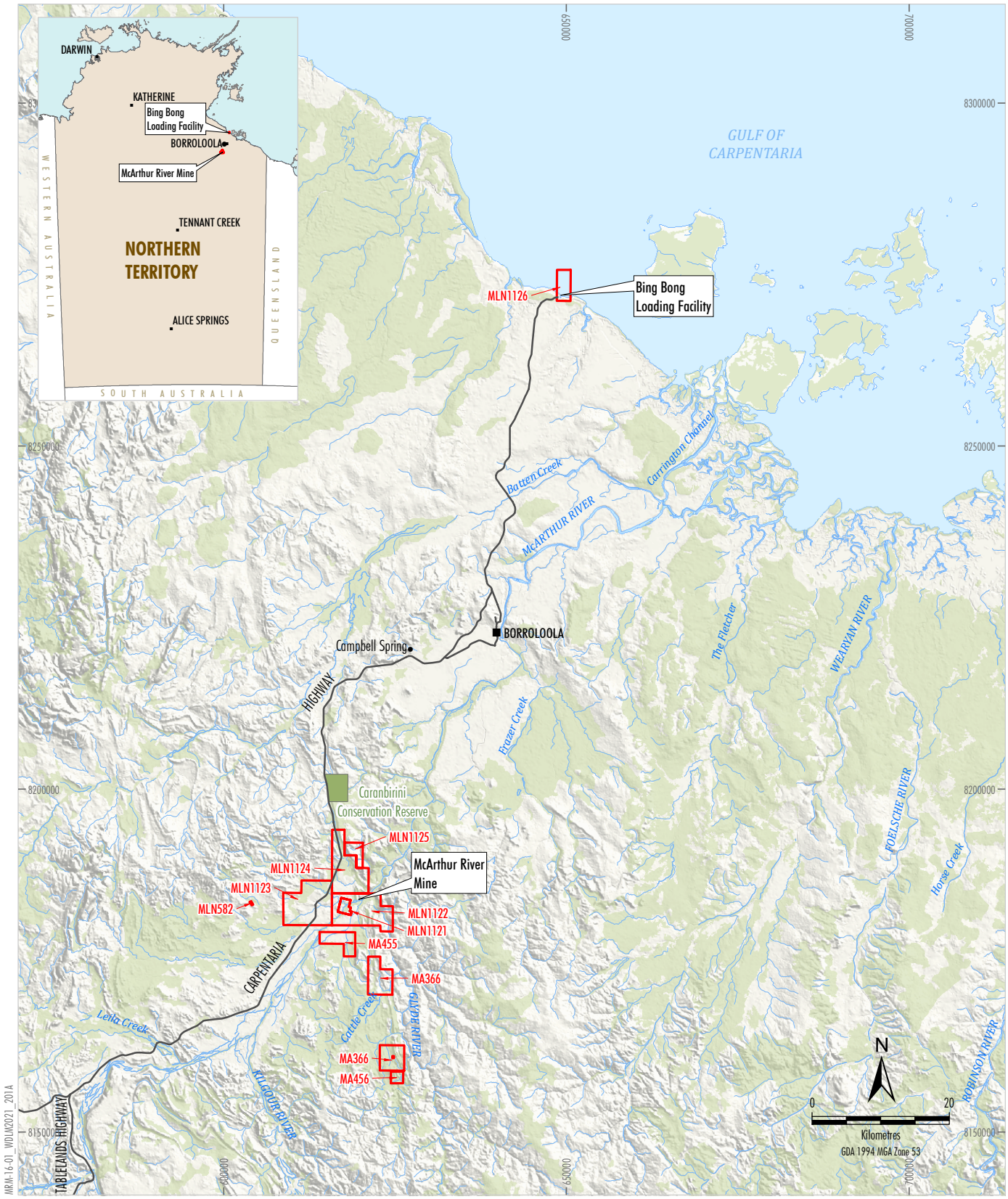
A recent review of the environmental performance of the Mine and BBLF over the period 1 May 2020 to 30 April 2021 was undertaken for the *McArthur River Mine 2020-2021 Environmental Monitoring Report* (EMR) (Attachment 2).

To supplement and verify MRM's collection, review and analysis of environmental monitoring data for the EMR, external experts were engaged to review and provide conclusions regarding environmental performance (as reported in the technical appendices to the EMR). The operational activities of the Mine and BBLF during the EMR reporting period are described in Section 2 of the EMR (Attachment 2). The historical and recent observations of the physical environment relevant to water management and monitoring (e.g. climate, hydrology, river heights) are described in Attachment 3.

Subsequent to the end of the reporting period, an application to amend WDL 174-12 was submitted to the NT Department of Environment, Parks and Water Security (DEPWS) by MRM on 3 August 2021. The amendment was principally sought in relation to the following requested changes:

- the addition of two new discharge points for the Mine to align with discharge points approved under the *Mining Management Act, 2001* (NT);
- an update to condition wording to provide clarity regarding licence non-compliances as they relate to water quality exceedances;

- an update to site-specific trigger values in response to results from an ecotoxicology research program and a review of water quality guideline values for the McArthur River. The research program was undertaken in accordance with Recommendation 14 of the Northern Territory Environment Protection Authority (NT EPA) *Assessment Report 86*; and
- an update to the surface water monitoring program to modify sampling requirements during discharge.



LEGEND

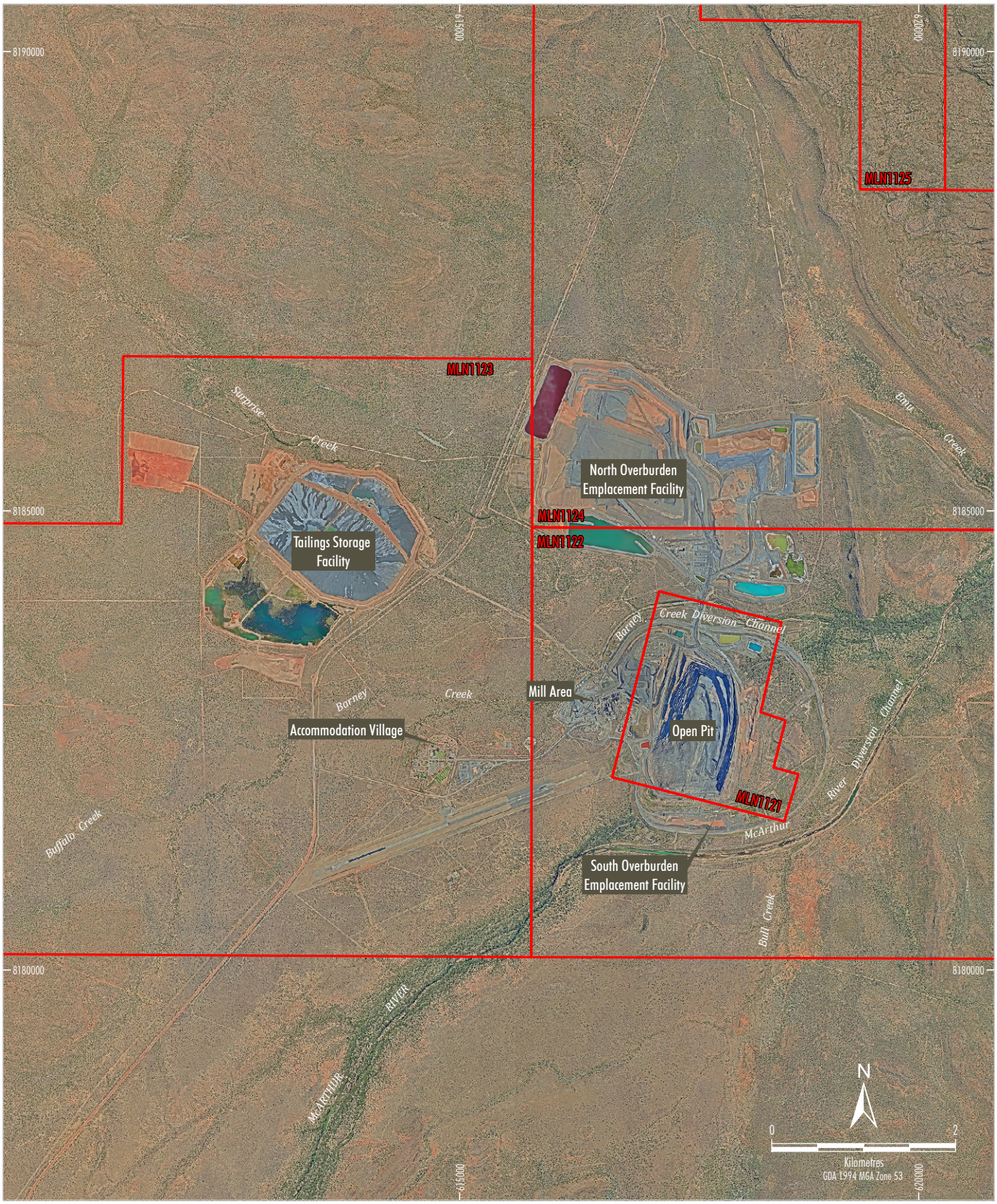
- Mineral Lease/Exploration
- Major Road
- River/Creek

Source: Geoscience Australia - Topography (2006); Department of Environment and Natural Resources (2016)

McARTHUR RIVER MINE

Regional Locality

Figure 1



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LEGEND

Mineral Lease

Source: Orthophoto MRM (2020); Department of Environment and Natural Resources (2016)

McARTHUR RIVER MINE

Mine Site

Figure 2

LEGEND

Mineral Lease

Source: Orthophoto MRM (2018); Department of Environment and Natural Resources (2016)

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McARTHUR RIVER MINE

Bing Bong Loading Facility

Figure 3

TABLE 1: WDL 174-11 MONITORING REPORT REQUIREMENTS

Waste Discharge Licence 174-11	Section
45 The licensee must ensure that each Monitoring Report is prepared in consultation with a Qualified Person to determine the relevance of the information being provided as it relates to the waste discharge component of the site and in the format described in the National Water Quality Management Strategy, Australian Guidelines for Water Quality Monitoring and Reporting, Chapter 7 and must include:	This Monitoring Report and its appendices have been generally structured consistent with Chapter 7 of the Guideline. This includes the provision of the executive summary and primary technical report. This Monitoring Report is based on reviews completed by the qualified specialists WRM Water & Environment Pty Ltd (WRM).
45.1 a data analysis and interpretation using the National Water Quality Management Strategy, Australian Guidelines for Water Quality Monitoring and Reporting, Chapter 6;	This Monitoring Report has been generally structured consistent with Chapter 6 of the Guideline. This includes: • analysis of changes in time and space (Section 4); • checks for data integrity (Appendix A); • comparison of site and water quality guidelines (Section 6); and • interpretation in relation to study objectives (Section 7).
45.2 a tabulation of all monitoring data required as a condition of this licence;	Tabulation of data required under the monitoring schedules listed in Conditions 25 to 27 of WDL 174-11 is provided in Section 4.2 and the EMR (Attachment 2).
45.3 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available);	A summary of long term trends for surface water sites in the McArthur River has been provided from 1 January 2008 (where data was available) in Section 4.3 of this report. Cease to flow conditions were observed for all monthly observations at the Bing Bong Dredge Spoil Drain, and hence no water quality sampling was undertaken during the reporting period. As such, please refer to *Waste Discharge Licence 174-10 Monitoring Report 1 June 2017 – 31 May 2018* (MRM, 2018) for long term trend analysis of Bing Bong Dredge Discharge Point (BBDDP) monitoring data. Long term trend analysis for the various monitoring programs is also provided in the EMR (Attachment 2) and its Appendices.
45.4 includes mine derived loads of contaminants for the contaminants listed in Appendix 3 Table 1, reporting to the McArthur River including sources of contaminant loads, compared against background loads in the McArthur and Glyde River;	Refer to Section 5 and Attachment 4.
45.5 a comparison of the mine derived contaminant loads referred to in Condition 45.4 against contaminant loads reporting to the McArthur River from July 2017 to June 2018;	Refer to Section 5 and Attachment 4.
45.6 an assessment of all monitoring data (including flow rate and calculated volume from each river contributing to water quality at SW11) and whether the activity has been conducted in a manner that has ensured the McArthur River and waters potentially impacted from the Bing Bong discharge point are being protected at all times from mine related impacts.	Refer to Section 6 and Attachment 3.

2 Community Values and Beneficial Uses

2.1 Community Values

Community values are particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, health, safety or welfare, and requires protection from the effects of stressors.

In accordance with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments [ANZG], 2018), MRM has identified the following community values for the receiving waters downstream of the Mine, including:

- aquatic ecosystems (slightly to moderately disturbed);
- primary industries including stock drinking water, irrigation and general water uses;
- recreation and aesthetics; and
- cultural and spiritual values.

Typically, the most stringent water quality objectives are associated with the protection of aquatic ecosystems, and therefore MRM's environmental management and monitoring program targets the protection of downstream aquatic ecosystem values.

The condition of the McArthur River in the vicinity of the Mine is considered as a 'slightly to moderately disturbed system' due to the influence of pastoralism and grazing throughout the catchment. The ANZG (2018) guidelines recommend that a 95 percent (%) species protection level should be applied to slightly to moderately disturbed systems, as is the case for the McArthur River in the vicinity of the Mine.

2.2 Beneficial Uses

The WDL lists the following beneficial uses as declared under the *Water Act 1992* (NT) and the sensitivity of the surrounding land use and environment in the vicinity of the Mine. These include:

- Declared beneficial uses and/or water quality objectives are:
  - McArthur River Area: aquatic ecosystem protection, recreational water quality and aesthetics (Gazette references G9 11 March 1998 and G20 27 May 1988); and
  - McArthur River Catchment Area: environment, cultural and riparian (Gazette reference G10 14 March 2001).
- Sites of conservation significance (SOCS):
  - Sir Edward Pellow Island group (SOCS No. 33);
  - McArthur River coastal floodplain (SOCS No. 34); and
  - Borroloola area (SOCS No. 35).

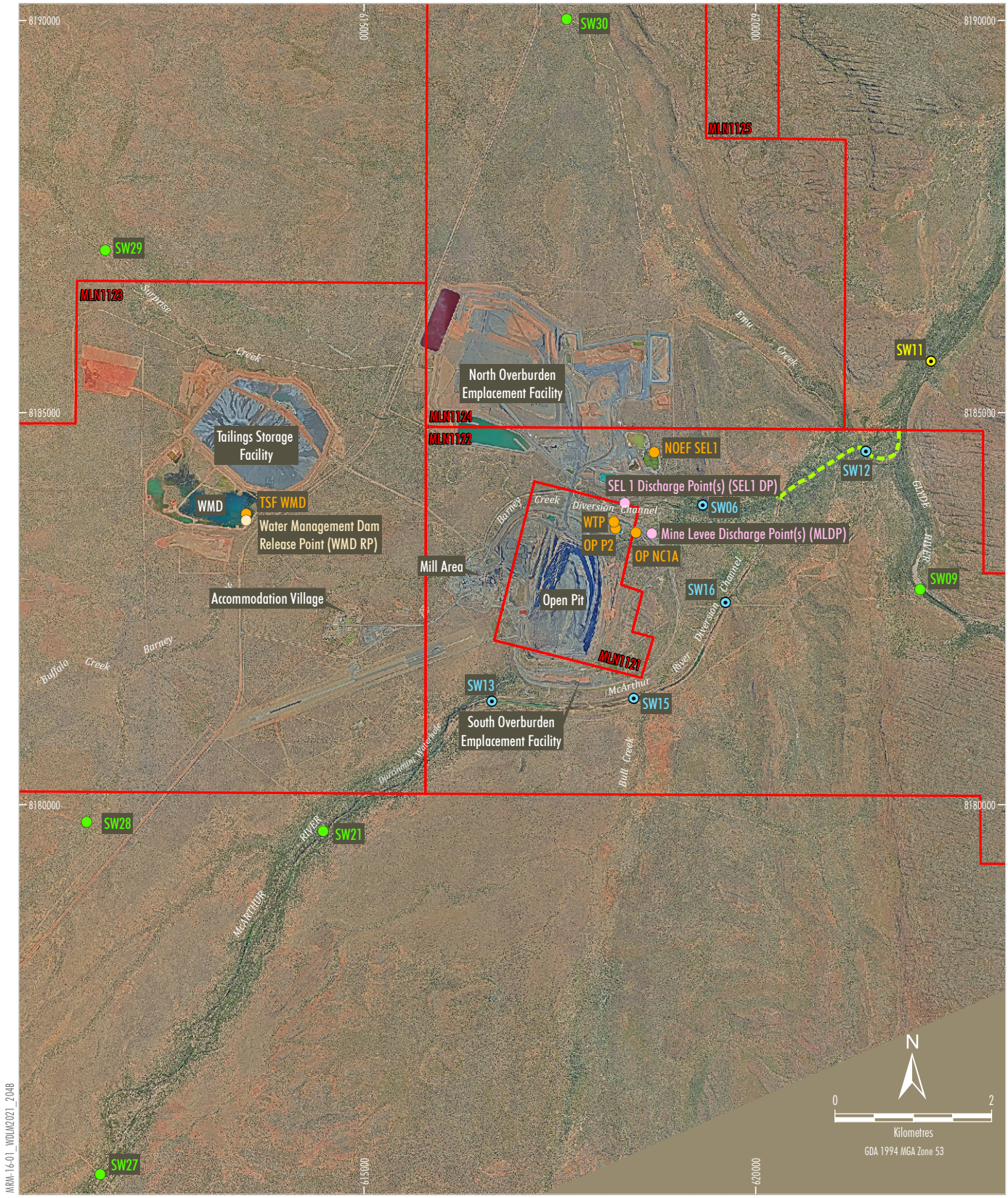
2.3 Mixing Zones

In accordance with NT EPA *Guidelines on Mixing Zones* (2013), mixing zones are specifically defined areas where the water quality may be below that required to protect environmental values and beneficial uses.

Mixing zones allow for a designated zone of potential impact between the authorised discharge points and the compliance points, in lieu of prescribing concentration requirements at authorised discharge points (NT EPA, 2013). At the Mine, the mixing zone is located between the authorised discharge points within the mineral leases, and the SW11 compliance monitoring point in the McArthur River receiving environment (Figure 4).

The zone extends along the McArthur River from the confluence of the McArthur River Diversion Channel up to the northern (downstream) boundary of MLN 1122.

Controlled discharge is also conveyed along Little Barney Creek and Barney Creek (including the Barney Creek Diversion Channel). However, these reaches are located in operational areas of the Mine site, are highly ephemeral, are not considered important refugia for the persistence of any aquatic species, nor do they provide a major ecological role within the wider catchment (IPE, 2019). For these reasons, the Little Barney Creek and Barney Creek reaches are not afforded mixing zone status.



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LEGEND

- Mineral Lease
- Artificial Surface Water Monitoring Site
- Authorised Dischange Point
- Authorised Release Point
- Compliance Point
- Control Surface Water Monitoring Site
- Potential Impact Surface Water Monitoring Site

Mixing Zones

- McArthur River

McARTHUR RIVER MINE

Mine Surface Water Monitoring Sites, Discharge Locations and Mixing Zone

Source: Orthophoto MRM (2020); Department of Environment and Natural Resources (2016); MRM (2021)

Figure 4

3 Monitoring Objectives and Method

3.1 Authorised Discharge Points

The authorised discharge points and compliance points over the reporting period (as detailed in WDL 174-11) are reproduced in Table 2 below, and shown on Figure 4 for the Mine and Figure 5 for the BBLF.

TABLE 2: WDL 174-11 AUTHORISED DISCHARGE POINTS AND COMPLIANCE MONITORING POINTS

	Description	Location
Authorised Discharge Points		
Mine Levee Discharge Point (s) (MLDP) (Mine levee pumping outlets)	Discharges through Mine Levee Discharge Point(s) (MLDP) include: 1. Rain water collecting in the old McArthur River Channel (NC1A) inside the Mine levee. 2. Groundwater from dewatering bores around main pit collected in and then discharged from Pond 2 (P2). 3. Water from the Water Management Dam. 4. Treated water from the Water Treatment Plant that will be stored in P2 prior to discharge from the MLDP. Waters discharged at MLDP are pumped over the mine levee wall and flow into the Old McArthur River channel upstream of the McArthur River and Glyde River confluence.	Latitude: -16.42743° Longitude: 136.11143°
South-East Levee 1 Discharge Point (SEL1 DP)	Rain water collecting inside the South Eastern Levee and separated from all contaminated seepages. Discharges are pumped via pipe line to Barney Creek and then flow into the McArthur River. Discharge can only occur when flow as measured in the McArthur River at the downstream gauging station is in excess of 20 cubic metres per second (m^3/s).	Latitude: -16.42394° Longitude: 136.10824°
Dredge Spoil Drain (BBDDP)	The dredge spoil perimeter drain exit point (BBDDP) is located on the tidal mudflats to the east of the loading facility and within a tidal area. The drain is constructed around the external boundary of the dredge spoil cells to intercept saline water and extends approximately 400 metres from the final cell. The drain receives overflow from: 1. the final dredge spoil emplacement area cell when in operation; 2. saline water from the perimeter drain which surrounds the dredge spoil emplacement area. At BBDDP passive releases flow across the intertidal flats to the Gulf of Carpentaria via the Bing Bong navigation channel. For purposes of clarity this licence does not authorise dredging and/or pumping or disposal of dredge slurry to the Dredge Spoil Emplacement Area.	Latitude: -15.62972° Longitude: 136.39479°
Compliance Monitoring Points		
SW11	The monitoring point is situated along the McArthur River approximately at the edge of lease MLN 1122. SW11 is downstream of the confluence of the Glyde River. SW11 is approximately: • 5 km downstream of MLDP; and • 6 km downstream of SEL1 DP.	Latitude: -16.40739° Longitude: 136.14478°
BBDDP	The BBDDP is located on tidal mudflats approximately 750 metres east of the loading facility. The BBDDP is the only compliance point (as per WDL 174-11) at the BBLF.	Latitude: -16.405839° Longitude: 136.40018°

LEGEND

- Surface Water Monitoring Site
- Authorised Discharge Point

Source: Orthophoto MRM (2018); Department of Environment and Natural Resources (2016); IPE (2019); MRM (2019)

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McARTHUR RIVER MINE

Bing Bong Loading Facility
Surface Water Monitoring Sites

Figure 5

3.2 Compliance Points and Trigger Levels

WDL 174-11 details Site-specific Trigger Values (SSTVs) for compliance monitoring points SW11 and BBDDP. The SSTVs for the compliance points are reproduced in Table 3 below. SSTV compliance is assessed against Condition 39 of WDL 174-11 which is reproduced below:

39. A non-compliance with this licence includes:

39.1. an exceedance of a trigger value at SW11, as specified in Appendix 3, on three consecutive sampling occasions;

39.2. an exceedance of greater than or equal to three times a trigger value at SW11;

39.3 subsequent consecutive exceedances of trigger values as described in Condition 39.1 and 39.2.

TABLE 3: WDL 174-11 COMPLIANCE POINTS AND SSTVS

	Site Code			SW11	BBDDP
Parameter	**Abbr**	**Units**	**Analysis**	**SSTVs***	**ANZECC (2000)**
Field Measurements					
pH	pH	pH Units	In situ	6.0-8.5	8.0-8.4[12]
Electrical Conductivity	EC	µS/cm		1000[7]	-
Dissolved Oxygen	DO	% saturation		85-120	-
Metals and Metalloids					
Aluminium	Al	µg/L	Filtered (0.45 µm)	55[1]	0.5[10]
Arsenic (III)	As			24[1]	2.3[10]
Cadmium	Cd			1.73[3]	5.5[1]
Copper	Cu			10.97[2]	1.3[11]
Iron (II) & (III)	Fe			300[3]	-
Lead	Pb			16.6[4]	4.4[11]
Manganese	Mn			1900[1]	80[3]
Mercury	Hg			0.6[1]	0.4[1]
Nickel	Ni			11[1]	70[1]
Zinc	Zn			62.68[2]	15[11]
Total Petroleum Hydrocarbons (TPH)					
TPH Fraction C6 – C9	NA	µg/L		-	-
Benzene	NA			950[13]	500[13]
TPH Fraction C10 – C14	NA			600[5]	600[9]
C15 – C28	NA				
C29 – C36	NA				
Other					
Sulphate	SO_4	mg/L		341[6]	-
Nitrate	NO_3	µg/L		700[8]	-

µS/cm = microSiemens per centimetre, µg/L = micrograms per litre, mg/L = milligrams per litre

Trigger Value Derivation

1. Australia and New Zealand Environment and Conservation Council (ANZECC) 2000 95% TV Table 3.4.1.
2. Hardness Modified Trigger Value (HMTV) from the *MRM Sustainability Development Water Management Plan 2010-2011*.
3. ANZECC 2000 interim indicative working level.
4. TV approved by Administering Agency 2010.
5. Based on the aqueous solubility of mineral oils and as found in the document Intervention Value outlined in the *Environmental Quality Objectives in the Netherlands* (1994.)
6. Calculated on the 95th % level of protection (% of species) Hydrobiology *(212) Sulphate Trigger Value for MRM Mine: 2012 prepared by McArthur River Mining*.
7. TV approved by Administering Agency 2012.
8. ANZECC 2000 Moderate reliability Trigger Value.
9. TV approved by Administering Agency 2013.
10. ANZECC 2000 Environmental concern level/indicative interim working level. Metals and Metalloids Chapter 8.3.7.1.
11. ANZECC 2000 High Reliability 95% Trigger Value. Metals and Metalloids Chapter 8.3.7.1.
12. ANZECC 2000 Default Trigger Values – Tropical Australia Table 3.3.4.
13. ANZECC 2000 Moderate Reliability 95% Trigger Value. Aromatic Hydrocarbons – Chapter 8.3.7.7 Table 8.3.14

* SSTV are applicable to filtered samples for metals and metalloids.

3.3 WDL 174-11 Monitoring Program

Conditions 25 to 27 of WDL 174-11 outline MRM's monitoring requirements, and these conditions are reproduced below.

25. *The licensee must conduct surface water monitoring in accordance with Appendix 4.*
26. *The licensee must conduct fluvial sediment monitoring in accordance with Appendix 5.*
27. *The licensee must conduct biota monitoring in accordance with Appendix 6.*

Water monitoring data is provided in Attachment 3 and summarised in Section 4 of the EMR main report (Attachment 2). A summary of reporting period and long-term water quality trends for the McArthur River, including SW11, is provided in Section 4.3.

There was no observed discharge via the BBDDP during the reporting period, and hence no water quality sampling was undertaken during the reporting period. As such, please refer to *Waste Discharge Licence 174-10 Monitoring Report 1 June 2017 – 31 May 2018* (MRM, 2018) for long term trend analysis of BBDDP monitoring data. It is noted no dredge spoil has been actively emplaced at the BBLF since 2013.

The results for all other monitoring required under WDL 174-11, including long-term trend analysis where data is available, can be sourced directly from the specialist consultant reports appended to the EMR (Attachment 2):

- *Assessment of Bioavailable Metal Concentrations and Lead Isotope Ratios of Seafloor Sediments in the Bing Bong Loading Facility Transshipment Area, November 2020* (IndoPacific Environmental [IPE], 2021e) (Appendix W of Attachment 2).
- *Annual Marine Monitoring Program, Bing Bong Loading Facility, November 2020* (IPE, 2021a) (Appendix P of Attachment 2).
- *Monitoring of Select Analytes and Lead Isotope Ratios in Fluvial Sediments, Fish, Crustaceans and Molluscs, 2020* (IPE, 2021g) (Appendix K of Attachment 2).
- *Annual Seagrass Survey of the Bing Bong Loading Facility, 2020* (IPE, 2021b) (Appendix O of Attachment 2).
- *Aquatic Fauna of the McArthur River, Northern Territory, Early Dry Season, 2020* (IPE, 2021c) (Appendix L of Attachment 2).
- *Aquatic Fauna of the McArthur River, Northern Territory, Late Dry Season, 2020* (IPE, 2021d) (Appendix L of Attachment 2)
- *McArthur River Freshwater Aquatic Macroinvertebrate Assessment, 2020* (IPE, 2021f) (Appendix J of Attachment 2).
- *Surface Water Monitoring Report 2020/21* (WRM, 2021a) (Appendix R of Attachment 2) (Attachment 3).

The monitoring programs, including the sampling and analysis methodology used, are described in the specialist consultant reports appended to the EMR (Attachment 2). The specialist reports also describe the environmental settings during the sampling and EMR reporting period (where relevant).

Additionally, the *2020/21 Mine Derived Analyte Loads Assessment* is included as Attachment 4.

In addition to addressing the requirements of WDL 174-11, the objectives of the monitoring programs are to allow for the assessment of MRM's performance against its key environmental objectives, which are as follows:

- protect the McArthur River beneficial uses and community values from mining impacts;
- facilitate development of the ecosystems and their functions along the McArthur River Diversion Channel for terrestrial and aquatic flora and fauna;
- achieve a recovering trend in the water quality and ecosystem function in creeks on the Mine site within 20 years of cessation of mining;

- minimise air quality related impacts from the Mine's operations with respect to community health and environment; and
- protect the community values and beneficial uses adjacent to the BBLF and transhipment corridor.

4 Monitoring Results

4.1 Summary of Authorised Discharges

Table 4 shows the authorised discharges from the MLDP, SEL1 DP and Water Management Dam (WMD) Release Point (RP) to the McArthur River receiving waters between 1 May 2020 and 30 April 2021. All managed releases of mine derived water occurred during the 2020/21 wet season. A total of approximately 2,037.7 megalitres (ML) was released from authorised discharge points during the reporting period. This included approximately:

- 711.3 ML via the MLDP;
- 18.0 ML via the SEL1 DP; and
- 1,308.4 ML via the WMD RP.

TABLE 4: MLDP, SEL1 DP AND WMD RP MANAGED RELEASES

Discharge Event ID	Managed Release Point	Location Site ID	Release Start Date / Time	Release Finish Date / Time	Release Flow Rate (L/s)	Duration	Total Release (ML)
1	MLDP	P2	20/12/2020 7:26	20/12/2020 16:00	304	9 hrs	9.41
2	MLDP	WMD	20/12/2020 7:46	20/12/2020 20:00	298	12 hrs	13.12
3	MLDP	WMD	22/12/2020 8:30	08/01/2021 16:59	283	17.4 days	424.97
4	SEL1 DP	SEL1	24/12/2020 14:00	28/12/2020 12:15	53	3.9 days	17.99
5	WMD RP	WMD	25/12/2020 16:40	28/12/2020 11:35	1,149	2.8 days	274.23
6	WMD RP	WMD	30/12/2020 8:15	04/01/2021 14:00	1,047	5.2 days	474.68
7	MLDP	WMD	22/02/2021 13:20	24/02/2021 16:57	301	2.2 days	55.90
8	MLDP	WMD	22/02/2021 13:35	23/02/2021 14:35	916	1 days	82.50
9	WMD RP	WMD	21/03/2021 11:57	29/03/2021 17:41	670	8.2 days	477.0
10	MLDP	WMD	21/02/2021 12:52	29/03/2021 14:27	298	8.1 days	207.90
						Total	**2,037.7**

L/s = litres per second

4.1.1 Water Treatment

During the reporting period, poor quality water from the mine was treated with hydrated lime in the North Overburden Emplacement Facility South-East Perimeter Runoff Dam. Water was treated as required, up to a rate of 240 L/s. In total, 764 tonnes of hydrated lime were used to treat approximately 2,913 ML of poor quality water. Of this, approximately 2,695 ML of treated water was transferred out of the dam for waste discharge and release activities.

4.2 Tabulation of Monitoring Data

Condition 45.2 of WDL 174-11 requires that this Monitoring Report provides a tabulation of monitoring data required as a condition of WDL 174-11. The water quality monitoring data for the McArthur River downstream compliance point SW11 is provided in Table 5. Sampling was undertaken on at least a weekly basis at SW11 with the exception of between September 2020 and December 2020, where cease to flow conditions were observed.

Water quality monitoring data for all surface water monitoring sites outlined in Appendix 4: Table 1 of WDL 174-11 (i.e. SW06, SW08, SW09, SW11, SW12, SW13, SW15, SW16, SW21, SW27, SW28, SW29, SW30 and SW32) is tabulated in Appendix A of Attachment 3.

TABLE 5: WATER QUALITY DATA FOR SW11 SSTV PARAMETERS

Monitoring Location	Date	pH - Field (pH Unit)	EC - Field (µS/cm)	DO - Field (%)	Filtered Al (µg/L)	Filtered As (µg/L)	Filtered Cd (µg/L)	Filtered Cu (µg/L)	Filtered Fe (µg/L)	Filtered Pb (µg/L)	Filtered Mn (µg/L)	Filtered Hg (µg/L)	Filtered Ni (µg/L)	Filtered Zn (µg/L)	TPH C6-C9 (µg/L)	Benzene (µg/L)	TPH C10-C36 (µg/L)	SO_4 (mg/L)	NO_3 (µg/L)
McArthur River - Compliance Monitoring Point																			
SSTVs		**6.0-8.5**	**1000**	**85-120**	**55**	**24**	**1.73**	**10.97**	**300**	**16.6**	**1900**	**0.6**	**11**	**62.68**	**-**	**950**	**600**	**341**	**700**
SW11	03/05/2020 11:31	8.23	438	102.6	<5	0.8	<0.2	<1	6	<0.5	3.5	<0.01	<1	<2	<20	<1	<50	31	495
SW11	10/05/2020 10:51	8.14	560	111.4	<5	<0.5	<0.2	<1	6	<0.5	117	<0.01	<1	<2	<20	<1	<50	41	448
SW11	17/05/2020 9:57	8.16	620	108.7	2.4	0.8	<0.02	0.38	16	<0.01	195	<0.02	0.75	0.3	<20	<1	<50	55	580
SW11	24/05/2020 11:00	8.47	642	107.4	1.4	0.85	<0.02	0.38	16	<0.01	242	<0.02	0.72	<0.1	<20	<1	<50	54.6	500
SW11	31/05/2020 9:52	8.11	687	110	2.4	0.75	<0.02	0.36	12	<0.01	150	<0.02	0.58	<0.1	<20	<1	<50	50.6	440
SW11	08/06/2020 11:37	7.85	761	99.7	0.9	0.7	<0.02	0.38	8	<0.01	261	<0.02	0.69	0.1	<20	<1	<50	68.2	600
SW11	14/06/2020 9:49	8.39	798	89.9	<5	0.7	<0.2	<1	<5	<0.5	244	<0.01	<1	<2	<20	<1	<50	73	523
SW11	21/06/2020 9:54														<20	<1	<50		
SW11	21/06/2020 9:59	8.25	826	91.1	<5	0.8	<0.2	<1	<5	<0.5	295	<0.01	<1	<2				90	530
SW11	28/06/2020 10:33	8.27	908	83.5	<5	0.7	<0.2	<1	6	<0.5	668	<0.01	<1	<2	<20	<1	<50	97	600
SW11	05/07/2020 9:42	7.07	890	86.1	<5	0.8	<0.2	<1	8	<0.5	817	<0.01	<1	<2				92	377
SW11	05/07/2020 10:04														<20	<1	<50		
SW11	12/07/2020 8:33	8.38	934	60	<5	0.8	<0.2	<1	14	<0.5	638	<0.01	<1	<2	<20	<1	<50	81	122
SW11	19/07/2020 10:16	8.14	944	92.4	<5	0.6	<0.2	<1	7	<0.5	397	<0.01	<1	<2	<20	<1	<50	77	<100
SW11	26/07/2020 10:56	7.85	868	91.3	0.5	0.5	<0.02	0.27	8	<0.01	0.76	<0.02	0.65	<0.1	<20	<1	<50	53	<100
SW11	02/08/2020 11:00	7.54	866	96.8	0.7	0.6	<0.02	0.25	56	<0.01	1.3	<0.02	0.67	<0.1	<20	<1	<50	53	<100
SW11	08/08/2020 16:07	8.35	930	85	0.8	0.65	<0.02	0.32	58	0.01	0.79	<0.02	0.6	0.1	<20	<1	<50	53	<100
SW11	16/08/2020 8:39	7.32	879	91.2	1.2	0.7	<0.02	0.33	118	0.01	68.1	<0.02	0.61	<0.1	<20	<1	<50	53.9	<20
SW11	24/08/2020 11:00	6.79	923	85.9	1.6	0.85	<0.02	0.39	66	0.1	1.91	<0.02	0.62	0.2	<20	<1	<50	51.9	<20
SW11	07/09/2020 17:06	8.49	884	131.9	2.3	1.1	<0.02	0.49	10	0.03	1.23	<0.02	0.73	0.3	<20	<1	<50	49.2	<20
SW11	20/12/2020 7:19	7.76	76.4	92.4	42	<0.5	<0.2	<1	70	<0.5	4.9	<0.01	<1	<2	<20	<1	<50	3.4	2079
SW11	21/21/2020 7:19	7.11	114	91.7	33	<0.5	<0.2	<1	70	<0.5	6.4	<0.01	<1	<2	<20	<1	<50	15	1694
SW11	23/12/2020 7:04	7.44	174	84.9	37	<0.5	<0.2	<1	97	<0.5	1.6	<0.01	<1	<2	<20	<1	<50	41	1051
SW11	27/12/2020 12:09	6.77	35.8	80.8	135	<0.5	<0.2	<1	189	<0.5	2.6	<0.01	<1	<2	<20	<1	<50	2	632
SW11	31/13/2020 11:38	7.86	26.2	90.4	270	<0.5	<0.2	<1	269	<0.5	2.4	<0.01	<1	<2	<20	<1	<50	1.2	370
SW11	03/01/2021 8:12	7.52	302	88.6	51	<0.5	<0.2	<1	140	<0.5	24	<0.01	<1	<2	<20	<1	<50	97	614
SW11	10/01/2021 7:40	7.17	144	84.3	40	<0.5	<0.2	<1	185	<0.5	8.2	<0.01	<1	<2	<20	<1	<50	13	763
SW11	17/01/2021 7:48	7.71	178	33.3	27	0.6	<0.2	<1	196	<0.5	41	<0.01	<1	<2	<20	<1	<50	7.1	486
SW11	24/01/2021 8:40	7.64	89	87.3	75	<0.5	<0.2	<1	307	<0.5	1.7	<0.01	<1	<2	<20	<1	<50	2.4	<100
SW11	31/01/2021 7:53	7.27	170	86.9	44.2	0.65	<0.02	0.56	180	0.09	0.96	<0.02	0.5	0.1	<20	<1	<50	5	300
SW11	07/02/2021 12:08	7.31	62	83.2	30	<1	<0.1	<1	180	<1	<1	<0.1	<1	<5	<20	<1	<50	<1	132
SW11	14/02/2021 8:14	7.54	110	88.8	129	0.6	<0.2	1	269	<0.5	1.1	<0.01	<1	<2	<20	<1	<50	3.5	133
SW11	21/02/2021 8:30	7.41	89.6	91.8	85	<0.5	<0.2	<1	185	<0.5	1	<0.01	<1	<2	<20	<1	<50	2.3	120
SW11	23/02/2021 7:14	7.35	320	88.8	18	<0.5	<0.2	<1	107	<0.5	1.6	<0.01	<1	<2	<20	<1	<50	99	182
SW11	28/02/2021 8:49	7.44	158	90.6	27	0.5	<0.2	<1	210	<0.5	16	<0.01	<1	<2	<20	<1	<50	6.2	360
SW11	07/03/2021 7:42	7.45	244	88.9	8	0.6	<0.2	<1	115	<0.5	22	<0.01	<1	<2	<20	<1	<50	8.5	432
SW11	14/03/2021 8:02	7.46	240	86.7	<5	0.5	<0.2	<1	45	<0.5	<0.5	<0.01	<1	<2	<20	<1	<50	5.7	208
SW11	21/03/2021 8:05	7.63	21.2	93.7	63	<0.5	<0.2	<1	86	<0.5	2.2	<0.01	<1	<2	<20	<1	<50	0.4	140
SW11	22/03/2021 7:17	7.45	18.6	90.6	63	<0.5	<0.2	<1	112	<0.5	1.5	<0.01	<1	<2	<20	<1	<50	0.2	<100

Monitoring Location	Date	pH - Field (pH Unit)	EC - Field (µS/cm)	DO - Field (%)	Filtered Al (µg/L)	Filtered As (µg/L)	Filtered Cd (µg/L)	Filtered Cu (µg/L)	Filtered Fe (µg/L)	Filtered Pb (µg/L)	Filtered Mn (µg/L)	Filtered Hg (µg/L)	Filtered Ni (µg/L)	Filtered Zn (µg/L)	TPH C6-C9 (µg/L)	Benzene (µg/L)	TPH C10-C36 (µg/L)	SO_4 (mg/L)	NO_3 (µg/L)
McArthur River - Compliance Monitoring Point																			
SSTVs		**6.0-8.5**	**1000**	**85-120**	**55**	**24**	**1.73**	**10.97**	**300**	**16.6**	**1900**	**0.6**	**11**	**62.68**	**-**	**950**	**600**	**341**	**700**
SW11	28/03/2021 8:23	7.91	266	83.1	18	<0.5	<0.2	<1	95	<0.5	57	<0.01	<1	<2	<20	<1	<50	65	183
SW11	04/04/2021 10:52	8.14	224	96.2	24	<0.5	<0.2	<1	129	<0.5	24	<0.01	<1	<2	<20	<1	<50	9	372
SW11	11/04/2021 7:55	7.5	296	86.8	<10	<1	<0.1	<1	<50	<1	2	<0.1	<1	<5	<20	<1	<50	12	398
SW11	18/04/2021 8:11	7.8	370	87.6	<5	0.7	<0.2	<1	15	<0.5	46	<0.01	<1	<2	<20	<1	<50	14	377
SW11	25/04/2021 7:44	8.23	434	87.8	<5	0.7	<0.2	<1	9	<0.5	68	<0.01	<1	<2	<20	<1	<50	18	381

Note: Shaded results show instances whereby monitoring results were greater than SSTV.

4.3 Surface Water Quality

Surface water quality for each SSTV parameter at sites on the McArthur River and Glyde River for the Reporting Period and historically are presented in Charts 1 to 34. The reporting period graphs present the weekly rainfall record from the gauge at McArthur River Airport from the Department of Environment and Science SILO Patched Point Data Service, and the historical graphs present the rainfall as monthly.

There was no observed discharge via the BBDDP, and hence no relating charts are presented in this section. As such, please refer to *Waste Discharge Licence 174-10 Monitoring Report 1 June 2017 – 31 May 2018* (MRM, 2018) for long term trend analysis of BBDDP monitoring data.

4.3.1 pH

Field measured pH is presented in Chart 1 for the reporting period. Recorded pH measurements at SW11 were within the SSTV limits. The pH values during the reporting period are generally consistent with the range of historical values (Chart 2), ranging between 7.0 and 8.5 (pH units). Decreases in pH are observed during the wet season, coinciding with periods of rainfall runoff events.

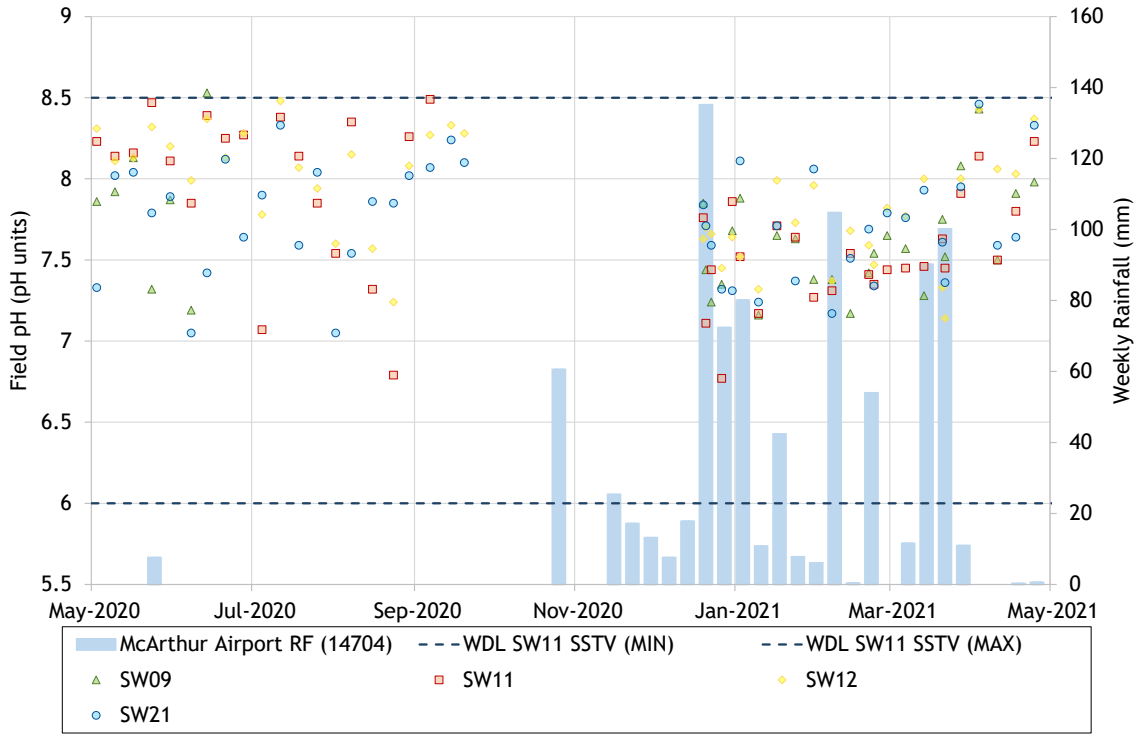

Chart 1: Reporting Period Field pH and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

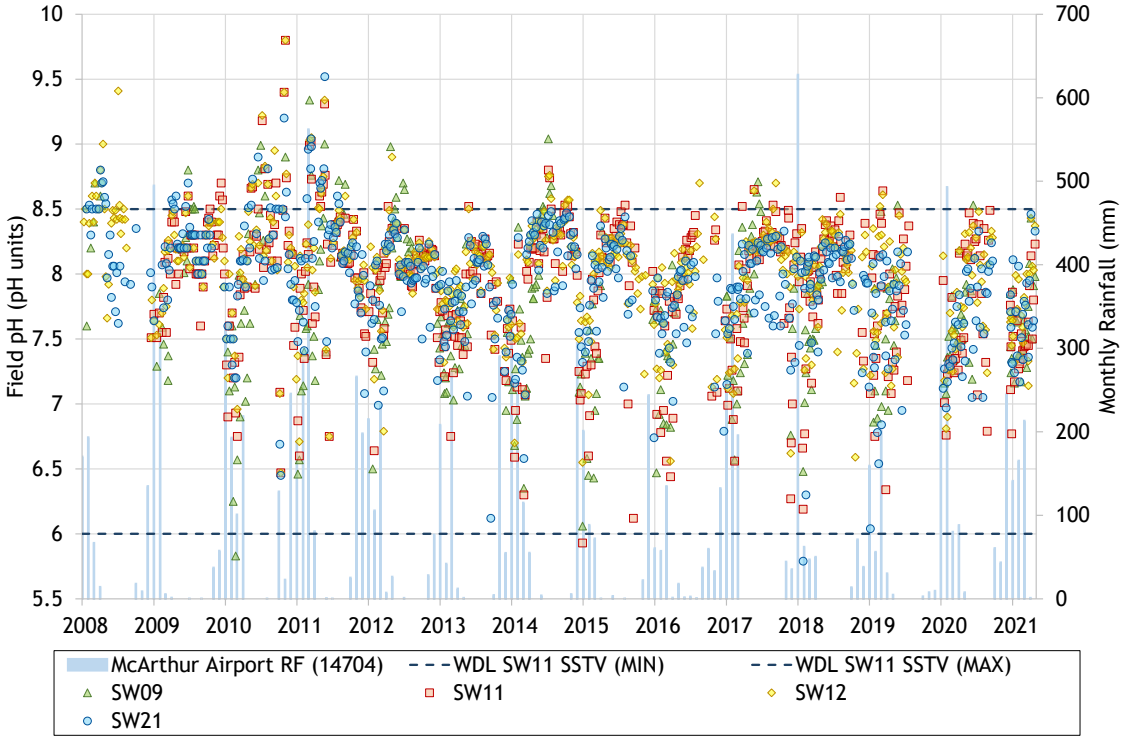

Chart 2: Historical Field pH and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.2 Electrical Conductivity

Chart 3 presents the electrical conductivity (EC) (laboratory measured) for the reporting period. Recorded EC concentrations were below the SSTV at SW11 during the reporting period.

An increasing trend is observed as the dry season progresses as a result of evaporation and reduced flow volumes, and a higher contribution from groundwater expressing as surface water baseflow. Rapid decreases in EC occur as a result of the dilution provided by rainfall events. During the reporting period, EC levels were generally consistent with the range of historical values (Chart 4).

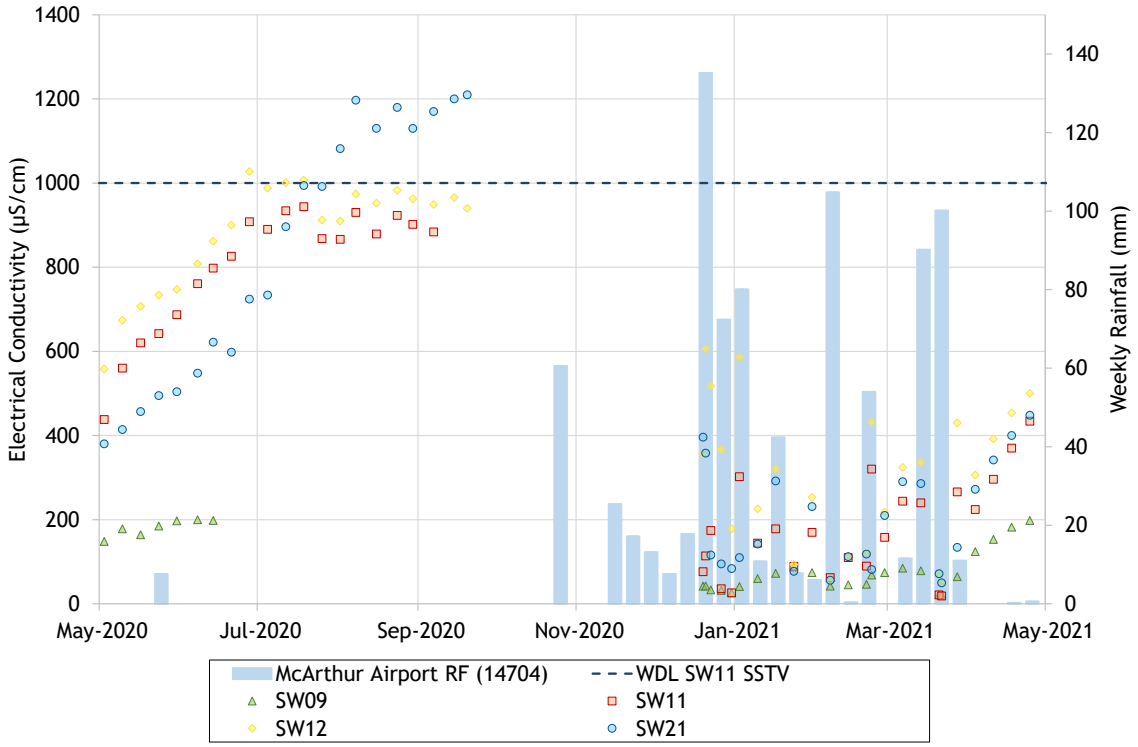

Chart 3: Reporting Period Laboratory Electrical Conductivity and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

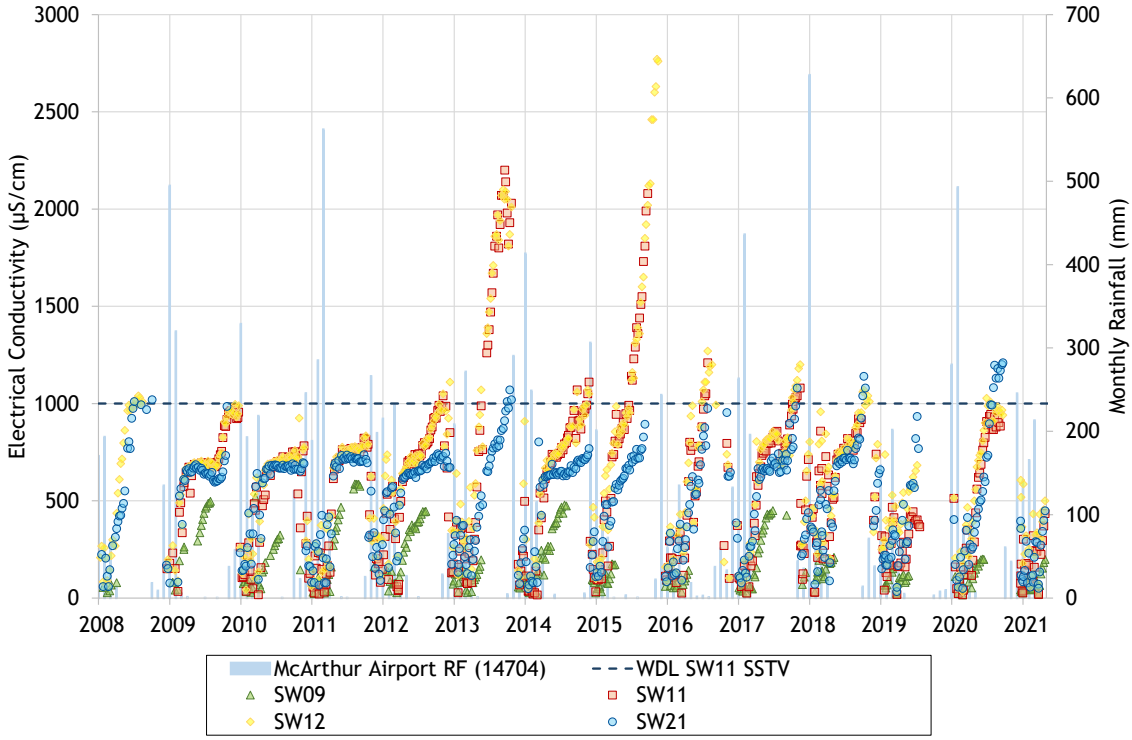

Chart 4: Historical Laboratory Electrical Conductivity and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.3 Dissolved Oxygen

Chart 5 presents the field dissolved oxygen (DO) measurements for the reporting period. There were nine instances of the DO water quality parameter measured outside the SSTV at SW11 during the reporting period: one above the maximum SSTV (120% saturation) and eight below the minimum SSTV (85% saturation).

DO concentrations were typically in the range 60 to 120% saturation. The levels exhibit a slightly greater variation during the dry season, including sites upstream of the Mine (Chart 5)

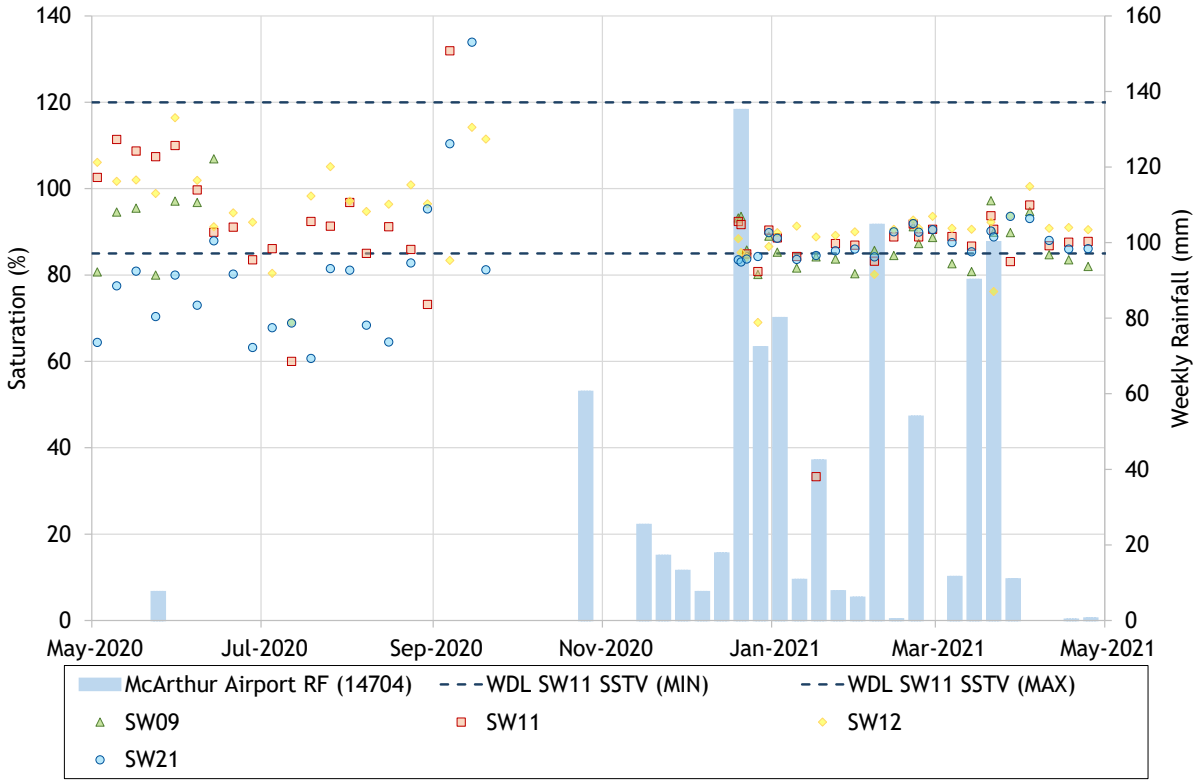

Chart 5: Reporting Period Dissolved Oxygen and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

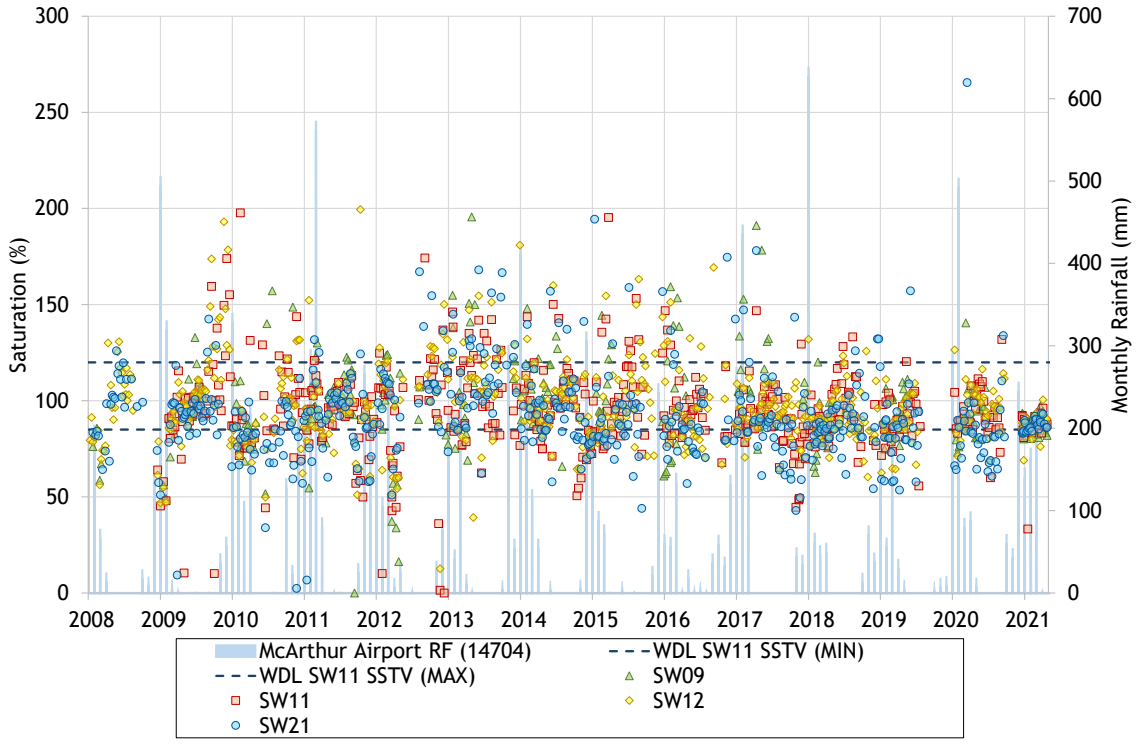

Chart 6: Historical Dissolved Oxygen and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.4 Filtered Aluminium

Filtered aluminium (Al) concentrations are presented on Chart 7 for the reporting period. Seven instances whereby the filtered Al concentrations were beyond the SSTV at SW11 occurred during the reporting period and are discussed further in Section 6.

The data indicates consistently low concentrations during the dry season, and higher concentrations during the wet season. Spikes in filtered Al, of similar concentration, are observed in the historical time series (Chart 8), also coinciding with periods of high rainfall.

During the reporting period, the highest concentrations occurred following the January 2021 and March 2021 rainfall events. An increase in concentrations was recorded at all monitoring locations, including the upstream and control sites. This suggests a significant source of filtered Al in the upstream McArthur River catchment (i.e. upstream of the Mine).

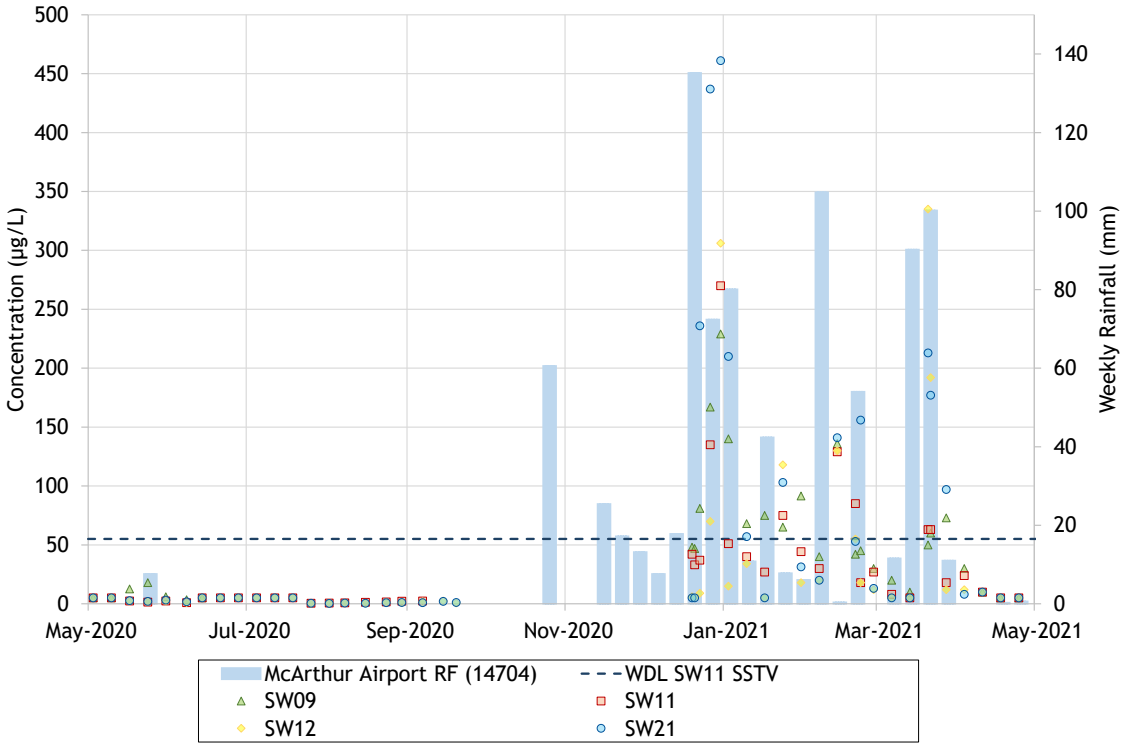

Chart 7: Reporting Period Filtered Al and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

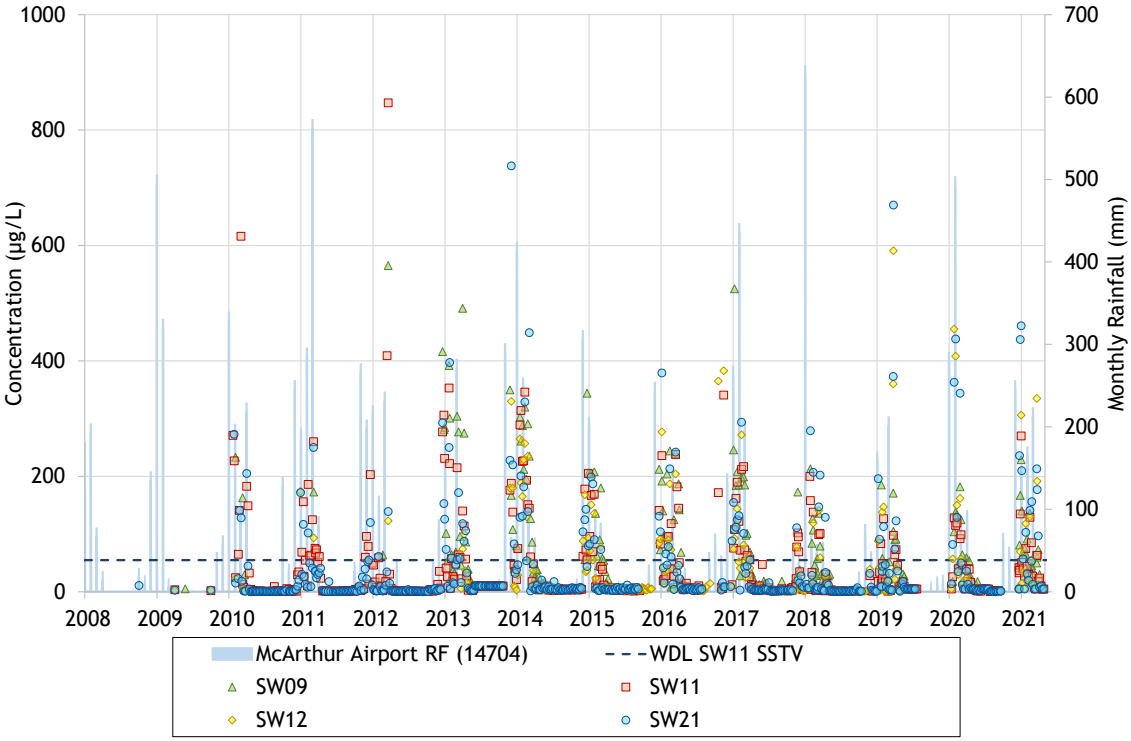

Chart 8: Historical Filtered Al and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.5 Filtered Arsenic

Filtered arsenic (As) concentrations are presented on Chart 9 for the reporting period. Recorded filtered As concentrations were below the SSTV at SW11 during the reporting period. Filtered As concentrations were low, which is consistent with the historical data (Chart 10).

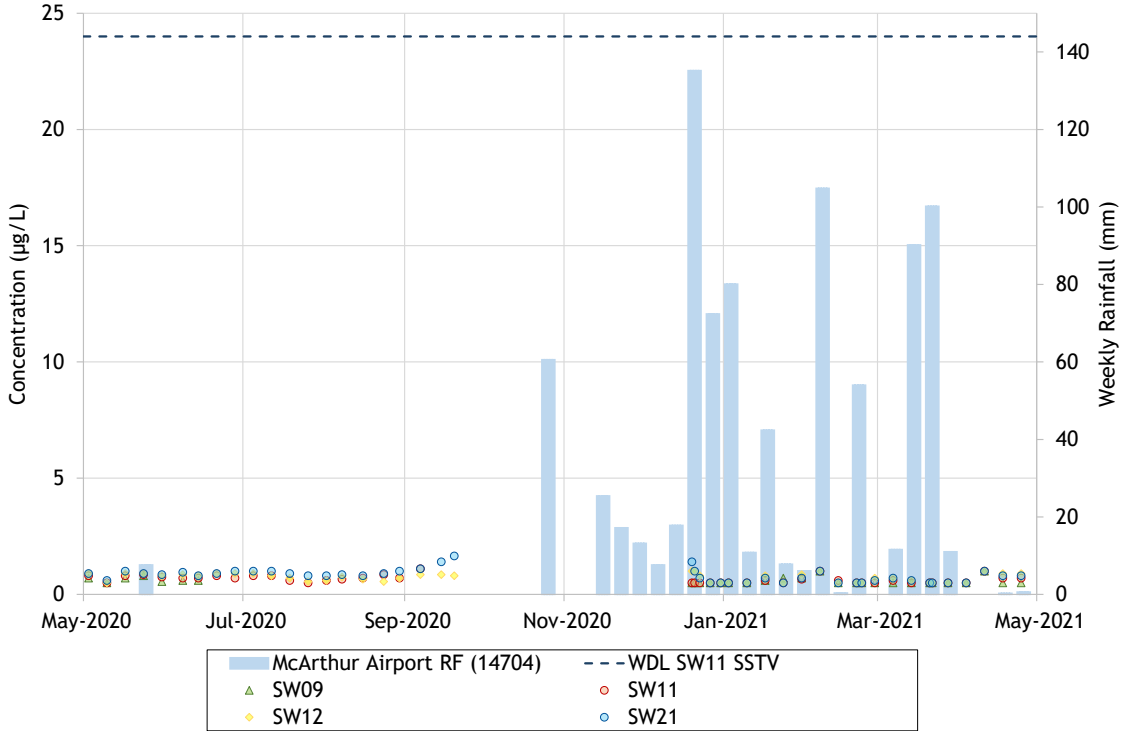

Chart 9: Reporting Period Filtered As and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

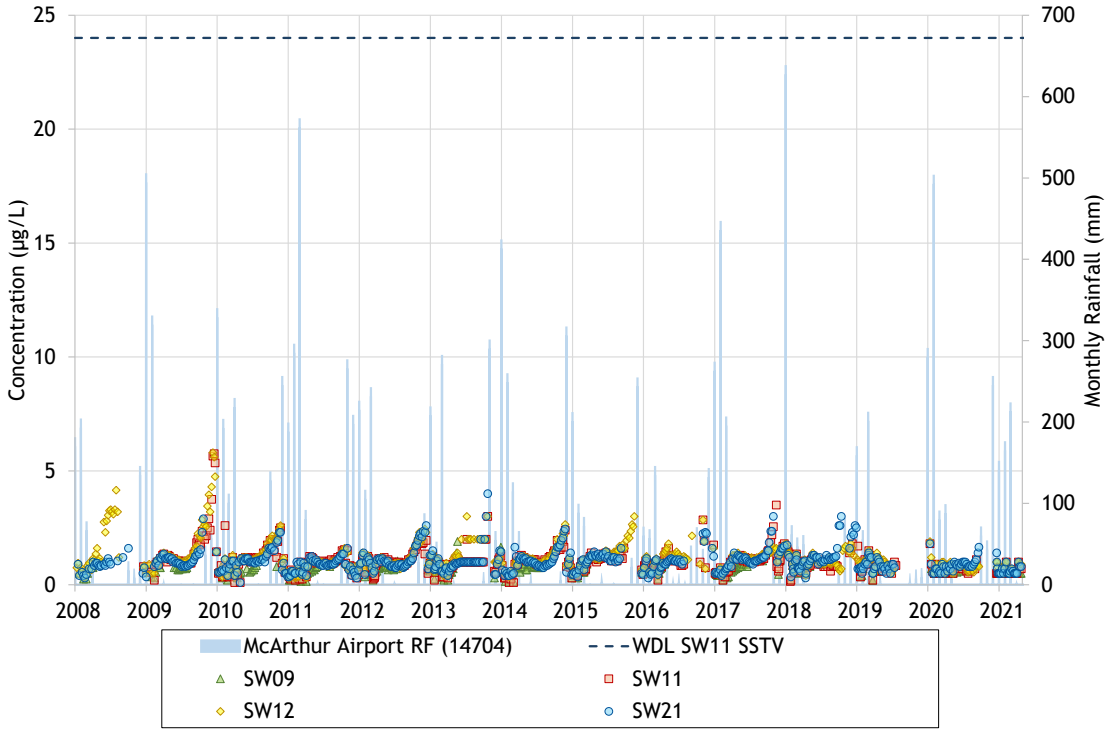

Chart 10: Historical Filtered As and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.6 Filtered Cadmium

Filtered cadmium (Cd) concentrations are presented on Chart 11 for the reporting period. Recorded filtered Cd concentrations were below the SSTV at SW11 during the reporting period. The data show no significant trends during the reporting period. The majority of the samples were below the limit of reporting (0.1 µg/L to 0.2 µg/L), and consistent with historical concentrations (Chart 12).

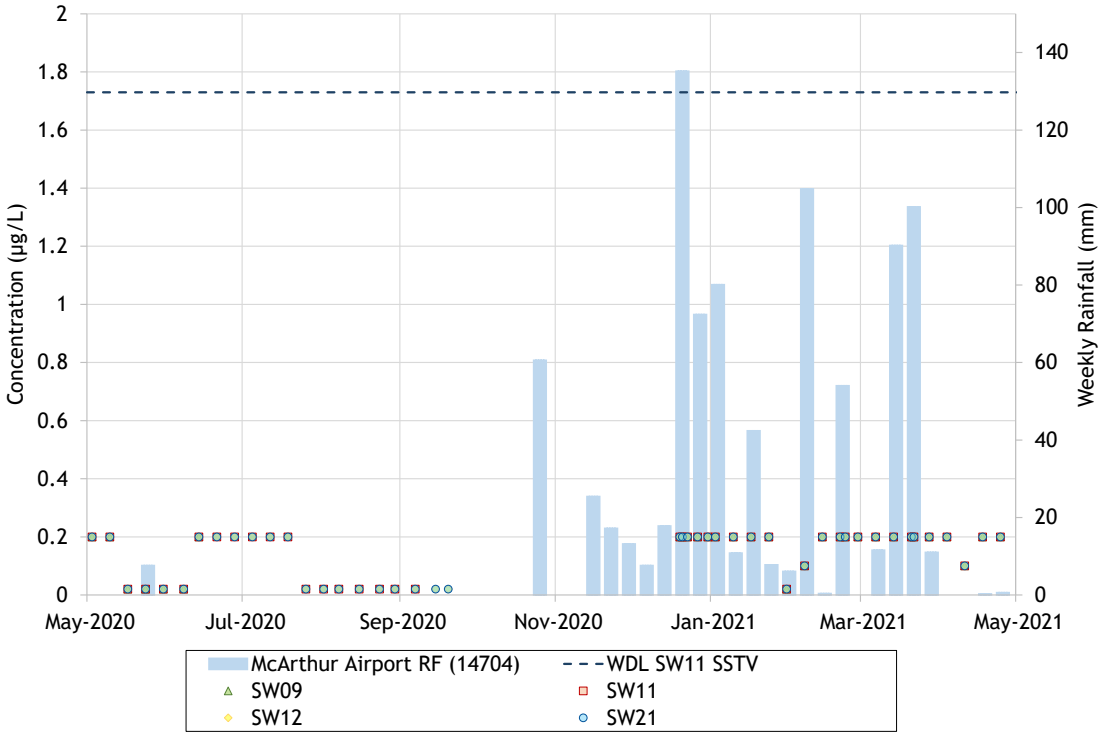

Chart 11: Reporting Period Filtered Cd and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

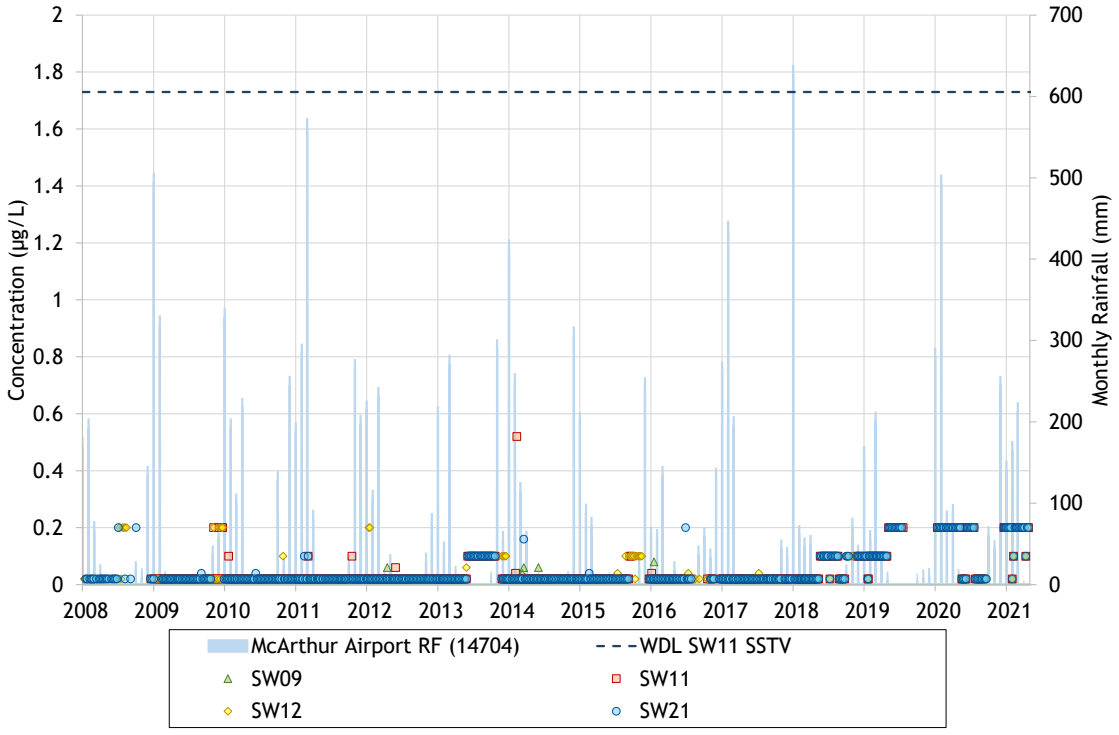

Chart 12: Historical Filtered Cd and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.7 Filtered Copper

Chart 13 presents the filtered copper (Cu) concentrations for the reporting period. Recorded filtered Cu concentrations were below the SSTV at SW11 throughout the reporting period. During the reporting period, all measured filtered Cu concentrations were below 1.0 µg/L, which is consistent with the historical data (Chart 14).

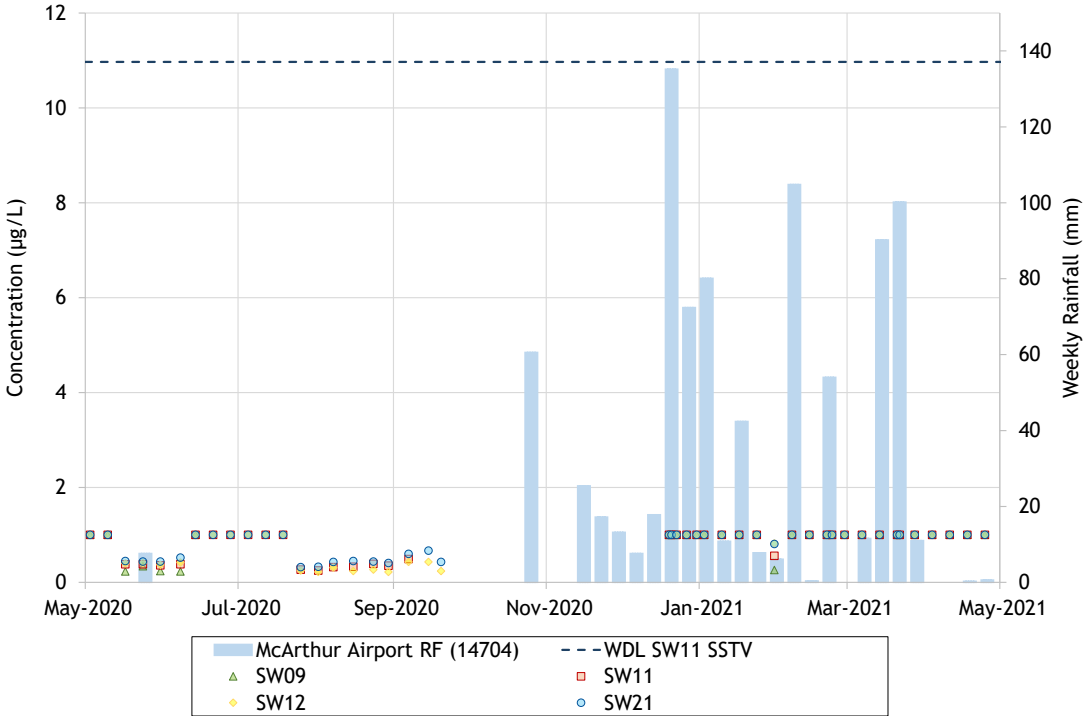

Chart 13: Reporting Period Filtered Cu and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

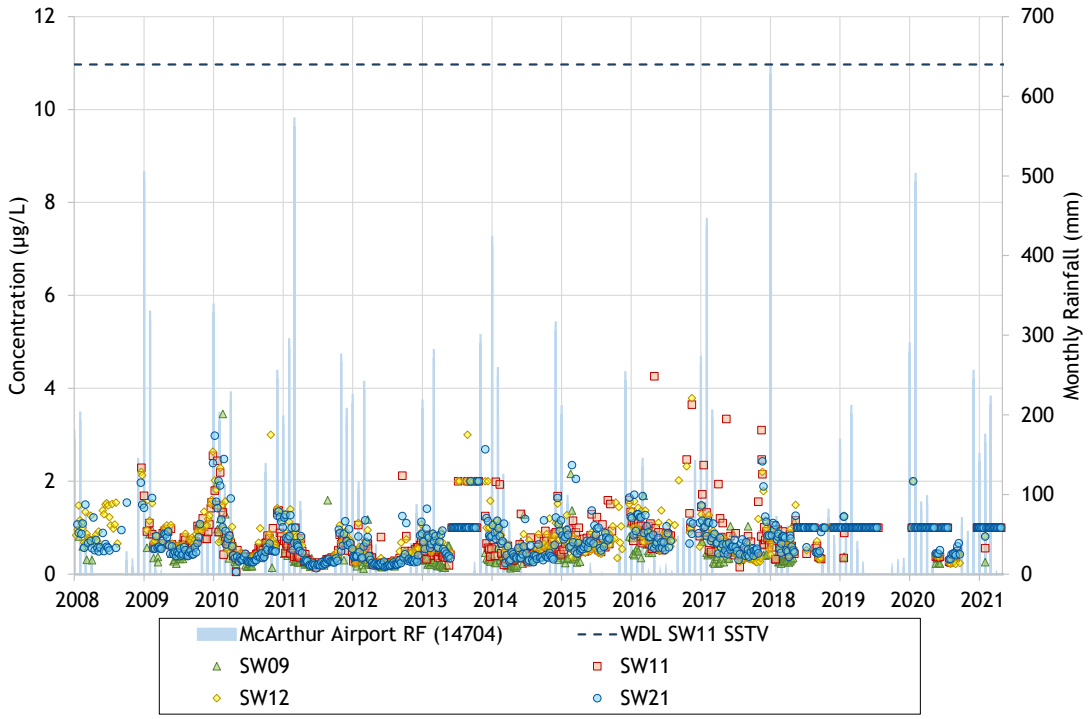

Chart 14: Historical Filtered Cu and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.8 Filtered Iron

Filtered iron (Fe) concentrations are presented in Chart 15 for the reporting period. Concentrations were generally stable through the dry season (with the exception of SW09), with fluctuations through the wet season associated with the rainfall events. The data for the reporting period is generally consistent with the historical data (Chart 16).

One instance of filtered Fe beyond the SSTV at SW11 was recorded during the reporting period (24 January 2021). Consistent with previous years, at the time of the incident, concentrations were also elevated at SW09, on the Glyde River, which indicates there is an influence from the Glyde River catchment on water quality at SW11 (Chart 16). Additionally, no active discharge was occurring at the time. As such, the high level of filtered Fe is considered non-mine related. Further discussion is included in Section 6.

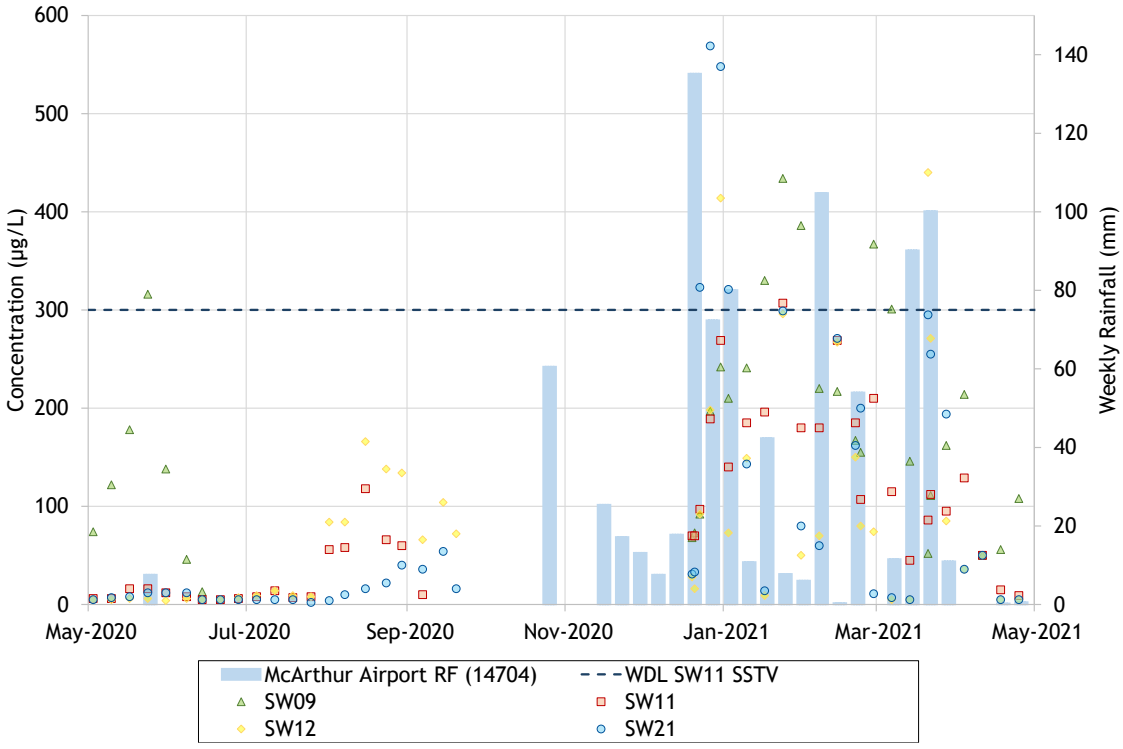

Chart 15: Reporting Period Filtered Fe and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

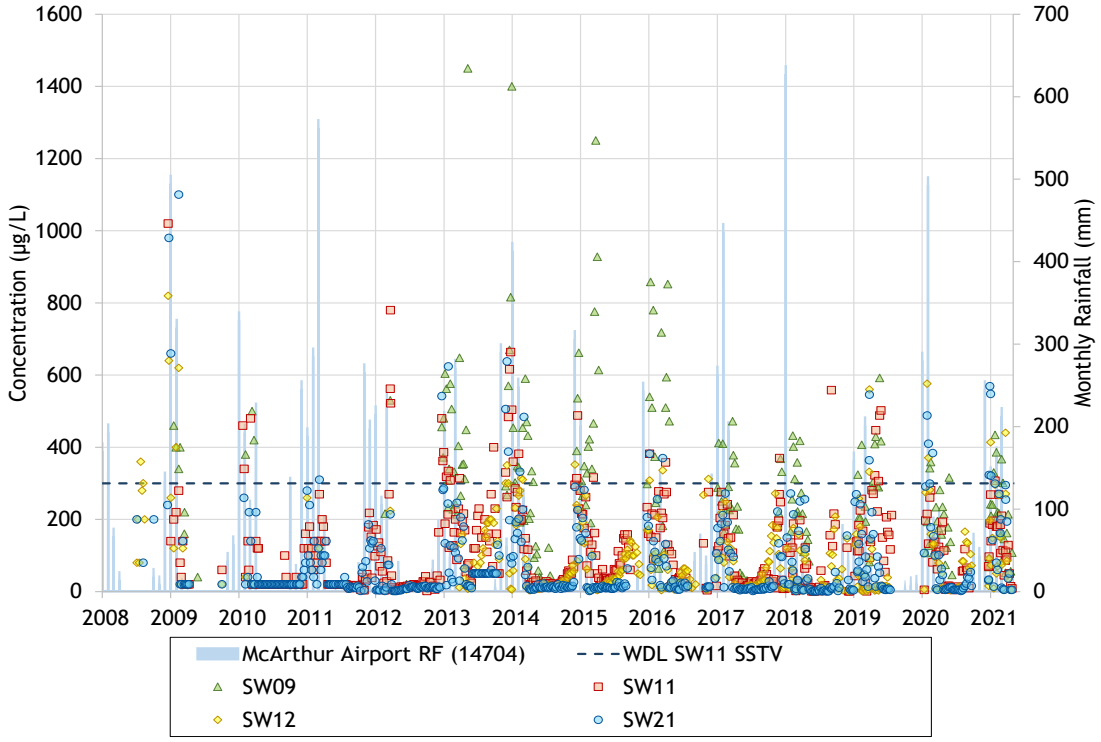

Chart 16: Historical Filtered Fe and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.9 Filtered Lead

Chart 17 presents the filtered lead (Pb) concentrations for the reporting period. Recorded filtered Pb concentrations were below the SSTV at SW11 during the reporting period.

During the reporting period, low concentrations were recorded throughout, with all concentrations below 1.0 µg/L, consistent with the historical dataset (Chart 18).

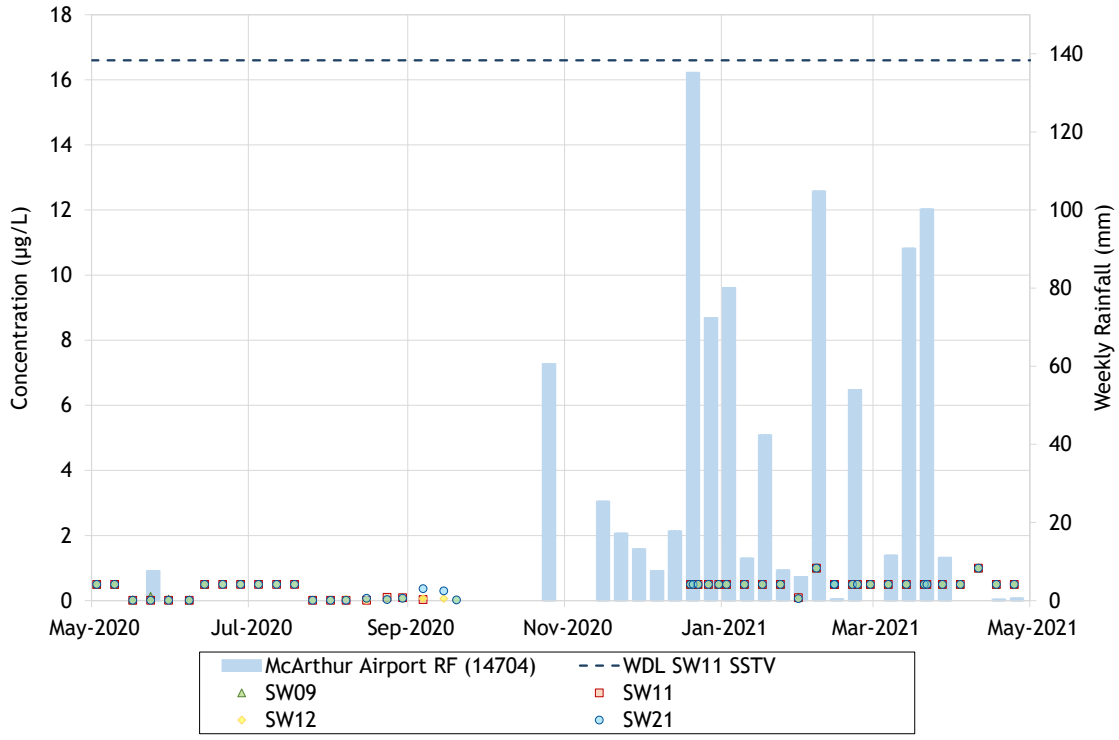

Chart 17: Reporting Period Filtered Pb and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

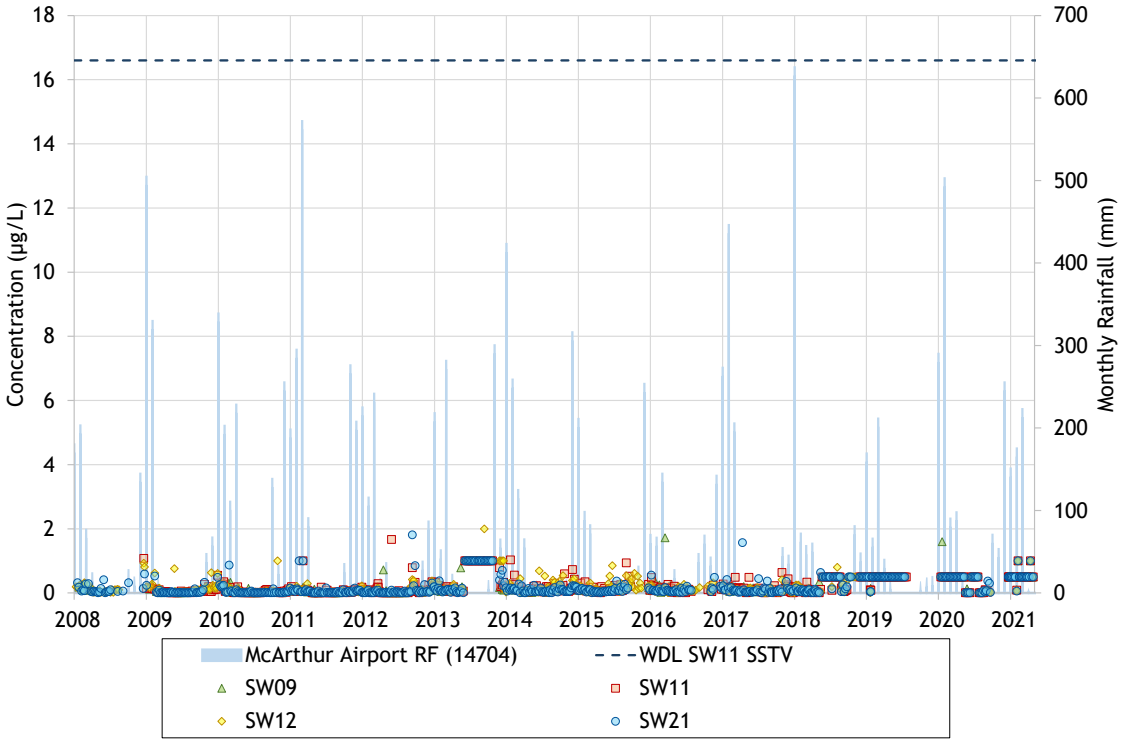

Chart 18: Historical Filtered Pb and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.10 Filtered Manganese

Chart 19 presents the filtered manganese (Mn) concentrations for the reporting period. Recorded filtered Mn concentrations were below the SSTV at SW11 during the reporting period.

The historical data (Chart 20) shows that the filtered Mn levels in upstream McArthur River (SW21) and Glyde River (SW09) were consistently low. Filtered Mn levels downstream of the Mine (SW11 and SW12) were generally low during the wet seasons but elevated during the dry seasons.

During the reporting period, the highest concentrations were recorded at SW11 and SW12 with the highest concentrations occurring between May 2020 and September 2020. There was no flow at this time at SW06 (Barney Creek) or SW26 (Emu Creek), which are located upstream of SW11 and SW12. This suggests that the increase downstream may be a function of the increased relative contribution of groundwater baseflow to the surface water system during the period of higher filtered Mn. Filtered Mn has also been confirmed as occurring within the natural mineralisation associated with the fault structures.

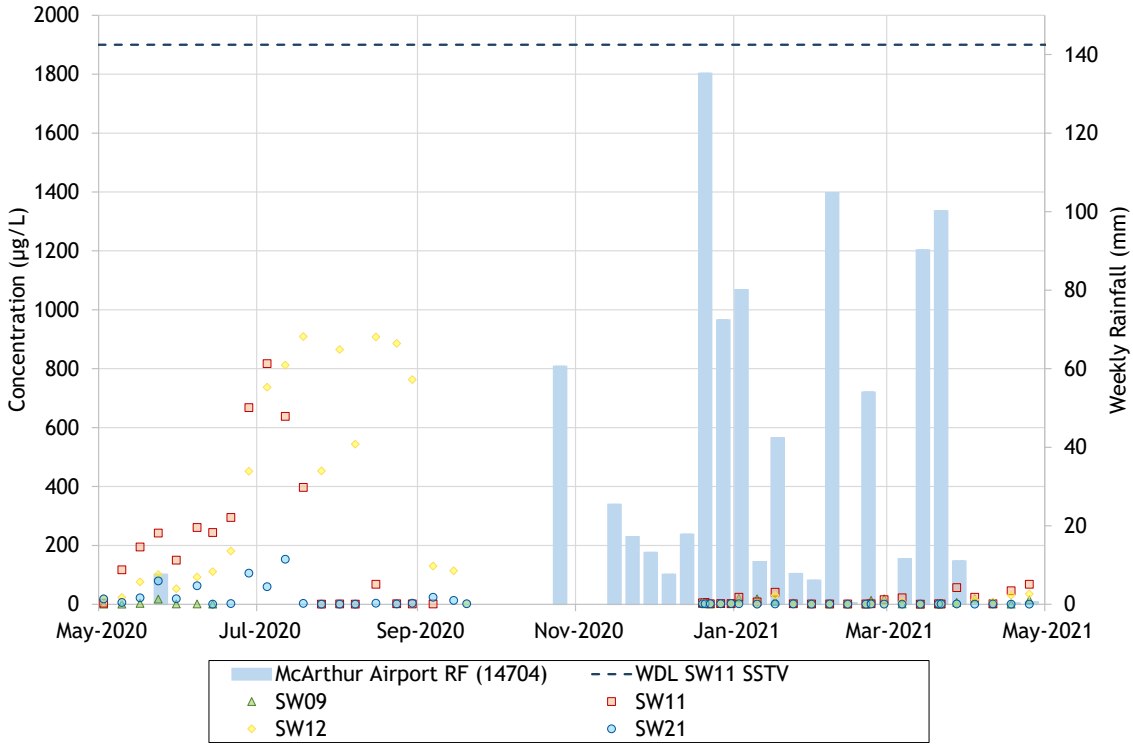

Chart 19: Reporting Period Filtered Mn and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

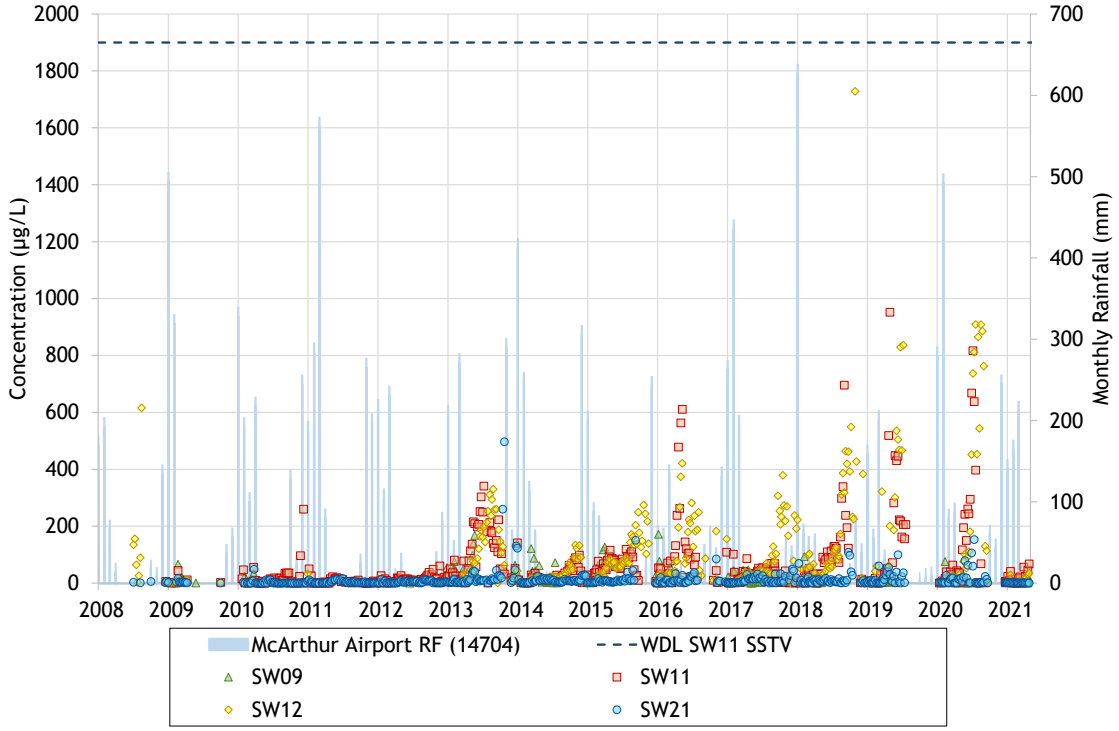

Chart 20: Historical Filtered Mn and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.11 Filtered Mercury

Filtered mercury (Hg) concentrations for the reporting period are presented in Chart 21. Recorded filtered Hg concentrations at SW11 were below the SSTV during the reporting period. The majority of filtered Hg samples were below the limits of reporting (0.01 µg/L, 0.02 µg/L and 0.1 µg/L), consistent with the historical dataset (Chart 22).

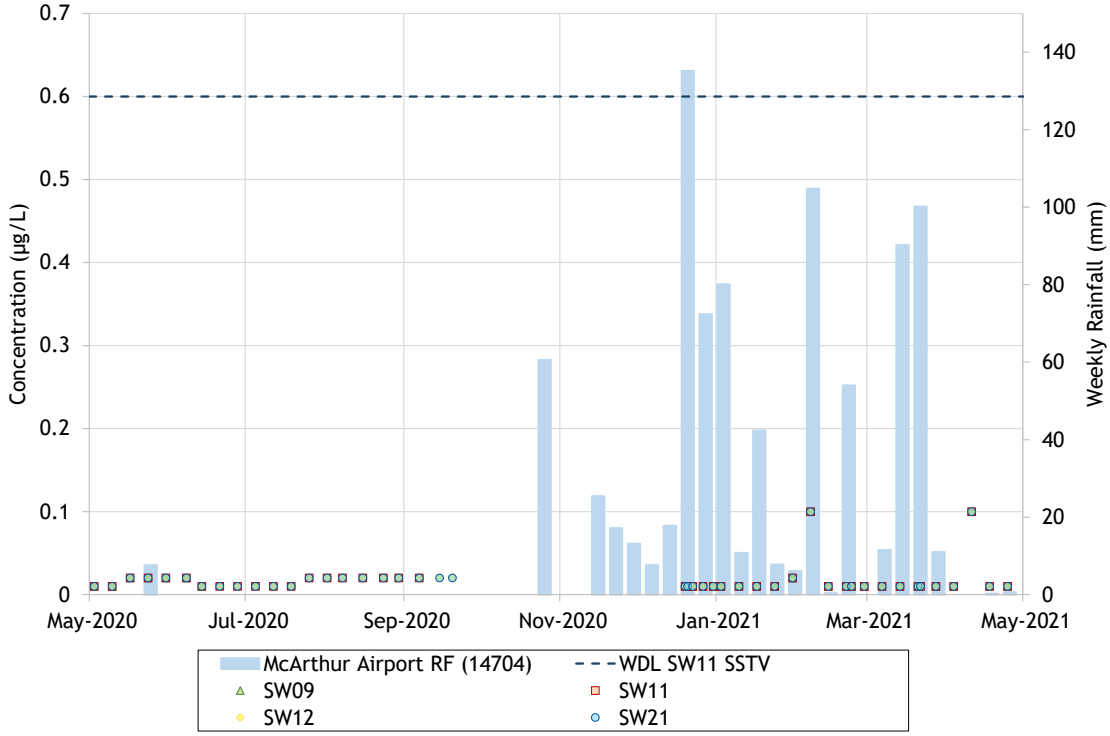

Chart 21: Reporting Period Filtered Hg and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

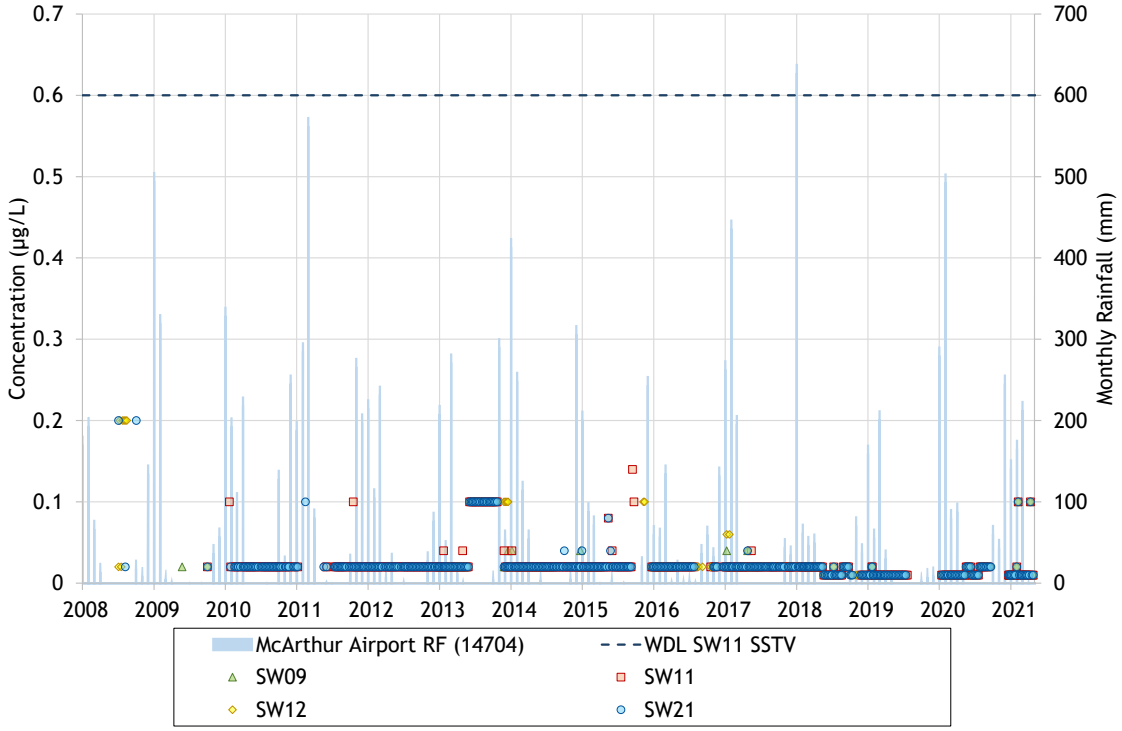

Chart 22: Historical Filtered Hg and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.12 Filtered Nickel

Filtered nickel (Ni) concentrations for the reporting period are presented in Chart 23. Recorded filtered Ni concentrations at SW11 were below the SSTV during the reporting period. All samples for filtered Ni recorded concentrations below 1.0 µg/L. Concentrations during the reporting period were consistent with the historical record (Chart 24).

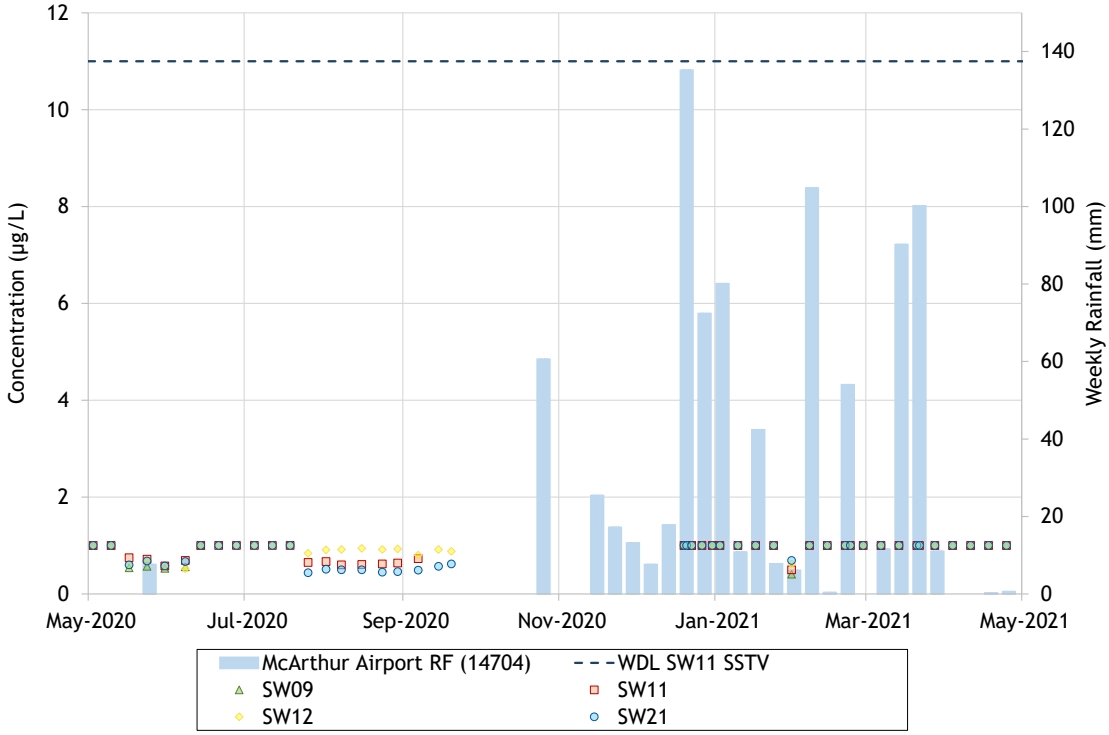

Chart 23: Reporting Period Filtered Ni and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

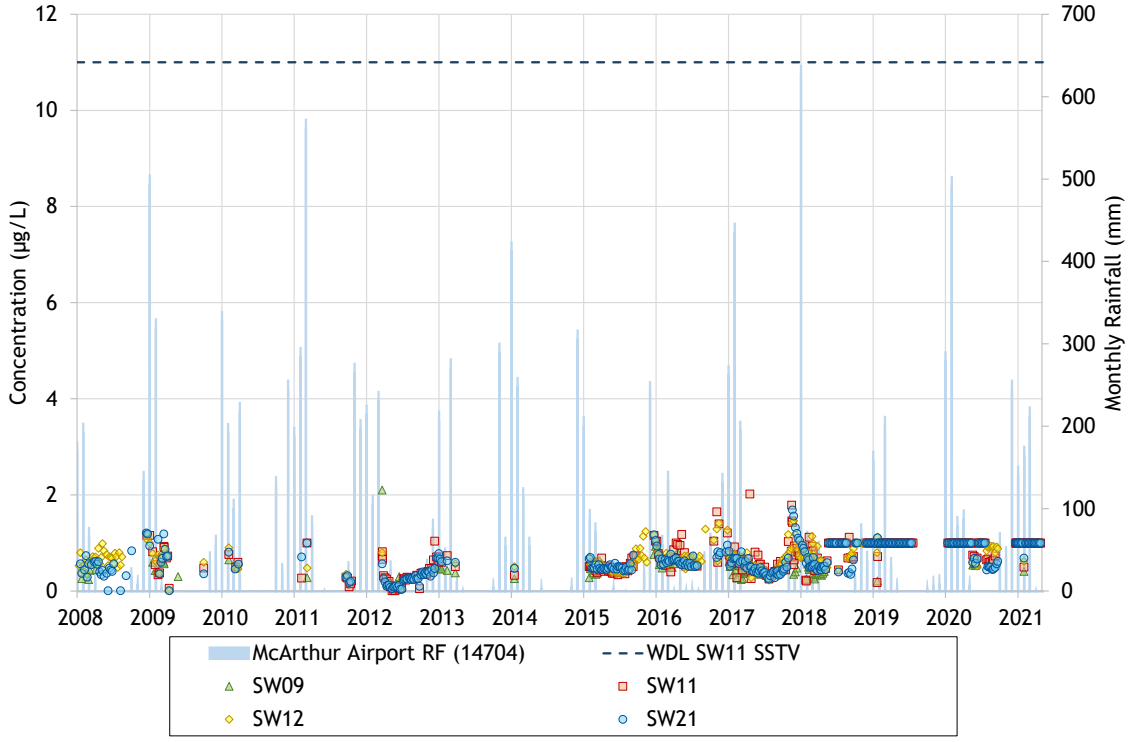

Chart 24: Historical Filtered Ni and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.13 Filtered Zinc

Concentrations of filtered zinc (Zn) for the reporting period are presented in Chart 25. Recorded filtered Zn concentrations at SW11 were below the SSTV during the reporting period. Concentrations measured throughout the reporting period were low and are within the range of historical concentrations (Chart 26).

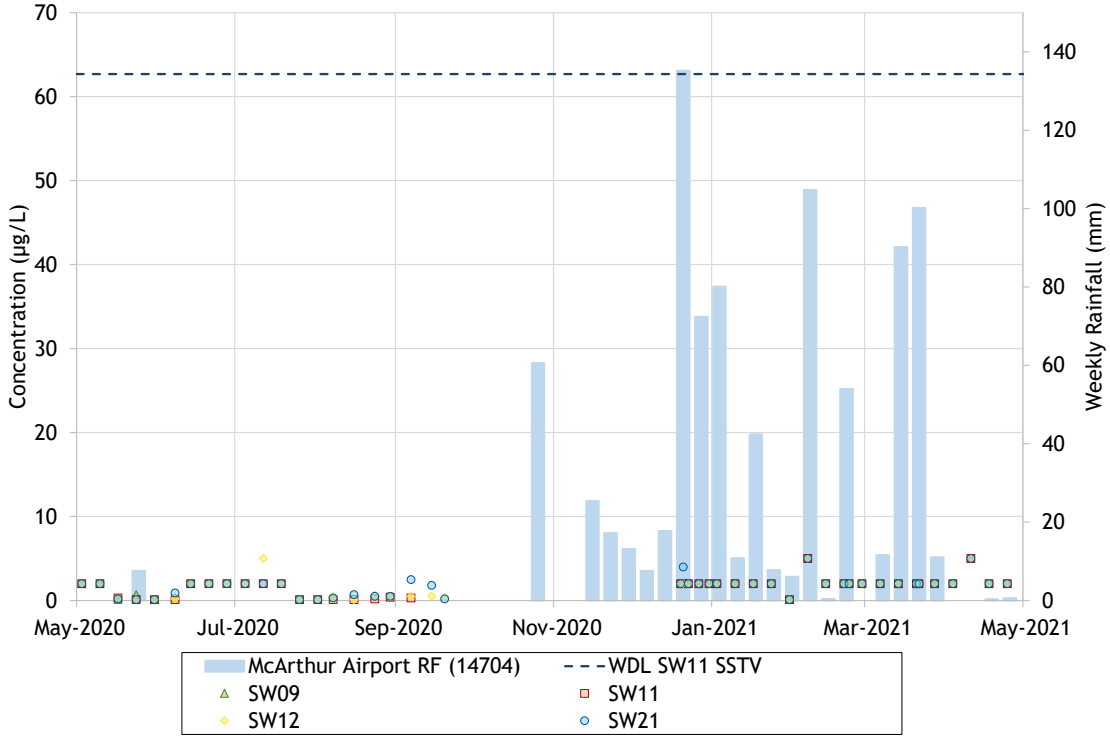

Chart 25: Reporting Period Filtered Zn and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

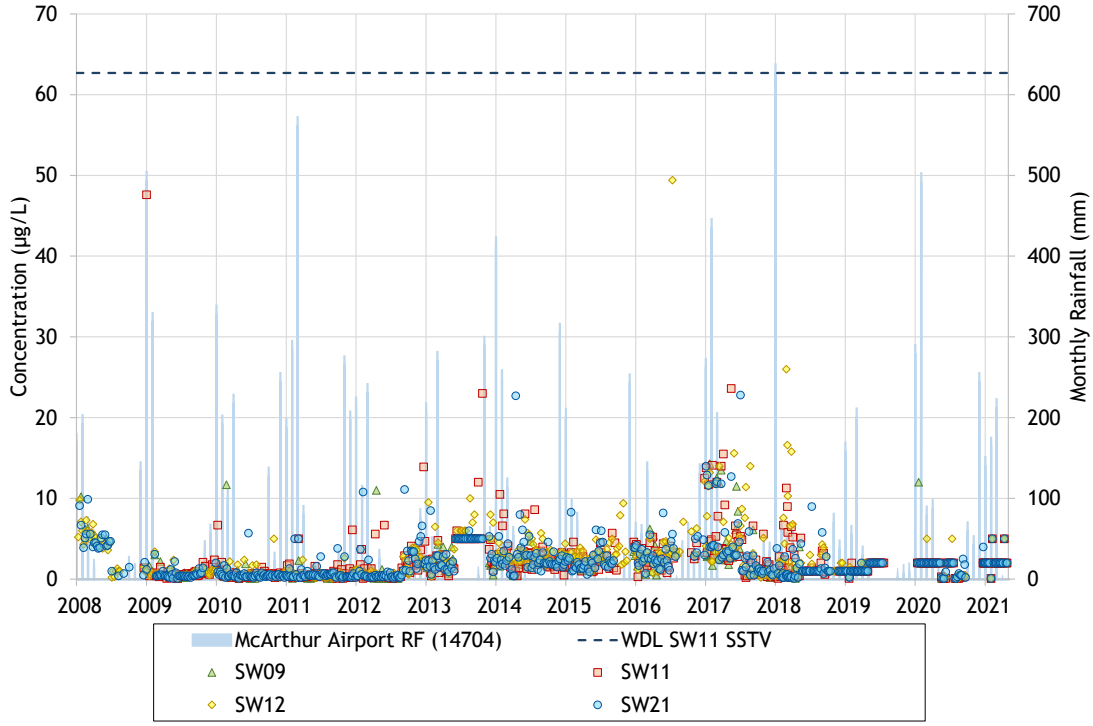

Chart 26: Historical Filtered Zn and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.14 Sulphate

Recorded sulphate (SO_4) concentrations at SW11 were below the SSTV during the reporting period (Chart 27). SO_4 concentrations show a similar trend to EC levels where values are highest during the dry season and lowest during the wet season. During the reporting period, SO_4 levels were generally consistent with historical levels (Chart 28).

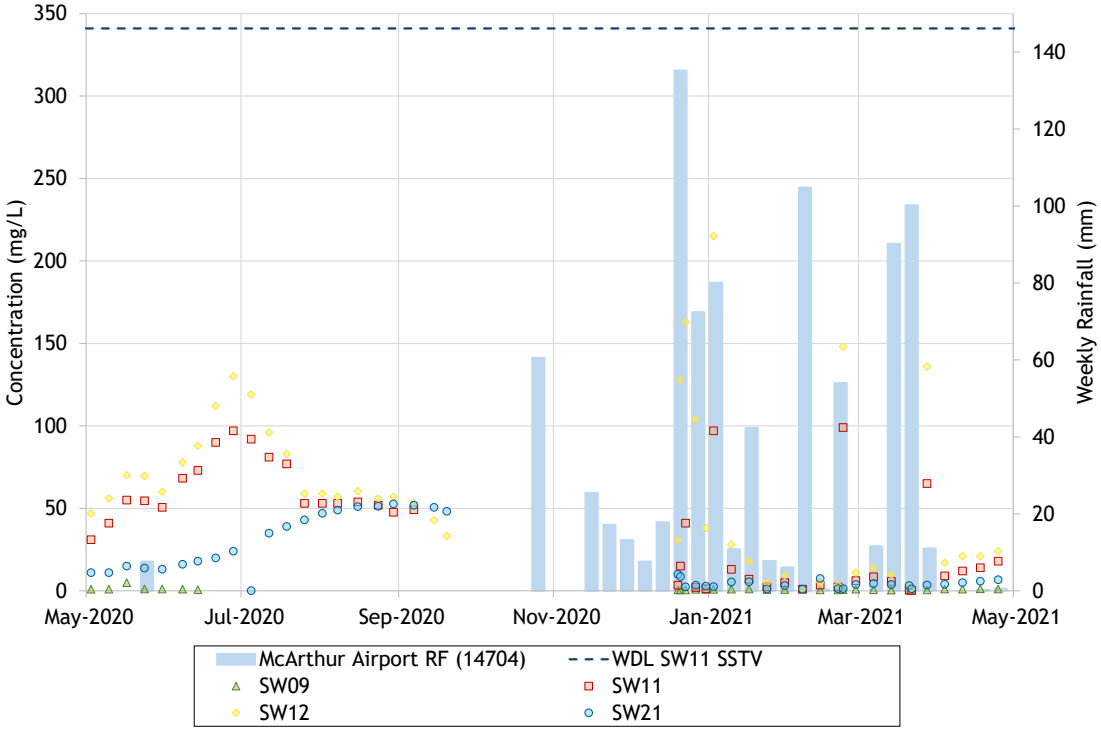

Chart 27: Reporting Period Sulphate (SO_4) and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

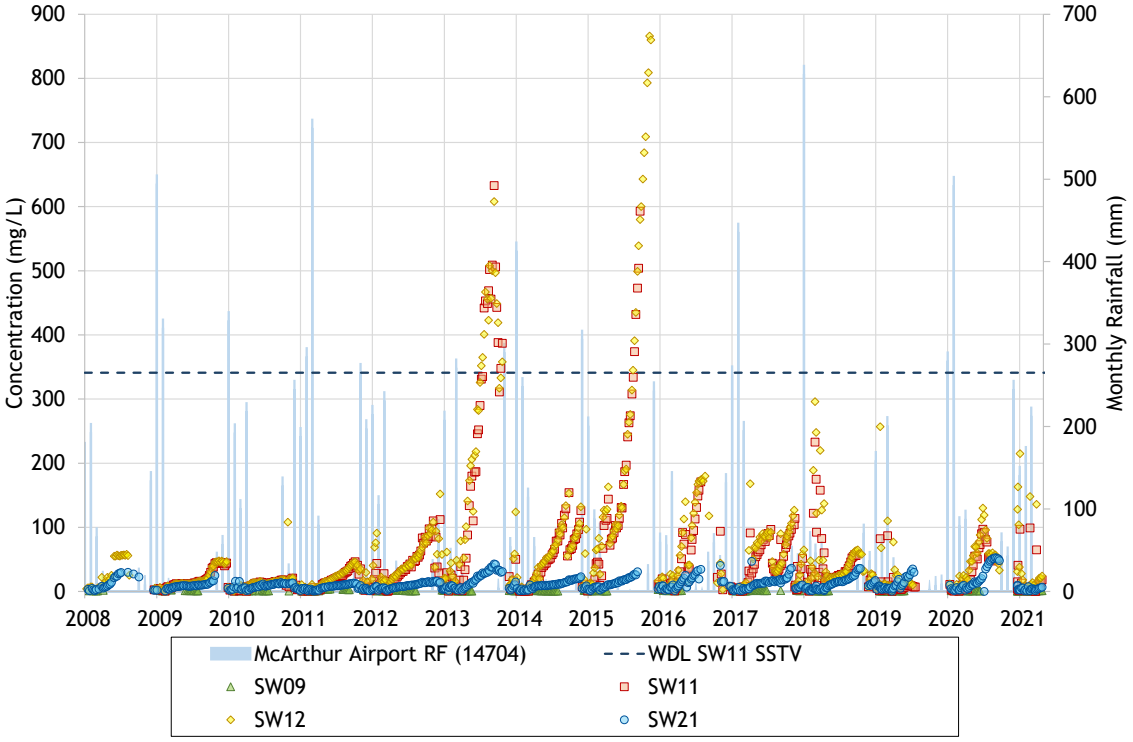

Chart 28: Historical SO_4 and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.15 Nitrate

Nitrate (NO_3) concentrations are presented in Chart 29 for the reporting period. Fluctuations are observed across the majority of sites from January 2020 onwards, after which the majority of the wet season rainfall occurred.

During the reporting period, NO_3 levels at SW12 remained relatively low and NO_3 levels at SW09 and SW11 were elevated at the onset of the wet season, which is consistent with the historical trends.

There were four instances where NO_3 concentrations were beyond the SSTV during the reporting period. These instances are discussed further in Section 6. A key observation was that after January 2021, elevated NO_3 was also recorded at the Glyde River monitoring location, SW09 and therefore it is considered that the natural Glyde River catchment (i.e. upstream of the Mine) inflows have influenced concentrations (Chart 30).

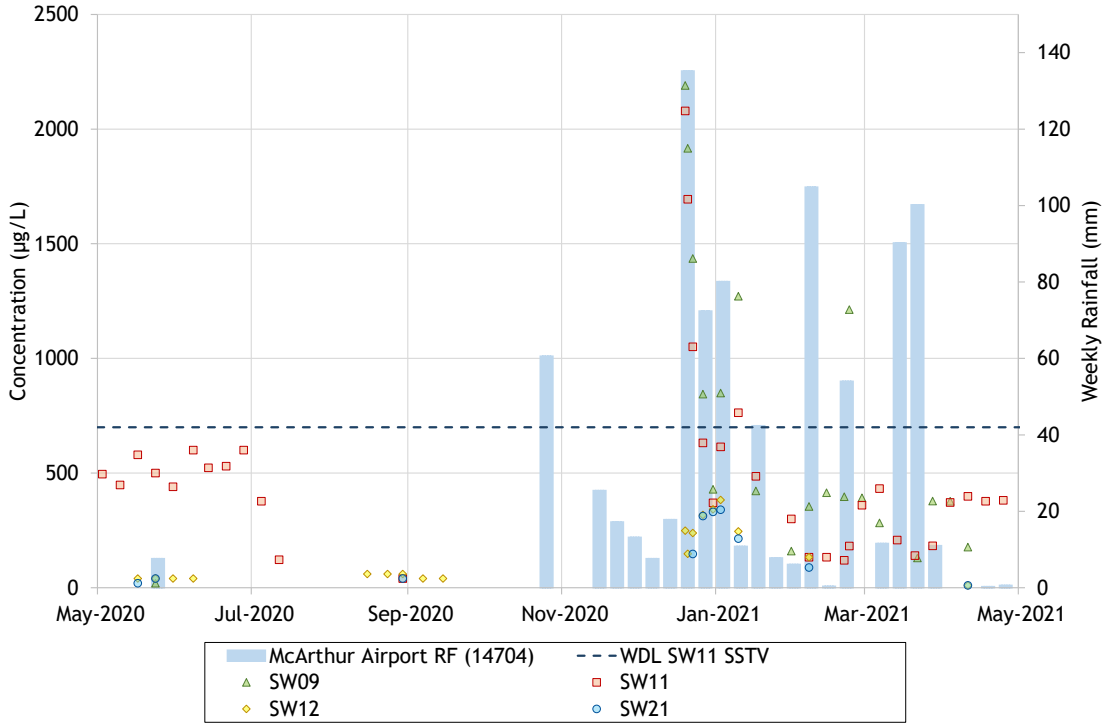

Chart 29: Reporting Period Nitrate (NO_3) and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

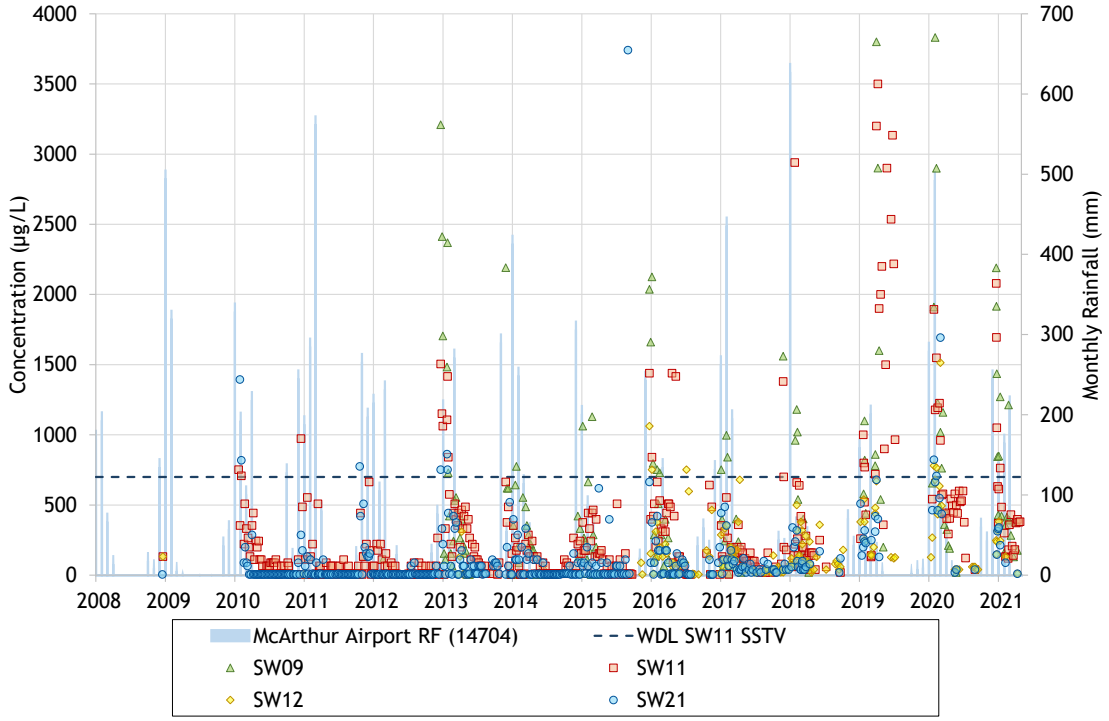

Chart 30: Historical NO_3 and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

4.3.16 Total Petroleum Hydrocarbons

Charts 31-34 describe the total petroleum hydrocarbons (TPH) and benzene concentrations for the reporting and historical periods. TPH and benzene concentrations are extremely low during the reporting period. Recorded TPH and benzene concentrations at SW11 were below the SSTVs, consistent with the historical data.

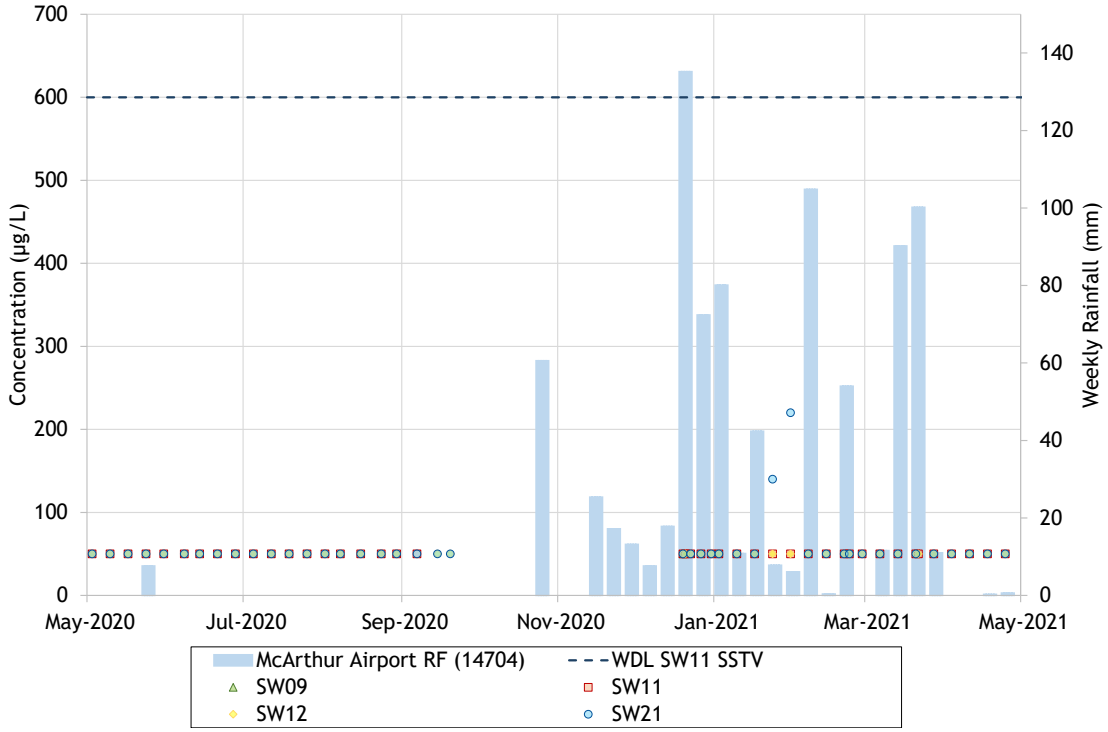

Chart 31: Reporting Period TPH C10-C36 Fraction and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

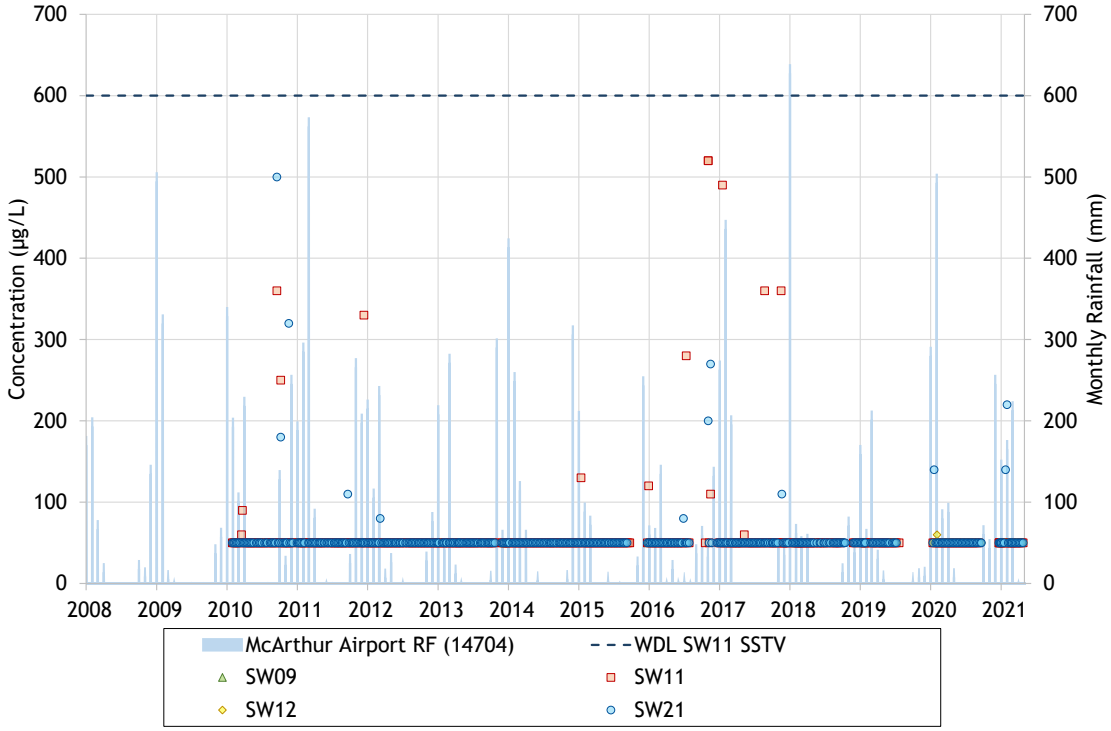

Chart 32: Historical TPH C10-C36 Fraction and Monthly Rainfall – McArthur River and Glyde River Monitoring Sites

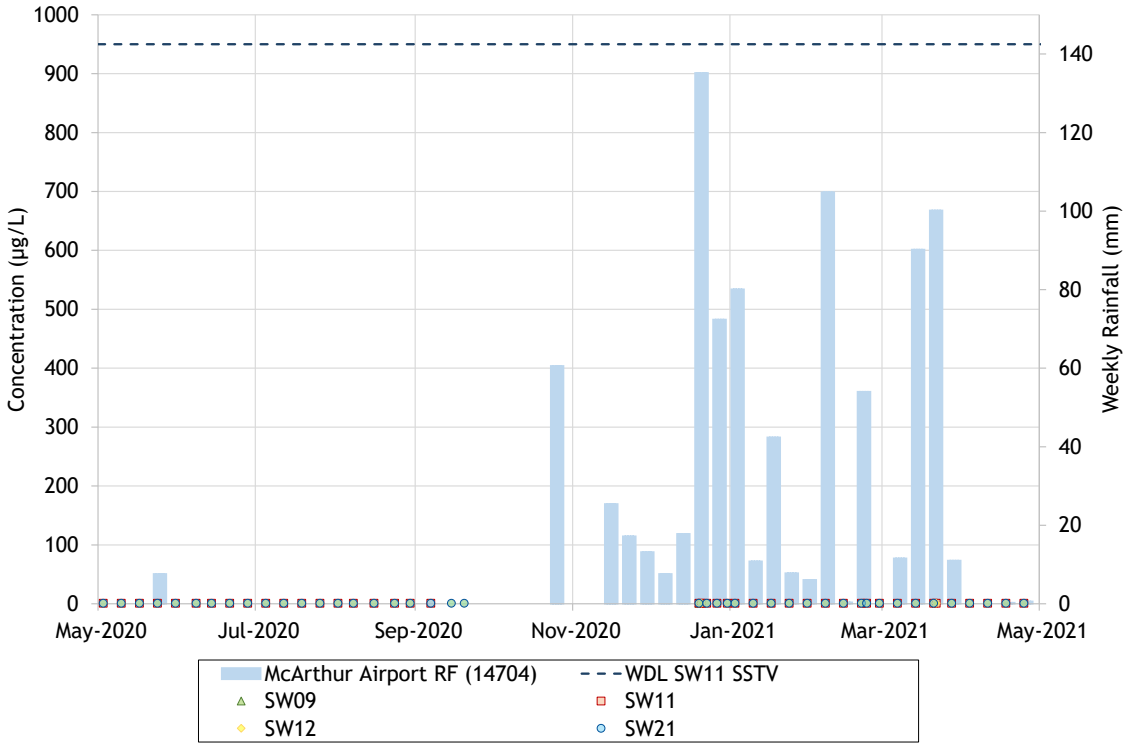

Chart 33: Reporting Period Benzene and Weekly Rainfall – McArthur River and Glyde River Monitoring Sites

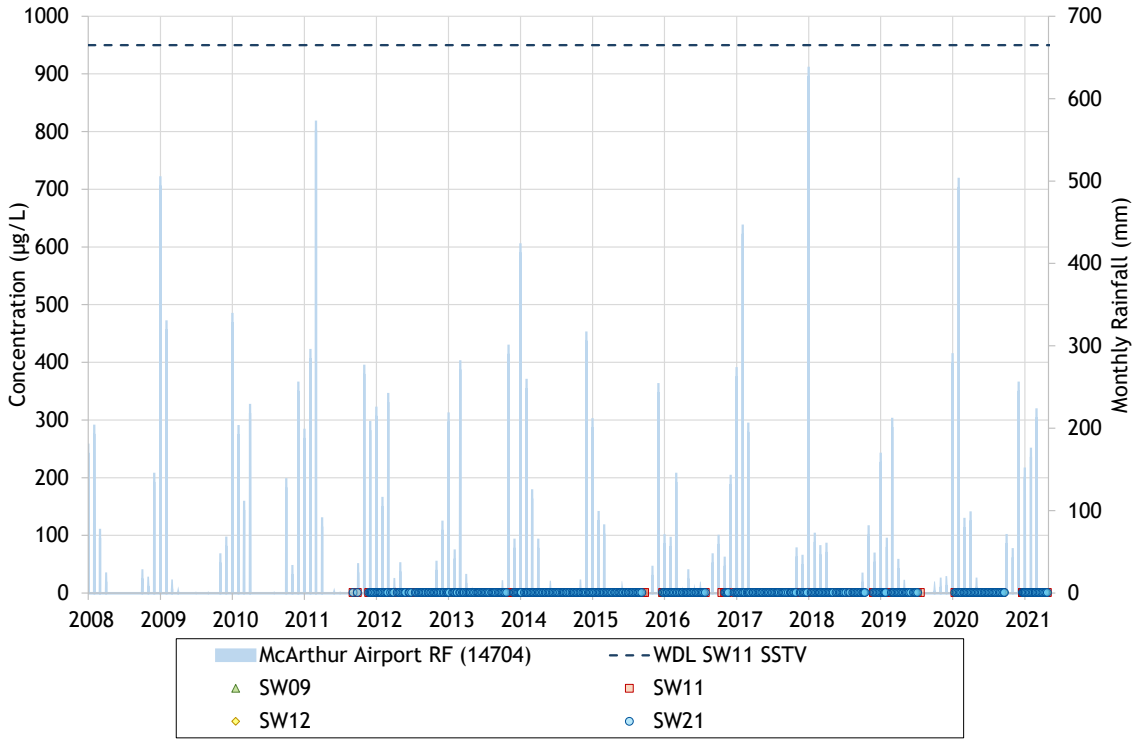

Chart 34: Historical Benzene and Monthly Rainfall – McArthur River and Glyde River Monitoring Site

5 Analyte Loads

Analyte loads have been estimated for the period between 1 May 2020 and 30 April 2021 by WRM (2021b). The full assessment report is provided in Attachment 4, with a summary of key findings provided below.

The loads assessment was undertaken to:

- estimate the actively discharged mine derived analyte loads produced by the Mine from managed released during the current reporting period;
- compare the annual managed release loads discharge since the 2017/18 reporting period;
- compare the background McArthur River loads at the SW21 upstream location with managed release loads over the current reporting period; and
- estimate the Glyde River and Emu Creek flows based on measured water level data, where available, during the current reporting period.

Analyte loads for the reporting period were estimated using the following methodology:

1. Daily discharge rates:
    a. Metered managed release flow volumes from managed release storages.
    b. For SW21, daily flow was obtained from the M.I.M pump gauging station located upstream of the Mine.
2. Daily analyte concentrations:
    a. Analyte concentrations were typically recorded on a weekly timestep. Daily concentrations were obtained by linearly interpolating between the recorded data points.
    b. Water quality values that were listed as below the LOR were assumed to be equal to the LOR value, which will likely overestimate the concentration (and therefore the estimated load).
3. Annual analyte load estimation:
    a. The annual analyte loads for a given period were estimated by:
        i. Multiplying the interpolated daily concentrations by the daily flows to give an estimated daily load.
        ii. Summing the estimated daily loads over the annual reporting period.

In loads assessments, the total concentrations are considered more environmentally significant, especially for those analytes with the potential for bioaccumulation in sediment-ingesting biota and biomagnification within the aquatic food chain.

5.1 Loads Estimate for SW21 and Managed Release

Loads estimates, which are presented in Table 6, included the McArthur River upstream of the Mine at SW21 and mine derived analyte loads produced by the Mine from managed releases.

Given the array of inherent uncertainties in the calculation of annual analyte loads in natural systems such as the upstream McArthur River, there are a number of limitations in the current assessment. These include (WRM, 2021b):

- There is a naturally high uncertainty in estimating loads in natural systems due to their dynamic nature and natural variability. Weekly or even daily water quality measurements may not capture a number of the natural processes that affect water quality during a flow event. Hence, there is a level of uncertainty in the estimated annual analyte loads, particularly for natural surface water reporting locations; and

- It is very difficult to accurately measure every source of water in a dynamic system such as the McArthur River and the Mine to the point that the sum of pre-mine analyte loads and mine derived analyte loads will equal the post-mine loads. As such, it is impossible to achieve an accurate metal balance.

TABLE 6: ESTIMATED SURFACE WATER FLOW VOLUMES AND ANALYTE LOADS FOR THE PERIOD 1 MAY 2020 TO 30 APRIL 2021 (AFTER WRM 2021B)

Parameter	Unit	SW21 (pre-mine)	Managed Releases from the Mine	Percentage Increase
Total Flow	ML	426,374	2,038	0.48%
Al_F	kg	75,879	10.8	0.01%
Al_T	kg	8,314,779	760	0.01%
As_F	kg	264	4.61	1.72%
As_T	kg	2,002	8.33	0.42%
Cd_F	kg	75.7	0.43	0.57%
Cd_T	kg	75.7	0.44	0.58%
Cu_F	kg	425	2.04	0.07%
Cu_T	kg	5,900	2.33	0.48%
Fe_F	kg	110,777	15	0.01%
Fe_T	kg	9,350,634	975	0.01%
Pb_F	kg	253	1.14	0.45%
Pb_T	kg	4,325	7.71	0.18%
Mn_F	kg	588	918	156%
Mn_T	kg	120,475	1,242	1.03%
Hg_F	kg	12.0	0.002	0.17%
Hg_T	kg	25.4	0.10	0.40%
Ni_F	kg	424	3.91	0.92%
Ni_T	kg	6,100	4.89	0.08%
Zn_F	kg	1,099	18.1	1.65%
Zn_T	kg	15,290	56.9	0.37%
SO_4	tonnes	1,282	11,164	871%
NO_3	kg	66,054	738	1.12%
TDS	tonnes	42,084	18,224	43.3%
TSS	tonnes	258,986	22	0.01%

kg = kilograms, TDS = total dissolved solids, TSS = total suspended solids

The following observations, as reported in WRM (2021b), are made:

> *Increases in estimated analyte loads due to managed releases from the Mine were generally less than 10% (including for total Pb and total Zn) except for SO_4, TDS and filtered Mn. The results show that estimated analyte load increased by approximately 870% for SO_4.*
>
> *Significant increases in SO_4, TDS and filtered Mn were mainly due to managed releases via the MLDP and WMD RP.*

Although managed release loads for WDL analytes SO_4 and filtered Mn were elevated compared to background loads at SW21 (Table 6), their concentrations in the McArthur River at the SW11 compliance point remained well below the SSTVs (Section 4) for the reporting period, indicating a low risk to the receiving environment.

Comparison of 2017/18 Managed Release Loads

On 31 July 2018, the NT EPA issued its Assessment Report for *McArthur River Mining Pty Ltd – McArthur River Mine Overburden Management Project* (the NT EPA *Assessment Report 86*) (NT EPA, 2018). The NT EPA *Assessment Report 86* recommends (under Recommendation 3) that the annual loads of Pb and Zn discharged to the McArthur River in future years (July to June) do not exceed the loads discharged in 2017/18, taking into account seasonal variations in rainfall, and subject to future annual load calculations.

The annual managed release loads for total Zn and total Pb for the previous three years have been compared to the managed release loads for the 2017/18 period (Chart 38). Based on the comparison and in accordance with Recommendation 3 of the NT EPA Assessment Report, the managed release loads for the 2020/21, 2019/20 and 2018/19 reporting periods were less than the annual baseline limit defined by the 2017/18 managed release loads. It should be noted that the 2020/21, 2019/20 and 2018/19 reporting periods were from May to April whereas the 2017/18 reporting period was from July to June.

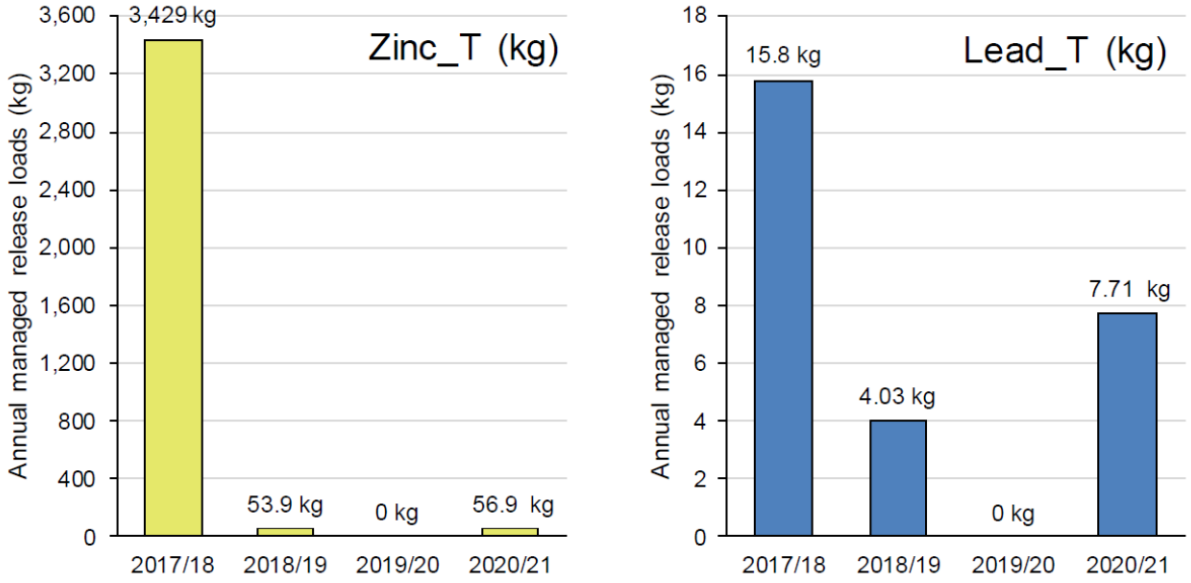

Chart 35: Comparison of Estimated Total Zinc and Total Lead Loads 2020/21 to 2017/18

6 Discussion

All water quality results collected at SW11 and BBDDP are compared to the relevant SSTVs. Where results were triggered by Condition 39 of WDL 174-11, an investigation was conducted to confirm if the cause was attributable to MRM's operations, including in consideration of:

- whether managed release was occurring at the time; and
- comparison to upstream water quality results at control sites (e.g. catchments unaffected by the Mine, such as the Glyde River and upstream McArthur River).

MRM provided investigation reports to the NT DEPWS in accordance with Condition 38 of WDL 174-11. The investigation reports included consideration of the potential contributing factors to instances when monitoring results were beyond SSTVs (e.g. operational or naturally occurring) and the likely risk of environmental harm.

Two investigation reports (as triggered by WDL 174-11 Condition 39) were submitted to NT DEPWS over the reporting period for the SW11 compliance monitoring site. The elevated results triggering investigation reports are summarised in Table 7.

TABLE 7: REVIEW OF ANALYTE RESULTS AT SW11 AGAINST WDL 174-11 SSTVS

Site	Analyte Result at SW11				Elevated Result Related to Active Discharge?	Elevated Result Triggered Investigation Report?	Investigation Report Confirms Elevated Result is from MRM Operations?
Quality Parameter	DO	Al*	Fe*	NO_3			
	% sat	µg/L	µg/L	µg/L			
SSTV	85 – 120	55	300	700			
28 June, 2020	83.5				No	No	NA
12 July, 2020	60.0				No	No	NA
7 September, 2020	131.9				No	No	NA
20 December, 2020				2,079	No	No	NA
21 December, 2020				1,694	No	No	NA
23 December, 2020				1,051	No	Yes (NO_3)	No
23 December, 2020	84.9				No	No	NA
27 December, 2020	80.8	135			No	No	NA
31 December, 2020		270			No	Yes (filtered Al)	No
10 January, 2021	84.3			763	No	No	NA
17 January, 2021	33.3				No	No	NA
24 January, 2021		75	307		No	No	NA
9 February, 2021	83.2				No	No	NA
16 February, 2021		129			No	No	NA
21 February, 2021		85			No	No	NA
21 March, 2021		63			No	No	NA
22 March, 2021		63			No	No	NA
28 March, 2021	83.1				No	No	NA

* Analytes are filtered.

6.1 Review of Monitoring Data Against SSTVs at SW11

As summarised in Table 7, instances of monitoring results beyond SSTVs at SW11 were generally attributable to naturally elevated concentrations of the analyte (e.g. as evidenced by elevated concentrations of the analyte at upstream monitoring locations), and as such, the likely risk of environmental harm was considered to be low.

The section below provides further details on the analytes for which concentrations were elevated beyond the SSTV at SW11 (DO, filtered Al, filtered Fe and NO_3). The performance for other sites along the McArthur River and its tributaries is provided in Attachment 3.

During the reporting period, 10 discharge events occurred between 20 December 2020 and 21 March 2021. A total of approximately 711.3 ML, 18.0 ML and 1,308.4 ML of water was released via the MLDP, the SEL1 DP, and the WMD RP, respectively.

McArthur River Dissolved Oxygen

DO results were outside the SSTV limits on nine occasions during the reporting period: one above the maximum SSTV (120% saturation) and eight below the minimum SSTV (85% saturation). None of the results triggered an investigation report. DO concentrations below 85% were frequently recorded for many sites during the middle and late stages of the dry season, including upstream monitoring sites unaffected by mining activities. The data indicated that dissolved oxygen concentrations below the SSTV were likely caused by natural catchment variation.

DO results outside the SSTV range are considered non-mine related and resultant of natural river processes.

McArthur River Filtered Aluminium

Filtered Al results were beyond the SSTV at SW11 on seven occasions during the reporting period, with only one triggering an investigation report due to a value exceeding three-times the SSTV.

Managed releases were occurring during the high levels of filtered Al recorded at SW11 on 31 January 2021. Notwithstanding, the filtered Al levels in the managed releases were lower than the upstream McArthur River control monitoring location, SW21. Hence, it was found that managed releases from the Mine did not contribute to the filtered Al results being elevated beyond the SSTV at SW11.

Numerous natural exceedances of the filtered Al SSTV at SW11 have occurred during every wet season reviewed in the historical dataset (Chart 8). As in previous years, the high levels of filtered Al beyond the SSTV during the reporting period coincided with even higher filtered Al concentrations at sites upstream of the mine's influence, such as SW09 and SW21.

Filtered Al results beyond the SSTV are considered non-mine related and resultant of natural river processes.

McArthur River Filtered Iron

Filtered Fe results were beyond the SSTV at SW11 on one occasion during the reporting period, which occurred on 24 January 2021. The result did not trigger an investigation report. On the same day, the filtered Fe level recorded at SW09 in the Glyde River, upstream of the Mine, was greater than SW11. The filtered Fe levels at SW21 were also elevated (only 8 µg/L lower than the value recorded at SW11). In addition, there was no managed release occurring from the Mine on 24 January 2021. Hence, managed releases from the Mine did not contribute to the filtered Fe result being elevated beyond the SSTV at SW11.

The analysis methodology for filtered Fe uses a 0.45 µm filter during sample preparation. Accordingly, any fine insoluble Fe precipitation less than 0.45 µm in the sampled water is included in the filtered Fe concentration reported. Elevated filtered Fe concentrations have occurred during several previous years since 2010, typically during or shortly after the wet season. Fe is known to exist in water as micron-sized particles in addition to being a dissolved constituent. Some measured and reported concentrations are likely to comprise of both dissolved and suspended Fe constituents.

Filtered Fe results beyond the SSTV are considered non-mine related and resultant of natural river processes.

McArthur River Nitrate

NO_3 monitoring results at SW11 were beyond the SSTV on four occasions during the reporting period, three of which occurring in a row, triggering an investigation report. The highest recorded value at SW11 was 2,079 µg/L on 20 December 2020.

Water discharge occurred during two of the four results reported beyond the SSTV. Notwithstanding this, the NO_3 levels in the managed releases were lower than the upstream McArthur River and Glyde River control monitoring locations (SW21 and SW09) at the time. Hence, it was found that the managed releases from the Mine did not contribute to the NO_3 results being elevated beyond the SSTV at SW11.

Numerous natural exceedances of the NO_3 SSTV have occurred during most years reviewed in the historical dataset (Chart 30). As in previous years, the SW11 exceedances during the reporting period coincided with even higher NO_3 levels at sites upstream of the mine influence, particularly in the Glyde River at SW09.

NO_3 results beyond the SSTV are considered non-mine related and resultant of natural river processes.

6.2 Review of Monitoring Data Against SSTVs at BBDDP

As described in WDL 174-11, the dredge spoil perimeter drain exit point (i.e. discharge and monitoring point BBDDP) is located on the tidal mudflats to the east of the BBLF. The dredge spoil perimeter drain is constructed around the external boundary of the dredge spoil cells to intercept saline water (i.e. runoff or seepage from the dredge spoil emplacement).

There was no observed discharge via the BBDDP during the reporting period and therefore there is no natural surface water quality for consideration against the SSTVs for the BBDDP.

7 Conclusion

This Monitoring Report has been submitted in accordance with Condition 43 of WDL 174-12, and covers the reporting period 1 May 2020 to 30 April 2021. The previous WDL 174-11 was in effect during the reporting period, and this Monitoring Report has been written pursuant to conditions thereof. Site surface water monitoring data and mine derived analyte loads for the reporting period have been assessed by WRM (2021a) (2021b) (Attachments 3 and 4).

In addition to addressing the requirements of WDL 174-11, the objectives of the monitoring programs are to allow for the assessment of MRM's performance against its key environmental objectives, which are as follows:

- protect the McArthur River beneficial uses and community values from mining impacts;
- facilitate development of the ecosystems and their functions along the McArthur River Diversion Channel for terrestrial and aquatic flora and fauna;
- achieve a recovering trend in the water quality and ecosystem function in creeks on the Mine site within 20 years of cessation of mining;
- minimise air quality related impacts from the Mine's operations with respect to community health and environment; and
- protect the community values and beneficial uses adjacent to the BBLF and transhipment corridor.

WRM (2021b) reviewed the mine derived analyte loads for the period between 1 May 2020 and 30 April 2021. During the reporting period, 10 discharge events occurred between 20 December 2020 and 21 March 2021. A total of approximately 711.3 ML, 18.0 ML and 1,308.4 ML (total of 2,037.7 ML) of water was released to the McArthur River via the MLDP, the SEL1 DP, and the WMD RP, respectively.

The NT EPA *Assessment Report 86* recommends (under Recommendation 3) that the annual loads of Pb and Zn discharged to the McArthur River in future years (July to June) do not exceed the loads discharged in 2017/18, taking into account seasonal variations in rainfall, and subject to future annual load calculations. Based on the comparison and in accordance with Recommendation 3, the managed release loads for total Pb and Zn for the 2020/21 reporting period were less than the annual baseline limit defined by the 2017/18 managed release loads.

In the reporting period, there were two investigation reports related to elevated results beyond SSTVs at SW11 submitted to NT DEPWS, as required by WDL 174-11. The investigation reports related to the SSTVs for filtered Al and NO_3 water quality parameters.

A summary of the results triggering investigations are as follows:

- Filtered Al results were beyond the SSTV on seven occasions during the reporting period, with only one triggering an investigation report due to a value exceeding three-time the SSTV. The sources of the Al are considered to be outside of the influence of the Mine, including the upstream McArthur River catchment and the Glyde River catchment and therefore are considered unrelated to mining activity.
- NO_3 monitoring results were beyond the SSTV on four occasions during the reporting period, three of which occurring in a row, triggering an investigation report. The Glyde River has historically accounted for elevated NO_3 results at SW11 and review of data from the reporting period confirmed that this catchment continued to heavily influence NO_3 at SW11.

Additionally, there were nine instances of elevated results for dissolved oxygen and one instance of filtered iron outside the SSTV, however, these did not trigger investigation in accordance with conditions of WDL 174-11. Dissolved oxygen concentrations below 85% were frequently recorded for many McArthur River monitoring sites during the middle and late stages of the dry season, including upstream monitoring sites unaffected by mining activities. The data indicated that dissolved oxygen concentrations below the SSTV were likely caused by natural catchment variation. The elevated result for filtered iron was found to be influenced by catchment inflows from upstream of the Mine.

Based on the review of surface water quality monitoring data between 1 May 2020 and 30 April 2021, WRM concluded that:

> *MRM continue to implement effective controls to minimise the risk of environmental harm of downstream receiving waters due to Mine operations. The review concluded that the beneficial uses and community values of the McArthur River continue to be protected from potential mining derived impacts.*
>
> *There were no mine derived SSTV exceedances or non-compliances recorded at the SW11 compliance point in the McArthur River during the reporting period. The SSTV exceedances recorded at SW11 during the reporting period were unrelated to mine activities and were a result of natural river processes and contributions from sources upstream of the Mine.*

No dredge spoil was actively emplaced at the BBLF over the reporting period. Accordingly, there was no managed release from the dredge spoil emplacement area. Additionally, there was no observed passive discharge via the dredge spoil drain over the reporting period and therefore no natural surface water quality for consideration against the SSTVs for the BBDDP.

MRM will continue to implement the existing monitoring program in accordance with conditions of WDL 174-12.

8 Certification

I, Adam Hatfield, have reviewed this report and I confirm that to the best of my knowledge and ability all the information provided in the report is true and accurate.

Adam Hatfield

Manager – Health, Safety, Environment and Community

McArthur River Mining

9 References

Australian and New Zealand Environment and Conservation Council and the Agriculture and Resource Management Council of Australia and New Zealand (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Australian and New Zealand Governments (2018) *ANZ Guidelines for Fresh and Marine Water Quality.*

Indo-Pacific Environmental (2019) Memorandum; *Recommendations on potential bund heights within the Barney Creek Channel.*

Indo-Pacific Environmental (2021a) *Annual Marine Monitoring Program, Bing Bong Loading Facility, November 2020*.

Indo-Pacific Environmental (2021b) *Annual Seagrass Survey of the Bing Bong Loading Facility, 2020.*

Indo-Pacific Environmental (2021c) *Aquatic Fauna of the McArthur River, Northern Territory, Early Dry Season, 2020.*

Indo-Pacific Environmental (2021d) *Aquatic Fauna of the McArthur River, Northern Territory, Late Dry Season, 2020.*

Indo-Pacific Environmental (2021e) *Assessment of Bioavailable Metal Concentrations and Lead Isotope Ratios of Seafloor Sediments in the Bing Bong Loading Facility Transshipment Area, November 2020*

Indo-Pacific Environmental (2021f) *McArthur River Freshwater Aquatic Macroinvertebrate Assessment, 2020*.

Indo-Pacific Environmental (2021g) *Monitoring of Select Analytes and Lead Isotope Ratios in Fluvial Sediments, Fish, Crustaceans and Molluscs, 2020.*

McArthur River Mining Pty Ltd (2018) *Waste Discharge Licence 174-10 Monitoring Report 1 June 2017-31 May 2018.*

McArthur River Mining Pty Ltd (2020) *McArthur River Mine 2019-2020 Environmental Monitoring Report.*

Northern Territory Environmental Protection Authority (2013) *Guidelines on Mixing Zones.*

Northern Territory Environmental Protection Authority (2018) *McArthur River Mining Pty Ltd – McArthur River Mine Overburden Management Project.*

WRM Water & Environment Pty Ltd (2021a) *Surface Water Monitoring Report 2020/21*.

WRM Water & Environment Pty Ltd (2021b) *2020/21 Mine Derived Analyte Loads Assessment.*

10 Abbreviations

Acronym	Definition
%	percent
°C	degrees Celsius
Al	Aluminium
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Governments
As	Arsenic
BBDDP	Bing Bong Dredge Spoil Discharge Point
BBLF	Bing Bong Loading Facility
Cd	Cadmium
Cu	Copper
DEPWS	Department of Environment, Parks and Water Security
DO	dissolved oxygen
DP	discharge point
EC	electrical conductivity
EMR	Environmental Monitoring Report
Fe	Iron
Hg	Mercury
IPE	IndoPacific Environment
kg	kilograms
km	kilometres
L/s	litres per second
LOR	limit of reporting
m	metres
m^3/s	Cubic metres per second
mg/L	milligrams per litre
ML	megalitres
MLDP	Mine Levee Discharge Point
MLN	Mineral Lease Number
Mn	Manganese
MRM	McArthur River Mining Pty Ltd
Ni	Nickel
NO_3	Nitrate
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
P1	Pond 1
P2	Pond 2
Pb	Lead
RP	Release Point
RPD	Relative percentage difference
SEL 1 DP	South-east Levee 1 Discharge Point
SO_4	Sulphate

Acronym	Definition
SOCS	sites of conservation significance
SSTV	site-specific trigger values
TDS	total dissolved solids
the Mine	McArthur river Mine
TPH	Total Petroleum Hydrocarbons
TSS	total suspended solids
VOA	Variation of Authorisation
WDL	Waste Discharge Licence
WMD	Water Management Dam
WRM	WRM Water & Environment Pty Ltd
Zn	Zinc
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre

Appendix A

Quality Assurance

All surface water samples have been collected according to MRM management plans and procedures and the requirements of WDL 174-11 (Conditions 29, 33 and 34), which includes:

- Collection of samples in accordance with Australian Standards by or under the supervision of a qualified sampler.
- The date on which the sample was collected.
- The time at which the sample was collected.
- The location at which the sample was collected.
- The name of the person who collected the sample.
- The chain of custody forms relating to the sample.
- The field measurements (if any) and analytical results (if any) relating to the sample.
- Laboratory quality assurance and quality control documentation including certification of the MRM Environmental Laboratory in accordance with requirements of the National Association of Testing Authorities.

Quality assurance and quality control is routinely undertaken as part of the natural surface water monitoring program. This includes collection of duplicate samples and analysis of both field and laboratory 'blank' samples.

To monitor the consistency of the laboratory instruments used to measure water quality and examine the variability introduced during sample collection and preparation, MRM frequently collects duplicate water samples as part of the monitoring program. The relative percentage difference (RPD) between these duplicate analyses and the original analytical result provide a useful measure of instrumental consistency.

The relationship between concentrations of analytes (i.e. filtered primary metals, total primary metals and major ions) in the original samples and concentrations of the analytes in the blind sample are presented on Charts A1 to A3. The following is of note regarding the duplicate sample analysis during the reporting period:

- For primary filtered metals, a total of 83 duplicate samples (1,909 analyte samples) were collected during the reporting period. Of the 1,909 analyte samples, 111 analyte samples exceeded 20% of the RPD. Only 13 of the 111 sample exceedances had levels greater ten times the limit of reporting (LOR).
- For primary total metals, a total of 77 duplicate samples (1,848 analyte samples) were collected during the reporting period. Of the 1,848 analyte samples, 179 analyte samples exceeded 20% of the RPD. Only 37 of the 179 sample exceedances had levels greater ten times the LOR.
- For major ions, a total of 85 duplicate samples (1,703 analyte samples) were collected during the reporting period. Of the 1,703 analyte samples, 14 analyte samples exceeded 20% of the RPD. None of the 14 sample exceedances had levels greater ten times the LOR.

None of these results are indicative of instrument malfunction or procedural errors, and the analytical reproducibility indicated is adequate for monitoring of natural surface water. Overall, the duplicate results show low variability which provides a high degree of confidence in the monitoring program data.

Blank water samples are routinely analysed to check that the analytical instruments are not reporting erroneously high values (e.g. due to contamination or instrument malfunction). 51 blank samples were prepared and sent for analysis from the surface water monitoring program over the reporting period. In general, the quality of the blanks was very high, with most target analytes below the limit of detection. The results provide further confidence in the monitoring program data. Further details of the quality assurance results are provided in Attachment 3.

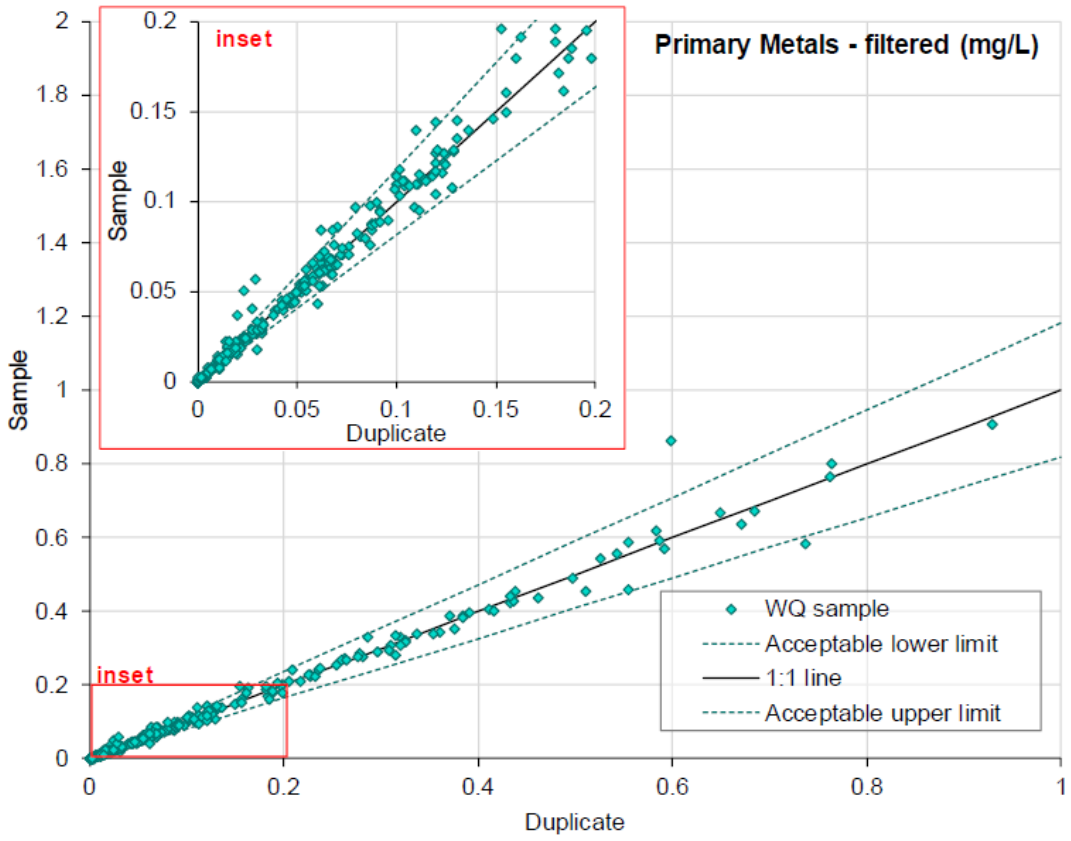

Chart A1: Relationship Between Filtered Primary Metal Concentrations in Samples and Blind Duplicates

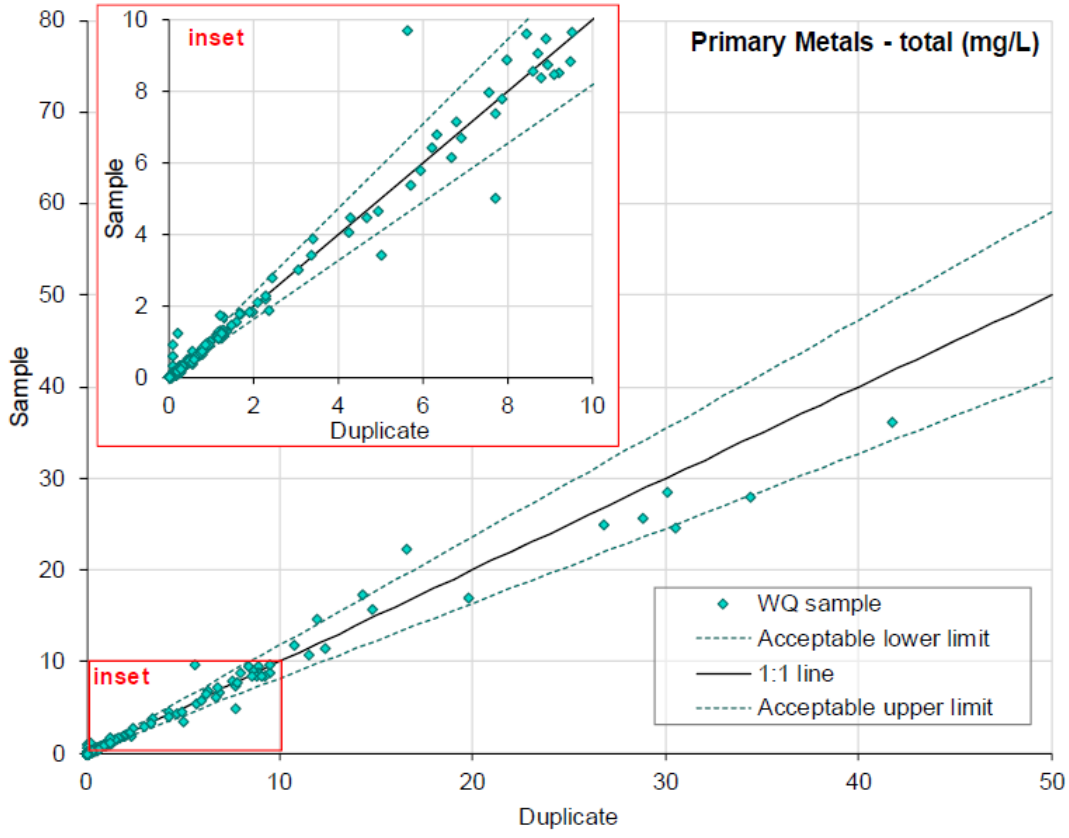

Chart A2: Relationship Between Total Primary Metal Concentrations in Samples and Blind Duplicates

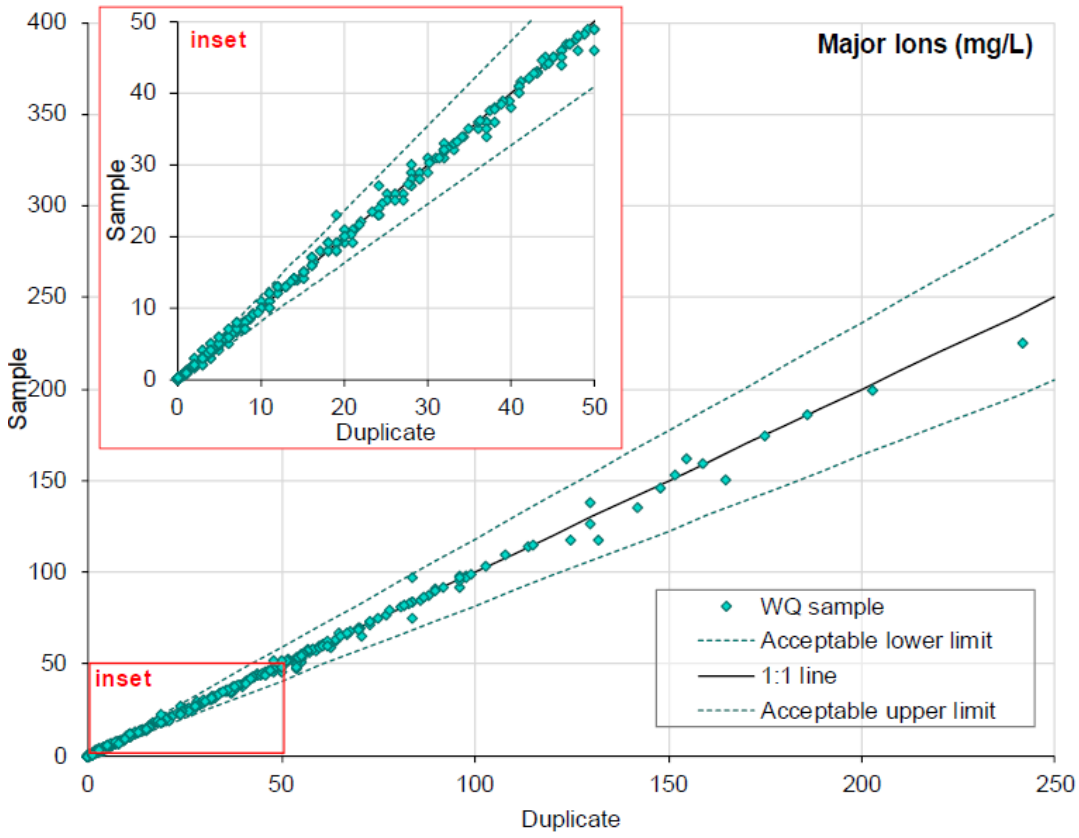

Chart A3: Relationship Between Major Ion Concentrations in Samples and Blind Duplicates

Attachment 1

Waste Discharge Licence 174-11

Northern Territory Government

WASTE DISCHARGE LICENCE

(Pursuant to section 74 of the *Water Act*)

Licensee	McArthur River Mining Pty Ltd
Licence Number:	**WDL174-11**
Registered Business Address:	Level 44, 1 Macquarie Place, Sydney NSW 2000
Postal Address	PO Box 36281, Winnellie NT 0820
ACN:	008 167 815
ABN:	90 008 167 815
Premises Address:	McArthur River Mine and Bing Bong Loading Facility, Carpentaria Highway, Borroloola, NT
Anniversary Date:	31 August
Commencement Date:	28 April 2019
Amendment Date:	-
Expiry Date:	28 April 2021
Licensed Activity:	Controlled discharge of waste water in accordance with Table 2 and subject to the conditions of this licence from: • Mine Lease Northern (MLN) 1121, 1122, 1123, 1124 into the McArthur River; and • MLN 1126 into marine waters at the Bing Bong Loading Facility.

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INFORMATION ABOUT THIS LICENCE

Definitions of Terms

- A section including the definition of terms used in this Licence can be found at the end of it.
- Terms used in the waste discharge licence which are defined in the *Water Act* (the Act) have the meaning given in that Act unless specifically indicated otherwise.

Responsibilities of Licensee

- It is an offence under the *Water Act*, if the holder of a waste discharge licence contravenes or fails to comply with the conditions of a waste discharge licence.
- Licensees must comply at all times with the requirements of the Water Act and all applicable laws.
- Except as expressly provided for in this licence, the licensee must not:
  - cause environmental harm either directly or indirectly;
  - allow waste to come into contact with water; or
  - allow water to be polluted.
- Without limiting the conditions of this licence, in conducting the activity, the licensee must do all things reasonable and practicable to:
  - prevent or minimise the likelihood of pollution occurring as a result of, or in connection with, the activity;
  - prevent or minimise the likelihood of environmental harm occurring as a result, or in connection with, the activity;
  - effectively respond to pollution and the risk of pollution occurring as a result of, or in connection with, the activity;
  - effectively respond to environmental harm and the risk of environmental harm occurring as a result of or in connection with the activity; and
  - apply the principles of ecologically sustainable development.

Duration of licence

- This licence will remain in force until its expiry date, it is surrendered by the licensee, or until it is suspended or revoked by the Controller of Water Resources.
- As set out in section 94 of the Water Act, the holder of a licence may, at any time, surrender the licence.

Amendment, Modification or Revocation of Licence (section 93 of the *Water Act*)

- As set out in section 93 of the Water Act, the Controller of Water Resources may, by notice:
  - amend or modify the terms and conditions of a licence;
  - revoke a licence; or
  - suspend a licence.

Public Register

- A copy of this Licence will be placed on a register in accordance with section 95 of the Act.
- A copy of waste discharge licences and any plans for environmental management, reports, submissions or documents required as a condition of a waste discharge licence, will be placed on a register.
- The Administering Agency makes this register freely available from the Northern Territory Environment Protection Authority (NT EPA) website.

Beneficial Use Declaration (section 73 of the Water Act)

- Beneficial Use Declaration (BUD) is a legislated process that reduces the effects of water pollution and assists in the protection and management of water. The community decides how a particular water body should be used by choosing on one or more Beneficial Use categories.

Environmental Interests

- This section highlights the beneficial uses as declared under the *Water Act* and the sensitivity of the surrounding land use and environment associated with the location of the approved activity.
- Declared beneficial uses and or water quality objectives are:
    - McArthur River Area: Aquatic ecosystem protection, recreational water quality and aesthetics (Gazette references G9 11 March 1998 and G20 27 May 1998); and
    - McArthur River Catchment Area: Environment, cultural and riparian (Gazette references G10 14 March 2001).
- Sites of Conservation Significance
    - SOCS Number 33: Sir Edward Pellew Island group;
    - SOCS Number 34: McArthur River coastal floodplain; and
    - SOCS Number 35: Borroloola area.

Cultural Interests

- It is the licensee's responsibility to contact the Aboriginal Areas Protection Authority, appropriate land council or other governing body and ensure that any Authority Certificates required as a result of conducting the licenced activity are obtained and complied with.

RULES FOR INTERPRETING THE CONDITIONS OF THIS LICENCE

- Where there is a discrepancy between the conditions of this licence and any plan, standard, guideline or other document referred to in this licence, the conditions of this licence prevail to the extent of the inconsistency.
- Any reference to any standard (Australian or international) in this licence means the relevant parts of the current version of that standard.
- A reference to any guideline or code of practice (or to the relevant parts of any guideline or code of practice) in this licence means the current version of the guideline or code of practice.
- Under section 76 of the *Water Act*, any contravention of or failure to comply with this licence by the licensee may be an offence.
- In this licence, unless the contrary intention appears, words that are defined in the *Water Act* are intended to have the meaning given to them in that Act.

LICENCE CONDITIONS

GENERAL

1. The licensee must ensure the contact details recorded with the Administering Agency for this licence are correct at all times.
2. The licensee must at all times have a 24 hour emergency contact.
3. The licensee must notify the Administering Agency prior to making any operational change that will cause, or is likely to cause, an increase in the potential for environmental harm.
4. The licensee must cause clear and legible signage, in English, to be displayed in a prominent location at each public entrance to the premises that includes the following details:
    4.1. waste discharge licence number issued under the *Water Act*; and
    4.2. 24 hour emergency contact details.
5. The licensee must cause a copy of this licence to be available for inspection by any person, in hard copy form, at the premises.
6. The licensee must provide to the Administering Agency, within 10 business days of a request, a copy of any document, monitoring data or other information in relation to the activity, must be provided in electronic form by emailing waste@nt.gov.au unless otherwise specified.
7. All notices, reports, documents or other correspondence required to be provided as a condition of this licence, unless otherwise specified as a condition of this licence, must be provided in electronic form to the Administering Agency.
8. The licensee must maintain and implement the current version of the documents listed in Table 1.

Table 1 – Licence Documents

Document Number	Document Title
1	Communication Plan Waste Discharge Licence (WDL 174-10)
2	Emergency Response Plan McArthur River Mining

9. Within 10 business days of any amendment being made to a document listed in **Error! Reference source not found.** the licensee must provide the amended document to the Administering Agency, along with:

    9.1 a tabulated summary of the amendment(s) with document references;

    9.2 reasons for the amendment(s); and

    9.3 an assessment of environmental risk associated with the amendment(s).

10. The Administering Agency may require the licensee to revise or amend and resubmit any amended document or document provided in accordance with this licence. Where the Administering Agency requires a document to be resubmitted, the licensee must submit it to the Administering Agency by the date specified by the Administering Agency.
11. The licensee must operate and maintain a community feedback number.
12. The licensee must display the community feedback number:
    12.1. where the licensee has a website, in a prominent location on the licensees website;
    12.2. in the Communication Plan Waste Discharge Licence; and
    12.3. in other publicly available documents relating to the activity.
13. The licensee must maintain a Complaint Log for all complaints received by the licensee in

relation to the activity.

14. The licensee must ensure that the Complaint Log includes, for each complaint received by the licensee, the following information:

    14.1. the person to whom the complaint was made;

    14.2. the person responsible for managing the complaint;

    14.3. the date and time the complaint was reported;

    14.4. the date and time of the event(s) that led to the complaint;

    14.5. the contact details of the complainant if known, or where no details are provided a note to that effect;

    14.6. the nature of the complaint;

    14.7. the nature of event(s) giving rise to the complaint;

    14.8. prevailing weather conditions at the time (where relevant to the complaint)

    14.9. the action taken in relation to the complaint, including any follow-up contact with the complainant; and

    14.10. if no action was taken, why no action was taken.

EARLY SURRENDER OF LICENCE

15. Any reports, records or other information required or able to be provided by the licensee under this licence must be submitted to the Administering Agency prior to the licensee surrendering the licence. If the date on which a report, record or other information is required falls after the date the licensee requests to surrender this licensee, the licensee must provide the report, record or information as far as possible using data available to the licensee up to and including the date the request to surrender the licence is made.

OPERATIONAL

16. The licensee must, without limiting any other condition of this licence, in conducting the activity do all things reasonable and practicable to ensure the activity does not adversely affect the Declared Beneficial Uses and Objectives and Sites of Conservation Significance as declared from time to time, including those applying to:

    - McArthur River Area: Aquatic ecosystem protection, recreational water quality and aesthetics (Gazette references G9 11 March 1998 and G20 27 May 1998);
    - McArthur River Catchment Area: Environment, cultural and riparian (Gazette references G10 14 March 2001);
    - SOCS Number 33: Sir Edward Pellew Island group;
    - SOCS Number 34: McArthur River coastal floodplain; and
    - SOCS Number 35: Borroloola area.

17. The licensee must ensure any plant and equipment used by the licensee in conducting the activity:

    17.1. is reasonably fit for purpose and use to which it is put;

    17.2. is maintained; and

    17.3. is operated by a person trained to use the plant and equipment.

18. No change, replacement or alteration of plant and equipment is permitted if the change, replacement or alteration increases the risk of environmental harm for the licenced activity, unless approved by the Administering Agency.

19. The licensee must submit a Dredging and Dredge Spoil Management Plan to the Administering Agency 20 business days prior to the commencement of any dredging activities.

20. The licensee must comply with the Dredging and Dredge Spoil Management Plan.

DISCHARGES

Discharges to water

21. This licence authorises discharge to water from the authorised discharge point(s) as identified in Table 2 and Appendix 2, and as otherwise allowed in accordance with the conditions of this licence.

22. The licensee must ensure that all discharge events at each authorised discharge point consist only of waste from the source(s) as specified in Table 2.

Table 2: Authorised Discharge Points

Authorised Discharge Points	Description	Location[1]
Mine Levee Discharge Point(s) (MLDP) (Mine levee pumping outlets)	Discharges through Mine Levee Discharge Point (s) (MLDP) include: 1. Rain water collecting in the old McArthur River Channel (NC1A) inside the Mine levee. 2. Groundwater from dewatering bores around main pit collected in and then discharged from Pond 2 (P2). 3. Water from the Water Management Dam. 4. Treated water from the Water Treatment Plant that will be stored in (P2) prior to discharge from the MLDP. Waters discharged at Mine Levee Discharge Point(s) are pumped over the mine levee wall and flow into the Old McArthur River channel upstream of the McArthur River and Glyde River confluence.	Easting: 618661 Northing: 8183459
South-East Levee 1 Discharge Point (SEL1 DP)	Rain water collecting inside the South Eastern Levee and separated from all contaminated seepages. Discharges are pumped via pipe line to Barney Creek and then flow into the McArthur River. Discharge can only occur when flow as measured in the McArthur River at the downstream gauging station is in excess of $20m^3/s$.	Easting: 618702 Northing: 8184377

[1] MGA94 Zone 53

Authorised Discharge Points	Description	Location[1]
Dredge Spoil Drain (BBDDP)	The dredge spoil perimeter drain exit point (BBDDP) is located on the tidal mudflats to the east of the loading facility and within a tidal area. The drain is constructed around the external boundary of the dredge spoil cells to intercept saline water and extends approximately 400 metres from the final cell. The drain receives overflow from: 1. the final dredge spoil emplacement area cell when in operation; 2. saline water from the perimeter drain which surrounds the dredge spoil emplacement area. At BBDDP passive releases flow across the intertidal flats to the Gulf of Carpentaria via the Bing Bong navigation channel. For the purposes of clarity this licence does not authorise dredging and/or pumping or disposal of dredge slurry to the Dredge Spoil Encasement Area.	Easting: 649514 Northing: 8271536

23. The licensee must, for discharge points MLDP and SEL1 DP, install, operate and maintain a device to measure and record, for each discharge event:

    23.1. the time the discharge commenced and the duration of the discharge;

    23.2. the discharge rate of flow; and

    23.3. the discharge volume.

24. The licensee must ensure that the discharge from all discharge events at each authorised discharge point does not:

    24.1. contain any floating debris, oil, grease, petroleum hydrocarbon sheen, scum, litter or other objectionable matter;

    24.2. cause or generate odours which would adversely affect the use of surrounding waters;

    24.3. cause algal blooms in the receiving water;

    24.4. cause visible change in the behaviour of fish or other aquatic organisms in the receiving water;

    24.5. cause mortality of fish or other aquatic organisms; or

    24.6. cause adverse impacts on plants.

MONITORING

25. The licensee must conduct surface water monitoring in accordance with Appendix 4.

26. The licensee must conduct fluvial sediment monitoring in accordance with Appendix 5.

27. The licensee must conduct biota monitoring in accordance with Appendix 6.

28. The licensee must ensure that all samples and field environmental data are representative of the conditions at the time of sampling.

29. The licensee must ensure that all samples and field environmental data are collected in accordance with recognised Australian Standards and guidelines (such as AS/NZS 5667, ANZECC/ARMCANZ).

30. The licensee must ensure that all monitoring samples are analysed at a laboratory with current NATA accreditation or equivalent, for the parameters to be analysed in the laboratory.

31. The licensee must ensure that any proposed revisions to the monitoring required by Condition 25 to 27 (other than typographical changes or revisions to formatting or referencing) are:

    31.1. reviewed by a suitably qualified professional, who must produce a written report about their review;

    31.2. submitted to the Administering Agency with justification for revisions; and

    31.3. submitted to the Administering Agency, in both hard copy and electronic form (with a complete copy of the qualified professional's review), 20 business days prior to the proposed implementation date.

32. The licensee must for all land based water monitoring points specified in the monitoring documents:

    32.1. install and maintain appropriate identification signage so that they are reasonably identifiable at all times; and

    32.2. maintain safe access and egress, as is reasonable and practicable.

33. The licensee must ensure any samples collected in accordance with the monitoring documents or in connection with the activity or this licence, are obtained by, or under the supervision of a qualified sampler.

34. The licensee must ensure that, for each sample collected in accordance with the monitoring documents or the activity the following information must be recorded and retained:

    34.1. the date on which the sample was collected;

    34.2. the time at which the sample was collected;

    34.3. the location at which the sample was collected;

    34.4. the name of the person who collected the sample;

    34.5. the chain of custody forms relating to the sample;

    34.6. the field measurements (if any) and analytical results (if any) relating to the sample; and

    34.7. laboratory quality assurance and quality control documentation.

RECORDING AND REPORTING

35. The licensee must keep records of all non-compliances with this licence. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.

36. The licensee must notify the Administering Agency of any non-compliance with this licence as soon as practicable after (and in any case within 24 hours after) first becoming aware of the

non-compliance.

37. The licensee must include in the notification of non-compliance the following information:

    37.1. when the non-compliance was detected and by whom;

    37.2. the date and time of the non-compliance;

    37.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge; and

    37.4. a date when an incident investigation report will be submitted to the Administering Agency.

38. Within 10 business days of notifying the Administering Agency of any non-compliance, or a timing otherwise agreed by the Administering Agency, the licensee must provide the Administering Agency an investigation report that includes:

    38.1. when the non-compliance was detected and by whom;

    38.2. the date and time of the non-compliance;

    38.3. whether discharge was occurring at the time of the non-compliance and the source of the discharge and monitoring data of the discharge water;

    38.4. the actual and potential causes and contributing factors to the non-compliance;

    38.5. the risk of environmental harm arising from the non-compliance;

    38.6. all water quality monitoring data collected in accordance with Appendix 4 for monitoring sites SW6, SW9, SW11, SW12, SW21, SW27, SW24, SW26, SW30, SW28 and SW29 (as shown in Appendix 2) collected for the date the non-compliance was triggered and three sampling rounds prior to the non-compliance being detected;

    38.7. available flow rates for the McArthur River, Barney Creek and Surprise Creek and flow rate at SW11 to demonstrate any influence these creeks and rivers may have had on the exceedance of trigger value;

    38.8. rainfall recorded at the site prior to the exceedance of trigger values and non-compliance occurring;

    38.9. the action(s) that have or will be undertaken to mitigate any environmental harm arising from the non-compliance;

    38.10. corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur; and

    38.11. if no action was taken, why no action was taken.

39. A non-compliance with this licence includes:

    39.1. an exceedance of a trigger value at SW11, as specified in Appendix 3, on three consecutive sampling occasions;

    39.2. an exceedance of greater than or equal to three times a trigger value at SW11;

    39.3. subsequent consecutive exceedances of trigger values as described in Condition 39.1 and 39.2.

40. The licensee must keep records of all exceedances of trigger values specified in Appendix 3 Table 1. These records must be adequate to enable the licensee to comply with the non-compliance notification conditions of this licence.

41. The licensee must submit to the Administering Agency a Monthly Discharge Report for any month when a discharge occurs from the South-East Levee 1 and / or the Mine Levee

Discharge Point, to waste@nt.gov.au.

42. The Monthly Discharge Report is due by the end of the subsequent calendar month following a discharge and must include:

    42.1. the discharge start and end dates and times for each discharge event in that month;

    42.2. source of water discharged during each discharge event;

    42.3. the total volumes of water discharged for each discharge event;

    42.4. include all analysis of water quality monitoring conducted as per Appendix 4 Table 1 for each discharge event; and

    42.5. for South-east Levee 1 include calculations to demonstrate that the $20m^3/s$ flow as measured in the McArthur River at the downstream gauging station has been achieved for the necessary time of the discharge event.

43. The licensee must submit a completed Annual Return to the Administering Agency within 10 business days after each anniversary date of this licence, which report relates to the preceding 12 month period.

44. The licensee must complete and provide to the Administering Agency a Monitoring Report, as prescribed by this licence, by 31 August each year, which relates to the preceding 1 May to 30 April period.

45. The licensee must ensure that each Monitoring Report is prepared in consultation with a Qualified Person to determine the relevance of the information being provided as it relates to the waste discharge component of the site and in the format described in the National Water Quality Management Strategy, Australian Guidelines for Water Quality Monitoring and Reporting, Chapter 7 and must include:

    45.1. a data analysis and interpretation using the National Water Quality Management Strategy, Australian Guidelines for Water Quality Monitoring and Reporting, Chapter 6;

    45.2. a tabulation of all monitoring data required as a condition of this licence;

    45.3. includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available);

    45.4. includes mine derived loads of contaminants for the contaminants listed in Appendix 3 Table 1, reporting to the McArthur River including sources of contaminant loads, compared against background loads in the McArthur River and Glyde River;

    45.5. a comparison of the mine derived contaminant loads referred to in Condition 45.4 against contaminant loads reporting to the McArthur River from July 2017 to June 2018;

    45.6. an assessment of all monitoring data (including flow rate and calculated volume from each river contributing to water quality at SW11) and whether the activity has been conducted in a manner that has ensured the McArthur River and waters potentially impacted from the Bing Bong discharge point are being protected at all times from mine related impacts.

PERFORMANCE IMPROVEMENT

46. The licensee must develop and submit to the administering authority an Adaptive Management Plan.

47. A draft Adaptive Management Plan must be provided to the Administering Authority by 30

November 2020.

48. The final Adaptive Management Plan must be provided to the Administering Authority by 31 March 2021.

49. The Adaptive Management Plan must set out how the licensee will ensure the health of the McArthur River is protected from mine related impacts. The Adaptive Management Plan must include as a minimum:

    49.1. clear, measurable environmental objectives for all significant environmental risks and potential impacts for the:

    - area from the discharge points to SW11 including all convergent water sources;
    - area from SW11 to mouth of the McArthur River.

    49.2. measurable performance indicators underpinned by scientific evidence and Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018 to demonstrate whether environmental objectives are being met. At a minimum measurable performance indicators must be specified for surface water, groundwater, fluvial sediments and biota.

    49.3. triggers to warn of potential for performance indicators to be exceeded.

    49.4. realistic and achievable contingency interventions to maintain performance indicators if triggers are exceeded.

    49.5. clearly defined management measures / actions capable of being implemented in a timely way to ensure that the performance indicators are not exceeded and environmental objectives are achieved.

    49.6. clear processes to guide decision making if triggers are exceeded that address timeframes for initiation of actions, including decisions to discontinue an activity, and responsibility and evidentiary basis for decision-making.

    49.7. a continual feedback system to ensure appropriate actions are initiated when triggered and environmental objectives are always being met.

    49.8. review management actions as required based on knowledge gained from experience at the site and elsewhere across industry.

50. The Adaptive Management Plan required by Condition 48 must:

    50.1 be prepared by a suitably qualified person;

    50.2 the final Adaptive Management Plan must be reviewed by a suitably qualified third party prior to submission to the Administering Authority.

51. The licensee must conduct a review of all environmental monitoring undertaken for the McArthur River and provide one consolidated Environmental Monitoring Program to the administering Authority.

52. A draft Environmental Monitoring Program must be provided to the administering authority by 30 November 2020.

53. The final Environmental Monitoring Program must be provided to the administering authority by 31 March 2021.

54. The revised Environmental Monitoring Program must be capable of identifying and quantifying impacts of mining activities to assess the health of the McArthur River.

55. At a minimum, the Environmental Monitoring Program for the Mine must:

    55.1. be capable of determining whether performance indicators and environmental objectives as outlined in the Adaptive Management Plan are being met.

55.2. quantify impacts to water quality and trends in groundwater and surface water at appropriate points including upstream and downstream of the mine to determine that environmental objectives and performance indicators are being met.

55.3. include upstream and downstream monitoring in terms of fluvial sediment and biota (including macroinvertebrates) diversity and abundance.

55.4. ensure that all likely parameters and contaminants of concern are monitored in groundwater, surface water, fluvial sediment and biota.

55.5. quantify mine-derived loads of lead and zinc entering the McArthur River each year.

55.6. include appropriate monitoring sites to assess the effectiveness of source control in reducing contaminant loads entering the McArthur River.

55.7. include an aquatic ecosystem monitoring program in line with recommendation 14 and 15 of the NT EPA Assessment Report 86 McArthur River Mine Overburden Management Project McArthur River Mining Pty Ltd July 2018.

56. The monitoring undertaken for the Bing Bong Dredge Spoil Drain Discharge Point (BBDDP) in accordance with Appendix 4, 5 and 6 must be reviewed to:

56.1. ensure that the beneficial uses and sites of conservation significance surrounding the BBDDP are protected from any discharges from the Bing Bong Dredge Spoil Drain Discharge Point.

56.2. determine if additional monitoring in the Dredge Spoil Drain is required to verify the likely source of any exceedances detected at the BBDDP.

57. The licensee must provide an Environmental Monitoring Program for the Bing Bong Dredge Spoil Drain Discharge Point to the Administering Authority by 31 March 2021.

58. The Environmental Monitoring Program for the Bing Bong Dredge Spoil Drain Discharge Point must include:

58.1. any revised water and sediment monitoring required to achieve the objectives of Condition 56.1.

58.2. a biota monitoring plan that will replace the biota monitoring schedule in Appendix 6.

59. The Environmental Monitoring Programs required by Condition 51 and 57 must:

59.1. be prepared in accordance with the National Water Quality Management Strategy Australian Guidelines for Water Quality Monitoring and Reporting October 2000.

59.2. be prepared by a suitably qualified person.

59.3. the final environmental monitoring program must be reviewed by a suitably qualified third party prior to submission to the Administering Authority.

60. The licensee must ensure a device is installed to measure flow and calculate the volume of water from the Glyde River and Emu Creek contributing to flow, volume and water quality at SW11.

61. The licensee must ensure the devices required by condition 60 are installed by 31 December 2019.

62. The licensee must include in the monitoring report, average weekly flow and calculated volumes in each creek or river outlined in condition 60, calculated volumes contributed to SW11 and at any time a non-compliance is reported.

END OF LICENCE CONDITIONS

This licence is not valid unless signed below:

Jo Townsend

Controller of Water Resources

Dated the 27 May 2019

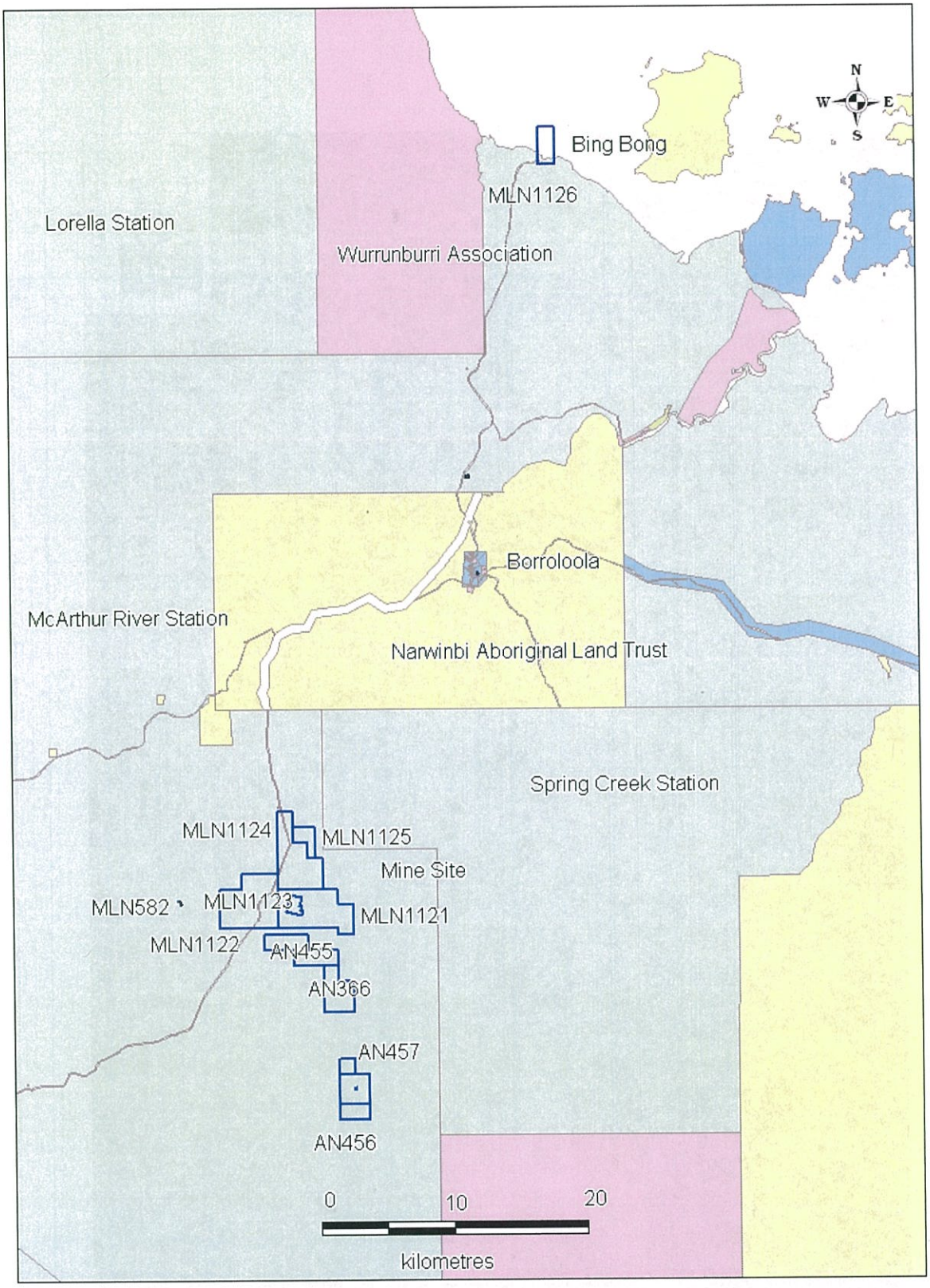
DEFINITIONS

In this licence, unless a contrary intention appears:

Term	Definition
24 hour emergency contact	the phone number of a person who can be contacted at any time and be capable of responding to and providing information about any incident associated with the activity.
Activity	the Licenced activity as described on the covering page of this licence.
Administering Agency	means the Department of Environment and Natural Resources, or if dissolved, another Government Department with responsibility of administering the Act.
Annual Return	a prescribed format for demonstrating and reporting compliance with the conditions of this licence.
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000: National Water Quality Management Strategy: *Australian Guidelines for Water Quality Monitoring and Reporting.*
Business days	a day not Saturday, Sunday or a public holiday, in the Northern Territory.
Community feedback number	a telephone number enabling members of the public to contact, at any time, a person or voice mail system that can accept, on behalf of the licensee, enquiries or complaints about the activity, and to which the licensee must respond.
Complaint Log	a register of complaints to be maintained by the Licensee that records the details of each complaint received in relation to the activity.
Communication Plan	a written plan documenting proposed consultation and communications for the activity before, during and after the activity which includes a strategy for communicating with members of the public who are likely to have a real interest in, or be affected by, the activity.
Contact details	includes the 24 hour emergency contact, and name, position title and phone number of a representative of the licensee who can be contacted about the licence and activity.
Contaminant	a solid, liquid or gas or any combination of such substances and includes: (a) noise, odour, heat and electromagnetic radiation; (b) a prescribed substance or prescribed class of substances; and (c) a substance having a prescribed property or prescribed class of properties.
Discharges	allow a liquid, gas or other substance to flow out from where it has been confined.
Emergency Response Plan	a written plan documenting the licensee's procedures for responding to emergencies caused by, resulting from or associated with the activity and that may cause environmental harm.
Environmental harm	any harm to or adverse effect on, or potential harm to or potential adverse effect on, the environment
incident	includes: (a) an accident, emergency or malfunction; and (b) a deliberate action, whether or not that action was taken by the person conducting the activity in the course of which the incident occurred.
Land	includes water and air on, above or under land.
Litter	litter, garbage, rubbish, refuse or waste matter, and includes the body of a dead animal.

Term	Definition
Maintain	kept in a manner that it does not present or cause a risk of environmental harm or a hazard to persons or property or, for the purposes of documents including plans, a process of reviewing and amending documentation to ensure it is relevant.
NATA	National Association of Testing Authorities, Australia.
Non-compliance	failure or refusal to comply, whether by act or omission, with obligations or requirements
Non-compliance notification	a prescribed format for notifying the Administering Agency of a non-compliance.
Plant and equipment	all material items used in association with the activity, including (but not limited to) storage vessels and containers, pipe work and hosing, vehicles (including vessels), tools, and measuring equipment.
Pollute	in relation to water, means directly or indirectly to alter the physical, thermal, chemical, biological or radioactive properties of the water so as to render it less fit for a prescribed beneficial use for which it is or may reasonably be used, or to cause a condition which is hazardous or potentially hazardous to: (a) public health, safety or welfare; (b) animals, birds, fish or aquatic life or other organisms; or (c) plants.
Pollution	(a) a contaminant or waste that is emitted, discharged, deposited or disturbed or that escapes; or (b) a contaminant or waste, effect or phenomenon, that is present in the environment as a consequence of an emission, discharge, deposition, escape or disturbance or a contaminant or waste.
Premises	the premises identified in this licence which includes equipment, plant and structures, whether stationary or portable, and the land on which premises are situated.
Public entrance	access to the premises that is utilised by the public.
Qualified person	A person who has professional qualifications, training and skills and experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods, literature.
Qualified sampler	a person who has training and experience in obtaining samples from the relevant environmental medium.
Trigger values	assigned value for each indicator used to assess the risk to an environmental value, a value that initiates some type of pre-defined management action.
Waste	Includes matter or a thing, whether wholly or partly in a solid, liquid or gaseous state, which, if added to water, may pollute the water.
Wastewater	water that contains a contaminant or waste.
Water	means water, whether or not it contains impurities.

APPENDIX 1: McArthur River Mine Tenements



APPENDIX 2: Authorised Discharge Points and Compliance Point Location

Figure 1: McArthur River Mine Authorised Discharge Points and Compliance Location (SW11)

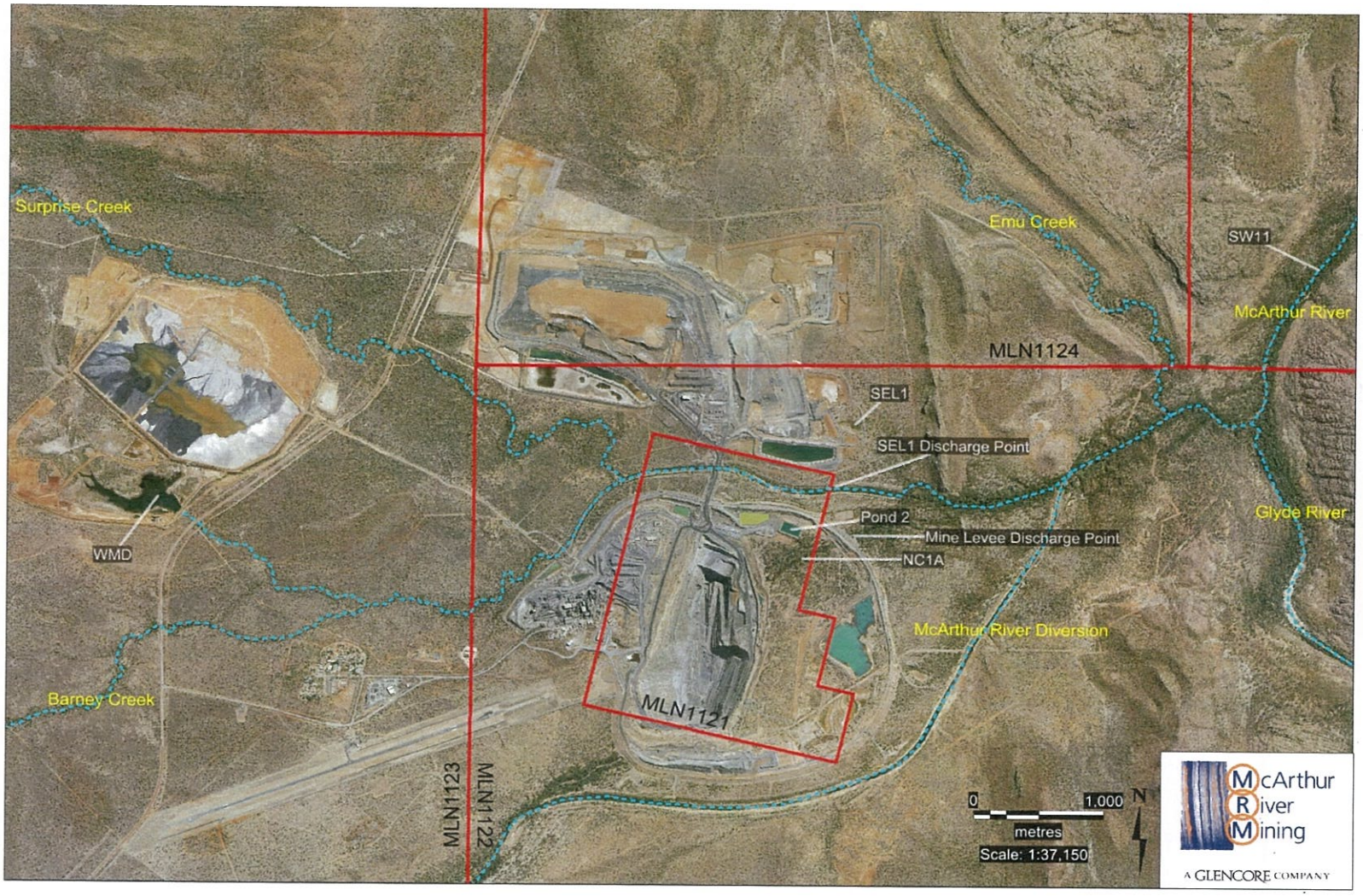
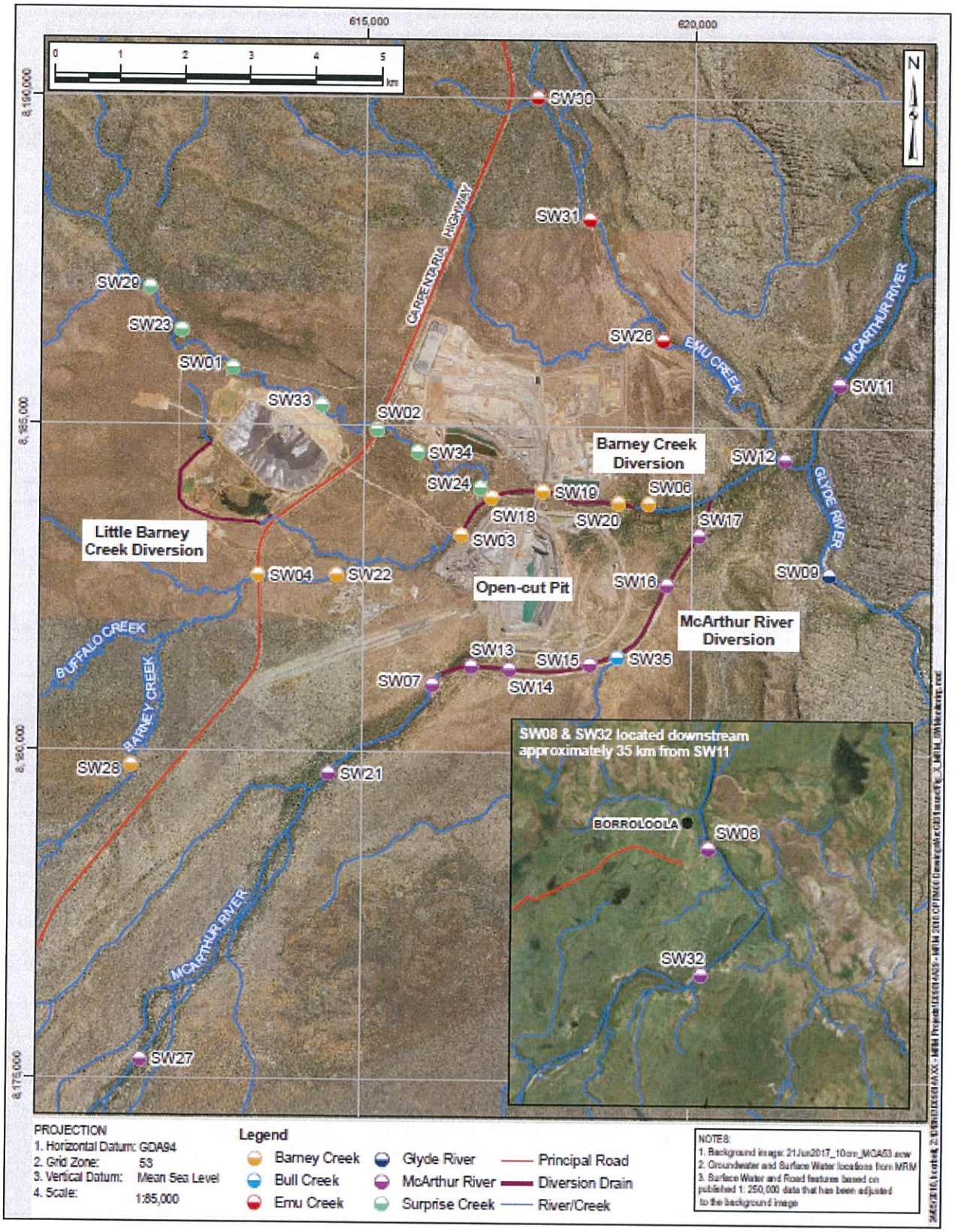


Figure 2: Bing Bong Loading Facility Authorised Discharge Points, Compliance Location (BBDDP) and Monitoring Points

Figure 3: McArthur River Mine Water Monitoring Points



APPENDIX 3: Site Specific Trigger Values

Table 1: Site Specific Trigger Values

	Site Code			SW11	BBDDP
	Easting*			622238	649514
	Northing*			8185656	8271536
Parameter	**Abbr**	**Units**	**Analysis**	**SSTV's****	**ANZECC (2000)**
Field Measurements					
pH	pH	pH units	In situ	6.0-8.5	8.0-8.4[12]
Electrical Conductivity	EC	µS/cm^{-1}		1000[7]	
Dissolved Oxygen	DO	% saturation		85-120	
Metals and Metalloids					
Aluminium	Al	µg/l	Filtered (0.45 µg/l)	55[1]	0.5[10]
Arsenic(III)	As			24[1]	2.3[10]
Cadmium	Cd			1.73[2]	5.5[1]
Copper	Cu			10.97[2]	1.3[11]
Iron (II) & (III)	Fe			300[3]	
Lead	Pb			16.6[4]	4.4[11]
Manganese	Mn			1900[1]	80[3]
Mercury	Hg			0.6[1]	0.4[11]
Nickel	Ni			11[1]	70[1]
Zinc	Zn			62.68[2]	15[11]
Total Petroleum Hydrocarbons (TPH)					
TPH Fraction C6 – C9	NA	µg/l			
Benzene	NA			950[13]	500[13]
TPH Fraction C10-C14	NA			600[5]	600[9]
C15-C28	NA				
C29-C36	NA				
Other					
Sulphate	SO_4	mg/l		341[6]	-
Nitrate	NO_3	µg/l		700[1]	-

KEY:

W – Weekly

Trigger Value Derivation

1. ANZECC 2000 95% TV Table 3.4.1.
2. Hardness Modified Trigger Value (HMTV) from the *MRM Sustainable Development Water Management Plan 2010-2011.*
3. ANZECC 2000 interim indicative working level.
4. TV approved by Administering Agency 2010.
5. Based on the aqueous solubility of mineral oils and as found in the document Intervention Value outlined in the *Environmental Quality Objectives in the Netherlands* (1994).
6. Calculated on the 95% level of protection (% of species). *Hydrobiology (212) Sulphate Trigger Value for MRM Mine: 2012 prepared by McArthur River Mining.*
7. TV approved by Administering Agency 2012
8. ANZECC 2000 moderate reliability Trigger Value.
9. TV approved by Administering Agency 2013.
10. ANZECC 2000 Environmental concern level/indicative interim working level. Metals and Metalloids Chapter 8.3.7.1
11. ANZECC 2000 High Reliability 95% Trigger Value. Metals and Metalloids Chapter 8.3.7.1
12. ANZECC 2000 Default Trigger Values- Tropical Australia Table 3.3.4
13. ANZECC 2000 Moderate Reliability 95% Trigger Value. Aromatic Hydrocarbons- Chapter 8.3.7.7 Table 8.3.14

*MGA94 Zone 53

**SSTV are applicable to filtered samples for metals and metalloids.

APPENDIX 4: Table 1 Surface Water Monitoring – McArthur River Mine

				Water Quality Monitoring Data for Water being Discharged from Site					Compliance Point	Upstream McArthur River		Non-Impacted Upstream Barney Creek	Non-Impacted Upstream Surprise Creek	Non-Impacted Upstream Emu Creek	Non-Impacted Upstream Glyde River	Downstream of Discharge Points along the McArthur River				McArthur River Diversion		
			Site Code	P2	NC1A	WMD	WTP	SEL1	SW11	SW27	SW21	SW28	SW29	SW30	SW09	SW06	SW12	SW32	SW08	SW13	SW15	SW16
			Easting**	618212	618468	613496	618190	618702	622238	611632	614478	611458	611695	617586	622098	619324	621404	640492	640798	616630	618443	619613
			Northing**	8183525	8183399	8183622	8183611	8184377	8185656	8175289	8179667	8179782	8187072	8190016	8182747	8183816	8184501	8215594	8221572	8181322	8181361	8182579
PARAMETER	**Abbrev.**	**Units**	**Analysis**	**FREQUENCY**																		
Environmental Field Data																						
pH*	pH	pH	In situ/ laboratory	W UP	W UN	W UW	W	W US	W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Electrical conductivity*	EC	µS/cm							W U C	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Dissolved oxygen*	DO	% sat.							W U C	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Temperature*	Temp	°C							W U C	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Turbidity	NTU	NTU							W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Total suspended solids	TSS	mg/L							W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Total dissolved solids	TDS	mg/L							W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Hardness		mg/L							W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
River flow	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals and Metalloids																						
Aluminium	Al	µg/L	Total and Filtered (0.45 µm)	W UP	W UN	W UW	W	W US	W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Arsenic	As								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Cadmium	Cd								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Copper	Cu								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Iron	Fe								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Lead	Pb								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Manganese	Mn								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Mercury	Hg								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Nickel	Ni								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Zinc	Zn								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Antimony	Sb	µg/L	Total and Filtered (0.45 µm)	W UP	W UN	W UW	W	W US -	W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Barium	Ba								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Beryllium	Be								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Bismuth	Bi								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Boron	B								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Chromium	Cr								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Cobalt	Co								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Molybdenum	Mo								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Selenium	Se								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Silver	Ag								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W

				Water Quality Monitoring Data for Water being Discharged from Site					Compliance Point	Upstream McArthur River		Non-Impacted Upstream Barney Creek	Non-Impacted Upstream Surprise Creek	Non-Impacted Upstream Emu Creek	Non-Impacted Upstream Glyde River	Downstream of Discharge Points along the McArthur River				McArthur River Diversion		
			Site Code	P2	NC1A	WMD	WTP	SEL1	SW11	SW27	SW21	SW28	SW29	SW30	SW09	SW06	SW12	SW32	SW08	SW13	SW15	SW16
			Easting**	618212	618468	613496	618190	618702	622238	611632	614478	611458	611695	617586	622098	619324	621404	640492	640798	616630	618443	619613
			Northing**	8183525	8183399	8183622	8183611	8184377	8185656	8175289	8179667	8179782	8187072	8190016	8182747	8183816	8184501	8215594	8221572	8181322	8181361	8182579
PARAMETER	**Abbrev.**	**Units**	**Analysis**			**FREQUENCY**																
Thallium	Tl								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Uranium	U								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Vanadium	V								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Total Petroleum Hydrocarbons																						
TPH	TPH								W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
Benzene									W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
TPH Fraction C6-C9									W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
TPH Fraction C10-C14		µg/L	Total	UP	UN	UW	W	US	W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
TPH Fraction C15-C28									W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
TPH Fraction C29-C36									W U	-	-	-	-	-	-	W U	W U	-	-	-	-	-
Other																						
Sulphate	SO_4								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Nitrate	NO_3								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Calcium	Ca								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Chloride	Cl								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Sodium	Na	mg/L		W UP	W UN	W UW	W	W US	W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Potassium	K								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Magnesium	Mg								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Carbonate	CO_3^2								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W
Bicarbonate	HCO3								W U	W	W U	W	W	W	W	W U	W U	M	M	W	W	W

Key:

UP = upon discharge from P2 via MLDP;

US = upon discharge from SEL1 DP;

UN = upon discharge from NC1A via MLDP;

UW = upon discharge from WMD via MLDP;

W = weekly;

M = monthly;

U = when it is expected authorised discharges will reach SW11, SW12 and SW6 then weekly while discharging;

C = continuous monitoring to achieve greater or equal to 90% data capture rate at SW11;

*Parameters measured insitu;

**MGA94 Zone 53

Appendix 4 – Table 2 - Surface Water monitoring – Bing Bong Loading Facility

				Surface Water				
			Site Code	DSD1	DSD2	DSD3	DSD4	BBDDP
			Easting*	649503	649157	648145	648325	649514
			Northing*	8271430	8270544	8270886	8271385	8271536
PARAMETER	**Abbr.**	**Units**	**Analysis**	**FREQUENCY**				
Environmental Parameters								
pH**	pH	pH	In situ/ laboratory	W	W	W	W	W M
Electrical conductivity**	EC	µS/cm						
Dissolved oxygen**	DO	% sat.						
Temperature**	Temp	°C						
Turbidity	NTU	NTU						
Total suspended solids	TSS	mg/L						
Total dissolved solids	TDS	mg/L						
Metals and Metalloids								
Aluminium	Al	µg/L	Filtered (0.45 µm)	W	W	W	W	W M
Arsenic	As							
Boron	Bo							
Cadmium	Cd							
Cobalt	Co							
Copper	Cu							
Iron	Fe							
Lead	Pb							
Manganese	Mn							
Mercury	Hg							
Nickel	Ni							
Thallium	Tl							
Zinc	Zn							
Total Petroleum Hydrocarbons								
TPH	TPH	µg/L	Total	W	W	W	W	W
Benzene								
Fraction C6-C9								
Fraction C10-C14								
Fraction C15-C28								
Fraction C29-C36								
Other								
Sulphate	SO_4	mg/L		W	W	W	W	W M
Nitrate	NO_3	µg/L						

Key: W = weekly when active dredge disposal is occurring
M = monthly when flowing

*MGA94 Zone 53, **Parameters measured insitu

APPENDIX 5: Table 1 Fluvial Sediment Monitoring – McArthur River Mine

				Compliance Point	Upstream McArthur River		Non-Impacted Upstream Barney Creek	Non-Impacted Upstream Surprise Creek	Non-Impacted Upstream Emu Creek	Non-Impacted Upstream Glyde River	Downstream of Discharge Points along the McArthur River				McArthur River Diversion		
			Site Code	SW11	SW27	SW21	SW28	SW29	SW30	SW09	SW06	SW12	SW32	SW08	SW13	SW15	SW16
			Easting*	622238	611632	614478	611458	611695	617586	622098	619324	621404	640492	640798	616630	618443	619613
			Northing*	8185656	8175289	8179667	8179782	8187072	8190016	8182747	8183816	8184501	8215594	8221572	8181322	8181361	8182579
PARAMETER	**Abbrev.**	**Units**	**Analysis**														
Environmental Field Data																	
pH	pH	pH		A	A	A	A	A	A	A	A	A	A	A	A	A	A
Electrical conductivity	EC	µS/cm		A	A	A	A	A	A	A	A	A	A	A	A	A	A
Moisture content			%	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Particle size distribution	PSD		<%> 2mm & 63µm	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Metals and Metalloids																	
Aluminium	Al	Mg/kg dry weight	<63µm sediment fraction	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Antimony	Sb			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Arsenic	As			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Barium	Ba			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Beryllium	Be			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Bismuth	Bi			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Boron	B			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cadmium	Cd			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Chromium	Cr			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cobalt	Co			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Copper	Cu			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Iron	Fe			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Lead	Pb			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Manganese	Mn			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Mercury	Hg			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Molybdenum	Mo			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Nickel	Ni			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Selenium	Se			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Silver	Ag			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Thallium	Tl			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Uranium	U			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Vanadium	V			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Zinc	Zn			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Lead Isotope Ratio	PbIR			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Other																	

				Compliance Point	Upstream McArthur River		Non-Impacted Upstream Barney Creek	Non-Impacted Upstream Surprise Creek	Non-Impacted Upstream Emu Creek	Non-Impacted Upstream Glyde River	Downstream of Discharge Points along the McArthur River				McArthur River Diversion		
			Site Code	SW11	SW27	SW21	SW28	SW29	SW30	SW09	SW06	SW12	SW32	SW08	SW13	SW15	SW16
			Easting*	622238	611632	614478	611458	611695	617586	622098	619324	621404	640492	640798	616630	618443	619613
			Northing*	8185656	8175289	8179667	8179782	8187072	8190016	8182747	8183816	8184501	8215594	8221572	8181322	8181361	8182579
PARAMETER	Abbrev.	Units	Analysis														
Calcium	Ca	Mg/kg dry weight	Soluble ion extract	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Magnesium	Mg			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sodium	Na			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Potassium	K			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Chloride	Cl			A	A	A	A	A	A	A	A	A	A	A	A	A	A
Sulphate	SO_4			A	A	A	A	A	A	A	A	A	A	A	A	A	A

A – Annual sampling.

*MGA94 Zone 53

APPENDIX 5: Table 2 – Fluvial Sediment Monitoring – Bing Bong Loading Facility

	Fluvial Sediment			
			Site Code	BBDDP
			Easting*	649514
			Northing*	8271536
PARAMETER	**Abbr.**	**Units**	**Analysis**	**FREQUENCY**
Environmental Parameters				
pH	pH	pH		A
Electrical conductivity	EC	µS/cm		A
Moisture content		%		A
Metals and Metalloids				
Aluminium	Al	Mg/kg dry weight	<63µm sediment fraction	A
Antimony	Sb			A
Arsenic	As			A
Boron	Bo			A
Barium	Ba			A
Beryllium	Be			A
Bismuth	Bi			A
Cadmium	Cd			A
Cobalt	Co			A
Chromium	Cr			A
Copper	Cu			A
Iron	Fe			A
Lead	Pb			A
Manganese	Mn			A
Mercury	Hg			A
Molybdenum	Mo			A
Nickel	Ni			A
Selenium	Se			A
Silver	Ag			A
Thallium	Tl			A
Uranium	U			A
Vanadium	V			A
Zinc	Zn			A
Other				
Sulphate	SO_4	Mg/kg dry weight	Soluble ion extract	A
Calcium	Ca			A
Magnesium	Mg			A
Sodium	Na			A
Potassium	K			A
Chloride	Cl			A

Key: A – Annual sample.

*MGA94 Zone 53

Appendix 6 – Biota Monitoring for McArthur River Mine and Bing Bong Loading Facility

Project Name	Locations	Project Description	Report Frequency
Bing Bong Diffuse Gradients in Thin Films	Bing Bong Loading Facility Gulf of Carpentaria	Diffusive Gradients in Thin Films (DGT) are deployed in the marine environment at sites adjacent to the Bing Bong Loading Facility. This includes sites located in the Bing Bong Swing Basin and Navigation Channel. The DGTs are deployed quarterly in the water column to accumulate metals over several days. The DGTs provide time-integrated average concentrations of bioavailable metals over the deployment period. The metal concentrations are compared, where applicable, to relevant marine water quality guidelines.	Annually
Annual Marine Monitoring Program	Bing Bong Loading Facility Gulf of Carpentaria	Collection of marine biota, sediment and water samples for analysis of potentially mine derived metals and metalloids. Collection targets the area adjacent the Bing Bong Loading Facility as well as sites in the Gulf of Carpentaria to the northwest and southeast of the Loading Facility. Metal concentrations in commonly consumed species are compared to Maximum Permitted Concentrations with data also used to calculate safe daily consumption amounts where relevant. Marine water and sediment metal concentrations are used to quantify the potential impact from the Loading Facility and are compared to relevant quality guidelines.	Annually
Metals in Freshwater Biota	McArthur River Surprise Creek Barney Creek Emu Creek Robinson River Limmen River	Collection of freshwater biota samples for analysis of mine derived metals. Collection targets both lower order indicator species and higher order commonly consumed species. Samples are collected from upstream and downstream McArthur River and throughout the mine catchments such as Barney Creek and Surprise Creek. Samples are also taken from regional reference sites such as the Limmen and Robinson Rivers. Metal concentrations in commonly consumed species are compared to Maximum Permitted Concentrations. Concentrations are also used to calculate safe daily consumption amounts where relevant.	Annually
Seagrass Assessment	Bing Bong Loading Facility Gulf of Carpentaria	Seagrass monitoring to determine whether any observed change in seagrass distribution or composition has occurred in the marine waters adjacent the Bing Bong Loading Facility. Monitoring also aims to determine whether any change identified is naturally occurring or related to the Loading Facility operations.	Annually
Vegetation Monitoring	Bing Bong	Monitoring of the vegetation adjacent the Bing Bong Dredge Spoil Emplacement Facility to determine if hyper saline seepage from the facility is impacting nearby vegetation communities.	Every 3 Years
Aquatic Fauna	McArthur River	Survey of the abundance and diversity of aquatic fauna along the McArthur River,	Biannually (early and late

Abundance & Diversity - McArthur River Catchment	Barney Creek Surprise Creek	McArthur River Diversion Channel, Barney Creek and Surprise Creek. Data is used to monitor potential impacts from mine operations and to determine the effectiveness of rehabilitation works along the McArthur River Diversion Channel by comparing data to control sites	dry season)
Macro Invertebrates - McArthur River Catchment	McArthur River Surprise Creek Barney Creek Glyde River	Survey of macro-invertebrate abundance and diversity in aquatic ecosystems. Data is used to monitor potential impacts from mine operations and to determine the effectiveness of rehabilitation works along the McArthur River Diversion Channel. Sampling is conducted annually during the recessional flow period.	Annually (late wet season/early dry season)

Attachment 2

McArthur River Mine 2020-2021 Environmental Monitoring Report

(download link to documents provided separately)

Attachment 3

Surface Water Monitoring Report 2020/21 – McArthur River Mine and Bing Bong Loading Facility

Surface Water Monitoring Report 2020/21

McArthur River Mine and Bing Bong Loading Facility

McArthur River Mining Pty Ltd
0790-104-C3, 17 August 2021

Report Title	Surface Water Monitoring Report 2020/21, McArthur River Mine and Bing Bong Loading Facility
Client	McArthur River Mining Pty Ltd PO Box 36821 Winnellie, NT. 0821 AUSTRALIA
Report Number	0790-104-C3

Revision Number	Report Date	Report Author	Reviewer
0	28/06/2021	PS/AMC	JO
1	5/08/2021	PS/AMC	JO
2	11/08/2021	PS/AMC	JO
3	17/08/2021	PS/AMC	JO

For and on behalf of WRM Water & Environment Pty Ltd
Level 9, 135 Wickham Tce, Spring Hill
PO Box 10703 Brisbane Adelaide St Qld 4000
Tel 07 3225 0200

Julian Orth

Principal Engineer

NOTE: This report has been prepared on the assumption that all information, data and reports provided to us by our client, on behalf of our client, or by third parties (e.g. government agencies) is complete and accurate and on the basis that such other assumptions we have identified (whether or not those assumptions have been identified in this advice) are correct. You must inform us if any of the assumptions are not complete or accurate. We retain ownership of all copyright in this report. Except where you obtain our prior written consent, this report may only be used by our client for the purpose for which it has been provided by us.

Executive Summary

This report has been prepared to detail findings of the annual review of surface water quality monitored as part of the McArthur River Mining Pty Ltd (MRM) natural and artificial surface water monitoring programs during the period between 1 May 2020 to 30 April 2021 (the reporting period).

MONITORING PROGRAM OVERVIEW

The MRM surface water monitoring includes the Natural Surface Water (NSW) monitoring program and the Artificial Surface Water (ASW) monitoring program.

Natural Surface Water Program

MRM has developed a NSW monitoring program, which specifies the sampling requirements and procedures for the monitoring of the McArthur River, its onsite tributaries, and the surrounding receiving environment. The objectives of the monitoring, as detailed in the McArthur River Mine (the Mine) Water Management Plan (WMP) (MRM 2020b), are to:

- Characterise water quality at monitoring sites upstream and downstream of Mine operations.
- Assess the potential impacts on the receiving waters from Mine operations.
- Assess the measured surface water quality against WDL 174 Site-Specific Trigger Values (SSTVs) to verify compliance (monitoring location SW11).
- Identify the potential sources of contamination measured at water monitoring sites.
- Assess the efficacy of controls implemented by MRM to prevent contamination of receiving waters downstream of the Mine in the McArthur River.

The NSW monitoring network includes locations along the McArthur River, the Glyde River, Surprise Creek, Barney Creek and Emu Creek. Monitoring locations are also located along diverted sections of Barney Creek and the McArthur River. NSW monitoring locations include upstream control sites and downstream potentially impacted sites.

Artificial Surface Water Program

The ASW monitoring program specifies the sampling requirements and procedures for monitoring water in designated water storage facilities. The objectives of the ASW monitoring program, as detailed in the Mine WMP (MRM 2020b), are to:

- Identify potential contamination in water to determine risk and appropriate management options.
- Identify suitable water storage options and determine whether offsite discharge is a viable disposal option.
- Collect data to assess environmental performance and provide information for contamination source investigations.

The ASW monitoring locations are situated at major Mine infrastructure locations and have been classified into common domains. The domains are Metallurgy (Tailings Storage Facility and Mill), Open Pit (OP), Northern Overburden Emplacement Facility (NOEF) and the Bing Bong Loading Facility (BBLF).

ASW sites consist of ponds, sumps, dams and sediment traps, which are used as part of the site water management system to collect, store, or manage potentially mine-affected water and sediments.

WASTE DISCHARGE LICENSE AND VARIATION OF AUTHORISATION

Pursuant to Section 74 of the Water Act 1992 (Northern Territory of Australia 2018), MRM was granted Waste Discharge Licence 174-11 (the WDL) on 28 April 2019, which enabled the conditional discharge of wastewater at specified locations over the reporting period. This included the Mine Levee Discharge Point (MLDP) into the old McArthur River, the South-East Levee 1 Discharge Point (SEL1 DP) into Barney Creek Diversion and the Bing Bong Dredge Spoil Drain (BBDDP) into marine waters at the BBLF.

Pursuant to the Mining Management Act (NT) in the Variation of Authorisation (VOA) 0059, MRM was also authorised over the reporting period to undertake conditional discharges of wastewater at the Water Management Dam (WMD) into Little Barney Creek, via the WMD Release Point.

MRM's WDL and VOA enables discharge of water from the Mine to the McArthur River as required for operations. The WDL has strict environmental conditions relating to mine water discharges to protect the values of the McArthur River and downstream users. The WDL identifies the downstream compliance point as SW11, where potentially mine-affected waters are considered mixed with river water by the time flow reaches the compliance point.

Site Specific Trigger Values (SSTVs) are listed in the WDL for SW11 and BBDDP and are compared to the compliance point's water quality monitoring results. Where a potential non-compliance of the SSTVs is identified, an investigation report is completed with notices documented by MRM and submitted to the NT Department of Environment, Parks and Water Security (DEPWS).

SUMMARY OF THE MINE MONITORING PROGRAM RESULTS

Rainfall influences

Approximately 877 mm of rainfall over the 2020/21 wet season was recorded at the Mine, which is slightly higher than average (716 mm). The majority of rainfall occurred over the wet season months between November and April, with the McArthur River ceasing to flow at the SW11 compliance point between August/September 2020 and December 2020.

Natural Surface Water

A neutral pH was reported across all the natural surface water monitoring locations, including those located in the onsite tributaries. Sulphate (SO_4) levels were less than 200 mg/L across all the McArthur River monitoring locations, including the SW11 compliance point.

Filtered metal levels were below the SSTVs at the SW11 compliance point, with the only exceptions found to be derived from natural catchment sources located upstream of the Mine. These included:

- elevated filtered aluminium (Al) levels recorded at the McArthur River upstream control site, which caused exceedances at the SW11 compliance point.
- elevated filtered iron (Fe) and nitrate (NO_3) levels recorded at the Glyde River upstream control site, which caused exceedances at the SW11 compliance point.

No SSTV exceedances at the SW11 compliance point which triggered investigation were found to be related to the Mine's operations.

Regarding the TSF interception trench and NSW quality downstream of the trench in Surprise Creek, there was a slight reduction in electrical conductivity (EC) and sulphate levels, and a notable reduction in the filtered metals reviewed. It was concluded that the trench was acting as intended and intercepting TSF Cell seepage before it can enter Surprise Creek.

Artificial Surface Water

Several water management activities were undertaken during the reporting period, including lime treatment in NOEF South-East Perimeter Runoff Dam (SEPROD). In total, 764 tonnes of hydrated lime was used in NOEF SEPROD during the reporting period to treat approximately 2,913 megalitres (ML) of mine water. Of this, approximately 2,695 ML of treated water was transferred out of the dam for waste discharge and release activities.

As part of ongoing environmental improvements, the NOEF West D Sump (WDS) was lined with a high density polyethylene (HDPE) liner over the reporting period to minimise the risk of seepage to local groundwater.

In relation to water quality, the majority of ASW sites had a neutral pH during the reporting period except for four sites where median water pH levels were less than 5. These storages included:

- NOEF West Perimeter Runoff Dam (WPROD) – median pH of 3.8;
- NOEF South Perimeter Runoff Dam (SPROD) – median pH of 4.9;
- NOEF East Perimeter Runoff Dam (EPROD) – median pH of 4.4; and
- OP Lake Archer (LA) – median pH of 2.6.

Low pH water in the above storages is likely attributed to the residual mill leachate circuit water and NOEF seepage.

Over the reporting period, there was no spillway overflow reported from any of the major water storages to the receiving environment, including from the four low pH storages listed above.

Waste Discharge

Over the reporting period, approximately 711.3 ML, 18.0 ML and 1,308.4 ML of mine water was released via the MLDP (from TSF WMD and OP P2), the SEL1 DP (from NOEF SEL1 and the WMD RP (from the TSF WMD siphons), respectively. The total volume of water release to the McArthur River was approximately 2037.7 ML.

During the reporting period, two investigation reports related to exceedances of an SSTV at SW11 were documented by MRM and submitted to NT DEPWS, as required by WDL 174-11. The investigation reports related to the exceedance of filtered Al and NO_3 SSTV at SW11. A summary of the analyte exceedances triggering the investigations includes:

- Filtered Al: A measured level of 270 µg/L at SW11, which is greater than three times the SSTV (55 µg/L), coincided with elevated levels upstream of the mining lease. It was concluded that the exceedance was unrelated to mining activity.
- Filtered NO_3: Three (3) consecutive exceedances of the 700 µg/L SSTV was measured at SW11, all of which coincided with elevated levels at the Glyde River upstream control site. It was concluded that the exceedances were unrelated to mining activity.

Additionally, there was one SSTV exceedance of filtered Fe and nine exceedances of dissolved oxygen at SW11. These exceedances did not trigger the requirement to undertake an investigation in accordance with Conditions 38 and 39 of WDL 174-11.

SUMMARY OF THE BBLF MONITORING PROGRAM RESULTS

Rainfall Influences

Approximately 989 mm of rainfall over the 2020/21 wet season was recorded at the BBLF, which is slightly higher than average (863 mm).

Natural Surface Water

There was no observed discharge via the BBDDP and therefore no NSW quality data was recorded to consider against the SSTVs for the BBDDP.

Water Quality Monitoring

No samples were taken at the dredge spoil drain monitoring sites (DSD1 to DSD4) as no dredging occurred during the reporting period. The BBDDP compliance point was inspected monthly for flow in accordance with WDL 174-11. No water quality samples were taken during the reporting period as there was no observed flow during any of the monthly inspections.

Waste Discharge

There was no observed discharge via the BBDDP. No dredging occurred during the reporting period and therefore no controlled discharge of waste water occurred.

CONCLUSION

Based on the review of surface water quality monitoring data between 1 May 2020 and 30 April 2021, MRM continue to implement effective controls to minimise the risk of environmental harm of downstream receiving waters due to Mine operations. The review concluded that the beneficial uses and community values of the McArthur River continue to be protected from potential mining derived impacts.

There were no mine derived SSTV exceedances or non-compliances recorded at the SW11 compliance point in the McArthur River during the reporting period. The SSTV exceedances recorded at SW11 during the reporting period were unrelated to mine activities and were a result of natural river processes and contributions from sources upstream of the Mine.

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1 Introduction

WRM Water & Environment Pty Ltd (WRM) has been commissioned by McArthur River Mining Pty Ltd (MRM) to prepare the MRM annual surface water monitoring report. This report provides the results of surface water monitoring completed during the period between 1 May 2020 to 30 April 2021 (the reporting period).

This report has been prepared to support regulatory process and forms part of the annual Environmental Monitoring Report (EMR) to be submitted to the Northern Territory Department of Industry, Tourism and Trade (DITT).

1.1 SITE LOCATION AND MINE INFRASTRUCTURE

MRM is a subsidiary of Glencore and is the operator of the McArthur River Mine (the Mine). MRM operations consist of the Open Pit zinc/lead/silver mine, a concentrator and processing plant, and the Bing Bong Loading Facility (BBLF).

The Mine is located in the Northern Territory approximately 70 km southwest of the township of Borroloola and approximately 740 km southeast of Darwin. The concentrate from the Mine is trucked to the BBLF, which is located approximately 50 km north of the township of Borroloola and on the Gulf of Carpentaria, for distribution worldwide. A locality plan of the Mine and BBLF sites is shown in Figure 1.1.

MRM mining operations consist of:

- Mining of ore within the Open Pit using conventional load and haul method to the run of mine pad for stockpiling.
- Mining of waste rock within the Open Pit using excavators, and transport by haul truck to the Overburden Emplacement Facilities (OEFs).
- Processing of ore via crushing, heavy media separation, grinding, flotation, lead oxidation, dewatering and concentrate handling and storage.
- Thickening of tailings generated by ore processing and piping of tailings for disposal at the Tailings Storage Facility (TSF).
- Transport of product materials by road train along the Carpentaria Highway to the BBLF, where the product is barged offshore for transfer to ships in the Gulf of Carpentaria.
- Other ancillary activities, such as dam construction, flood protection works, rehabilitation and excavation of borrow material for construction activities.

Open cut mining commenced in 2005, following cessation of underground mining. The location of key infrastructure at the Mine is presented in Figure 1.2.

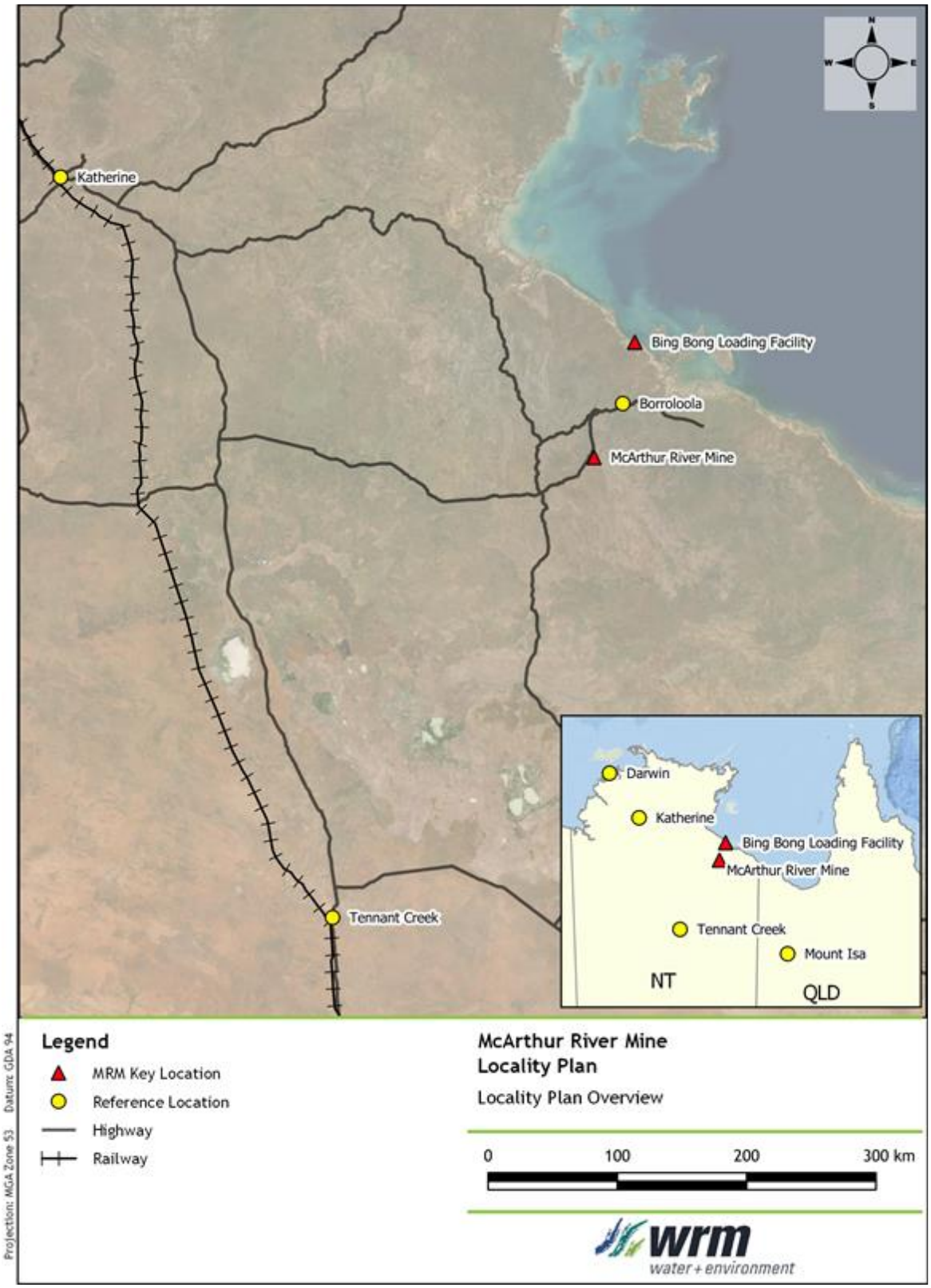

Figure 1.1 – Location of McArthur River Mine and Bing Bong Loading Facility

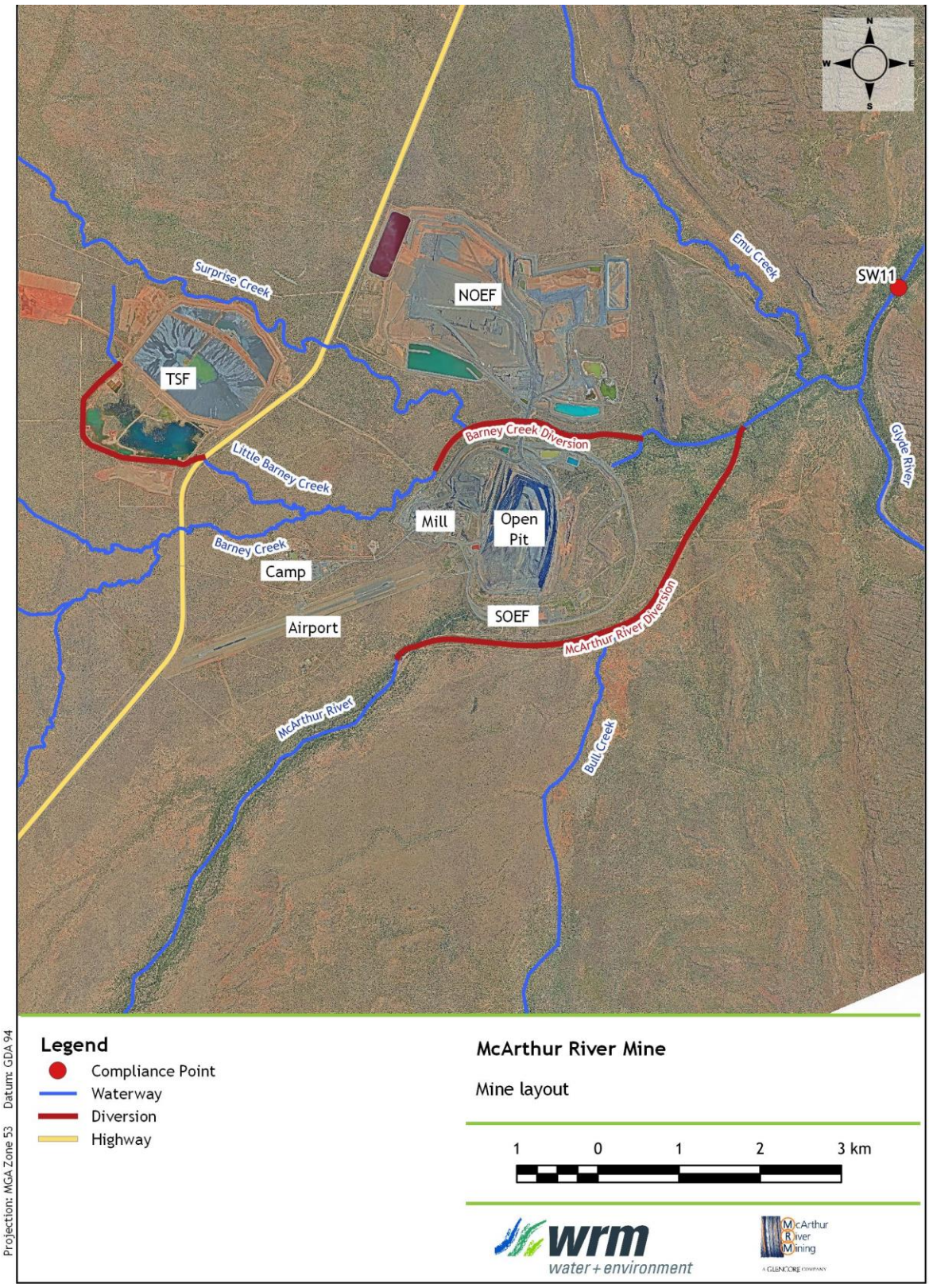

Figure 1.2 – Mine layout

1.2 COMMUNITY VALUES AND BENEFICIAL USES

1.2.1 Environmental Objectives

Key environmental objectives have been developed as a result of environmental assessment processes (including EISs), environmental risk assessments, stakeholder engagement and feedback, development of management and monitoring plans, specialist investigations, independent monitoring reviews and regulatory approvals.

The key environmental management objectives for the Mine are included in the Mine's Adaptive Management Plan (MRM 2020a), and are described as follows:

- Protect the McArthur River beneficial uses and community values from mining impacts;
- Facilitate development of the ecosystems and their functions along the McArthur River Diversion Channel for terrestrial and aquatic flora and fauna;
- Achieve a recovering trend in the water quality and ecosystem function in creeks on the Mine site within 20 years of cessation of mining; and
- Minimise air quality related impacts from the Mine's operations with respect to community health and the environment.

These overarching objectives are supplemented by environmental triggers detailed in sub-management plans. The Mine's Water Management Plan (WMP) (MRM 2020b) is applicable to this report and includes community values for the McArthur River and beneficial uses.

1.2.2 Community values

Community values are the qualities of waterways to be protected from activities in the catchment. Protecting community values aims to maintain healthy aquatic ecosystems and waterways that are safe and suitable for community use. Community values reflect the ecological, social and economic values and uses of the waterway (such as stock water, cultural uses, maintaining biodiversity, fishing and agriculture).

The processes to identify community values and determine water quality objectives (WQOs) are based on the National Water Quality Management Strategy: Implementation Guidelines (NWQMS, 1998). They are further outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018).

Based on the above guidelines, MRM has identified a number of community values for the receiving waters downstream of the Mine. These include:

- aquatic ecosystems;
- primary industries including stock drinking water, irrigation and general water uses;
- recreation and aesthetics; and
- cultural and spiritual values.

The condition of the McArthur River in the vicinity of the Mine is considered as Level 2: slightly to moderately disturbed ecosystems due to the influence of pastoralism and grazing throughout the catchment.

1.2.3 Beneficial uses

The WDL lists the following beneficial uses as declared under the Water Act and the sensitivity of the surrounding land use and environment in the vicinity of the Mine. These include:

- Declared beneficial uses and/or water quality objectives are:
  - McArthur River Area: Aquatic ecosystem protection, recreational water quality and aesthetics; and
  - McArthur River Catchment Area: environment, cultural and riparian.

- Sites of conservation significance (SOCS):
  - Sir Edward Pellow Island group (SOCS No. 33);
  - McArthur River coastal floodplain (SOCS No. 34); and
  - Borroloola area (SOCS No. 35).

1.2.4 Mixing zones

Mixing zones are specifically defined areas where the water quality may be below that required to protect community values and beneficial uses. Mixing zones allow for a designated zone of impact between MRM's authorised discharge points and the compliance points, in lieu of prescribing concentration requirements at authorised discharge points.

The current mixing zone extends along the McArthur River from the end of the Diversion Channel up to the northern (downstream) boundary of MLN 1122. Waste water discharge is also conveyed along Little Barney Creek and Barney Creek (including the Barney Creek Diversion Channel). However, these reaches are located in operational mine areas, are highly ephemeral (providing little waste water dilution), are not considered important refugia for the persistence of any aquatic species, nor do they provide a major ecological role within the wider catchment (IPE, 2019). For these reasons, the Little Barney Creek and Barney Creek reaches are not afforded mixing zone status.

1.2.5 Natural surface water (NSW) monitoring program

MRM have developed a NSW monitoring program, which specifies the sampling requirements and procedures for the monitoring of the McArthur River, its onsite tributaries, and the surrounding receiving environment. The objectives of the monitoring, as detailed in the McArthur River Mine (the Mine) Water Management Plan (WMP) (MRM 2020b), are to:

- Characterise water quality at monitoring sites upstream and downstream of Mine operations.
- Assess the potential impacts on the receiving waters from Mine operations.
- Assess the measured surface water quality against WDL 174 Site-Specific Trigger Values (SSTVs) to verify compliance (monitoring location SW11).
- Identify the potential sources of contamination measured at water monitoring sites.
- Assess the efficacy of controls implemented by MRM to prevent contamination of receiving waters downstream of the Mine in the McArthur River.

The NSW monitoring network includes locations along the McArthur River, the Glyde River, Surprise Creek, Barney Creek and Emu Creek. Monitoring locations are also located along diverted sections of Barney Creek and the McArthur River. NSW monitoring locations include upstream control sites and downstream potentially impacted sites.

1.2.6 Artificial surface water (ASW) monitoring program

The ASW monitoring program specifies the sampling requirements and procedures for monitoring water in designated water storage facilities. The objectives of the ASW monitoring program, as detailed in the Mine WMP (MRM 2020b), are to:

- Identify potential contamination in water to determine risk and appropriate management options.
- Identify suitable water storage options and determine whether offsite discharge is a viable disposal option.
- Collect data to assess environmental performance and provide information for contamination source investigations.

The ASW monitoring locations are situated at major Mine infrastructure locations and have been classified into common domains. The domains are Metallurgy (Tailings Storage Facility and Mill)

Open Pit (OP), Northern Overburden Emplacement Facility (NOEF) and the Bing Bong Loading Facility (BBLF).

ASW sites consist of ponds, sumps, dams and sediment traps, which are used as part of the site water management system to collect, store, or manage potentially mine-affected water and sediments.

1.2.7 Monitoring Program procedures

The Water Monitoring Procedure (PRO-2200023) and Artificial Surface Water Monitoring Procedure (PRO-2200025) outline the water quality sampling adopted by MRM. The procedures include details of the sampling techniques, measurement of field readings and the collection and transport of the samples. Quality Assurance / Quality Control (QA/QC) procedures and requirements are also included.

1.3 REPORT PURPOSE AND STRUCTURE

This report has been prepared to detail the annual review of surface water quality monitored as part of the MRM's NSW and ASW monitoring programs.

This report is structured as follows:

- Section 2 provides an overview of the physical environment characteristics in the vicinity of the Mine.
- Section 3 summarises the results of the natural surface water monitoring at the Mine undertaken during the 2020/21 reporting period.
- Section 4 summarises the results of the artificial surface water monitoring at the Mine undertaken during the 2020/21 reporting period.
- Section 5 provides a description of the Bing Bong Loading Facility and summaries the water quality monitoring data collected during the 2002/21 reporting period.
- Section 6 presents the main findings of the 2020/21 surface water monitoring assessment.
- Section 7 is a list of references.
- Appendix A - provides the NSW monitoring data for the 2020/21 reporting period.
- Appendix B -presents the results of the QA/QC assessment for the 2020/21.
- Appendix C -provides the ASW monitoring data for the 2020/21 reporting period.
- Appendix D - presents and assessment of the potential impact of the TSF interception trench on the Surprise Creek water quality.
- Appendix E - presents a review of Little Barney Creek geomorphic characteristics downstream of release point.

2 McArthur River Mine

2.1 CLIMATE

The McArthur River catchment experiences a monsoonal climate regime, which is strongly seasonal with distinct wet and dry seasons. The average daily minimum and maximum temperatures at the Mine range between 12°C (in July) and 39°C (in November).

The rainfall and evaporation variations at the Mine are described in the following sections.

2.1.1 Available data

Recorded rainfall and Class A pan evaporation data was available for the Mine site from the BoM evaporation station at the MRM Airport (Station No. 14704).

Rainfall and evaporation data was obtained for the Mine site from the Department of Environment and Science (DES) SILO Patched Point Data Service. The SILO Patched Point data have been derived from climate data recorded at the MRM Airport (Station No. 14704). Days with missing data are in-filled with synthetic data that has been interpolated from recorded data at nearby regional stations as described by Jeffreys et al. (2001). The SILO Patched Point data provides a continuous daily data set between 1889 and 2021. Derived daily pan evaporation, lake evaporation and actual evapotranspiration rates were also available for the MRM Airport from the SILO Patched Point Data Service.

2.1.2 Rainfall

Table 2.1 shows the mean monthly and annual SILO Patched Point data rainfalls at the MRM Airport station based on the available 132 years of data.

The average monthly rainfalls at the Mine exhibit distinct wet (November to April) and dry (May to October) seasons during the year, with a dry season low of 0.4 mm in August to a wet season high of 193 mm in January. The wet season average monthly rainfalls (32 mm to 193 mm) are significantly higher than the equivalent dry season monthly rainfalls (0.4 mm to 15 mm). The recorded mean annual rainfall at the Mine site over the period 1889 to 2021 is approximately 725 mm.

The daily rainfall from 1 May 2020 to 30 April 2021 and the cumulative rainfall is shown in Figure 2.1. Approximately 877 mm of rainfall occurred this reporting period. The highest daily rainfall (77.6 mm) during the period was recorded on 21 March 2021.

2.1.3 Evaporation

Table 2.1 shows the mean monthly and annual SILO Patched Point evaporation values at the MRM Airport based on the available 132 years of data. Figure 2.2 shows the variation of mean monthly evaporation and evapotranspiration at the Mine. The average annual pan evaporation at the Mine is estimated to be approximately 2,753 mm, which is approximately 3.8 times the average annual rainfall.

Table 2.1 – SILO Patched Point mean monthly rainfall, evaporation and evapotranspiration at MRM airport

Month	Mean Monthly Rainfall (mm)	Mean Monthly Pan Evaporation (mm)
July	1.3	185.0
August	0.4	220.3
September	3.2	258.9
October	14.9	303.9
November	44.7	295.2
December	110.9	275.4
January	193.0	233.4
February	172.3	192.7
March	139.6	210.7
April	32.0	209.7
May	7.4	196.0
June	5.1	171.9
Annual	724.7	2,753

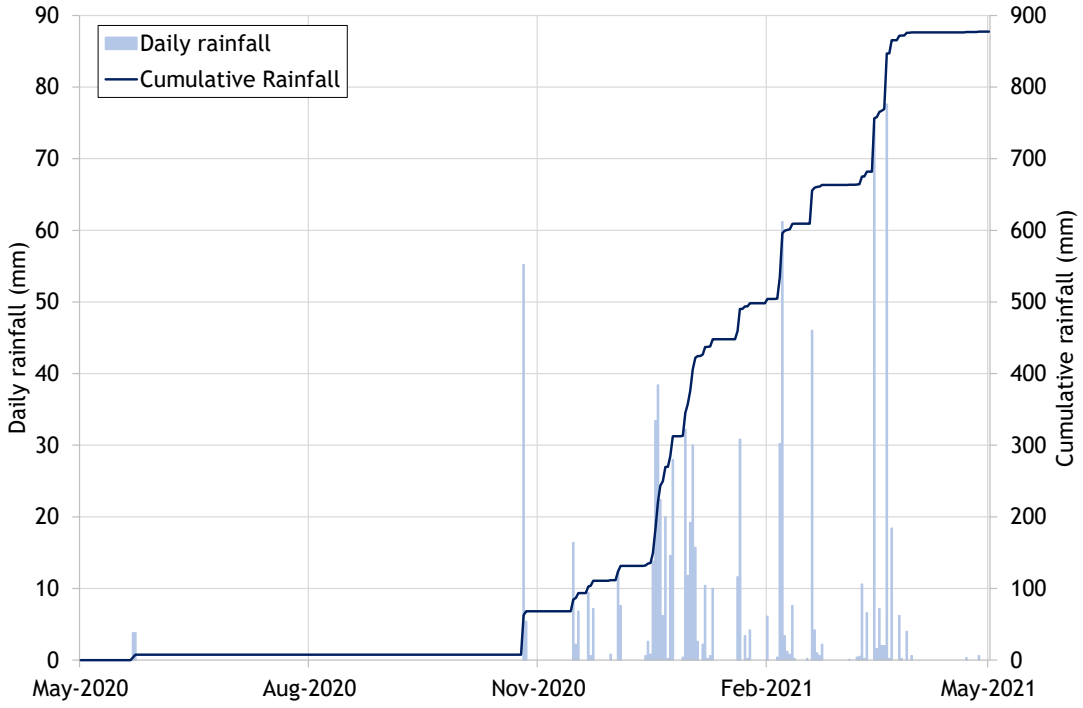

Figure 2.1 – McArthur River Airport Daily Rainfall and Cumulative Rainfall (1 May 2019 to 30 April 2020)

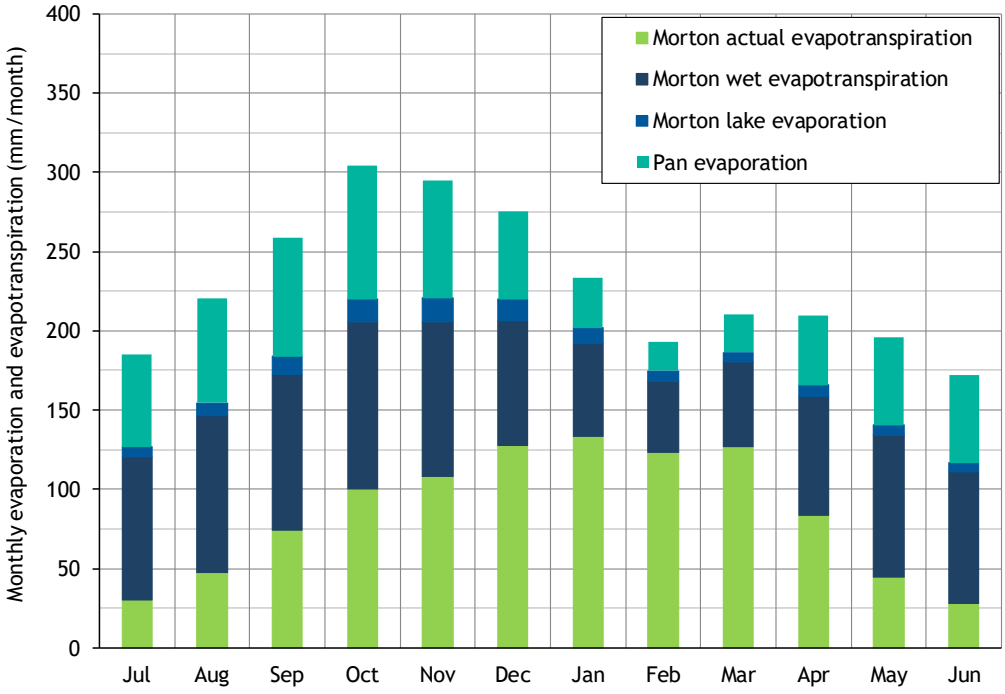

Figure 2.2 – SILO Patched Point data monthly evaporation and evapotranspiration at MRM Airport

2.2 REGIONAL CATCHMENTS

The McArthur River is the major surface water feature in the region. The McArthur River originates in the Barkly Ranges and flows in a northeast direction before discharging into the Gulf of Carpentaria near the Sir Edward Pellew Group Islands. The river falls more than 250 m over its 330 km length. The total catchment area of the McArthur River is approximately 18,000 km^2.

Figure 2.3 shows the drainage network of the McArthur River catchment and its major tributaries, including Batten Creek, Scrubby Creek, Tooganginie Creek, the Kilgour River, the Glyde River, Barney Creek and Rocky Creek. The catchment is bounded by the Limmen Bight River and Rosie River catchments to the west and northwest, the Wiso and Barkly Basins to the south and the Robinson River catchment to the east.

The catchment is sparsely populated with isolated communities, including the township of Borroloola. Land use is predominantly pastoralism and grazing throughout the catchment. The McArthur River system is considered a slightly to moderately disturbed system in accordance with ANZG (2018).

The Mine site is located adjacent to the McArthur River between its confluences with the Glyde and Kilgour rivers in the middle reaches of the catchment. The Glyde River, which has a catchment area of approximately 2,440 km^2, originates 95 km southeast of the Mine and joins the McArthur River approximately 6.9 km downstream of the mine site. The Kilgour River, which originates approximately 112 km south of the Mine, has a catchment area of approximately 3,100 km^2 and joins the McArthur River approximately 20.7 km upstream of the mine site. The McArthur River bed level in the reach adjacent to the mine site is between 16 mAHD and 21 mAHD.

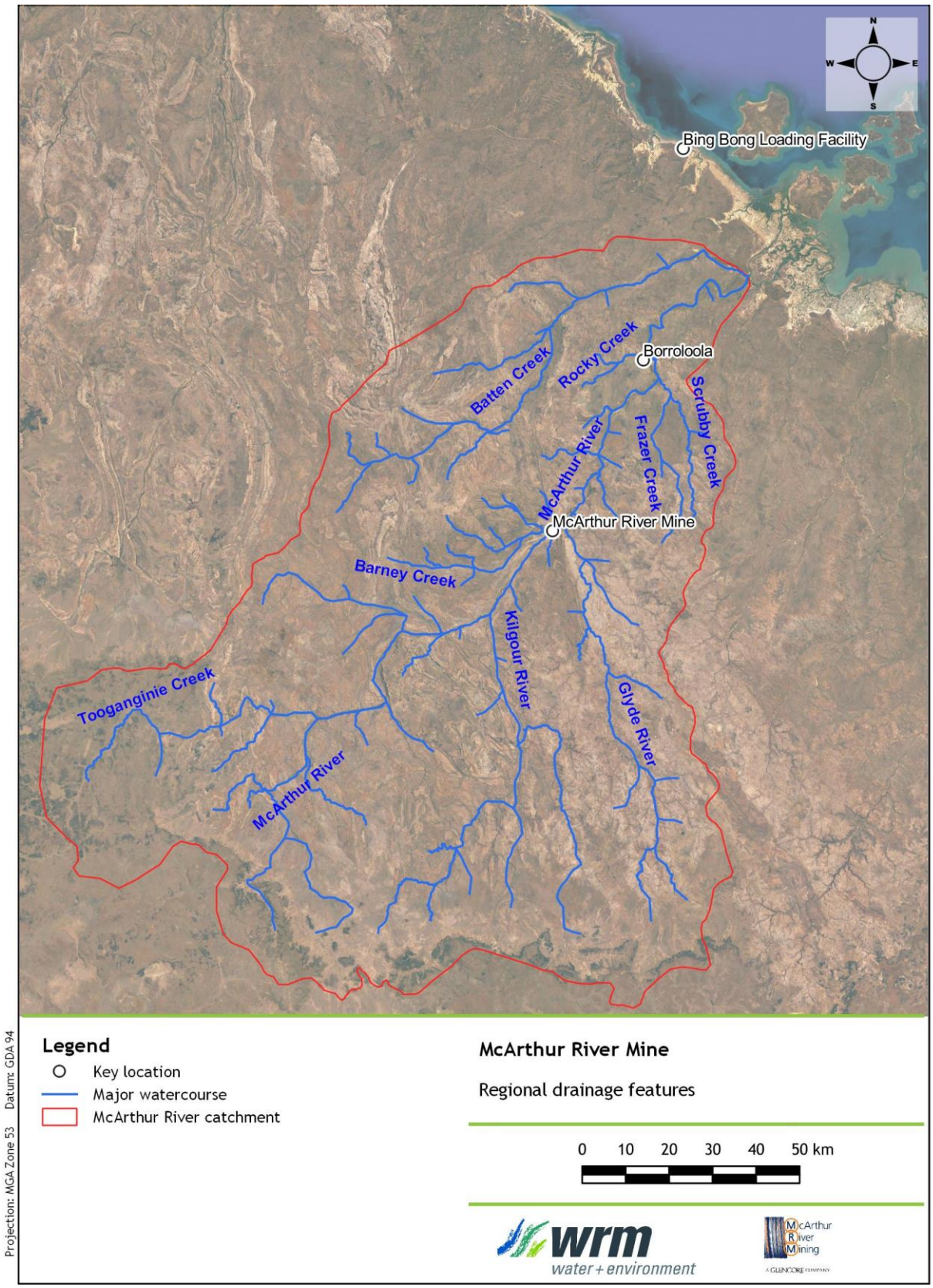

Figure 2.3 – Regional drainage features

2.3 LOCAL CATCHMENTS AND TOPOGRAPHY

Figure 2.4 shows the local drainage network in the vicinity of the Mine site and the surface topography. Most of the mine site is within the McArthur River floodplain. The Glyde River joins the McArthur River to the northeast (and downstream) of the mine. Bull Creek and Emu Creek join the McArthur River from the east and northwest respectively in the vicinity of the mine upstream of the Glyde River confluence. Barney Creek and Surprise Creek join the McArthur River from the western side through the mine site.

The mine occupies a small portion of the catchments of Barney, Surprise and Emu creeks. Most of the existing mine infrastructure is located on a low hill (Barney Hill) between the confluences of Barney Creek, Surprise Creek and the McArthur River.

The McArthur River, Barney Creek and Little Barney Creek have been realigned within the mine site to allow for mining activities. In addition, a flood protection levee has been constructed to protect the Open Pit and mine infrastructure from McArthur River flooding. Bull Creek is intercepted by the McArthur River Diversion Channel. Surprise Creek is intercepted by the Barney Creek Diversion Channel. The above stream realignments are shown in Figure 2.4.

A summary of the key watercourses characteristics within the mine lease include:

- The McArthur River is the major drainage feature through the mine lease. The MRM operational area within the catchment was approximately 13.8 km^2 during the reporting period. McArthur River Diversion Channel is a 5.5 km diversion of the McArthur River which allowed open cut mining access to the deposits beneath the river. The river was diverted to the east around the Open Pit.
- Barney Creek joins the McArthur River from the western side within MLN1122 approximately 2.1 km upstream of the downstream mine lease boundary. The MRM operational area within the catchment was approximately 9.6 km^2 comprising the TSF, NOEF processing plant and Open Pit. Barney Creek Diversion Channel is a 2.5 km diversion of Barney Creek to allow construction of the northern section of the levee wall. The following natural streams join Barney Creek within the Mine.
    - Surprise Creek joins Barney Creek from the northeastern side within MLN1122 approximately 5.6 km upstream of the downstream mine lease boundary. The MRM operational area within the catchment was approximately 1.3 km^2 comprising the NOEF.
    - Little Barney Creek joins Barney Creek from the northwestern side within MLN1123 approximately 8.3 km upstream of the downstream mine lease boundary. The MRM operational area within the catchment was approximately 5.3 km^2 comprising the TSF complex (including the WMD). Little Barney Creek Diversion is a 2.9 km diversion around the southern side of the TSF complex.
- Emu Creek joins the McArthur River from the northwestern side within MLN1122 approximately 1.1 km upstream of the downstream mine lease boundary. The MRM operational area within the catchment was approximately 4.2 km^2 comprising the NOEF.
- Bull Creek joins the McArthur River Diversion from the eastern side within MLN1122 approximately 2.9 km upstream of the downstream mine lease boundary. There are no current or planned MRM operations planned within the Bull Creek catchment.
- Glyde River joins the McArthur River from the southeastern side within MLN1122 approximately 0.4 km upstream of the downstream mine lease boundary. There are no current or planned MRM operations within the Glyde River catchment.

Table 2.2 shows the catchment area of the McArthur River and its tributaries that drain through the mine lease. Table 2.2 also shows the MRM operational areas within each of the tributary catchments during the reporting period and the distance from the end (mouths) of each tributary to the downstream mine lease boundary.

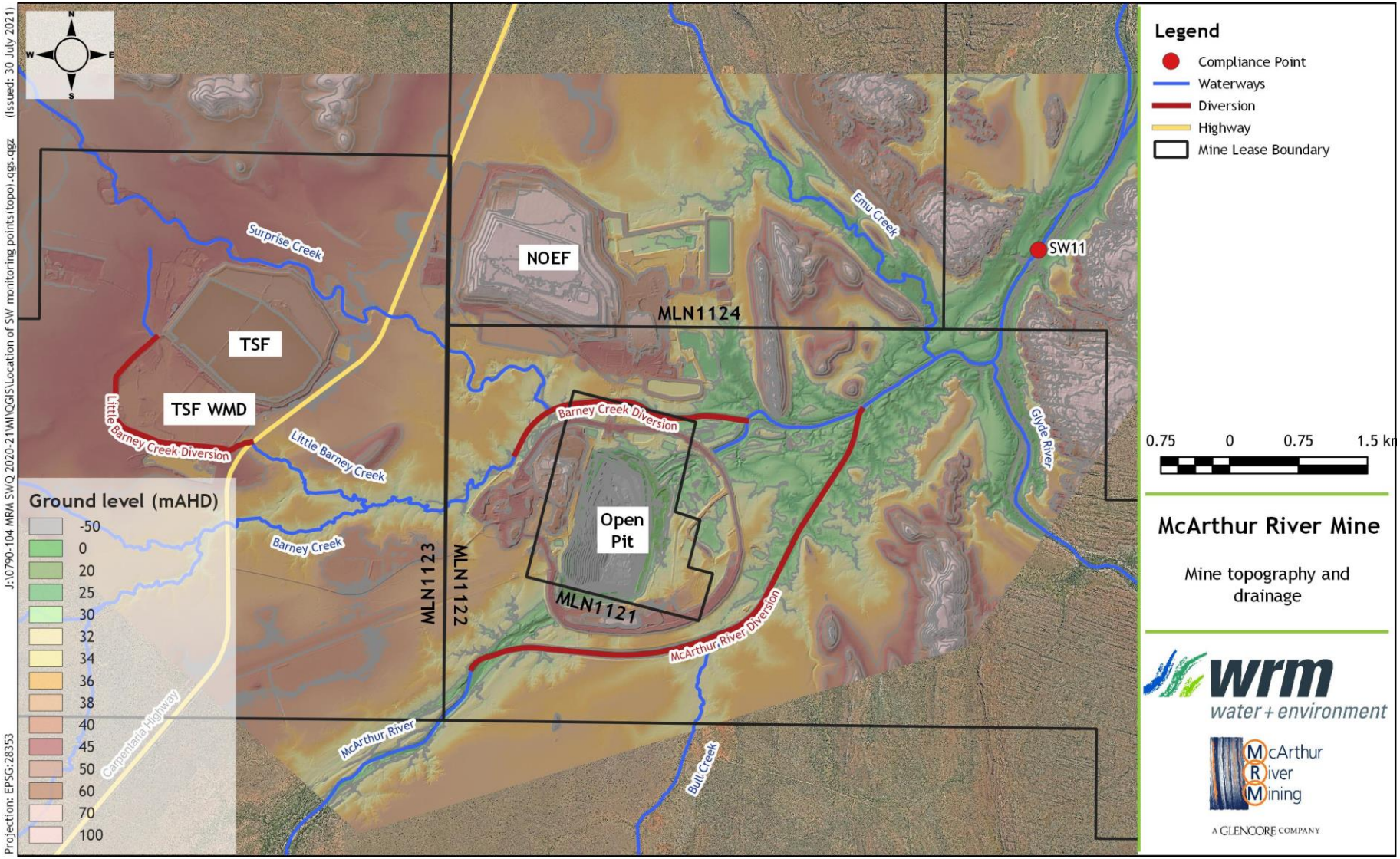

Figure 2.4 – Mine topography and drainage

Table 2.2 – Catchment areas of watercourses in the vicinity of the Mine

Watercourse	Catchment area (km^2)	Stream mouth distance from downstream mine lease boundary (km)	2020/21 MRM operational area within the stream catchment (km^2)
McArthur River at upstream of the mine	9,600	-	0
Glyde River	2,400	0.4	0
Barney Creek	700	2.1	9.6
Surprise Creek	*100*	*5.6*	*1.3*
Little Barney Creek	*12*	*8.3*	*5.3*
Emu Creek	65	1.1	4.2
Bull Creek	115	2.9	0
McArthur River downstream of the mine	12,920	-	13.8

2.4 GEOLOGY

The geology of the Mine area has been described in several previous reports (e.g., MRM OMP - EIS and Supplement to the EIS (MRM 2017; 2018)). The current understanding of the fault structures is presented in Figure 2.5. Of relevance to this surface water report are the areas where the faults are inferred to intersect the creeks and diversions. The faults have been confirmed to contain natural mineralisation in many locations and may also act as either barriers or preferential pathways for groundwater flow. As a result, these structures have the potential to influence surface water quality. Outside of the fault structures, several mineralised zones have been mapped, typically associated with the HYC Pyritic Shale. Other satellite zones, prospects, outside of the HYC Shale, such as Cooley I and II, have also been identified (Figure 2.5). The McArthur River Diversion intersects these zones of natural mineralisation.

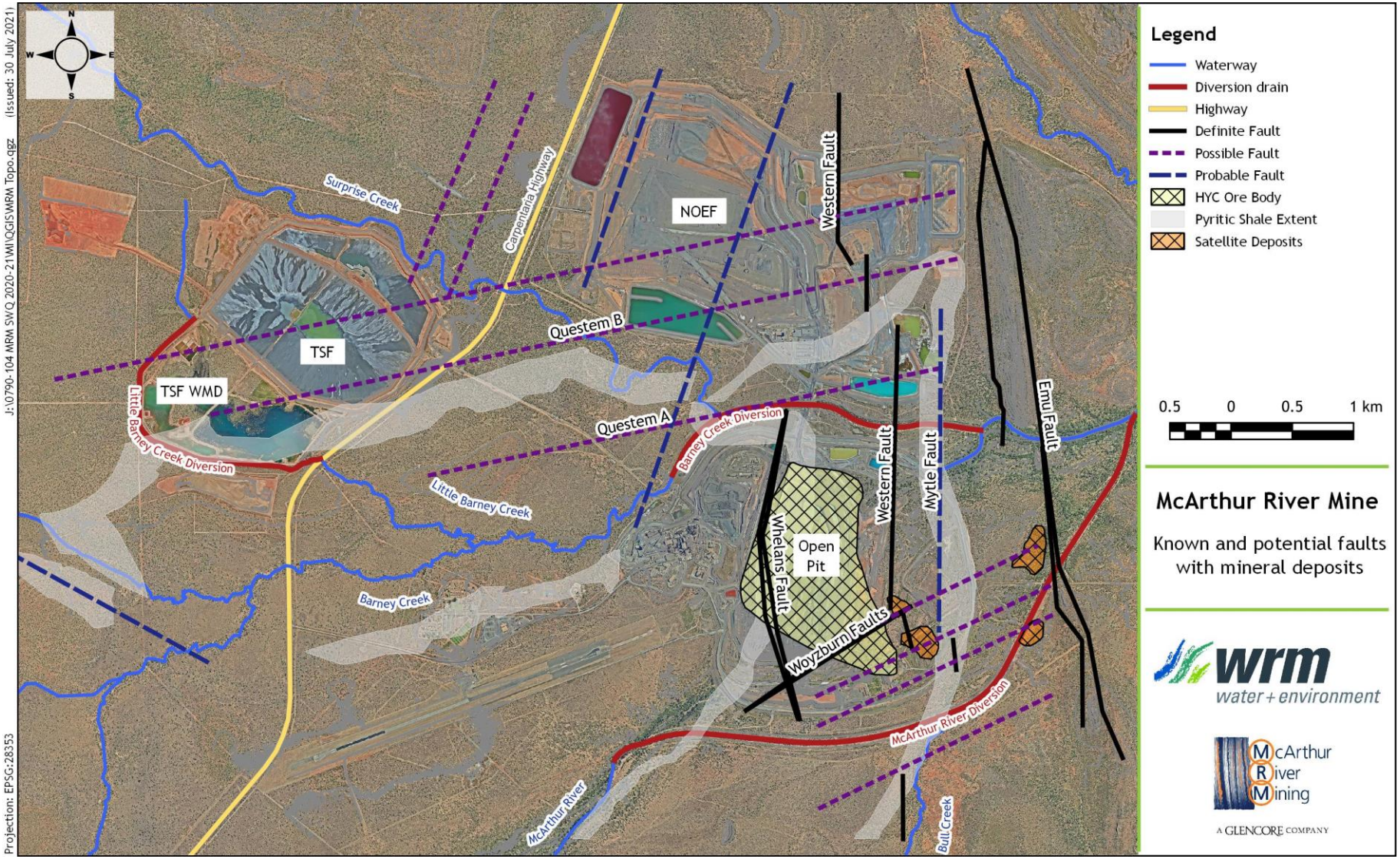

Figure 2.5 – Structural framework of the greater mining region (after Logan 2018)

3 McArthur River Mine natural surface water monitoring

3.1 MONITORING LOCATIONS

The NSW monitoring network includes sites along the McArthur River, Barney Creek, Surprise Creek, Emu Creek and Glyde River. Upstream control sites and downstream potential impact sites are located along all local creeks and rivers except for the Glyde River, which is considered removed from potential mine impacts and therefore only has one monitoring location. Monitoring sites are also located along diverted sections of Barney Creek and the McArthur River. The NSW monitoring locations are shown in Figure 3.1, with a description of the locations provided in Table 3.1.

Two of the monitoring locations (SW08 and SW32) are located further downstream along the McArthur River, at the Burketown Crossing in Borroloola. SW08 is located at the Burketown Crossing, while SW32 is located 6 km upstream of the Crossing to prevent sample bias from tidal influences and the Borroloola sewerage works.

Table 3.1 – Description of Natural Surface Water Monitoring Locations

Catchment	Monitoring Location	Site Type	Location Description
McArthur River	SW27[a]	Upstream	McArthur River, crossing to Merlin Diamond Mine
	SW21[a]	Control	McArthur River, between Merlin crossing and Wurrini Waterhole
	SW10	Potential Impact	McArthur River, upstream of the Djirrinmini Waterhole and rock bar
	SW07	Potential Impact	McArthur River, Djirrinmini Waterhole
	SW13[a]	Potential Impact	McArthur River Diversion Channel, upstream of the crossing
	SW14	Potential Impact	McArthur River Diversion Channel, adjacent viewing platform
	SW15[a]	Potential Impact	McArthur River Diversion Channel, upstream of Bull Creek
	SW16[a]	Potential Impact	McArthur River Diversion Channel, adjacent power line crossing
	SW17	Potential Impact	McArthur River Diversion Channel, upstream of the confluence with Barney Creek
	SW12[a]	Potential Impact	McArthur River, downstream of Barney Creek and Emu Creek and upstream of the Glyde River
	SW11[a]	Potential Impact	McArthur River, 900 m north of the boundary of MLN1122.
	SW32[a]	Potential Impact	McArthur River, 6 km upstream of the Burketown causeway
	SW08[a]	Potential Impact	McArthur River, Burketown causeway at Borroloola, 60 km downstream from mine site
Barney Creek	SW28[a]	Control	Barney Creek, southwest of site, adjacent the Carpentaria Highway
	SW04	Potential Impact	Barney Creek, upstream of the Carpentaria Highway bridge
	SW22	Potential Impact	Barney Creek, adjacent MRM camp
	SW03	Potential Impact	Barney Creek, upstream of causeway
	SW18	Potential Impact	Barney Creek Diversion Channel, downstream of Surprise Creek
	SW19	Potential Impact	Barney Creek Diversion Channel, downstream of Haul Road bridge
	SW20	Potential Impact	Barney Creek Diversion Channel, lower reach
	SW06[a]	Potential Impact	Barney Creek, south of Barramundi Dreaming, in the old McArthur River
Surprise Creek	SW29[a]	Control	Surprise Creek, upstream of Tailings Storage Facility
	SW23	Potential Impact	Surprise Creek, upstream of Tailings Storage Facility
	SW01	Potential Impact	Surprise Creek, upstream of crossing
	SW36	Potential Impact	Surprise Creek, adjacent northwest side of Cell 1
	SW33	Potential Impact	Surprise Creek, adjacent Cell 1, at old Surprise Creek pump station
	SW02	Potential Impact	Surprise Creek, downstream of Carpentaria Highway bridge
	SW34	Potential Impact	Surprise Creek, south of the NOEF
	SW24	Potential Impact	Surprise Creek, upstream of confluence with Barney Creek Diversion Channel
Emu Creek	SW30[a]	Control	Emu Creek, north of site, adjacent the Carpentaria Highway
	SW31	Potential Impact	Emu Creek, along cattle exclusion boundary fence.
	SW26	Potential Impact	Emu Creek, upstream of crossing
Glyde River	SW09[a]	Control	Glyde River, upstream of confluence with the McArthur River

[a] Monitoring location listed in Table 1, Appendix 4 of the WDL

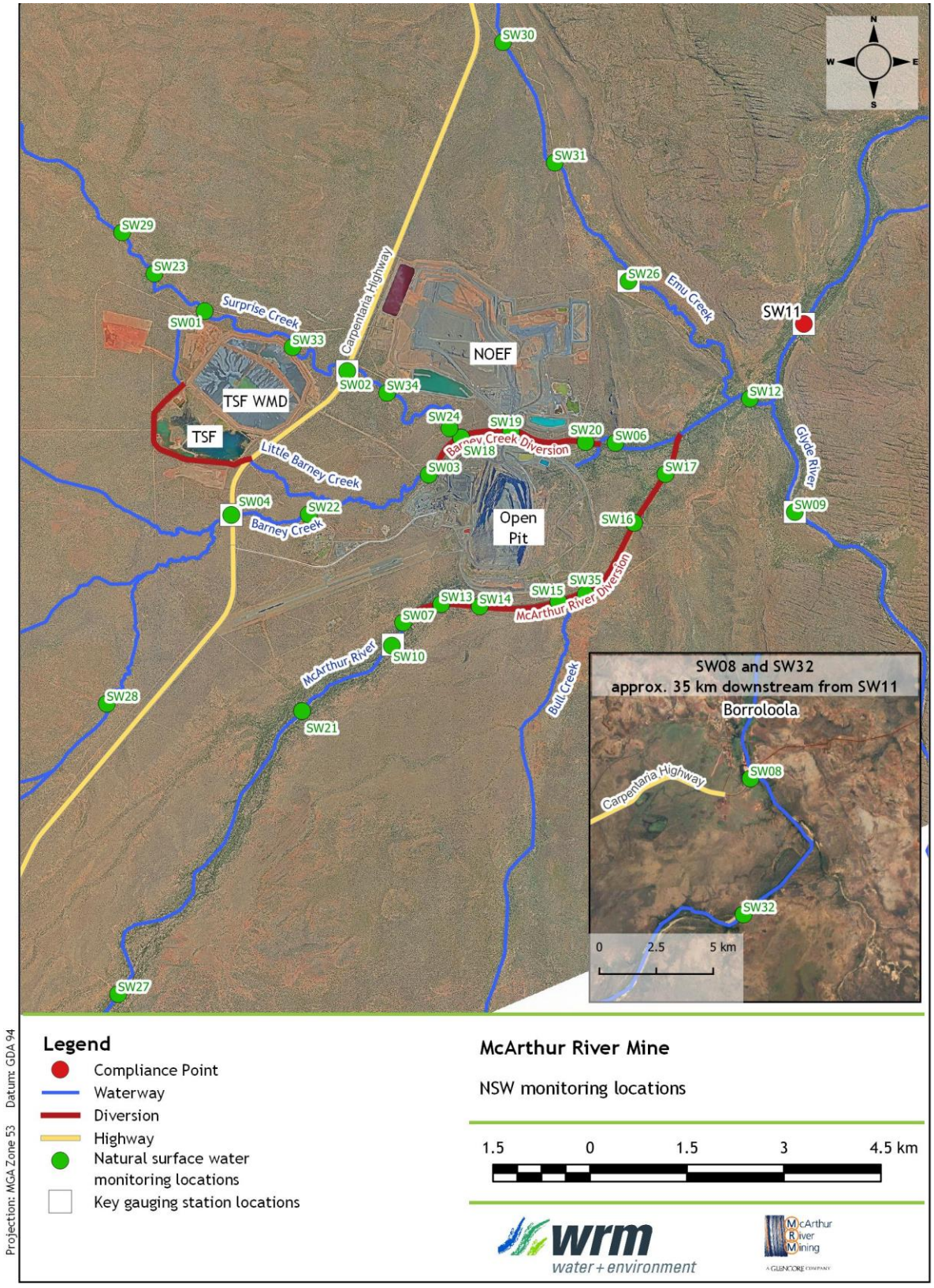

Figure 3.1 – Natural surface water monitoring locations

3.2 WASTE DISCHARGE LICENCE

3.2.1 General

During the reporting period, MRM operated under Waste Discharge Licence 174-11 (the WDL) and Variation of Authorisation (VoA) 0059. Under the WDL and VoA, managed releases from the Mine are permitted from authorised discharge and release points in accordance with the conditions of the WDL and VoA. Managed releases from an authorised discharge or release point are permitted only when the managed release will not cause the exceedance of SSTVs at the downstream compliance point (SW11) (refer Section 3.2.3). The WDL also specifies regulatory requirements for monitoring, recording and reporting of mine water releases and mining activities that are associated with the WDL as well as ongoing investigations and plans in support of the WDL.

3.2.2 Authorised discharge and release points

Figure 3.2 shows the authorised discharge points and compliance point specified in the WDL and VoA at the Mine. This includes:

- Discharges through Mine Levee Discharge Point (MLDP) including:
  - Rain water collecting in the old McArthur River Channel (OP NC1A) inside the Mine Levee Wall;
  - Groundwater from dewatering bores around the main pit collected and then discharged from Pond 2 (OP P2);
  - Water from the Water Management Dam (TSF WMD);
  - Treated water from the Water Treatment Plant that will be stored in OP P2 prior to discharge from MLDP; and

    Discharges from the MLDP are piped from the various holding ponds to the old McArthur River channel upstream of the McArthur River and Glyde River confluence.
- Discharges through South East Levee 1 (NOEF SEL1) discharge point (SEL1 DP) including:

  Rain water collecting inside the South Eastern Levee and separated from all contaminated seepages. Discharges are pumped via pipeline to Barney Creek and then flow into the McArthur River. Discharge can only occur when flow is measured in the McArthur River at the downstream gauging station is in excess of 20 m^3/s.

In addition, pursuant to the Mining Management Act (NT) in the VoA 0059, MRM is authorised for managed releases of wastewater at the WMD into Little Barney Creek via the WMD Release Point (WMD RP).

All authorised discharge and release points at the mine enter the McArthur River upstream of the Glyde River confluence. The compliance monitoring point along the McArthur River is SW11, which is located downstream of the Glyde River confluence and downstream of the mixing zone.

3.2.3 Surface water site specific trigger values

The adopted surface water quality indicators relevant to meeting the community values (Section 1.2.1) and protecting declared beneficial uses (Section 1.2.3) including aquatic ecosystems are sourced from the WDL conditions. MRM's SSTVs specified for the receiving waters at SW11 are shown in Table 3.2.

The WDL SSTVs have been derived from ANZECC & ARMCANZ (2000) default trigger values (95% level of ecosystem protection) for most surface water parameters, with the exception of electrical conductivity, sulphate, iron and total petroleum hydrocarbons. The sulphate SSTV has been derived from ecotoxicology assessments and in consultation with the regulator. The iron SSTV is an interim indicative working level. The total petroleum hydrocarbons SSTV is based on the aqueous solubility of mineral oils as found in the document Intervention Value outlined in the Environmental Quality Objectives in the Netherlands (1994).

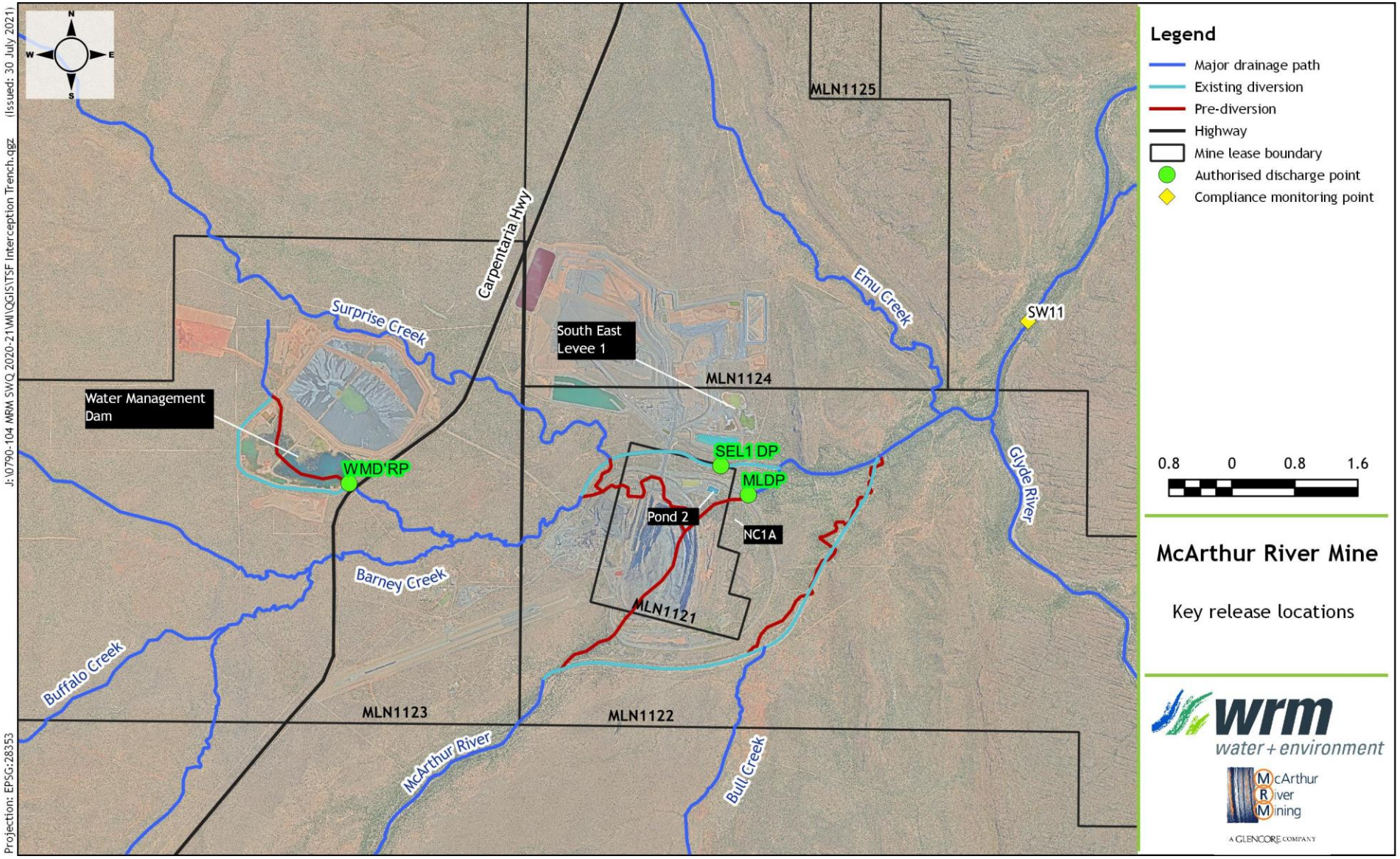

Figure 3.2 – Location of Water Storage Dams that are connected to Authorised Discharge Points and the Compliance Monitoring Point (SW11)

The influence of hardness on natural surface waters in the vicinity of the Mine have been taken into account for cadmium, copper, lead and zinc through the use of hardness modified trigger values (HMTVs). The HMTVs have been calculated according to the methodology given in Table 3.4.3 of ANZECC & ARMCANZ (2000). The SSTVs listed in Table 3.2 have been adopted as the WQOs for the receiving waters downstream of the Mine. Use of the SSTVs as WQOs is appropriate, as the SSTVs are generally based on aquatic ecosystem protection which is considered to be the most conservative of the community values listed above.

The ANZECC & ARMCANZ (2000) guidelines have been progressively updated from 2018. Default trigger values for some analytes may be updated in the future. It is also noted that ANZG (2018) recommends that copper trigger values are no longer modified for water hardness. The recommended algorithms for determining HMTVs for cadmium, lead and zinc given in ANZECC & ARMCANZ (2000) have been retained in ANZG (2018). The ANZG (2018) also notes that the default guideline value from the ANZECC & ARMCANZ (2000) guidelines for NO_3 is erroneous. However, this value has been retained as a WQO pending a future update to the SSTVs.

Table 3.2 - Site Specific Trigger Values (SSTVs) for SW11 from WDL174-11

Parameter	Abbreviation	Units	Analysis	SSTV at SW11
pH	pH	pH units	In Situ	6.0-8.5
Electrical Conductivity	EC	µS/cm		1,000
Dissolved Oxygen	DO	% Saturation		85-120
Aluminium	Al	µg/L	Filtered 0.45µm	55
Arsenic	As			24
Cadmium	Cd			1.73
Copper	Cu			10.97
Iron	Fe			300
Lead	Pb			16.6
Manganese	Mn			1,900
Mercury	Hg			0.6
Nickel	Ni			11
Zinc	Zn			62.68
TPH Fraction C6-C9	NA	µg/L		-
Benzene	NA			950
TPH Fraction C10-C14	NA			600
TPH Fraction C15-C28	NA			
TPH Fraction C29-C36	NA			
Sulphate	SO_4	mg/L		341
Nitrate	NO_3	µg/L		700

Dashes indicate no data.

3.2.4 Operational rules during discharge

Managed releases from an authorised discharge point to the receiving waters shall be approved prior to the release in accordance with the WDL by either the:

- General Manager - Operations;
- Manager – Environment, Safety and People;
- Superintendent - Environment and Community; or
- Other position with delegated authority from one of the above.

In the event of a managed release, Waste Discharge Procedure PRO-2200035 shall be reviewed and all releases will occur in compliance with this document and the WDL. The Superintendent - Environment and Community is responsible for the operation of the Waste Discharge Procedure PRO-2200035.

Sampling requirements for all managed releases will be undertaken in accordance with Conditions of the WDL.

3.2.5 Notification of a managed release event

Notification of the release event to the Administering Authority is provided in a monthly discharge monitoring report that must be completed by the end of the subsequent calendar month following any discharge event. The details included in the monthly discharge monitoring report are specified in Condition 40 of WDL 174-11.

The Administering Authority must be notified of any non-compliance with the WDL within 24 hours of first becoming aware of the non-compliance. Details to be provided in the notification of non-compliance are specified in Condition 37 of WDL 174-11.

3.2.6 Reporting requirements

A completed Annual Return must be provided to the Administering Authority within 10 business days after the anniversary date (31 August) that relates to the preceding 12 month period.

A completed Monitoring Report must be provided to the Administrating Agency by 31 August each year that relates to the 1 May to 30 April period.

3.3 REPORTING PERIOD MONITORING RESULTS

This section includes a summary of the results from the NSW monitoring program for the reporting period.

3.3.1 McArthur River and Glyde River

There are 13 NSW monitoring locations for the McArthur River, the McArthur River Diversion and Glyde River, eight of which are listed in Table 1, Appendix 4 of the WDL as identified in Table 3.1 and shown in Figure 3.1. These include:

- One upstream monitoring location (SW27 on the McArthur River).
- Two control monitoring locations (SW21 on the McArthur River and SW09 on the Glyde River), which are considered to be upstream of the mine influence and used to determine background conditions.
- Eight potentially impacted monitoring locations (SW07, SW13, SW14, SW15, SW16, SW17, SW12 and SW11), which are within the mining domains, have the potential to be impacted by mining activities.
- Two potentially impacted monitoring locations (SW32 and SW08), which are located approximately 35 km downstream of the Mine.

3.3.1.1 River Heights and Discharge

Two gauging stations monitor river height and flow in the McArthur River (Figure 3.1):

- Upstream Gauging Station (USGS / MIM Pump), located upstream of the Mine.
- Downstream Gauging Station (DSGS), located downstream of the Mine at the compliance point for the McArthur River, SW11.

Figure 3.3 shows the McArthur River water level (mAHD) and flow rate (m^3/s) from the above-gauging stations as well as weekly rainfall recorded at the McArthur River Airport gauging station (14704) for the reporting period.

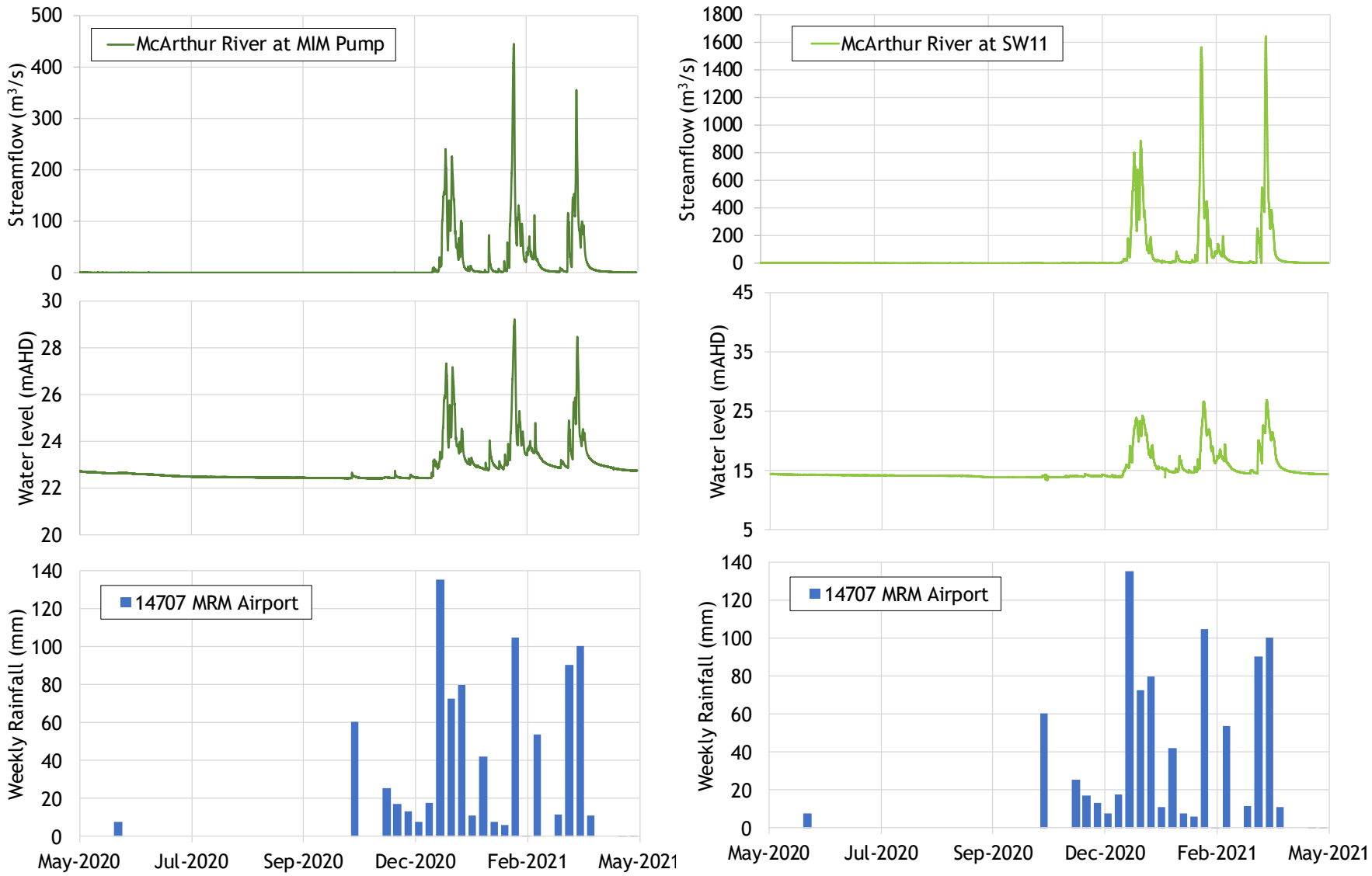

Figure 3.3 – McArthur River Height and Flow – USGS and DSGS as well as Weekly Rainfall at MRM Airport (1 May 2020 to 30 April 2021)

3.3.1.2 Monitoring Results

A total of 478 samples were collected during the reporting period, from 13 monitoring locations on the McArthur River and Glyde River. Appendix A -presents the NSW monitoring data collected at sites listed in Table 1, Appendix 4 of the WDL during the reporting period. All NSW data is also provided to DITT on a quarterly basis.

Discussion of exceedances of the SSTVs pursuant to Condition 39 of WDL 174-11 is provided in Section 4.5. The results presented in this section will focus on the following key monitoring locations:

- SW21 (upstream McArthur River);
- SW12 (downstream McArthur River);
- SW11 (Compliance Monitoring Point); and
- SW09 (Gylde River).

Each of the above sites experienced "cease to flow" / dry conditions through the reporting period and no natural surface water samples were collected at these times. Notably, this occurred at SW11 during the dry season between August/September 2020 and December 2020.

The 2020/21 reporting period has been assessed in the context of the long-term data set from 2008. Long-term water quality plots (1 January 2008 to 30 April 2021) have been prepared for the following analytes:

- field pH - Figure 3.4
- laboratory electrical conductivity (EC) - Figure 3.5
- sulphate (SO_4) - Figure 3.6
- field dissolved oxygen (DO) - Figure 3.7
- filtered[1] aluminium (Al_F) - Figure 3.8
- filtered arsenic (As_F) - Figure 3.9
- filtered cadmium (Cd_F) - Figure 3.10
- filtered cobalt (Co_F) - Figure 3.11
- filtered copper (Cu_F) - Figure 3.12
- filtered iron (Fe_F) - Figure 3.13
- filtered lead (Pb_F) - Figure 3.14
- filtered manganese (Mn_F) - Figure 3.15
- filtered mercury (Hg_F) - Figure 3.16
- filtered nickel (Ni_F) - Figure 3.17
- filtered thallium (Tl_F) - Figure 3.18
- filtered zinc (Zn_F) - Figure 3.19
- nitrate (NO_3) - Figure 3.20
- Total Petroleum Hydrocarbons (TPH)/Benzene - Figure 3.21 and Figure 3.22

The reporting period graphs include the monthly rainfall record from the gauge at McArthur River Airport (14704) (DES 2020a).

[1] Filtered is referred to as _F in the remainder of the report.

SSTVs for SW11 are also presented on the graphs as dashed lines (where values have been defined for the analyte). Where exceedances of the SSTVs at SW11 have occurred, these instances are highlighted and discussed in the following section.

pH (Field)

Figure 3.4 shows the field measured pH from 1 January 2008 to 30 April 2021.

This plot shows that the pH levels have remained fairly consistent over time in the McArthur River and Glyde River. However, it does appear that dry season fluctuations have reduced in recent years, from around the 2015 dry season.

During the reporting period, pH levels were generally consistent with the range of historical values, between 7.0 and 8.5 (pH units). Decreases in pH were observed during the wet season, coinciding with periods of rainfall runoff events.

There were no recorded SSTV exceedances at SW11 during the reporting period.

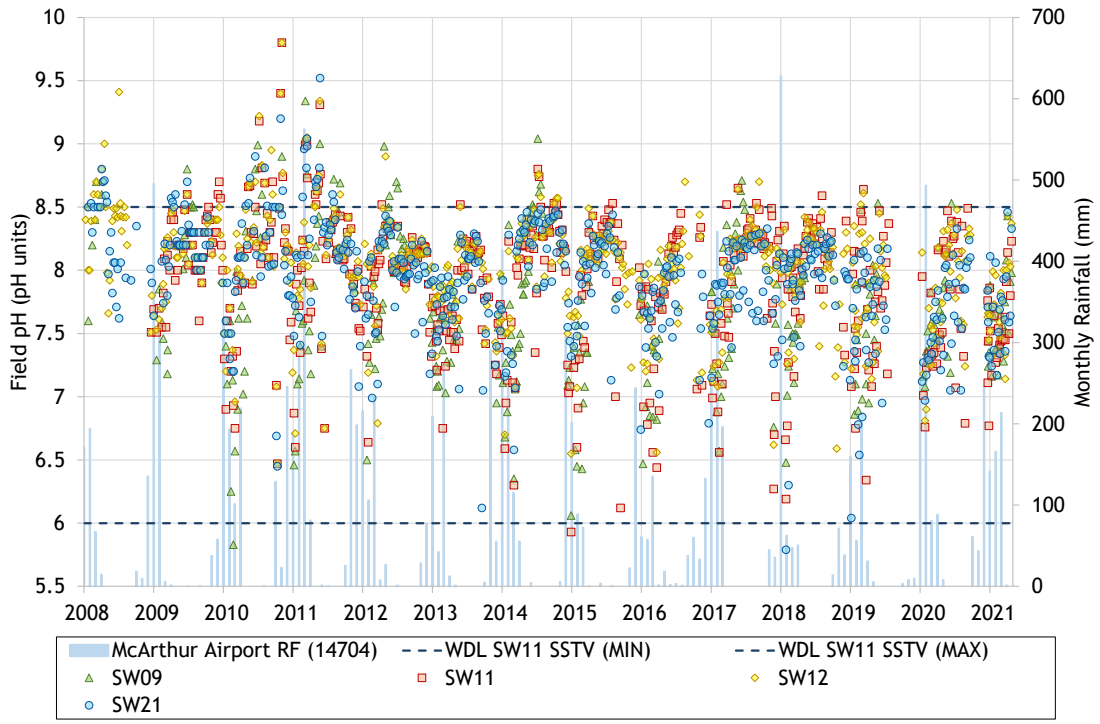

Figure 3.4 – McArthur River and Glyde River – Field pH, Monthly Rainfall and SW11 SSTVs - January 2008 to April 2021

EC (Laboratory)

Figure 3.5 shows the laboratory measured EC from 1 January 2008 to 30 April 2021.

Historically, EC levels in McArthur River and Glyde River follow a cyclic trend. That is, EC levels sharply increase during the dry season due to increased evaporation, reduced flow volumes and a higher contribution from groundwater expressing as surface water baseflow. This is followed by rapid decreases in EC during the wet season due to the dilution provided by rainfall events. It should also be noted that the EC in the Glyde River is notably lower than the McArthur River. The EC levels in the in the McArthur River, upstream of the Mine (SW21) are not significantly different from the EC downstream of the Mine (SW12 and SW11), with the exception of the 2013, 2014 and 2015 dry seasons.

During the reporting period, EC levels were generally consistent with the range of historical values. During the 2020 dry season, the EC levels at the upstream control location SW21 exceeded the SSTV as well as the EC levels recorded at the downstream locations SW11 and SW12.

There were no recorded SSTV exceedances at SW11 during the reporting period.

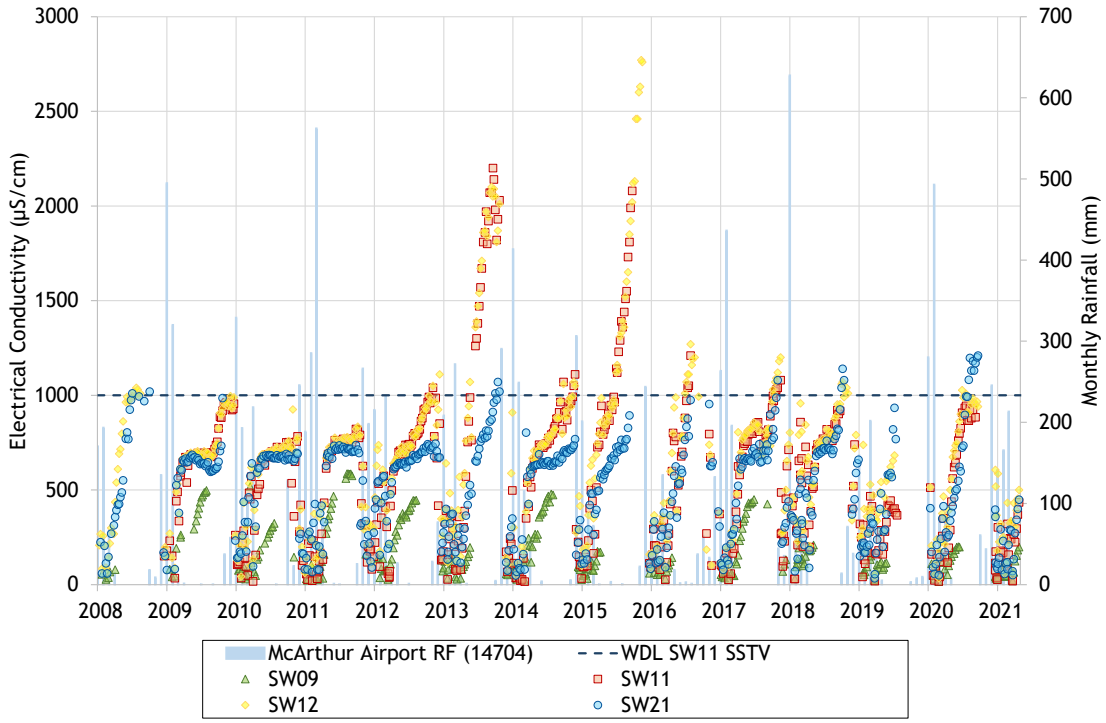

Figure 3.5 McArthur River and Glyde River, Historical – Laboratory EC, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

SO_4

Figure 3.6 shows the measured SO_4 from 1 January 2008 to 30 April 2021.

SO_4 levels show a similar trend to EC levels where values are highest during the dry season and lowest during the wet season.

During the reporting period, SO_4 levels were generally consistent with historical levels. The highest levels during the reporting period were recorded from late December 2020 to early January 2021 at SW12 and SW11, coinciding with periods of managed releases from the Mine.

There were no exceedances of the SSTV for SO_4 at SW11 during the reporting period.

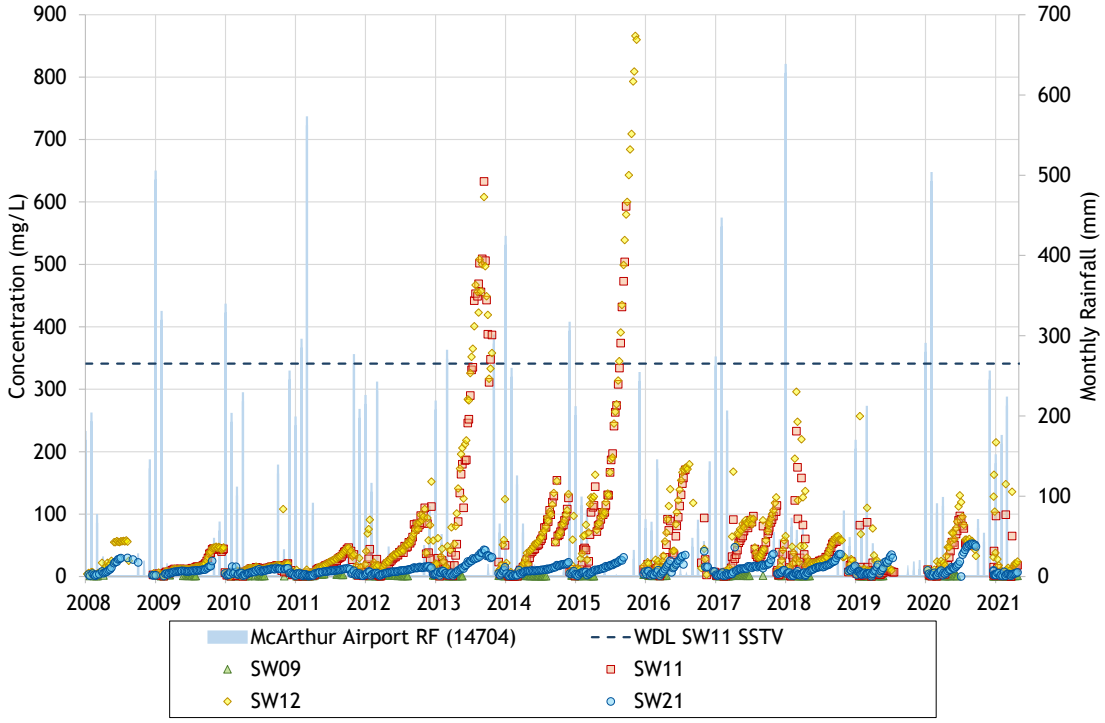

Figure 3.6 – McArthur River and Glyde River, Historical – SO_4, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

DO (Field)

Figure 3.7 shows the field DO levels from 1 January 2008 to 30 April 2021.

DO levels were typically in the range 60 to 120 % saturation. The levels exhibit a slightly greater variation during the dry season. Some of the highest values (in particular the 265.5% saturation result for SW21) are likely to be erroneous and arising from production of pure oxygen by photosynthetic organisms which can generate apparently super-saturated values when measured with a DO meter calibrated against air-saturated (rather than pure oxygen-saturated) water.

During the reporting period, the spread of DO levels in the McArthur River and frequency below 85% saturation was slightly lower during the middle and late stages of the dry season, when compared to previous years.

There were nine exceedances of the SSTV for DO at SW11 during the reporting period: one above the maximum SSTV (120% saturation) and eight below the minimum SSTV (85% saturation). These exceedances did not trigger the requirement to undertake an investigation in accordance with Conditions 38 and 39 of WDL 174-11.

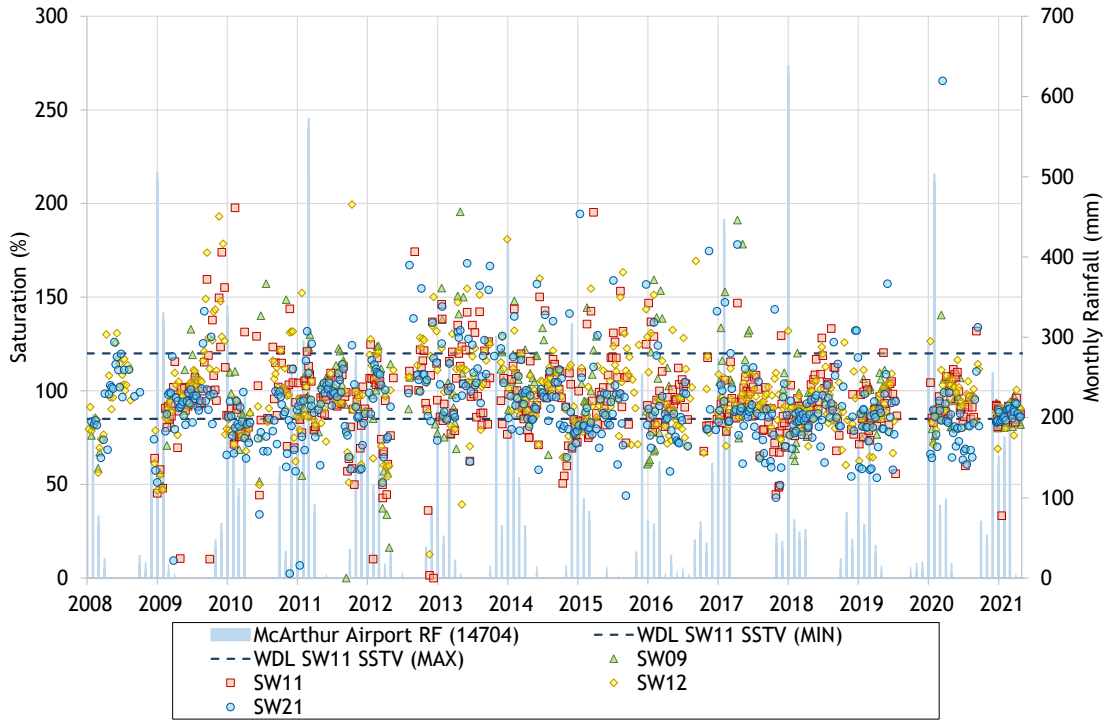

Figure 3.7 – McArthur River and Glyde River, Historical – Field DO, Monthly Rainfall and SW11 SSTVs - January 2008 to April 2021

Al_F

Figure 3.8 show the Al_F levels from 1 January 2008 to 30 April 2021

The long-term data indicates consistently low Al_F levels during the dry season, and higher levels during the wet season. Spikes in Al_F levels can be seen in the historical plot below (Figure 3.7), coinciding with periods of high rainfall.

During the reporting period, the highest concentrations occurred following the January 2021 and March 2021 rainfall events. SW21 recorded the highest Al_F levels. This suggests a significant source of Al_F is from the McArthur River catchment upstream of the Mine.

There were seven exceedances of the Al_F SSTV at SW11 during the reporting period. These have been discussed further in Section 4.5.

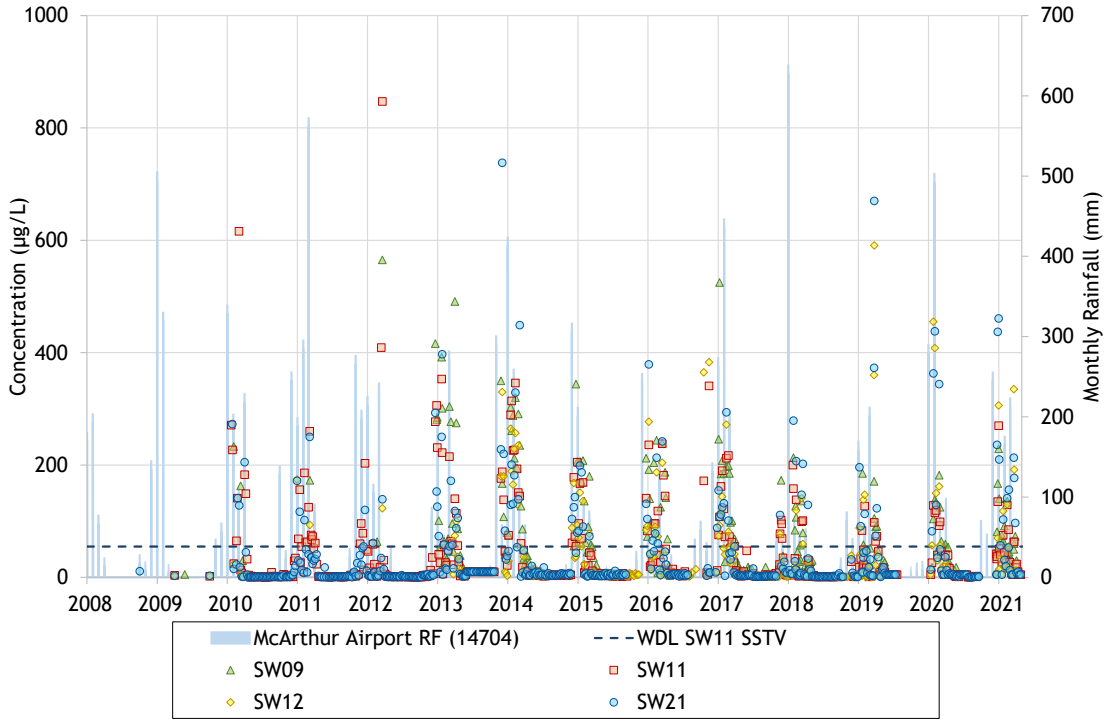

Figure 3.8 – McArthur River and Glyde River, Historical – Al_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

As_F

Figure 3.9 shows the As_F levels from 1 January 2008 to 30 April 2021.

The long-term data suggests that As_F levels are consistently low, but increase slightly as the dry season progresses.

During the reporting period, As_F levels remained low and were consistent with historical trends.

There were no exceedances of the SSTV for As_F at SW11 during the reporting period.

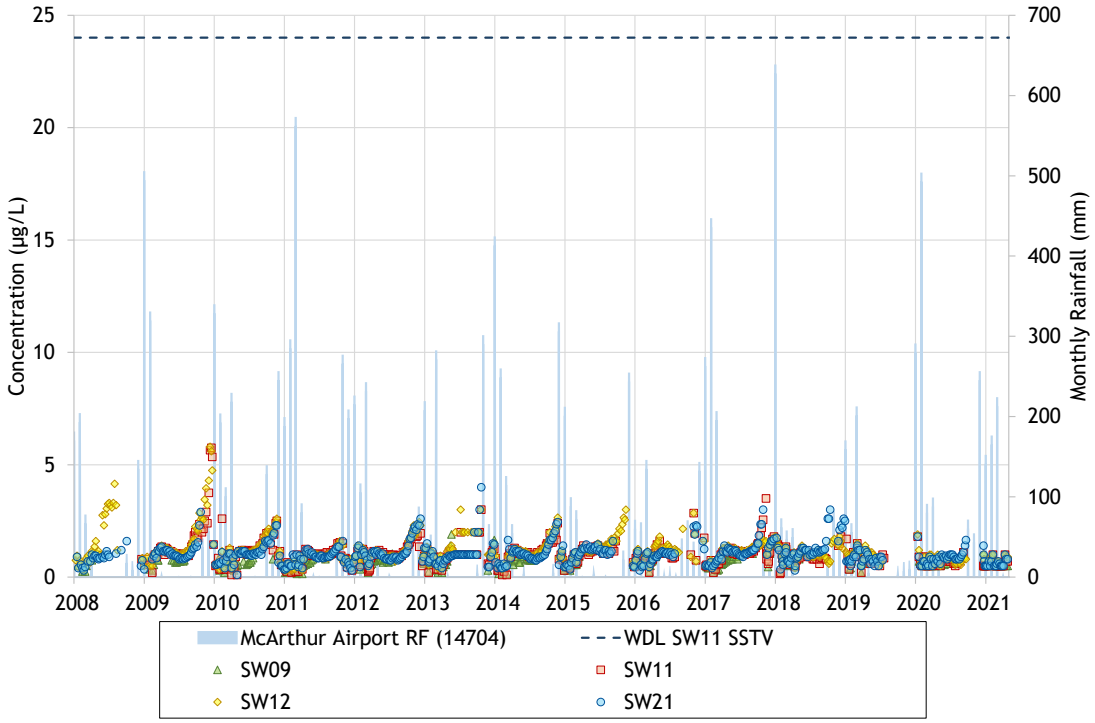

Figure 3.9 – McArthur River and Glyde River, Historical – As_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Cd_F

Figure 3.10 shows the Cd_F levels from 01 January 2008 to 30 April 2021.

The long-term data suggests that Cd_F levels are consistently low and below the limit of reporting.

During the reporting period, all Cd_F levels were below the limit of reporting of 0.1 to 0.2 µg/L. These levels were consistent with the historical concentrations.

There were no exceedances of the SSTV for Cd_F at SW11 during the reporting period.

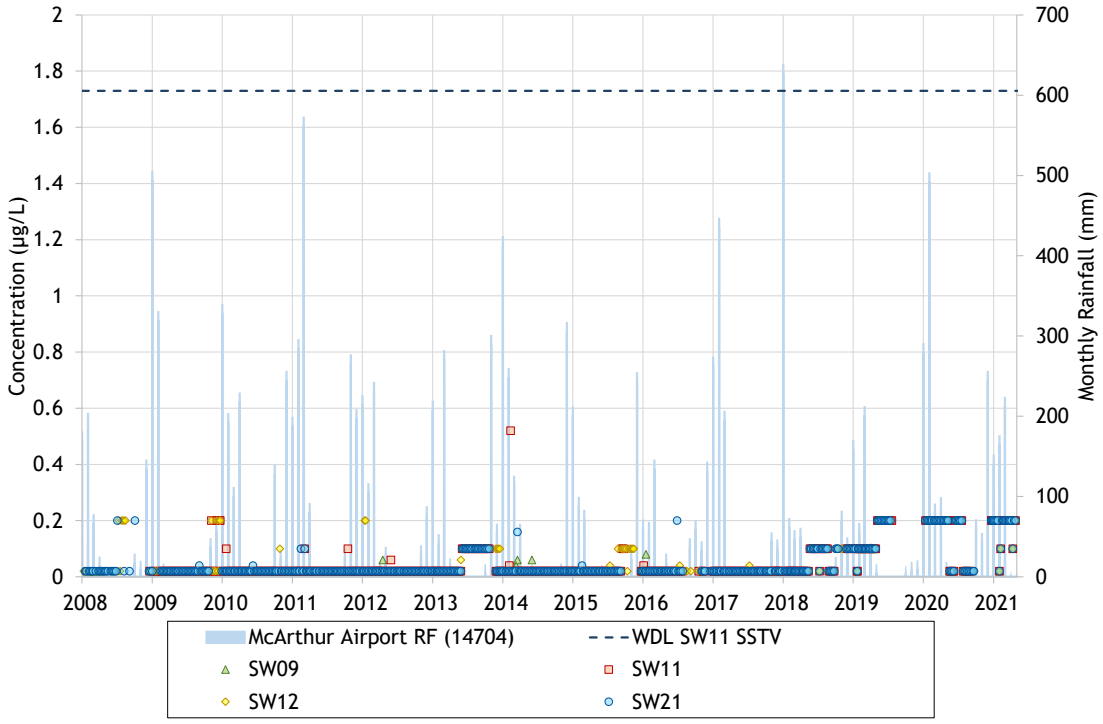

Figure 3.10 – McArthur River and Glyde River, Historical – Cd_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Co_F

Figure 3.11 shows the filtered Co_F levels from 1 January 2008 to 30 April 2021.

The long-term data suggests that Co_F levels were consistently low, with the exception of some values in the 2018 dry season at SW12 and SW11.

During the reporting period, all Co_F levels at SW11 were below 1.0 µg/L, which is consistent with the historical levels. SW12 recorded the highest Co_F levels during the reporting period.

There were no exceedances of the SSTV for Co_F at SW11 during the reporting period as there is no SSTV for Co_F.

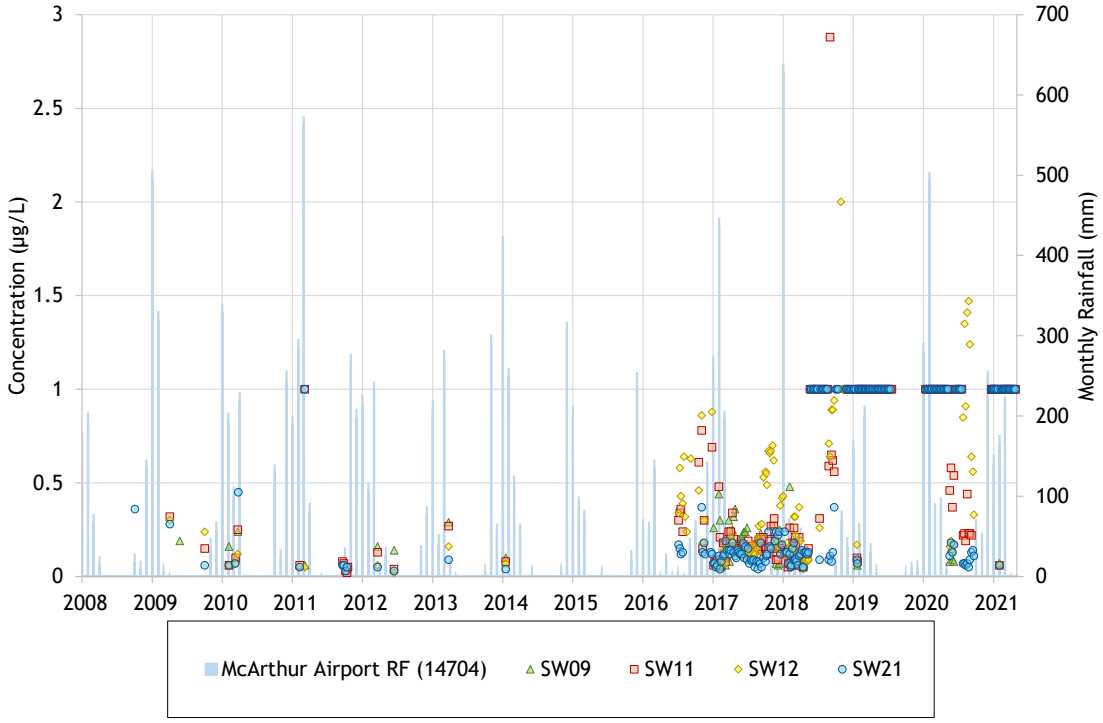

Figure 3.11 – McArthur River and Glyde River, Historical – Co_F and Monthly Rainfall - January 2008 to April 2021

Cu_F

Figure 3.12 shows the Cu_F levels from 1 January 2008 to 30 April 2021.

The long-term data suggests that Cu_F levels were consistently low.

During the reporting period, all measured Cu_F levels were below 1.0 µg/L which is consistent with the historical trends.

There were no exceedances of the SSTV for Cu_F at SW11 during the reporting period.

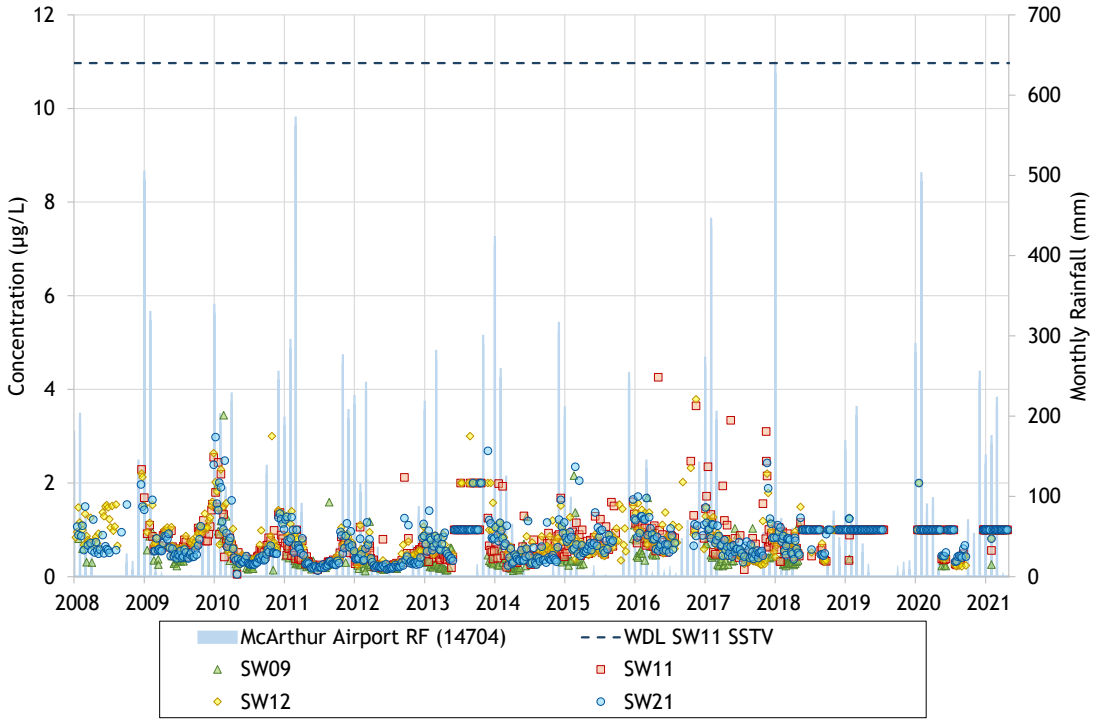

Figure 3.12 – McArthur River and Glyde River, Historical – Cu_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Fe_F

Figure 3.13 shows the Fe_F levels from 01 January 2008 to 30 April 2021.

Long-term data suggests that Fe_F levels were generally lower through the dry season (with the exception of SW09), with fluctuations through the wet season associated with natural rainfall runoff events.

During the reporting period, the recorded Fe_F levels were generally consistent with historical trends.

There was one exceedance of the Fe_F SSTV at SW11 during the reporting period (24/01/2021). On the same day, the Fe_F level recorded at SW09 in the Glyde River, which is upstream of the Mine, was greater than SW11. The Fe_F level at SW21 was also elevated (only 8 µg/L lower than the value recorded at SW11). This suggests that elevated Fe_F levels at SW11 are influenced by the McArthur River and Glyde River catchment inflows from upstream of the Mine These exceedances did not trigger the requirement to undertake an investigation in accordance with Conditions 38 and 39 of WDL 174-11.

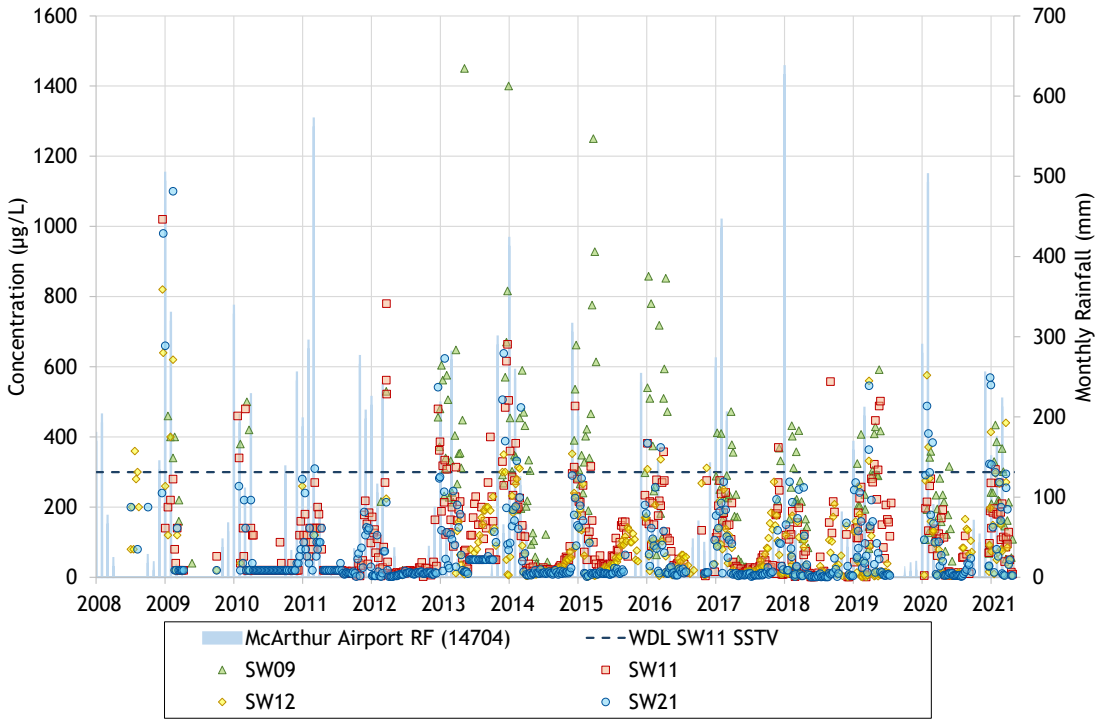

Figure 3.13 – McArthur River and Glyde River, Historical – Fe_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Pb_F

Figure 3.14 shows the Pb_F concentrations from 1 January 2008 – 30 April 2021.

The long-term data suggests that Pb_F levels are consistently low.

During the reporting period, all measured Pb_F levels were below 1.0 µg/L which is consistent with the historical concentrations.

There were no exceedances of the SSTV for Pb_F at SW11 during the reporting period.

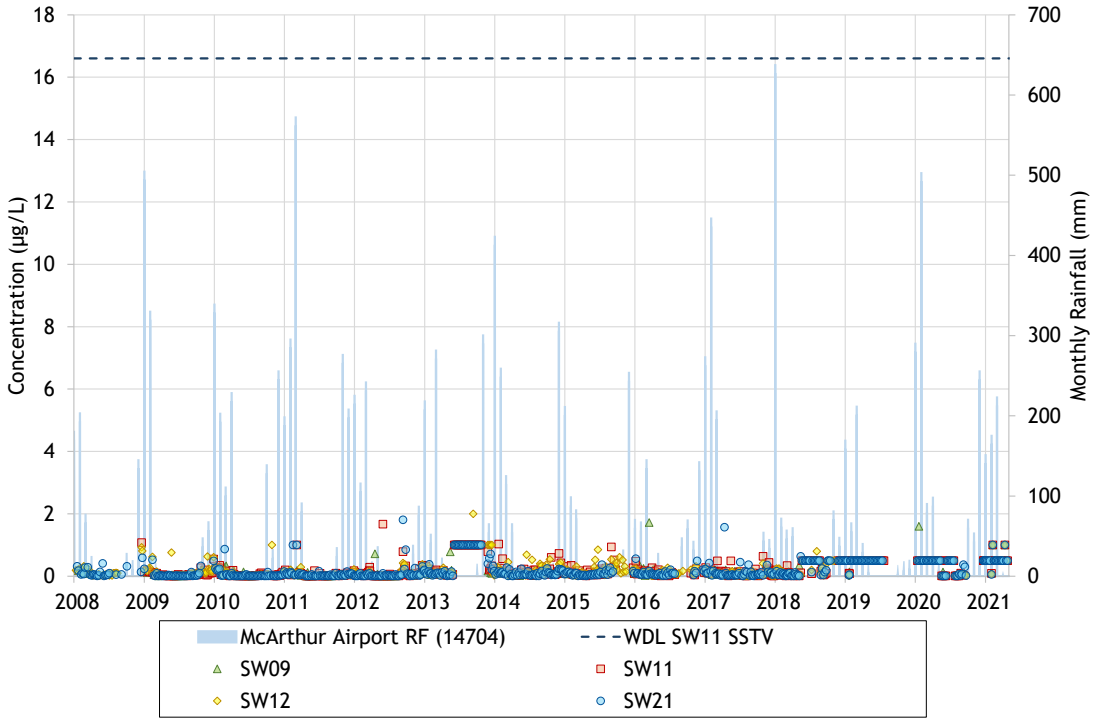

Figure 3.14 – McArthur River and Glyde River, Historical – Pb_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Mn_F

Figure 3.15 shows the Mn_F levels from 1 January 2008 to 30 April 2021.

The long-term data shows that the Mn_F levels in upstream McArthur River (SW21) and Glyde River (SW09) were consistently low. Mn_F levels downstream of the Mine (at SW12 and SW11) were generally low during the wet seasons but elevated during the dry seasons.

During the reporting period, the highest Mn_F levels were recorded at SW11 and SW12 with the highest concentrations occurring between May 2020 and September 2020. There was no flow at this time at SW06 (Barney Creek) or SW26 (Emu Creek), which are located upstream of SW11 and SW12. This suggests that the source may be derived from groundwater baseflow to the surface water system during the period of higher Mn_F. Mn_F has also been confirmed as occurring within the natural mineralisation associated with geological faults.

There were no exceedances of the SSTV for Mn_F at SW11 during the reporting period.

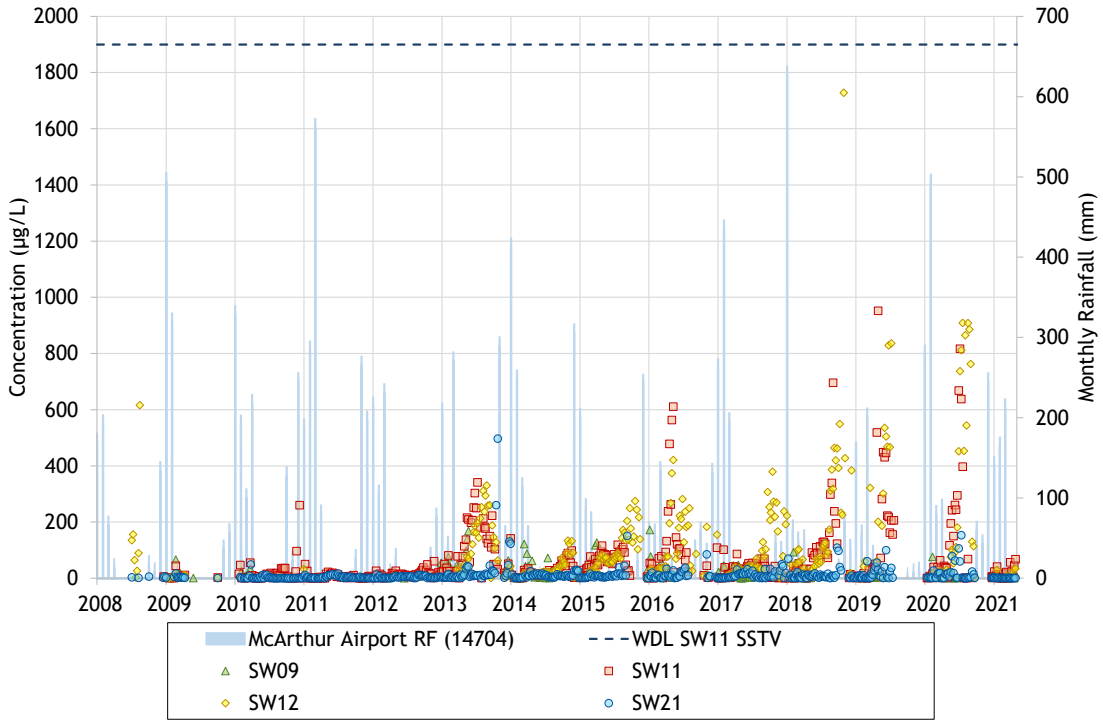

Figure 3.15 – McArthur River and Glyde River, Historical – Mn_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Hg_F

Figure 3.16 shows the Hg_F levels from 01 January 2008 to 30 April 2021.

The long-term data suggests that Hg_F levels are consistently low.

During the reporting period, all Hg_F levels were below the limit of reporting of 0.01, 0.02 and 0.1 µg/L, which is consistent with the historical trends.

There were no exceedances of the SSTV for Hg_F at SW11 during the reporting period.

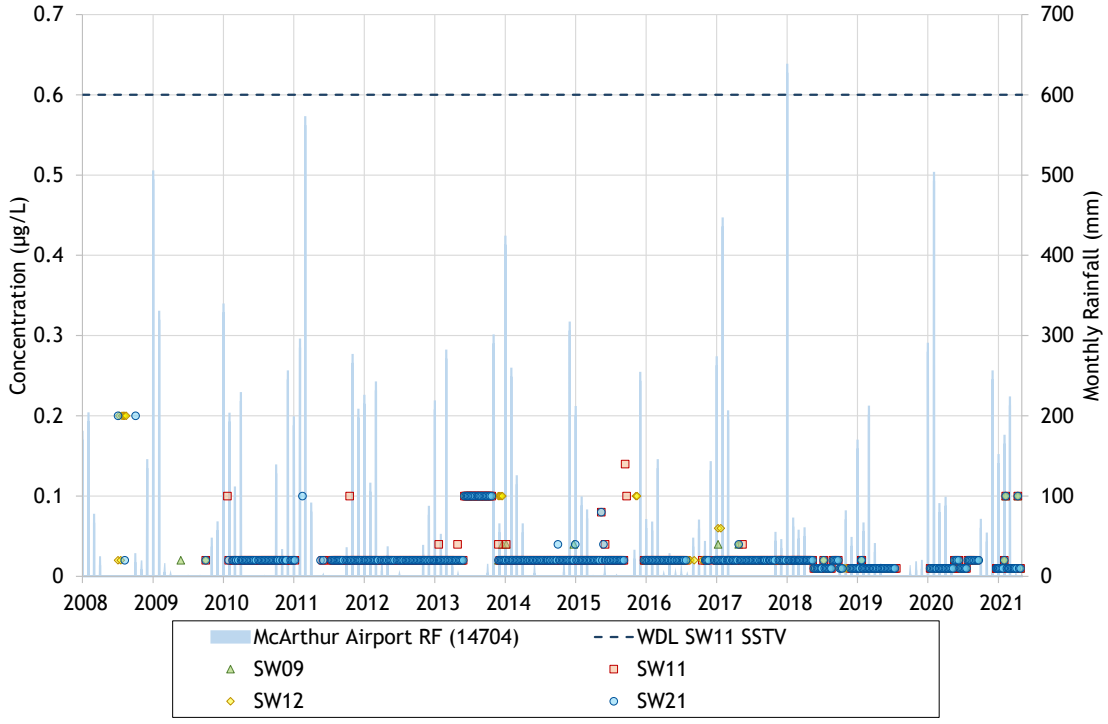

Figure 3.16 – McArthur River and Glyde River, Historical – Hg_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Ni_F

Figure 3.17 shows the Ni_F levels from 1 January 2008 to 30 April 2021.

The long-term data suggests that Ni_F levels are consistently low.

During the reporting period, all measured Ni_F levels were below 1.0 µg/L, which is consistent with the historical trends.

There were no exceedances of the SSTV for Ni_F at SW11 during the reporting period.

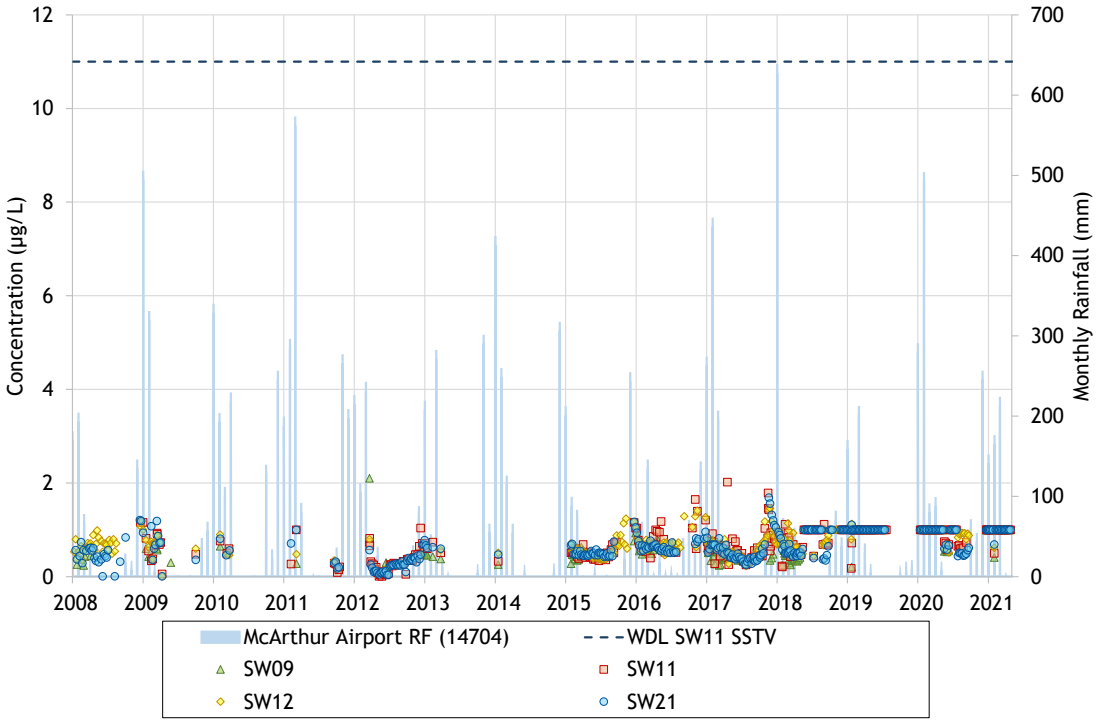

Figure 3.17 – McArthur River and Glyde River, Historical – Ni_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Tl_F

Figure 3.18 shows the Tl_F levels from 01 January 2008 to 30 April 2021.

The long-term data suggests that Tl_F levels were consistently low, with the exception of one period in 2017/18 wet season at SW11 and SW12 coinciding with periods of managed releases from the Mine.

During the reporting period, all Tl_F levels were below 1.0 µg/L, which is consistent with the historical concentrations.

There were no exceedances of the SSTV for Tl_F at SW11 during the reporting period as there is no SSTV for Tl_F.

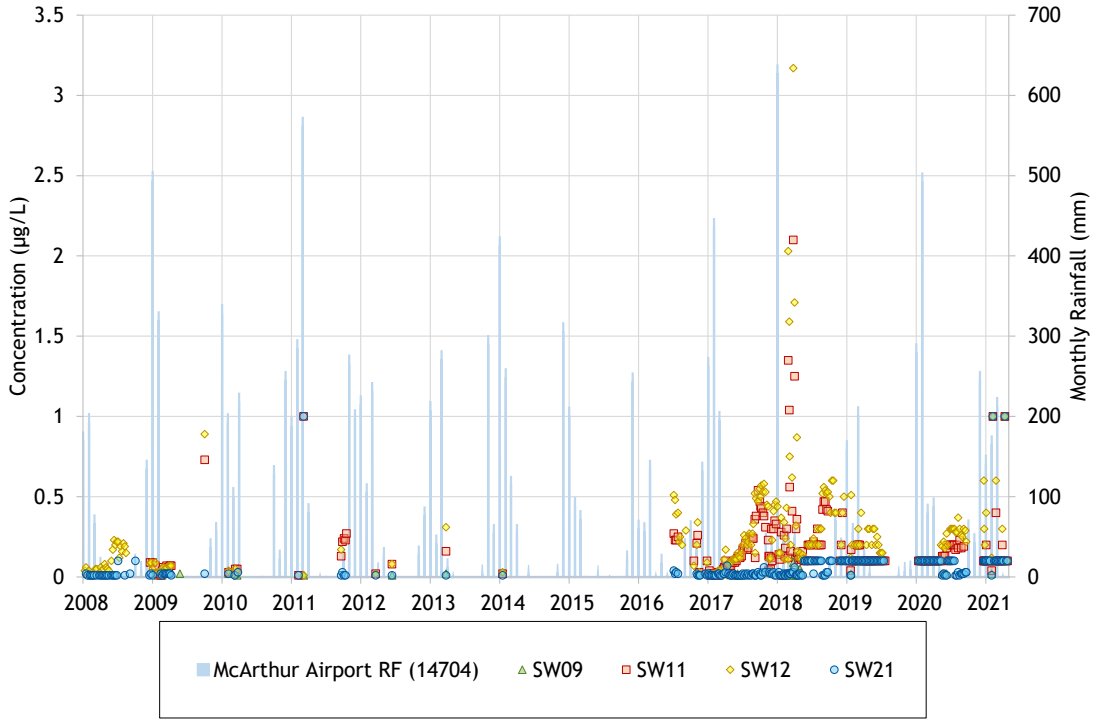

Figure 3.18 – McArthur River and Glyde River, Historical – Tl_F and Monthly Rainfall - January 2008 to April 2021

Zn_F

Figure 3.19 shows the Zn_F levels from 1 January 2008 to 30 April 2021.

The long-term data suggests that Zn_F levels were consistently low, with a small number of isolated elevated values (up to 50 µg/L) in downstream McArthur River (SW11 and SW12).

During the reporting period, Zn_F levels were at or below 5.0 µg/L, which is consistent with the historical trends.

There were no exceedances of the SSTV for Zn_F at SW11 during the reporting period.

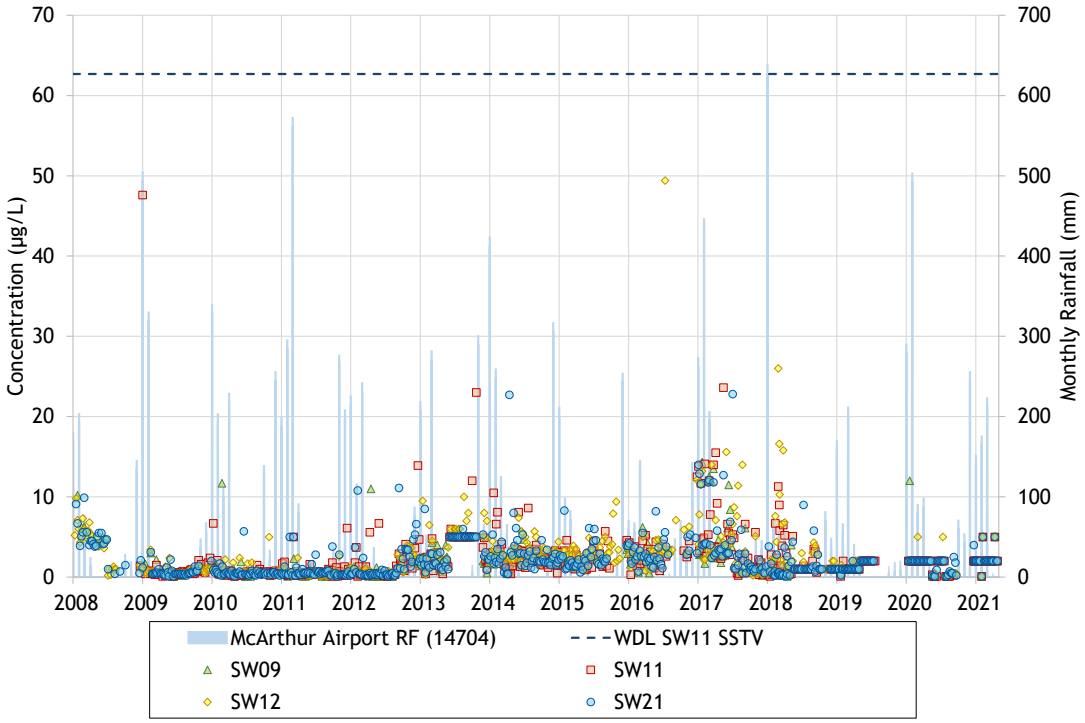

Figure 3.19 – McArthur River and Glyde River, Historical – Zn_F, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

NO_3

Figure 3.20 shows the NO_3 levels from 1 January 2008 – 30 April 2021.

The long-term data suggests that the NO_3 levels at McArthur River locations upstream of the Glyde River (SW21 and SW12) were generally low. Conversely, SW11 and SW09 typically exhibit elevated NO_3 levels during the wet season.

During the reporting period, SW21 and SW12 NO_3 levels remained relatively low and NO_3 levels at SW09 and SW11 were elevated from the onset of the wet season. This is consistent with the historical trends.

There were 4 exceedances of the SSTV for NO_3 during the reporting period. These occurrences coincided with elevated NO_3 levels at upstream SW09. This indicates that the NO_3 levels at SW11 were influenced by the natural Glyde River catchment inflows from upstream of the Mine. This is further supported by the fact that NO_3 levels at SW12 were significantly lower than the SSTV at the time of the exceedances. Further discussion is included in Section 4.5.

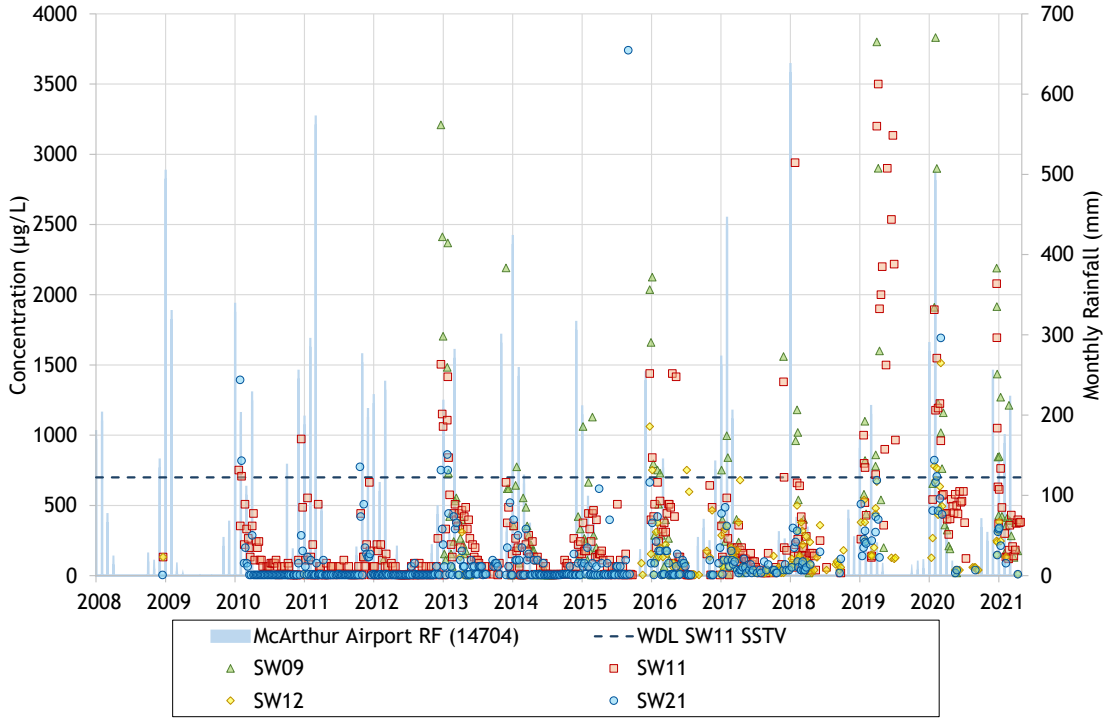

Figure 3.20 - McArthur River and Glyde River, Historical – NO_3, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

TPH Fraction C10-C36 (sum)

Figure 3.21 shows the TPH Fraction C10-C36 (sum) from 01 January 2008 to 30 April 2021.

The long-term data suggests that TPH Fraction C10-C36 levels were consistently low, with a small number of isolated elevated values in McArthur River at SW21 and SW11.

During the reporting period, TPH Fraction C10-C36 levels were generally at the limit of reporting of 5.0 µg/L, with a few exceptions at SW21 and SW12.

There were no exceedances of the SSTV for TPH at SW11 during the reporting period.

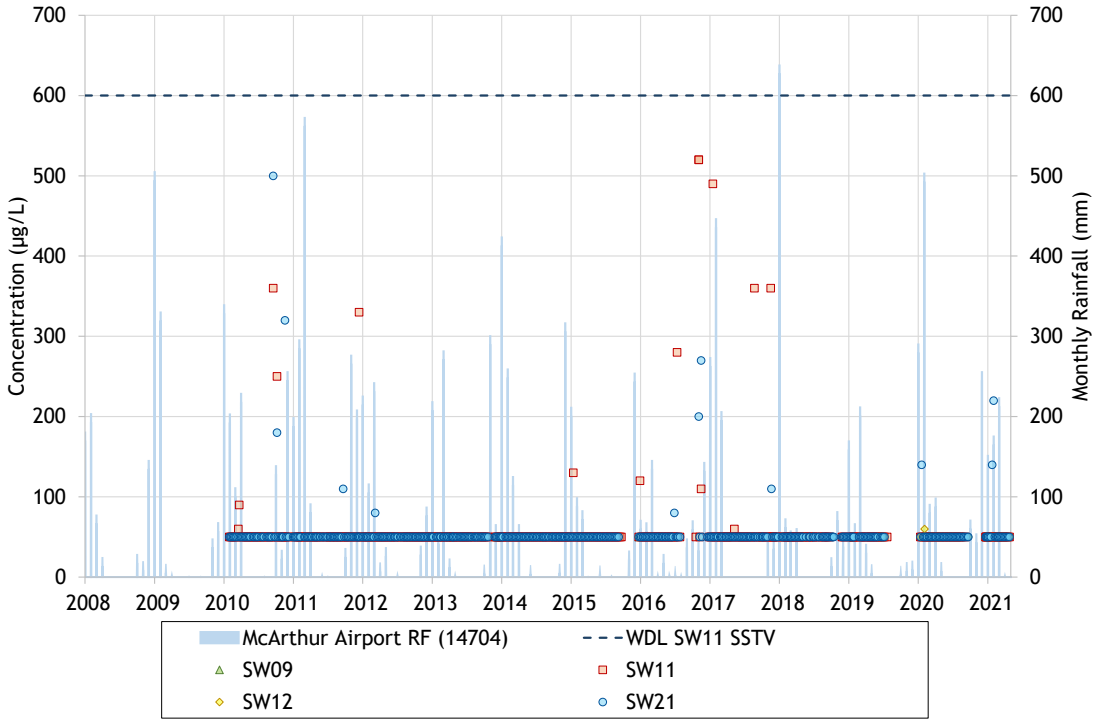

Figure 3.21 – McArthur River and Glyde River, Historical – TPH Fraction C10-C36 (sum), Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

Benzene

Figure 3.22 shows Benzene from 1 January 2008 – 30 April 2021.

The long-term data suggests that Benzene levels are consistently low.

All measured concentrations were below 1.0 µg/L (the limit of reporting) during the reporting period which is consistent with the historical concentrations.

There were no exceedances of the SSTV at SW11 during the reporting period.

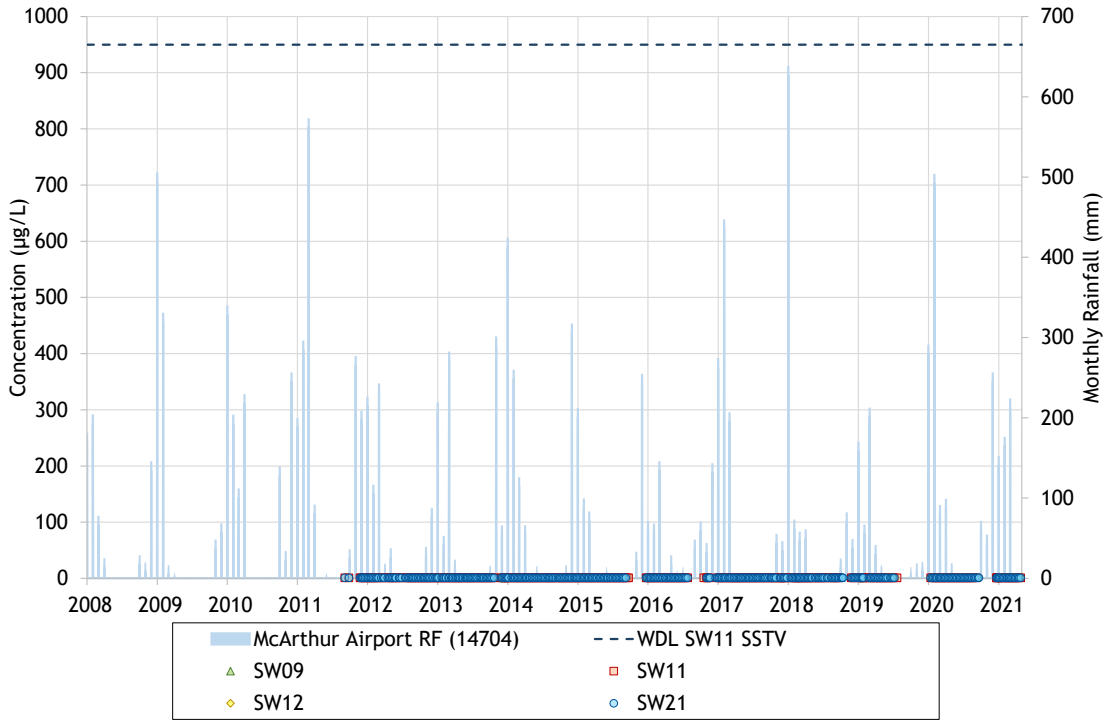

Figure 3.22 – McArthur River and Glyde River, Historical – Benzene, Monthly Rainfall and SW11 SSTV - January 2008 to April 2021

3.3.1.3 Glyde River mixing zone extent

MRM personnel collected water quality data 1.5 km downstream of SW11 during the reporting period to investigate the mixing zone extent of the McArthur River and Glyde River water. The water quality samples were collected on 28 February 2021. Figure 3.23 shows the EC recorded 1.5 km downstream of SW11, as well as the EC recorded at SW12, SW11 and SW09 on the same day. An additional sample on the east bank of the McArthur River was also collected. The following is of note regarding the sampling dates:

- 28 February 2021:
  - Based on recorded water level data, flow in the McArthur River at MIM Pump was approximately 522 ML/d. The Glyde River water level logger failed on 21 February 2021, however based on visual observations, flow in the Glyde River at SW09 was between approximately 86 and 172 ML/d. Based on these flow rates and recorded water quality (218 µS/cm at SW12 and 74 µS/cm at SW09), the estimated fully mixed EC level downstream of McArthur River confluence with the Glyde River was between approximately 180 and 200 µS/cm.
  - Figure 3.23 shows that the recorded EC levels downstream of the confluence is similar to the lower estimate of the fully mixed EC level. It can also be seen that the EC level at SW11 is consistent on the west bank with the 1.5 km downstream sample, which may indicate the flows were fully mixed on the west bank before SW11. The eastern bank is also generally consistent.

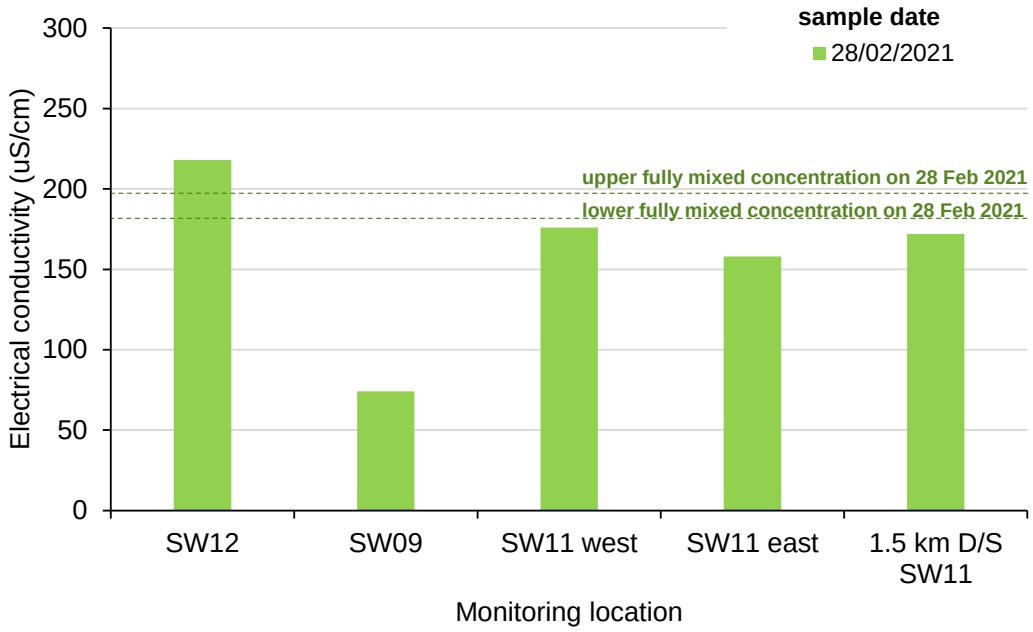

Figure 3.23 – Electrical conductivity recorded in the McArthur River at SW12, SW11 and 1.5 km downstream of SW11 as well as the Glyde River at SW09

3.3.2 Local creeks - Surprise, Barney and Emu creeks

3.3.2.1 General

NSW data from the past three years for Surprise, Barney and Emu creeks has been plotted on timeseries graphs for each of the main analytes (pH, Electrical Conductivity, Sulphate, Thallium, Zinc) at the upstream control locations (SW28, SW29 and SW30 respectively) as well as the most downstream locations (SW06, SW24 and SW26 respectively) to aid in the discussion

of trends. Appendix A -presents the NSW monitoring data collected at sites listed in Table 1, Appendix 4 of the WDL during the reporting period. All NSW data is also provided to DITT on a quarterly basis.

3.3.2.2 Surprise Creek

Surprise Creek flows past the TSF and NOEF before joining with the Barney Creek Diversion Channel. The NSW monitoring program for Surprise Creek includes eight sampling locations, as indicated in Table 3.1. This includes:

- one control monitoring location (SW29), which is considered to be upstream of the Mine influence and is used to determine background conditions.
- seven potentially impacted monitoring locations (SW23, SW01, SW36, SW33, SW02, SW34, and SW24), which are downstream of the mine areas and have the potential to be impacted by mining activities.

Figure 3.24 shows the water level (mAHD) and flow rate (m^3/s) recorded at the Surprise Creek Gauging Station (SCGS) at SW02 during the reporting period. The daily rainfall recorded at the McArthur River Airport gauging station (14704) is also presented.

Flow at the Surprise Creek gauging station commenced in late December 2020. Prior to this, there were no recorded flows.

3.3.2.3 Barney Creek

Barney Creek is located south of the TSF before being rerouted to the Barney Creek Diversion Channel, which lies between the NOEF and Open Pit. The Diversion Channel flows in an easterly direction and joins the McArthur River downstream of the Mine.

The NSW monitoring program for Barney Creek includes eight sampling locations, as indicated in Table 3.1. This includes:

- One control monitoring location (SW28), which is considered to be upstream of the mine influence and is used to determine background conditions.
- Seven potentially impacted monitoring locations (SW04, SW22, SW03, SW18, SW19, SW20, and SW06), which are either within or downstream of the mining domains and have the potential to be impacted by mining activities.

Figure 3.25 shows the water level (mAHD) and flow rate (m^3/s) recorded at the Barney Creek Gauging Station (BCGS) at SW04 for the reporting period. Daily rainfall recorded at McArthur River Airport gauging station (14704) is also presented.

Flow at the Barney Creek gauging station commenced in late December 2020. Prior to this, there were no recorded flows.

3.3.2.4 Emu Creek

Emu Creek is located to the northeast of the NOEF and joins the McArthur River downstream of the Mine and upstream of SW11. The NSW monitoring program for Emu Creek includes three sampling locations, as indicated in Table 3.1, which includes:

- One control monitoring location (SW30), which is considered to be upstream of the Mine influence and is used to determine background conditions.
- Two monitoring locations (SW31 and SW26), which are within or downstream of mining areas and have the potential to be impacted by mining activities.

Figure 3.26 shows the water level (mAHD) and flow rate (m^3/s) recorded at the SW26 water level logger on Emu Creek for the reporting period.

Flow at the Emu Creek gauging station commenced in November 2021. Prior to this, there were no recorded flows.

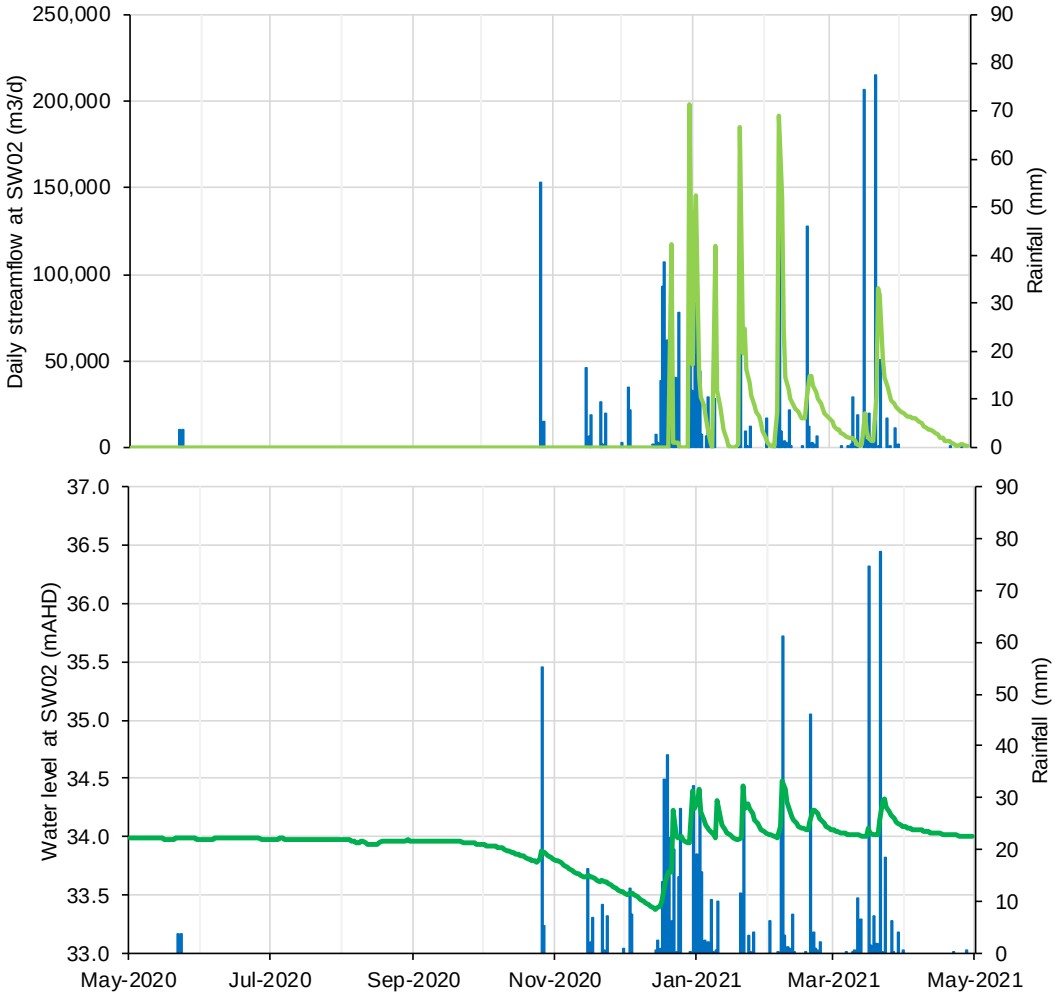

Figure 3.24 – Surprise Creek Height and Flow (1 May 2020 to 30 April 2021)

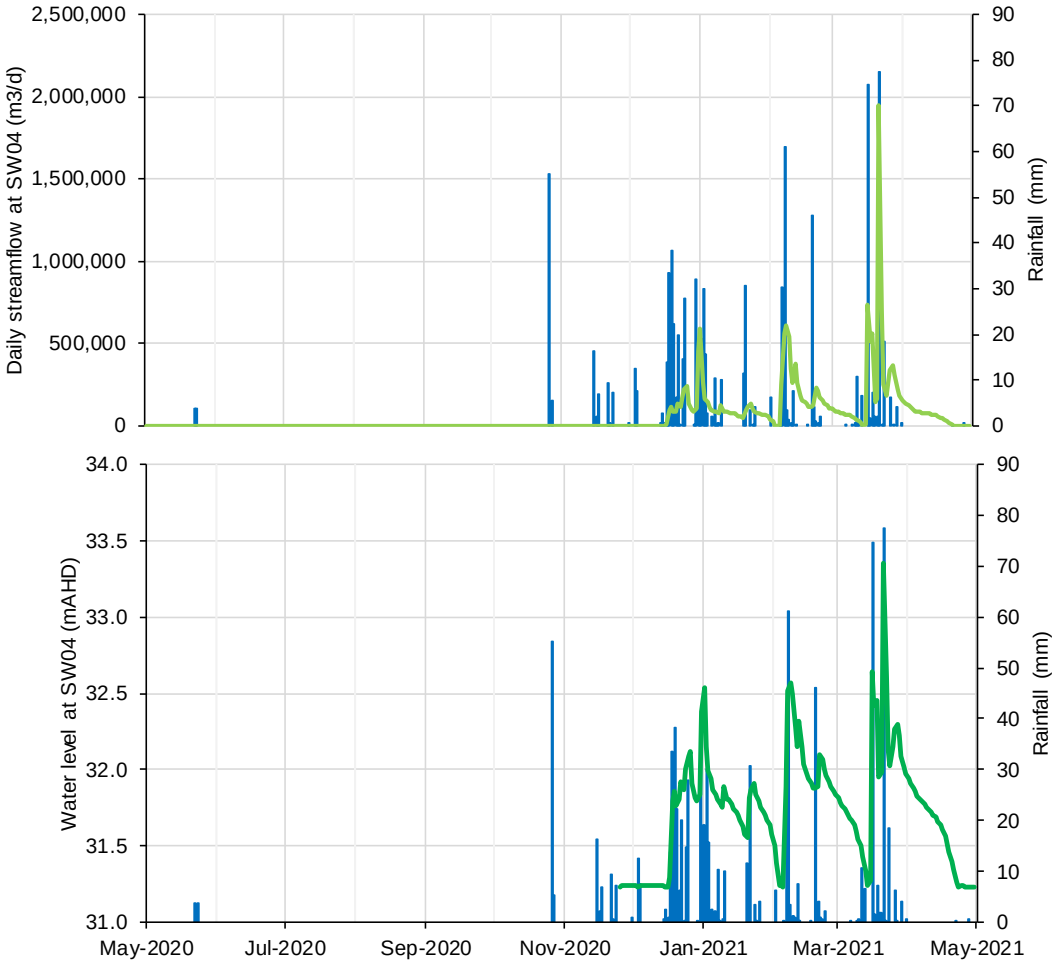

Figure 3.25 – Barney Creek Height and Flow (1 May 2020 to 30 April 2021)

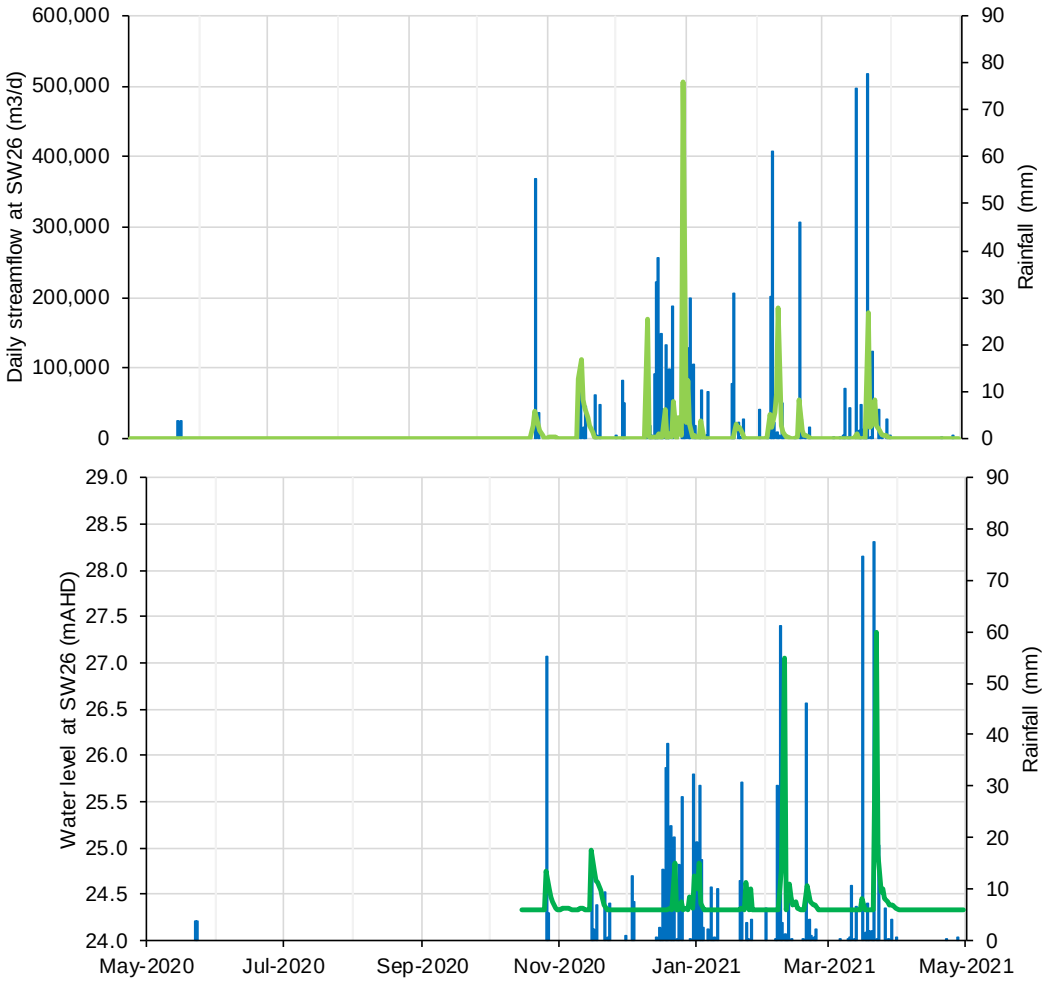

Figure 3.26 – Emu Creek Height and Flow (1 May 2020 to 30 April 2021)

3.3.2.5 Monitoring Results

pH (Field)

Figure 3.27 shows the field pH levels at locations on Surprise Creek (SW29 and SW24), Barney Creek (SW28 and SW06) and Emu Creek (SW30 and SW26) from 1 May 2018 to 30 April 2021.

Surprise Creek

pH levels at SW29 (upstream Surprise Creek) are typically lower than those recorded at SW24 (downstream Surprise Creek). All pH levels recorded in Surprise Creek during the three year period were below 8.5.

Barney Creek

High pH levels were recorded in Barney Creek which is consistent with water in contact with dolomite. The highest pH value recorded was 8.52 at SW06, downstream from the NOEF and Open Pit. The lowest value (6.30) was measured at SW28. Values downstream of the Mine (SW06) are slightly basic, averaging 7.6 during the three year reporting period, and within historical trends.

Emu Creek

The pH levels recorded in Emu Creek over the three year period are generally consistent. There was no identifiable differences between the pH levels recorded at SW30 (upstream Emu Creek) and SW26 (downstream Emu Creek).

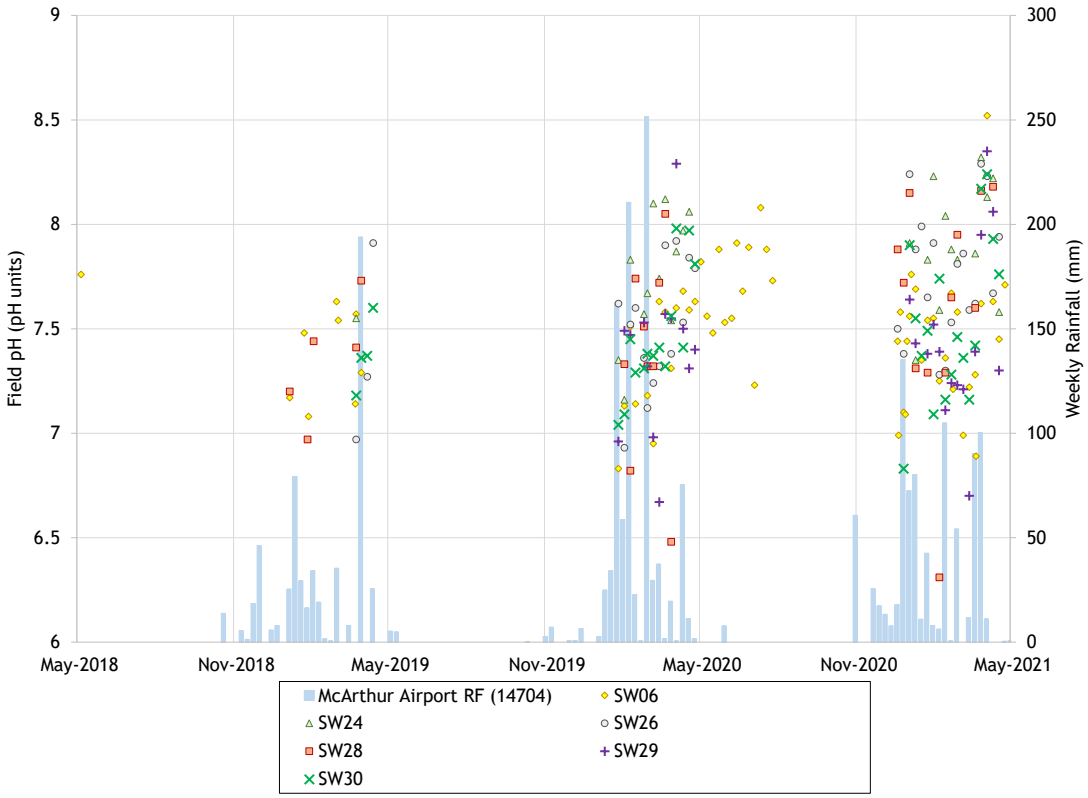

Figure 3.27 – Surprise, Barney and Emu Creeks, pH (Field) and Weekly Rainfall - May 2018 to April 2021

EC (Laboratory) & SO_4

Figure 3.28 and Figure 3.29 show the laboratory EC and SO_4 levels at locations on Surprise Creek (SW29 and SW24), Barney Creek (SW28 and SW06) and Emu Creek (SW30 and SW26) from 1 May 2018 to 30 April 2021. EC and SO_4 had a similar response during the reporting period.

Surprise Creek

EC and SO_4 levels were slightly elevated at SW24, compared to SW29, generally during low-flow conditions. SW24 is located downstream of the TSF and appears to be influenced by mine derived baseflows. This is similar to historical trends.

Barney Creek

During the reporting period, the highest EC and SO_4 levels were recorded at SW06 during the wet season, which were associated with managed releases from WMD RP and MLDP. EC and SO_4 levels were also elevated during the dry season due to mine derived baseflows.

Emu Creek

EC and SO_4 levels in Emu Creek were consistently low during the three year period.

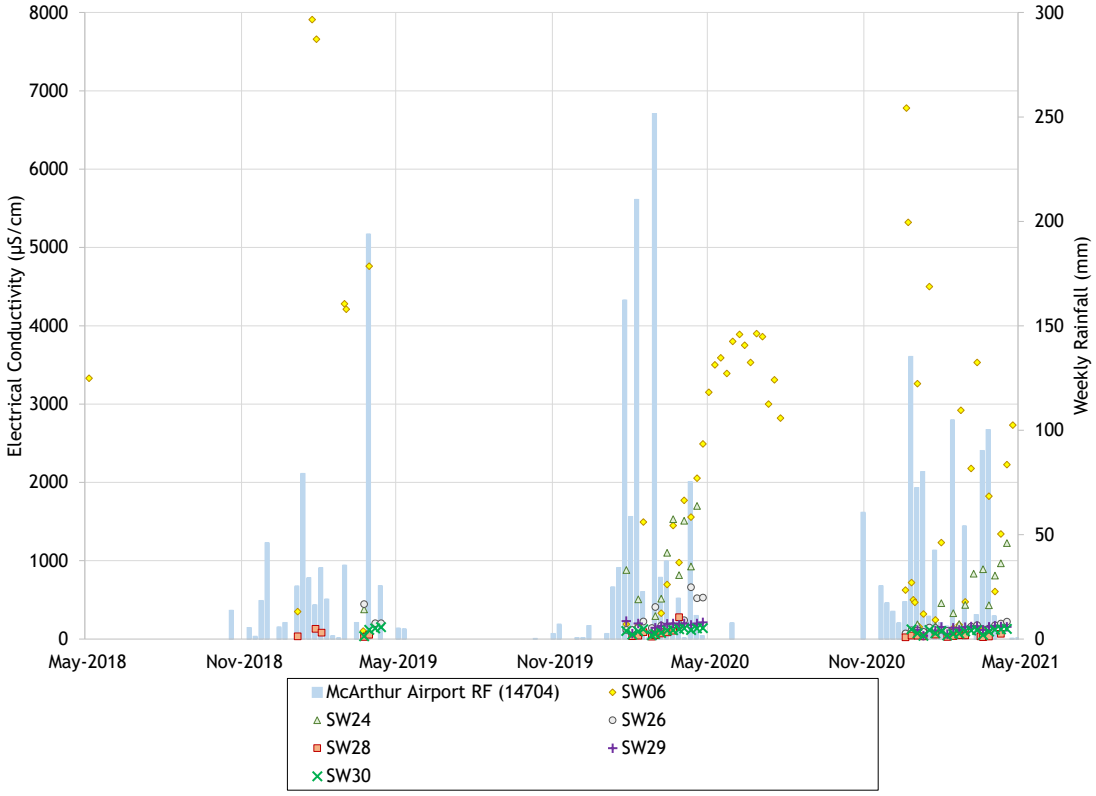

Figure 3.28 – Surprise, Barney and Emu Creeks, Historical – Laboratory EC and Weekly Rainfall - May 2018 to April 2021

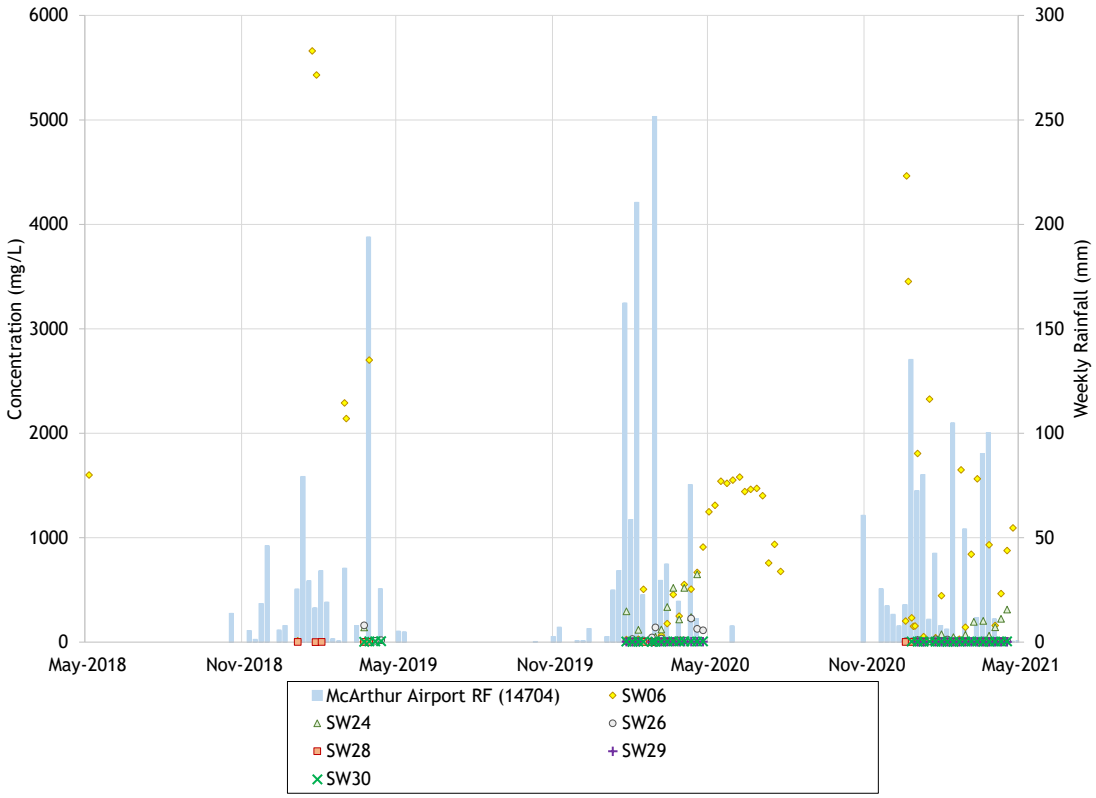

Figure 3.29 – Surprise, Barney and Emu Creeks, Historical – SO_4 and Weekly Rainfall - May 2018 to April 2021

Tl_F

Figure 3.30 shows the Tl_F levels in Surprise Creek (SW29 and SW24), Barney Creek (SW28 and SW06) and Emu Creek (SW30 and SW26) from 1 May 2019 to 30 April 2021.

Surprise Creek

Tl_F levels were consistently low during the three year period.

Barney Creek

Tl_F levels at SW06 in Barney Creek were elevated during the 2018/19 and 2020/21 reporting periods. These elevated levels were associated with managed releases from WMD RP and MLDP.

Emu Creek

Tl_F levels in Emu Creek were consistently low during the three year period.

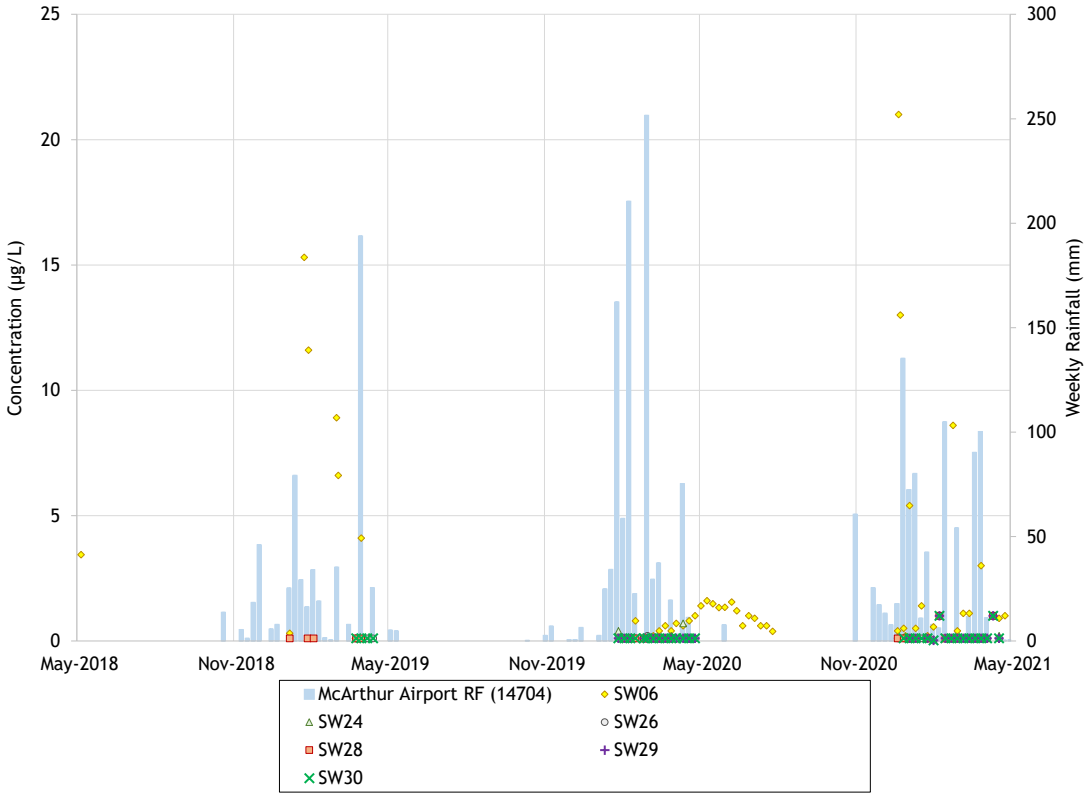

Figure 3.30 – Surprise, Barney and Emu Creeks, Historical – Tl_F and Weekly Rainfall - May 2018 to April 2021

Zn_F

Figure 3.31 shows the Zn_F levels in Surprise Creek (SW29 and SW24), Barney Creek (SW28 and SW06) and Emu Creek (SW30 and SW26) from 1 May 2018 to 30 April 2021.

Surprise Creek

Zn_F levels were low for the upstream location assessed (SW29). The downstream location (SW24) presents one elevated concentration during the 2018/19 reporting period and only slightly elevated levels during the 2019/20 reporting period.

Barney Creek

Zn_F levels were low for the upstream location assessed (SW28). The downstream location (SW06) presents the most notable elevated concentrations during the 2018/19 and 2020/21 reporting periods. These elevated levels however were associated with managed releases from WMD RP and MLDP.

Emu Creek

Zn_F levels were low for the upstream location assessed (SW30). The downstream location (SW26) presents slightly elevated concentrations during the 2019/20 reporting period, within the range of the other downstream monitoring locations.

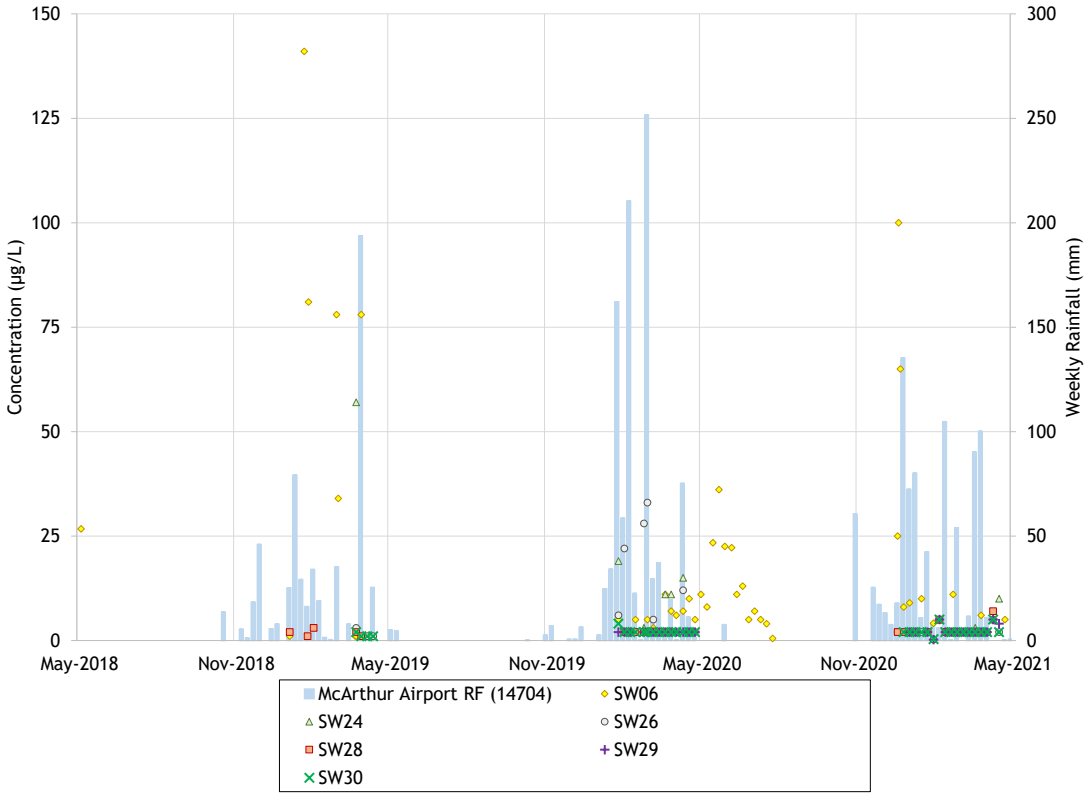

Figure 3.31 – Surprise, Barney and Emu Creeks, Historical – Zn_F and Weekly Rainfall - May 2018 to April 2021

3.3.2.6 Impact of TSF Interception Trench on Surprise Creek water quality

The potential impact of the TSF interception trench on the Surprise Creek water quality was assessed in Appendix D -. The following was of note regarding this assessment:

- Regarding ASW quality in the TSF interception trench sump:

- EC, sulphate, filtered thallium and filtered zinc levels recorded in the TSF interception trench sump are notably greater the Surprise Creek natural baseline levels. These results suggest that the water collected in the TSF interception trench sump is a combination of TSF Cell seepage and the natural Surprise Creek baseflow. Hence, it can be concluded that the trench is acting as intended and intercepting TSF Cell seepage before it can enter Surprise Creek.

- Regarding NSW quality downstream of the TSF interception trench in Surprise Creek:
  - There is no discernible difference in Surprise Creek pH levels after the commencement of pumping from the interception trench;
  - There is a slight reduction in EC and sulphate levels in Surprise Creek downstream of the interception trench, one year after the commencement of pumping; and
  - For both filtered thallium and filtered zinc, the metal concentrations appear to be notably lower in Surprise Creek downstream of the interception trench, after the commencement of pumping from the interception trench.

3.3.3 Downstream of the Mine at Borroloola

Two NSW monitoring locations (SW08 and SW32) on the McArthur River are located downstream of the Mine, near Borroloola (see Figure 3.1). During the reporting period, six samples were collected at SW08 and five samples were collected at SW32. The data from these locations was reviewed and comparison was made to the SW11 SSTVs as an informal assessment (SSTVs are only formally applied to the SW11 compliance point). The following is of note regarding these results:

- At SW32:
  - The DO levels were below the SW11 SSTV for three of the five samples collected.
  - pH levels were elevated above the SW11 SSTV for one of the five samples.
  - No other analytes, including potentially mine derived metals, were found to exceed the SW11 SSTVs in the five samples collected.
- At SW08:
  - EC levels were elevated above the SW11 SSTVs for two of the six samples collected.
  - DO levels were below the SW11 SSTVs for four of the six samples collected.
  - pH, Al_F and SO_4 levels were elevated above the SW11 SSTVs for one of the six samples collected.
  - No other analytes, including potentially mine derived metals, were found to exceed the SW11 SSTVs in the six samples collected.

The elevated EC, SO_4 and pH levels recorded at SW08 were found to be caused by the tidal influences experienced at Borroloola. The elevated Al_F and reduced DO recorded at SW08 are consistent with the findings for the NSW monitoring sites in the vicinity of the Mine. The data indicates that there are naturally high background concentrations of Al_F and low levels of DO in the McArthur River catchment.

The SSTV exceedances recorded at SW08 during the reporting period were determined to be unrelated to mine activities, and were considered to be a result of natural river and estuary processes.

3.4 QUALITY ASSURANCE AND QUALITY CONTROL

As detailed in the MRM NSW Monitoring Procedure (PRO-2200023), Quality Assurance and Quality Control (QA/QC) is routinely undertaken as part of the NSW monitoring program. This includes collection of duplicate analyses and analysis of both field and laboratory 'blank' samples. Discussion of the QA/QC results for the reporting period is provided in the following sections.

3.4.1.1 Duplicate Analyses

Duplicate samples were collected for all water monitoring programs over the reporting period. A single duplicate sample was generally collected for every ten surface water samples collected. The sample sites were selected at random by the sampler. Duplicates were typically collected as spilt samples. For the spilt duplicates, a large volume of water was collected in the field in bulk samples bottles and then split into separate sample bottles in the sample preparation laboratory. A register was used to assign random three-digit numbers to the duplicate sample so no relationship to the original site ID could be made by the laboratory conducting the analysis. The dispatch procedure for duplicate samples was identical to the procedure for that particular batch of samples.

The results from all duplicate samples taken over the 2020/21 reporting period have been provided in Appendix B -. This includes duplicates from all water quality classes. The relative percent difference (RPD%) has been calculated and is provided in the table with the duplicate data.

Figures have been plotted below showing the relationship between concentrations of analytes in the original samples and concentrations of analytes in the blind duplicates. Figure 3.32 to Figure 3.34 present the relationships for the concentration of filtered primary metals, total primary metals and major cations and anions for the 2020/21 reporting period, respectively.

These figures also show the acceptable upper and lower bands for duplicate variability. According to DES (2018), samples with RPD values ≤20% indicate an acceptable result. However, for samples that are at or close to the LOR (less than 10 times the LOR), DES (2018) permits the RPD to exceed 20%. Due to the variable nature of the sample LORs over time and between analytes, it is not clear what LOR should be adopted for any given sample. Hence, we have not placed any special considerations for samples close to the LOR.

The following is of note regarding the duplicate sample analysis:

- For primary filtered metals, a total of 83 duplicate samples (1,909 analyte samples) were collected for primary filtered metals during the reporting period. Of the 1,909 analyte samples, 111 analyte samples exceeded 20% of the RPD. Only 13 of the 111 sample exceedances had levels greater than ten times the LOR. These exceedances were as follows:
  - Mn_F in 8 duplicate samples;
  - Fe_F in 3 duplicate samples; and
  - Al_F in 1 duplicate sample.
- For primary total metals, a total of 77 duplicate samples (1,848 analyte samples) were collected for primary total metals during the reporting period. Of the 1,848 analyte samples, 179 analyte samples exceeded 20% of the RPD. Only 37 of the 179 sample exceedances had levels greater than ten times the LOR (note that where LOR values were unknown for total metals, the filtered LORs were adopted). These exceedances were as follows:
  - Mn_T in 13 duplicate samples;
  - Al_T in 12 duplicate sample;
  - Fe_T in 10 duplicate samples;
  - Pb_T in 1 duplicate sample; and
  - Zn_T in 1 duplicate sample.
- For major ions, a total of 85 duplicate samples (1,703 analyte samples) were collected for major ions during the reporting period. Of the 1,703 analyte samples, 14 analyte samples exceeded 20% of the RPD. None of the 14 sample exceedances had levels greater than ten times the LOR.

3.4.1.2 Conclusion

Overall, the duplicate results show low variability which provides a high degree of confidence in the monitoring program data

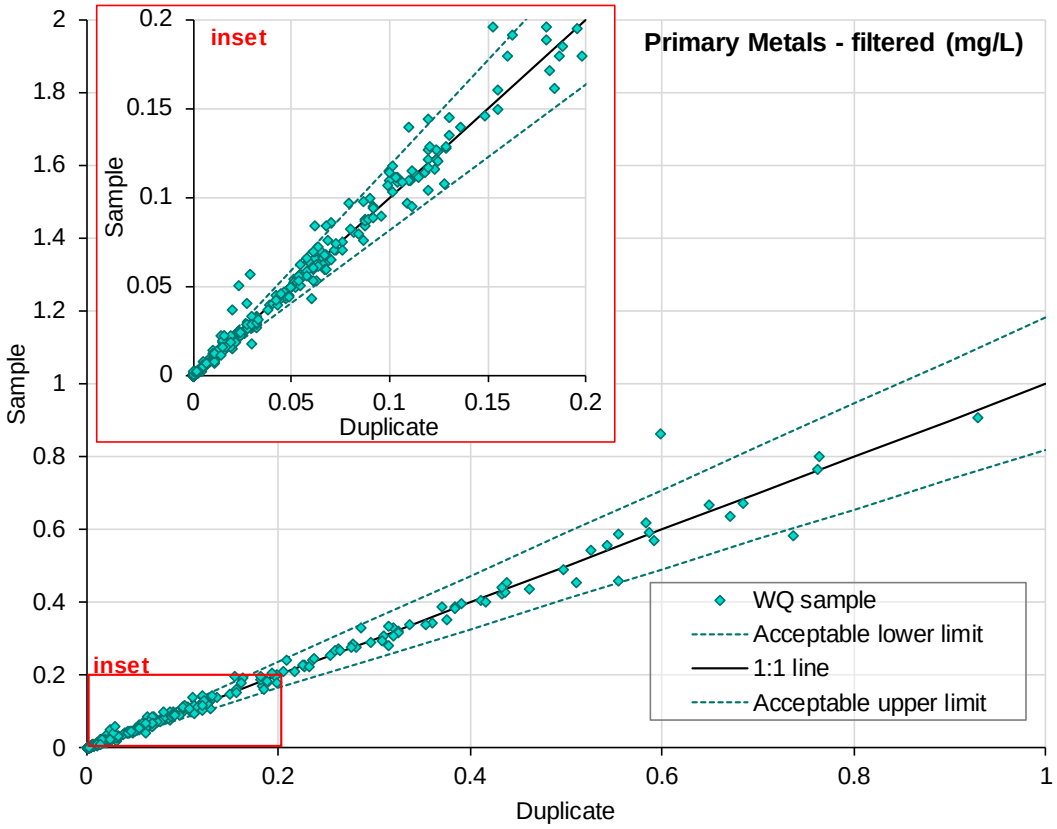

Figure 3.32 – Relationship between filtered primary metal concentrations in samples and blind duplicates, 2020/21 reporting period

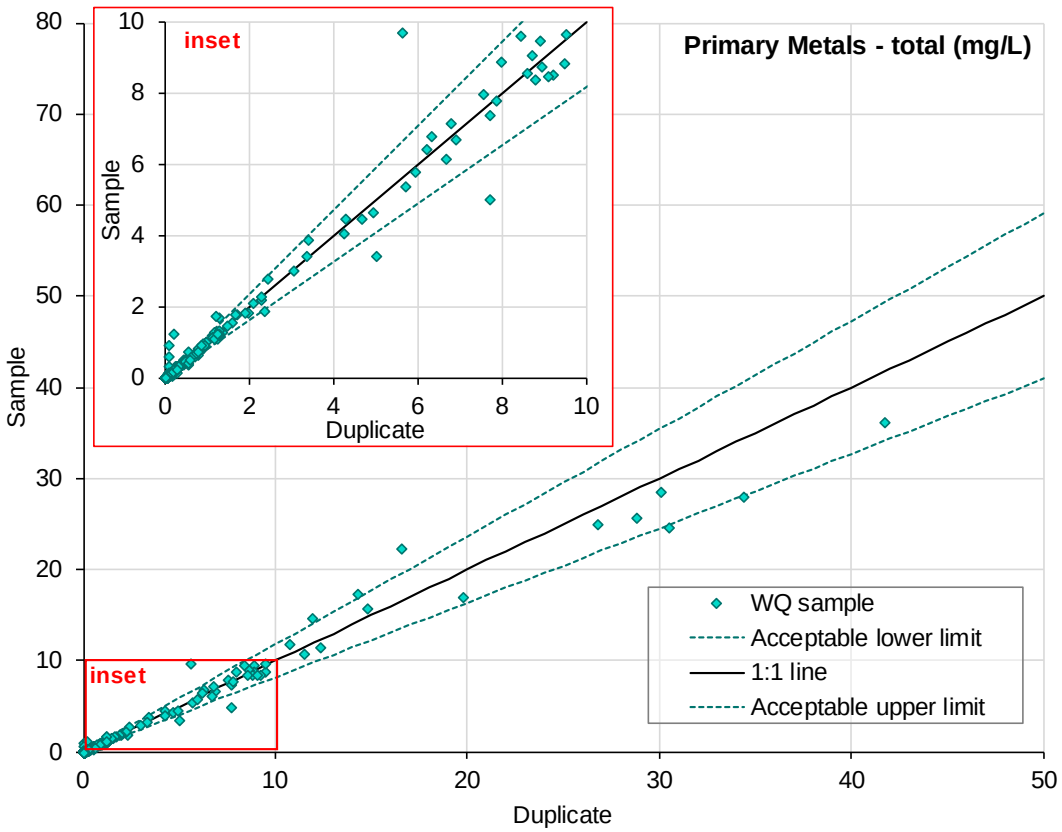

Figure 3.33 – Relationship between total primary metal concentrations in samples and blind duplicates, 2020/21 reporting period

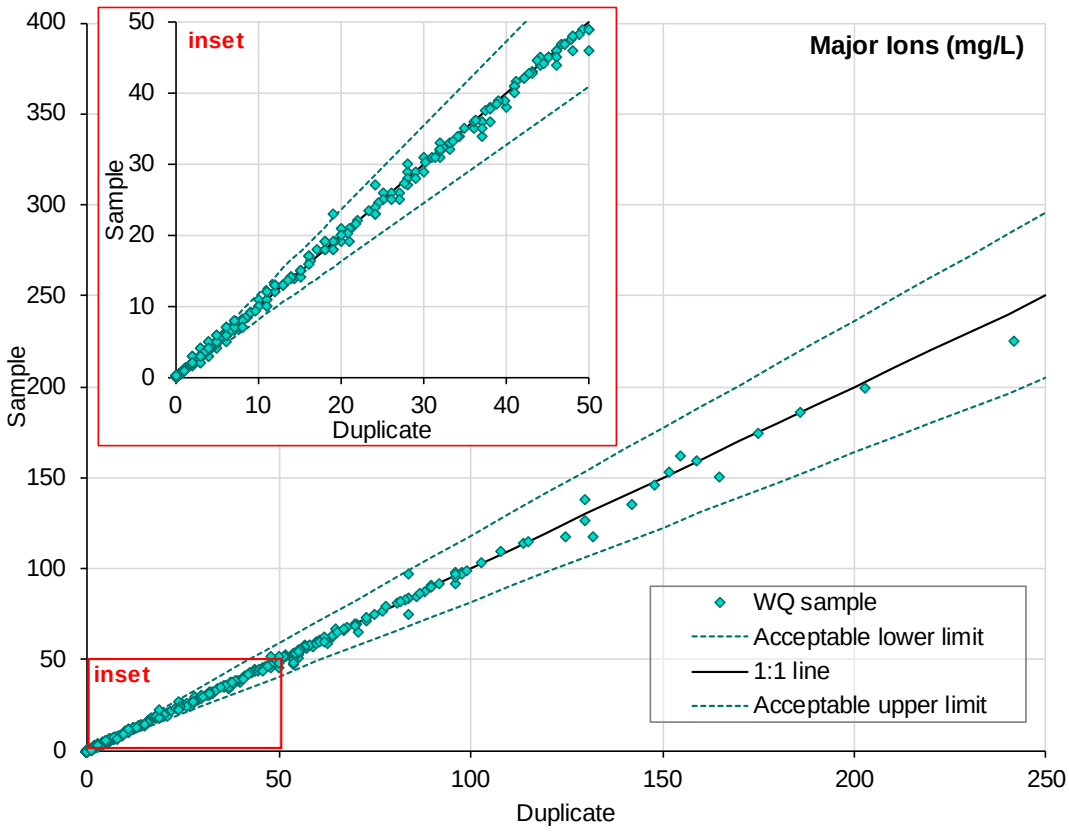

Figure 3.34 – Relationship between major ion concentrations in samples and blind duplicates, 2020/21 reporting period

3.4.1.3 Blank Analyses

Fifty one (51) blank samples were prepared and sent for analysis from the surface water monitoring program over the 2020/21 reporting period. Of the 51 blanks, 26 were field blanks and 25 were trip blanks. Definitions of the blank types are given below;

- Trip blanks: were prepared in the MRM laboratory with analyte free water and were designed to assess contamination introduced during the dispatch and shipping procedures and analysis by the external laboratories.
- Field blanks: were prepared under normal field sampling conditions using analyte free water and were designed to assess and identify errors and contamination in field handling and sample collection. Since field blanks were also dispatched to the receiving laboratory with normal field samples they were also used to identify contamination introduced during the dispatch, shipping and analysis.

The analytical results from all trip blanks and field blanks sampled over the reporting period can be found in Appendix B -. In general the quality of the blanks was very high, with most target analytes generally below the limit of detection. The results provide further confidence in the monitoring program data.

Concentrations of TDS in the blank samples were elevated on two of occasions:

- The field blank obtained on 8/06/2020 recorded a TDS concertation of 20 mg/L. Concentrations of TDS were high at a number of sites sampled on 8/06/2020
- The field blank obtained on 31/01/2021 recorded a TDS concentration of 30 mg/L. Concentrations of filtered iron were high at a number of sites sampled on 31/01/2021.

4 McArthur River Mine artificial surface water monitoring

4.1 MONITORING LOCATIONS

The ASW monitoring locations listed in the WDL include the TSF Water Management Dam (TSF WMD), Open Pit Pond 2 (OP P2), Open Pit Northern Crossing 1A (OP NC1A), Water Treatment Plant (OP WTP) and NOEF South East Levee 1 (NOEF SEL1). These storages are used as part of the site water management system to collect, store, and/or release potentially mine-affected water. MRM monitor numerous other ASW locations in addition to the ASW locations listed in the WDL as part of the ASW monitoring program. The ASW monitoring locations are shown on Figure 4.1. The objectives of the ASW monitoring program are given in Section 1.2.6.

The 47 analytes listed in Appendix 4, Table 1 of the WDL have been reviewed for each of the five ASW sites. Appendix A - presents the monitoring data collected at each ASW site during the reporting period. All ASW data is provided to DITT on a quarterly basis.

ASW monitoring data was available for three of the five sites listed in the WDL during the reporting period. Samples were not taken at OP NC1A as the storage was generally dry and there were no managed releases from this storage during the reporting period. Samples were not taken at the OP WTP as it was not operated during the reporting period.

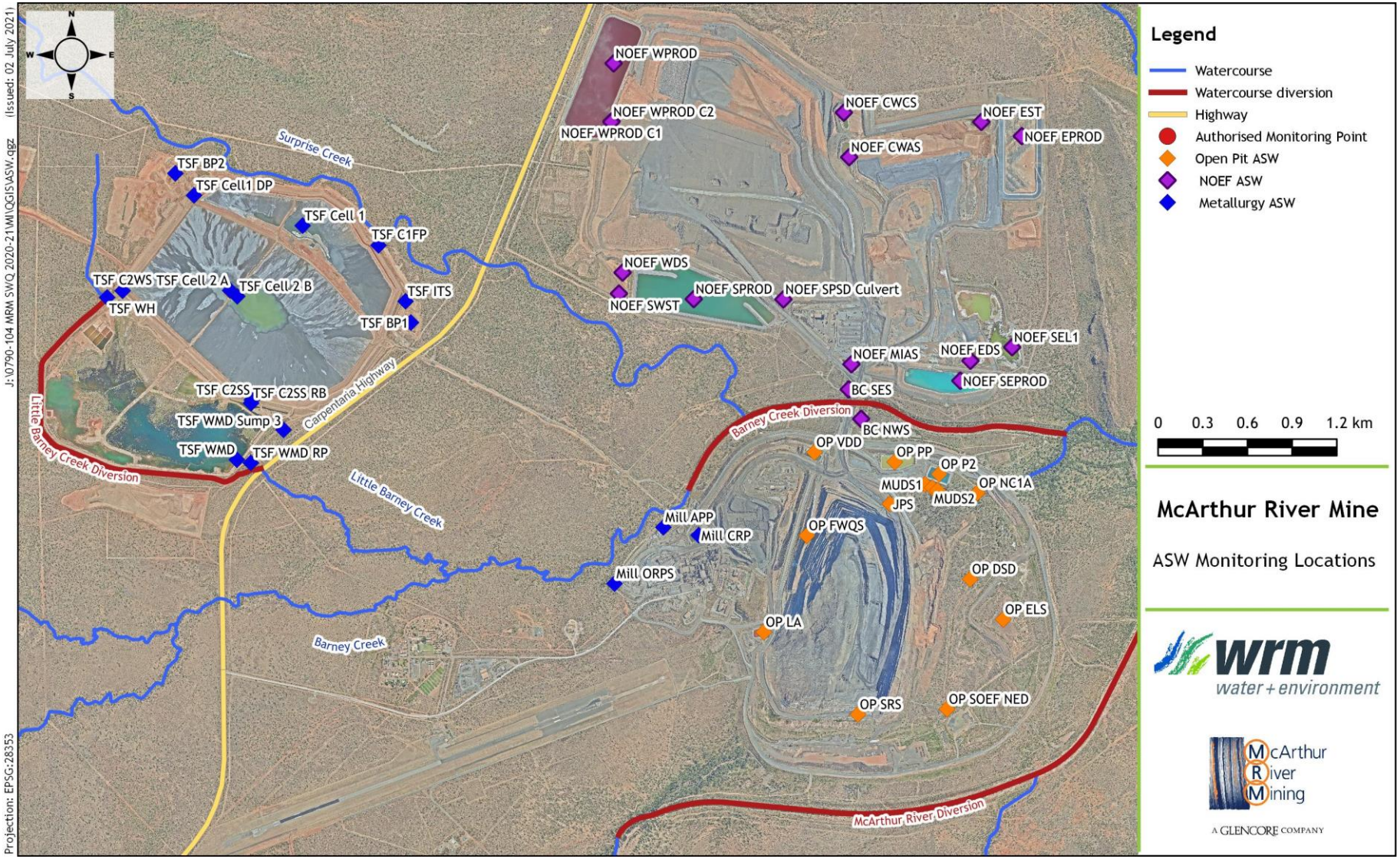

Figure 4.1 – Artificial Surface Water (ASW) Monitoring Locations

4.2 ARTIFICIAL SURFACE WATER CLASSIFICATION SYSTEM

A water classification system has been adopted at the Mine since the beginning of the 2015/16 reporting period and is an operational tool that helps optimise the management of water on-site. The current classification system has six water classes based on water quality. The classification system is outlined in Table 4.1, with further details of the classification system included in the Mine's WMP (MRM 2020b). The table outlines the six water classes adopted at the Mine, typical sources of this water, and the concentration of the limiting Contaminants of Potential Concern (COPC) relative to the WDL SW11 SSTVs.

Table 4.1 – McArthur River Mine Water Classification System

Class	Class Description	Description of Typical Sources	Water Quality - Number of Times above the WDL SSTV[a]	
			SO_4 and EC	All Other CoPCs
Class 1	Diverted Water	Upstream catchments unaffected by mining	<1	<1
Class 2	Surface Water	Cleared area and clay / topsoil stockpiles	<1	<1
Class 3	Treated permeate	Permeate from the reverse osmosis water treatment plant	<1	<1
Class 4	Managed Release Water			
Sub-class a	*Best Quality*	Runoff from cleared area and clay / topsoil stockpiles and treated by sediment dams, raw water	1-3	1-4
Sub-class b	*Good Quality*	Surface runoff from cleared areas with some exposed / capped LS NAF[b] waste material, raw / intercepted groundwater	3-5	4-20
Sub-class c	*Medium Quality*	Surface runoff from cleared areas with some capped and/or exposed MS NAF[c] waste material, and treated water	5-25	20-50
Class 5	Poor Water Quality	Seepage from the TSF and NOEF, water stored in underground void	25-30	50-1,000
Class 6	Process Water	Water used within the Mill and other process streams, seepage from ore stockpiles	>30	>1,000

ML/day = megalitres per day.
[a] - The number of times of exceedance shown is based on the limiting Concentration of Potential Concern (CoPC). Concentrations of other contaminants may be lower when compared with the WDL 174 trigger values.
[b] - LS-NAF – low salinity non-acid forming.
[c] - MS-NAF – metalliferous saline non-acid forming.

4.2.1 Median ASW water classes for the 2020/21 reporting period

Table 4.2 to Table 4.4 provide the median water classification, median pH and limiting COPC at each ASW monitoring site during the reporting period for the NOEF[2] domain, OP[3] domain and the Metallurgy domain, respectively. The location of each ASW monitoring site is shown in Figure 4.1. The following is of note regarding the median water classes:

- For the 19 NOEF ASW sites:
  - 8 sites were Class 6 with limiting CoPCs including filtered aluminium, filtered iron, filtered zinc and sulphate;
  - 1 site was Class 5 with limiting CoPCs including sulphate;
  - 9 sites were Class 4 with limiting CoPCs including EC, sulphate and filtered zinc; and
  - 1 site was Class 2.
- For the 13 Open Pit ASW monitoring sites:
  - 3 sites were Class 6 with limiting CoPCs including filtered aluminium, filtered cadmium, filtered iron, filtered zinc and sulphate;
  - 5 sites were Class 5 with limiting CoPCs including filtered aluminium and filtered zinc; and
  - 5 sites were Class 4 with limiting CoPCs including EC, sulphate and filtered zinc.
- For the 18 Metallurgy ASW sites:
  - 2 sites were Class 6 with limiting CoPCs including filtered zinc;
  - 8 site was Class 5 with limiting CoPCs filtered lead, filtered zinc and sulphate;
  - 7 sites were Class 4 with limiting CoPCs including EC, sulphate and filtered zinc; and
  - 1 site was Class 2.

ASW sites had a circumneutral pH during the reporting period, except for four sites where median water pH levels were less than 5. These storages included:

- NOEF WPROD - median pH of 3.8;
- NOEF SPROD - median pH of 4.9;
- NOEF EPROD - median pH of 4.4; and
- OP LA – median pH of 2.6.

Low pH water in the above storages was likely attributed to the residual mill leachate circuit water and NOEF seepage.

Over the reporting period, there was no spillway overflow reported from any of the major water storages to the receiving environment, including from the four low pH storages listed above.

As part of ongoing environmental improvements over the reporting period, the NOEF West D Sump (WDS) was lined by MRM with a high density polyethylene (HDPE) liner to minimise the risk of seepage to local groundwater.

[2] North Overburden Emplacement Facility
[3] Open Pit

Table 4.2 – McArthur River Mine ASW Monitoring Locations – NOEF domain

Site	Site Code	Location Description	No. samples[b]	Median Class	Median pH (pH Unit)	Limiting CoPC[a]
Barney Creek North-West Sump	BC NWS	Sump located on the northwest side of Barney Creek haul bridge	6	4c	7.44	SO_4
Barney Creek South-East Sump	BC SES	Sump located on the southeast side of the Barney Creek haul bridge	8	4c	7.46	SO_4
NOEF Central West A Sump	NOEF CWAS	Seepage collection sump located north of the NOEF central valley	41	6	7.80	SO_4
NOEF Central West C Sump	NOEF CWCS	Sump located to the north of the NOEF CWAS	45	4c	7.88	EC, SO_4
NOEF East Drain Sump	NOEF EDS	Seepage collection sump located to the north of SEPROD	45	5	7.67	SO_4
NOEF East Perimeter Runoff Dam	NOEF EPROD	Runoff pond located on the eastern side of the NOEF	40	6	4.38	Al, Zn, SO_4
NOEF East Sediment Trap	NOEF EST	Sediment trap located to the northeast of the NOEF	11	4c	7.99	SO_4
NOEF Mining Industrial Area Sump	NOEF MIAS	Sump located adjacent the NOEF Mining Offices	12	4b	7.75	SO_4
NOEF South East Levee 1	NOEF SEL1	Storage behind the levee wall northeast of SEPROD	51	4c	7.92	EC, SO_4
NOEF South East Perimeter Runoff Dam	NOEF SEPROD	Runoff pond located on the southeast side of the NOEF	57	4c	8.38	EC, SO_4
NOEF South West Sediment Trap	NOEF SWST	Sediment trap to the southwest of the NOEF	4	2	7.57	-
NOEF Southern Perimeter Runoff Dam	NOEF SPROD	Runoff pond located on the southern side of the NOEF	51	6	4.93	Zn
NOEF Southern Perimeter Sediment Dam Culvert	NOEF SPSD Culvert	Culvert located upstream of the SPSD	4	6	5.55	Fe, Zn, SO_4
NOEF West A Sump	NOEF WAS	Small seepage sump on south side of the NOEF	28	6	5.28	Fe, Zn, SO_4
NOEF West D Sump	NOEF WDS	Sump located west of SPROD	30	4c	6.55	EC, SO_4
NOEF Western Perimeter Runoff Dam	NOEF WPROD	Runoff pond located on the western side of the NOEF	51	6	3.88	Zn
NOEF Western Perimeter Runoff Dam Underdrain	NOEF WPROD UD	Sump collecting water from under the WPROD HDPE liner	5	4b	7.01	Zn
NOEF WPROD Culvert 1	NOEF WPROD C1	Culvert directing dump seepage to NOEF WPROD	4	6	6.22	SO_4
NOEF WPROD Culvert 2	NOEF WPROD C2	Culvert directing dump seepage to NOEF WPROD	4	6	7.33	SO_4

[a] refers to filtered metals only
[b] during 2020/21 reporting period

Table 4.3 – McArthur River Mine ASW Monitoring Locations – OP domain

Site	Site Code	Location Description	No. samples[b]	Median Class	Median pH (pH Unit)	Limiting CoPC[a]
Open Pit Donkey Senior Drain	OP DSD	Drain collecting runoff from within the mine levee wall catchment	1	5	7.84	Al
Open Pit East Levee Storage	OP ELS	Storage east of the pit and inside the mine levee wall	6	5	5.61	Zn
Open Pit Foot Wall Quarry Sump	OP FWQS	Sump collecting groundwater expression in footwall quarry on northwest side of Open Pit	11	4c	6.96	EC, SO_4
Open Pit J Pit Sump	OP JPS	Sump northeast wall of the pit within the J stage cutback	7	4b	7.22	Zn, SO_4
Open Pit Lake Archer	OP LA	Dam west of Open Pit	4	6	2.62	Al, Cd, Fe, Zn, SO_4
Open Pit Pete's Pond	OP PP	Dam north of the pit and inside the mine levee wall	51	5	6.79	Zn
Open Pit Pond 2	OP P2	Transfer pond located to the northeast of the Open Pit	50	4c	8.21	EC, SO_4
Open Pit SOEF North-East Drain	OP SOEF NED	Drain collecting runoff from the northeast of the SOEF	1	4a	7.36	Zn
Open Pit South Ramp Sump	OP SRS	Sump collecting groundwater expression on the Open Pit south ramp	7	4a	8.00	EC, Zn, SO_4
Open Pit MUDS UGB1 Hole H	MUDS1	Underground dewatering pump to replace Evase - located northeast of the open pit	28	6	6.44	Zn
Open Pit MUDS UGB2 Hole B	MUDS2	Underground dewatering pump to replace Evase - located northeast of the open pit	19	6	6.43	Zn
Open Pit MUDS UGB3 Hole G	MUDS3	Underground dewatering pump to replace Evase - located northeast of the open pit	39	5	6.53	Zn
Open Pit Van Duncan's Dam	OP VDD	Dam northwest of the pit and inside the mine levee wall	12	5	5.98	Zn

[a] refers to filtered metals only
[b] during 2020/21 reporting period

Table 4.4 – McArthur River Mine ASW Monitoring Locations – Metallurgy domain

Site	Site Code	Location Description	No. samples[b]	Median Class	Median pH (pH Unit)	Limiting CoPC[a]
TSF Borrow Pit 1	TSF BP1	Borrow pit east of Cell 1	3	4a	8.09	EC, SO_4
TSF Borrow Pit 2	TSF BP2	Borrow pit west of Cell 1 / Cell 2	7	2	8.32	-
TSF Cell 1	TSF Cell 1	Cell 1	36	5	6.85	Zn
TSF Cell 1 Discharge Pipe	TSF Cell 1 DP	Outflow pipe from TSF Cell 1	1	5	7.17	Zn
TSF Cell 1 Filter Pipe	TSF C1FP	Filter pipe located on northern embankment of Cell 1	2	4c	6.77	EC, Zn, SO_4
TSF Cell 2 A	TSF C2A	Cell 2 - west side of causeway	33	5	6.62	Zn
TSF Cell 2 B	TSF C2B	Cell 2 - east side of causeway	11	5	6.11	Pb, Zn, SO_4n
TSF Cell 2 Spillway Seep	TSF C2SS	Water intercepted from the spillway	7	5	7.59	Zn
TSF Cell 2 Spillway Seep Recovery Bore	TSF C2SS RB	Recovery bore at old Cell 2 spillway	3	5	6.69	Zn
TSF Cell 2 Wall Seep	TSF C2WS	Water intercepted from the Cell 2 west corner	3	4c	7.37	Zn, SO_4
TSF Interception Trench Sump	TSF ITS	Lowest sump in the trench to the north of Cell 1	51	4c	7.29	EC, SO_4
TSF Water Management Dam	TSF WMD	Clean water dam to the southwest of Cell 2	56	4c	7.97	EC, SO_4
TSF Water Management Dam Release Point	TSF WMD RP	Outlet of the WMD siphons	4	4c	7.88	EC, SO_4
TSF Water Management Dam Sump 3	TSF WMD Sump 3	Sump to southeast of WMD that collects water from the WMD pipeline drain	12	6	6.85	Zn
TSF Waterhole	TSF WH	Wetland to the west of Cell 2	5	4a	7.76	EC, SO_4
Mill Anti Pollution Pond	Mill APP	Runoff pond to the northwest of the HM Plant	11	5	6.75	Zn
Mill Concentrator Runoff Pond	Mill CRP	Runoff pond to the north of the Concentrator	12	5	6.95	Pb, Zn
Mill Old ROM Pad Sump	Mill ORPS	Sump adjacent to west perimeter of the old ROM Pad	4	6	6.25	Zn

[a] refers to filtered metals only
[b] during 2020/21 reporting period

4.2.2 Performance over reporting period

The results of the 2020/21 ASW study have been assessed against the relevant Trigger Action Response Plan (TARP) from MRM's Adaptive Management Plan (MRM, 2020b). The relevant TARP refers to the quality of water passively released to the receiving environment from sediments traps. The only sediment trap to passively release to the receiving environment over the reporting period was the NOEF South West Sediment Trap (NOEF SWST). The relevant sediment trap TARPs are provided in Table 4.5.

Based on the ASW assessment, NOEF SWST had a median water class of 2 during the 2020/21 reporting period. This would trigger the Level 1 TARP, which would not require any immediate actions aside from continuing the monitoring program and annual reporting.

Table 4.5 – Sediment trap TARP

Environmental objective	Performance indicator	Monitoring site(s)	Parameters	Frequency/sample size	Analysis/sampling methodology	Level	Triggers	Action/Response
Protect the McArthur River beneficial users and community values from mining impacts	Sediment trap water quality is of acceptable standard	Sediment management sites	Physical and chemical parameters detailed in WDL 174	Weekly	Samples are collected in accordance with MRM's Artificial Surface Water Monitoring procedure PRO-2200025	Level 1	Sediment trap water quality is Class 2 or better based on median concentrations over the reporting period (as detailed in the WMP)	Continue monitoring program. Annual reporting.
						Level 2	Sediment trap water quality is Class 4 based on median concentrations over the reporting period (as detailed in the WMP)	Implement investigation to determine if additional controls or management actions are necessary to return trigger value to Level 1. Continue monitoring program. Annual reporting.
						Level 3	Sediment trap water quality is Class 5 or greater based on median concentrations over the reporting period (as detailed in the WMP)	Implement Level 3 investigation and response process as detailed in Section 5.1 of the Adaptive Management Plan. Consider potential sources and pathways, which may have contributed to the trigger exceedance. Undertake investigation to determine the performance of the environmental objective considering results from other monitoring programs and historical (Pre-Overburden Management Project) performance. Issue assessment report to DEPWS, DITT within 10 days of assessment completion. Consider implementation of management and contingency measures outlined in Section 6 and 7 of the Adaptative Management Plan.

4.3 WATER QUALITY TREATMENT

During the 2020/21 reporting period, NOEF SEPROD treated Class 5 and 6 waters using hydrated lime. Water was treated as required, up to a rate of 240 L/s with pumped mine water inflows and treated water outflows occurring simultaneously. The treated water was dewatered from NOEF SEPROD to Water Management Dam (TSF WMD) via Pond 2 (OP P2).

Figure 4.2 shows the following information for the reporting period:

- Tonnes of hydrated lime used in NOEF SEPROD;
- Recorded water levels and stored volumes in NOEF SEPROD;
- Metered mine water transfers pumped into NOEF SEPROD for treatment; and
- Metered mine water transfers pumped out of NOEF SEPROD to OP P2.

The following is of note regarding Figure 4.2:

- 764.2 tonnes of hydrated lime was used in NOEF SEPROD during the reporting period, the majority of which was used during the wet season;
- Approximately 2,913 ML was pumped into NOEF SEPROD during the reporting period, 2,695 ML of which was treated and transferred to OP P2. The remainder was dewatered to NOEF SPROD and OP PP when the NOEF SEPROD stored water volume exceeded the Maximum Operating Level volume (440 ML);
- Based on the volume of mine water transfers pumped out of NOEF SEPROD to OP P2, MRM used approximately 284 kg (0.28 tonnes) of hydrated lime per 1 ML of Class 5/6 water transferred to TSF WMD during the reporting period; and
- OP WTP was not operated during the 2020/21 reporting period.

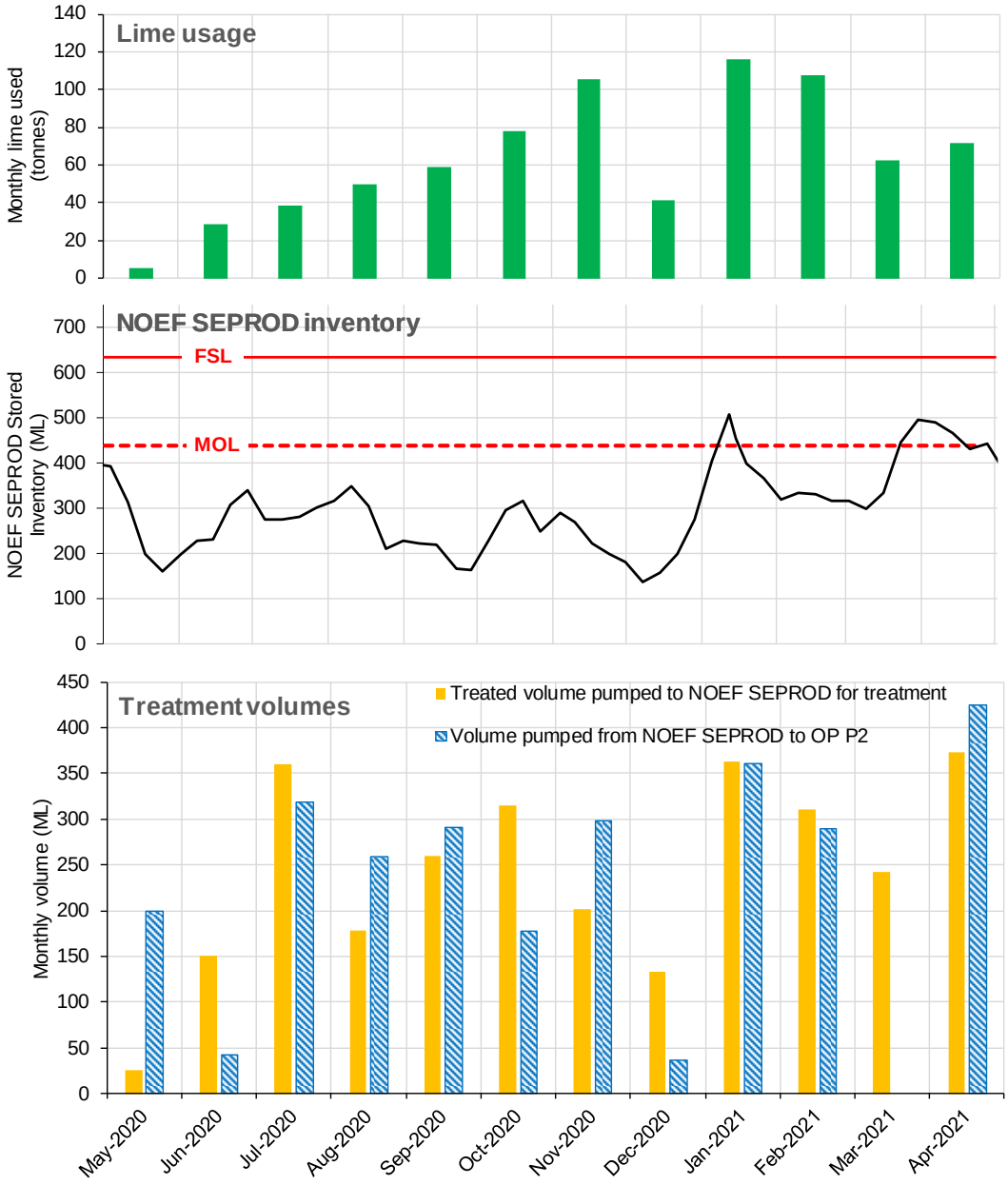

Figure 4.2 – Recorded lime usage, NOEF SEPROD inventory levels and NOEF SEPROD transfer volumes

4.4 MINE WATER DISCHARGE EVENTS

4.4.1 General

As discussed in Section 3.2, MRM's WDL allows for the conditional discharge of wastewater at specified locations, including from the MLDP into the old McArthur River and from the SEL1 DP into Barney Creek. The location of these discharge points is shown in Figure 3.2. Potential discharge water sources are also shown in Figure 3.2.

In addition, pursuant to the Mining Management Act (NT) in the VoA, MRM is authorised for managed releases of wastewater at the TSF WMD into the Little Barney Creek (via the WMD RP).

WDL 174-11 identifies the downstream compliance point as SW11, which is also shown in Figure 3.2. Potentially mine-affected waters are considered mixed by the time the river flow passes SW11 through the use of mixing zones upstream of SW11.

4.4.2 Water volume discharged during the reporting period

Table 4.6 shows the releases from MLDP, SEL1 DP and WMD RP to the McArthur River receiving waters between 1 May 2020 and 30 April 2021. A total of approximately 2037.7 ML was released from authorised discharge points during the 2020/21 reporting period. This included:

- approximately 711.3 ML via the MLDP (from TSF WMD and OP P2);
- approximately 18.0 ML via the SEL1 DP (from NOEF SEL1); and
- approximately 1,308.4 ML via the WMD RP (from the TSF WMD syphons).

Table 4.6 – MLDP, SEL1 DP and WMD RP managed releases (sorted by release start date)

Discharge event ID	Managed release point	Location Site ID	Release Start Date / Time	Release Finish Date / Time	Release flow rate* (l/s)	Duration	Total Release (ML)
1	MLDP	P2	20/12/2020 7:26	20/12/2020 16:00	304	9 hrs	9
2	MLDP	WMD	20/12/2020 7:46	20/12/2020 20:00	298	12 hrs	13
3	MLDP	WMD	22/12/2020 8:30	8/01/2021 16:59	283	17.4 days	425
4	SEL1	SEL1	24/12/2020 14:00	28/12/2020 12:15	53	3.9 days	18
5	WMD RP	WMD	25/12/2020 16:40	28/12/2020 11:35	1,149	2.8 days	274
6	WMD RP	WMD	30/12/2020 8:15	4/01/2021 14:00	1,047	5.2 days	475
7	MLDP	WMD	22/02/2021 13:20	24/02/2021 16:57	301	2.2 days	56
8	WMD RP	WMD	22/02/2021 13:35	23/02/2021 14:35	916	1 days	82
9	WMD RP	WMD	21/03/2021 11:57	29/03/2021 17:41	670	8.2 days	477
10	MLDP	WMD	21/03/2021 12:52	29/03/2021 14:27	298	8.1 days	208

* Average over release period

4.4.3 Water quality discharged during the reporting period

Figure 4.3 to Figure 4.7 show the managed release volumes (separated by source) and the water quality in OP P2, TSF WMD and NOEF SEL1 for the following analytes:

- pH
- Electrical conductivity (EC)
- Sulphate
- Filtered thallium; and
- Filtered zinc.

The following is of note regarding these results:

- For OP P2:
  - pH, EC and sulphate levels remained relatively consistent before and after managed releases were undertaken.

- Filtered thallium and filtered zinc levels were elevated for the first six months of the year before gradually reducing during November and December 2020. Levels generally remained lower throughout the remainder of the wet season, including when managed releases occurred on 20 December 2020.

- For TSF WMD:
  - pH, EC and sulphate levels remained at relatively consistent levels before and after managed releases were undertaken.
  - Filtered thallium and filtered zinc levels were elevated for the first six months of the year before gradually reducing during November and December 2020. Levels generally remained lower throughout the remainder of the wet season, including when managed releases occurred. Filtered thallium and filtered zinc levels tended to increase during refilling of the TSF WMD following release events. It is possible that levels remained low during the wet season due to dilution from rainfall-runoff inflows.
- For NOEF SEL1:
  - pH levels remained at relatively consistent levels before and after managed releases were undertaken.
  - EC and sulphate levels were elevated during the dry season due to evapo-concentration. Levels dropped immediately at the commencement and prior to undertaking managed releases. It is likely that the significant reduction in EC and sulphate levels in December 2020 was due to dilution from rainfall-runoff inflows
  - Filtered thallium and zinc levels were generally low during the reporting period. There was a slight elevation of filtered metal levels during April 2021. The source of elevated filtered zinc levels at the end of the reporting period may be due to mine affected inflows from East Drain Sump.

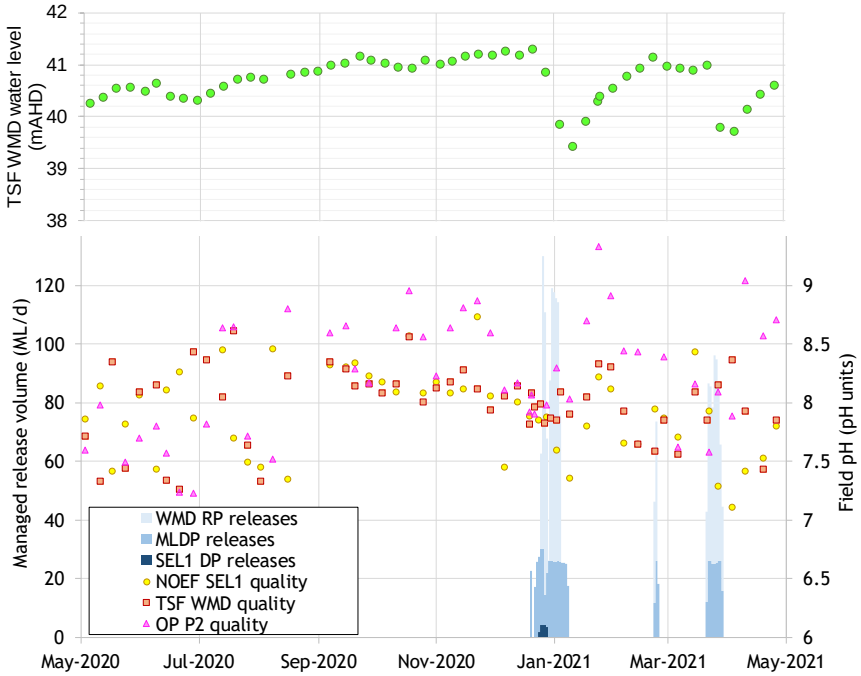

Figure 4.3 – Recorded pH at OP P2, NOEF SEL1 and TSF WMD, managed releases from the Mine, TSF WMD water level

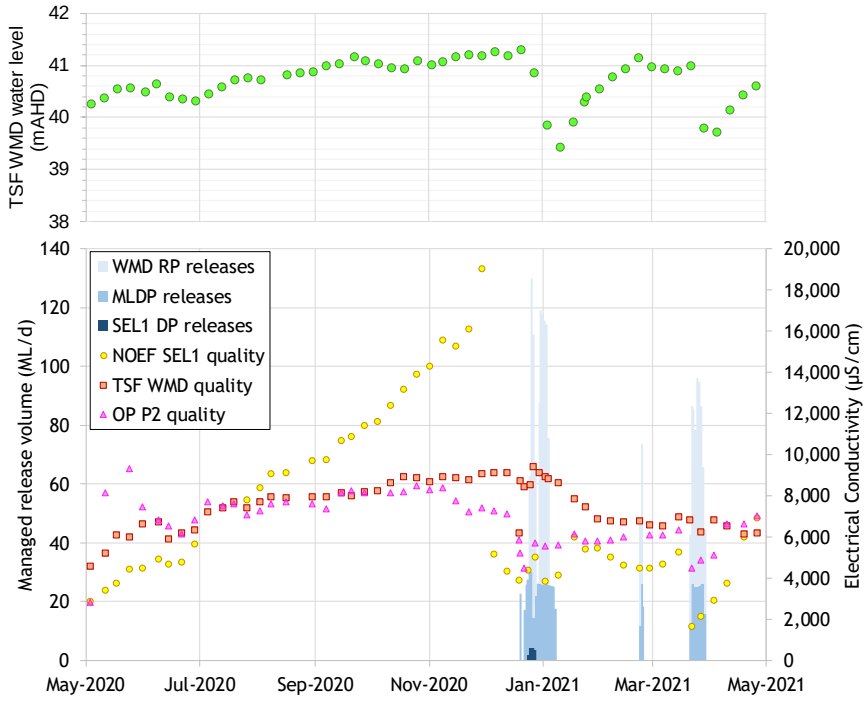

Figure 4.4 – Recorded EC at OP P2, NOEF SEL1 and TSF WMD, managed releases from the Mine, TSF WMD water level

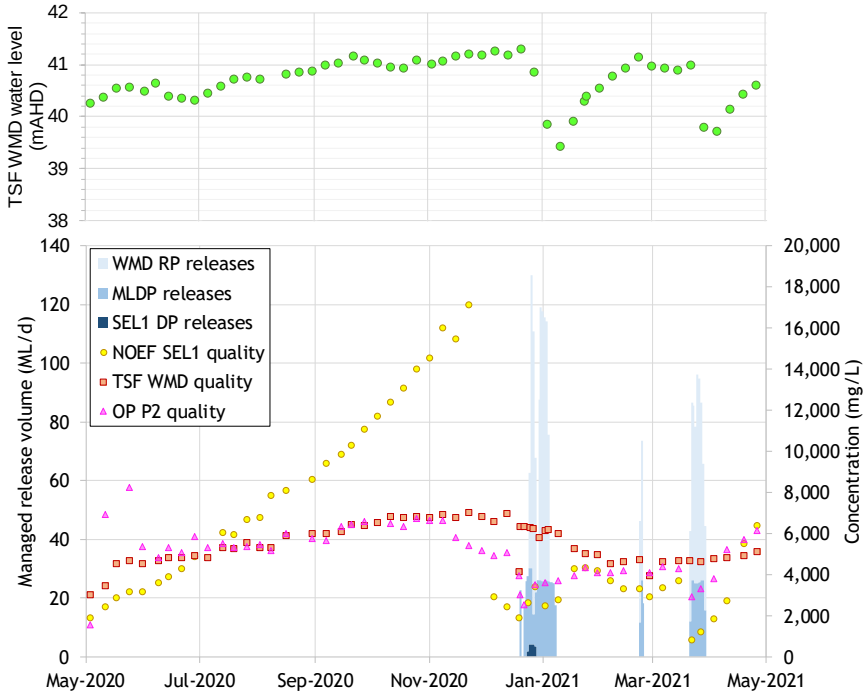

Figure 4.5 – Recorded sulphate at OP P2, NOEF SEL1 and TSF WMD, managed releases from the Mine, TSF WMD water level

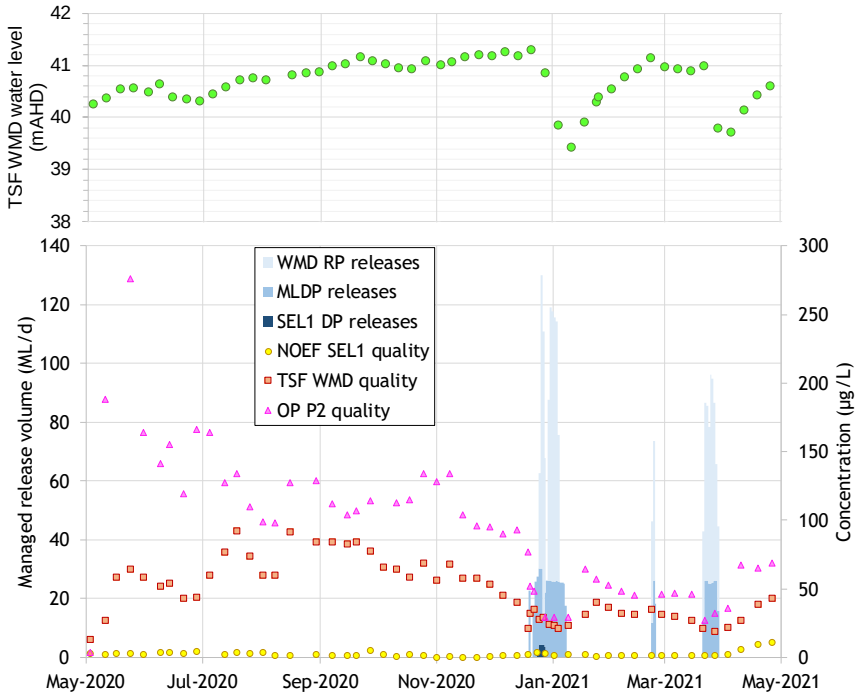

Figure 4.6 – Recorded filtered thallium at OP P2, NOEF SEL1 and TSF WMD, managed releases from the Mine, TSF WMD water level

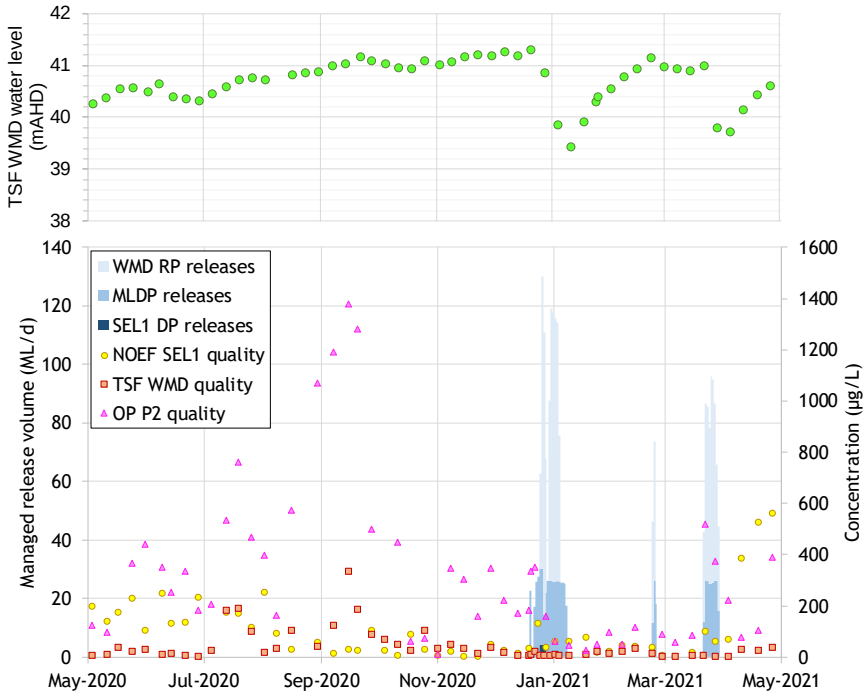

Figure 4.7 – Recorded filtered zinc at OP P2, NOEF SEL1 and TSF WMD, managed releases from the Mine, TSF WMD water level

4.4.4 Downstream water quality

The potential downstream impacts of releases from WMD RP was investigated in accordance with conditions of the VoA. This included:

- Investigating the recorded water quality at SW03 and SW06 (or SW20 when SW06 was not available) during days when releases occurred; and
- Reviewing of inspection records of Little Barney Creek as evidence of visible flows conditions and erosion checks during days when there were releases from WMD RP.

Figure 4.8 shows the recorded EC at SW03 and SW06 (or SW20 when SW06 records were not available), which was assessed for WMD RP release days as per the VoA. This figure also shows the weekly rainfalls during the reporting period, as well as the WMD RP release days. The following is of note:

- EC levels in Barney Creek (and the Barney Creek Diversion Channel) were typically elevated during managed release events from WMD RP (up to 7,391 µS/cm at SW03) due to elevated EC levels in WMD RP water releases;
- EC levels in Barney Creek at SW03, and SW06/SW20 reduced to less than 300 µS/cm immediately following the cessation of the January 2021 managed release events from WMD RP. EC levels at SW20 also reduced to natural baseline levels following the cessation of WMD RP releases. EC levels at SW06/SW20 increased again as natural surface runoff receded and mine affected base flows dominated inflows to Barney Creek Diversion Channel;
- EC levels at SW06/SW20 initially reduced and then became elevated following the February 2021 and March 2021 WMD RP release event;
- During managed releases from WMD RP, EC levels in Barney Creek at SW06/SW20 were generally within the range of typical dry season EC levels; and
- EC levels in downstream locations (SW06 and SW20) were typically lower than upstream readings (SW03) during WMD RP release events, suggesting that the WMD RP releases were diluted by natural catchment inflows (i.e. Surprise Creek).

As highlighted in Section 4.5, although EC levels were elevated in Barney Creek during the WMD RP releases, the monitoring records demonstrated that release water was rapidly diluted in the McArthur River and there were no exceedances of the EC SSTV at the SW11 compliance point.

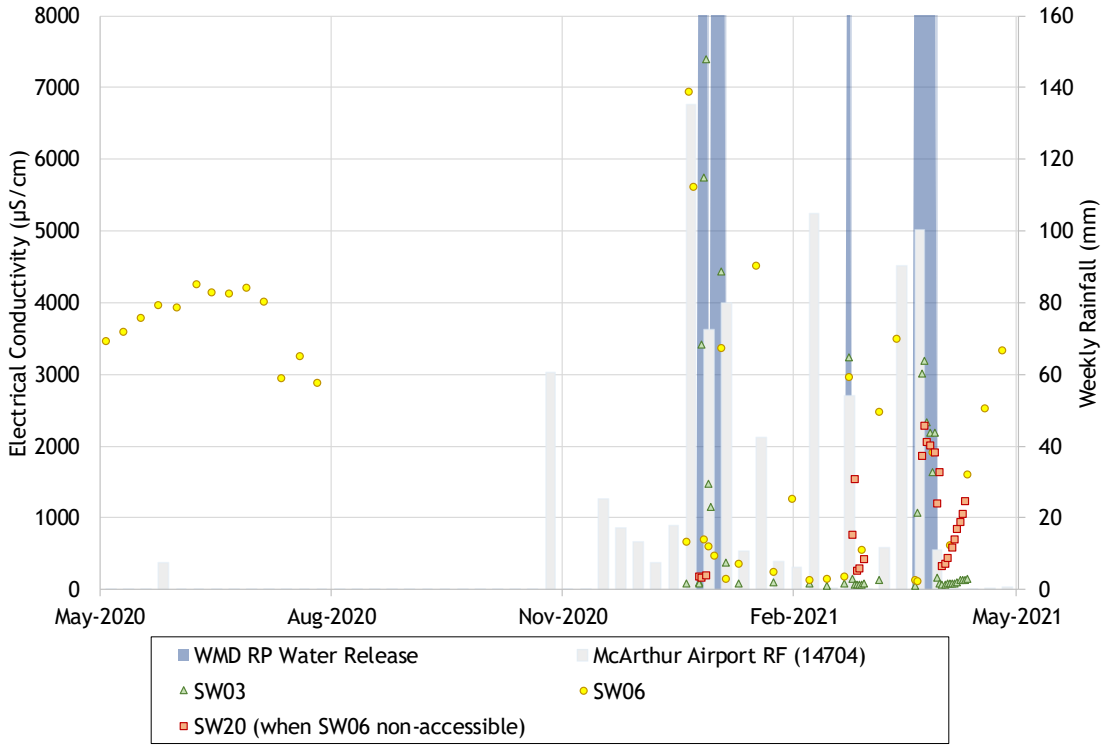

Figure 4.8 – Recorded EC at SW03 and SW06 (or SW20) during managed releases from WMD RP

4.4.5 Inspections undertaken during managed mine water discharges

MRM personnel are required to measure field parameters at SW03 and SW06 (or SW20 when SW06 was not accessible) during and for two weeks following completion of the release activities for the season or until parameters return to baseline in accordance with conditions of the VoA.

Figure 4.9 shows a summary of the inspection records downstream of the WMD RP. The following is of note regarding the four WMD RP release events (release events 5, 6, 8 and 9 in Table 4.6):

- Release event 5 (December 2020):
  - During the release event, water quality was recorded at SW03 and SW06/20 for 4 of the 4 release days
- Release event 6 (December 2020/January 2021):
  - During the release event, water quality was recorded at SW03 during 5 of the 6 release days. Water quality was recorded at SW06/20 for 6 of the 6 release days.
- Release event 8 (February 2021):
  - During the release event, water quality was not recorded at SW03 or SW06/20 for the first day of the release event. Water quality was recorded at both locations of the second (and final) day release event.
- Release event 9 (March 2021):
  - During the release event, water quality was recorded at SW03 and SW06/20 for 9 of the 9 release days.
  - Following the release event, water quality at the downstream locations was recorded daily for the 2 weeks following completion of release activities for the season in accordance with the VoA.

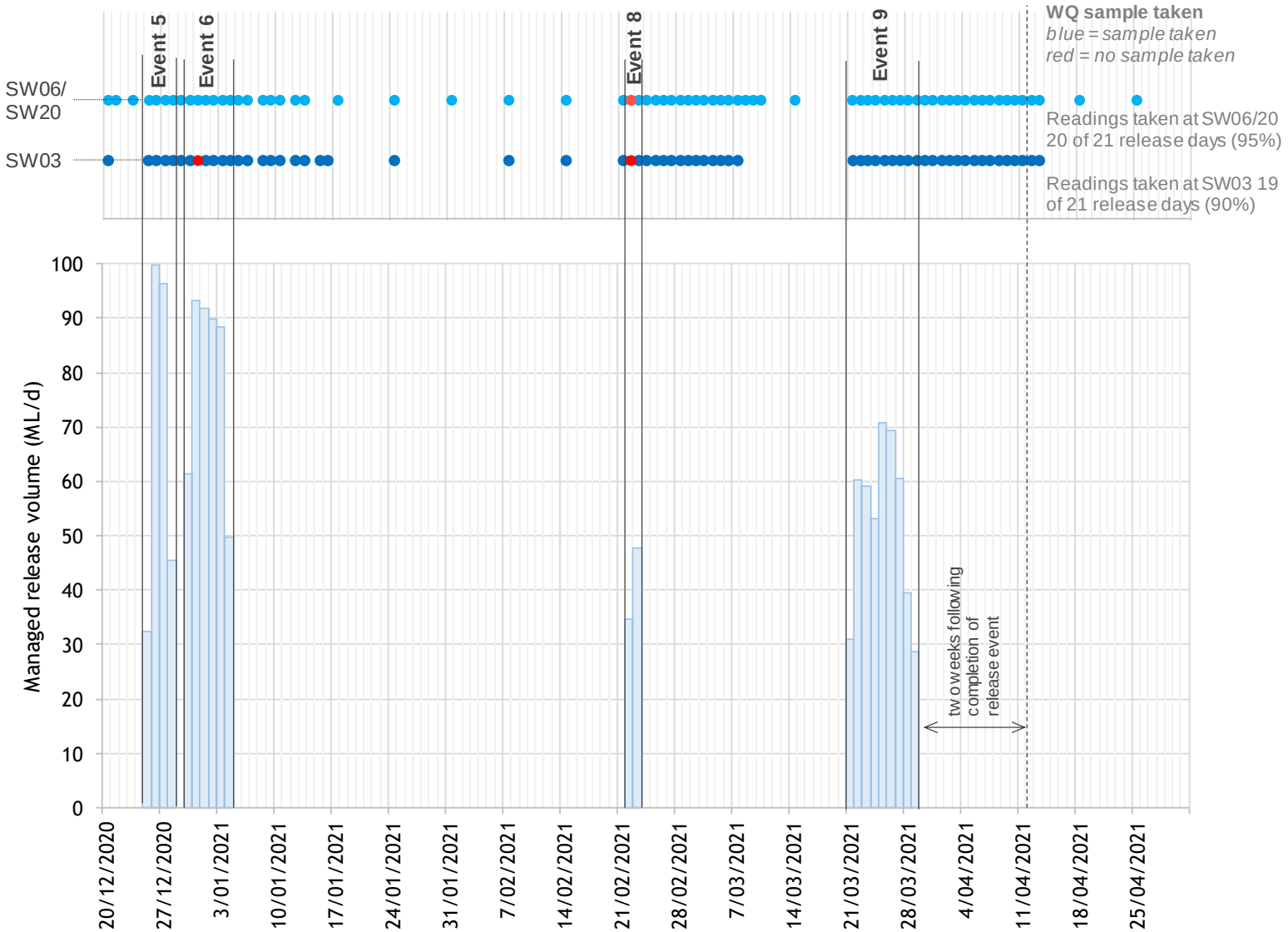

Figure 4.9 – WMD RP inspection summary, at downstream locations (SW03, SW06/SW20)

4.4.6 Flow and erosion monitoring

MRM personnel are required to undertake daily inspections of the Little Barney Creek Diversion Channel in accordance with conditions of the VoA during WMD RP managed release events. Inspections are undertaken to confirm that:

Continuous flow in Little Barney Creek is occurring along the length of the drainage system between the WMD RP release outlet and Little Barney Creek Diversion Channel; and

There is no noticeable erosion occurring in the rock basin (e.g. gullying of the WMD downstream embankment)

Figure 4.10 shows the WMD RP inspection area.

The inspection records completed during WMD RP managed release events are shown in Figure 4.11. This figure shows that:

- Observable flow conditions were observed 21 of the 21 release days from WMD RP; and
- The condition of the rock basin was confirmed to not be affected by erosion 21 of the 21 release days from WMD RP.

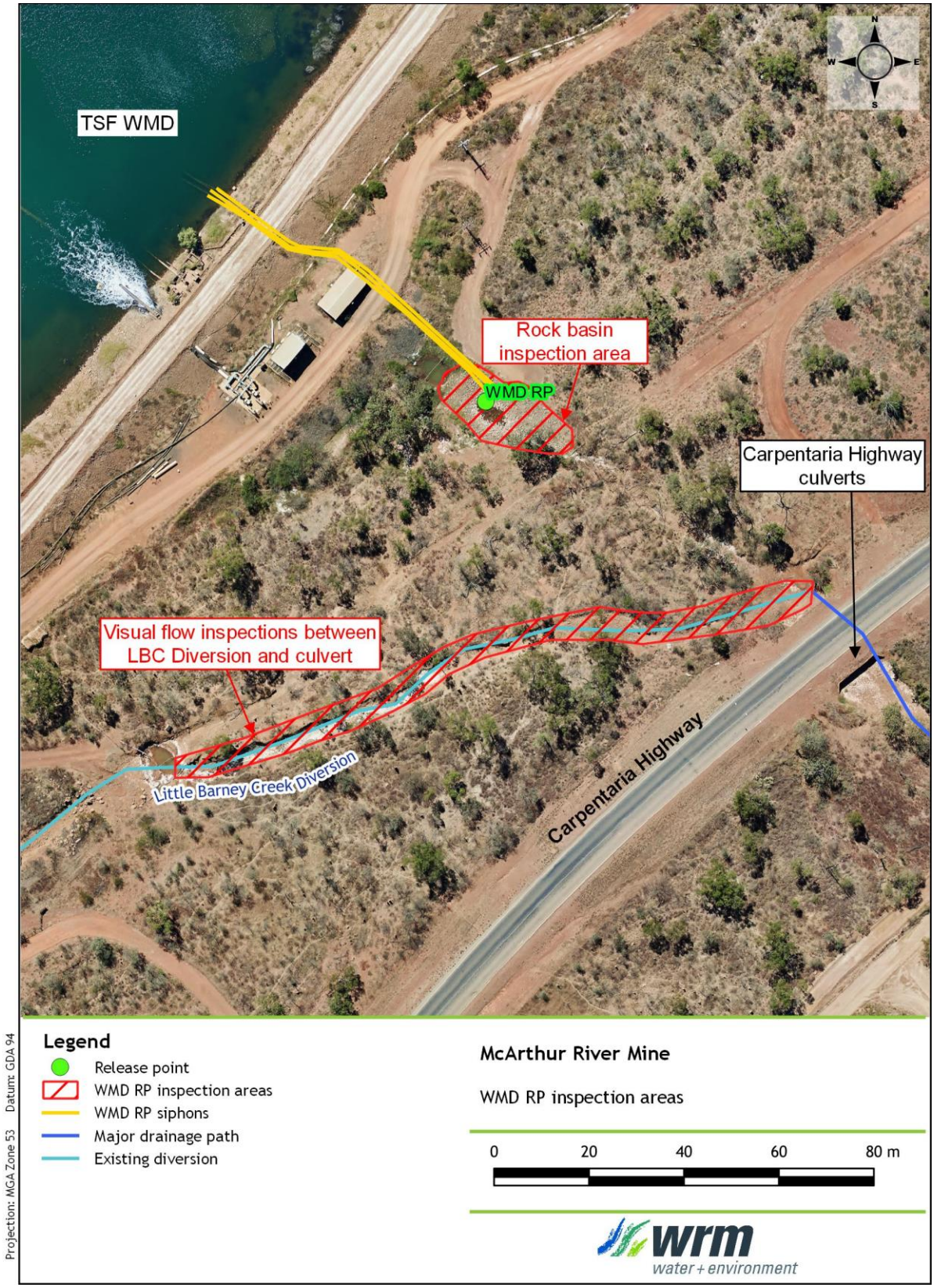

Figure 4.10 – WMD RP inspection area

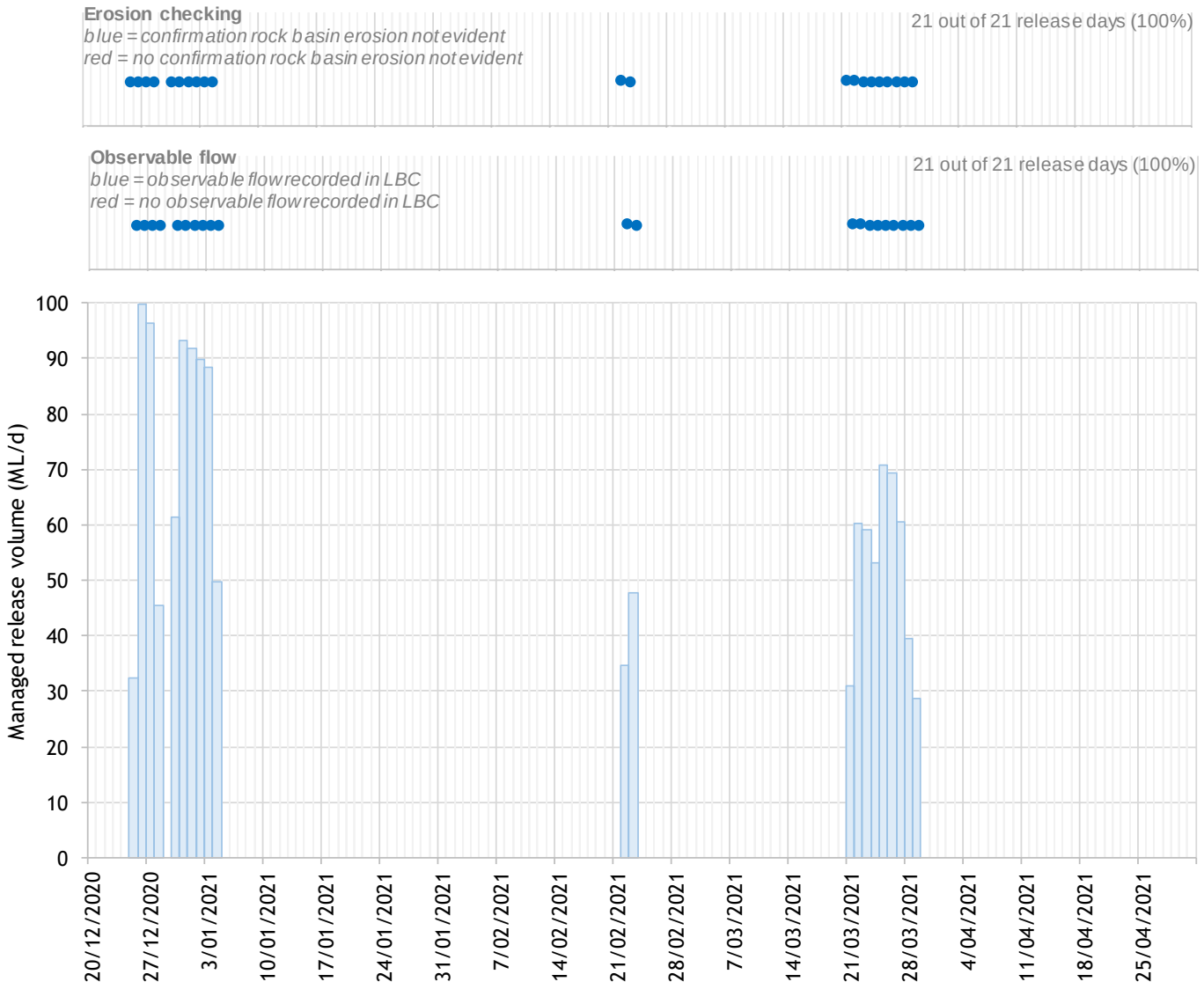

Figure 4.11 – WMD RP inspection summary, at WMD RP

Additional details regarding the geomorphology of Little Barney Creek as it relates to the risk of erosion downstream of the WMD RP is provided in Section 4.4.7.

4.4.7 Little Barney Creek geomorphic assessment

Appendix E -presents a review of Little Barney Creek geomorphic characteristics downstream of WMD RP. This assessment was undertaken in accordance with conditions of the VoA. The findings of this assessment included:

- little to no erosion occurred in the vicinity of the Little Barney Creek culvert crossing and therefore it is expected that no major geomorphic changes have occurred as a result of any authorised discharge from the WMD RP; and
- There have been no significant changes in the Little Barney Creek channel with little to no bed erosion along the length of the channel since 2018.

4.5 SSTV EXCEEDANCES

An investigation report for an exceedance of an SSTV is undertaken in accordance with condition 38 of the WDL when:

1. An exceedance of a trigger value at SW11 on three consecutive sampling occasions.
2. An exceedance of greater than or equal to three times a trigger value at SW11.
3. Subsequent consecutive exceedances of trigger values as described above.

In the reporting period, 2 investigation reports related to exceedance of an SSTV at SW11 were documented by MRM and submitted to DEPWS, as required by WDL 174-11. Table 4.7 summarises each of the exceedances. Further information of exceedances necessitating an investigation report for the water quality parameters Al_F and NO_3 are in Sections 4.5.1.1 and 4.5.1.2.

The nature of the exceedances is discussed in the following sections.

Table 4.7 – Summary of SSTV Exceedances and WDL Notifications during the Reporting Period

Exceedance ID	Date of Exceedance	Description	DO (85 to 125 % sat)	NO_3 (700 ug/L)	Fe_F (300 ug/L)	Al_F (55 ug/L)	Reportable Under WDL Condition 39*
EXC0086	28/06/2020	SW11 exceedance for DO (lower limit)	83.5	-	-	-	No
EXC0087	12/07/2020	SW11 exceedance for DO (lower limit)	60.0	-	-	-	No
EXC0088	7/09/2020	SW11 exceedance for DO (upper limit)	131.9	-	-	-	No
EXC0089	20/12/2020	SW11 exceedance for NO3	-	2,079	-	-	No
EXC0090	21/12/2020	SW11 exceedance for NO3	-	1,694	-	-	No
EXC0091	23/12/2020	SW11 exceedance for NO3	-	1,051	-	-	Yes
EXC0092	23/12/2020	SW11 exceedance for DO	84.9	-	-	-	No
EXC0093	27/12/2020	SW11 exceedance for DO and Al_F	80.8	-	-	135	No
EXC0094	31/12/2020	SW11 exceedance for Al_F	-	-	-	270	Yes
EXC0095	10/01/2021	SW11 exceedance for DO (lower limit) and NO3	84.3	763	-	-	No
EXC0096	17/01/2021	SW11 exceedance for DO (lower limit)	33.3	-	-	-	No
EXC0097	26/01/2021	SW11 exceedance for Al_F and Fe_F	-	-	307	75	No
EXC0098	9/02/2021	SW11 exceedance for DO (lower limit)	83.2	-	-	-	No
EXC0099	16/02/2021	SW11 exceedance for Al_F	-	-	-	129	No
EXC0100	21/02/2021	SW11 exceedance for Al_F	-	-	-	85	No
EXC0101	21/03/2021	SW11 exceedance for Al_F	-	-	-	63	No
EXC0102	22/03/2021	SW11 exceedance for Al_F	-	-	-	63	No
EXC0102	28/03/2021	SW11 exceedance for DO (lower limit)	83.1	-	-	-	No

* - An exceedance of a trigger value at SW11 on three consecutive sampling occasions; 2. an exceedance of greater than or equal to three times a trigger value at SW11; 3. subsequent consecutive exceedances of trigger values as described in 1 and 2.

4.5.1.1 Aluminium (Filtered)

Figure 4.12 shows the Al_F levels for SW09, SW11, SW12 and SW21 during the 2020/2021 wet season. The following is of note with respect to the Al_F exceedances during the reporting period:

- Seven exceedances of the Al_F SSTV occurred at SW11 during the reporting period, with only one triggering an investigation event due to a value exceeding three-times the SSTV. All exceedances occurred on or after 27 December 2020.
- Mine water discharges were occurring during the exceedance event on 31 January 2021. Notwithstanding this, the Al_F levels in the discharged mine water were lower than the upstream McArthur River control monitoring location (SW21). Hence, it was found that the mine water discharges did not contribute to the Al_F exceedance at SW11.
- Numerous natural exceedances of the Al_F SSTV at SW11 have occurred during every wet season reviewed (see Figure 3.8). As in previous years, the reported SW11 exceedances during the reporting period coincided with even higher Al_F concentrations at sites upstream of the mine influence, such as SW09 and SW21. Hence, the reported Al_F exceedances (including the results triggering investigation) during the reporting period were not caused by mining activities at MRM.

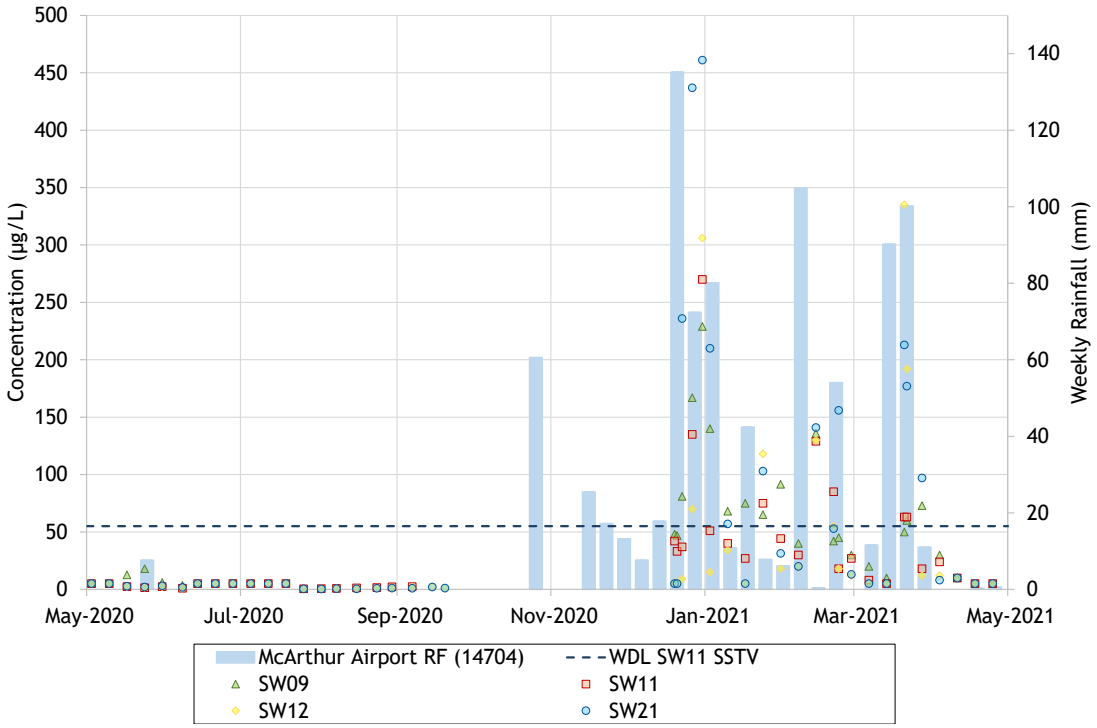

Figure 4.12 – McArthur River and Glyde River, Reporting Period - Al_F and Weekly Rainfall - May 2020 to April 2021

4.5.1.2 NO_3

Figure 4.13 shows the NO_3 levels for SW09, SW11, SW12 and SW21 during the 2020/2021 wet season. The following is of note with respect to the NO_3 exceedances during the reporting period:

- Four exceedances of the NO_3 SSTV occurred at SW11 during the reporting period, three of which occurred in a row, triggering an investigation event. The exceedances occurred

during December and January. The highest recorded value was 2,079 µg/L on 20 December 2020, which is lower than three times the SSTV of 700 µg/L.

- Water discharge occurred during two of the four reported exceedances. Notwithstanding this, the NO_3 levels in the discharged mine water were lower than the upstream McArthur River and Glyde River control monitoring locations (SW09 and SW21). Hence, it was found that the mine water discharges did not contribute to the NO_3 exceedance at SW11.
- Numerous natural exceedances of the NO_3 SSTV have occurred during most years reviewed. As in previous years, the SW11 exceedances during the reporting period coincided with even higher NO_3 levels at sites upstream of the mine influence, particularly in the Glyde River at SW09.

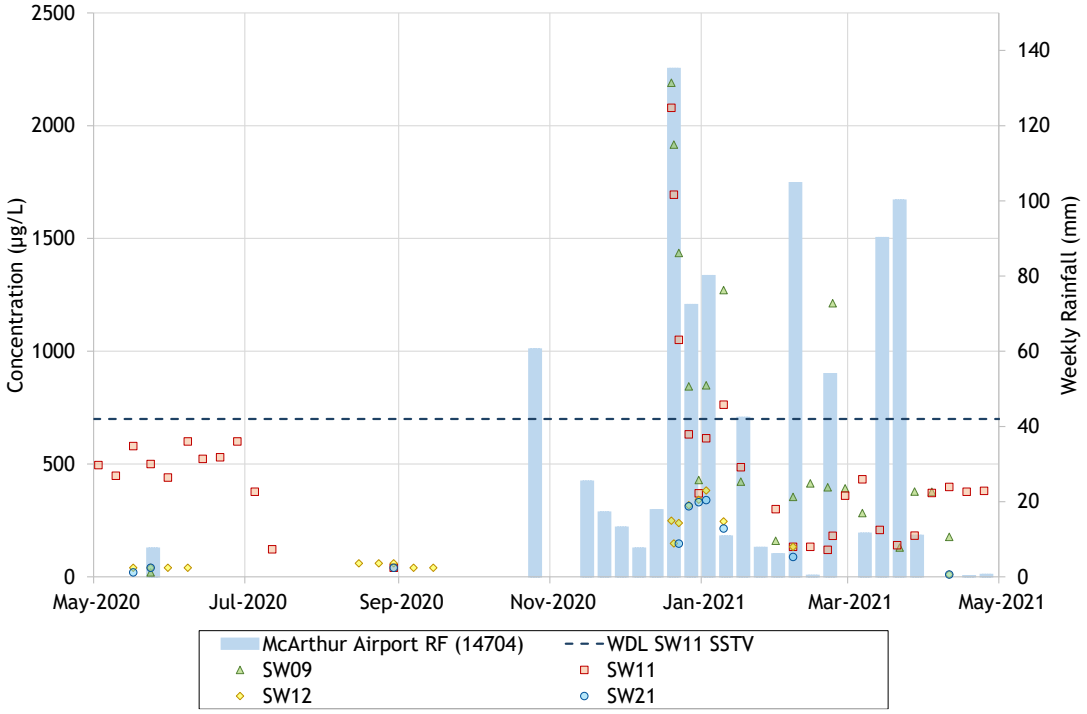

Figure 4.13 – McArthur River and Glyde River, Reporting Period - NO_3 and Weekly Rainfall - May 2020 to April 2021

4.5.2 Performance over the reporting period

The results of the 2020/21 NSW quality assessment have been assessed against the downstream water quality TARP from MRM's Adaptive Management Plan (MRM, 2020a). The relevant TARPs refer to the 2020/21 SSTV exceedances at SW11, which are discussed in Section 4.5.2. The relevant TARPs are provided in Table 4.8.

Based on the assessment of the SSTV exceedances, the Mine was in Level 1 for the majority of the 2020/21 reporting period. The TARP level was elevated to Level 2 16 times in the 2020/21 reporting period. Triggering the Level 2 TARP required internal investigations and notifications to be undertaken and the continuation of monitoring.

The TARP level was elevated to Level 3 twice during the 2020/21 reporting period. Triggering the Level 3 TARP required MRM to submit an investigation report into the cause of the exceedances to DEPWS. Both investigation reports found that the exceedances were not due to the Mine and therefore the events were downgraded to Level 2 of the TARP.

Table 4.8 – Downstream water quality TARP

Environmental objective	Performance indicator	Monitoring site(s)	Parameters	Frequency/sample size	Analysis/sampling methodology	Level	Triggers	Action/Response
Protect the McArthur River beneficial users and community values from mining impacts	Water quality downstream of the McArthur River Mine lease does not exceed site specific trigger values.	SW11 detailed in Figure 6 of the Adaptive Management Plan	In accordance with WDL 174.	In accordance with WDL 174.	In accordance with WDL 174.	Level 1	SW11 analyte less than or equal to SSTV.	Continue monitoring program. Annual reporting.
						Level 2	SW11 analyte greater than SSTV but less than 3 x SSTV	Implement investigation to determine if additional controls or management actions are necessary to return trigger value to Level 1. Continue monitoring program. Annual reporting.
						Level 3	Monitoring indicates: 1. SW11 analyte greater than SSTV on three consecutive sampling occasions 2. SW11 analyte equal to or greater than 3 x SSTV 3. Subsequence consecutive exceedances of SSTVs described in 1 and 2 above	Implement Level 3 investigation and response process as detailed in Section 5.1 of the Adaptive Management Plan. Consider potential sources and pathways, which may have contributed to the trigger exceedance. If the exceedance is not due to the Mine, issue the investigation report to DEPWS, DITT within 10 days of assessment completion. Report as Level 2. If investigation confirms the exceedance is due to the Mine, undertake an assessment against the environmental objective considering results from other monitoring programs and historical (Pre-Overburden Management Project) performance. Issue assessment report to DEPWS, DITT within 10 days of assessment completion. Consider implementation of management and contingency measures outlined in Section 6 and 7of the Adaptative Management Plan.

5 Bing Bong Loading Facility

5.1 SITE LOCATION AND INFRASTRUCTURE

The Bing Bong Loading Facility (BBLF) is located on the Gulf Coast, approximately 120 km north of the Mine (Figure 1.1). The BBLF is situated on MLN 1126, which is located on the Bing Bong Pastoral Lease, owned by Colinta Holdings Pty Ltd.

Road trains fitted with protective covers transport the bulk concentrate from the Mine to the BBLF. The concentrate is offloaded within the Concentrate Shed, a fully covered unloading storage facility. Three surface runoff ponds (BB SRPs) are located around the southeast corner of the Concentrate Shed. These ponds capture/contain rainfall and surface water runoff from the shed and surrounding area. Water contained in the ponds is disposed of via sprinkler and pond evaporation.

Adjacent to the Bing Bong mineral lease (MLN 1126) is the Dredge Spoil Emplacement Area (DSEA), which is also known as the Dredge Spoil Ponds. The emplacement facility is located on the former Non-Pastoral Land Use Approval, NP033.

The purpose-built bulk carrier, MV Aburri, is used to transfer concentrate from the Concentrate Shed to large bulk carrier ships off the Gulf Coast via the shallow Swing Basin and Bing Bong navigation channel. When required, maintenance dredging of the basin and navigation channel occurs to ensure the MV Aburri has sufficient depth (>3.5 m draft) to operate fully loaded. A cutter-suction dredge is typically used to remove marine clays and silts, depositing dredge spoil onshore at the DSEA. Dredging was last completed in 2013.

The DSEA consists of a series of settling ponds or cells designed to increase retention times allowing for dredge fines to settle and marine water to pass between cells. A perimeter drain constructed along the west, south and eastern external boundaries of the DSEA was installed to intercept seepage when the dredge ponds are in operation or when the ponds contain significant amounts of direct rainfall.

In accordance with WDL 174-11, controlled discharge is passively released from the perimeter drain at the Bing Bong Dredge Discharge Point (BBDDP).

Figure 5.1 – Bing Bong Loading Facility Site Layout

5.2 PHYSICAL ENVIRONMENT

5.2.1 Climate

The BBLF experiences a monsoonal climate regime similar to the Mine, which is strongly seasonal with distinct wet and dry seasons. The average daily minimum and maximum temperatures at BBLF range between approximately 19^{0}C (in July) and approximately 35^{0}C in (November and December). Note that the BBLF climate averages are based on data for Centre Island within the Sir Edward Pellew Group, which is located about 40 km east of the BBLF.

5.2.2 Available data

Recorded rainfall data was available for the BBLF site for the reporting period was provided by MRM. Long term rainfall data was available from the SILO grid point at the Bing Bong Port at -15.65 latitude / 136.40 longitude.

Rainfall and evaporation data was obtained for the BBLF site from the Queensland Climate Change Centre of Excellence (QCCCE) SILO Data Drill Service. Days with missing data are in-filled with synthetic data that has been interpolated from recorded data at nearby regional stations as described by Jeffreys et al. (2001). The SILO Data Drill Service provides a continuous daily data set between 1889 and 2021, including derived daily pan evaporation, lake evaporation and actual evapotranspiration rates for the Bing Bong Port.

5.2.3 Rainfall

Table 5.1 shows the mean monthly and annual rainfalls at the BBLF site based on the available 132 years of data from the SILO Data Drill.

The average monthly rainfalls at BBLF exhibit distinct wet (November to April) and dry (May to October) seasons during the year, with a dry season low of 0.4 mm in August to a wet season high of 209 mm in February. BBLF has a mean annual rainfall of approximately 863 mm.

Rainfall is also monitored by MRM at the Bing Bong Port gauge (14729), located at the BBLF. Approximately 989 mm of rainfall occurred during the period between 1 May 2020, and 30 April 2021. The daily rainfall for this period for Bing Bong Port and the cumulative rainfall are shown in Figure 5.2.

5.2.4 Evaporation

Table 5.1 also shows the mean monthly and annual SILO Data Drill pan evaporation values at the BBLF site based on the available 132 years of data. Figure 5.3 shows the variation of mean monthly evaporation and evapotranspiration at the BBLF site. The average annual pan evaporation at the BBLF site is estimated to be approximately 2,533 mm, which is approximately 2.9 times the average annual rainfall. The evaporation rate is high throughout the year, with highest evaporation rates occurring in the months between August and January. Evaporation at BBLF is generally much higher than rainfall in all months, except February and March.

Table 5.1 – SILO Data Drill mean monthly rainfall and evaporation at BBLF

Month	Mean Monthly Rainfall (mm)	Mean Monthly Pan Evaporation (mm)
July	1.0	178.1
August	0.4	208.0
September	2.4	237.6
October	9.6	266.2
November	40.8	263.7
December	123.5	248.5
January	206.6	214.8
February	208.9	175.3
March	195.5	192.6
April	58.2	196.9
May	10.5	185.5
June	5.3	166.0
Annual	862.6	2,533

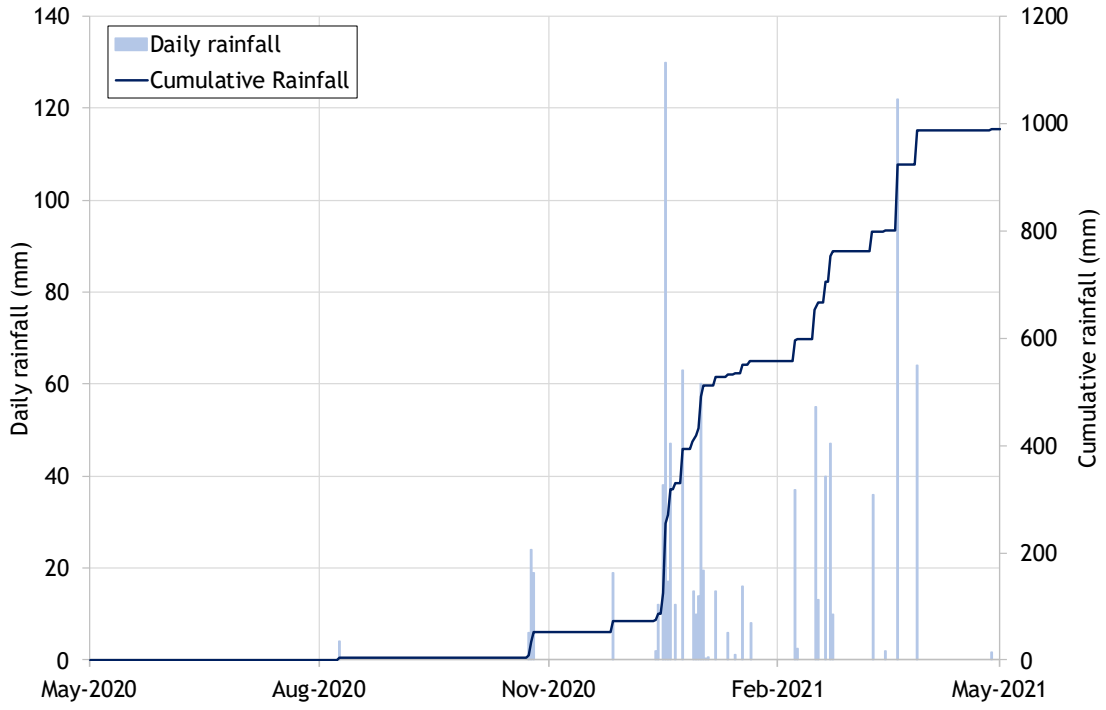

Figure 5.2 – Bing Bong Port Daily Rainfall and Cumulative Rainfall (1 May 2020 to 30 April 2021)

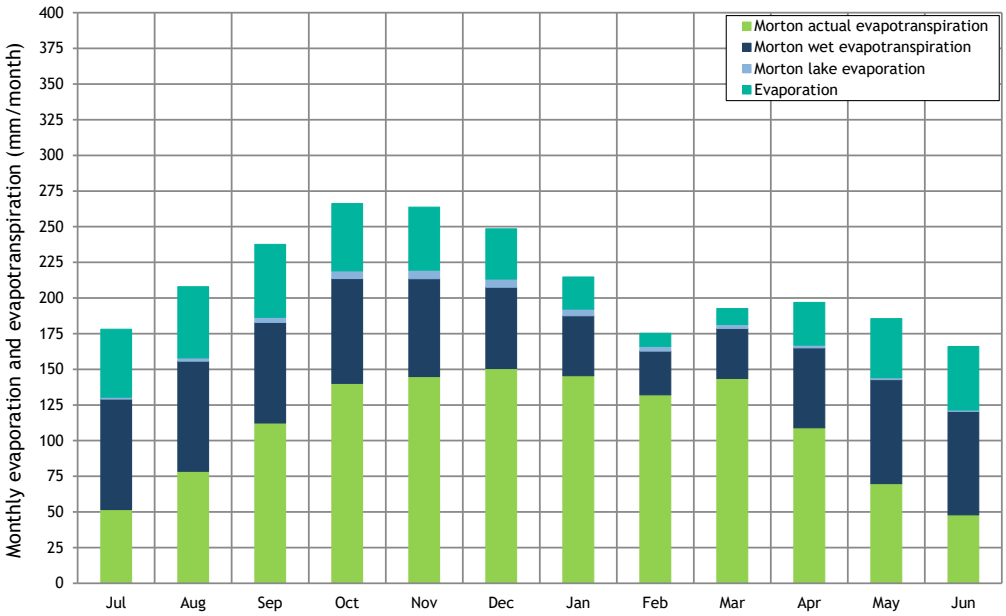

Figure 5.3 – SILO Data Drill monthly evaporation and evapotranspiration at BBLF

5.2.5 Surface Hydrology

The topography of the BBLF is shown in Figure 5.4. The majority of infrastructure involved with the transfer of concentrate on-shore to off-shore is situated on the built-up foreshore area immediately along the coast. The Concentrate Shed and the majority of the hardstand area are located upgradient of the main surface water runoff pond with sumps and pumps used to direct any downgradient runoff (particularly around the ship loader) back to the main pond.

The DSEA settlement ponds have been engineered for water to move between cells downgradient. Water flows from the north-western corner towards the south-eastern corner, diverting back up towards the north eastern corner and overflowing from Cell 5 into the drain. The elevation of the perimeter drain surrounding the DSEA is highest at monitoring location DSD04 and lowest at DSD01, exiting the drain to the environment via BBDDP.

The two dominant drainage features in the wider area are Mule Creek and Bing Bong Creek. Home Creek is a small tributary of the larger Bing Bong Creek. The BBLF is located on the catchment divide, with areas to the southeast of the dredge spoil ponds draining to Mule Creek and areas to the west draining to Home Creek then Bing Bong Creek.

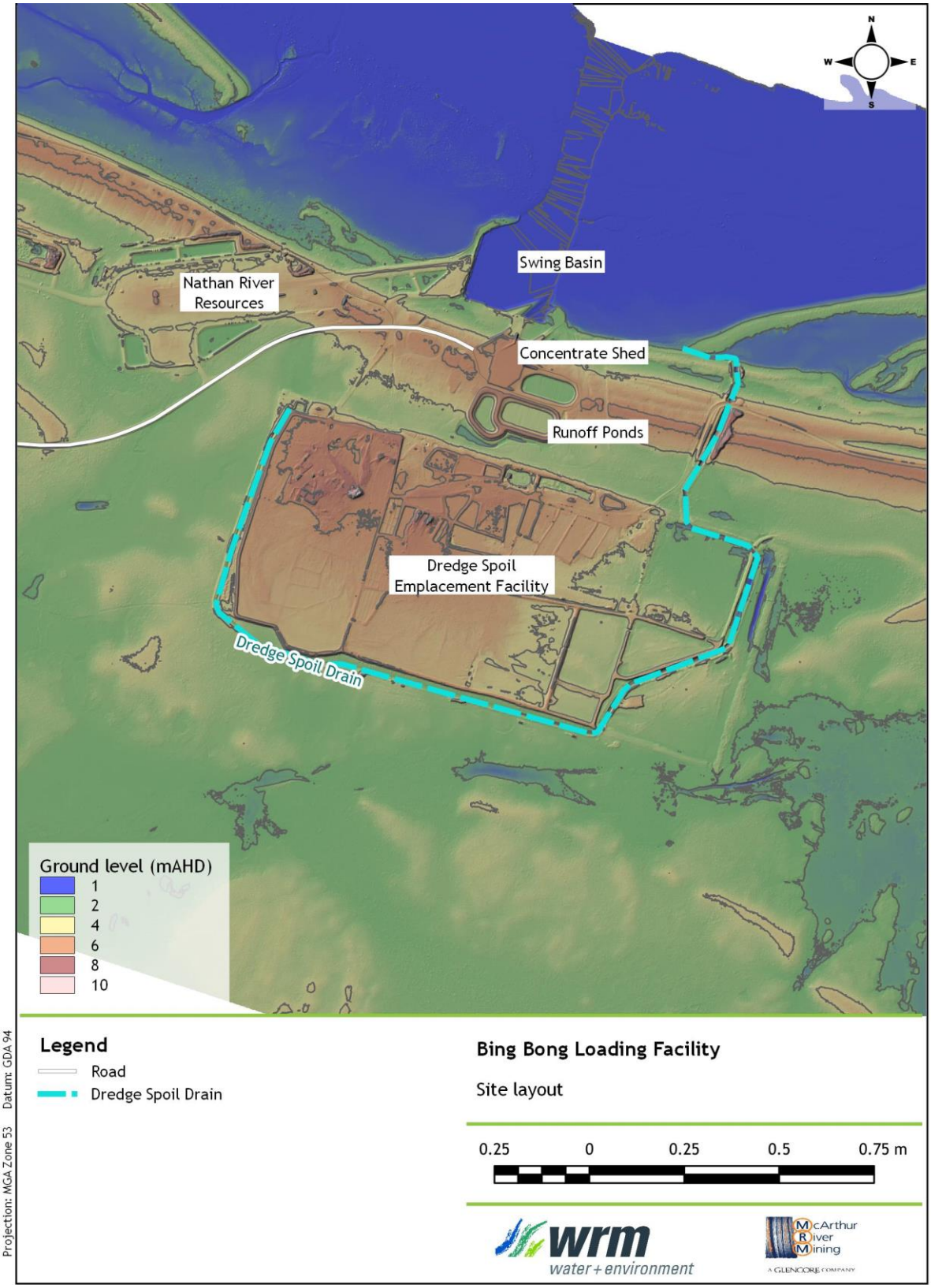

Figure 5.4 – Topography of the BBLF

5.3 BING BONG LOADING FACILITY SURFACE WATER MONITORING PROGRAM

5.3.1 Monitoring Locations

The BBLF surface water monitoring network consists of:

- One NSW monitoring location (Bing Bong Dredge Spoil Discharge Point - BBDDP).
- Seven ASW monitoring locations (Dredge Spoil Drain and Surface Runoff Ponds).

The BBDDP is located on tidal mudflats to the east of the loading facility (Figure 5.5). The dredge spoil drain extends from the final cell of the emplacement facility approximately 400 m north, releasing flow across the intertidal flats into the Gulf of Carpentaria via the Bing Bong navigation channel. The BBDDP is the only compliance point (as per WDL 174-11) at the BBLF.

A summary of the artificial surface water monitoring sites is provided in Table 5.2. The dredge spoil drain sites (DSD 1 to DSD 4) and BBDDP are listed in WDL 174-11 and are required to be sampled weekly during active dredging. The three surface runoff pond monitoring locations are sampled on a monthly basis.

Table 5.2 – Bing Bong Artificial Surface Water Monitoring Locations

Site	Site code	Location description
Bing Bong Dredge Spoil Drain 1	BB DSD1	Drain to the north of the Mule Creek boat ramp road Bing Bong Dredge Spoil Drain 2
Bing Bong Dredge Spoil Drain 2	BB DSD2	Southeast corner of DSEA
Bing Bong Dredge Spoil Drain 3	BB DSD3	Southwest corner of DSEA
Bing Bong Dredge Spoil Drain 4	BB DSD4	Northwest corner of DSEA
Bing Bong Surface Runoff Pond 1	BB SRP1	East of the concentrate shed
Bing Bong Surface Runoff Pond 2	BB SRP2	Southeast of concentrate shed
Bing Bong Surface Runoff Pond 3	BB SRP3	South of concentrate shed

In addition to the monitoring undertaken during active dredging, monitoring is also undertaken at BBDDP monthly when flowing, per the WDL 174-11 requirements.

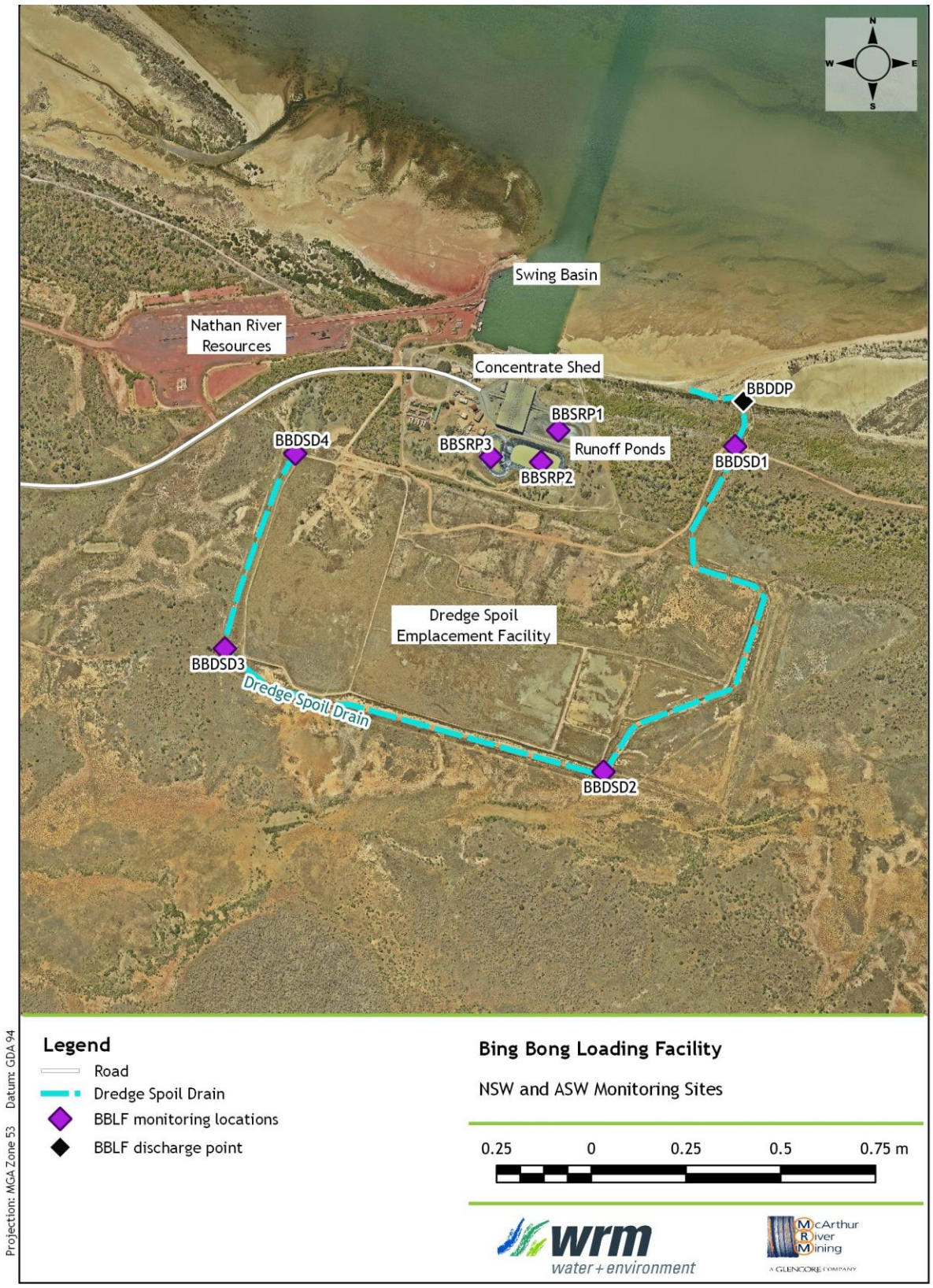

Figure 5.5 – Location of Bing Bong Loading Facility NSW and ASW Monitoring Sites

5.3.2 Site-Specific Trigger Values

The SSTVs for BBDDP are listed in WDL 174-11 and summarised in Table 5.3. These are generally based on ANZECC & ARMCANZ (2000) marine water guidelines. The SSTVs are applied to the BBDDP compliance point.

Table 5.3 – Site Specific Trigger Values for BBDDP from WDL 174-11

Parameter	Abbreviation	Units	Analysis	SSTV at BBDDP
pH	pH	pH units	In Situ	8.0-8.4
Electrical Conductivity	EC	µS/cm		-
Dissolved Oxygen	DO	% Saturation		-
Aluminium	Al	µg/L	Filtered 0.45µm	0.5
Arsenic	As			2.3
Cadmium	Cd			5.5
Copper	Cu			1.3
Iron	Fe			-
Lead	Pb			4.4
Manganese	Mn			80
Mercury	Hg			0.4
Nickel	Ni			70
Zinc	Zn			15
TPH Fraction C6-C9	NA	µg/L		-
Benzene	NA			500
TPH Fraction C10-C14	NA			600
TPH Fraction C15-C28	NA			
TPH Fraction C29-C36	NA			
Sulphate	SO_4	mg/L		-
Nitrate	NO_3	µg/L		-

Dashes indicate no data.

5.4 SURFACE WATER MONITORING RESULTS

As discussed in Section 5.3.1, the BBDDP and the dredge spoil drain sites (DSD 1 to DSD 4) are required to be sampled weekly during active dredging. No active dredging occurred during the reporting period and therefore weekly sampling was not completed. The BBDDP was inspected on a monthly basis for flow in accordance with WDL 174-11, however, no samples were taken due to no observed flow. Hence, there were no samples for BBDDP presented in this report. The monthly inspection summary is presented in Table 5.4.

Table 5.4 – Summary of Monitoring Data for Bing Bong ASW

Monitoring location	Date	Dry (yes/no)	Access (yes/no)	Comment
ASW BBDDP	21/05/2020	No	Yes	Not flowing or not connected
ASW BBDDP	27/06/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	24/07/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	3/09/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	30/09/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	13/10/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	10/11/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	12/12/2020	Yes	Yes	Dry, not flowing or not connected
ASW BBDDP	12/01/2021	No	Yes	Not flowing or not connected
ASW BBDDP	9/02/2021	No	Yes	Not flowing or not connected

6 Summary

WRM has prepared the annual review of surface water quality monitored as part of the MRM natural and artificial surface water monitoring programs during the period between 1 May 2020 to 30 April 2021 (the reporting period).

6.1 MONITORING PROGRAM OVERVIEW

The MRM surface water monitoring includes the Natural Surface Water (NSW) monitoring program and the Artificial Surface Water (ASW) monitoring program.

6.1.1 Natural Surface Water Program

MRM has developed a NSW monitoring program, which specifies the sampling requirements and procedures for the monitoring of the McArthur River, its onsite tributaries, and the surrounding receiving environment. The objectives of the monitoring, as detailed in the McArthur River Mine (the Mine) Water Management Plan (WMP) (MRM 2020b), are to:

- Characterise water quality at monitoring sites upstream and downstream of Mine operations.
- Assess the potential impacts on the receiving waters from Mine operations.
- Assess the measured surface water quality against WDL 174 Site-Specific Trigger Values (SSTVs) to verify compliance (monitoring location SW11).
- Identify the potential sources of contamination measured at water monitoring sites.
- Assess the efficacy of controls implemented by MRM to prevent contamination of receiving waters downstream of the Mine in the McArthur River.

The NSW monitoring network includes locations along the McArthur River, the Glyde River, Surprise Creek, Barney Creek and Emu Creek. Monitoring locations are also located along diverted sections of Barney Creek and the McArthur River. NSW monitoring locations include upstream control sites and downstream potentially impacted sites.

6.1.2 Artificial Surface Water Program

The ASW monitoring program specifies the sampling requirements and procedures for monitoring water in designated water storage facilities. The objectives of the ASW monitoring program, as detailed in the Mine WMP (MRM 2020b), are to:

- Identify potential contamination in water to determine risk and appropriate management options.
- Identify suitable water storage options and determine whether offsite discharge is a viable disposal option.
- Collect data to assess environmental performance and provide information for contamination source investigations.

The ASW monitoring locations are situated at major Mine infrastructure locations and have been classified into common domains. The domains are Metallurgy (Tailings Storage Facility and Mill), Open Pit (OP), Northern Overburden Emplacement Facility (NOEF) and the Bing Bong Loading Facility (BBLF).

ASW sites consist of ponds, sumps, dams and sediment traps, which are used as part of the site water management system to collect, store, or manage potentially mine-affected water and sediments.

6.2 WASTE DISCHARGE LICENSE AND VARIATION OF AUTHORISATION

Pursuant to Section 74 of the Water Act 1992 (Northern Territory of Australia 2018), MRM was granted Waste Discharge Licence 174-11 (the WDL) on 28 April 2019, which enabled the conditional discharge of wastewater at specified locations over the reporting period. This included the Mine Levee Discharge Point (MLDP) into the old McArthur River, the South-East Levee 1 Discharge Point (SEL1 DP) into Barney Creek Diversion and the Bing Bong Dredge Spoil Drain (BBDDP) into marine waters at the BBLF.

Pursuant to the Mining Management Act (NT) in the Variation of Authorisation (VOA) 0059, MRM was also authorised over the reporting period to undertake conditional discharges of wastewater at the Water Management Dam (WMD) into Little Barney Creek, via the WMD Release Point.

MRM's WDL and VOA enables discharge of water from the Mine to the McArthur River as required for operations. The WDL has strict environmental conditions relating to mine water discharges to protect the values of the McArthur River and downstream users. The WDL identifies the downstream compliance point as SW11, where potentially mine-affected waters are considered mixed with river water by the time flow reaches the compliance point.

Site Specific Trigger Values (SSTVs) are listed in the WDL for SW11 and BBDDP and are compared to the compliance point's water quality monitoring results. Where a potential non-compliance of the SSTVs is identified, an investigation report is completed with notices documented by MRM and submitted to the NT Department of Environment, Parks and Water Security (DEPWS).

6.3 SUMMARY OF THE MINE MONITORING PROGRAM RESULTS

6.3.1 Rainfall influences

Approximately 877 mm of rainfall over the 2020/21 wet season was recorded at the Mine, which is slightly higher than average (716 mm). The majority of rainfall occurred over the wet season months between November and April, with the McArthur River ceasing to flow at the SW11 compliance point between August/September 2020 and December 2020.

6.3.2 Natural Surface Water

A neutral pH was reported across all the natural surface water monitoring locations, including those located in the onsite tributaries. Sulphate (SO_4) levels were less than 200 mg/L across all the McArthur River monitoring locations, including the SW11 compliance point.

Filtered metal levels were below the SSTVs at the SW11 compliance point, with the only exceptions found to be derived from natural catchment sources located upstream of the Mine. These included:

- elevated filtered aluminium (Al) levels recorded at the McArthur River upstream control site, which caused exceedances at the SW11 compliance point.
- elevated filtered iron (Fe) and nitrate (NO_3) levels recorded at the Glyde River upstream control site, which caused exceedances at the SW11 compliance point.

No SSTV exceedances at the SW11 compliance point which triggered investigation were found to be related to the Mine's operations.

Regarding the TSF interception trench and NSW quality downstream of the trench in Surprise Creek, there was a slight reduction in electrical conductivity (EC) and sulphate levels, and a notable reduction in the filtered metals reviewed. It was concluded that the trench was acting as intended and intercepting TSF Cell seepage before it can enter Surprise Creek.

6.3.3 Artificial Surface Water

Several water management activities were undertaken during the reporting period, including lime treatment in NOEF South-East Perimeter Runoff Dam (SEPROD). In total, 764 tonnes of hydrated lime was used in NOEF SEPROD during the reporting period to treat approximately

2,913 megalitres (ML) of mine water. Of this, approximately 2,695 ML of treated water was transferred out of the dam for waste discharge and release activities.

As part of ongoing environmental improvements, the NOEF West D Sump (WDS) was lined with a high density polyethylene (HDPE) liner over the reporting period to minimise the risk of seepage to local groundwater.

In relation to water quality, the majority of ASW sites had a neutral pH during the reporting period except for four sites where median water pH levels were less than 5. These storages included:

- NOEF West Perimeter Runoff Dam (WPROD) – median pH of 3.8;
- NOEF South Perimeter Runoff Dam (SPROD) – median pH of 4.9;
- NOEF East Perimeter Runoff Dam (EPROD) – median pH of 4.4; and
- OP Lake Archer (LA) – median pH of 2.6.

Low pH water in the above storages is likely attributed to the residual mill leachate circuit water and NOEF seepage.

Over the reporting period, there was no spillway overflow reported from any of the major water storages to the receiving environment, including from the four low pH storages listed above.

6.3.4 Waste Discharge

Over the reporting period, approximately 711.3 ML, 18.0 ML and 1,308.4 ML of mine water was released via the MLDP (from TSF WMD and OP P2), the SEL1 DP (from NOEF SEL1 and the WMD RP (from the TSF WMD siphons), respectively. The total volume of water release to the McArthur River was approximately 2037.7 ML.

During the reporting period, two investigation reports related to exceedances of an SSTV at SW11 were documented by MRM and submitted to NT DEPWS, as required by WDL 174-11. The investigation reports related to the exceedance of filtered Al and NO_3 SSTV at SW11. A summary of the analyte exceedances triggering the investigations includes:

- Filtered Al: A measured level of 270 µg/L at SW11, which is greater than three times the SSTV (55 µg/L), coincided with elevated levels upstream of the mining lease. It was concluded that the exceedance was unrelated to mining activity.
- Filtered NO_3: Three (3) consecutive exceedances of the 700 µg/L SSTV was measured at SW11, all of which coincided with elevated levels at the Glyde River upstream control site. It was concluded that the exceedances were unrelated to mining activity.

Additionally, there was one SSTV exceedance of filtered Fe and nine exceedances of dissolved oxygen at SW11. These exceedances did not trigger the requirement to undertake an investigation in accordance with Conditions 38 and 39 of WDL 174-11.

6.4 SUMMARY OF THE BBLF MONITORING PROGRAM RESULTS

6.4.1 Rainfall Influences

Approximately 989 mm of rainfall over the 2020/21 wet season was recorded at the BBLF, which is slightly higher than average (863 mm).

6.4.2 Natural Surface Water

There was no observed discharge via the BBDDP and therefore no NSW quality data was recorded to consider against the SSTVs for the BBDDP.

6.4.3 Water Quality Monitoring

No samples were taken at the dredge spoil drain monitoring sites (DSD1 to DSD4) as no dredging occurred during the reporting period. The BBDDP compliance point was inspected monthly for flow in accordance with WDL 174-11. No water quality samples were taken during the reporting period as there was no observed flow during any of the monthly inspections.

6.4.4 Waste Discharge

There was no observed discharge via the BBDDP. No dredging occurred during the reporting period and therefore no controlled discharge of waste water occurred.

6.5 CONCLUSION

Based on the review of surface water quality monitoring data between 1 May 2020 and 30 April 2021, MRM continue to implement effective controls to minimise the risk of environmental harm of downstream receiving waters due to Mine operations. The review concluded that the beneficial uses and community values of the McArthur River continue to be protected from potential mining derived impacts.

There were no mine derived SSTV exceedances or non-compliances recorded at the SW11 compliance point in the McArthur River during the reporting period. The SSTV exceedances recorded at SW11 during the reporting period were unrelated to mine activities and were a result of natural river processes and contributions from sources upstream of the Mine.

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Appendix A - NSW monitoring data

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Table A.1: Analyte sampling data for SW06, Barney Creek

Timestamps	Barney Creek - SW06																																										
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 10:28	7.82	3150	117.4	21.84	7	<10	2804	1450	<5	2.8	<0.2	<1	17	<0.5	2738	<0.01	3	11	<0.2	114	<1	<0.2	173	<0.5	4	1.7	3	<0.5	1.4	3	<1	<1	<20	<50	1246	113	251	274	154	9	200	374	<1
10/05/2020 11:50	7.56	3500	135.1	26.62	7	<10	3066	1727	<5	2.3	<0.2	<1	20	<0.5	3107	<0.01	3	8	<0.2	102	<1	<0.2	126	<0.5	4	1.8	<1	<0.5	1.6	4	<1	<1	<20	<50	1310	<100	305	294	188	12	235	389	<1
17/05/2020 9:24	7.48	3590	80.9	22.34	7	<10	3140	1960	0.5	2.2	<0.1	0.4	96	0.07	2850	<0.1	3.76	23.4	<0.25	92.2	<0.25	<0.25	225	<0.5	3.94	1.6	<1	<0.25	1.48	3.8	0.95	<1	<20	<50	1540	100	328	352	224	13	276	391	<1
24/05/2020 9:57	7.88	3390	86.8	16.45	7	40	3240	2000	4.4	1.6	<0.1	0.5	108	0.07	2620	<0.1	3.69	36.1	<0.25	88.8	<0.25	<0.25	177	<0.5	4.18	1.5	<1	<0.25	1.33	3.89	0.8	<1	<20	<50	1520	140	340	366	224	12.3	280	406	<1
31/05/2020 9:23	7.53	3800	99	19.65	6	<10	3110	2030	2.6	1.3	<0.1	0.36	68	0.05	1980	<0.1	3.1	22.5	<0.25	80.4	<0.25	<0.25	194	<0.5	2.69	1.4	<1	<0.25	1.34	3.79	0.6	<1	<20	<50	1550	160	341	376	226	12.3	286	411	<1
8/06/2020 12:25	7.55	3890	102.3	23.57	6	10	3540	2040	1.6	1.5	<0.1	0.52	88	<0.05	1760	<0.1	3.3	22.2	<0.25	85	<0.25	<0.25	263	<0.5	2.37	1.7	<1	<0.25	1.55	4.21	0.8	<1	<20	<50	1580	160	342	362	233	12.5	288	412	<1
14/06/2020 9:26	7.91	3750	71	19.21	7	<10	3312	1943	<5	1.3	<0.2	<1	<5	<0.5	1535	<0.01	2	11	<0.2	69	<1	<0.2	185	<0.5	2	1.5	<1	<0.5	1.2	4	<1	<1	<20	<50	1440	144	362	385	214	12	252	426	<1
21/06/2020 9:37	7.68	3530	71.1	20.99	6	16	3214	1697	<5	1.2	<0.2	<1	<5	<0.5	1417	<0.01	3	13	<0.2	77	<1	<0.2	140	<0.5	1	1.5	<1	<0.5	0.6	3	<1	<1	<20	<50	1462	135	301	370	211	11	229	417	<1
28/06/2020 10:01	7.89	3900	67	18.05	5	<10	3638	1883	<5	1.4	<0.2	<1	7	<0.5	1487	<0.01	3	5	<0.2	78	<1	<0.2	313	<0.5	2	1.1	<1	<0.5	1	2	<1	<1	<20	<50	1471	102	318	402	241	11	264	447	<1
5/07/2020 10:30	7.23	3860	78.7	18.9	5	<10	3382	1879	<5	1.3	<0.2	<1	10	<0.5	1164	<0.01	3	7	<0.2	65	<1	<0.2	99	<0.5	2	1.2	<1	<0.5	0.9	4	<1	<1	<20	<50	1401	<100	317	382	237	12	264	392	<1
12/07/2020 7:54	8.08	3000	65.5	19.31	7	<10	2130	1271	<5	1.3	<0.2	<1	11	<0.5	1377	<0.01	2	5	<0.2	39	<1	<0.2	119	<0.5	1	1.1	<1	<0.5	0.6	3	<1	<1	<20	<50	757	109	180	308	134	9	200	454	<1
19/07/2020 9:48	7.88	3310	98	16.9	6	60	2990	1525	<5	1.4	<0.2	<1	<5	<0.5	262	<0.01	2	4	<0.2	37	<1	<0.2	121	<0.5	<1	1.1	<1	<0.5	0.6	4	<1	<1	<20	<50	936	<100	200	330	175	11	249	434	<1
26/07/2020 10:29	7.73	2820	101.8	16.41		<10	2166		1	0.85	<0.1	0.48	<10	<0.05	2.15	<0.1	2.27	<0.5	<0.25	30	<0.25	<0.25	198	<0.5	0.39	0.95	<1	<0.25	0.38	4.17	0.3	<1	<20	<50	676	<100		304				475	<1
20/12/2020 12:02	7.44	624	74.2	28.7	154	64	538	257	10	1.1	<0.2	2	35	1.2	35	<0.01	<1	25	0.2	69	<1	0.2	46	<0.5	<1	0.6	1	<0.5	0.4	<1	2	<1	<20	<50	201	1287	48	28	19	5	33	38	<1
21/12/2020 7:50	6.99	6780	41.3	27.7	4	<10	7538	5154	<5	1.6	0.7	<1	9	<0.5	402	<0.01	2	100	1	120	<1	1	294	<0.5	<1	3.5	<1	<0.5	21	1	1	<1	<20	<50	4464	1974	574	246	328	49	904	97	<1
23/12/2020 7:33	7.58	5320	74.9	28.9	47	36	5826	4126	<5	1.8	0.2	1	19	<0.5	289	<0.01	2	65	0.4	75	<1	0.4	350	<0.5	<1	3.3	2	<0.5	13	<1	2	<1	<20	<50	3453	487	369	162	264	44	778	70	<1
27/12/2020 7:21																															<1	<20	<50									
27/12/2020 13:03	7.1	720	13.8	30.2	150	150	522	269	13	1.6	<0.2	1	95	<0.5	96	<0.01	1	8	<0.2	152	<1	<0.2	54	<0.5	<1	0.6	<1	<0.5	0.5	<1	3				231	118	33	12	15	6	45	55	<1
29/12/2020 10:05	7.09	500	94.9	26.4	138	84	330	172	19	0.6	<0.2	1	137	<0.5	23	<0.01	<1	<2	<0.2	149	<1	<0.2	31	<0.5	<1	0.4	1	<0.5	0.2	<1	3	<1	<20	<50	151	368	20	10	10	4	29	44	<1
31/12/2020 11:53	7.44	468	50	29.1	70	38	306	174	10	0.6	<0.2	<1	75	<0.5	21	<0.01	<1	<2	<0.2	156	<1	<0.2	29	<0.5	<1	0.3	<1	<0.5	0.1	<1	1	<1	<20	<50	153	207	23	8.8	9	5	28	38	<1
3/01/2021 8:39	7.56	3260	82.2	29	329	532	3140	1978	<5	0.7	<0.2	<1	25	<0.5	413	<0.01	1	9	0.2	53	<1	0.2	197	<0.5	1	1.3	<1	<0.5	5.4	<1	2	<1	<20	<50	1805	217	160	102	138	22	384	64	<1
5/01/2021 10:23	7.76	154	84.5	30.6	385	328	102	52	107	0.6	<0.2	<1	267	<0.5	1.1	<0.01	<1	<2	<0.2	69	<1	<0.2	24	<0.5	<1	0.4	<1	<0.5	<0.1	<1	4	<1	<20	<50	7.8	390	11	3.2	2	2	6	68	<1
10/01/2021 8:03	7.69	318	89.6	29	519	688	194	120	12	1.4	<0.2	<1	40	<0.5	0.6	<0.01	<1	<2	<0.2	24	<1	<0.2	38	<0.5	<1	0.4	<1	<0.5	0.5	<1	<1	<1	<20	<50	52	161	17	14	11	5	19	82	<1
17/01/2021 8:23	7.35	4500	70.2	28.5	48	70	4432	2607	<5	2.6	<0.2	<1	35	<0.5	9339	<0.01	6	10	<0.2	64	<1	<0.2	154	<0.5	18	3.4	<1	<0.5	1.4	5	<1	<1	<20	<50	2326	<100	407	191	153	21	386	326	<1
24/01/2021 8:18	7.54	244	91.4	29.1	92	38	208	87	81	1	<0.2	<1	75	<0.5	7.5	<0.01	<1	<2	<0.2	30	<1	<0.2	34	<0.5	<1	0.3	<1	<0.5	0.2	<1	1	<1	<20	<50	41	<100	14	7.9	7	3	13	66	<1
31/01/2021 7:33	7.55	1230	73.9	29.7	44	50	950	584	1.4	1.6	<0.02	0.7	6	0.02	1630	<0.02	1.4	4.1	0.2	71.2	<0.05	0.2	109	<0.1	2.1	1.1	<0.2	<0.05	0.56	1.36	2.35	<1	<20	<50	443	80	90.5	52	45.2	7.8	86.9	175	<1
7/02/2021 12:55	7.25	58	68.7	28.6	377	424	95	18	20	<1	<0.1	<1	120	<1	<1	<0.1	<1	<5	<1	37	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	<1	88.54	4	3	2	2	2	24	<1
14/02/2021 8:31	7.36	138	73.2	31.5	87	26	186	48	288	0.9	<0.2	<1	244	<0.5	1.7	<0.01	<1	2	<0.2	37	<1	<0.2	32	<0.5	<1	0.3	<1	<0.5	0.1	<1	2	<1	<20	<50	20	<100	9	4.7	4	2	6	34	<1
21/02/2021 8:09	7.67	180	90.8	27.8	102	82	220	63	98	0.8	<0.2	<1	132	<0.5	3.5	<0.01	<1	<2	<0.2	30	<1	<0.2	30	<0.5	<1	0.2	<1	<0.5	<0.1	<1	1	<1	<20	<50	27	<100	11	7.3	6	2	9	50	<1
23/02/2021 6:59	7.21	2920	89.1	29	33	40	3050	1480	<5	1	<0.2	<1	<5	<0.5	92	<0.01	<1	11	0.4	64	<1	0.4	101	<0.5	<1	1.9	<1	<0.5	8.6	<1	<1	<1	<20	<50	1648	453	175	84	99	23	254	54	<1
28/02/2021 9:32	7.58	474	90.4	28.2	58	54	316	188	9	1.2	<0.2	<1	42	<0.5	296	<0.01	<1	<2	<0.2	36	<1	<0.2	48	<0.5	<1	0.3	<1	<0.5	0.4	<1	1	<1	<20	<50	141	<100	31	20	14	4	27	87	<1
7/03/2021 8:00	6.99	2178	63.8	27.7	52	70	1844	1114	<5	1.9	<0.2	<1	13	<0.5	3808	<0.01	2	2	<0.2	89	<1	<0.2	104	<0.5	5	1.7	<1	<0.5	1.1	3	<1	<1	<20	<50	841	<100	172	108	89	10	166	292	<1
14/03/2021 8:28	7.22	3530	72.1	28	24	20	3198	1911	<5	2.2	<0.2	<1	14	<0.5	3834	<0.01	4	<2	<0.2	42	<1	<0.2	165	<0.5	6	2.2	<1	<0.5	1.1	5	<1	<1	<20	<50	1562	<100	302	305	144	15	281	350	<1
21/03/2021 8:26	7.28	130	63	26.8	309	246	82	42	47	<0.5	<0.2	<1	119	<0.5	0.5	<0.01	<1	<2	<0.2	60	<1	<0.2	18	<0.5	<1	0.4	<1	<0.5	<0.1	<1	3	<1	<20	<50	11	110	9	2.8	2	2	5	45	<1
22/03/2021 7:36	6.89	110	57.3	26.5	237	154	176	36	196	<0.5	<0.2	1	243	<0.5	2.3	<0.01	<1	2	<0.2	38	<1	<0.2	19	<0.5	<1	0.2	<1	<0.5	<0.1	<1	3	<1	<20	<50	11	<100	8	2.7	2	3	4	34	<1
28/03/2021 8:49	7.62	1823	42.9	29.1	148	144	1620	967	<5	<0.5	<0.2	<1	7	<0.5	79	<0.01	<1	6	<0.2	45	<1	<0.2	83	<0.5	<1	1.1	<1	<0.5	3	<1	<1	<1	<20	<50	931	<100	100	58	64	13	174	47	<1
4/04/2021 11:14	8.52	606	95.3	28.2	77	36	406	235	17	0.6	<0.2	<1	45	<0.5	347	<0.01	<1	<2	<0.2	43	<1	<0.2	35	<0.5	<1	0.2	1	<0.5	0.1	<1	1	<1	<20	<50	158	<100	36	24	20	4	35	101	<1
11/04/2021 8:24	7.63	1340	80	26.8	30.1	42	1030	698	<10	2	<0.1	<1	<50	<1	1020	<0.1	1	<5	<1	93	<1	<1	110	<1	1	<1	<10	<1	<1	1	<10	<1	<20	<50	463	<50	108	74	60	9	104	243	<1
18/04/2021 8:35	7.45	2227	64.2	22.3	37	52	1978	1164	<5	2.2	<0.2	<1	12	<0.5	2842	<0.01	2	<2	<0.2	115	<1	<0.2	60	<0.5	4	1.4	<1	<0.5	0.9	3	<1	<1	<20	<50	876	<100	192	148	94	11	166	278	8
25/04/2021 8:10	7.71	2730	57.7	21.6	13	34	2488	1545	<5	1.9	<0.2	<1	16	<0.5	3485	<0.01	3	5	<0.2	85	<1	<0.2	111	<0.5	4	1.7	<1	<0.5	1	3	<1	<1	<20	<50	1092	<100	250	203	128	13	223	412	<1

Table A.2: Analyte sampling data for SW08, McArthur River

Timestamps	McArthur River - SW08																																														
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
21/10/2020 10:11	8.33	4870	95.8	31.4	4	<10	2850	573	2.9	1.4	<0.1	0.66	<10	0.12	0.58	<0.1	0.46	2.6	<0.25	336	<0.25	<0.25	369	<0.5	<0.05	0.95	<1	<0.25	<0.05	0.375	3.05				192	40	61.3	1450	746	26.5	102	111	<1
14/11/2020 8:44	7.75	9240	79.7	30.5	7	<10	5744	1223	<5	<0.5	<0.2	1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	374	<1	<0.2	421	<0.5	<1	1	<1	<0.5	<0.1	<1	2	<1	<20	<50	380	<100	116	2731	1813	57	227	109	<1
1/02/2021 12:46	7.47	84	88.2	34	21	6	68	31	<10	<1	<0.1	<1	80	<1.	<1	<0.1	<1	<5	<1	48	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	2	<50	6	4	4	2	4	23	<1
17/02/2021 11:42	7.12	102	80.6	31	202	194	136	39	90	<0.5	<0.2	<1	185	<0.5	0.8	<0.01	<1	<2	<0.2	67	<1	<0.2	24	<0.5	<1	0.3	<1	<0.5	<0.1	<1	2	<1	<20	<50	4.7	340	8	3.4	2	2	4	42	<1
9/03/2021 11:15	7.2	142	84.4	32.5	6	<10	126	52	25	<0.5	<0.2	<1	138	<0.5	6.4	<0.01	<1	<2	<0.2	67	<1	<0.2	26	<0.5	<1	0.2	<1	<0.5	<0.1	<1	<1	<1	<20	<50	4.6	<100	10	7.2	4	2	7	64	<1
22/04/2021 12:14	8.71	194	84.9	29.1	6	<10	100	78	<5	0.5	<0.2	<1	25	<0.5	2.2	<0.01	<1	<2	<0.2	107	<1	<0.2	10	<0.5	<1	0.2	<1	<0.5	<0.1	<1	<1	<1	<20	<50	6.5	<100	14	9.5	6	2	10	90	<1

Table A.3: Analyte sampling data for SW09, Glyde River

Glyde River - SW09																																														
Timestamps	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 8:12	7.86	148	80.7	24.06	6	<10	72	63	<5	0.7	<0.2	<1	74	<0.5	<0.5	<0.01	<1	<2	<0.2	67	<1	<0.2	27	<0.5	<1	0.1	<1	<0.5	<0.1	<1	<1				1	<100	11	5	3	3	8	66	<1
10/05/2020 10:51	7.92	178	94.6	26.98	5	<10	84	66	<5	<0.5	<0.2	<1	122	<0.5	0.6	<0.01	<1	<2	<0.2	73	<1	<0.2	26	<0.5	<1	0.2	<1	<0.5	<0.1	<1	<1				1	<100	11	5.3	4	3	9	77	<1
17/05/2020 10:51	8.13	164	95.5	26.23	6	<10	90	78.1	12.6	0.7	<0.02	0.23	178	0.02	3.05	<0.02	0.54	<0.1	<0.05	76.6	<0.05	<0.05	26	<0.1	0.08	0.2	<0.2	<0.05	0.02	0.09	0.35				<5	<20	13.3	4	4.2	3.9	10.9	80	<1
24/05/2020 10:58	7.32	185	80	22.66	8	40	110	80.7	17.9	0.8	<0.02	0.34	316	0.13	17.6	<0.02	0.57	0.7	<0.05	82.4	<0.05	<0.05	19	<0.1	0.15	0.25	<0.2	<0.05	0.02	0.089	0.4				1.1	20	14	4	4.2	3.9	11.1	85	<1
31/05/2020 10:10	7.87	197	97.1	22.59	4	<10	100	83.7	6	0.55	<0.02	0.24	138	0.05	1.51	<0.02	0.53	<0.1	<0.05	70.6	<0.05	<0.05	26	<0.1	0.09	0.25	<0.2	<0.05	0.02	0.088	0.25				1.1	<20	14.3	6	4.3	3.9	11.6	88	<1
8/06/2020 9:52	7.19	200	96.8	22.86	3	<10	120	85.2	3.5	0.6	<0.02	0.23	46	0.02	1.05	<0.02	0.56	0.3	<0.05	80.8	<0.05	<0.05	24	<0.1	0.08	0.3	<0.2	<0.05	0.02	0.102	0.25				1	<20	14.9	6	4.4	3.8	11.7	93	<1
14/06/2020 13:50	8.53	198	106.9	31.61	12	40	94	85	<5	0.6	<0.2	<1	13	<0.5	<0.5	<0.01	<1	<2	<0.2	73	<1	<0.2	21	<0.5	<1	0.3	<1	<0.5	<0.1	<1	<1				0.7	<100	15	6.1	4	4	12	95	<1
20/12/2020 10:39	7.85	41.8	93.2	28.7	9	12	18	10	48	<0.5	<0.2	<1	68	<0.5	2.5	<0.01	<1	<2	<0.2	20	<1	<0.2	16	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1	<1	<20	<50	0.6	2190	1	3.8	2	3	2	9	<1
21/12/2020 7:06	7.44	42.2	93.6	28.9	8	10	46	8	47	<0.5	<0.2	<1	73	<0.5	2.1	<0.01	<1	<2	<0.2	16	<1	<0.2	18	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.5	1916	1	4.4	2	2	1	7	<1
23/12/2020 6:53	7.24	33	85.8	29.2	23	24	94	10	81	<0.5	<0.2	<1	92	<0.5	1.1	<0.01	<1	<2	<0.2	17	<1	<0.2	14	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.6	1436	2	2.4	1	2	1	10	<1
27/12/2020 11:57	7.35	31.6	80.1	29.7	53	46	66	<0.5	167	<0.5	<0.2	<1	197	<0.5	2.5	<0.01	<1	<2	<0.2	15	<1	<0.2	13	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1				0.9	844	<1	2.6	2	2	<1	6	<1
31/12/2020 11:28	7.68	26.2	89	28.8	86	74	<10	<0.5	229	<0.5	<0.2	<1	242	<0.5	2.2	<0.01	<1	<2	<0.2	14	<1	<0.2	11	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1				0.9	429	<1	2.1	1	2	<1	6	<1
3/01/2021 8:05	7.88	40.8	85.3	29.3	34	30	32	10	140	<0.5	<0.2	<1	210	<0.5	21	<0.01	<1	<2	<0.2	24	<1	<0.2	13	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1				0.9	849	2	3.1	2	2	1	16	<1
10/01/2021 7:31	7.16	59.8	81.6	30.9	18	12	52	19	68	<0.5	<0.2	<1	241	<0.5	19	<0.01	<1	<2	<0.2	23	<1	<0.2	15	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				1	1271	4	3.8	2	3	2	22	<1
17/01/2021 7:36	7.65	72.2	84.2	31.3	11	10	82	19	75	0.6	<0.2	<1	330	<0.5	10	<0.01	<1	<2	<0.2	24	<1	<0.2	17	<0.5	<1	0.1	<1	<0.5	<0.1	<1	<1				1.1	422	3	4.4	3	3	3	25	<1
24/01/2021 8:32	7.63	87	83.7	31.2	37	96	62	28	65	0.7	<0.2	<1	434	<0.5	4.7	<0.01	<1	<2	<0.2	44	<1	<0.2	18	<0.5	<1	0.1	<1	<0.5	<0.1	<1	1				0.8	<100	5	5.1	3	3	4	37	<1
31/01/2021 7:46	7.38	74	80.3	32.5	8	<10	60	26.1	91.5	0.7	<0.02	0.26	386	0.1	1.81	<0.02	0.41	0.1	<0.05	42.8	<0.05	<0.05	20	0.2	0.07	0.05	<0.2	<0.05	0.02	0.042	0.95				0.8	160	4.5	4	3.1	2.9	3.6	29	<1
7/02/2021 12:01	7.38	42	85.7	29.7	15.8	<5	50	9	40	<1	<0.1	<1	220	<1	<1	<0.1	<1	<5	<1	21	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				<1	354.16	2	4	3	3	1	12	<1
14/02/2021 8:04	7.17	44.8	84.5	30.6	14	<10	82	13	136	<0.5	<0.2	<1	217	<0.5	1.2	<0.01	<1	<2	<0.2	23	<1	<0.2	17	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.6	414	2	2.8	2	2	2	15	<1
21/02/2021 8:22	7.42	46.4	91.2	28.6	13	<10	74	13	42	<0.5	<0.2	<1	167	<0.5	0.8	<0.01	<1	<2	<0.2	18	<1	<0.2	15	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.6	397	2	3	2	2	2	17	<1
23/02/2021 7:07	7.54	68.2	87.3	29.3	19	<10	38	21	45	<0.5	<0.2	<1	155	<0.5	13	<0.01	<1	<2	<0.2	31	<1	<0.2	13	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.7	1213	4	3.3	2	2	3	23	<1
28/02/2021 8:42	7.65	74.2	88.7	30.8	5	<10	48	24	30	<0.5	<0.2	<1	367	<0.5	19	<0.01	<1	<2	<0.2	32	<1	<0.2	16	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				1	392	5	4.5	2	3	3	34	<1
7/03/2021 7:33	7.57	84.8	82.6	30.9	5	<10	114	27	20	<0.5	<0.2	<1	301	<0.5	1.4	<0.01	<1	<2	<0.2	36	<1	<0.2	20	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.7	283	5	4.3	3	3	4	38	<1
14/03/2021 7:49	7.28	78.4	80.8	30.7	4	<10	80	23	10	<0.5	<0.2	<1	146	<0.5	0.8	<0.01	<1	<2	<0.2	24	<1	<0.2	21	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.4	<100	4	4.5	3	2	3	28	<1
21/03/2021 7:58	7.75	21.4	97.2	26.7	29	42	30	<0.5	50	<0.5	<0.2	<1	52	<0.5	<0.5	<0.01	<1	<2	<0.2	7	<1	<0.2	6	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.3	<100	<1	1.3	<1	<1	<1	9	<1
22/03/2021 7:08	7.52	19.8	89.9	26.4	39	62	22	<0.5	60	<0.5	<0.2	<1	111	<0.5	1.4	<0.01	<1	<2	<0.2	8	<1	<0.2	6	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.3	130	<1	1.5	<1	1	<1	7	<1
28/03/2021 8:14	8.08	64.4	89.8	29.9	21	18	58	22	73	<0.5	<0.2	<1	162	<0.5	6.3	<0.01	<1	<2	<0.2	31	<1	<0.2	11	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.6	378	4	2.9	2	2	3	30	<1
4/04/2021 11:22	8.43	124	94.7	29.5	8	<10	60	42	30	<0.5	<0.2	<1	214	<0.5	19	<0.01	<1	<2	<0.2	46	<1	<0.2	5	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				1.1	377	7	4	3	2	6	57	<1
11/04/2021 7:49	7.5	153	84.7	30	4.6	6	106	71	<10	<1	<0.1	<1	<50	<1	<1	<0.1	<1	<5	<1	70	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				1	177.08	12	5	4	3	10	77	<1
18/04/2021 8:04	7.91	182	83.5	26.7	4	<10	96	63	<5	<0.5	<0.2	<1	56	<0.5	<0.5	<0.01	<1	<2	<0.2	76	<1	<0.2	<1	<0.5	<1	0.2	<1	<0.5	<0.1	<1	<1				1.2	<100	10	5.3	3	3	9	87	<1
25/04/2021 7:36	7.98	198	82	25	6	<10	114	74	<5	0.5	<0.2	<1	108	<0.5	15	<0.01	<1	<2	<0.2	76	<1	<0.2	6	<0.5	<1	0.2	<1	<0.5	<0.1	<1	<1				1.1	<100	12	5.7	3	3	11	104	<1

Table A.4: Analyte sampling data for SW11, McArthur River

	McArthur River - SW11																																															
Timestamps	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 11:31	8.23	438	102.6	24.25	7	<10	244	157	<5	0.8	<0.2	<1	6	<0.5	3.5	<0.01	<1	<2	<0.2	223	<1	<0.2	60	<0.5	<1	0.5	<1	<0.5	<0.1	<1	<1	<1	<20	<50	31	495	27	26	12	3	22	146	<1
10/05/2020 10:51	8.14	560	111.4	25.51	5	<10	264	205	<5	<0.5	<0.2	<1	6	<0.5	117	<0.01	<1	<2	<0.2	223	<1	<0.2	52	<0.5	<1	0.5	<1	<0.5	0.1	<1	1	<1	<20	<50	41	448	38	33	16	4	27	169	<1
17/05/2020 9:57	8.16	620	108.7	23.18	5	10	390	280	2.4	0.8	<0.02	0.38	16	<0.01	195	<0.02	0.75	0.3	<0.05	269	<0.05	<0.05	71	<0.1	0.46	0.6	<0.2	<0.05	0.13	0.918	1.55	<1	<20	<50	55	580	50	40	22.2	4.2	37.6	207	4
24/05/2020 11:00	8.47	642	107.4	17.68	4	10	380	281	1.4	0.85	<0.02	0.38	16	<0.01	242	<0.02	0.72	<0.1	<0.05	280	<0.05	<0.05	51	<0.1	0.58	0.7	<0.2	<0.05	0.13	0.929	1.2	<1	<20	<50	54.6	500	50.7	42	22.1	4.1	37.4	215	3
31/05/2020 9:52	8.11	687	110	20.54	4	<10	400	295	2.4	0.75	<0.02	0.36	12	<0.01	150	<0.02	0.58	<0.1	<0.05	265	<0.05	<0.05	62.5	<0.1	0.37	0.75	0.2	<0.05	0.13	0.943	1.3	<1	<20	<50	50.6	440	52.7	48	23.7	4.2	39.8	234	<1
8/06/2020 11:37	7.85	761	99.7	22.81	5	10	490	327	0.9	0.7	<0.02	0.38	8	<0.01	261	<0.02	0.69	0.1	<0.05	318	<0.05	<0.05	82.5	<0.1	0.54	0.75	<0.2	<0.05	0.18	1.17	1.55	<1	<20	<50	68.2	600	58.3	54	27.2	4.2	44.2	252	2
14/06/2020 9:49	8.39	798	89.9	20.34	4	<10	418	338	<5	0.7	<0.2	<1	<5	<0.5	244	<0.01	<1	<2	<0.2	307	<1	<0.2	70	<0.5	<1	0.8	<1	<0.5	0.2	1	<1	<1	<20	<50	73	523	63	54	25	4	44	260	<1
21/06/2020 9:54																																<1	<20	<50										
21/06/2020 9:59	8.25	826	91.1	21.95	4	<10	492	334	<5	0.8	<0.2	<1	<5	<0.5	295	<0.01	<1	<2	<0.2	318	<1	<0.2	71	<0.5	<1	0.8	<1	<0.5	<0.1	<1	<1				90	530	53	64	28	4	49	278	<1
28/06/2020 10:33	8.27	908	83.5	18.69	5	<10	544	424	<5	0.7	<0.2	<1	6	<0.5	668	<0.01	<1	<2	<0.2	389	<1	<0.2	122	<0.5	1	0.8	<1	<0.5	0.2	<1	<1	<1	<20	<50	97	600	66	70	41	5	63	278	<1
5/07/2020 9:42	7.07	890	86.1	18.14	6	<10	564	378	<5	0.8	<0.2	<1	8	<0.5	817	<0.01	<1	<2	<0.2	423	<1	<0.2	74	<0.5	1	0.9	<1	<0.5	0.2	1	<1				92	377	62	72	34	4	54	285	<1
5/07/2020 10:04																																<1	<20	<50										
12/07/2020 8:33	8.38	934	60	20.77	8	<10	390	330	<5	0.8	<0.2	<1	14	<0.5	638	<0.01	<1	<2	<0.2	351	<1	<0.2	87	<0.5	<1	1	<1	<0.5	0.2	<1	<1	<1	<20	<50	81	122	51	73	34	5	49	289	2
19/07/2020 10:16	8.14	944	92.4	18.11	8	<10	676	373	<5	0.6	<0.2	<1	7	<0.5	397	<0.01	<1	<2	<0.2	366	<1	<0.2	84	<0.5	<1	1	<1	<0.5	0.2	<1	<1	<1	<20	<50	77	<100	57	77	40	5	56	317	<1
26/07/2020 10:56	7.85	868	91.3	18.65		<10	488		0.5	0.5	<0.02	0.27	8	<0.01	0.76	<0.02	0.65	<0.1	<0.05	352	<0.05	<0.05	119	<0.1	0.22	1.15	<0.2	<0.05	0.17	0.871	0.3	<1	<20	<50	53	<100		74				301	<1
2/08/2020 11:00	7.54	866	96.8	19.39	8	<10	506		0.7	0.6	<0.02	0.25	56	<0.01	1.3	<0.02	0.67	<0.1	<0.05	397	<0.05	<0.05	110	<0.1	0.23	1.15	<0.2	<0.05	0.2	0.887	0.3	<1	<20	<50	53	<100		77				319	<1
8/08/2020 16:07	8.35	930	85	23.51		<10	470		0.8	0.65	<0.02	0.32	58	0.01	0.79	<0.02	0.6	0.1	<0.05	398	<0.05	<0.05	119	<0.1	0.19	1.3	<0.2	<0.05	0.18	0.829	0.45	<1	<20	<50	53	<100		80				299	<1
16/08/2020 8:39	7.32	879	91.2	23.03	6	<10	580	365	1.2	0.7	<0.02	0.33	118	0.01	68.1	<0.02	0.61	<0.1	<0.05	423	<0.05	<0.05	112	<0.1	0.44	1.5	<0.2	<0.05	0.23	0.773	0.6	<1	<20	<50	53.9	<20	56.8	88	42.8	5	54.2	292	5
24/08/2020 11:00	6.79	923	85.9	21.15	6	10	500	370	1.6	0.85	<0.02	0.39	66	0.1	1.91	<0.02	0.62	0.2	<0.05	427	<0.05	<0.05	144	<0.1	0.23	1.45	<0.2	<0.05	0.18	0.763	0.6	<1	<20	<50	51.9	<20	56.4	90	44.5	5	55.6	279	16
7/09/2020 17:06	8.49	884	131.9	32.06	2	<10	510	350	2.3	1.1	<0.02	0.49	10	0.03	1.23	<0.02	0.73	0.3	0.05	371	<0.05	0.05	136	<0.1	0.22	1.95	<0.2	<0.05	0.19	0.713	1.35	<1	<20	<50	49.2	<20	45.9	102	48.8	5.7	57.1	261	16
20/12/2020 11:34	7.76	76.4	92.4	28.8	32	48	40	24	42	<0.5	<0.2	<1	70	<0.5	4.9	<0.01	<1	<2	<0.2	35	<1	<0.2	19	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1	<1	<20	<50	3.4	2079	4	5.7	3	3	4	21	<1
21/12/2020 7:19	7.11	114	91.7	28.7	24	34	88	32	33	<0.5	<0.2	<1	70	<0.5	6.4	<0.01	<1	<2	<0.2	32	<1	<0.2	23	<0.5	<1	0.1	<1	<0.5	<0.1	<1	1	<1	<20	<50	15	1694	4	6.9	4	3	5	19	<1
23/12/2020 7:04	7.44	174	84.9	29.1	128	150	148	65	37	<0.5	<0.2	<1	97	<0.5	1.6	<0.01	<1	<2	<0.2	50	<1	<0.2	24	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2	<1	<20	<50	41	1051	9	5.3	4	3	10	25	<1
27/12/2020 12:09	6.77	35.8	80.8	30	60	46	86	3	135	<0.5	<0.2	<1	189	<0.5	2.6	<0.01	<1	<2	<0.2	16	<1	<0.2	12	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1	<1	<20	<50	2	632	1	2.6	1	2	<1	7	<1
31/12/2020 11:38	7.86	26.2	90.4	29.3	104	94	24	<0.5	270	<0.5	<0.2	<1	269	<0.5	2.4	<0.01	<1	<2	<0.2	13	<1	<0.2	11	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1	<1	<20	<50	1.2	370	<1	2.1	1	2	<1	6	<1
3/01/2021 8:12	7.52	302	88.6	29	135	146	234	110	51	<0.5	<0.2	<1	140	<0.5	24	<0.01	<1	<2	<0.2	71	<1	<0.2	25	<0.5	<1	0.2	<1	<0.5	0.2	<1	2	<1	<20	<50	97	614	13	7.6	7	3	19	32	<1
10/01/2021 7:40	7.17	144	84.3	30.3	122	126	122	56	40	<0.5	<0.2	<1	185	<0.5	8.2	<0.01	<1	<2	<0.2	52	<1	<0.2	19	<0.5	<1	0.3	<1	<0.5	<0.1	<1	<1	<1	<20	<50	13	763	11	5.1	3	3	7	51	<1
17/01/2021 7:48	7.71	178	33.3	31.2	24	18	164	63	27	0.6	<0.2	<1	196	<0.5	41	<0.01	<1	<2	<0.2	57	<1	<0.2	23	<0.5	<1	0.3	1	<0.5	<0.1	<1	1	<1	<20	<50	7.1	486	12	6.2	4	3	8	66	<1
24/01/2021 8:40	7.64	89	87.3	30.2	148	168	116	29	75	<0.5	<0.2	<1	307	<0.5	1.7	<0.01	<1	<2	<0.2	55	<1	<0.2	18	<0.5	<1	0.2	<1	<0.5	<0.1	<1	3	<1	<20	<50	2.4	<100	6	4	3	3	4	32	<1
31/01/2021 7:53	7.27	170	86.9	31.5	19	20	110	73	44.2	0.65	<0.02	0.56	180	0.09	0.96	<0.02	0.5	0.1	<0.05	103	<0.05	<0.05	29	0.1	0.06	0.3	<0.2	<0.05	0.04	0.273	2.6	<1	<20	<50	5	300	13.9	6	4	3	9.3	71	<1
7/02/2021 12:08	7.31	62	83.2	29.2	297	310	92	18	30	<1	<0.1	<1	180	<1	<1	<0.1	<1	<5	<1	37	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	<1	132.81	4	4	3	3	2	26	<1
14/02/2021 8:14	7.54	110	88.8	30.4	507	556	142	47	129	0.6	<0.2	1	269	<0.5	1.1	<0.01	<1	<2	<0.2	80	<1	<0.2	23	<0.5	<1	0.3	<1	<0.5	<0.1	<1	3	<1	<20	<50	3.5	133	10	2.3	2	2	5	49	<1
21/02/2021 8:30	7.41	89.6	91.8	28.4	81	58	98	34	85	<0.5	<0.2	<1	185	<0.5	1	<0.01	<1	<2	<0.2	53	<1	<0.2	17	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2	<1	<20	<50	2.3	120	7	3.3	2	2	4	36	<1
23/02/2021 7:14	7.35	320	88.8	28.5	120	138	284	118	18	<0.5	<0.2	<1	107	<0.5	1.6	<0.01	<1	<2	<0.2	64	<1	<0.2	23	<0.5	<1	0.2	<1	<0.5	0.4	<1	1	<1	<20	<50	99	182	17	7.4	7	3	18	35	<1
28/02/2021 8:49	7.44	158	90.6	29.9	19	12	82	63	27	0.5	<0.2	<1	210	<0.5	16	<0.01	<1	<2	<0.2	66	<1	<0.2	22	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2	<1	<20	<50	6.2	360	13	6.3	3	3	7	77	<1
7/03/2021 7:42	7.45	244	88.9	30.1	7	<10	190	99	8	0.6	<0.2	<1	115	<0.5	22	<0.01	<1	<2	<0.2	109	<1	<0.2	29	<0.5	<1	0.3	<1	<0.5	<0.1	<1	<1	<1	<20	<50	8.5	432	19	8.5	5	3	13	111	<1
14/03/2021 8:02	7.46	240	86.7	29.8	10	12	166	92	<5	0.5	<0.2	<1	45	<0.5	<0.5	<0.01	<1	<2	<0.2	90	<1	<0.2	30	<0.5	<1	0.3	<1	<0.5	<0.1	<1	1	<1	<20	<50	5.7	208	18	7.7	4	3	12	96	<1

Timestamps	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
21/03/2021 8:05	7.63	21.2	93.7	26.7	32	36	50	<0.5	63	<0.5	<0.2	<1	86	<0.5	2.2	<0.01	<1	<2	<0.2	10	<1	<0.2	8	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1	<1	<20	<50	0.4	140	<1	1.3	<1	1	<1	8	<1
22/03/2021 7:17	7.45	18.6	90.6	26.3	33	40	46	<0.5	63	<0.5	<0.2	<1	112	<0.5	1.5	<0.01	<1	<2	<0.2	8	<1	<0.2	6	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1	<1	<20	<50	0.2	<100	<1	1.3	<1	1	<1	8	<1
28/03/2021 8:23	7.91	266	83.1	29.3	89	64	146	94	18	<0.5	<0.2	<1	95	<0.5	57	<0.01	<1	<2	<0.2	76	<1	<0.2	20	<0.5	<1	0.2	<1	<0.5	0.2	<1	<1	<1	<20	<50	65	183	14	6.6	5	3	14	57	<1
4/04/2021 10:52	8.14	224	96.2	28.6	20	10	112	87	24	<0.5	<0.2	<1	129	<0.5	24	<0.01	<1	<2	<0.2	94	<1	<0.2	12	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	1	<1	<20	<50	9	372	15	7.2	5	3	12	99	<1
11/04/2021 7:55	7.5	296	86.8	29	7.3	6	178	151	<10	<1	<0.1	<1	<50	<1	2	<0.1	<1	<5	<1	161	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	12	398.43	29	10	8	3	19	139	<1
18/04/2021 8:11	7.8	370	87.6	25.1	6	<10	206	140	<5	0.7	<0.2	<1	15	<0.5	46	<0.01	<1	<2	<0.2	195	<1	<0.2	<1	<0.5	<1	0.4	<1	<0.5	<0.1	<1	1	<1	<20	<50	14	377	26	13	6	3	18	149	13
25/04/2021 7:44	8.23	434	87.8	24.1	5	<10	258	175	<5	0.7	<0.2	<1	9	<0.5	68	<0.01	<1	<2	<0.2	204	<1	<0.2	19	<0.5	<1	0.5	<1	<0.5	<0.1	<1	<1	<1	<20	<50	18	381	32	17	8	3	23	218	<1

Table A.5: Analyte sampling data for SW12, McArthur River

Timestamps	McArthur River - SW12																																											
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 11:43	8.31	558	106.1	26.49	5	<10	308	207	<5	0.9	<0.2	<1	<5	<0.5	21	<0.01	<1	<2	<0.2	280	<1	<0.2	70	<0.5	<1	0.6	<1	<0.5	0.1	<1	2	<1	<20	<50	47	<100	37	36	16	3	28	201	<1
10/05/2020 11:15	8.11	674	101.7	27.8	4	<10	348	254	<5	<0.5	<0.2	<1	<5	<0.5	23	<0.01	<1	<2	<0.2	272	<1	<0.2	61	<0.5	<1	0.7	<1	<0.5	0.2	<1	2	<1	<20	<50	56	<100	48	42	19	4	33	221	<1
17/05/2020 10:19	8.13	707	102	24.47	5	10	440	315	2.2	0.9	<0.02	0.4	6	<0.01	76.3	<0.02	0.59	0.2	<0.05	312	<0.05	<0.05	80.5	<0.1	0.16	0.75	<0.2	<0.05	0.19	1.08	2.05	<1	<20	<50	70	40	56.1	50	25.7	4.5	42.5	225	7
24/05/2020 11:22	8.32	734	98.9	20.45	3	50	450	325	1.5	0.9	<0.02	0.41	6	<0.01	101	<0.02	0.69	0.2	<0.05	329	<0.05	<0.05	60.5	<0.1	0.19	0.8	<0.2	<0.05	0.22	1.14	1.8	<1	<20	<50	69.6	40	58.2	52	27	4.5	43.6	235	7
31/05/2020 10:04	8.2	747	116.4	21.93	5	<10	400	325	2.2	0.8	<0.02	0.37	4	0.01	53.2	<0.02	0.56	<0.1	<0.05	299	<0.05	<0.05	67.5	<0.1	0.13	0.8	<0.2	<0.05	0.18	1.09	1.8	<1	<20	<50	60.1	40	57.3	54	26.9	4.4	44.3	251	2
8/06/2020 11:57	7.99	808	101.9	24.96	2	<10	520	351	1	0.85	<0.02	0.42	6	0.01	92.6	<0.02	0.52	0.2	<0.05	348	<0.05	<0.05	73	<0.1	0.17	0.85	<0.2	<0.05	0.27	1.3	2.2	<1	<20	<50	77.8	40	61.8	60	30.3	4.5	47.8	254	11
14/06/2020 10:01	8.37	862	91.2	20.64	2	<10	460	366	<5	0.8	<0.2	<1	<5	<0.5	111	<0.01	<1	<2	<0.2	338	<1	<0.2	73	<0.5	<1	0.8	<1	<0.5	0.2	1	1	<1	<20	<50	88	<100	69	62	29	5	47	274	<1
21/06/2020 10:14	8.13	900	94.4	22.07	2	<10	524	367	<5	0.9	<0.2	<1	<5	<0.5	181	<0.01	<1	<2	<0.2	346	<1	<0.2	71	<0.5	<1	0.8	<1	<0.5	<0.1	<1	1	<1	<20	<50	112	<100	57	73	33	5	54	303	<1
28/06/2020 10:52	8.28	1027	92.2	19.68	2	<10	626	478	<5	0.9	<0.2	<1	7	<0.5	452	<0.01	<1	<2	<0.2	460	<1	<0.2	133	<0.5	<1	0.9	<1	<0.5	0.3	<1	1	<1	<20	<50	130	<100	72	85	49	6	72	322	<1
5/07/2020 9:42																																<1	<20	<50									
5/07/2020 10:04	7.78	988	80.4	17.79	2	<10	622	431	<5	0.9	<0.2	<1	9	<0.5	737	<0.01	<1	<2	<0.2	538	<1	<0.2	88	<0.5	<1	1.1	<1	<0.5	0.3	1	<1				119	<100	65	85	41	5	65	281	10
12/07/2020 8:18	8.48	1001	69	19.59	3	<10	482	375	<5	0.8	<0.2	<1	14	<0.5	812	<0.01	<1	5	<0.2	498	<1	<0.2	88	<0.5	<1	1.1	<1	<0.5	0.3	<1	<1	<1	<20	<50	96	<100	53	83	41	5	59	319	<1
19/07/2020 10:32	8.07	1007	98.3	18.26	2	<10	636	396	<5	0.7	<0.2	<1	9	<0.5	909	<0.01	<1	<2	<0.2	489	<1	<0.2	88	<0.5	1	1.1	<1	<0.5	0.3	1	<1	<1	<20	<50	83	<100	59	84	45	6	60	274	<1
26/07/2020 11:12	7.94	912	105.1	18.46		<10	514		0.1	0.55	<0.02	0.25	8	0.01	453	<0.02	0.84	0.1	<0.05	527	<0.05	<0.05	116	<0.1	0.85	1.25	<0.2	<0.05	0.28	1.02	0.45	<1	<20	<50	59	<100		81				319	6
2/08/2020 11:15	7.6	910	97.1	19.32	4	<10	548		0.6	0.6	<0.02	0.22	84	0.02	865	<0.02	0.91	0.1	<0.05	617	<0.05	<0.05	113	<0.1	1.35	1.25	<0.2	<0.05	0.28	0.981	0.5	<1	<20	<50	59	<100		84				326	<1
8/08/2020 15:51	8.15	974	94.7	26.2		<10	518		0.8	0.75	<0.02	0.31	84	0.05	544	<0.02	0.92	0.5	<0.05	593	<0.05	<0.05	127	<0.1	0.91	1.5	<0.2	<0.05	0.37	0.913	0.8	<1	<20	<50	57	<100		85				304	<1
16/08/2020 8:57	7.57	952	96.4	21.04	5	<10	610	392	0.4	0.65	<0.02	0.24	166	0.02	908	<0.02	0.94	<0.1	<0.05	671	<0.05	<0.05	110	<0.1	1.41	1.35	<0.2	<0.05	0.3	0.783	0.6	<1	<20	<50	60.4	60	62.4	96	46.5	5.1	57.3	322	<1
24/08/2020 11:27	7.24	983	100.9	21.32	6	<10	570	397	1.2	0.55	<0.02	0.27	138	0.03	886	<0.02	0.92	0.6	<0.05	730	<0.05	<0.05	121	<0.1	1.47	1.3	<0.2	<0.05	0.26	0.812	0.45	<1	<20	<50	55.9	60	63.8	98	46.7	4.8	57.7	300	22
30/08/2020 9:44	8.08	963	96.5	21.2	8	<10	610	399	0.9	0.7	<0.02	0.22	134	0.06	763	<0.02	0.93	0.4	<0.05	749	<0.05	<0.05	128	<0.1	1.24	1.25	<0.2	<0.05	0.25	0.757	0.45	<1	<20	<50	57	60	63.8	98	48	5	58.3	317	7
7/09/2020 16:54	8.27	949	83.4	28.67	33	90	580	381	1.8	0.85	<0.02	0.43	66	0.06	130	<0.02	0.8	0.5	0.05	652	<0.05	0.05	130	<0.1	0.64	1.55	<0.2	<0.05	0.3	0.71	0.85				53.3	40	59.3	104	50.5	5.6	56.7	303	4
15/09/2020 14:01	8.33	966	114.2	33.11	12	50	661	383	2.4	0.85	<0.02	0.43	104	0.06	114	<0.02	0.92	0.5	0.1	766	<0.05	0.1	145	<0.1	0.56	1.6	<0.2	<0.05	0.29	0.598	1	<1	<20	<50	42.8	40	61.3	110	50.3	5.4	55.8	301	19
20/09/2020 10:34	8.28	940	111.5	30.1	7	<10	570	377	0.7	0.8	<0.02	0.24	72	0.02	1.96	<0.02	0.88	0.4	0.05	799	<0.05	0.05	122	<0.1	0.33	1.5	<0.2	<0.05	0.22	0.451	0.6	<1	<20	<50	33.2	<20	61	98	48.3	5.1	54.5	296	25
20/12/2020 11:48	7.63	356	88.4	29.4	100	64	218	146	6	1	<0.2	1	28	<0.5	4.9	<0.01	<1	<2	<0.2	124	<1	<0.2	46	<0.5	<1	0.7	<1	<0.5	<0.1	<1	5	<1	<20	<50	31	249	24	21	12	4	21	109	<1
21/12/2020 7:34	7.7	606	85.2	27.9	71	52	424	250	<5	1	<0.2	<1	16	<0.5	2.9	<0.01	<1	<2	<0.2	130	<1	<0.2	66	<0.5	<1	0.9	<1	<0.5	0.6	<1	5	<1	<20	<50	128	148	36	27	18	5	39	123	<1
23/12/2020 7:21	7.66	518	84.1	28.7	567	580	372	234	9	0.8	<0.2	1	92	<0.5	1.2	<0.01	<1	<2	<0.2	137	<1	<0.2	57	<0.5	<1	0.8	<1	<0.5	0.3	<1	4	<1	<20	<50	163	239	29	13	14	5	39	62	<1
27/12/2020 7:33																																<1	<20	<50									
27/12/2020 13:15	7.45	366	69	29.8	547	558	318	120	70	<0.5	<0.2	<1	198	<0.5	1.4	<0.01	<1	<2	<0.2	111	<1	<0.2	32	<0.5	<1	0.4	<1	<0.5	0.2	<1	2				104	317	15	6.4	7	4	20	37	<1
31/12/2020 11:47	7.64	178	86.6	28.4	627	678	112	58	306	<0.5	<0.2	<1	414	<0.5	1.9	<0.01	<1	<2	<0.2	78	<1	<0.2	17	<0.5	<1	0.3	<1	<0.5	<0.1	<1	3	<1	<20	<50	38	342	10	3.1	3	2	8	34	<1
3/01/2021 8:27	7.52	586	89.8	29.1	268	338	436	233	15	<0.5	<0.2	<1	73	<0.5	4.2	<0.01	<1	<2	<0.2	110	<1	<0.2	34	<0.5	<1	0.3	<1	<0.5	0.4	<1	2	<1	<20	<50	215	383	25	14	15	4	41	54	<1
10/01/2021 7:53	7.32	226	91.3	30.1	220	220	156	91	34	<0.5	<0.2	<1	149	<0.5	2	<0.01	<1	<2	<0.2	75	<1	<0.2	23	<0.5	<1	0.6	<1	<0.5	<0.1	<1	<1	<1	<20	<50	28	246	19	6.3	4	3	11	75	<1
17/01/2021 8:01	7.99	320	88.8	30.9	41	24	206	129	<5	0.8	<0.2	<1	9	<0.5	30	<0.01	<1	<2	<0.2	106	<1	<0.2	31	<0.5	<1	0.6	<1	<0.5	<0.1	<1	3	<1	<20	<50	18	<100	26	8.7	5	3	16	125	<1
24/01/2021 8:52	7.73	93.4	89.2	29	305	330	92	35	118	<0.5	<0.2	<1	296	<0.5	1.5	<0.01	<1	<2	<0.2	55	<1	<0.2	16	<0.5	<1	0.2	<1	<0.5	<0.1	<1	4	<1	<20	<50	5	<100	8	3.3	2	2	4	35	<1
31/01/2021 8:02	7.96	253	90	31.6	24	20	160	116	17.9	0.85	<0.02	0.82	50	0.07	0.51	<0.02	0.62	0.1	<0.05	152	<0.05	<0.05	34.5	0.1	0.07	0.5	0.4	<0.05	0.12	0.528	4.6	<1	<20	<50	9.3	<20	22.1	8	5	3.2	14.7	112	<1
7/02/2021 12:46	7.37	56	80.1	27.9	641	939	99	21	20	<1	<0.1	<1	70	<1	<1	<0.1	<1	<5	<1	38	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	<1	132.81	5	2	1	2	2	25	<1
14/02/2021 8:22	7.68	114	90.6	30.3	751	780	134	47	130	<0.5	<0.2	<1	267	<0.5	1	<0.01	<1	<2	<0.2	85	<1	<0.2	24	<0.5	<1	0.5	<1	<0.5	<0.1	<1	3	<1	<20	<50	5.2	<100	10	2.1	2	2	5	50	<1
21/02/2021 8:42	7.59	122	92.7	28.3	133	98	152	51	55	<0.5	<0.2	<1	150	<0.5	0.9	<0.01	<1	<2	<0.2	65	<1	<0.2	22	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2	<1	<20	<50	3.5	<100	11	3.6	2	2	6	50	<1
23/02/2021 7:25	7.47	432	90.8	28.2	165	192	356	165	18	<0.5	<0.2	<1	80	<0.5	1	<0.01	<1	<2	<0.2	70	<1	<0.2	28	<0.5	<1	0.3	<1	<0.5	0.6	<1	2	<1	<20	<50	148	<100	22	9.9	11	4	27	38	<1
28/02/2021 9:24	7.82	218	93.6	30.3	28	16	126	93	12	0.7	<0.2	<1	74	<0.5	1.5	<0.01	<1	<2	<0.2	87	<1	<0.2	28	<0.5	<1	0.3	<1	<0.5	<0.1	<1	2	<1	<20	<50	11	<100	19	7.5	4	3	11	107	<1
7/03/2021 7:53	7.77	324	90.8	30.1	6	<10	204	142	<5	0.7	<0.2	<1	<5	<0.5	9	<0.01	<1	<2	<0.2	144	<1	<0.2	34	<0.5	<1	0.4	<1	<0.5	<0.1	<1	2	<1	<20	<50	14	<100	28	11	6	3	17	171	<1
14/03/2021 8:16	8	336	90.6	29.6	11	<10	176	141	<5	0.6	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	134	<1	<0.2	36	<0.5	<1	0.6	<1	<0.5	<0.1	<1	3	<1	<20	<50	9.7	<100	28	25	5	3	18	147	6

| McArthur River - SW12 | | |

Table A.6: Analyte sampling data for SW13, McArthur River

| | McArthur River - SW13 | | |

Table A.7: Analyte sampling data for SW15, McArthur River

| | McArthur River – SW15 | | |

Table A.8: Analyte sampling data for SW16, McArthur River

Timestamps	McArthur River – SW16																																													
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 8:58	8.2	460	96.4	24.54	4	<10	246	180	<5	1.1	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	237	<1	<0.2	61	<0.5	<1	0.6	<1	<0.5	0.1	<1	1				16	<100	33	30	13	3	24	188	<1
10/05/2020 9:03	7.33	562	95.1	26.24	3	<10	316	217	<5	<0.5	<0.2	<1	<5	<0.5	119	<0.01	<1	<2	<0.2	273	<1	<0.2	60	<0.5	<1	0.7	<1	<0.5	0.2	<1	1				24	<100	40	37	16	4	28	201	<1
17/05/2020 8:02	7.74	598	93	24.73	3	<10	200	264	1.9	0.9	<0.02	0.36	<2	<0.01	155	<0.02	0.63	0.3	0.05	312	<0.05	0.05	73.5	<0.1	0.19	0.85	0.4	<0.05	0.3	0.871	1.9				35	60	45.7	44	22	4.2	36.5	206	6
24/05/2020 8:19	7.96	571	95.9	19.74	3	10	310	257	1.5	0.9	<0.02	0.39	<2	<0.01	69.4	<0.02	0.54	0.2	<0.05	303	<0.05	<0.05	43	<0.1	0.11	0.75	<0.2	<0.05	0.24	0.923	1.8				24.7	20	45.7	42	19.9	4	34.6	220	6
31/05/2020 7:49	7.85	652	83	22.62	3	<10	360	279	2.1	0.75	<0.02	0.31	<2	<0.01	85	<0.02	0.52	0.1	<0.05	284	<0.05	<0.05	63	<0.1	0.11	0.7	<0.2	<0.05	0.23	0.927	1.6				28.7	20	48.8	48	22.5	4.2	38.3	236	<1
8/06/2020 10:45	7.6	852	101.6	25.99	2	2010	520	350	1.8	1	<0.02	0.45	<2	0.02	245	<0.02	0.64	1.4	0.1	330	<0.05	0.1	90	<0.1	0.21	1.05	0.6	<0.05	0.53	1.22	2.5				75.9	80	59.3	80	37.6	4.3	48.9	254	<1
14/06/2020 13:07	8.22	668	110.3	28.02	3	<10	366	296	<5	1	<0.2	<1	<5	<0.5	36	<0.01	<1	<2	<0.2	326	<1	<0.2	64	<0.5	<1	0.8	<1	<0.5	0.3	<1	2				28	<100	53	47	20	5	40	258	<1
21/06/2020 11:17	7.85	694	105.6	26.05	2	<10	404	287	<5	1	<0.2	<1	<5	<0.5	120	<0.01	<1	<2	<0.2	352	<1	<0.2	69	<0.5	<1	0.8	<1	<0.5	<0.1	<1	1				39	<100	44	58	24	4	43	276	<1
28/06/2020 9:11	7.88	742	93	19.37	2	<10	618	354	<5	0.9	<0.2	<1	<5	<0.5	201	<0.01	<1	<2	<0.2	416	<1	<0.2	96	<0.5	<1	0.8	<1	<0.5	0.5	<1	2				37	<100	52	60	32	6	54	261	<1
5/07/2020 11:01	7.75	760	82.9	20.42	2	<10	424	317	<5	1.3	<0.2	<1	<5	<0.5	117	<0.01	<1	<2	<0.2	469	<1	<0.2	79	<0.5	<1	1	<1	<0.5	0.7	1	1				44	<100	44	66	28	5	50	233	9
12/07/2020 9:57	8.51	826	70.7	22.52	<1	<10	342	311	<5	1.1	<0.2	<1	<5	<0.5	433	<0.01	<1	<2	<0.2	510	<1	<0.2	72	<0.5	<1	1.2	<1	<0.5	0.6	<1	<1				53	<100	43	72	32	5	49	262	7
19/07/2020 8:27	7.08	850	85.6	17.28	1	<10	520	331	<5	0.9	<0.2	<1	<5	<0.5	146	<0.01	<1	<2	<0.2	428	<1	<0.2	78	<0.5	<1	1.1	<1	<0.5	0.8	1	1				48	<100	43	70	36	6	54	278	<1
26/07/2020 9:40	7.96	1256	83	18.02		<10	790		0.4	0.85	<0.02	0.15	<2	<0.01	477	<0.02	0.69	<0.1	0.15	253	<0.05	0.15	157	<0.1	0.29	1.65	0.8	<0.05	0.96	1.86	1.7				164	<100		145				240	<1
2/08/2020 9:39	7.53	1116	99.2	18.59	<1	<10	704		0.5	0.85	<0.02	0.16	4	<0.01	647	<0.02	0.64	0.1	0.15	326	<0.05	0.15	128	<0.1	0.48	1.7	0.6	<0.05	0.96	1.74	1.45				131	<100		126				296	<1
8/08/2020 13:17	8.09	942	100.9	27.38		<10	502		0.5	1.1	<0.02	0.3	10	0.05	153	<0.02	0.4	1	<0.05	525	<0.05	<0.05	119	<0.1	0.24	1.5	<0.2	<0.05	0.95	1.24	1.55				63	<100		86				284	<1
16/08/2020 7:54	6.94	890	63.6	21.2	1	<10	570	360	1.6	1.35	<0.02	0.25	18	0.03	439	<0.02	0.42	0.1	<0.05	631	<0.05	<0.05	108	<0.1	0.47	1.65	<0.2	<0.05	1.24	1.27	1.85				63.8	<20	46.5	90	44.6	6	59.3	277	5
24/08/2020 12:10	7.4	999	104.4	26.41	1	<10	550	385	1.4	1.3	<0.02	0.29	26	0.08	387	<0.02	0.44	0.8	0.05	589	<0.05	0.05	84.5	<0.1	0.46	1.9	<0.2	<0.05	1.15	1.33	1.55				83	<20	53.3	106	51.1	5.5	61.1	257	18
30/08/2020 10:25	8.07	965	108.9	25.3	<1	10	600	378	1.5	1.3	<0.02	0.21	26	0.05	390	<0.02	0.39	0.4	<0.05	625	<0.05	<0.05	138	<0.1	0.44	1.85	<0.2	<0.05	1.21	1.26	1.6				79.5	40	51.7	106	50.7	5.6	60.4	268	9
7/09/2020 15:57	8.4	922	148.5	33	1	<10	550	363	1.3	1.65	<0.02	0.2	24	0.07	247	<0.02	0.38	0.3	<0.05	619	<0.05	<0.05	147	<0.1	0.27	2	<0.2	<0.05	1.44	1.01	2.1				73.6	<20	47	106	52.1	6.2	59.7	251	15
15/09/2020 12:58	8.45	976	161.4	33.16	17	190	655	368	3.3	1.75	<0.02	0.29	24	0.07	80.2	<0.02	0.43	0.2	<0.05	610	<0.05	<0.05	149	<0.1	0.22	2.25	<0.2	<0.05	0.94	1.06	1.75				77.8	<20	49.4	124	54.1	6.1	59.4	251	19
20/09/2020 9:29	8.17	991	99.1	28.2	1	<10	610	374	1.1	1.8	<0.02	0.37	18	0.09	453	<0.02	0.63	2.9	0.05	735	<0.05	0.05	147	<0.1	0.53	2.25	<0.2	<0.05	1.07	0.9	1.5				79.9	<20	50	112	56.4	6.1	60.4	255	18
27/09/2020 9:18	7.22	1050	72.7	27.8	1	<10	942	401	0.8	1.8	<0.02	0.13	50	0.03	752	<0.02	0.56	0.4	<0.05	672	<0.05	<0.05	145	<0.1	0.98	2.1	<0.2	<0.05	0.89	0.907	1.2				97.1	<20	57.5	128	62.7	5.8	62.5	271	<1
4/10/2020 8:40		1050			2	<10	640	392	1.7	2	<0.02	0.16	56	0.39	814	<0.02	0.57	5.7	<0.05	731	<0.05	<0.05	190	<0.1	1.01	2.3	<0.2	<0.05	0.84	0.844	1.25				92.3	<20	54.6	134	63	5.9	62.2	273	<1
4/10/2020 8:58	7.7	1050	81.1	27.7	2	<10	640	392	1.7	2	<0.02	0.16	56	0.39	814	<0.02	0.57	5.7	<0.05	731	<0.05	<0.05	190	<0.1	1.01	2.3	<0.2	<0.05	0.84	0.844	1.25				92.3	<20	54.6	134	63	5.9	62.2	273	<1
11/10/2020 7:32	7.5	1000	61	23.7	2	<10	610		1.1	1.85	<0.02	0.07	64	0.04	0.53	<0.02	0.56	0.5	<0.05	718	<0.05	<0.05	145	<0.1	1.41	2.15	<0.2	<0.05	0.54	0.632	0.55					<20		118				269	<1
18/10/2020 8:07	7.84	1060	47.4	26.6	2	10	640	387	1	2.25	<0.02	0.18	44	0.06	1430	<0.02	0.63	1.2	0.05	829	<0.05	0.05	153	<0.1	1.74	2.45	<0.2	<0.05	0.68	0.633	0.6				81.3	<20	52.8	130	65.2	6.3	61.9	271	<1
25/10/2020 6:58	7.57	1080	37.5	26.7	3	<10	620	397	7.4	2.65	<0.02	0.19	40	0.03	1380	<0.02	0.62	1.3	0.05	811	<0.05	0.05	211	<0.1	1.66	2.7	<0.2	<0.05	0.61	0.609	0.65				82.4	<20	54.1	134	68.1	6.4	63.6	279	<1
1/11/2020 9:46	8.09	994	105.1	31.5	8	24	478	318	<5	2.3	<0.2	<1	6	<0.5	387	<0.01	<1	<2	<0.2	607	<1	<0.2	168	<0.5	<1	2.3	<1	<0.5	0.9	<1	1				68	<100	41	125	53	6	52	285	<1
8/11/2020 14:34	8.39	1103	149.5	37.1	4	14	536	393	<5	2.8	<0.2	<1	7	<0.5	93	<0.01	<1	<2	<0.2	530	<1	<0.2	163	<0.5	<1	3	<1	<0.5	1.3	<1	2				78	<100	46	139	75	6	68	240	27
15/11/2020 10:27	8.24	966	150.2	33.1	16	<10	550	293	<5	1.1	<0.2	<1	<5	<0.5	378	<0.01	<1	<2	<0.2	524	<1	<0.2	67	<0.5	<1	2.2	<1	<0.5	<0.1	<1	1				63	<100	45	121	49	6	44	222	11
22/11/2020 14:51	8.22	998	184.1	38.3	8	<10	572	362	<5	1.9	<0.2	<1	<5	<0.5	76	<0.01	<1	<2	<0.2	419	<1	<0.2	159	<0.5	<1	2	<1	<0.5	1.1	<1	3				83	<100	44	135	70	6	61	244	24
29/11/2020 8:06	7.71	950	86.9	29.6	3	<10	536	291	<5	2.3	<0.2	<1	9	<0.5	728	<0.01	<1	5	<0.2	480	<1	<0.2	157	<0.5	<1	2.6	<1	<0.5	0.7	<1	<1				50	<100	36	102	54	6	49	260	<1
6/12/2020 11:29	8.22	704	142.5	37.9	8	10	400	251	<5	2.5	<0.2	<1	5	<0.5	112	<0.01	<1	<2	<0.2	403	<1	<0.2	144	<0.5	<1	2.1	<1	<0.5	0.8	<1	2				35	<100	31	72	45	5	42	215	20
20/12/2020 10:30	7.8	344	86.6	29.5	66	46	228	128	<5	1.1	<0.2	<1	15	<0.5	0.9	<0.01	<1	<2	<0.2	149	<1	<0.2	55	<0.5	<1	0.9	<1	<0.5	0.4	<1	4				11	132	22	22	11	3	18	137	<1
27/12/2020 11:38	7.57	86.2	83.9	29.8	675	658	54	29	387	<0.5	<0.2	1	532	<0.5	2	<0.01	<1	<2	<0.2	55	<1	<0.2	16	0.6	<1	0.3	<1	<0.5	<0.1	<1	4				3.7	345	7	1.7	1	2	3	37	<1
3/01/2021 7:53	7.98	116	90.1	29	263	274	70	43	204	0.6	<0.2	<1	317	<0.5	1.4	<0.01	<1	<2	<0.2	82	<1	<0.2	19	<0.5	<1	0.3	<1	<0.5	<0.1	<1	3				3.2	350	9	2.5	2	2	5	58	<1
10/01/2021 7:20	7.68	194	83.3	30.2	238	226	118	72	28	<0.5	<0.2	<1	120	<0.5	<0.5	<0.01	<1	<2	<0.2	85	<1	<0.2	24	<0.5	<1	0.7	<1	<0.5	<0.1	<1	<1				6.5	236	14	5.6	4	3	9	76	<1
17/01/2021 7:25	7.8	288	86.9	31.1	40	12	264	115	<5	0.5	<0.2	<1	11	<0.5	0.6	<0.01	<1	<2	<0.2	106	<1	<0.2	29	<0.5	<1	0.6	<1	<0.5	<0.1	<1	3				5.5	<100	23	7.5	4	3	14	127	<1
24/01/2021 8:06	7.58	79.8	88.8	29	304	318	68	31	138	<0.5	<0.2	<1	327	<0.5	1.4	<0.01	<1	<2	<0.2	56	<1	<0.2	15	<0.5	<1	0.2	<1	<0.5	<0.1	<1	4				1.1	<100	7	2.9	2	2	3	35	<1
31/01/2021 7:23	7.98	234	85.9	31.9	22	10	140	111	21.5	0.65	<0.02	0.78	54	0.05	0.42	<0.02	0.65	<0.1	<0.05	156	<0.05	<0.05	31.5	0.1	0.05	0.45	<0.2	<0.05	0.05	0.477	4.75				3.2	<20	21.4	6	4.3	3.2	13.9	111	<1
7/02/2021 11:50	7.4	56	81.8	27.9	612	945	96	21	40	<1	<0.1	<1	90	<1	<1	<0.1	<1	<5	<1	38	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				<1	132.81	5	2	1	2	2	27	<1

| McArthur River - SW16 | | |

Table A.9: Analyte sampling data for SW21, McArthur River

Timestamps	McArthur River - SW21																																											
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 8:18	7.33	380	64.4	24.68	4	<10	194	145	<5	0.9	<0.2	<1	<5	<0.5	18	<0.01	<1	<2	<0.2	224	<1	<0.2	56	<0.5	<1	0.4	<1	<0.5	<0.1	<1	1	<1	<20	<50	11	<100	26	22	11	3	19	174	<1
10/05/2020 9:48	8.02	414	77.5	26.01	3	<10	218	154	<5	0.6	<0.2	<1	7	<0.5	6.4	<0.01	<1	<2	<0.2	192	<1	<0.2	46	<0.5	<1	0.5	<1	<0.5	<0.1	<1	1	<1	<20	<50	11	<100	29	22	11	3	20	162	<1
17/05/2020 9:45	8.04	457	80.9	25.31	5	<10	260	198	2.6	1	<0.02	0.45	8	0.01	22.2	<0.02	0.6	0.2	<0.05	209	<0.05	<0.05	55	<0.1	0.11	0.5	<0.2	<0.05	<0.01	0.828	1.9	<1	<20	<50	15	20	36.9	24	14	3.6	25.6	180	4
24/05/2020 9:53	7.79	495	70.4	20.85	4	<10	260	210	2.1	0.9	<0.02	0.44	12	<0.01	79.4	<0.02	0.68	0.1	<0.05	227	<0.05	<0.05	43	<0.1	0.18	0.6	<0.2	<0.05	0.02	0.872	1.6	<1	<20	<50	13.8	40	38.9	30	15.9	3.6	27.4	196	1
31/05/2020 11:21	7.89	504	80	22.75	4	<10	280	219	3.2	0.85	<0.02	0.44	12	0.01	18.8	<0.02	0.58	<0.1	<0.05	204	<0.05	<0.05	48.5	<0.1	0.13	0.6	<0.2	<0.05	<0.01	0.914	1.8	<1	<20	<50	13.1	<20	40.1	28	13.9	3.6	28.9	202	<1
8/06/2020 8:45	7.05	548	73	22.05	5	20	320	244	1.7	0.95	<0.02	0.52	12	0.01	63.3	<0.02	0.67	0.9	0.05	242	<0.05	0.05	54.5	<0.1	0.17	0.7	<0.2	<0.05	0.01	1.11	1.7	<1	<20	<50	16.1	<20	44.5	34	17.2	3.7	32.2	231	<1
14/06/2020 12:16	7.42	622	87.9	23.85	3	<10	322	256	<5	0.8	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	243	<1	<0.2	52	<0.5	<1	0.6	<1	<0.5	<0.1	1	1	<1	<20	<50	18	<100	47	35	16	4	33	236	<1
21/06/2020 12:30	8.12	598	80.2	25.05	3	<10	346	244	<5	0.9	<0.2	<1	<5	<0.5	2.3	<0.01	<1	<2	<0.2	237	<1	<0.2	55	<0.5	<1	0.6	<1	<0.5	<0.1	<1	1	<1	<20	<50	20	<100	43	40	18	4	33	244	<1
28/06/2020 8:53	7.64	724	63.2	19.64	4	<10	434	322	<5	1	<0.2	<1	<5	<0.5	106	<0.01	<1	<2	<0.2	285	<1	<0.2	73	<0.5	<1	0.7	<1	<0.5	<0.1	<1	1	<1	<20	<50	24	<100	55	49	27	6	45	254	<1
5/07/2020 12:26	7.9	734	67.8	21.01	2	<10	418	299	<5	1	<0.2	<1	<5	<0.5	60	<0.01	<1	<2	<0.2	315	<1	<0.2	72	<0.5	<1	0.7	<1	<0.5	<0.1	1	<1	<1	<20	<50	<0.1	<100	51	55	25	4	42	248	8
12/07/2020 10:39	8.33	896	68.9	22.63	3	<10	450	357	<5	1	<0.2	<1	5	<0.5	153	<0.01	<1	<2	<0.2	319	<1	<0.2	72	<0.5	<1	0.8	<1	<0.5	<0.1	1	<1	<1	<20	<50	35	<100	54	67	32	5	54	308	<1
19/07/2020 9:42	7.59	994	60.7	17.74	3	<10	598	408	<5	0.9	<0.2	<1	<5	<0.5	2.9	<0.01	<1	<2	<0.2	279	<1	<0.2	70	<0.5	<1	0.9	<1	<0.5	<0.1	2	<1	<1	<20	<50	39	<100	64	75	38	6	60	390	<1
26/07/2020 10:43	8.04	992	81.5	20.03		<10	592		0.4	0.8	<0.02	0.32	2	<0.01	0.31	<0.02	0.44	<0.1	<0.05	305	<0.05	<0.05	105	<0.1	0.07	1.1	<0.2	<0.05	<0.01	1.95	1.05	<1	<20	<50	43	<100		83				348	<1
2/08/2020 8:31	7.05	1082	81.1	19.03	3	<10	574		0.3	0.8	<0.02	0.33	4	<0.01	0.43	<0.02	0.51	<0.1	<0.05	365	<0.05	<0.05	112	<0.1	0.07	1.15	<0.2	<0.05	<0.01	2.14	0.95	<1	<20	<50	47	<100		89				414	<1
8/08/2020 12:18	7.54	1197	68.4	22.57		<10	724		0.6	0.85	<0.02	0.43	10	0.01	0.39	<0.02	0.5	0.3	<0.05	370	<0.05	<0.05	119	<0.1	0.06	1.25	<0.2	<0.05	0.03	2.07	1.15	<1	<20	<50	49	<100		94				429	<1
16/08/2020 8:34	7.86	1130	64.5	21.94	3	10	710	511	0.4	0.8	<0.02	0.45	16	0.07	3.53	<0.02	0.5	0.7	<0.05	382	<0.05	<0.05	106	<0.1	0.07	1.3	<0.2	<0.05	0.01	2.11	1.25	<1	<20	<50	51	<20	75.5	106	45	7.1	78.4	432	11
24/08/2020 13:12	7.85	1180	82.8	24.34	2	<10	660	518	0.9	0.9	<0.02	0.44	22	0.03	1.3	<0.02	0.45	0.5	<0.05	378	<0.05	<0.05	134	<0.1	0.05	1.55	<0.2	<0.05	0.02	2.23	1.4	<1	<20	<50	51.3	<20	70.9	108	45.1	7.3	82.8	397	32
30/08/2020 11:31	8.02	1130	95.3	23.1	3	20	720	541	1.1	1	<0.02	0.41	40	0.07	3.82	<0.02	0.46	0.5	<0.05	378	<0.05	<0.05	131	<0.1	0.09	1.5	<0.2	<0.05	0.02	2.14	1.5	<1	<20	<50	52.7	40	70.9	114	45.7	7.7	88.4	427	23
7/09/2020 15:06	8.07	1170	110.4	28.72	1	<10	680	537	1	1.1	<0.02	0.6	36	0.37	24	<0.02	0.49	2.5	0.05	348	<0.05	0.05	129	<0.1	0.13	1.7	<0.2	<0.05	0.02	2.07	1.85	<1	<20	<50	51.8	<20	61.8	120	46.6	8.3	92.9	425	21
15/09/2020 12:10	8.24	1200	133.9	31.5	3	40	825	537	2.1	1.4	<0.02	0.67	54	0.3	13.5	<0.02	0.57	1.8	0.1	327	<0.05	0.1	158	0.1	0.14	2	<0.2	<0.05	0.03	1.86	2.4	<1	<20	<50	50.6	<20	52.6	134	47.7	8.9	98.5	393	36
20/09/2020 8:33	8.1	1210	81.2	27.2	2	<10	740	549	1.1	1.65	<0.02	0.43	16	0.02	1.6	<0.02	0.62	0.2	<0.05	399	<0.05	<0.05	174	<0.1	0.11	2.1	<0.2	<0.05	0.03	1.77	2.65	<1	<20	<50	48.2	<20	57.9	116	46.9	8.7	98.3	397	42
20/12/2020 10:02	7.84	396	83.5	28.5	88	76	202	158	<5	1.4	<0.2	<1	31	<0.5	2	<0.01	<1	<2	<0.2	159	<1	<0.2	53	<0.5	<1	0.8	<1	<0.5	<0.1	<1	4	<1	<20	<50	10	<100	23	25	12	4	24	141	<1
21/12/2020 6:49	7.71	358	83	28.9	121	128	218	142	<5	1	<0.2	1	33	<0.5	1.7	<0.01	<1	4	<0.2	143	<1	<0.2	54	<0.5	<1	0.9	<1	<0.5	<0.1	<1	4				8.7	<100	24	21	9	4	20	147	<1
23/12/2020 6:34	7.59	116	83.7	28	1045	850	90	49	236	0.7	<0.2	1	323	<0.5	2.1	<0.01	<1	<2	<0.2	59	<1	<0.2	30	<0.5	<1	0.5	<1	<0.5	<0.1	<1	6	<1	<20	<50	2.4	147	10	3.3	2	3	6	47	<1
27/12/2020 10:52	7.32	94.8	84.3	29.5	586	584	100	31	437	0.5	<0.2	1	569	<0.5	2.2	<0.01	<1	<2	<0.2	62	<1	<0.2	22	0.7	<1	0.3	<1	<0.5	<0.1	<1	4	<1	<20	<50	3.4	313	7	1.7	1	3	3	39	<1
31/12/2020 11:14	7.31	83.6	89.8	28.2	590	606	42	28	461	<0.5	<0.2	<1	548	<0.5	2.5	<0.01	<1	<2	<0.2	54	<1	<0.2	14	0.6	<1	0.2	<1	<0.5	<0.1	<1	3	<1	<20	<50	2.9	331	6	1.4	<1	2	3	35	<1
3/01/2021 7:17	8.11	110	88.5	29.2	204	200	86	43	210	<0.5	<0.2	<1	321	<0.5	1.6	<0.01	<1	<2	<0.2	79	<1	<0.2	19	<0.5	<1	0.2	<1	<0.5	<0.1	<1	3	<1	<20	<50	2.5	340	10	2.2	1	2	5	54	<1
10/01/2021 7:00	7.24	142	83.6	29.3	561	598	92	54	57	<0.5	<0.2	1	143	<0.5	0.6	<0.01	<1	<2	<0.2	48	<1	<0.2	23	<0.5	<1	0.6	<1	<0.5	<0.1	<1	<1	<1	<20	<50	5.4	214	11	4	3	3	6	63	<1
17/01/2021 7:14	7.71	292	84.5	32.3	39	14	196	113	<5	0.7	<0.2	<1	14	<0.5	1.4	<0.01	<1	<2	<0.2	103	<1	<0.2	28	<0.5	<1	0.5	<1	<0.5	<0.1	<1	3	<1	<20	<50	5.5	<100	23	7	4	3	13	121	<1
24/01/2021 7:36	7.37	77.4	85.6	29.1	252	258	108	29	103	<0.5	<0.2	<1	299	<0.5	1.3	<0.01	<1	<2	<0.2	52	<1	<0.2	15	<0.5	<1	0.2	<1	<0.5	<0.1	<1	4	<1	<20	140	1.1	<100	6	3	2	2	3	33	<1
31/01/2021 6:56	8.06	231	86	33	21	20	130	105	31.4	0.7	<0.02	0.81	80	0.06	0.58	<0.02	0.69	<0.1	<0.05	149	<0.05	<0.05	32	0.1	0.06	0.4	<0.2	<0.05	0.01	0.404	4.55	<1	<20	220	3.2	<20	20.1	6	4.4	3.1	13.4	104	<1
7/02/2021 8:51	7.17	56	84.2	27.8	642	874	100	21	20	<1	<0.1	<1	60	<1	<1	<0.1	<1	<5	<1	38	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10	<1	<20	<50	<1	88.54	5	2	1	2	2	26	<1
14/02/2021 7:24	7.51	112	90	30.2	989	952	130	44	141	<0.5	<0.2	<1	271	<0.5	0.9	<0.01	<1	<2	<0.2	84	<1	<0.2	23	<0.5	<1	0.6	<1	<0.5	<0.1	<1	3	<1	<20	<50	7.5	<100	10	2	2	2	5	45	<1
21/02/2021 7:26	7.69	118	91.9	28.4	107	68	154	48	53	<0.5	<0.2	<1	162	<0.5	0.8	<0.01	<1	<2	<0.2	62	<1	<0.2	19	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2	<1	<20	<50	1.3	<100	10	3.3	2	2	6	56	<1
23/02/2021 6:43	7.34	81.8	89.9	28.2	166	170	68	28	156	<0.5	<0.2	<1	200	<0.5	1.2	<0.01	<1	<2	<0.2	45	<1	<0.2	16	<0.5	<1	0.1	<1	<0.5	<0.1	<1	2	<1	<20	<50	1.3	<100	6	2.4	2	2	3	37	<1
28/02/2021 8:08	7.79	210	90.5	30.2	16	<10	106	92	13	0.6	<0.2	<1	11	<0.5	<0.5	<0.01	<1	<2	<0.2	96	<1	<0.2	28	<0.5	<1	0.1	<1	<0.5	<0.1	<1	2	<1	<20	<50	3.9	<100	19	6.2	3	2	11	106	<1
7/03/2021 7:16	7.76	290	87.5	31	5	<10	174	128	<5	0.7	<0.2	<1	7	<0.5	<0.5	<0.01	<1	<2	<0.2	133	<1	<0.2	32	<0.5	<1	0.4	<1	<0.5	<0.1	<1	2	<1	<20	<50	4.4	<100	25	8	5	2	16	135	<1
14/03/2021 7:27	7.93	286	85.4	30.9	14	<10	154	119	<5	0.6	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	108	<1	<0.2	31	<0.5	<1	0.4	<1	<0.5	<0.1	<1	3	<1	<20	<50	3.9	<100	23	7.9	4	2	15	127	5
21/03/2021 7:17	7.61	71.4	90.2	25.8	979	1106	24	24	213	<0.5	<0.2	<1	295	<0.5	1.1	<0.01	<1	<2	<0.2	37	<1	<0.2	14	<0.5	<1	0.3	<1	<0.5	<0.1	<1	2	<1	<20	<50	3.2	<100	5	1.4	<1	2	2	31	<1

| McArthur River - SW21 | | |

Table A.10: Analyte sampling data for SW27, McArthur River

Timestamps	McArthur River - SW27																																										
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 9:17	8	278	73	25.45	6	<10	150	112	<5	0.8	<0.2	<1	7	<0.5	1.4	<0.01	<1	<2	<0.2	175	<1	<0.2	43	<0.5	<1	0.4	<1	<0.5	<0.1	<1	1				4.9	<100	20	12	6	3	15	137	<1
10/05/2020 8:08	7.9	338	73.3	25.2	5	<10	170	135	<5	0.7	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	162	<1	<0.2	42	<0.5	<1	0.4	<1	<0.5	<0.1	<1	2				5.8	<100	27	14	7	3	16	144	<1
17/05/2020 7:56	8.4	352	68	24.33	7	30	200	163	3.8	0.9	<0.02	0.45	4	<0.01	0.43	<0.02	0.58	<0.1	<0.05	195	<0.05	<0.05	41.5	<0.1	0.04	0.5	<0.2	<0.05	<0.01	0.654	2.25				10	100	31.9	14	8.1	3.3	20.3	150	4
20/12/2020 6:58	8.1	372	60.1	28.5	53	24	254	155	6	1.4	<0.2	1	50	<0.5	1.8	<0.01	1	<2	<0.2	159	<1	<0.2	53	<0.5	<1	0.9	<1	<0.5	<0.1	<1	4				9.1	<100	24	23	10	4	23	151	<1
27/12/2020 10:37	7.4	86.8	83	29.8	532	476	46	30	413	<0.5	<0.2	1	525	<0.5	1.9	<0.01	<1	<2	<0.2	54	<1	<0.2	16	0.6	<1	0.3	<1	<0.5	<0.1	<1	3				3.3	367	7	1.7	1	2	3	35	<1
3/01/2021 7:07	7.6	112	86.6	29.2	191	146	94	44	270	0.5	<0.2	<1	365	<0.5	1.8	<0.01	<1	<2	<0.2	80	<1	<0.2	18	<0.5	<1	0.3	<1	<0.5	<0.1	<1	3				2.6	358	10	2.2	1	2	5	54	<1
10/01/2021 7:08	7.8	160	80.7	30.2	185	130	158	74	31	<0.5	<0.2	<1	138	<0.5	0.6	<0.01	<1	<2	<0.2	75	<1	<0.2	19	<0.5	<1	0.5	<1	<0.5	<0.1	<1	<1				5.3	231	17	3.5	2	3	8	76	<1
17/01/2021 7:25	8	264	79.6	31.6	35	12	202	103	<5	0.6	<0.2	<1	18	<0.5	0.7	<0.01	<1	<2	<0.2	104	<1	<0.2	26	<0.5	<1	0.5	<1	<0.5	<0.1	<1	2				4.6	<100	22	5.2	3	3	12	118	<1
24/01/2021 7:25	7.3	78	82.6	29.1	256	244	68	24	138	<0.5	<0.2	<1	336	<0.5	1.4	<0.01	<1	<2	<0.2	54	<1	<0.2	15	<0.5	<1	0.2	<1	<0.5	<0.1	<1	4				1	<100	5	2.9	2	2	3	35	<1
31/01/2021 6:47	8	173	81.7	32.8	23	20	100	76.2	54.6	0.65	<0.02	0.91	138	0.16	0.65	<0.02	0.84	3.6	<0.05	125	<0.05	<0.05	29.5	0.1	0.06	0.35	<0.2	<0.05	0.03	0.222	4.4				3.1	<20	15.4	4	3.8	3.3	9.2	77	<1
7/02/2021 8:43	7.31	54	83.6	27.8	455	871	100	21	10	<1	<0.1	<1	<50	<1	<1	<0.1	<1	<5	<1	36	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				<1	132.81	5	2	1	2	2	23	<1
14/02/2021 7:14	7.8	112	89.5	29.8	919	914	142	44	152	<0.5	<0.2	<1	299	<0.5	0.9	<0.01	<1	<2	<0.2	88	<1	<0.2	22	<0.5	<1	0.6	<1	<0.5	<0.1	<1	3				8	<100	9	2.1	2	2	5	44	<1
21/02/2021 7:15	8	128	88.8	28.4	139	86	168	53	48	<0.5	<0.2	<1	161	<0.5	0.7	<0.01	<1	<2	<0.2	70	<1	<0.2	19	<0.5	<1	0.2	<1	<0.5	<0.1	<1	2				1.5	<100	11	3.1	2	2	6	58	<1
28/02/2021 7:59	7.9	196	85.4	29.9	18	10	120	87	11	0.6	<0.2	<1	68	<0.5	0.5	<0.01	<1	<2	<0.2	88	<1	<0.2	26	<0.5	<1	0.3	<1	<0.5	<0.1	<1	2				3.2	<100	18	5.3	3	2	10	109	<1
7/03/2021 8:00	8	280	83.1	30.8	4	<10	176	124	<5	0.6	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	137	<1	<0.2	30	<0.5	<1	0.3	<1	<0.5	<0.1	<1	2				3.7	<100	25	6.8	4	2	15	151	<1
14/03/2021 7:54	8.2	288	86.9	30.5	12	<10	174	121	<5	0.6	<0.2	<1	5	<0.5	<0.5	<0.01	<1	<2	<0.2	123	<1	<0.2	31	<0.5	<1	0.4	<1	<0.5	<0.1	<1	3				2.8	<100	23	6.7	3	2	15	125	<1
21/03/2021 7:09	7.7	81.2	88.5	26.1	1523	1564	14	28	214	<0.5	<0.2	<1	302	<0.5	1	<0.01	<1	<2	<0.2	40	<1	<0.2	15	<0.5	<1	0.4	<1	<0.5	<0.1	<1	3				3.8	<100	6	1.6	1	2	3	30	<1
28/03/2021 7:20	7.8	130	89.8	29.5	126	58	128	55	104	<0.5	<0.2	<1	194	<0.5	1	<0.01	<1	<2	<0.2	88	<1	<0.2	16	<0.5	<1	0.1	<1	<0.5	<0.1	<1	2				3.4	<100	11	3.2	2	2	7	67	<1
4/04/2021 13:36	8	264	99.3	31	18	<10	132	101	9	<0.5	<0.2	<1	29	<0.5	0.9	<0.01	<1	<2	<0.2	141	<1	<0.2	15	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	2				3.4	<100	19	6.4	4	3	13	125	<1
11/04/2021 13:27	8.34	338	96	31.2	5.7	8	202	183	<10	<1	<0.1	<1	<50	<1	<1	<0.1	<1	<5	<1	214	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				4	<50	37	9	6	3	22	175	3
18/04/2021 7:19	8.3	388	75.6	26.6	4	<10	184	161	<5	0.8	<0.2	<1	<5	<0.5	5.6	<0.01	<1	<2	<0.2	198	<1	<0.2	<1	<0.5	<1	0.5	<1	<0.5	<0.1	<1	2				4.7	<100	31	10	5	2	20	154	16
25/04/2021 13:05	8.2	430	94.5	29.2	6	10	234	185	<5	0.8	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	190	<1	<0.2	10	<0.5	<1	0.4	<1	<0.5	<0.1	<1	2				5.1	<100	34	11	5	3	24	235	<1

Table A.11: Analyte sampling data for SW28, Barney Creek

Timestamps	Barney Creek - SW28																																												
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
20/12/2020 9:55	7.88	22.4	72.3	27.4	314	144	198	4	2229	0.6	<0.2	2	1159	0.7	6.9	<0.01	1	2	<0.2	18	<1	<0.2	28	1.4	<1	<0.1	1	<0.5	<0.1	<1	3				0.4	101	2	0.7	<1	2	<1	10	<1
27/12/2020 10:26	7.72	44	83.7	31.2	179	30	120	13	1364	0.7	<0.2	1	688	<0.5	4.1	<0.01	1	<2	<0.2	30	<1	<0.2	18	0.7	<1	0.2	<1	<0.5	<0.1	<1	1				0.5	<100	3	1.3	<1	2	2	20	<1
3/01/2021 6:57	8.15	41.2	88.5	28.6	178	74	114	11	1047	0.7	<0.2	1	581	<0.5	3.7	<0.01	<1	<2	<0.2	29	<1	<0.2	18	0.7	<1	0.1	<1	<0.5	<0.1	<1	2				1	227	2	3.3	2	2	1	14	<1
10/01/2021 6:50	7.31	33.6	87.1	25.9	1377	604	224	12	1130	<0.5	<0.2	1	646	<0.5	2.9	<0.01	<1	<2	<0.2	10	<1	<0.2	18	0.7	<1	0.2	<1	<0.5	<0.1	<1	<1				0.6	<100	2	1.2	<1	2	1	14	<1
24/01/2021 7:16	7.29	56	80.2	29.7	308	86	238	12	1516	0.9	<0.2	1	693	<0.5	4.6	<0.01	<1	<2	<0.2	34	<1	<0.2	26	0.8	<1	0.2	<1	<0.5	<0.1	<1	2				0.6	<100	2	4.4	3	2	2	20	<1
7/02/2021 8:35	6.31	26	86.6	26.6	269	136	138	9	360	<1.	<0.1	<1	250	<1	2	<0.1	<1	<5	<1	15	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				<1	<50	2	<1	<1	2	1	12	<1
14/02/2021 7:06	7.29	38.8	89.9	30.7	78	24	138	12	568	<0.5	<0.2	<1	377	<0.5	2.4	<0.01	<1	<2	<0.2	26	<1	<0.2	23	<0.5	<1	0.1	<1	<0.5	<0.1	<1	1				0.5	<100	2	2.8	2	1	1	13	<1
21/02/2021 7:07	7.65	48.4	92.6	28	85	72	102	15	353	0.5	<0.2	<1	336	<0.5	2.6	<0.01	<1	<2	<0.2	28	<1	<0.2	21	<0.5	<1	0.1	<1	<0.5	<0.1	<1	1				0.4	<100	3	3.8	2	1	2	17	<1
28/02/2021 7:51	7.95	47	92.2	28.4	63	20	60	14	302	0.6	<0.2	<1	264	<0.5	1.9	<0.01	<1	<2	<0.2	24	<1	<0.2	20	<0.5	<1	0.1	<1	<0.5	<0.1	<1	1				0.5	<100	3	4.3	2	1	2	20	<1
18/03/2021		34			253	96	154	11	688	<0.5	<0.2	1	354	<0.5	2.3	<0.01	<1	<2	<0.2	19	<1	<0.2	23	<0.5	<1	<0.1	1	<0.5	<0.1	<1	<1				0.5	<100	2	1.4	<1	2	1	14	<1
21/03/2021 7:01	7.6	22.8	90.1	24.8	226	228	60	4	448	<0.5	<0.2	<1	231	<0.5	1.3	<0.01	<1	<2	<0.2	9	<1	<0.2	11	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.2	<100	1	0.7	<1	2	<1	9	<1
28/03/2021 7:11	8.16	32.8	92.3	28.8	120	50	94	8	610	<0.5	<0.2	<1	358	<0.5	2	<0.01	<1	<2	<0.2	21	<1	<0.2	12	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				0.5	<100	2	2.9	2	1	1	17	<1
11/04/2021 13:40	8.18	67	87.8	30.6	65.4	16	111	27	120	16	<0.1	<1	110	<1	1	<0.1	<1	7	<1	50	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				<1	<50	6	4	3	2	3	31	<1

Table A.12: Analyte sampling data for SW29, Surprise Creek

| Surprise Creek – SW29 | | |

Table A.13: Analyte sampling data for SW30, Emu Creek

Timestamps	Emu Creek - SW30																																													
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
27/12/2020 12:35	6.83	122	78.1	34.5	4	<10	56	33	69	<0.5	<0.2	<1	45	<0.5	17	<0.01	<1	<2	<0.2	16	<1	<0.2	25	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				5.1	2608	5	7.3	4	3	5	38	<1
3/01/2021 8:57	7.9	70.6	89	28.7	7	<10	38	18	124	<0.5	<0.2	<1	81	<0.5	5	<0.01	<1	<2	<0.2	13	<1	<0.2	19	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				2.8	2303	3	4.6	3	3	2	22	<1
10/01/2021 8:20	7.55	40	84.6	29.4	2	<10	70	29	25	<0.5	<0.2	<1	41	<0.5	0.7	<0.01	<1	<2	<0.2	11	<1	<0.2	24	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				3.8	835	5	6	4	3	4	26	<1
17/01/2021 8:39	7.37	114	65.6	30.2	2	<10	62	28	14	<0.5	<0.2	<1	17	<0.5	50	<0.01	<1	<2	<0.2	10	<1	<0.2	32	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				4.4	<100	5	7.5	4	3	4	38	<1
24/01/2021 9:13	7.49	72.2	87.3	29.9	12	<10	116	22	124	<0.5	<0.2	<1	103	<0.5	1.3	<0.01	<1	<2	<0.2	13	<1	<0.2	21	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				2.5	<100	4	4.4	3	2	3	27	<1
31/01/2021 8:21	7.09	100	60.1	30.5	4	<10	60	31.5	131	0.4	<0.02	0.2	70	0.06	16.7	<0.02	0.22	0.3	<0.05	19.2	<0.05	<0.05	37	<0.1	0.03	<0.05	<0.2	<0.05	0.02	0.011	0.4				3.4	<20	5.2	4	4.8	3.3	4.5	36	<1
7/02/2021 9:32	7.74	46	90.9	27.7	35.3	<5	73	16	3560	<1	<0.1	1	1370	<1	9	<0.1	<1.	<5	<1	14	<1	<1	<50	1	<1	<1	<10	<1	<1	<1	<10				2	<50	3	3	2	2	2	17	<1
14/02/2021 8:51	7.16	63.8	89.2	29.9	14	<10	104	18	228	<0.5	<0.2	<1	120	<0.5	0.8	<0.01	<1	<2	<0.2	10	<1	<0.2	27	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				2.4	<100	3	4.2	3	2	2	20	<1
21/02/2021 9:03	7.28	69.6	91.8	28.5	20	<10	88	20	183	<0.5	<0.2	<1	114	<0.5	1	<0.01	<1	<2	<0.2	9	<1	<0.2	25	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				2.6	<100	4	4.3	3	2	3	27	<1
28/02/2021 9:47	7.46	95.8	93.7	29.3	5	<10	62	28	45	<0.5	<0.2	<1	48	<0.5	13	<0.01	<1	<2	<0.2	12	<1	<0.2	32	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				4.4	<100	5	7.1	4	3	4	35	<1
7/03/2021 8:18	7.36	108	64.7	29.2	3	<10	94	30	54	<0.5	<0.2	<1	39	<0.5	13	<0.01	<1	<2	<0.2	15	<1	<0.2	33	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				4.6	<100	5	6.6	5	3	4	38	<1
14/03/2021 8:54	7.16	114	56.5	29.5	4	<10	84	31	23	<0.5	<0.2	<1	32	<0.5	19	<0.01	<1	<2	<0.2	13	<1	<0.2	37	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				4.6	<100	5	7.2	5	3	4	38	<1
21/03/2021 8:51	7.42	51.2	89.9	25.9	37	<10	52	13	204	<0.5	<0.2	<1	166	<0.5	1	<0.01	<1	<2	<0.2	7	<1	<0.2	14	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				1.3	<100	3	2.9	2	2	2	21	<1
28/03/2021 9:09	8.17	93.2	89.9	28.6	24	<10	56	28	134	<0.5	<0.2	<1	63	<0.5	2.7	<0.01	<1	<2	<0.2	14	<1	<0.2	21	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				3.4	<100	5	5.1	5	2	4	39	<1
4/04/2021 10:32	8.24	118	84.7	28	9	<10	54	31	73	<0.5	<0.2	<1	59	<0.5	17	<0.01	<1	<2	<0.2	15	<1	<0.2	16	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				4.6	<100	5	6.6	5	3	4	43	<1
11/04/2021 12:01	7.93	122	84.2	30.8	5.3	<5	91	45	<10	<1	<0.1	<1.	<50	<1	18	<0.1	<1	<5	<1	19	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				5	<50	8	8	7	4	6	47	<1
18/04/2021 8:59	7.76	128	75.4	25	5	<10	64	32	16	<0.5	<0.2	<1	21	<0.5	26	<0.01	<1	<2	<0.2	19	<1	<0.2	<1	<0.5	<1	<0.1	<1	<0.5	<0.1	<1	<1				5.6	<100	5	8.3	5	3	4	43	<1

Table A.14: Analyte sampling data for SW32, McArthur River

	McArthur River - SW32																																											
Timestamps	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
21/10/2020 9:27	8.57	418	84.8	31.2	2	<10	260	168	2.6	1.8	<0.02	0.32	6	<0.01	0.4	<0.02	0.39	<0.1	<0.05	165	<0.05	<0.05	59.5	<0.1	0.06	0.75	<0.2	<0.05	0.01	0.64	3.05				17.9	<20	29.5	28	17.5	3	23	149	<1
14/11/2020 8:16	8.02	408	68.4	32.2	1	<10	192	150	<5	0.8	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	117	<1	<0.2	30	<0.5	<1	0.6	<1	<0.5	<0.1	<1	2				18	<100	30	31	15	2	18	153	<1
1/02/2021 13:03	7.25	92	92.6	34.5	54.8	22	82	31	10	<1	<0.	<1	90	<1	<1	<0.1	<1	<5	<1	54	<1	<1	<50	<1	<1	<1	<10	<1	<1	<1	<10				2	<50	6	5	3	2	4	30	<1
9/03/2021 10:30	7.17	220	82.1	32	6	<10	162	84	10	<0.5	<0.2	<1	151	<0.5	17	<0.01	<1	<2	<0.2	101	<1	<0.2	32	<0.5	<1	0.3	<1	<0.5	<0.1	<1	<1				7	<100	16	8.6	5	2	11	93	<1
22/04/2021 11:54	8.02	296	94.7	29.6	3	<10	152	124	<5	0.6	<0.2	<1	16	<0.5	<0.5	<0.01	<1	<2	<0.2	160	<1	<0.2	11	<0.5	<1	0.3	<1	<0.5	<0.1	<1	<1				9.8	<100	22	11	6	3	17	133	<1

Appendix B - QA/QC analysis

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Table B.1: Duplicate sample results, filtered metals, 2020/21 reporting period (Aluminium to Molybdenum)

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
SW02	28/06/2020 9:59	Original	5	0.2	1.3	65	1	1	277	0.2	0.5	1	1	5	0.5	7.1	0.01	0.4
		Duplicate	5	0.2	1.2	64	1	1	276	0.2	0.5	1	1	5	0.5	6.5	0.01	0.4
		RPD (%)	0%	0%	8%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%
SW02	5/07/2020 13:15	Original	5	0.2	1.7	63	1	1	82	0.2	0.5	1	1	5	0.5	20	0.01	0.4
		Duplicate	5	0.2	1.7	64	1	1	80	0.2	0.5	1	1	5	0.5	15	0.01	0.4
		RPD (%)	0%	0%	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	29%	0%	0%
SW02	26/07/2020 9:53	Original	2.3	0.25	1.2	40.2	0.25	0.05	192	0.1	0.5	0.05	0.21	14	0.05	0.53	0.1	0.55
		Duplicate	1.2	0.05	1.1	40.2	0.05	0.01	163	0.02	0.1	0.03	0.22	10	0.05	0.33	0.02	0.4
		RPD (%)	63%	133%	9%	0%	133%	133%	16%	133%	133%	50%	5%	33%	0%	47%	133%	32%
SW02	2/08/2020 14:50	Original	1.5	0.25	1.35	44.8	0.25	0.05	196	0.1	0.5	0.06	0.17	22	0.05	0.8	0.1	0.6
		Duplicate	0.7	0.05	1.2	42	0.05	0.01	153	0.02	0.1	0.03	0.15	14	0.04	0.44	0.02	0.5
		RPD (%)	73%	133%	12%	6%	133%	133%	25%	133%	133%	67%	13%	44%	22%	58%	133%	18%
SW02	3/01/2021 12:20	Original	76	0.2	0.6	25	1	1	30	0.2	0.5	1	1	51	0.5	19	0.01	0.2
		Duplicate	87	0.2	0.6	26	1	1	30	0.2	0.5	1	1	55	0.5	19	0.01	0.1
		RPD (%)	13%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	8%	0%	0%	0%	67%
SW02	10/01/2021 7:33	Original	212	0.2	0.5	7	1	1	12	0.2	0.5	1	1	121	0.5	1.1	0.01	0.1
		Duplicate	204	0.2	0.5	7	1	1	13	0.2	0.5	1	1	125	0.5	1.2	0.01	0.1
		RPD (%)	4%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%	3%	0%	9%	0%	0%
SW02	17/01/2021 7:45	Original	5	0.2	1.8	51	1	1	62	0.2	0.5	1	1	5	0.5	89	0.01	0.4
		Duplicate	5	0.2	1.8	53	1	1	63	0.2	0.5	1	1	5	0.5	92	0.01	0.3
		RPD (%)	0%	0%	0%	4%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%	0%	29%
SW02	7/02/2021 12:54	Original	30	1	1	17	1	1	50	0.1	1	1	1	50	1	1	0.1	1
		Duplicate	30	1	1	17	1	1	50	0.1	1	1	1	50	1	1	0.1	1
		RPD (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW02	14/02/2021 10:38	Original	9	0.2	0.8	44	1	1	56	0.2	0.5	1	1	10	0.5	0.5	0.01	0.2
		Duplicate	8	0.2	0.8	44	1	1	56	0.2	0.5	1	1	10	0.5	0.5	0.01	0.2
		RPD (%)	12%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW02	7/03/2021 9:11	Original	5	0.2	1.2	81	1	1	71	0.2	0.5	1	1	5	0.5	6.2	0.01	0.2
		Duplicate	5	0.2	1.3	82	1	1	72	0.2	0.5	1	1	5	0.5	5.5	0.01	0.2
		RPD (%)	0%	0%	8%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	12%	0%	0%
SW02	11/04/2021 11:51	Original	10	1	1	122	1	1	110	0.1	1	1	1	50	1	44	0.1	1
		Duplicate	10	1	2	120	1	1	100	0.1	1	1	1	50	1	49	0.1	1
		RPD (%)	0%	0%	67%	2%	0%	0%	10%	0%	0%	0%	0%	0%	0%	11%	0%	0%
SW04	10/01/2021 7:24	Original	582	0.2	0.5	12	1	1	17	0.2	0.5	1	1	458	0.5	2.4	0.01	0.2
		Duplicate	736	0.2	0.5	12	1	1	17	0.2	0.6	1	1	554	0.5	2.9	0.01	0.2
		RPD (%)	23%	0%	0%	0%	0%	0%	0%	0%	18%	0%	0%	19%	0%	19%	0%	0%
SW04	17/01/2021 7:38	Original	452	0.2	1	29	1	1	32	0.2	0.5	1	1	282	0.5	2.5	0.01	0.3
		Duplicate	510	0.2	1	32	1	1	32	0.2	0.5	1	1	315	0.5	3	0.01	0.3
		RPD (%)	12%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	11%	0%	18%	0%	0%
SW04	7/02/2021 13:17	Original	100	1	1	18	1	1	50	0.1	1	1	1	110	1	1	0.1	1

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
		Duplicate	90	1	1	17	1	1	50	0.1	1	1	1	110	1	1	0.1	1
		RPD (%)	11%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW04	7/03/2021 8:19	Original	674	0.2	0.6	45	1	1	29	0.2	0.5	1	1	403	0.5	2.7	0.01	0.2
		Duplicate	684	0.2	0.7	45	1	1	27	0.2	0.5	1	1	415	0.5	2.8	0.01	0.2
		RPD (%)	1%	0%	15%	0%	0%	0%	7%	0%	0%	0%	0%	3%	0%	4%	0%	0%
SW07	10/05/2020 12:01	Original	5	0.2	0.5	201	1	1	52	0.2	0.5	1	1	5	0.5	16	0.01	0.5
		Duplicate	5	0.2	0.5	197	1	1	51	0.2	0.5	1	1	5	0.5	15	0.01	0.5
		RPD (%)	0%	0%	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	6%	0%	0%
SW07	17/05/2020 12:01	Original	2.7	0.05	0.95	226	0.05	0.01	59.5	0.02	0.1	0.14	0.41	8	0.01	60.5	0.02	0.55
		Duplicate	2.4	0.05	0.95	227	0.05	0.01	61	0.02	0.1	0.13	0.52	8	0.03	61.2	0.02	0.55
		RPD (%)	12%	0%	0%	0%	0%	0%	2%	0%	0%	7%	24%	0%	100%	1%	0%	0%
SW07	14/06/2020 12:40	Original	5	0.2	0.8	276	1	1	56	0.2	0.5	1	1	5	0.5	53	0.01	0.6
		Duplicate	5	0.2	0.9	281	1	1	54	0.2	0.5	1	1	5	0.5	61	0.01	0.6
		RPD (%)	0%	0%	12%	2%	0%	0%	4%	0%	0%	0%	0%	0%	0%	14%	0%	0%
SW07	21/06/2020 12:05	Original	5	0.2	0.8	253	1	1	59	0.2	0.5	1	1	5	0.5	15	0.01	0.6
		Duplicate	5	0.2	0.9	254	1	1	58	0.2	0.5	1	1	5	0.5	13	0.01	0.6
		RPD (%)	0%	0%	12%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	14%	0%	0%
SW07	12/07/2020 14:00	Original	5	0.2	0.9	332	1	1	68	0.2	0.5	1	1	5	0.5	53	0.01	0.6
		Duplicate	5	0.2	0.9	319	1	1	67	0.2	0.5	1	1	5	0.5	54	0.01	0.6
		RPD (%)	0%	0%	0%	4%	0%	0%	1%	0%	0%	0%	0%	0%	0%	2%	0%	0%
SW07	19/07/2020 10:05	Original	5	0.2	0.8	319	1	1	65	0.2	0.5	1	1	5	0.5	16	0.01	0.6
		Duplicate	5	0.2	0.7	325	1	1	70	0.2	0.5	1	1	5	0.5	19	0.01	0.7
		RPD (%)	0%	0%	13%	2%	0%	0%	7%	0%	0%	0%	0%	0%	0%	17%	0%	15%
SW07	8/08/2020 17:02	Original	1.7	0.05	0.8	339	0.05	0.01	97	0.02	0.1	0.08	0.52	2	0.01	1.06	0.02	0.8
		Duplicate	1.3	0.05	0.8	336	0.05	0.01	109	0.02	0.1	0.08	0.55	4	0.02	1.2	0.02	0.85
		RPD (%)	27%	0%	0%	1%	0%	0%	12%	0%	0%	0%	6%	67%	67%	12%	0%	6%
SW07	16/08/2020 9:02	Original	1.2	0.05	0.95	395	0.05	0.01	84.5	0.02	0.1	0.16	0.31	4	0.02	22.3	0.02	0.8
		Duplicate	1.3	0.05	0.9	391	0.05	0.01	87.5	0.02	0.1	0.14	0.43	4	0.02	19.1	0.02	0.8
		RPD (%)	8%	0%	5%	1%	0%	0%	3%	0%	0%	13%	32%	0%	0%	15%	0%	0%
SW07	7/09/2020 17:02	Original	1.2	0.05	1.1	407	0.05	0.01	112	0.02	0.1	0.11	0.49	4	0.13	3.99	0.02	0.8
		Duplicate	1.1	0.05	1.05	411	0.05	0.01	104	0.02	0.1	0.11	0.4	4	0.04	4.52	0.02	0.85
		RPD (%)	9%	0%	5%	1%	0%	0%	7%	0%	0%	0%	20%	0%	106%	12%	0%	6%
SW07	15/09/2020 16:02	Original	1.8	0.05	1.15	455	0.05	0.01	114	0.02	0.1	0.17	0.43	6	0.05	16.3	0.02	0.9
		Duplicate	2.1	0.1	1.15	438	0.05	0.01	118	0.02	0.1	0.17	0.6	6	0.15	16.7	0.02	0.95
		RPD (%)	15%	67%	0%	4%	0%	0%	3%	0%	0%	0%	33%	0%	100%	2%	0%	5%
SW07	8/11/2020 14:08	Original	5	0.2	2.2	341	1	1	110	0.2	0.5	1	1	5	0.5	0.5	0.01	1.3
		Duplicate	5	0.2	2.3	359	1	1	111	0.2	0.5	1	1	5	0.5	0.6	0.01	1.3
		RPD (%)	0%	0%	4%	5%	0%	0%	1%	0%	0%	0%	0%	0%	0%	18%	0%	0%
SW07	24/01/2021 16:00	Original	128	0.2	0.5	54	1	1	14	0.2	0.5	1	1	337	0.5	1.4	0.01	0.2
		Duplicate	129	0.2	0.5	51	1	1	14	0.2	0.5	1	1	353	0.5	1.6	0.01	0.2
		RPD (%)	1%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%
SW07	31/01/2021 12:02	Original	20	0.05	0.65	146	0.05	0.01	33.5	0.02	0.1	0.07	0.8	56	0.05	0.52	0.02	0.4

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
		Duplicate	18.9	0.05	0.65	149	0.05	0.01	29.5	0.02	0.1	0.06	0.77	58	0.05	0.54	0.02	0.45
		RPD (%)	6%	0%	0%	2%	0%	0%	13%	0%	0%	15%	4%	4%	0%	4%	0%	12%
SW07	21/02/2021 12:01	Original	43	0.2	0.5	68	1	1	19	0.2	0.5	1	1	150	0.5	0.9	0.01	0.2
		Duplicate	47	0.2	0.5	67	1	1	22	0.2	0.5	1	1	155	0.5	0.9	0.01	0.2
		RPD (%)	9%	0%	0%	1%	0%	0%	15%	0%	0%	0%	0%	3%	0%	0%	0%	0%
SW07	28/02/2021 8:19	Original	13	0.2	0.6	95	1	1	26	0.2	0.5	1	1	56	0.5	0.5	0.01	0.3
		Duplicate	12	0.2	0.7	92	1	1	27	0.2	0.5	1	1	54	0.5	0.5	0.01	0.3
		RPD (%)	8%	0%	15%	3%	0%	0%	4%	0%	0%	0%	0%	4%	0%	0%	0%	0%
SW07	21/03/2021 14:00	Original	239	0.2	0.5	42	1	1	14	0.2	0.5	1	1	331	0.5	1.1	0.01	0.3
		Duplicate	208	0.2	0.5	44	1	1	14	0.2	0.5	1	1	285	0.5	1	0.01	0.3
		RPD (%)	14%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	15%	0%	10%	0%	0%
SW07	28/03/2021 7:45	Original	98	0.2	0.5	88	1	1	16	0.2	0.5	1	1	180	0.5	0.9	0.01	0.2
		Duplicate	87	0.2	0.5	88	1	1	15	0.2	0.5	1	1	187	0.5	0.9	0.01	0.1
		RPD (%)	12%	0%	0%	0%	0%	0%	6%	0%	0%	0%	0%	4%	0%	0%	0%	67%
SW07	4/04/2021 11:44	Original	10	0.2	0.5	140	1	1	16	0.2	0.5	1	1	42	0.5	0.5	0.01	0.1
		Duplicate	11	0.2	0.5	136	1	1	16	0.2	0.5	1	1	42	0.5	0.5	0.01	0.1
		RPD (%)	10%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW09	10/01/2021 7:31	Original	68	0.2	0.5	23	1	1	15	0.2	0.5	1	1	241	0.5	19	0.01	0.1
		Duplicate	67	0.2	0.5	22	1	1	14	0.2	0.5	1	1	235	0.5	19	0.01	0.1
		RPD (%)	1%	0%	0%	4%	0%	0%	7%	0%	0%	0%	0%	3%	0%	0%	0%	0%
SW11	10/05/2020 12:04	Original	5	0.2	0.5	223	1	1	52	0.2	0.5	1	1	6	0.5	117	0.01	0.5
		Duplicate	5	0.2	0.5	226	1	1	53	0.2	0.5	1	1	7	0.5	120	0.01	0.5
		RPD (%)	0%	0%	0%	1%	0%	0%	2%	0%	0%	0%	0%	15%	0%	3%	0%	0%
SW11	14/06/2020 9:50	Original	5	0.2	0.7	307	1	1	70	0.2	0.5	1	1	5	0.5	244	0.01	0.8
		Duplicate	5	0.2	0.7	310	1	1	62	0.2	0.5	1	1	5	0.5	236	0.01	0.8
		RPD (%)	0%	0%	0%	1%	0%	0%	12%	0%	0%	0%	0%	0%	0%	3%	0%	0%
SW11	21/06/2020 12:07	Original	5	0.2	0.8	318	1	1	71	0.2	0.5	1	1	5	0.5	295	0.01	0.8
		Duplicate	5	0.2	0.9	324	1	1	76	0.2	0.5	1	1	5	0.5	307	0.01	0.8
		RPD (%)	0%	0%	12%	2%	0%	0%	7%	0%	0%	0%	0%	0%	0%	4%	0%	0%
SW11	28/06/2020 10:33	Original	5	0.2	0.7	389	1	1	122	0.2	0.5	1	1	6	0.5	668	0.01	0.8
		Duplicate	5	0.2	0.6	383	1	1	124	0.2	0.5	1	1	7	0.5	648	0.01	0.8
		RPD (%)	0%	0%	15%	2%	0%	0%	2%	0%	0%	0%	0%	15%	0%	3%	0%	0%
SW11	12/07/2020 14:01	Original	5	0.2	0.8	351	1	1	87	0.2	0.5	1	1	14	0.5	638	0.01	1
		Duplicate	5	0.2	0.7	375	1	1	88	0.2	0.5	1	1	16	0.5	671	0.01	1
		RPD (%)	0%	0%	13%	7%	0%	0%	1%	0%	0%	0%	0%	13%	0%	5%	0%	0%
SW11	16/08/2020 9:03	Original	1.2	0.05	0.7	423	0.05	0.01	112	0.02	0.1	0.44	0.33	118	0.01	68.1	0.02	1.5
		Duplicate	2.2	0.05	0.75	432	0.05	0.01	103	0.02	0.1	0.43	0.28	102	0.02	67.7	0.02	1.5
		RPD (%)	59%	0%	7%	2%	0%	0%	8%	0%	0%	2%	16%	15%	67%	1%	0%	0%
SW11	24/08/2020 11:00	Original	1.6	0.05	0.85	427	0.05	0.01	144	0.02	0.1	0.23	0.39	66	0.1	1.91	0.02	1.45
		Duplicate	1.7	0.05	0.75	436	0.05	0.01	120	0.02	0.1	0.24	0.34	58	0.1	1.49	0.02	1.5
		RPD (%)	6%	0%	13%	2%	0%	0%	18%	0%	0%	4%	14%	13%	0%	25%	0%	3%
SW11	30/08/2020 9:09	Original	2.2	0.05	0.7	443	0.05	0.01	126	0.02	0.1	0.23	0.35	60	0.09	1.49	0.02	1.35

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
		Duplicate	1.3	0.05	0.8	432	0.05	0.01	125	0.02	0.1	0.25	0.37	68	0.06	1.72	0.02	1.3
		RPD (%)	51%	0%	13%	3%	0%	0%	1%	0%	0%	8%	6%	13%	40%	14%	0%	4%
SW11	21/12/2020 7:52	Original	33	0.2	0.5	32	1	1	23	0.2	0.5	1	1	70	0.5	6.4	0.01	0.1
		Duplicate	32	0.2	0.5	32	1	1	25	0.2	0.5	1	1	65	0.5	6.7	0.01	0.1
		RPD (%)	3%	0%	0%	0%	0%	0%	8%	0%	0%	0%	0%	7%	0%	5%	0%	0%
SW11	23/12/2020 7:05	Original	37	0.2	0.5	50	1	1	24	0.2	0.5	1	1	97	0.5	1.6	0.01	0.2
		Duplicate	20	0.2	0.5	52	1	1	25	0.2	0.5	1	1	79	0.5	1.8	0.01	0.2
		RPD (%)	60%	0%	0%	4%	0%	0%	4%	0%	0%	0%	0%	20%	0%	12%	0%	0%
SW11	27/12/2020 12:08	Original	135	0.2	0.5	16	1	1	12	0.2	0.5	1	1	189	0.5	2.6	0.01	0.1
		Duplicate	131	0.2	0.5	15	1	1	13	0.2	0.5	1	1	180	0.5	2.6	0.01	0.1
		RPD (%)	3%	0%	0%	6%	0%	0%	8%	0%	0%	0%	0%	5%	0%	0%	0%	0%
SW11	31/12/2020 11:38	Original	270	0.2	0.5	13	1	1	11	0.2	0.5	1	1	269	0.5	2.4	0.01	0.1
		Duplicate	262	0.2	0.5	14	1	1	11	0.2	0.5	1	1	259	0.5	2.4	0.01	0.1
		RPD (%)	3%	0%	0%	7%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%
SW11	3/01/2021 8:12	Original	51	0.2	0.5	71	1	1	25	0.2	0.5	1	1	140	0.5	24	0.01	0.2
		Duplicate	23	0.2	0.5	73	1	1	23	0.2	0.5	1	1	110	0.5	23	0.01	0.2
		RPD (%)	76%	0%	0%	3%	0%	0%	8%	0%	0%	0%	0%	24%	0%	4%	0%	0%
SW11	10/01/2021 7:40	Original	40	0.2	0.5	52	1	1	19	0.2	0.5	1	1	185	0.5	8.2	0.01	0.3
		Duplicate	39	0.2	0.5	52	1	1	18	0.2	0.5	1	1	188	0.5	11	0.01	0.3
		RPD (%)	3%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	2%	0%	29%	0%	0%
SW11	17/01/2021 7:49	Original	27	0.2	0.6	57	1	1	23	0.2	0.5	1	1	196	0.5	41	0.01	0.3
		Duplicate	32	0.2	0.7	55	1	1	22	0.2	0.5	1	1	180	0.5	27	0.01	0.3
		RPD (%)	17%	0%	15%	4%	0%	0%	4%	0%	0%	0%	0%	9%	0%	41%	0%	0%
SW11	24/01/2021 16:02	Original	75	0.2	0.5	55	1	1	18	0.2	0.5	1	1	307	0.5	1.7	0.01	0.2
		Duplicate	76	0.2	0.5	53	1	1	18	0.2	0.5	1	1	319	0.5	1.7	0.01	0.2
		RPD (%)	1%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%
SW11	31/01/2021 12:03	Original	44.2	0.05	0.65	103	0.05	0.01	29	0.02	0.1	0.06	0.56	180	0.09	0.96	0.02	0.3
		Duplicate	46.6	0.05	0.7	102	0.05	0.01	27	0.02	0.2	0.06	0.65	198	0.15	1.02	0.02	0.3
		RPD (%)	5%	0%	7%	1%	0%	0%	7%	0%	67%	0%	15%	10%	50%	6%	0%	0%
SW11	7/02/2021 12:08	Original	30	1	1	37	1	1	50	0.1	1	1	1	180	1	1	0.1	1
		Duplicate	30	1	1	38	1	1	50	0.1	1	1	1	160	1	1	0.1	1
		RPD (%)	0%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%	12%	0%	0%	0%	0%
SW11	14/02/2021 8:14	Original	129	0.2	0.6	80	1	1	23	0.2	0.5	1	1	269	1	1.1	0.01	0.3
		Duplicate	129	0.2	0.5	84	1	1	24	0.2	0.5	1	1	263	0.5	1.1	0.01	0.3
		RPD (%)	0%	0%	18%	5%	0%	0%	4%	0%	0%	0%	0%	2%	67%	0%	0%	0%
SW11	23/02/2021 7:16	Original	18	0.2	0.5	64	1	1	23	0.2	0.5	1	1	107	0.5	1.6	0.01	0.2
		Duplicate	20	0.2	0.5	61	1	1	22	0.2	0.5	1	1	99	0.5	1.6	0.01	0.2
		RPD (%)	11%	0%	0%	5%	0%	0%	4%	0%	0%	0%	0%	7%	0%	0%	0%	0%
SW11	28/02/2021 8:49	Original	27	0.2	0.5	66	1	1	22	0.2	0.5	1	1	210	0.5	16	0.01	0.2
		Duplicate	29	0.2	0.6	62	1	1	24	0.2	0.5	1	1	216	0.5	15	0.01	0.2
		RPD (%)	7%	0%	20%	6%	0%	0%	9%	0%	0%	0%	0%	3%	0%	6%	0%	0%
SW11	7/03/2021 7:42	Original	8	0.2	0.6	109	1	1	29	0.2	0.5	1	1	115	0.5	22	0.01	0.3

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
		Duplicate	7	0.2	0.6	104	1	1	30	0.2	0.5	1	1	112	0.5	16	0.01	0.3
		RPD (%)	13%	0%	0%	5%	0%	0%	3%	0%	0%	0%	0%	3%	0%	27%	0%	0%
SW11	14/03/2021 7:29	Original	5	0.2	0.5	90	1	1	30	0.2	0.5	1	1	45	0.5	0.5	0.01	0.3
		Duplicate	5	0.2	0.5	96	1	1	32	0.2	0.5	1	1	49	0.5	0.5	0.01	0.4
		RPD (%)	0%	0%	0%	7%	0%	0%	7%	0%	0%	0%	0%	9%	0%	0%	0%	33%
SW11	21/03/2021 14:02	Original	63	0.2	0.5	10	1	1	8	0.2	0.5	1	1	86	0.5	2.2	0.01	0.1
		Duplicate	68	0.2	0.5	8	1	1	5	0.2	0.5	1	1	70	0.5	0.5	0.01	0.1
		RPD (%)	8%	0%	0%	20%	0%	0%	38%	0%	0%	0%	0%	19%	0%	77%	0%	0%
SW11	22/03/2021 8:00	Original	63	0.2	0.5	8	1	1	6	0.2	0.5	1	1	112	0.5	1.5	0.01	0.1
		Duplicate	62	0.2	0.5	8	1	1	6	0.2	0.5	1	1	115	0.5	1.5	0.01	0.1
		RPD (%)	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	0%	0%
SW11	28/03/2021 8:23	Original	18	0.2	0.5	76	1	1	20	0.2	0.5	1	1	95	0.5	57	0.01	0.2
		Duplicate	30	0.2	0.5	69	1	1	19	0.2	0.5	1	1	112	0.5	29	0.01	0.2
		RPD (%)	67%	0%	0%	9%	0%	0%	5%	0%	0%	0%	0%	18%	0%	49%	0%	0%
SW11	4/04/2021 10:52	Original	24	0.2	0.5	94	1	1	12	0.2	0.5	1	1	129	0.5	24	0.01	0.1
		Duplicate	24	0.2	0.5	92	1	1	11	0.2	0.5	1	1	121	0.5	24	0.01	0.1
		RPD (%)	0%	0%	0%	2%	0%	0%	8%	0%	0%	0%	0%	6%	0%	0%	0%	0%
SW11	11/04/2021 7:56	Original	10	1	1	161	1	1	50	0.1	1	1	1	50	1	2	0.1	1
		Duplicate	10	1	1	155	1	1	50	0.1	1	1	1	50	1	2	0.1	1
		RPD (%)	0%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW11	18/04/2021 8:13	Original	5	0.2	0.7	195	1	1	1	0.2	0.5	1	1	15	0.5	46	0.01	0.4
		Duplicate	5	0.2	0.8	196	1	1	1	0.2	0.5	1	1	20	0.5	45	0.01	0.4
		RPD (%)	0%	0%	14%	1%	0%	0%	0%	0%	0%	0%	0%	33%	0%	2%	0%	0%
SW11	25/04/2021 7:44	Original	5	0.2	0.7	204	1	1	19	0.2	0.5	1	1	9	0.5	68	0.01	0.5
		Duplicate	5	0.2	0.7	192	1	1	15	0.2	0.5	1	1	10	0.5	67	0.01	0.5
		RPD (%)	0%	0%	0%	6%	0%	0%	21%	0%	0%	0%	0%	11%	0%	1%	0%	0%
SW12	19/07/2020 10:30	Original	5	0.2	0.7	489	1	1	88	0.2	0.5	1	1	9	0.5	909	0.01	1.1
		Duplicate	5	0.2	0.6	496	1	1	89	0.2	0.5	1	1	11	0.5	929	0.01	1.2
		RPD (%)	0%	0%	14%	1%	0%	0%	1%	0%	0%	0%	0%	22%	0%	2%	0%	9%
SW12	2/08/2020 11:16	Original	0.6	0.05	0.6	617	0.05	0.01	113	0.02	0.1	1.35	0.22	84	0.02	865	0.02	1.25
		Duplicate	0.6	0.05	0.55	582	0.05	0.01	113	0.02	0.1	0.96	0.22	62	0.02	598	0.02	1.3
		RPD (%)	0%	0%	8%	6%	0%	0%	0%	0%	0%	29%	0%	26%	0%	31%	0%	4%
SW12	8/08/2020 17:01	Original	0.8	0.05	0.75	593	0.05	0.01	127	0.02	0.1	0.91	0.31	84	0.05	544	0.02	1.5
		Duplicate	0.6	0.05	0.7	586	0.05	0.01	124	0.02	0.1	0.91	0.3	68	0.03	525	0.02	1.45
		RPD (%)	25%	0%	7%	1%	0%	0%	2%	0%	0%	0%	3%	19%	40%	3%	0%	3%
SW12	15/09/2020 16:01	Original	2.4	0.1	0.85	766	0.05	0.01	145	0.02	0.1	0.56	0.43	104	0.06	114	0.02	1.6
		Duplicate	2.3	0.05	0.8	762	0.05	0.01	131	0.02	0.1	0.52	0.47	120	0.07	100	0.02	1.6
		RPD (%)	4%	50%	6%	1%	0%	0%	10%	0%	0%	7%	9%	15%	17%	12%	0%	0%
SW12	20/09/2020 10:30	Original	0.7	0.05	0.8	799	0.05	0.01	122	0.02	0.1	0.33	0.24	72	0.02	1.96	0.02	1.5
		Duplicate	0.5	0.05	0.75	764	0.05	0.01	124	0.02	0.1	0.3	0.24	64	0.02	1.71	0.02	1.35
		RPD (%)	29%	0%	6%	4%	0%	0%	2%	0%	0%	9%	0%	11%	0%	13%	0%	10%
SW13	8/06/2020 9:28	Original	1.2	0.05	0.95	286	0.05	0.01	60	0.02	0.1	0.27	0.42	4	0.01	109	0.02	0.65

Site	Date	Type	Aluminium (Filtered) (µg/L)	Antimony (Filtered) (µg/L)	Arsenic (Filtered) (µg/L)	Barium (Filtered) (µg/L)	Beryllium (Filtered) (µg/L)	Bismuth (Filtered) (µg/L)	Boron (Filtered) (µg/L)	Cadmium (Filtered) (µg/L)	Chromium (Filtered) (µg/L)	Cobalt (Filtered) (µg/L)	Copper (Filtered) (µg/L)	Iron (Filtered) (µg/L)	Lead (Filtered) (µg/L)	Manganese (Filtered) (µg/L)	Mercury (Filtered) (µg/L)	Molybdenum (Filtered) (µg/L)
		Duplicate	1.1	0.05	0.85	277	0.05	0.01	67	0.02	0.1	0.27	0.41	4	0.01	107	0.02	0.65
		RPD (%)	8%	0%	11%	3%	0%	0%	12%	0%	0%	0%	2%	0%	0%	2%	0%	0%
SW13	5/07/2020 11:30	Original	5	0.2	0.8	389	1	1	47	0.2	0.5	1	1	5	0.5	12	0.01	0.6
		Duplicate	5	0.2	0.9	370	1	1	46	0.2	0.5	1	1	5	0.5	11	0.01	0.6
		RPD (%)	0%	0%	13%	5%	0%	0%	2%	0%	0%	0%	0%	0%	0%	8%	0%	0%
SW13	1/11/2020 9:55	Original	5	0.2	3.2	385	1	1	127	0.2	0.5	1	1	5	0.5	11	0.01	1.1
		Duplicate	5	0.2	3.3	383	1	1	120	0.2	0.5	1	1	5	0.5	14	0.01	1
		RPD (%)	0%	0%	3%	1%	0%	0%	6%	0%	0%	0%	0%	0%	0%	27%	0%	9%
SW17	24/05/2020 8:35	Original	1.5	0.05	0.9	334	0.05	0.01	64.5	0.02	0.1	0.14	0.4	2	0.01	69.5	0.02	0.75
		Duplicate	1.6	0.05	0.8	314	0.05	0.01	58.5	0.02	0.1	0.12	0.39	2	0.01	61.3	0.02	0.75
		RPD (%)	7%	0%	11%	6%	0%	0%	9%	0%	0%	14%	3%	0%	0%	12%	0%	0%
SW17	31/05/2020 8:01	Original	1.9	0.05	0.8	288	0.05	0.01	61.5	0.02	0.1	0.1	0.35	2	0.01	43.1	0.02	0.65
		Duplicate	1.8	0.05	0.8	296	0.05	0.01	63.5	0.02	0.1	0.12	0.37	4	0.01	60.8	0.02	0.7
		RPD (%)	5%	0%	0%	3%	0%	0%	3%	0%	0%	20%	6%	100%	0%	41%	0%	8%
SW17	26/07/2020 9:55	Original	0.5	0.05	0.85	555	0.05	0.01	116	0.02	0.1	0.06	0.21	4	0.01	2.07	0.02	1.35
		Duplicate	0.3	0.05	0.9	543	0.05	0.01	123	0.02	0.1	0.06	0.21	4	0.01	2.32	0.02	1.4
		RPD (%)	40%	0%	6%	2%	0%	0%	6%	0%	0%	0%	0%	0%	0%	12%	0%	4%
SW17	15/11/2020 10:39	Original	5	0.2	1.3	587	1	1	74	0.2	0.5	1	1	5	0.5	165	0.01	2
		Duplicate	5	0.2	1.8	554	1	1	73	0.2	0.5	1	1	5	0.5	92	0.01	2.2
		RPD (%)	0%	0%	38%	6%	0%	0%	1%	0%	0%	0%	0%	0%	0%	44%	0%	10%
SW18	7/03/2021 8:27	Original	5	0.2	1.5	66	1	1	68	0.2	0.5	1	1	5	0.5	0.5	0.01	0.6
		Duplicate	5	0.2	1.6	66	1	1	67	0.2	0.5	1	1	5	0.5	0.5	0.01	0.6
		RPD (%)	0%	0%	7%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW19	3/01/2021 11:00	Original	5	0.2	1	40	1	1	172	0.2	0.5	1	1	7	0.5	198	0.01	1
		Duplicate	5	0.2	0.8	43	1	1	182	0.2	0.5	1	1	11	0.9	204	0.01	1.1
		RPD (%)	0%	0%	20%	8%	0%	0%	6%	0%	0%	0%	0%	57%	80%	3%	0%	10%
SW21	24/05/2020 15:05	Original	2.1	0.05	0.9	227	0.05	0.01	43	0.02	0.1	0.18	0.44	12	0.01	79.4	0.02	0.6
		Duplicate	1.6	0.05	0.9	225	0.05	0.01	43	0.02	0.1	0.16	0.44	10	0.01	77.8	0.02	0.55
		RPD (%)	24%	0%	0%	1%	0%	0%	0%	0%	0%	11%	0%	17%	0%	2%	0%	8%
SW21	27/12/2020 10:52	Original	437	0.2	0.5	62	1	1	22	0.2	0.7	1	1	569	0.5	2.2	0.01	0.3
		Duplicate	461	0.2	0.5	55	1	1	16	0.2	0.6	1	1	591	0.5	2.2	0.01	0.3
		RPD (%)	5%	0%	0%	11%	0%	0%	27%	0%	14%	0%	0%	4%	0%	0%	0%	0%
SW21	21/02/2021 12:00	Original	53	0.2	0.5	62	1	1	19	0.2	0.5	1	1	162	0.5	0.8	0.01	0.2
		Duplicate	63	0.2	0.5	66	1	1	22	0.2	0.5	1	1	184	0.5	1.2	0.01	0.1
		RPD (%)	19%	0%	0%	6%	0%	0%	16%	0%	0%	0%	0%	14%	0%	50%	0%	50%
SW21	14/03/2021 8:04	Original	5	0.2	0.6	108	1	1	31	0.2	0.5	1	1	5	0.5	0.5	0.01	0.4
		Duplicate	5	0.2	0.6	128	1	1	33	0.2	0.5	1	1	5	0.5	0.5	0.01	0.4
		RPD (%)	0%	0%	0%	19%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	0%	0%
SW21	18/04/2021 7:32	Original	5	0.2	0.8	222	1	1	1	0.2	0.5	1	1	5	0.5	0.8	0.01	0.5
		Duplicate	5	0.2	0.7	232	1	1	1	0.2	0.5	1	1	5	0.5	1.1	0.01	0.5
		RPD (%)	0%	0%	13%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	38%	0%	0%

Table B.2: Duplicate sample results, filtered metals, 2020/21 reporting period (Nickel to Zinc)

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
SW02	28/06/2020 9:59	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	5/07/2020 13:15	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	3
		RPD (%)	0%	0%	0%	0%	0%	0%	40%
SW02	26/07/2020 9:53	Original	0.28	1	0.25	0.08	0.94	0.85	0.5
		Duplicate	0.24	0.2	0.05	0.11	0.876	0.7	0.1
		RPD (%)	15%	133%	133%	32%	7%	19%	133%
SW02	2/08/2020 14:50	Original	0.24	1	0.25	0.11	0.94	0.8	0.5
		Duplicate	0.22	0.2	0.05	0.12	0.934	0.8	0.1
		RPD (%)	9%	133%	133%	9%	1%	0%	133%
SW02	3/01/2021 12:20	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	10/01/2021 7:33	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	17/01/2021 7:45	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	7/02/2021 12:54	Original	1	10	1	1	1	10	6
		Duplicate	1	10	1	1	1	10	6
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	14/02/2021 10:38	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	7/03/2021 9:11	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	11/04/2021 11:51	Original	1	10	1	1	1	10	5
		Duplicate	1	10	1	1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW04	10/01/2021 7:24	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW04	17/01/2021 7:38	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW04	7/02/2021 13:17	Original	1	10	1	1	1	10	5

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
		Duplicate	1	10	1	1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW04	7/03/2021 8:19	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	10/05/2020 12:01	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	17/05/2020 12:01	Original	0.69	0.2	0.05	0.01	0.85	1.35	0.1
		Duplicate	0.67	0.2	0.05	0.01	0.85	1.35	2.1
		RPD (%)	3%	0%	0%	0%	0%	0%	182%
SW07	14/06/2020 12:40	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	21/06/2020 12:05	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	12/07/2020 14:00	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	19/07/2020 10:05	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	8/08/2020 17:02	Original	0.48	0.2	0.05	0.02	1.46	1.25	0.3
		Duplicate	0.51	0.2	0.05	0.02	1.47	1.25	0.2
		RPD (%)	6%	0%	0%	0%	1%	0%	40%
SW07	16/08/2020 9:02	Original	0.61	0.2	0.05	0.01	1.65	1.35	0.1
		Duplicate	0.5	0.2	0.05	0.01	1.53	1.5	0.1
		RPD (%)	20%	0%	0%	0%	8%	11%	0%
SW07	7/09/2020 17:02	Original	0.44	0.2	0.05	0.02	1.65	2.1	1
		Duplicate	0.39	0.2	0.05	0.02	1.68	2.15	0.4
		RPD (%)	12%	0%	0%	0%	2%	2%	86%
SW07	15/09/2020 16:02	Original	0.47	0.2	0.05	0.03	1.56	2.35	0.5
		Duplicate	0.5	0.2	0.05	0.03	1.58	2.4	1.9
		RPD (%)	6%	0%	0%	0%	1%	2%	117%
SW07	8/11/2020 14:08	Original	1	1	0.5	0.1	1	4	2
		Duplicate	1	1	0.5	0.1	1	4	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	24/01/2021 16:00	Original	1	1	0.5	0.1	1	4	2
		Duplicate	1	1	0.5	0.1	1	5	2
		RPD (%)	0%	0%	0%	0%	0%	22%	0%
SW07	31/01/2021 12:02	Original	0.67	0.2	0.05	0.02	0.447	4.35	0.1

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
		Duplicate	0.69	0.2	0.05	0.01	0.455	4.25	0.3
		RPD (%)	3%	0%	0%	67%	2%	2%	100%
SW07	21/02/2021 12:01	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	28/02/2021 8:19	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	21/03/2021 14:00	Original	1	1	0.5	0.1	1	3	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	40%	0%
SW07	28/03/2021 7:45	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	4/04/2021 11:44	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW09	10/01/2021 7:31	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	10/05/2020 12:04	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	14/06/2020 9:50	Original	1	1	0.5	0.2	1	1	2
		Duplicate	1	1	0.5	0.2	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	21/06/2020 12:07	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	28/06/2020 10:33	Original	1	1	0.5	0.2	1	1	2
		Duplicate	1	1	0.5	0.2	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	12/07/2020 14:01	Original	1	1	0.5	0.2	1	1	2
		Duplicate	1	1	0.5	0.2	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	16/08/2020 9:03	Original	0.61	0.2	0.05	0.23	0.773	0.6	0.1
		Duplicate	0.61	0.2	0.05	0.24	0.792	0.6	0.1
		RPD (%)	0%	0%	0%	4%	2%	0%	0%
SW11	24/08/2020 11:00	Original	0.62	0.2	0.05	0.18	0.763	0.6	0.2
		Duplicate	0.61	0.2	0.05	0.18	0.771	0.55	0.3
		RPD (%)	2%	0%	0%	0%	1%	9%	40%
SW11	30/08/2020 9:09	Original	0.64	0.2	0.05	0.18	0.711	0.7	0.4

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
		Duplicate	0.69	0.2	0.05	0.19	0.743	0.7	0.3
		RPD (%)	8%	0%	0%	5%	4%	0%	29%
SW11	21/12/2020 7:52	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	23/12/2020 7:05	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	27/12/2020 12:08	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	31/12/2020 11:38	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	3/01/2021 8:12	Original	1	1	0.5	0.2	1	2	2
		Duplicate	1	1	0.5	0.2	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	67%	0%
SW11	10/01/2021 7:40	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	17/01/2021 7:49	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	24/01/2021 16:02	Original	1	1	0.5	0.1	1	3	2
		Duplicate	1	1	0.5	0.1	1	3	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	31/01/2021 12:03	Original	0.5	0.2	0.05	0.04	0.273	2.6	0.1
		Duplicate	0.58	0.2	0.05	0.04	0.286	2.6	0.6
		RPD (%)	15%	0%	0%	0%	5%	0%	143%
SW11	7/02/2021 12:08	Original	1	10	1	1	1	10	5
		Duplicate	1	10	1	1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	14/02/2021 8:14	Original	1	1	0.5	0.1	1	3	2
		Duplicate	1	1	0.5	0.1	1	3	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	23/02/2021 7:16	Original	1	1	0.5	0.4	1	1	2
		Duplicate	1	1	0.5	0.4	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	28/02/2021 8:49	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	7/03/2021 7:42	Original	1	1	0.5	0.1	1	1	2

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	14/03/2021 7:29	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	21/03/2021 14:02	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	22/03/2021 8:00	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	28/03/2021 8:23	Original	1	1	0.5	0.2	1	1	2
		Duplicate	1	1	0.5	0.2	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	4/04/2021 10:52	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	11/04/2021 7:56	Original	1	10	1	1	1	10	5
		Duplicate	1	10	1	1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	18/04/2021 8:13	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	25/04/2021 7:44	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW12	19/07/2020 10:30	Original	1	1	0.5	0.3	1	1	2
		Duplicate	1	1	0.5	0.3	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW12	2/08/2020 11:16	Original	0.91	0.2	0.05	0.28	0.981	0.5	0.1
		Duplicate	0.9	0.2	0.05	0.3	0.994	0.45	0.2
		RPD (%)	1%	0%	0%	7%	1%	10%	100%
SW12	8/08/2020 17:01	Original	0.92	0.2	0.05	0.37	0.913	0.8	0.5
		Duplicate	0.95	0.2	0.05	0.36	0.927	0.8	0.3
		RPD (%)	3%	0%	0%	3%	2%	0%	40%
SW12	15/09/2020 16:01	Original	0.92	0.2	0.05	0.29	0.598	1	0.5
		Duplicate	0.93	0.2	0.05	0.28	0.601	1.05	0.5
		RPD (%)	1%	0%	0%	3%	1%	5%	0%
SW12	20/09/2020 10:30	Original	0.88	0.2	0.05	0.22	0.451	0.6	0.4
		Duplicate	0.85	0.2	0.05	0.23	0.442	0.6	0.4
		RPD (%)	3%	0%	0%	5%	2%	0%	0%
SW13	8/06/2020 9:28	Original	0.73	0.2	0.05	0.02	1.09	1.4	0.3

Site	Date	Type	Nickel (Filtered) (µg/L)	Selenium (Filtered) (µg/L)	Silver (Filtered) (µg/L)	Thallium (Filtered) (µg/L)	Uranium (Filtered) (µg/L)	Vanadium (Filtered) (µg/L)	Zinc (Filtered) (µg/L)
		Duplicate	0.7	0.2	0.05	0.02	1.1	1.35	0.4
		RPD (%)	4%	0%	0%	0%	1%	4%	33%
SW13	5/07/2020 11:30	Original	1	1	0.5	0.1	1	1	2
		Duplicate	1	1	0.5	0.1	1	1	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW13	1/11/2020 9:55	Original	1	1	0.5	0.1	2	6	2
		Duplicate	1	1	0.5	0.1	2	6	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW17	24/05/2020 8:35	Original	0.58	0.2	0.05	0.21	0.959	1.65	0.1
		Duplicate	0.57	0.2	0.05	0.2	0.953	1.65	0.2
		RPD (%)	2%	0%	0%	5%	1%	0%	100%
SW17	31/05/2020 8:01	Original	0.5	0.2	0.05	0.18	0.944	1.5	0.1
		Duplicate	0.53	0.2	0.05	0.18	0.976	1.55	0.1
		RPD (%)	6%	0%	0%	0%	3%	3%	0%
SW17	26/07/2020 9:55	Original	0.3	0.2	0.05	0.48	1.11	0.95	0.1
		Duplicate	0.3	0.2	0.05	0.48	1.11	1	0.1
		RPD (%)	0%	0%	0%	0%	0%	5%	0%
SW17	15/11/2020 10:39	Original	1	1	0.5	0.1	1	4	2
		Duplicate	1	1	0.5	0.1	1	5	2
		RPD (%)	0%	0%	0%	0%	0%	25%	0%
SW18	7/03/2021 8:27	Original	1	1	0.5	0.4	1	1	10
		Duplicate	1	1	0.5	0.4	1	1	9
		RPD (%)	0%	0%	0%	0%	0%	0%	10%
SW19	3/01/2021 11:00	Original	1	1	0.5	5.2	1	1	13
		Duplicate	1	5	0.5	5.5	1	1	14
		RPD (%)	0%	400%	0%	6%	0%	0%	8%
SW21	24/05/2020 15:05	Original	0.68	0.2	0.05	0.02	0.872	1.6	0.1
		Duplicate	0.66	0.2	0.05	0.01	0.894	1.6	0.3
		RPD (%)	3%	0%	0%	50%	3%	0%	200%
SW21	27/12/2020 10:52	Original	1	1	0.5	0.1	1	4	2
		Duplicate	1	1	0.5	0.1	1	4	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW21	21/02/2021 12:00	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW21	14/03/2021 8:04	Original	1	1	0.5	0.1	1	3	2
		Duplicate	1	1	0.5	0.1	1	3	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW21	18/04/2021 7:32	Original	1	1	0.5	0.1	1	2	2
		Duplicate	1	1	0.5	0.1	1	2	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%

Table B.3: Duplicate sample results, total metals, 2020/21 reporting period (Aluminium to Molybdenum)

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
SW02	28/06/2020 9:59	Original	16	1.9	2	68	1	1	299	0.2	5	1	1	93	1	12	0.05	1
		Duplicate	20	2	2	69	1	1	294	0.2	5	1	1	106	1	13	0.05	1
		RPD (%)	22%	5%	0%	1%	0%	0%	2%	0%	0%	0%	0%	13%	0%	8%	0%	0%
SW02	5/07/2020 13:15	Original	46	0.2	3	66	1	1	171	0.2	5	1	1	103	1	25	0.05	1
		Duplicate	46	0.2	3	74	1	1	161	0.2	5	1	1	108	1	24	0.05	1
		RPD (%)	0%	0%	0%	11%	0%	0%	6%	0%	0%	0%	0%	5%	0%	4%	0%	0%
SW02	3/01/2021 12:20	Original	614	0.2	1	35	1	1	38	0.2	5	1	1	340	1	30	0.05	1
		Duplicate	609	0.2	2	34	1	1	38	0.2	5	1	1	333	1	32	0.05	1
		RPD (%)	1%	0%	67%	3%	0%	0%	0%	0%	0%	0%	0%	2%	0%	6%	0%	0%
SW02	10/01/2021 7:33	Original	3881	0.2	1	17	1	1	11	0.2	5	1	2	2287	5	91	0.05	1
		Duplicate	3383	0.2	1	16	1	1	11	0.2	5	1	2	2271	3	83	0.05	1
		RPD (%)	14%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	1%	50%	9%	0%	0%
SW02	17/01/2021 7:45	Original	122	0.5	2	95	1	1	71	0.2	5	1	1	130	1	221	0.05	1
		Duplicate	113	0.4	2	94	1	1	69	0.2	5	1	1	142	1	225	0.05	1
		RPD (%)	8%	22%	0%	1%	0%	0%	3%	0%	0%	0%	0%	9%	0%	2%	0%	0%
SW02	7/02/2021 12:54	Original	1070	1	1	24	1	1	50	0.1	1	1	1	720	4	52	0.1	1
		Duplicate	1220	1	1	24	1	1	50	0.1	1	1	1	720	4	41	0.1	1
		RPD (%)	13%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	24%	0%	0%
SW02	14/02/2021 10:38	Original	207	0.2	2	48	1	1	51	0.2	5	1	1	180	1	61	0.05	1
		Duplicate	271	0.2	1	51	1	1	51	0.2	5	1	1	179	1	62	0.05	1
		RPD (%)	27%	0%	67%	6%	0%	0%	0%	0%	0%	0%	0%	1%	0%	2%	0%	0%
SW02	7/03/2021 9:11	Original	120	0.4	3	102	1	1	96	0.2	5	1	1	129	1	84	0.05	1
		Duplicate	72	0.4	2	102	1	1	93	0.2	5	1	1	89	1	55	0.05	1
		RPD (%)	50%	0%	40%	0%	0%	0%	3%	0%	0%	0%	0%	37%	0%	42%	0%	0%
SW02	11/04/2021 11:51	Original	80	1	1	122	1	1	80	0.1	1	1	1	200	2	182	0.1	1
		Duplicate	40	1	1	122	1	1	80	0.1	1	1	1	130	1	123	0.1	1
		RPD (%)	67%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	42%	67%	39%	0%	0%
SW04	10/01/2021 7:24	Original	25720	0.2	6	148	1	1	21	0.2	32	7	14	25002	14	254	0.05	1
		Duplicate	28853	0.2	6	145	1	1	23	0.2	34	7	15	26767	15	265	0.05	1
		RPD (%)	11%	0%	0%	2%	0%	0%	9%	0%	6%	0%	7%	7%	7%	4%	0%	0%
SW04	17/01/2021 7:38	Original	22361	0.5	2	111	1	1	32	0.2	15	4	7	9681	11	307	0.05	1
		Duplicate	16609	0.3	2	89	1	1	29	0.2	10	2	5	5622	3	85	0.05	1
		RPD (%)	30%	50%	0%	22%	0%	0%	10%	0%	40%	67%	33%	53%	114%	113%	0%	0%
SW04	7/02/2021 13:17	Original	7960	1	2	70	1	1	50	0.1	8	2	5	6800	6	132	0.1	1
		Duplicate	7530	1	2	71	1	1	50	0.1	7	2	4	6320	7	135	0.1	1
		RPD (%)	6%	0%	0%	1%	0%	0%	0%	0%	13%	0%	22%	7%	15%	2%	0%	0%
SW04	7/03/2021 8:19	Original	9488	0.7	2	74	1	1	36	0.2	7	1	4	4036	4	60	0.05	1
		Duplicate	8894	0.5	3	79	1	1	38	0.2	6	1	4	4227	4	66	0.05	1
		RPD (%)	6%	33%	40%	7%	0%	0%	5%	0%	15%	0%	0%	5%	0%	10%	0%	0%
SW07	10/05/2020 12:01	Original	184	0.2	1	270	1	1	57	0.2	5	1	1	299	1	108	0.05	1

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
		Duplicate	183	0.2	1	258	1	1	57	0.2	5	1	1	239	1	101	0.05	1
		RPD (%)	1%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	22%	0%	7%	0%	0%
SW07	17/05/2020 12:01	Original	177	0.05	0.95	243	0.05	0.01	61	0.02	0.2	0.43	0.5	270	0.14	151	0.02	0.55
		Duplicate	198	0.05	1.05	248	0.05	0.01	69	0.02	0.2	0.48	0.67	290	0.66	157	0.02	0.55
		RPD (%)	11%	0%	10%	2%	0%	0%	12%	0%	0%	11%	29%	7%	130%	4%	0%	0%
SW07	14/06/2020 12:40	Original	303	1.9	1	298	1	1	57	0.2	5	1	1	385	1	230	0.05	1
		Duplicate	278	1.7	1	291	1	1	54	0.2	5	1	1	382	1	231	0.05	1
		RPD (%)	9%	11%	0%	2%	0%	0%	5%	0%	0%	0%	0%	1%	0%	0%	0%	0%
SW07	21/06/2020 12:05	Original	245	0.2	2	294	1	1	80	0.2	5	1	1	306	1	170	0.05	1
		Duplicate	245	0.2	1	302	1	1	77	0.2	5	1	1	279	1	165	0.05	1
		RPD (%)	0%	0%	67%	3%	0%	0%	4%	0%	0%	0%	0%	9%	0%	3%	0%	0%
SW07	12/07/2020 14:00	Original	84	3	1	338	1	1	72	0.2	5	1	1	155	1	120	0.05	1
		Duplicate	80	3	1	319	1	1	73	0.2	5	1	1	154	1	118	0.05	1
		RPD (%)	5%	0%	0%	6%	0%	0%	1%	0%	0%	0%	0%	1%	0%	2%	0%	0%
SW07	19/07/2020 10:05	Original	79	0.4	2	343	1	1	83	0.2	5	1	1	123	1	111	0.05	1
		Duplicate	76	0.2	2	352	1	1	88	0.2	5	1	1	113	1	100	0.05	1
		RPD (%)	4%	67%	0%	3%	0%	0%	6%	0%	0%	0%	0%	8%	0%	10%	0%	0%
SW07	16/08/2020 9:02	Original	59.5	0.05	0.95	436	0.05	0.01	88.5	0.02	0.1	0.26	0.36	130	0.2	70.5	0.02	0.8
		Duplicate	75.6	0.05	0.85	413	0.05	0.01	107	0.02	0.1	0.26	0.48	138	0.26	71	0.02	0.8
		RPD (%)	24%	0%	11%	5%	0%	0%	19%	0%	0%	0%	29%	6%	26%	1%	0%	0%
SW07	7/09/2020 17:02	Original	66.7	0.05	1.25	420	0.05	0.01	112	0.02	0.1	0.21	2.36	116	4.61	46	0.02	0.9
		Duplicate	199	0.05	1.1	420	0.05	0.01	103	0.02	0.1	0.19	0.48	88	0.83	35.3	0.02	0.9
		RPD (%)	100%	0%	13%	0%	0%	0%	8%	0%	0%	10%	132%	27%	139%	26%	0%	0%
SW07	15/09/2020 16:02	Original	63.5	0.05	1.25	467	0.05	0.01	112	0.02	0.1	0.26	0.47	108	0.59	55.7	0.02	0.85
		Duplicate	53.5	0.05	1.2	462	0.05	0.01	115	0.02	0.1	0.25	0.65	104	0.85	54.6	0.02	0.95
		RPD (%)	17%	0%	4%	1%	0%	0%	3%	0%	0%	4%	32%	4%	36%	2%	0%	11%
SW07	8/11/2020 14:08	Original	920	0.2	3	488	1	1	111	0.2	5	2	4	1213	9	578	0.05	1
		Duplicate	75	0.2	3	424	1	1	118	0.2	5	1	1	178	1	67	0.05	1
		RPD (%)	170%	0%	0%	14%	0%	0%	6%	0%	0%	67%	120%	149%	160%	158%	0%	0%
SW07	24/01/2021 16:00	Original	17070	1.3	4	161	1	1	26	0.2	17	4	7	15796	5	122	0.05	1
		Duplicate	19824	0.3	2	152	1	1	23	0.2	16	4	7	14799	5	112	0.05	1
		RPD (%)	15%	125%	67%	6%	0%	0%	12%	0%	6%	0%	0%	7%	0%	9%	0%	0%
SW07	31/01/2021 12:02	Original	979	0.05	0.9	158	0.05	0.01	34	0.02	1.2	0.39	1.25	1150	0.51	31.4	0.02	0.45
		Duplicate	968	0.05	0.9	162	0.05	0.01	33	0.02	1.2	0.4	1.28	1120	2.4	32.1	0.02	0.45
		RPD (%)	1%	0%	0%	3%	0%	0%	3%	0%	0%	3%	2%	3%	130%	2%	0%	0%
SW07	21/02/2021 12:01	Original	11758	0.5	3	163	1	1	21	0.2	11	2	4	8895	4	86	0.05	1
		Duplicate	10795	0.3	2	147	1	1	19	0.2	10	2	4	7950	3	70	0.05	1
		RPD (%)	9%	50%	40%	10%	0%	0%	10%	0%	10%	0%	0%	11%	29%	21%	0%	0%
SW07	28/02/2021 8:19	Original	1148	0.4	1	129	1	1	30	0.2	5	1	1	1147	1	31	0.05	1
		Duplicate	1145	0.2	1	125	1	1	31	0.2	5	1	1	1127	1	31	0.05	1
		RPD (%)	0%	67%	0%	3%	0%	0%	3%	0%	0%	0%	0%	2%	0%	0%	0%	0%
SW07	21/03/2021 14:00	Original	24640	0.8	8	336	1	1	27	0.2	47	12	21	36128	13	416	0.05	1

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
		Duplicate	30538	0.7	8	327	1	1	28	0.2	50	12	21	41782	15	438	0.05	1
		RPD (%)	21%	13%	0%	3%	0%	0%	4%	0%	6%	0%	0%	15%	14%	5%	0%	0%
SW07	28/03/2021 7:45	Original	6714	0.2	1	135	1	1	23	0.2	9	2	4	5390	3	68	0.05	1
		Duplicate	6885	0.2	2	137	1	1	27	0.2	8	2	4	5690	2	71	0.05	1
		RPD (%)	3%	0%	67%	1%	0%	0%	16%	0%	12%	0%	0%	5%	40%	4%	0%	0%
SW07	4/04/2021 11:44	Original	896	0.2	1	157	1	1	17	0.2	5	1	1	1087	1	38	0.05	1
		Duplicate	931	0.2	1	163	1	1	17	0.2	5	1	1	1137	1	40	0.05	1
		RPD (%)	4%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	4%	0%	5%	0%	0%
SW09	10/01/2021 7:31	Original	1253	0.2	1	36	1	1	16	0.2	5	1	1	1335	1	51	0.05	1
		Duplicate	1336	0.2	1	40	1	1	14	0.2	5	1	1	1280	1	48	0.05	1
		RPD (%)	6%	0%	0%	11%	0%	0%	13%	0%	0%	0%	0%	4%	0%	6%	0%	0%
SW11	10/05/2020 12:04	Original	185	0.2	1	287	1	1	61	0.2	5	1	1	449	1	176	0.05	1
		Duplicate	202	0.2	1	293	1	1	59	0.2	5	1	1	423	1	171	0.05	1
		RPD (%)	9%	0%	0%	2%	0%	0%	3%	0%	0%	0%	0%	6%	0%	3%	0%	0%
SW11	14/06/2020 9:50	Original	89	1.7	1	327	1	1	70	0.2	5	1	1	341	1	340	0.05	1
		Duplicate	98	1.7	1	324	1	1	67	0.2	5	1	1	329	1	336	0.05	1
		RPD (%)	10%	0%	0%	1%	0%	0%	4%	0%	0%	0%	0%	4%	0%	1%	0%	0%
SW11	21/06/2020 12:07	Original	94	0.2	1	380	1	1	106	0.2	5	1	1	427	1	451	0.05	1
		Duplicate	84	0.2	1	367	1	1	102	0.2	5	1	1	392	1	446	0.05	1
		RPD (%)	11%	0%	0%	3%	0%	0%	4%	0%	0%	0%	0%	8%	0%	1%	0%	0%
SW11	28/06/2020 10:33	Original	52	1.9	1	423	1	1	127	0.2	5	1	1	612	1	739	0.05	1
		Duplicate	142	1.9	1	412	1	1	132	0.2	5	1	1	694	1	753	0.05	1
		RPD (%)	173%	0%	0%	3%	0%	0%	4%	0%	0%	0%	0%	13%	0%	2%	0%	0%
SW11	12/07/2020 14:01	Original	48	3.6	2	380	1	1	92	0.2	5	1	1	952	1	910	0.05	1
		Duplicate	49	2.7	2	398	1	1	89	0.2	5	1	1	873	1	849	0.05	1
		RPD (%)	2%	25%	0%	5%	0%	0%	3%	0%	0%	0%	0%	8%	0%	7%	0%	0%
SW11	16/08/2020 9:03	Original	18.1	0.05	0.8	441	0.05	0.01	112	0.02	0.1	0.49	0.32	600	0.05	143	0.02	1.55
		Duplicate	18.3	0.05	0.8	443	0.05	0.01	103	0.02	0.1	0.5	0.37	600	0.21	141	0.02	1.55
		RPD (%)	1%	0%	0%	0%	0%	0%	8%	0%	0%	2%	16%	0%	320%	1%	0%	0%
SW11	24/08/2020 11:00	Original	56.8	0.05	1.15	465	0.05	0.01	144	0.02	0.1	0.48	0.54	716	3.64	122	0.02	1.5
		Duplicate	47.2	0.05	0.95	460	0.05	0.01	122	0.02	0.1	0.4	0.48	536	1.88	82.3	0.02	1.55
		RPD (%)	17%	0%	17%	1%	0%	0%	15%	0%	0%	17%	11%	25%	48%	33%	0%	3%
SW11	30/08/2020 9:09	Original	28.5	0.05	0.95	480	0.05	0.01	129	0.02	0.1	0.34	0.45	298	0.88	49.9	0.02	1.45
		Duplicate	16.6	0.05	0.9	464	0.05	0.01	126	0.02	0.1	0.32	0.39	274	0.33	45.7	0.02	1.4
		RPD (%)	42%	0%	5%	3%	0%	0%	2%	0%	0%	6%	13%	8%	63%	8%	0%	3%
SW11	21/12/2020 7:52	Original	1880	0.2	1	65	1	1	25	0.2	5	1	1	1819	1	64	0.05	1
		Duplicate	2343	0.2	1	68	1	1	26	0.2	5	1	1	1958	1	40	0.05	1
		RPD (%)	25%	0%	0%	5%	0%	0%	4%	0%	0%	0%	0%	8%	0%	38%	0%	0%
SW11	23/12/2020 7:05	Original	8848	0.2	2	99	1	1	30	0.2	8	2	4	7782	3	97	0.05	1
		Duplicate	9476	0.2	2	98	1	1	31	0.2	9	2	3	7836	4	95	0.05	1
		RPD (%)	7%	0%	0%	1%	0%	0%	3%	0%	13%	0%	25%	1%	33%	2%	0%	0%
SW11	27/12/2020 12:08	Original	4471	0.7	1	42	1	1	14	0.2	5	1	2	3402	1	20	0.05	1

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
		Duplicate	4271	0.7	1	39	1	1	15	0.2	5	1	2	3346	1	20	0.05	1
		RPD (%)	4%	0%	0%	7%	0%	0%	7%	0%	0%	0%	0%	2%	0%	0%	0%	0%
SW11	31/12/2020 11:38	Original	8742	0.5	1	50	1	1	18	0.2	7	1	2	5778	3	24	0.05	1
		Duplicate	8932	0.6	1	48	1	1	15	0.2	8	1	2	5941	3	25	0.05	1
		RPD (%)	2%	20%	0%	4%	0%	0%	17%	0%	14%	0%	0%	3%	0%	4%	0%	0%
SW11	3/01/2021 8:12	Original	9614	0.5	3	141	1	1	34	0.2	13	3	5	8487	4	161	0.05	1
		Duplicate	8438	0.2	3	154	1	1	36	0.2	13	3	5	9071	4	179	0.05	1
		RPD (%)	12%	60%	0%	9%	0%	0%	6%	0%	0%	0%	0%	7%	0%	11%	0%	0%
SW11	10/01/2021 7:40	Original	7389	0.2	2	109	1	1	23	0.2	10	2	4	7165	3	119	0.05	1
		Duplicate	7689	0.2	2	116	1	1	20	0.2	10	2	3	6772	3	114	0.05	1
		RPD (%)	4%	0%	0%	6%	0%	0%	13%	0%	0%	0%	25%	5%	0%	4%	0%	0%
SW11	17/01/2021 7:49	Original	2189	0.7	1	118	1	1	19	0.2	5	1	1	1805	1	91	0.05	1
		Duplicate	2273	0.7	1	121	1	1	23	0.2	5	1	1	1882	1	78	0.05	1
		RPD (%)	4%	0%	0%	3%	0%	0%	21%	0%	0%	0%	0%	4%	0%	14%	0%	0%
SW11	24/01/2021 16:02	Original	11407	1.7	2	145	1	1	26	0.2	12	2	2	9662	4	123	0.05	1
		Duplicate	12330	1.9	2	147	1	1	25	0.2	10	2	2	9509	4	121	0.05	1
		RPD (%)	8%	12%	0%	1%	0%	0%	4%	0%	17%	0%	0%	2%	0%	2%	0%	0%
SW11	31/01/2021 12:03	Original	822	0.05	0.95	112	0.05	0.01	28.5	0.02	1	0.54	1	1200	0.65	57.6	0.02	0.35
		Duplicate	854	0.05	0.95	117	0.05	0.01	30	0.02	1.1	0.56	1.18	1280	0.93	64	0.02	0.35
		RPD (%)	4%	0%	0%	4%	0%	0%	5%	0%	10%	4%	18%	7%	43%	11%	0%	0%
SW11	7/02/2021 12:08	Original	8530	1	2	163	1	1	50	0.2	12	5	7	10800	6	188	0.1	1
		Duplicate	9200	1	2	157	1	1	50	0.1	12	4	7	11500	5	179	0.1	1
		RPD (%)	8%	0%	0%	4%	0%	0%	0%	50%	0%	20%	0%	6%	17%	5%	0%	0%
SW11	14/02/2021 8:14	Original	14763	0.9	5	279	1	1	39	0.2	31	8	15	17362	10	275	0.05	1
		Duplicate	11962	0.3	4	284	1	1	33	0.2	28	9	16	14337	10	286	0.05	1
		RPD (%)	19%	67%	20%	2%	0%	0%	15%	0%	10%	13%	7%	17%	0%	4%	0%	0%
SW11	23/02/2021 7:16	Original	9063	0.2	2	111	1	1	26	0.2	9	2	4	8544	3	99	0.05	1
		Duplicate	8689	0.2	3	106	1	1	25	0.2	8	2	4	8603	3	99	0.05	1
		RPD (%)	4%	0%	50%	5%	0%	0%	4%	0%	11%	0%	0%	1%	0%	0%	0%	0%
SW11	28/02/2021 8:49	Original	1256	0.2	1	94	1	1	26	0.2	5	1	1	1757	1	70	0.05	1
		Duplicate	1151	0.2	1	92	1	1	26	0.2	5	1	1	1703	1	65	0.05	1
		RPD (%)	8%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	3%	0%	7%	0%	0%
SW11	7/03/2021 7:42	Original	479	0.6	1	137	1	1	35	0.2	5	1	1	766	1	92	0.05	1
		Duplicate	488	0.5	2	129	1	1	35	0.2	5	1	1	756	1	86	0.05	1
		RPD (%)	2%	17%	100%	6%	0%	0%	0%	0%	0%	0%	0%	1%	0%	7%	0%	0%
SW11	14/03/2021 7:29	Original	472	0.5	1	142	1	1	32	0.2	5	1	1	834	1	109	0.05	1
		Duplicate	463	0.5	1	140	1	1	33	0.2	5	1	1	765	1	84	0.05	1
		RPD (%)	2%	0%	0%	1%	0%	0%	3%	0%	0%	0%	0%	8%	0%	23%	0%	0%
SW11	21/03/2021 14:02	Original	2084	0.2	1	30	1	1	9	0.2	5	1	1	1553	1	22	0.05	1
		Duplicate	2059	0.5	1	22	1	1	5	0.2	5	1	1	1567	1	26	0.05	1
		RPD (%)	1%	150%	0%	27%	0%	0%	44%	0%	0%	0%	0%	1%	0%	18%	0%	0%
SW11	22/03/2021 8:00	Original	2790	0.7	1	30	1	1	10	0.2	5	1	1	1779	1	19	0.05	1

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
		Duplicate	2411	0.7	1	30	1	1	9	0.2	5	1	1	1663	1	20	0.05	1
		RPD (%)	14%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%	7%	0%	5%	0%	0%
SW11	28/03/2021 8:23	Original	6165	0.3	2	134	1	1	28	0.2	5	2	3	4631	2	127	0.05	1
		Duplicate	6666	0.3	3	119	1	1	28	0.2	5	1	3	4917	3	97	0.05	1
		RPD (%)	8%	0%	50%	11%	0%	0%	0%	0%	0%	50%	0%	6%	50%	24%	0%	0%
SW11	4/04/2021 10:52	Original	1018	0.2	1	111	1	1	14	0.2	5	1	1	1463	1	67	0.05	1
		Duplicate	950	0.2	1	108	1	1	12	0.2	5	1	1	1446	1	67	0.05	1
		RPD (%)	7%	0%	0%	3%	0%	0%	14%	0%	0%	0%	0%	1%	0%	0%	0%	0%
SW11	11/04/2021 7:56	Original	210	1	1	167	1	1	50	0.1	1	1	1	610	1	84	0.1	1
		Duplicate	200	1	1	167	1	1	50	0.1	1	1	1	600	1	81	0.1	1
		RPD (%)	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	4%	0%	0%
SW11	18/04/2021 8:13	Original	150	0.2	2	215	1	1	1	0.2	5	1	1	351	1	94	0.05	1
		Duplicate	269	0.2	1	217	1	1	16	0.2	5	1	1	528	1	101	0.05	1
		RPD (%)	79%	0%	50%	1%	0%	0%	1500%	0%	0%	0%	0%	50%	0%	7%	0%	0%
SW11	25/04/2021 7:44	Original	240	0.6	2	253	1	1	28	0.2	5	1	1	465	1	139	0.05	1
		Duplicate	241	0.5	2	252	1	1	34	0.2	5	1	1	472	1	138	0.05	1
		RPD (%)	0%	17%	0%	0%	0%	0%	21%	0%	0%	0%	0%	2%	0%	1%	0%	0%
SW12	19/07/2020 10:30	Original	14	0.2	1	526	1	1	112	0.2	7	2	1	324	1	1229	0.05	1
		Duplicate	14	0.2	1	530	1	1	109	0.2	5	2	1	319	1	1235	0.05	1
		RPD (%)	0%	0%	0%	1%	0%	0%	3%	0%	29%	0%	0%	2%	0%	0%	0%	0%
SW12	15/09/2020 16:01	Original	487	0.05	1.05	798	0.05	0.01	135	0.02	0.6	1.12	0.69	1220	0.76	418	0.02	1.5
		Duplicate	490	0.05	1.2	828	0.05	0.01	135	0.02	0.6	1.34	0.79	1260	1.15	531	0.02	1.55
		RPD (%)	1%	0%	14%	4%	0%	0%	0%	0%	0%	20%	14%	3%	51%	27%	0%	3%
SW12	20/09/2020 10:30	Original	24.4	0.1	0.9	834	0.05	0.01	121	0.02	0.1	0.69	0.28	684	0.16	278	0.02	1.45
		Duplicate	26.4	0.1	0.85	846	0.05	0.01	120	0.02	0.1	0.7	0.3	706	0.09	297	0.02	1.55
		RPD (%)	8%	0%	6%	1%	0%	0%	1%	0%	0%	1%	7%	3%	44%	7%	0%	7%
SW13	8/06/2020 9:28	Original	153	0.05	0.95	296	0.05	0.01	66.5	0.02	0.2	0.62	0.54	294	0.18	216	0.02	0.65
		Duplicate	187	0.05	0.85	297	0.05	0.01	68	0.02	0.2	0.61	0.51	332	0.35	204	0.02	0.6
		RPD (%)	22%	0%	11%	0%	0%	0%	2%	0%	0%	2%	6%	13%	94%	6%	0%	8%
SW13	5/07/2020 11:30	Original	52	0.2	2	399	1	1	78	0.2	5	1	1	114	1	73	0.05	1
		Duplicate	46	0.2	2	409	1	1	72	0.2	5	1	1	94	1	74	0.05	1
		RPD (%)	12%	0%	0%	3%	0%	0%	8%	0%	0%	0%	0%	18%	0%	1%	0%	0%
SW13	1/11/2020 9:55	Original	1698	1	4	483	1	1	153	0.2	5	1	4	1715	32	106	0.05	1
		Duplicate	1253	0.2	4	442	1	1	155	0.2	5	1	3	1183	53	84	0.05	1
		RPD (%)	26%	80%	0%	8%	0%	0%	1%	0%	0%	0%	25%	31%	66%	21%	0%	0%
SW17	24/05/2020 8:35	Original	90.6	0.05	0.9	339	0.05	0.01	90.5	0.02	0.1	0.25	0.45	134	0.31	133	0.02	0.75
		Duplicate	89.6	0.05	0.85	328	0.05	0.01	56.5	0.02	0.2	0.22	0.45	122	0.18	125	0.02	0.75
		RPD (%)	1%	0%	6%	3%	0%	0%	38%	0%	100%	12%	0%	9%	42%	6%	0%	0%
SW17	31/05/2020 8:01	Original	115	0.05	0.95	301	0.05	0.01	64	0.02	0.1	0.23	0.42	140	0.17	116	0.02	0.75
		Duplicate	121	0.05	0.85	302	0.05	0.01	62.5	0.02	0.1	0.25	0.43	160	0.17	133	0.02	0.75
		RPD (%)	5%	0%	11%	0%	0%	0%	2%	0%	0%	9%	2%	14%	0%	15%	0%	0%
SW17	15/11/2020 10:39	Original	3419	0.2	2	654	1	1	97	0.2	5	1	2	4995	3	512	0.05	3

Site	Date	Type	Aluminium (Total) (µg/L)	Antimony (Total) (µg/L)	Arsenic (Total) (µg/L)	Barium (Total) (µg/L)	Beryllium (Total) (µg/L)	Bismuth (Total) (µg/L)	Boron (Total) (µg/L)	Cadmium (Total) (µg/L)	Chromium (Total) (µg/L)	Cobalt (Total) (µg/L)	Copper (Total) (µg/L)	Iron (Total) (µg/L)	Lead (Total) (µg/L)	Manganese (Total) (µg/L)	Mercury (Total) (µg/L)	Molybdenum (Total) (µg/L)
		Duplicate	5000	0.2	3	754	1	1	95	0.2	7	2	4	7707	3	587	0.05	3
		RPD (%)	46%	0%	50%	15%	0%	0%	2%	0%	40%	100%	100%	54%	0%	15%	0%	0%
SW18	7/03/2021 8:27	Original	617	0.6	3	79	1	1	83	0.2	5	1	1	380	3	26	0.05	1
		Duplicate	555	0.7	3	80	1	1	80	0.2	5	1	1	355	2	26	0.05	1
		RPD (%)	10%	17%	0%	1%	0%	0%	4%	0%	0%	0%	0%	7%	33%	0%	0%	0%
SW19	3/01/2021 11:00	Original	4458	0.2	3	63	1	1	197	0.2	5	1	3	2998	3	306	0.05	1
		Duplicate	4639	0.2	2	66	1	1	207	0.2	5	1	3	3024	3	306	0.05	1
		RPD (%)	4%	0%	33%	5%	0%	0%	5%	0%	0%	0%	0%	1%	0%	0%	0%	0%
SW21	24/05/2020 15:05	Original	188	0.05	0.95	249	0.05	0.01	45	0.02	0.2	0.38	0.53	294	0.11	148	0.02	0.6
		Duplicate	180	0.05	0.95	256	0.05	0.01	54.5	0.02	0.2	0.38	0.56	288	0.17	154	0.02	0.6
		RPD (%)	4%	0%	0%	3%	0%	0%	21%	0%	0%	0%	6%	2%	55%	4%	0%	0%
SW21	27/12/2020 10:52	Original	27983	0.7	5	253	1	1	36	0.2	30	8	13	28627	12	231	0.05	1
		Duplicate	34419	1.8	4	205	1	1	28	0.2	34	7	13	30106	13	260	0.05	1
		RPD (%)	23%	157%	20%	19%	0%	0%	22%	0%	13%	13%	0%	5%	8%	13%	0%	0%
SW21	21/02/2021 12:00	Original	8394	0.4	2	135	1	1	18	0.2	9	1	4	6434	3	52	0.05	1
		Duplicate	8794	0.3	2	130	1	1	18	0.2	8	1	3	6201	2	49	0.05	1
		RPD (%)	5%	25%	0%	4%	0%	0%	0%	0%	11%	0%	25%	4%	33%	6%	0%	0%
SW21	14/03/2021 8:04	Original	804	0.4	1	182	1	1	34	0.2	5	1	1	893	1	44	0.05	1
		Duplicate	860	0.5	1	181	1	1	34	0.2	5	1	1	930	1	42	0.05	1
		RPD (%)	7%	25%	0%	1%	0%	0%	0%	0%	0%	0%	0%	4%	0%	5%	0%	0%
SW21	18/04/2021 7:32	Original	178	0.3	2	259	1	1	20	0.2	5	1	1	212	2	50	0.05	1
		Duplicate	143	0.2	2	252	1	1	20	0.2	5	1	1	205	2	49	0.05	1
		RPD (%)	22%	40%	0%	3%	0%	0%	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%

Table B.4: Duplicate sample results, total metals, 2020/21 reporting period (Nickel to Zinc)

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
SW02	28/06/2020 9:59	Original	1	10	1	0.1	1	3	6
		Duplicate	1	10	1	0.1	1	3	5
		RPD (%)	0%	0%	0%	0%	0%	0%	18%
SW02	5/07/2020 13:15	Original	1	10	1	0.1	1	8	5
		Duplicate	1	10	1	0.1	1	8	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	3/01/2021 12:20	Original	1	10	1	0.1	1	3	5
		Duplicate	1	10	1	0.1	1	4	5
		RPD (%)	0%	0%	0%	0%	0%	29%	0%
SW02	10/01/2021 7:33	Original	1	10	1	0.1	1	7	9
		Duplicate	1	14	1	0.1	1	7	8
		RPD (%)	0%	33%	0%	0%	0%	0%	12%
SW02	17/01/2021 7:45	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	3	5
		RPD (%)	0%	0%	0%	0%	0%	67%	0%
SW02	7/02/2021 12:54	Original	1	10	1	1	1	10	19
		Duplicate	1	10	1	1	1	10	16
		RPD (%)	0%	0%	0%	0%	0%	0%	17%
SW02	14/02/2021 10:38	Original	1	10	1	0.1	1	4	5
		Duplicate	1	10	1	0.1	1	1	7
		RPD (%)	0%	0%	0%	0%	0%	120%	33%
SW02	7/03/2021 9:11	Original	1	10	1	0.1	1	7	5
		Duplicate	1	10	1	0.1	1	6	5
		RPD (%)	0%	0%	0%	0%	0%	15%	0%
SW02	11/04/2021 11:51	Original	1	10	1	1	1	10	7
		Duplicate	1	10	1	1	1	10	6
		RPD (%)	0%	0%	0%	0%	0%	0%	15%
SW04	10/01/2021 7:24	Original	12	10	1	0.3	1	67	41
		Duplicate	13	13	1	0.4	1	72	42
		RPD (%)	8%	26%	0%	29%	0%	7%	2%
SW04	17/01/2021 7:38	Original	8	10	1	0.1	1	39	31
		Duplicate	6	10	1	0.1	1	36	10
		RPD (%)	29%	0%	0%	0%	0%	8%	102%
SW04	7/02/2021 13:17	Original	4	10	1	1	1	20	16
		Duplicate	3	10	1	1	1	20	16
		RPD (%)	29%	0%	0%	0%	0%	0%	0%
SW04	7/03/2021 8:19	Original	3	10	1	0.1	1	19	6
		Duplicate	3	10	1	0.1	1	17	6
		RPD (%)	0%	0%	0%	0%	0%	11%	0%
SW07	10/05/2020 12:01	Original	1	10	1	0.1	1	2	5

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
		Duplicate	1	10	1	0.1	1	1	5
		RPD (%)	0%	0%	0%	0%	0%	67%	0%
SW07	17/05/2020 12:01	Original	0.79	0.2	0.05	0.01	0.837	2.15	0.5
		Duplicate	0.82	0.2	0.05	0.02	0.825	2.15	3.4
		RPD (%)	4%	0%	0%	67%	1%	0%	149%
SW07	14/06/2020 12:40	Original	1	10	1	0.1	1	1	5
		Duplicate	1	10	1	0.1	1	1	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	21/06/2020 12:05	Original	1	10	1	0.1	1	8	5
		Duplicate	1	10	1	0.1	1	9	5
		RPD (%)	0%	0%	0%	0%	0%	12%	0%
SW07	12/07/2020 14:00	Original	1	10	1	0.1	1	5	5
		Duplicate	1	10	1	0.1	1	6	5
		RPD (%)	0%	0%	0%	0%	0%	18%	0%
SW07	19/07/2020 10:05	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	5	5
		RPD (%)	0%	0%	0%	0%	0%	18%	0%
SW07	16/08/2020 9:02	Original	1.13	0.2	0.05	0.01	1.65	1.7	0.4
		Duplicate	1.08	0.2	0.05	0.01	1.57	1.8	0.6
		RPD (%)	5%	0%	0%	0%	5%	6%	40%
SW07	7/09/2020 17:02	Original	0.47	0.2	0.05	0.04	1.68	2.35	8.9
		Duplicate	0.46	0.2	0.05	0.03	1.71	2.25	3
		RPD (%)	2%	0%	0%	29%	2%	4%	99%
SW07	15/09/2020 16:02	Original	0.58	0.2	0.05	0.01	1.59	2.55	1.9
		Duplicate	0.6	0.2	0.05	0.01	1.57	2.6	3.8
		RPD (%)	3%	0%	0%	0%	1%	2%	67%
SW07	8/11/2020 14:08	Original	2	10	1	0.1	2	12	22
		Duplicate	1	10	1	0.1	2	5	5
		RPD (%)	67%	0%	0%	0%	0%	82%	126%
SW07	24/01/2021 16:00	Original	8	10	1	0.1	1	50	23
		Duplicate	8	10	1	0.1	1	45	19
		RPD (%)	0%	0%	0%	0%	0%	11%	19%
SW07	31/01/2021 12:02	Original	1.22	0.2	0.05	0.02	0.463	7.2	2.1
		Duplicate	1.21	0.2	0.05	0.02	0.479	7.25	2.3
		RPD (%)	1%	0%	0%	0%	3%	1%	9%
SW07	21/02/2021 12:01	Original	5	10	1	0.1	1	34	11
		Duplicate	5	10	1	0.1	1	35	8
		RPD (%)	0%	0%	0%	0%	0%	3%	32%
SW07	28/02/2021 8:19	Original	1	10	1	0.1	1	7	5
		Duplicate	1	10	1	0.1	1	8	5
		RPD (%)	0%	0%	0%	0%	0%	13%	0%
SW07	21/03/2021 14:00	Original	21	10	1	0.3	1	138	56

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
		Duplicate	22	10	1	0.3	1	138	58
		RPD (%)	5%	0%	0%	0%	0%	0%	4%
SW07	28/03/2021 7:45	Original	4	10	1	0.1	1	24	9
		Duplicate	5	10	1	0.1	1	23	8
		RPD (%)	22%	0%	0%	0%	0%	4%	12%
SW07	4/04/2021 11:44	Original	1	10	1	0.1	1	5	5
		Duplicate	1	10	1	0.1	1	5	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW09	10/01/2021 7:31	Original	1	10	1	0.1	1	8	5
		Duplicate	1	10	1	0.1	1	8	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	10/05/2020 12:04	Original	1	10	1	0.1	1	1	5
		Duplicate	1	10	1	0.1	1	1	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	14/06/2020 9:50	Original	1	10	1	0.1	1	1	5
		Duplicate	1	10	1	0.1	1	1	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	21/06/2020 12:07	Original	1	10	1	0.1	1	8	5
		Duplicate	1	10	1	0.1	1	8	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	28/06/2020 10:33	Original	1	10	1	0.3	1	3	5
		Duplicate	2	10	1	0.3	1	3	5
		RPD (%)	100%	0%	0%	0%	0%	0%	0%
SW11	12/07/2020 14:01	Original	1	10	1	0.3	1	8	5
		Duplicate	1	10	1	0.3	1	8	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	16/08/2020 9:03	Original	0.61	0.2	0.05	0.22	0.77	0.9	0.2
		Duplicate	0.69	0.2	0.05	0.25	0.845	0.95	0.7
		RPD (%)	13%	0%	0%	14%	10%	6%	250%
SW11	24/08/2020 11:00	Original	0.75	0.2	0.05	0.22	0.772	0.9	8
		Duplicate	0.69	0.2	0.05	0.2	0.794	0.85	4.2
		RPD (%)	8%	0%	0%	9%	3%	6%	48%
SW11	30/08/2020 9:09	Original	0.73	0.2	0.05	0.2	0.758	0.9	2.1
		Duplicate	0.7	0.2	0.05	0.19	0.757	0.85	0.8
		RPD (%)	4%	0%	0%	5%	0%	6%	62%
SW11	21/12/2020 7:52	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	67%	0%
SW11	23/12/2020 7:05	Original	4	10	1	0.1	1	23	13
		Duplicate	4	10	1	0.1	1	25	12
		RPD (%)	0%	0%	0%	0%	0%	9%	8%
SW11	27/12/2020 12:08	Original	2	10	1	0.1	1	17	5

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
		Duplicate	2	10	1	0.1	1	18	6
		RPD (%)	0%	0%	0%	0%	0%	6%	20%
SW11	31/12/2020 11:38	Original	4	10	1	0.1	1	29	9
		Duplicate	4	10	1	0.1	1	32	12
		RPD (%)	0%	0%	0%	0%	0%	10%	33%
SW11	3/01/2021 8:12	Original	6	10	1	0.3	1	34	16
		Duplicate	6	10	1	0.2	1	38	16
		RPD (%)	0%	0%	0%	33%	0%	12%	0%
SW11	10/01/2021 7:40	Original	5	11	1	0.1	1	30	13
		Duplicate	4	10	1	0.1	1	27	12
		RPD (%)	20%	9%	0%	0%	0%	10%	8%
SW11	17/01/2021 7:49	Original	1	10	1	0.1	1	9	5
		Duplicate	2	10	1	0.1	1	16	6
		RPD (%)	100%	0%	0%	0%	0%	78%	20%
SW11	24/01/2021 16:02	Original	5	10	1	0.1	1	32	13
		Duplicate	5	10	1	0.1	1	30	12
		RPD (%)	0%	0%	0%	0%	0%	6%	8%
SW11	31/01/2021 12:03	Original	1	0.2	0.05	0.05	0.294	5.25	2.1
		Duplicate	1.12	0.2	0.05	0.05	0.313	5.25	3.9
		RPD (%)	12%	0%	0%	0%	6%	0%	86%
SW11	7/02/2021 12:08	Original	7	10	1	1	1	30	22
		Duplicate	6	10	1	1	1	30	14
		RPD (%)	14%	0%	0%	0%	0%	0%	36%
SW11	14/02/2021 8:14	Original	15	10	1	0.4	1	80	44
		Duplicate	17	10	1	0.2	1	80	46
		RPD (%)	13%	0%	0%	50%	0%	0%	5%
SW11	23/02/2021 7:16	Original	4	10	1	0.5	1	18	13
		Duplicate	4	10	1	0.6	1	18	12
		RPD (%)	0%	0%	0%	20%	0%	0%	8%
SW11	28/02/2021 8:49	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	6	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	7/03/2021 7:42	Original	1	10	1	0.1	1	11	5
		Duplicate	1	10	1	0.1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	9%	0%
SW11	14/03/2021 7:29	Original	1	10	1	0.1	1	9	5
		Duplicate	1	10	1	0.1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	11%	0%
SW11	21/03/2021 14:02	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	11	5
		RPD (%)	0%	0%	0%	0%	0%	83%	0%
SW11	22/03/2021 8:00	Original	1	10	1	0.1	1	3	5

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
		Duplicate	1	10	1	0.1	1	1	5
		RPD (%)	0%	0%	0%	0%	0%	67%	0%
SW11	28/03/2021 8:23	Original	3	10	1	0.3	1	15	8
		Duplicate	3	10	1	0.3	1	16	9
		RPD (%)	0%	0%	0%	0%	0%	7%	13%
SW11	4/04/2021 10:52	Original	1	10	1	0.1	1	4	5
		Duplicate	1	10	1	0.1	1	4	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	11/04/2021 7:56	Original	1	10	1	1	1	10	5
		Duplicate	1	10	1	1	1	10	5
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	18/04/2021 8:13	Original	1	10	1	0.1	1	6	5
		Duplicate	1	10	1	0.1	1	5	6
		RPD (%)	0%	0%	0%	0%	0%	17%	20%
SW11	25/04/2021 7:44	Original	1	10	1	0.1	1	7	5
		Duplicate	1	10	1	0.1	1	9	5
		RPD (%)	0%	0%	0%	0%	0%	29%	0%
SW12	19/07/2020 10:30	Original	2	10	1	0.3	1	4	7
		Duplicate	1	10	1	0.3	1	4	5
		RPD (%)	50%	0%	0%	0%	0%	0%	29%
SW12	15/09/2020 16:01	Original	1.29	0.2	0.05	0.28	0.601	2.6	2.6
		Duplicate	1.43	0.2	0.05	0.28	0.603	2.65	2.6
		RPD (%)	11%	0%	0%	0%	0%	2%	0%
SW12	20/09/2020 10:30	Original	0.97	0.2	0.05	0.24	0.449	0.95	1
		Duplicate	1.01	0.2	0.05	0.27	0.449	0.95	0.6
		RPD (%)	4%	0%	0%	13%	0%	0%	40%
SW13	8/06/2020 9:28	Original	0.82	0.2	0.05	0.01	1.13	2.1	0.4
		Duplicate	0.78	0.2	0.05	0.02	1.08	2	1.1
		RPD (%)	5%	0%	0%	100%	4%	5%	175%
SW13	5/07/2020 11:30	Original	1	10	1	0.1	1	8	5
		Duplicate	1	10	1	0.1	1	7	5
		RPD (%)	0%	0%	0%	0%	0%	13%	0%
SW13	1/11/2020 9:55	Original	2	10	1	0.2	2	19	61
		Duplicate	2	10	1	0.3	2	17	78
		RPD (%)	0%	0%	0%	50%	0%	11%	28%
SW17	24/05/2020 8:35	Original	0.64	0.2	0.05	0.2	0.99	1.95	0.9
		Duplicate	0.6	0.2	0.05	0.2	0.972	1.95	0.6
		RPD (%)	6%	0%	0%	0%	2%	0%	33%
SW17	31/05/2020 8:01	Original	0.57	0.2	0.05	0.19	0.98	1.9	0.3
		Duplicate	0.61	0.2	0.05	0.19	0.991	1.95	0.4
		RPD (%)	7%	0%	0%	0%	1%	3%	33%
SW17	15/11/2020 10:39	Original	2	10	1	0.1	1	13	6

Site	Date	Type	Nickel (Total) (µg/L)	Selenium (Total) (µg/L)	Silver (Total) (µg/L)	Thallium (Total) (µg/L)	Uranium (Total) (µg/L)	Vanadium (Total) (µg/L)	Zinc (Total) (µg/L)
		Duplicate	4	10	1	0.1	1	21	7
		RPD (%)	100%	0%	0%	0%	0%	62%	17%
SW18	7/03/2021 8:27	Original	1	10	1	0.4	1	13	22
		Duplicate	1	10	1	0.4	1	12	19
		RPD (%)	0%	0%	0%	0%	0%	8%	14%
SW19	3/01/2021 11:00	Original	4	10	1	5.1	1	10	32
		Duplicate	3	10	1	5.1	1	11	31
		RPD (%)	25%	0%	0%	0%	0%	10%	3%
SW21	24/05/2020 15:05	Original	0.76	0.2	0.05	0.01	0.906	2.25	0.4
		Duplicate	0.81	0.2	0.05	0.01	0.916	2.35	0.8
		RPD (%)	7%	0%	0%	0%	1%	4%	100%
SW21	27/12/2020 10:52	Original	15	10	1	0.3	1	89	38
		Duplicate	15	10	1	0.3	1	81	43
		RPD (%)	0%	0%	0%	0%	0%	9%	13%
SW21	21/02/2021 12:00	Original	5	10	1	0.1	1	25	11
		Duplicate	4	10	1	0.1	1	29	5
		RPD (%)	20%	0%	0%	0%	0%	16%	55%
SW21	14/03/2021 8:04	Original	1	10	1	0.1	1	11	5
		Duplicate	1	10	1	0.1	1	12	5
		RPD (%)	0%	0%	0%	0%	0%	9%	0%
SW21	18/04/2021 7:32	Original	1	10	1	0.1	1	7	5
		Duplicate	1	10	1	0.1	1	4	16
		RPD (%)	0%	0%	0%	0%	0%	55%	105%

Table B.5: Duplicate sample results, major cation and anions, 2020/21 reporting period

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
SW02	28/06/2020 9:59	Original	162	146	151	899	0.1	19	225
		Duplicate	155	148	165	906	0.1	21	242
		RPD (%)	4%	1%	9%	1%	0%	10%	7%
SW02	5/07/2020 13:15	Original	127	114	97	512	0.1	14	138
		Duplicate	130	114	84	513	0.1	14	130
		RPD (%)	2%	0%	14%	0%	0%	0%	6%
SW02	26/07/2020 9:53	Original	-	98	-	340	0.1	-	-
		Duplicate	-	98	-	340	0.1	-	-
		RPD (%)	-	0%	-	0%	0%	-	-
SW02	2/08/2020 14:50	Original	-	91	-	265	0.1	-	-
		Duplicate	-	90	-	265	0.1	-	-
		RPD (%)	-	1%	-	0%	0%	-	-
SW02	3/01/2021 12:20	Original	9	8.1	6	23	0.491	3	9
		Duplicate	9	8.1	6	24	0.495	3	9
		RPD (%)	0%	0%	0%	4%	1%	0%	0%
SW02	10/01/2021 7:33	Original	3	2.1	1	2.6	0.1	2	2
		Duplicate	3	2	1	2.7	0.1	2	2
		RPD (%)	0%	5%	0%	4%	0%	0%	0%
SW02	17/01/2021 7:45	Original	46	38	26	153	0.1	6	40
		Duplicate	46	38	26	152	0.1	6	41
		RPD (%)	0%	0%	0%	1%	0%	0%	2%
SW02	7/02/2021 12:54	Original	6	4	4	8	0.05	2	5
		Duplicate	6	4	4	8	0.05	2	4
		RPD (%)	0%	0%	0%	0%	0%	0%	22%
SW02	14/02/2021 10:38	Original	22	15	13	52	0.1	4	19
		Duplicate	22	15	13	52	0.1	4	19
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW02	7/03/2021 9:11	Original	58	43	36	175	0.1	7	49
		Duplicate	57	43	37	175	0.1	7	50
		RPD (%)	2%	0%	3%	0%	0%	0%	2%
SW02	11/04/2021 11:51	Original	77	48	45	200	0.05	8	67
		Duplicate	77	48	44	203	0.05	8	65
		RPD (%)	0%	0%	2%	1%	0%	0%	3%
SW04	10/01/2021 7:24	Original	3	1.6	1	0.7	0.137	2	2
		Duplicate	2	1.9	1	0.7	0.104	2	2
		RPD (%)	40%	17%	0%	0%	27%	0%	0%
SW04	17/01/2021 7:38	Original	9	5.9	3	0.9	0.1	3	4
		Duplicate	9	5.9	3	1	0.1	3	4
		RPD (%)	0%	0%	0%	11%	0%	0%	0%
SW04	7/02/2021 13:17	Original	4	1	1	1	0.05	3	2

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	4	1	1	1	0.05	3	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW04	7/03/2021 8:19	Original	8	4.6	3	0.5	0.1	2	3
		Duplicate	8	4.7	3	0.5	0.1	2	3
		RPD (%)	0%	2%	0%	0%	0%	0%	0%
SW07	10/05/2020 12:01	Original	32	28	14	14	0.1	3	24
		Duplicate	33	28	14	14	0.1	3	24
		RPD (%)	3%	0%	0%	0%	0%	0%	0%
SW07	17/05/2020 12:01	Original	41.6	32	16.4	15	0.02	3.9	30.2
		Duplicate	41.1	32	16.3	15	0.02	4	30.1
		RPD (%)	1%	0%	1%	0%	0%	3%	0%
SW07	14/06/2020 12:40	Original	52	39	17	18	0.1	4	35
		Duplicate	53	39	16	18	0.1	4	37
		RPD (%)	2%	0%	6%	0%	0%	0%	6%
SW07	21/06/2020 12:05	Original	45	44	18	21	0.1	4	36
		Duplicate	45	44	18	20	0.1	4	36
		RPD (%)	0%	0%	0%	5%	0%	0%	0%
SW07	12/07/2020 14:00	Original	53	58	26	25	0.1	5	48
		Duplicate	52	58	25	25	0.1	5	48
		RPD (%)	2%	0%	4%	0%	0%	0%	0%
SW07	19/07/2020 10:05	Original	57	61	29	25	0.1	6	52
		Duplicate	59	61	29	26	0.1	6	50
		RPD (%)	3%	0%	0%	4%	0%	0%	4%
SW07	8/08/2020 17:02	Original	-	70	-	29	0.1	-	-
		Duplicate	-	70	-	30	0.1	-	-
		RPD (%)	-	0%	-	3%	0%	-	-
SW07	16/08/2020 9:02	Original	70	80	33.9	30.9	0.04	5.8	60.2
		Duplicate	70.4	78	34.3	31.4	0.04	5.9	60.6
		RPD (%)	1%	3%	1%	2%	0%	2%	1%
SW07	7/09/2020 17:02	Original	60.1	82	37.5	32.4	0.02	6.4	65.4
		Duplicate	60.2	82	37.4	32.3	0.02	6.4	65.4
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	15/09/2020 16:02	Original	61.3	92	38.4	31.9	0.02	6.7	68
		Duplicate	60.6	96	38.7	32	0.02	6.6	67.9
		RPD (%)	1%	4%	1%	0%	0%	2%	0%
SW07	8/11/2020 14:08	Original	36	104	48	31	0.1	7	75
		Duplicate	37	103	54	30	0.1	8	84
		RPD (%)	3%	1%	12%	3%	0%	13%	11%
SW07	24/01/2021 16:00	Original	6	2.9	2	1.1	0.1	2	3
		Duplicate	6	2.9	2	1.1	0.1	2	3
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW07	31/01/2021 12:02	Original	20.9	6	4.3	2.9	0.02	3.1	13.7

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	21.2	6	4.3	3	0.02	3.1	13.6
		RPD (%)	1%	0%	0%	3%	0%	0%	1%
SW07	21/02/2021 12:01	Original	11	3.4	2	1.6	0.1	2	6
		Duplicate	11	3.3	2	1.5	0.1	2	6
		RPD (%)	0%	3%	0%	6%	0%	0%	0%
SW07	28/02/2021 8:19	Original	19	6.4	3	3.9	0.1	2	11
		Duplicate	20	6.4	4	3.8	0.1	3	11
		RPD (%)	5%	0%	29%	3%	0%	40%	0%
SW07	21/03/2021 14:00	Original	6	1.6	1	3.5	0.1	2	3
		Duplicate	6	1.6	1	3.6	0.1	2	3
		RPD (%)	0%	0%	0%	3%	0%	0%	0%
SW07	28/03/2021 7:45	Original	11	3.3	2	3.5	0.1	3	7
		Duplicate	11	3.3	2	3.5	0.1	3	6
		RPD (%)	0%	0%	0%	0%	0%	0%	15%
SW07	4/04/2021 11:44	Original	21	7.7	5	4.2	0.1	3	13
		Duplicate	21	7.7	5	4.2	0.1	3	12
		RPD (%)	0%	0%	0%	0%	0%	0%	8%
SW09	10/01/2021 7:31	Original	4	3.8	2	1	1.271	3	2
		Duplicate	3	3.8	2	1	1.241	3	3
		RPD (%)	29%	0%	0%	0%	2%	0%	40%
SW11	10/05/2020 12:04	Original	38	33	16	41	0.448	4	27
		Duplicate	40	33	16	41	0.435	4	28
		RPD (%)	5%	0%	0%	0%	3%	0%	4%
SW11	14/06/2020 9:50	Original	63	54	25	73	0.523	4	44
		Duplicate	64	55	27	73	0.511	4	46
		RPD (%)	2%	2%	8%	0%	2%	0%	4%
SW11	21/06/2020 12:07	Original	53	64	28	90	0.53	4	49
		Duplicate	55	64	29	90	0.538	4	50
		RPD (%)	4%	0%	4%	0%	1%	0%	2%
SW11	28/06/2020 10:33	Original	66	70	41	97	0.6	5	63
		Duplicate	67	70	41	98	0.603	5	62
		RPD (%)	2%	0%	0%	1%	0%	0%	2%
SW11	12/07/2020 14:01	Original	51	73	34	81	0.122	5	49
		Duplicate	55	73	37	81	0.122	5	54
		RPD (%)	8%	0%	8%	0%	0%	0%	10%
SW11	16/08/2020 9:03	Original	56.8	88	42.8	53.9	0.02	5	54.2
		Duplicate	57.3	88	43	53.8	0.02	5	54.3
		RPD (%)	1%	0%	0%	0%	0%	0%	0%
SW11	24/08/2020 11:00	Original	56.4	90	44.5	51.9	0.02	5	55.6
		Duplicate	56.1	90	43.7	51.5	0.02	5	55.2
		RPD (%)	1%	0%	2%	1%	0%	0%	1%
SW11	30/08/2020 9:09	Original	57	92	44.1	47.6	0.04	5.4	55.8

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	57	92	44.5	47.8	0.04	5.4	56
		RPD (%)	0%	0%	1%	0%	0%	0%	0%
SW11	21/12/2020 7:52	Original	4	6.9	4	15	1.694	3	5
		Duplicate	5	6.9	4	15	1.719	3	5
		RPD (%)	22%	0%	0%	0%	1%	0%	0%
SW11	23/12/2020 7:05	Original	9	5.3	4	41	1.051	3	10
		Duplicate	9	5.2	4	41	1.049	3	11
		RPD (%)	0%	2%	0%	0%	0%	0%	10%
SW11	27/12/2020 12:08	Original	1	2.6	1	2	0.632	2	1
		Duplicate	1	2.5	1	2	0.638	2	1
		RPD (%)	0%	4%	0%	0%	1%	0%	0%
SW11	31/12/2020 11:38	Original	1	2.1	1	1.2	0.37	2	1
		Duplicate	1	2.1	1	1.2	0.363	2	1
		RPD (%)	0%	0%	0%	0%	2%	0%	0%
SW11	3/01/2021 8:12	Original	13	7.6	7	97	0.614	3	19
		Duplicate	12	7.7	6	96	0.625	3	18
		RPD (%)	8%	1%	15%	1%	2%	0%	5%
SW11	10/01/2021 7:40	Original	11	5.1	3	13	0.763	3	7
		Duplicate	10	5.1	4	12	0.783	3	7
		RPD (%)	10%	0%	29%	8%	3%	0%	0%
SW11	17/01/2021 7:49	Original	12	6.2	4	7.1	0.486	3	8
		Duplicate	11	6.2	3	7.8	0.479	3	7
		RPD (%)	9%	0%	29%	9%	1%	0%	13%
SW11	24/01/2021 16:02	Original	6	4	3	2.4	0.1	3	4
		Duplicate	5	3.9	3	2.3	0.1	3	4
		RPD (%)	18%	3%	0%	4%	0%	0%	0%
SW11	31/01/2021 12:03	Original	13.9	6	4	5	0.3	3	9.3
		Duplicate	14.3	6	4.2	4.9	0.28	3.1	9.7
		RPD (%)	3%	0%	5%	2%	7%	3%	4%
SW11	7/02/2021 12:08	Original	4	4	3	1	0.13281	3	2
		Duplicate	4	4	3	1	0.13281	3	2
		RPD (%)	0%	0%	0%	0%	0%	0%	0%
SW11	14/02/2021 8:14	Original	10	2.3	2	3.5	0.133	2	5
		Duplicate	10	2.2	2	3.4	0.13	2	5
		RPD (%)	0%	4%	0%	3%	2%	0%	0%
SW11	23/02/2021 7:16	Original	17	7.4	7	99	0.182	3	18
		Duplicate	16	7.4	8	99	0.174	3	19
		RPD (%)	6%	0%	13%	0%	4%	0%	5%
SW11	28/02/2021 8:49	Original	13	6.3	3	6.2	0.36	3	7
		Duplicate	13	6.3	3	6.1	0.401	3	8
		RPD (%)	0%	0%	0%	2%	11%	0%	13%
SW11	7/03/2021 7:42	Original	19	8.5	5	8.5	0.432	3	13

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	18	8.6	5	8.5	0.431	3	13
		RPD (%)	5%	1%	0%	0%	0%	0%	0%
SW11	14/03/2021 7:29	Original	18	7.7	4	5.7	0.208	3	12
		Duplicate	17	7.7	4	5.7	0.211	3	11
		RPD (%)	6%	0%	0%	0%	1%	0%	9%
SW11	21/03/2021 14:02	Original	1	1.3	1	0.4	0.14	1	1
		Duplicate	1	1.3	1	0.4	0.1	1	1
		RPD (%)	0%	0%	0%	0%	33%	0%	0%
SW11	22/03/2021 8:00	Original	1	1.3	1	0.2	0.1	1	1
		Duplicate	1	1.4	1	0.2	0.1	1	1
		RPD (%)	0%	7%	0%	0%	0%	0%	0%
SW11	28/03/2021 8:23	Original	14	6.6	5	65	0.183	3	14
		Duplicate	14	7	6	71	0.158	3	15
		RPD (%)	0%	6%	18%	9%	15%	0%	7%
SW11	4/04/2021 10:52	Original	15	7.2	5	9	0.372	3	12
		Duplicate	15	7.2	4	9	0.354	3	11
		RPD (%)	0%	0%	22%	0%	5%	0%	9%
SW11	11/04/2021 7:56	Original	29	10	8	12	0.39843	3	19
		Duplicate	28	11	7	12	0.39843	3	18
		RPD (%)	4%	10%	13%	0%	0%	0%	5%
SW11	18/04/2021 8:13	Original	26	13	6	14	0.377	3	18
		Duplicate	27	13	6	14	0.375	3	19
		RPD (%)	4%	0%	0%	0%	1%	0%	5%
SW11	25/04/2021 7:44	Original	32	17	8	18	0.381	3	23
		Duplicate	32	16	8	18	0.408	3	24
		RPD (%)	0%	6%	0%	0%	7%	0%	4%
SW12	19/07/2020 10:30	Original	59	84	45	83	0.1	6	60
		Duplicate	63	84	45	83	0.1	6	62
		RPD (%)	7%	0%	0%	0%	0%	0%	3%
SW12	2/08/2020 11:16	Original	-	84	-	59	0.1	-	-
		Duplicate	-	84	-	60	0.1	-	-
		RPD (%)	-	0%	-	2%	0%	-	-
SW12	8/08/2020 17:01	Original	-	85	-	57	0.1	-	-
		Duplicate	-	86	-	57	0.1	-	-
		RPD (%)	-	1%	-	0%	0%	-	-
SW12	15/09/2020 16:01	Original	61.3	110	50.3	42.8	0.04	5.4	55.8
		Duplicate	61	108	49.8	42.7	0.04	5.3	55.8
		RPD (%)	0%	2%	1%	0%	0%	2%	0%
SW12	20/09/2020 10:30	Original	61	98	48.3	33.2	0.02	5.1	54.5
		Duplicate	62.3	96	48.7	33.5	0.02	5.1	55.2
		RPD (%)	2%	2%	1%	1%	0%	0%	1%
SW13	8/06/2020 9:28	Original	50.3	46	19	20.3	0.02	4	36.2

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	50.6	46	19.2	20.7	0.02	4	36.3
		RPD (%)	1%	0%	1%	2%	0%	0%	0%
SW13	5/07/2020 11:30	Original	60	75	27	33	0.1	5	52
		Duplicate	60	75	24	32	0.1	5	48
		RPD (%)	0%	0%	12%	3%	0%	0%	8%
SW13	1/11/2020 9:55	Original	50	115	36	32	0.1	6	67
		Duplicate	54	115	38	32	0.1	6	67
		RPD (%)	8%	0%	5%	0%	0%	0%	0%
SW16	11/10/2020 7:33	Original	-	118	-	-	0.02	-	-
		Duplicate	-	132	-	-	0.02	-	-
		RPD (%)	-	11%	-	-	0%	-	-
SW16	6/12/2020 11:29	Original	31	72	45	35	0.1	5	42
		Duplicate	31	73	46	36	0.1	5	42
		RPD (%)	0%	1%	2%	3%	0%	0%	0%
SW17	24/05/2020 8:35	Original	46.9	42	20.1	23.4	0.02	4.1	35.1
		Duplicate	46.6	42	20	23.3	0.02	4.1	34.9
		RPD (%)	1%	0%	0%	0%	0%	0%	1%
SW17	31/05/2020 8:01	Original	48.9	46	21.7	24.5	0.02	4.2	37.7
		Duplicate	49.2	48	21.8	24.5	0.02	4.2	37.9
		RPD (%)	1%	4%	0%	0%	0%	0%	1%
SW17	26/07/2020 9:55	Original	-	87	-	69	0.1	-	-
		Duplicate	-	87	-	70	0.1	-	-
		RPD (%)	-	0%	-	1%	0%	-	-
SW17	15/11/2020 10:39	Original	46	160	58	82	0.1	6	47
		Duplicate	50	159	58	82	0.1	6	47
		RPD (%)	8%	1%	0%	0%	0%	0%	0%
SW18	7/03/2021 8:27	Original	52	43	34	186	0.202	7	47
		Duplicate	52	43	34	186	0.204	7	47
		RPD (%)	0%	0%	0%	0%	1%	0%	0%
SW19	3/01/2021 11:00	Original	136	96	118	1690	0.196	20	325
		Duplicate	142	96	125	1703	0.208	20	339
		RPD (%)	4%	0%	6%	1%	6%	0%	4%
SW21	24/05/2020 15:05	Original	38.9	30	15.9	13.8	0.04	3.6	27.4
		Duplicate	39.7	28	16.1	14	0.02	3.6	27.7
		RPD (%)	2%	7%	1%	1%	67%	0%	1%
SW21	27/12/2020 10:52	Original	7	1.7	1	3.4	0.313	3	3
		Duplicate	7	1.7	1	3.4	0.324	2	3
		RPD (%)	0%	0%	0%	0%	3%	40%	0%
SW21	21/02/2021 12:00	Original	10	3.3	2	1.3	0.1	2	6
		Duplicate	10	3.3	2	1.2	0.1	2	5
		RPD (%)	0%	0%	0%	8%	0%	0%	18%
SW21	14/03/2021 8:04	Original	23	7.9	4	3.9	0.1	2	15

Site	Date	Type	Calcium (Filtered) (mg/L)	Chloride (Filtered) (mg/L)	Sodium (Filtered) (mg/L)	Sulphate (Filtered) (mg/L)	Nitrate (Filtered) (mg/L)	Potassium (Filtered) (mg/L)	Magnesium (Filtered) (mg/L)
		Duplicate	24	7.9	4	3.9	0.1	2	15
		RPD (%)	4%	0%	0%	0%	0%	0%	0%

Table B.6: Blank analysis, 2020/21 reporting period (aluminium to lead)

Sample Type	Date	Aluminium_F (ug/L)	Aluminium_T (ug/L)	Antimony_F (ug/L)	Antimony_T (ug/L)	Arsenic_F (ug/L)	Arsenic_T (ug/L)	Barium_F (ug/L)	Barium_T (ug/L)	Beryllium_F (ug/L)	Beryllium_T (ug/L)	Bismuth_F (ug/L)	Bismuth_T (ug/L)	Boron_F (ug/L)	Boron_T (ug/L)	Cadmium_F (ug/L)	Cadmium_T (ug/L)	Chloride_F (mg/L)	Chromium_F (ug/L)	Chromium_T (ug/L)	Cobalt_F (ug/L)	Cobalt_T (ug/L)	Copper_F (ug/L)	Copper_T (ug/L)	EC - Lab (uS/cm)	Iron_F (ug/L)	Iron_T (ug/L)	Lead_F (ug/L)
Blank - SW - Field	10/05/2020 12:02	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	17/05/2020 12:02	1	1.9	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.02	7	2	2	0.01
Blank - SW - Field	24/05/2020 15:48	0.1	1	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.04	4	2	2	0.01
Blank - SW - Field	8/06/2020 14:21	0.3	0.2	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.01	5	2	2	0.01
Blank - SW - Field	5/07/2020 13:15	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	12/07/2020 14:02	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.02	5	10	0.5
Blank - SW - Field	8/08/2020 17:04	0.2		0.05		0.05		0.02		0.05		0.01		0.5		0.02		0.1	0.1		0.01		0.03		1	2		0.01
Blank - SW - Field	16/08/2020 9:05	0.1	0.1	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.09	3	2	2	0.01
Blank - SW - Field	3/01/2021 13:30	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	10/01/2021 11:05	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.02	5	10	0.5
Blank - SW - Field	24/01/2021 15:15	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	31/01/2021 12:04	0.1	0.7	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.01	2	2	2	0.01
Blank - SW - Field	7/02/2021 15:00	10	10	1	1	1	1	1	1	1	1	1	1	50	50	0.1	0.1	1	1	1	1	1	1	1	1	50	50	1
Blank - SW - Field	14/02/2021 0:00																											0.5
Blank - SW - Field	14/02/2021 12:05	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	21/02/2021 12:02	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	28/02/2021 12:00	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	7/03/2021 11:05	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	14/03/2021 11:30	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.16	5	10	0.5
Blank - SW - Field	21/03/2021 14:03	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	28/03/2021 10:45	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	4/04/2021 15:06	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	11/04/2021 16:02	10	10	1	1	1	1	1	1	1	1	1	1	50	50	0.1	0.1	1	1	1	1	1	1	1	1	50	50	1
Blank - SW - Field	18/04/2021 11:30	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Field	25/04/2021 13:08	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	10/05/2020 12:03	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	17/05/2020 12:03	1.2	0.7	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.02	8	2	2	0.01
Blank - SW - Lab	24/05/2020 16:00	0.2	0.7	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.02	3	2	2	0.01
Blank - SW - Lab	8/06/2020 14:20	0.6	0.8	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.01	6	2	2	0.01
Blank - SW - Lab	5/07/2020 14:00	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.54	5	10	0.5
Blank - SW - Lab	12/07/2020 14:03	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.06	5	10	0.5
Blank - SW - Lab	8/08/2020 17:03	0.3		0.05		0.05		0.02		0.05		0.01		0.5		0.02		0.1	0.1		0.01		0.02		1	2		0.01
Blank - SW - Lab	16/08/2020 9:04	0.1	0.1	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	2	0.02	0.02	2	0.1	0.1	0.01	0.01	0.01	0.04	2	2	2	0.01
Blank - SW - Lab	3/01/2021 13:31	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5

Blank - SW - Lab	10/01/2021 11:00	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	24/01/2021 15:00	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	31/01/2021 12:05	0.2	0.3	0.05	0.05	0.05	0.05	0.02	0.02	0.05	0.05	0.01	0.01	0.5	0.5	0.02	0.02	2	0.1	0.1	0.01	0.01	0.02	0.06	3	2	2	0.01
Blank - SW - Lab	7/02/2021 14:59	10	10	1	1	1	1	1	1	1	1	1	1	50	50	0.1	0.1	1	1	1	1	1	1	1	1	50	50	1
Blank - SW - Lab	14/02/2021 0:00																											0.5
Blank - SW - Lab	14/02/2021 12:00	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	21/02/2021 12:03	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.84	5	10	0.5
Blank - SW - Lab	28/02/2021 12:01	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.02	5	10	0.5
Blank - SW - Lab	7/03/2021 11:10	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	14/03/2021 11:35	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	21/03/2021 14:04	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	28/03/2021 10:45	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - SW - Lab	4/04/2021 15:05	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.12	5	10	0.5
Blank - SW - Lab	11/04/2021 16:00	10	10	1	1	1	1	1	1	1	1	1	1	50	50	0.1	0.1	1	1	1	1	1	1	1	1	50	50	1
Blank - SW - Lab	18/04/2021 11:15	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1.02	5	10	0.5
Blank - SW - Lab	25/04/2021 13:11	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5
Blank - WDL - Field	13/07/2020 10:52	5	5	0.2	0.2	0.5	1	1	1	1	1	1	1	1	1	0.2	0.2	0.1	0.5	5	1	1	1	1	1	5	10	0.5

Table B.7: Blank analysis, 2020/21 reporting period (lead to zinc)

Sample Type	Date	Lead_T (ug/L)	Magnesium_F (mg/L)	Manganese_F (ug/L)	Manganese_T (ug/L)	Mercury_F (ug/L)	Mercury_T (ug/L)	Molybdenum_F (ug/L)	Molybdenum_T (ug/L)	Nickel_F (ug/L)	Nickel_T (ug/L)	Nitrate_F (ug/L)	pH - Lab (pH Unit)	Potassium_F (mg/L)	Selenium_F (ug/L)	Selenium_T (ug/L)	Silver_F (ug/L)	Silver_T (ug/L)	Sulphate_F (mg/L)	Thallium_F (ug/L)	Thallium_T (ug/L)	TDS (mg/L)	TSS (mg/L)	Uranium_F (mg/L)	Uranium_F (ug/L)	Uranium_T (ug/L)	Vanadium_F (ug/L)	Vanadium_T (ug/L)	Zinc_F (ug/L)	Zinc_T (ug/L)
Blank - SW - Field	10/05/2020 12:02	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	17/05/2020 12:02	0.01	0.1	0.02	0.02	0.02	0.02	0.05	0.05	0.01	0.01	20	5.7	0.1	0.2	0.2	0.05	0.05	5	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Field	24/05/2020 15:48	0.05	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.04	0.05	20	5.7	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.9
Blank - SW - Field	8/06/2020 14:21	0.01	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.01	20	5.6	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.02	20	20	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Field	5/07/2020 13:15	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.3	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	12/07/2020 14:02	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.4	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	8/08/2020 17:04			0.01		0.02		0.05		0.01		100	5.3		0.2		0.05		0.1	0.01		10	10	1E-06	0.001		0.05		0.1	
Blank - SW - Field	16/08/2020 9:05	0.01	0.1	0.04	0.04	0.02	0.02	0.05	0.05	0.42	0.75	20	6	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Field	3/01/2021 13:30	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.9	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	10/01/2021 11:05	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	24/01/2021 15:15	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	31/01/2021 12:04	0.01	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.01	20	5.8	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Field	7/02/2021 15:00	1	1	1	1	0.1	0.1	1	1	1	1	50	5.56	1	10	10	1	1	1	1	1	10	5	0.001	1	1	10	10	5	5
Blank - SW - Field	14/02/2021 12:05	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.9	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	21/02/2021 12:02	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.5	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	28/02/2021 12:00	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	7/03/2021 11:05	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	14/03/2021 11:30	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	21/03/2021 14:03	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.7	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	28/03/2021 10:45	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	4/04/2021 15:06	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.6	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Field	11/04/2021 16:02	1	1	1	1	0.1	0.1	1	1	1	1	50	5.86	1	10	10	1	1	1	1	1	10	5	0.001	1	1	10	10	5	5
Blank - SW - Field	18/04/2021 11:30	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.8	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	2	2	5
Blank - SW - Field	25/04/2021 13:08	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	10/05/2020 12:03	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	17/05/2020 12:03	0.01	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.01	20	5.8	0.1	0.2	0.2	0.05	0.05	5	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Lab	24/05/2020 16:00	0.12	0.1	0.01	0.02	0.02	0.02	0.05	0.05	0.01	0.01	20	5.7	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.6
Blank - SW - Lab	8/06/2020 14:20	0.01	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.01	20	5.7	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.02	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Lab	5/07/2020 14:00	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.9	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	12/07/2020 14:03	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	8/08/2020 17:03			0.01		0.02		0.05		0.01		100	5.4		0.2		0.05		0.1	0.01		10	10	1E-06	0.001		0.05		0.1	
Blank - SW - Lab	16/08/2020 9:04	0.01	0.1	0.01	0.01	0.02	0.02	0.05	0.05	0.01	0.01	20	6.1	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	10	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.1
Blank - SW - Lab	3/01/2021 13:31	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.9	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	10/01/2021 11:00	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.5	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5

Blank - SW - Lab	24/01/2021 15:00	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.8	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	31/01/2021 12:05	0.03	0.1	0.01	0.03	0.02	0.02	0.05	0.05	0.03	0.07	20	5.9	0.1	0.2	0.2	0.05	0.05	0.1	0.01	0.01	30	10	1E-06	0.001	0.001	0.05	0.05	0.1	0.3
Blank - SW - Lab	7/02/2021 14:59	1	1	1	1	0.1	0.1	1	1	1	1	50	5.73	1	10	10	1	1	1	1	1	10	5	0.001	1	1	10	10	5	5
Blank - SW - Lab	14/02/2021 12:00	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	21/02/2021 12:03	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.9	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	28/02/2021 12:01	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	7/03/2021 11:10	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	14/03/2021 11:35	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.3	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	21/03/2021 14:04	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.5	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	28/03/2021 10:45	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	4/04/2021 15:05	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	5.5	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	11/04/2021 16:00	1	1	1	1	0.1	0.1	1	1	1	1	50	6.34	1	10	10	1	1	1	1	1	10	5	0.001	1	1	10	10	5	5
Blank - SW - Lab	18/04/2021 11:15	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.1	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - SW - Lab	25/04/2021 13:11	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5
Blank - WDL - Field	13/07/2020 10:52	1	1	0.5	5	0.01	0.05	0.1	1	1	1	100	6.2	1	1	10	0.5	1	0.1	0.1	0.1	10	10	0.001	1	1	1	1	2	5

Appendix C - ASW monitoring data

List of Tables

Table C.1: Analyte sampling data for Open Pit Pond 2 (P2), ASW Sites _____ 168
Table C.2: Analyte sampling data for TSF Water Management Dam (WMD), ASW Sites _____ 170
Table C.3: Analyte sampling data for NOEF South East Levee 1 (NC1A), ASW Sites _____ 172

Table C.1: Analyte sampling data for Open Pit Pond 2 (P2), ASW Sites

Timestamps	ASW Site - P2																																												
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 10:01	7.6	2830	81.2	26.6	13	<10	2938	1766	11	4.8	<0.2	<1	6	1.1	624	<0.01	2	126	0.4	77	<1	<1	194	<0.5	<1	1.9	<1	<0.5	3.4	3	6				1532	215	216	100	99	19	298	243	<1
11/05/2020 12:45	7.98	8170	79.2	26.8	11	<10	10802	6313	<5	<0.5	5.5	<1	<5	<0.5	1116	<0.01	3	96	<0.2	52	<1	<1	513	0.8	2	1.9	12	<0.5	188	<1	<1				6907	15689	479	252	410	57	1242	74	<1
24/05/2020 13:44	7.49	9340	85	24.54	4	20	12500	8010	9.2	0.65	7	0.2	<20	0.1	1180	<0.2	3.94	368	<0.5	60.4	<0.5	<0.1	707	2.7	3.57	2.5	11.8	<0.5	276	0.121	<0.5				8240	24700	606	294	428	77.9	1580	48	<1
31/05/2020 12:58	7.7	7450	113.8	26.23	6		8660	5540	2.1	1.65	5.36	<0.1	<20	0.97	524	<0.2	2.52	442	<0.5	55.2	<0.5	<0.1	482	1.6	2.3	1.55	7.6	<0.5	164	2.01	1.3				5360	12900	454	224	299	51.5	1070	182	<1
9/06/2020 10:28	7.8	6850	97.8	22.6	23	310	7800	4960	5.5	3.5	4	0.68	<20	15.6	424	<0.2	2.77	350	<0.5	45.4	<0.5	<0.1	412	1.2	1.71	1.95	5.8	<0.5	141	2.83	0.75				4820	920	427	198	258	46.6	946	232	<1
14/06/2020 8:48	7.57	6550	89	23.27	2	<10	7730	6043	<5	2.8	4	<1	<5	<0.5	388	0.042	4	252	0.2	58	<1	<1	504	1.6	2	1.9	1	<0.5	155	3	1				5326	10957	502	220	339	55	1163	201	<1
21/06/2020 8:57	7.24	6140	83	25.24	2	<10	8426	5130	41	2.2	3.1	<1	<5	<0.5	220	0.044	3	335	0.4	49	<1	<1	501	1.3	1	1.9	12	<0.5	119	2	<1				5044	10222	505	264	290	51	939	197	<1
28/06/2020 15:24	7.23	6810	84.5	25.08	3	<10	9270	6083	7	2.4	3.4	<1	<5	<0.5	128	<0.01	2	181	<0.2	37	<1	<1	486	1.2	<1	0.7	3	<0.5	166	1	<1				5842	12465	372	284	338	59	1252	172	<1
5/07/2020 17:15	7.82	7690	73.6	23.4	8	<10	9200	5870	<5	1.3	1.9	<1	<5	<0.5	1145	<0.01	5	206	0.7	24	<1	<1	414	1.8	9	2.5	<1	<0.5	164	<1	<1				5325	8692	608	240	350	72	1056	63	15
13/07/2020 8:48	8.64	7520	96.2	22.26	1	12	8976	6080	<5	<0.5	9.6	<1	<5	<0.5	2260	<0.01	9	534	<0.2	20	<1	<1	546	0.7	13	2.8	3	<0.5	127	<1	<1				5495	8995	471	229	330	58	1191	38	27
19/07/2020 10:37	8.65	7610	86.2	21.99	28	<10	8690	5460	<5	0.8	13	<1	<5	<0.5	2844	0.98	14	760	0.4	29	<1	<1	524	1.2	20	4	6	<0.5	134	<1	<1				5331	9683	495	191	317	56	1026	37	22
26/07/2020 14:38	7.72	7090	90.5	23.99	2	<10	8456	5242	<5	<0.5	8.5	<1	<5	<0.5	2200	<0.01	12	467	<0.2	22	<1	<1	533	0.7	21	2.3	<1	<0.5	110	<1	<1				5383	8464	541	214	259	52	945	58	12
2/08/2020 13:29	6.85	7290	75.5	22.91	5	<10	8558	5466	<5	<0.5	8.3	<1	<5	<0.5	1719	<0.01	11	396	<0.2	21	<1	<1	557	1.1	18	3.5	<1	<0.5	99	<1	<1				5469	10443	481	218	335	55	1036	61	4
8/08/2020 14:56	7.52	7630	88.3	25.09	5	<10	8628	5222	<5	<0.5	6.9	<1	<5	<0.5	1441	<0.01	10	162	<0.2	20	<1	<1	569	0.7	15	3.4	<1	<0.5	98	<1	<1				5180	10940	486	225	312	49	974	70	<1
16/08/2020 9:31	8.8	7690	94.6	24.96	4	60	8820	5880	5.6	<0.5	13.8	<0.1	<20	0.12	2640	<0.2	10.7	574	0.55	29	<0.5	<0.1	658	1.7	18.4	5.15	6.2	<0.5	127	0.201	<0.5				6010	12800	500	208	326	57.8	1130	71	5
30/08/2020 14:01		7590			2	<10	8780	5710	6.1	0.9	3.58	<0.1	<20	0.71	744	<0.2	7.81	1070	<0.5	27.4	<0.5	<0.05	781	1.7	9.18	4.7	6.8	<0.5	129	0.23	<0.5				5740	12800	503	216	325	56.1	1080	68	<1
7/09/2020 16:14	8.6	7360	103	27.83	2	<10	8590	5530	6.9	0.7	11.4	<0.1	<20	0.51	1820	<0.2	10.7	1190	<0.5	23.4	<0.5	<0.1	764	2.4	15	3.8	5.2	<0.5	112	0.151	<0.5				5650	11400	505	190	328	57.4	1040	69	<1
15/09/2020 13:18	8.66	8160	103.1	27.5	2	<10	9520	6160	10.2	0.9	28.2	<0.1	<20	0.8	3800	<0.2	12.5	1380	<0.5	32.8	<0.5	<0.1	756	2.8	20.6	3.05	5.6	<0.5	104	0.082	<0.5				6360	13900	490	212	340	63.6	1200	46	<1
20/09/2020 9:25	8.29	8250	99.7	28.3	4	<10	9790	6340	3	1	23.2	<0.1	<20	0.47	2730	<0.2	8.41	1280	<0.5	34	<0.5	<0.1	671	2.6	13.9	3.7	7.8	<0.5	107	0.062	<0.5				6450	14900	502	180	351	65.5	1240	44	<1
27/09/2020 13:26	8.17	8130	94	29.3	5	<10	9920	6460	6.4	0.9	21.8	<0.1	<20	<0.1	1840	<0.2	7.32	498	<0.5	35.2	<0.5	<0.1	712	2.9	12.7	3.8	6.6	<0.5	114	0.062	<0.5				6590	13400	508	196	355	66	1260	44	<1
11/10/2020 8:01	8.64	8140	93.6	28.9	1	<10	9560	6310	6.4	0.95	<0.2	0.23	<20	0.4	1040	<0.2	6.07	449	<0.5	33.6	<0.5	<0.1	653	2.6	8.34	3.85	6.6	<0.5	113	0.183	0.75				6480	12200	536	234	371	67.2	1210	66	2
18/10/2020 9:36	8.96	8200	96.6	29.9	5	10	9680	6250	22.1	1.1	0.04	0.26	<20	0.97	604	<0.2	3.96	59.8	0.6	33.6	<0.5	<0.1	711	<1	5.22	3.8	7	<0.5	115	0.235	<0.5				6340	12300	534	226	368	68.3	1190	71	<1
25/10/2020 8:32	8.56	8510	97	29.6	21	30	10100	6680	33.4	0.75	2.32	<0.1	<20	0.02	1090	<0.2	6.04	72.8	<0.5	33	<0.5	<0.1	885	2.6	8.65	3.2	7.2	<0.5	134	0.104	<0.5				6730	15200	551	232	387	71.5	1290	52	<1
1/11/2020 7:44	8.23	8300	95	29.6	2	12	10284	6796	<5	1	0.2	<1	<5	<0.5	365	<0.01	4	12	0.7	35	<1	<1	423	2.1	5	1.8	<1	<0.5	128	<1	<1				6637	12456	560	235	327	72	1311	50	<1
8/11/2020 11:07	8.64	8400	99.9	30.9	2	<10	10758	7098	<5	1.6	2.1	<1	<5	<0.5	284	<0.01	1	346	0.5	30	<1	<1	801	2.3	2	3.8	7	<0.5	134	<1	<1				6612	11231	550	237	345	60	1390	51	24
15/11/2020 7:27	8.81	7760	98	29.9	6	12	9348	5076	<5	0.7	1.7	<1	<5	<0.5	354	<0.01	<1	303	1.5	18	<1	<1	325	<0.5	<1	4	3	<0.5	104	<1	1				5813	8691	554	252	310	55	897	48	24
22/11/2020 9:13	8.87	7200	98.8	31.66	4	<10	8698	5076	<5	1.9	0.9	<1	<5	<0.5	171	<0.01	1	159	1.8	18	<1	<1	594	2	<1	3	<1	<0.5	96	<1	<1				5390	8204	494	266	275	55	933	23	23
29/11/2020 9:47	8.6	7430	99	32	2	<10	8904	5350	6	4.5	5	<1	<5	2	306	<0.01	1	345	4.1	19	<1	<1	832	1.2	<1	3.9	<1	<0.5	95	<1	<1				5151	5935	499	277	384	58	996	46	10
6/12/2020 12:14	8.11	7250	106	33.6	2	<10	9206	5565	<5	1.8	5.1	<1	<5	<0.5	232	<0.01	1	220	4	17	<1	<1	711	0.9	1	3.7	3	<0.5	90	<1	1				4916	4243	535	266	405	59	1027	47	10
13/12/2020 8:03	8.17	7120	103.2	31.3	<1	<10	8374	5403	<5	1.9	3.8	<1	<5	<0.5	145	<0.01	1	172	2.9	18	<1	<1	643	0.7	<1	3.9	<1	<0.5	93	<1	<1				5086	4973	583	289	363	59	958	63	<1
19/12/2020 8:52	7.92	5870	97.3	29.6	7	<10	6804	4241	<5	2	2.9	<1	<5	1.7	125	<0.01	2	183	3	38	<1	<1	332	0.6	1	4	5	<0.5	77	<1	<1				3931	3463	450	233	288	46	757	70	<1
20/12/2020 8:37	8.07	5230	101.3	27.9	6	<10	5340	3323	<5	1.8	2.5	<1	<5	8.9	225	<0.01	4	335	2.3	46	<1	<1	186	<0.5	2	4	5	<0.5	52	<1	<1	<1	<20	<50	3036	2393	346	186	232	28	597	79	<1
22/12/2020 9:08	7.9	4480	101.9	30	27	28	4768	2871	<5	2.4	2.3	<1	<5	1.7	214	<0.01	4	352	2.7	63	<1	<1	224	<0.5	3	4.8	3	<0.5	48	<1	2	<1	<20	<50	2550	1934	305	162	220	30	512	69	<1
28/12/2020 11:55	7.98	5720	138.1	35.4	14	14	5956	4153	<5	4.3	0.9	1	<5	2.9	301	<0.01	5	159	2	63	<1	<1	349	<0.5	2	6.2	<1	<0.5	29	4	4				3509	979	355	165	210	31	793	123	<1
2/01/2021 11:30	8.3	5560	135.4	33.2	7	<10	5600	4192	38	3.4	0.3	<1	<5	2.6	245	<0.01	3	61	1.8	54	<1	<1	371	<0.5	2	5.6	2	<0.5	29	3	<1				3622	536	343	157	215	31	810	101	13
9/01/2021 8:09	8.03	5600	108.2	32.8	4	<10	5996	3616	<5	3	0.3	<1	<5	0.7	208	<0.01	3	44	1.7	38	<1	<1	256	<0.5	1	5.9	<1	<0.5	29	2	<1				3705	611	357	168	192	32	661	95	15
18/01/2021 14:16	8.7	6120	101.7	33	1	<10	6640	4507	<5	2.2	0.2	<1	<5	<0.5	58	<0.01	2	28	2.7	45	<1	<1	354	<0.5	<1	7.5	8	<0.5	64	<1	<1				3934	12456	391	155	256	52	857	28	19
24/01/2021 15:08	9.33	5790	100.3	33.5	8	10	6516	4464	<5	1.4	1	<1	<5	<0.5	94	<0.01	2	48	3	33	<1	<1	383	0.9	1	7.7	5	<0.5	57	<1	<1				4324	16885	411	180	256	55	835	35	18

ASW Site - P2																																														
Timestamps	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
30/01/2021 13:30	8.91	5790	102.4	34.2	2	<10	6380	4100	8.2	1.75	1.1	<0.1	<20	0.37	54.2	<0.2	1.72	97.9	3.55	34.2	<0.5	<0.1	560	1.3	0.98	8.85	9.4	<0.5	52.4	0.511	1.5				4110	14500	400	170	232	48.1	754	40	7
6/02/2021 14:52	8.44	5870	97.5	32.8	79.2	142	7020	4120	<10	4	2.7	<1	<50	<1	381	<0.1	2	51	2	36	<1	<1.0	360	<1	1	7	<10	<1	48	<1	<10				4080	13236.73	424	184	232	56	744	45	3
13/02/2021 7:50	8.43	5980	99.8	31.5	3	<10	6588	4513	<5	3.7	1.9	<1	<5	<0.5	356	0.04	4	117	2.9	32	<1	<1	325	1	3	7.3	8	<0.5	45	<1	8				4186	13937	453	166	253	56	821	40	13
27/02/2021 9:21	8.39	6110	96.7	31.5	1	<10	6490	4577	<5	2.8	<0.2	<1	<5	<0.5	158	<0.01	2	90	2.8	21	<1	<1	316	1.2	<1	7.2	10	<0.5	46	<1	2				4114	12455	432	163	234	50	849	51	1
6/03/2021 9:55	7.62	6110	97.8	32.6	1	<10	7018	4745	<5	3.6	<0.2	<1	<5	0.5	167	<0.01	1	58	2.8	22	<1	<1	374	0.7	<1	7.5	<1	<0.5	47	<1	<1				4368	12646	428	159	254	54	893	41	4
15/03/2021 9:52	8.16	6330	108.1	32.4	<1	<10	6902	4307	<5	3.6	<0.2	<1	<5	<0.5	55	<0.01	1	84	1.9	19	<1	<1	438	0.7	<1	6.4	<1	<0.5	46	<1	1				4287	11469	403	151	221	46	802	47	4
22/03/2021 14:00	7.58	4490	104.1	30.1	170	214	4740	3206	19	2.1	2.4	<1	<5	1.6	330	<0.01	7	520	1.6	52	<1	<1	237	<0.5	5	4.8	13	<0.5	27	2	<1				2918	8308	295	108	142	32	600	67	<1
27/03/2021 10:27	8.09	4860	114	31.2	5	<10	5220	3060	<5	2.3	4.4	<1	<5	<0.5	317	<0.01	8	373	1.9	45	<1	<1	118	<0.5	5	5.2	6	<0.5	32	2	<1				3324	7840	322	109	152	32	548	68	<1
3/04/2021 15:26	7.89	5130	118.4	31.6	2	<10	5784	3655	<5	2.8	1.6	<1	<5	<0.5	100	<0.01	5	220	1.6	39	<1	<1	356	<0.5	2	5.6	3	<0.5	36	2	<1				3811	9984	354	141	176	38	673	74	<1
10/04/2021 7:57	9.04	6650	97.2	30.6	6.2	12	8320	5400	<10	2	7.6	<1	<50	<1	525	<0.1	2	77	2	48	<1	<1	470	1	2	4	<10	<1	67	<1	<10				5230	13590.89	464	167	248	59	1030	46	21
19/04/2021 15:28	8.57	6640	96.9	28.9	2	<10	9220	5814	15	1.5	2.7	<1	<5	2.1	266	<0.01	<1	103	1.7	39	<1	<1	501	1.3	<1	6.9	<1	<0.5	65	<1	<1				5685	15516	419	181	266	60	1158	33	30
26/04/2021 8:37	8.71	7020	99.6	28	2	<10	9846	6640	<5	2	5.7	<1	<5	<0.5	1296	<0.01	3	391	<0.2	33	<1	<1	536	<0.5	3	4.7	5	<0.5	69	<1	<1				6133	14261	474	177	284	71	1325	50	17

Table C.2: Analyte sampling data for TSF Water Management Dam (WMD), ASW Sites

Timestamps	ASW Site - WMD																																													
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 8:03	7.72	4590	84	24.71	2	<10	5098	3013	<5	3.3	<0.2	<1	<5	<0.5	<0.5	<0.01	1	6	0.5	36	<1	<1	334	<0.5	<1	4.7	<1	<0.5	13	1	3				3011	<100	446	240	230	45	461	51	3
11/05/2020 10:29	7.33	5230	86.6	25.69	12	20	5454	3230	<5	2.1	<0.2	<1	<5	<0.5	54	<0.01	<1	11	<0.2	33	<1	<1	384	<0.5	<1	4.4	<1	<0.5	27	<1	<1				3443	910	422	243	251	43	528	57	3
17/05/2020 8:35	8.35	6100	94.4	24.9	3	<10	6610	4200	3.2	2.3	0.36	0.45	<20	0.11	36.6	<0.2	0.91	38.7	0.55	35.4	<0.5	<0.1	515	<1	0.24	4.25	3.2	<0.5	58.5	1.12	0.6				4550	3260	462	270	300	51	741	54	2
24/05/2020 15:19	7.44	5990	82.7	22.93	7	30	7220	4540	5	2.05	<0.2	0.7	<20	<0.1	2.02	<0.2	0.74	21.8	<1	39.4	<0.5	<0.1	498	<1	<0.1	4.6	3.4	<0.5	64.5	0.978	0.65				4670	3920	485	266	310	54.2	808	61	<1
31/05/2020 14:53	8.09	6620	100	26.93	4		7330	4520	4.4	2.3	<0.2	0.88	<20	0.2	4.02	<0.2	0.64	30.2	<0.5	38.4	<0.5	<0.1	461	<1	<0.1	4.55	3.6	<0.5	58.4	0.891	0.8				4540	2680	483	262	314	52.4	805	48	8
9/06/2020 8:30	8.15	6750	89.2	22.69	5	<10	7430	4590	18.5	1.85	<0.2	0.43	<20	<0.1	0.92	<0.2	0.49	12.5	<0.5	34.8	<0.5	<0.1	568	<1	<0.1	4.15	3	<0.5	51.6	0.91	<0.5				4700	1760	493	272	313	54.1	815	54	5
14/06/2020 6:51	7.34	5920	103	23.76	1	<10	6480	5399	8	3.2	<0.2	<1	<5	<0.5	0.5	<0.01	<1	13	0.5	42	<1	<1	563	0.8	<1	4.1	<1	<0.5	54	<1	<1				4824	724	556	265	389	62	974	59	<1
21/06/2020 7:17	7.26	6190	104	24.49	1	<10	8006	4508	19	2.1	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	5	1	39	<1	<1	404	<0.5	<1	4.2	6	<0.5	43	<1	<1				4817	<100	542	282	303	53	766	49	7
28/06/2020 14:05	8.43	6340	106.5	23.87	6	<10	7816	4828	7	2.1	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	<2	<0.2	25	<1	<1	432	<0.5	<1	3.8	<1	<0.5	44	<1	<1				4910	<100	398	294	331	58	931	52	6
5/07/2020 15:40	8.37	7240	98.9	23.09	4	<10	8306	5071	<5	1.1	<0.2	<1	<5	<0.5	8.7	<0.01	<1	27	0.6	29	<1	<1	336	0.6	<1	3.5	<1	<0.5	60	<1	<1				4800	802	546	265	323	67	900	49	12
13/07/2020 8:08	8.05	7400	109.1	22.55	1	<10	8824	6053	<5	0.7	0.7	<1	<5	<0.5	328	<0.01	2	181	<0.2	25	<1	<1	519	0.6	2	2.8	8	<0.5	77	<1	<1				5295	2114	494	274	362	62	1170	49	18
19/07/2020 8:13	8.61	7730	96.7	20.43	1	<10	8584	5371	<5	1.4	1.8	<1	<5	<0.5	334	<0.01	2	190	0.6	34	<1	<1	549	0.8	3	3.9	<1	<0.5	92	<1	<1				5271	3278	528	245	355	61	984	43	10
26/07/2020 8:56	7.64	7430	79.7	22.01	2	10	8964	5480	<5	<0.5	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	99	<0.2	22	<1	<1	551	<0.5	<1	3.2	<1	<0.5	74	<1	<1				5550	2992	522	272	294	58	1015	56	<1
2/08/2020 14:40	7.33	7690	64.1	28.12	3	12	9078	5361	<5	1.4	<0.2	<1	<5	<0.5	1.3	<0.01	1	18	0.2	26	<1	<1	551	0.6	<1	3.8	<1	<0.5	60	<1	<1				5328	1056	528	282	357	56	982	35	21
8/08/2020 11:22	6.86	7960	85	24.01	1	<10	9018	5399	<5	<0.5	<0.2	<1	<5	<0.5	<0.5	<0.01	<1	34	0.3	23	<1	<1	540	<0.5	<1	3.2	<1	<0.5	60	<1	<1				5309	1692	513	285	345	57	1000	64	<1
16/08/2020 10:13	8.23	7880	97	25.61	6	10	9070	5760	8	1.1	2.32	0.49	<20	0.12	303	<0.2	2.57	104	<0.5	33.8	<0.5	<0.1	644	<1	2.71	4.45	2.6	<0.5	91.1	0.569	<0.5				5920	3260	553	282	367	64.3	1060	69	<1
30/08/2020 15:17		7960			1	10	9370	5890	4.8	1.05	0.56	0.9	<20	0.19	9.43	<0.2	0.81	42.2	<0.5	34.2	<0.5	<0.05	667	<1	<0.1	4.3	4.4	<0.5	83.8	0.6	<0.5				6010	2480	558	268	366	64.1	1090	72	<1
7/09/2020 17:55	8.35	7960	110.1	27.61	1	<10	9090	5870	7	1.1	1.22	0.39	<20	0.14	71.1	<0.2	1.32	123	<0.5	29.6	<0.5	<0.1	709	<1	0.89	4.1	4.6	<0.5	84	0.396	2.2				6020	3060	555	268	373	63.9	1090	73	<1
15/09/2020 11:50	8.29	8170	101.9	27.27	1	<10	9660	5950	7.9	1.15	4.06	0.25	<20	0.14	363	<0.2	3.05	337	<0.5	33.2	<0.5	<0.1	771	1.2	2.76	3.75	4.6	<0.5	82.7	0.425	<0.5				6110	4400	541	280	363	64.2	1120	70	<1
20/09/2020 10:47	8.14	8010	101.5	28.8	2	<10	9850	6340	7	1	4.34	0.4	<20	0.09	177	<0.2	2.54	187	<0.5	32.4	<0.5	<0.1	773	1.2	1.58	3.95	4.4	<0.5	84.4	0.385	<0.5				6440	4940	570	244	385	67.7	1190	67	<1
27/09/2020 14:40	8.16	8210	125.4	31.1	2	10	9730	6250	7.1	1.35	1.76	0.62	<20	0.27	13.8	<0.2	1.4	88.2	<0.5	34	<0.5	<0.1	808	<1	0.24	4.3	4.4	<0.5	77.5	0.427	0.6				6370	2880	569	304	382	66.8	1170	74	<1
4/10/2020 8:27	8.08	8250	103.7	28.1	1	<10	9890	6400	3.9	1.15	0.72	0.43	<2	0.34	35.4	<0.2	<0.1	68.8	<0.5	35.2	<0.5	<0.1	756	<1	0.24	4.25	3.6	<0.5	65.9	0.398	<0.5				6550	1260	583	278	388	69	1200	80	<1
11/10/2020 7:04	8.16	8610	100.2	27.5	<1	<10	10200	6670	5.6	1.3	0.42	0.54	<20	0.29	68.4	<0.2	1.2	50.3	<0.5	35.8	<0.5	<0.1	624	<1	0.43	4.1	3.8	<0.5	64.4	0.456	0.75				6810	<20	604	328	416	70.3	1250	84	<1
18/10/2020 11:02	8.56	8920	130.5	33.3	4	<10	10500	6710	10	1.45	0.4	0.83	<20	0.36	93.8	<0.2	1.32	25	<0.5	36.2	<0.5	<0.1	725	<1	0.45	4.8	2.4	<0.5	58.1	0.463	0.6				6760	40	612	300	419	71.2	1260	84	<1
25/10/2020 9:42	8.01	8870	105.9	31.3	5	<10	10500	6820	5.2	1.2	0.4	0.61	<20	0.2	250	<0.2	2.48	105	<0.5	34.2	<0.5	<0.1	766	<1	1.54	4.35	3	<0.5	68.5	0.423	<0.5				6850	2640	601	290	420	72.6	1290	81	<1
1/11/2020 9:54	8.13	8690	118.9	31.5	20	30	10838	6983	<5	2.1	<0.2	<1	<5	<0.5	134	<0.01	2	34	0.8	43	<1	<1	581	<0.5	<1	3.9	<1	<0.5	56	<1	<1				6796	1048	609	301	351	74	1326	86	<1
8/11/2020 11:50	8.18	8950	147.2	33.2	5	14	11824	7461	<5	1.2	<0.2	<1	<5	<0.5	159	<0.01	2	49	0.3	37	<1	<1	848	<0.5	<1	4.4	4	<0.5	68	<1	<1				6941	1616	582	301	403	68	1459	80	4
15/11/2020 13:23	8.28	8880	128.7	33.8	7	10	10810	5839	<5	0.5	<0.2	<1	<5	<0.5	238	<0.01	<1	35	<0.2	28	<1	<1	317	<0.5	<1	3.6	<1	<0.5	58	<1	<1				6778	1755	561	306	371	64	1078	88	<1
22/11/2020 13:32	8.12	8780	141.7	33.67	3	10	10930	6678	<5	1.7	<0.2	<1	<5	<0.5	305	<0.01	2	13	0.5	38	<1	<1	438	<0.5	<1	4.1	<1	<0.5	58	<1	<1				7011	809	551	313	344	65	1288	77	9
29/11/2020 11:53	7.94	9060	140.7	34.5	9	26	11610	6816	6	1.8	<0.2	<1	10	1	368	<0.01	3	37	0.9	41	<1	<1	822	<0.5	<1	4.5	3	<0.5	53	<1	<1				6851	589	564	315	444	68	1313	83	<1
6/12/2020 13:18	8.06	9140	134.2	34.6	6	<10	11268	7254	<5	1.8	<0.2	<1	5	<0.5	402	<0.01	2	19	0.9	35	<1	<1	573	<0.5	<1	4	<1	<0.5	45	<1	<1				6591	244	558	304	491	72	1423	78	5
13/12/2020 13:15	8.14	9100	128.2	34.2	4	44	11616	7323	<5	1.9	<0.2	<1	7	<0.5	441	<0.01	2	7	<0.2	38	<1	<1	682	<0.5	<1	4.4	<1	<0.5	40	<1	<1				6959	<100	631	324	456	76	1396	99	<1
19/12/2020 10:58	7.82	6170	90.4	28.5	69	48	7114	4463	<5	1.3	<0.2	<1	<5	<0.5	385	<0.01	2	8	0.4	40	<1	<1	266	<0.5	1	3.6	<1	<0.5	21	<1	<1				4134	1072	396	199	278	49	844	58	<1
20/12/2020 7:45	8.08	8710	91.3	28.2	6	<10	10552	6907	<5	1.9	<0.2	<1	6	0.9	434	<0.01	2	9	0.5	38	<1	<1	265	<0.5	<1	4.3	3	<0.5	32	<1	<1	<1	<20	<50	6352	<100	572	296	445	59	1330	87	<1
22/12/2020 8:29	7.96	8460	94.5	30.3	12	20	10408	6440	<5	1.9	<0.2	<1	5	<0.5	440	<0.01	1	22	0.5	41	<1	<1	330	<0.5	<1	4.5	3	<0.5	35	<1	<1	<1	<20	<50	6320	<100	526	296	458	69	1245	81	<1
25/12/2020 6:39	7.99	8560	95.1	30.8	4		10410	7113	<5	2.6	<0.2	<1	10	<0.5	424	<0.01	2	8	0.5	40	<1	<1	818	<0.5	<1	4.3	<1	<0.5	28	<1	<1	<1	<20	<50	6274	<100	573	280	463	74	1380	84	<1
27/12/2020 7:22	7.83	9420	95.2	29.6	5	12	10436	6774	<5	1.9	<0.2	<1	11	<0.5	415	<0.01	1	6	0.5	40	<1	<1	617	<0.5	<1	4	<1	<0.5	29	<1	<1				6244	<100	501	288	431	68	1341	90	<1
30/12/2020 6:38	7.87	9120	83	29.4	20	<10	10408	6085	<5	2.5	<0.2	<1	8	<0.5	755	<0.01	2	7	0.6	43	<1	<1	716	<0.5	1	3.7	10	<0.5	24	<1	<1	<1	<20	<50	5796	<100	562	290	376	68	1137	86	<1
2/01/2021 9:23	7.85	8930	99.8	30.9	6	10	9970	6949	7	2.8	<0.2	1	10	<0.5	617	<0.01	2	9	0.5	39	<1	<1	591	<0.5	<1	4	3	<0.5	23	<1	<1				6163	<100	602	298	468	70	1323	96	<1
4/01/2021 10:33	8.09	8820	105.7	31	8	<10	9860	5838	<5	2.2	<0.2	<1	7	0.9	588	<0.01	2	6	0.5	38	<1	<1	575	<0.5	<1	3.6	<1	<0.5	21	<1	<1				6212	<100	476	321	399	61	1129	90	<1
9/01/2021 13:51	7.9	8640	120.5	34.2	2	<10	9948	5313	<5	1.1	<0.2	<1	16	<0.5	1382	<0.01	2	8	0.4	28	<1	<1	387	<0.5	2	3.8	<1	<0.5	23	<1	<1				6004	<100	458	336	418	62	1012	108	<1

| ASW Site - WMD | | |

Table C.3: Analyte sampling data for NOEF South East Levee 1 (NC1A), ASW Sites

Timestamps	ASW Site - NC1A																																													
	pH - Field	Electrical Cond. - Lab	Dissolved Oxygen	Temperature	Turbidity - Lab	Total Susp. Solids	Total Dis. Solids	Hardness	Aluminium_F	Arsenic_F	Cadmium_F	Copper_F	Iron_F	Lead_F	Manganese_F	Mercury_F	Nickel_F	Zinc_F	Antimony_F	Barium_F	Beryllium_F	Bismuth_F	Boron_F	Chromium_F	Cobalt_F	Molybdenum_F	Selenium_F	Silver_F	Thallium_F	Uranium_F	Vanadium_F	Benzene	TPH C6-C9 Fraction	TPH C10-C36 Fraction (sum)	Sulphate_F	Nitrate_F	Calcium_F	Chloride_F	Sodium_F	Potassium_F	Magnesium_F	Bicarbonate	Carbonate
	pH Unit	µS/cm	% sat.	°C	NTU	mg/L	mg/L	mg/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	µg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
3/05/2020 9:31	7.86	2860	62.4	25.31	3	<10	2912	1947	<5	2.1	<0.2	<1	<5	<0.5	180	<0.01	4	199	0.6	101	<1	<1	119	<0.5	<1	3.3	<1	<0.5	2.5	1	6				1879	<100	194	24	42	16	355	100	<1
11/05/2020 11:59	8.14	3430	74.8	25.92	2	<10	3548	2285	<5	<0.5	<0.2	<1	<5	<0.5	170	<0.01	3	138	<0.2	66	<1	<1	136	<0.5	<1	4.5	<1	<0.5	2.1	<1	<1				2417	<100	177	29	53	15	448	103	<1
17/05/2020 13:51	7.42	3750	96.9	26.51	5	20	4330	2950	2.3	1.6	<0.1	0.38	<10	0.07	254	<0.1	4.29	173	0.75	68.8	<0.25	<0.05	152	<0.5	0.53	5.5	1.4	<0.25	2.4	2.14	2.3				2860	<20	245	32	60.4	18.4	568	118	<1
24/05/2020 13:56	7.82	4410	90.2	22.9	6	<10	4940	3300	2.1	1.7	0.04	0.59	<10	<0.05	249	<0.1	5.06	231	0.75	62.4	<0.25	<0.05	164	<0.5	0.52	5.2	1	<0.25	2.92	2.37	2.15				3140	<20	261	36	63.9	20.3	642	131	<1
31/05/2020 13:30	8.07	4480	111.8	26.15	5		4750	3390	3.3	1.85	<0.1	0.44	<10	<0.05	49.9	<0.1	3.63	103	0.7	57.2	<0.25	<0.05	146	<0.5	0.24	5.5	1	<0.25	2.38	2.43	2.65				3140	<20	267	34	66.4	20	661	130	<1
9/06/2020 10:02	7.43	4930	99.4	22.87	6	<10	5450	3770	3	1.7	0.1	0.52	<10	0.2	86.1	<0.1	5.55	248	0.8	55	<0.25	<0.05	201	<0.5	0.38	6.25	1.2	<0.25	3.53	2.96	2.7				3580	<20	286	38	70.2	21	742	143	<1
14/06/2020 9:13	8.11	4670	77.6	23.32	5	<10	4786	4528	<5	3.8	<0.2	<1	<5	<0.5	15	<0.01	6	130	0.9	59	<1	<1	174	<0.5	<1	6.1	<1	<0.5	3.2	3	4				3919	<100	324	43	91	24	903	156	<1
21/06/2020 9:22	8.26	4760	79.3	24.39	6	<10	6970	4282	20	1.5	<0.2	<1	<5	<0.5	37	<0.01	4	135	1.1	50	<1	<1	189	<0.5	<1	6.6	<1	<0.5	2.7	3	<1				4304	<100	315	50	75	25	849	172	<1
28/06/2020 11:24	7.87	5660	97.1	22.7	5	<10	7316	5481	<5	2.6	<0.2	<1	<5	<0.5	156	<0.01	8	235	0.7	34	<1	<1	184	<0.5	<1	6.4	<1	<0.5	4.3	4	2				4897	<100	315	56	98	27	1140	199	<1
13/07/2020 9:12	8.45	7480	85.2	22.23	9	40	9580	6867	<5	2.2	<0.2	<1	<5	<0.5	496	<0.01	6	175	<0.2	36	<1	<1	204	<0.5	<1	6.2	<1	<0.5	2	4	1				6062	<100	368	68	119	31	1444	204	<1
19/07/2020 11:00	7.7	7710	79.1	21.72	7	<10	9740	6625	<5	3.3	<0.2	<1	<5	0.6	152	<0.01	9	172	0.9	38	<1	<1	198	<0.5	<1	8.7	<1	<0.5	3.4	6	2				5970	<100	398	58	130	29	1367	218	<1
26/07/2020 11:36	7.49	7800	83	21.97	7	<10	10242	7217	<5	3	<0.2	<1	<5	<0.5	39	<0.01	6	116	0.8	30	<1	<1	206	<0.5	<1	8.9	<1	<0.5	2.8	5	2				6663	<100	426	72	101	29	1494	214	3
2/08/2020 11:39	7.45	8410	81.4	21.64	9	18	11102	7421	<5	2.2	<0.2	<1	<5	<0.5	106	<0.01	9	253	0.9	26	<1	<1	191	<0.5	<1	11	<1	<0.5	3.7	5	3				6759	253	448	79	98	27	1531	201	<1
8/08/2020 15:19	8.46	9070	94.7	25.96	13	22	11672	8139	<5	2.4	<0.2	<1	<5	<0.5	187	<0.01	6	93	0.7	23	<1	<1	224	<0.5	<1	11	<1	<0.5	1.6	5	4				7832	291	482	86	105	30	1684	241	<1
16/08/2020 9:26	7.35	9130	93.6	24.81	12	30	11800	8560	7.7	2.4	<0.2	0.45	<20	0.16	237	<0.2	6.95	29.1	1.25	30.4	<0.5	<0.1	263	<1	1.06	13.5	<2	<0.5	1.56	7.65	5				8100	<20	478	78	150	33.6	1790	242	15
30/08/2020 14:30		9690			20	30	13200	9280	5.7	4.25	<0.2	<0.1	<20	0.2	550	<0.2	10.2	58.8	0.95	31	<0.5	<0.05	355	<1	2.92	17.5	<2	<0.5	1.81	8.82	5.85				8650	<20	510	80	161	34.6	1940	266	13
7/09/2020 16:38	8.32	9770	150.6	29.72	16	20	13800	9850	6.3	4.1	<0.2	0.25	<20	0.22	418	<0.2	8.09	13.6	1.25	29.4	<0.5	<0.1	365	<1	1.5	17.5	<2	<0.5	0.93	6.28	9.55				9400	<200	534	82	176	36.6	2070	273	20
15/09/2020 13:40	8.31	10700	119.2	28	24	40	7308	10500	13.9	5.25	<0.4	<0.2	<40	0.38	482	<0.4	10.6	28.9	<1	33.2	<1	<0.2	458	<2	3.55	18	<4	<1	1	9.31	9.25				9860	<200	556	104	183	37.5	2210	274	25
20/09/2020 10:14	8.34	10900	115.6	28.2	16	30	7571	11100	5.9	5.05	<0.4	<0.2	<40	0.26	438	<0.4	7.9	27.5	<1	30.4	<1	<0.2	439	<2	2.98	18.5	<4	<1	1.35	9.89	7.3				10300	<200	588	96	195	39.9	2330	269	27
27/09/2020 13:38	8.23	11400	125.1	29.4	19	30	16500	11700	17.7	5.4	<0.4	0.47	58	0.82	831	<0.4	11.2	106	1.1	32	<1	<0.2	459	<2	11.3	18	<4	<1	5.14	10.2	6.25				11100	<200	595	114	211	41	2490	273	7
4/10/2020 7:16	8.18	11600	71.5	26.6	19	50	8525	12400	5.4	4.85	<0.4	<0.2	48	0.81	617	<0.4	6.16	28	1.25	32	<1	<0.2	396	<2	5.7	19	<4	<1	1.65	10.6	6.7				11700	<400	608	140	219	42.6	2630	275	<1
11/10/2020 8:22	8.09	12400	69.9	27.2	22	50	18200	13000	10.1	4.75	<0.4	0.35	60	0.47	484	<0.4	7.74	8.2	<1	32.6	<1	<0.2	257	<2	3.56	20	<4	<1	0.69	11.2	5				12400	<200	628	142	238	43.7	2780	258	<1
18/10/2020 9:56	8.57	13200	116.1	30.1	24	30	19100	13800	16.7	5.65	<0.4	0.38	46	0.98	855	<0.4	9.09	87.5	1.05	32.2	<1	<0.2	419	<2	8.56	19.5	<4	<1	2.27	10.9	4.65				13100	<200	652	154	254	45.7	2960	237	6
25/10/2020 8:47	8.08	13900	69.3	28.8	7	40	20500	14900	20.3	5.35	<0.4	<0.2	44	2.54	950	<0.4	8.37	31.8	1.1	36.2	<1	<0.2	583	<2	8.74	19.5	<4	<1	1	11	4.7				14000	<200	667	164	273	47.7	3220	228	<1
1/11/2020 8:34	8.18	14280	73.1	27	19	58	22364	14325	<5	4.7	<0.2	<1	13	<0.5	621	<0.01	5	8	1.4	29	<1	<1	230	<0.5	2	16	<1	<0.5	<0.1	13	5				14553	613	551	178	220	43	3145	191	19
8/11/2020 10:30	8.08	15550	109.9	27.6	23	70	26332	18636	<5	4.3	<0.2	<1	14	<0.5	785	<0.01	6	21	1.4	36	<1	<1	267	<0.5	3	22	6	<0.5	0.7	16	6				16025	607	632	198	306	49	4142	183	20
15/11/2020 7:52	8.12	15270	39.6	27.1	30	108	24194	16025	<5	3.9	<0.2	<1	<5	<0.5	2421	<0.01	9	<2	3.5	29	<1	<1	132	<0.5	1	51	5	<0.5	<0.1	17	12				15488	693	548	203	291	47	3559	194	<1
22/11/2020 9:56	8.73	16090	299.6	31.83	64	16	27532	17408	<5	6.5	<0.2	<1	<5	<0.5	752	<0.01	5	4	3.4	49	<1	<1	213	<0.5	<1	45	<1	<0.5	<0.1	20	12				17140	<100	552	226	267	53	3892	94	87
29/11/2020 10:20	8.06	19040	119.9	29.5	174	272	35562	23637	6	6.8	<0.2	<1	<5	<0.5	451	0.022	5	51	4.6	60	<1	<1	373	<0.5	1	52	5	<0.5	0.3	20	12				20293	<100	646	260	462	64	5348	110	26
6/12/2020 14:33	7.45	5160	104	36.1	11	34	5452	3755	<5	11	<0.2	<1	13	1	541	<0.01	4	25	1.4	31	<1	<1	197	<0.5	2	8.1	4	<0.5	1.1	8	8				2896	911	237	191	218	21	768	431	<1
13/12/2020 9:11	8.01	4330	97.2	30.4	2	24	4598	2950	<5	5.4	<0.2	<1	13	<0.5	537	<0.01	5	16	0.4	28	<1	<1	221	<0.5	<1	11	<1	<0.5	1.1	9	3				2419	649	252	203	167	21	564	232	33
19/12/2020 9:18	7.89	3890	81.2	27	12	<10	3706	2379	<5	3.8	<0.2	<1	11	0.6	347	<0.01	4	33	0.8	27	<1	<1	174	<0.5	<1	8.1	<1	<0.5	1.7	7	10				1895	169	215	124	126	16	447	188	12
24/12/2020 13:46	7.85	4380	98.6	33.6	1		4554	3254	<5	3.2	<0.2	1	<5	<0.5	396	<0.01	7	131	0.9	39	<1	<1	149	<0.5	3	9.6	2	<0.5	3.4	6	4	<1	<20	<50	2635	2940	230	71	98	16	651	117	<1
28/12/2020 12:12	7.88	5000	71.8	33.3	2	<10	6144	4241	5	3.7	<0.2	1	18	<0.5	182	<0.01	5	40	1.2	30	<1	<1	234	2	1	12	3	<0.5	2.6	6	<1				3405	1059	267	75	114	20	868	115	<1
2/01/2021 11:09	7.6	3870	69.1	32.2	5	18	3722	2764	<5	2.8	<0.2	1	<5	<0.5	159	<0.01	3	60	0.8	32	<1	<1	141	<0.5	<1	8.5	5	<0.5	1.6	3	1				2481	647	191	43	63	15	555	77	<1
9/01/2021 8:44	7.36	4150	64.8	33	2	<10	4284	2600	<5	2.2	<0.2	<1	18	<0.5	386	<0.01	4	63	0.7	21	<1	<1	100	<0.5	1	11	<1	<0.5	1.9	3	<1				2754	<100	200	41	65	15	510	112	<1
18/01/2021 14:27	7.8	6010	81.4	31.7	2	<10	7136	5251	<5	3.5	<0.2	<1	28	<0.5	309	<0.01	6	78	0.8	36	<1	<1	163	<0.5	2	14	8	<0.5	1.8	5	<1				4288	<100	345	55	110	23	1066	145	<1
24/01/2021 15:29	8.22	5400	121.9	36.7	2	10	6360	4731	6	3.8	<0.2	<1	9	<0.5	238	<0.01	4	17	0.5	28	<1	<1	165	<0.5	<1	13	<1	<0.5	0.8	5	<1				4342	<100	304	57	100	23	964	140	<1
30/01/2021 14:00	8.12	5460	108.7	35.6	2	<10	6200	4280	5.5	3.85	<0.2	0.52	58	0.57	291	<0.2	4.73	22.4	0.85	36.6	<0.5	<0.1	256	<1	0.79	16	2.4	<0.5	1.16	3.53	3.25				4200	<200	313	54	93.2	21.6	850	130	<1
6/02/2021 15:31	7.66	5040	82.3	30.8	14.1	32	5480	3920	<10	3	<0.1	<1	<50	<1	148	<0.1	4	46	<1	34	<1	<1	200	<1	<1	8	<10	<1	<1	2	<10				3710	88.54	297	47	86	22	772	115	<1

| ASW Site - NC1A | | |

Appendix D - TSF interception trench assessment

Memorandum

Date	17 August 2021	Pages	10
Attention	Senior Environmental Advisor		
Company	McArthur River Mining Pty Ltd		
Job No.	0790-104-E2		
Subject	Review of the potential water quality changes due to the TSF interception trench		

Overview

As requested, we have completed a review of the potential change in Surprise Creek water quality due to the operation of the Tailings Storage Facility (TSF) Interception Trench.

The TSF Interception Trench was constructed to the north of TSF Cell 1 in 2019 and pumping from the trench began on 13 December 2019. The purpose of the trench is to intercept potentially mine derived seepage from the TSF. Water collected in the TSF Interception Trench is gravity fed along an underground pipe network to a sump, which dewatered to TSF Cell 1. The location of the TSF Interception Trench is shown in Figure 1.

Surprise Creek water quality changes due to the TSF Interception Trench

Approach

The potential Surprise Creek water quality changes due to the TSF Interception Trench operation was assessed by comparing the natural surface water quality data collected upstream and downstream of the TSF Interception Trench as well as water dewatered from the TSF Interception Trench sump (after construction) for the following periods:

- 1 May 2017 to 13 December 2019: prior to the pumping out of TSF Interception Trench began; and
- 13 December 2019 to 30 April 2021: after pumping out of the TSF Interception Trench began.

Data recorded prior to 2017 was not used as part of this assessment, as it is incomplete for the upstream natural surface water monitoring locations.

SW29 and SW23 were selected as the upstream natural surface water monitoring locations. SW01, SW02 and SW33 were selected as the natural surface water monitoring locations potentially impacted by TSF seepage and the operation of the TSF Interception Trench.

The water quality readings at upstream and downstream locations were also compared against stream flows in Surprise Creek at SW02 (SCGS), as well as the recorded pumped volumes from the TSF Interception Trench back to TSF Cell 1.

Level 9, 135 Wickham Terrace, Spring Hill
PO Box 10703, Brisbane Adelaide St Qld 4000

Tel 07 3225 0200
wrmwater.com.au

ABN 96 107 404 544

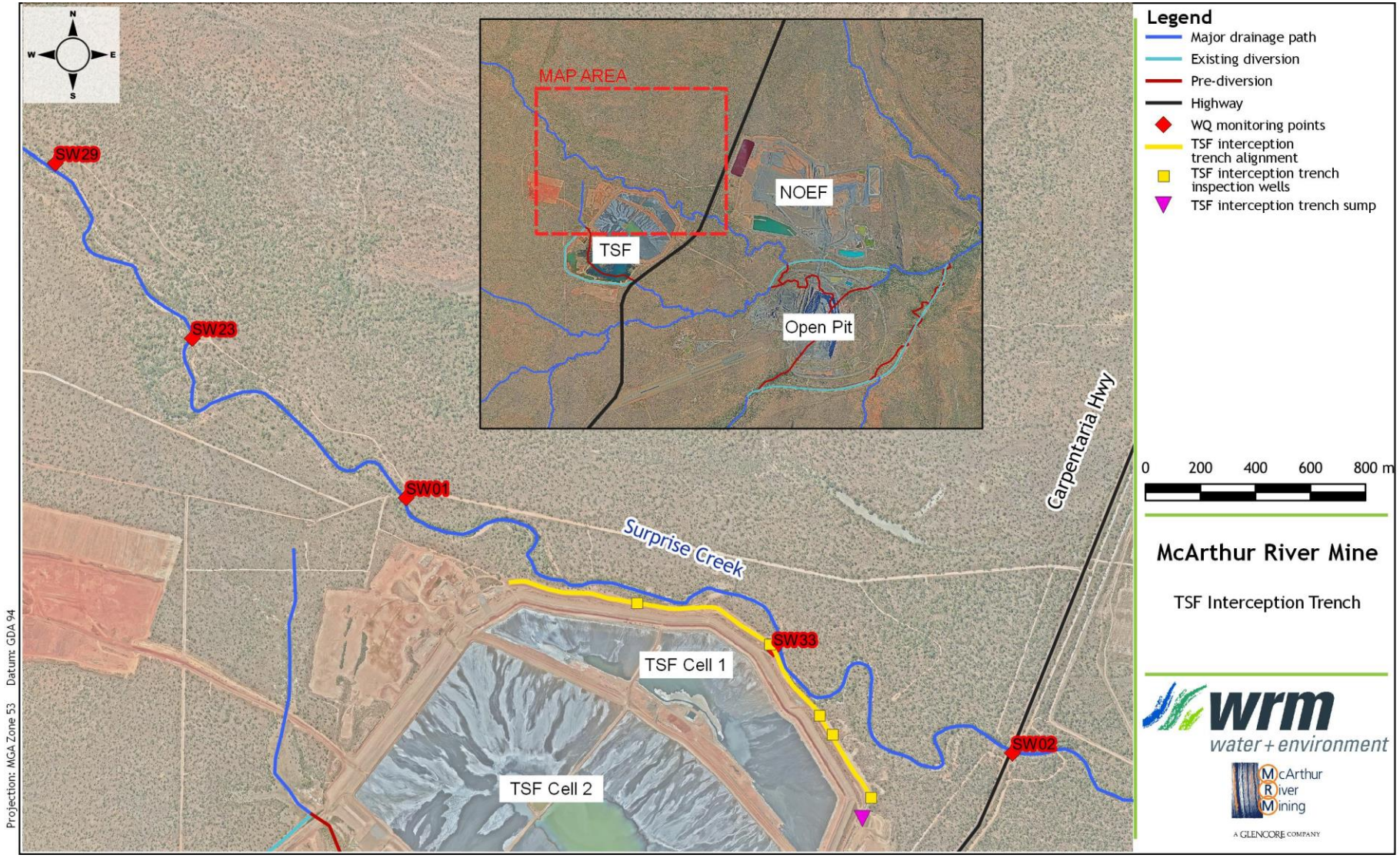

Figure 1 – Key assessment locations

Available data

Water data was provided by MRM for the period between 1 May 2017 and 30 April 2021 for:

- natural surface water monitoring sites SW29, SW23, SW01, SW02 and SW33;
- artificial surface water monitoring sites TSF Interception Trench Sump, TSF Cell 1, TSF Cell 2A and CSF Cell 2B; and
- Surprise Creek water level and flow data for SW02.

TSF Interception Trench pumping data was provided for the period between 13 December 2019 and 1 May 2021. There was a period were pumping data was unavailable, between 13 July 2020 and 15 October 2020.

Figure 2 shows the recorded streamflows in Surprise Creek at SW02. This figure shows that the highest peak discharge in Surprise Creek occurred in the 2017/18 wet season. Figure 3 shows a comparison of the monthly streamflows volumes in Surprise Creek at SW02 and the monthly volumes pumped out of the TSF interception trench.

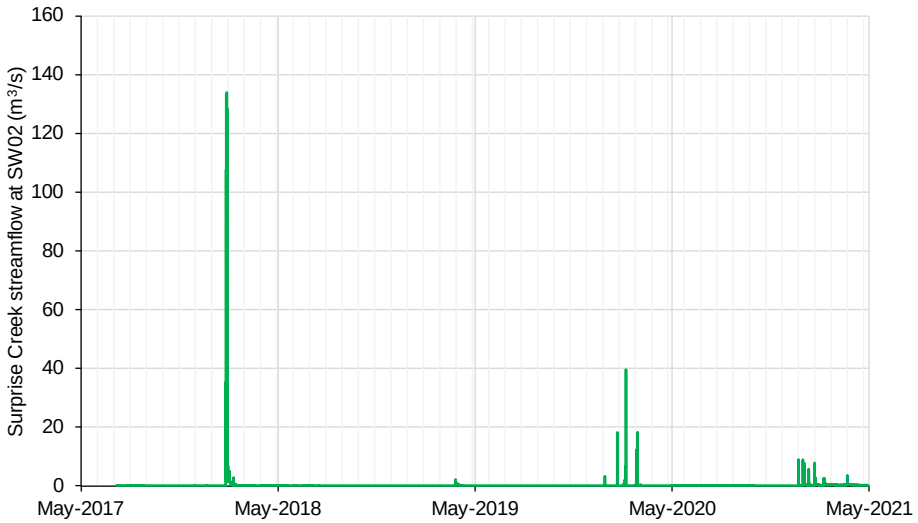

Figure 2 – Recorded streamflows in Surprise Creek at SW02

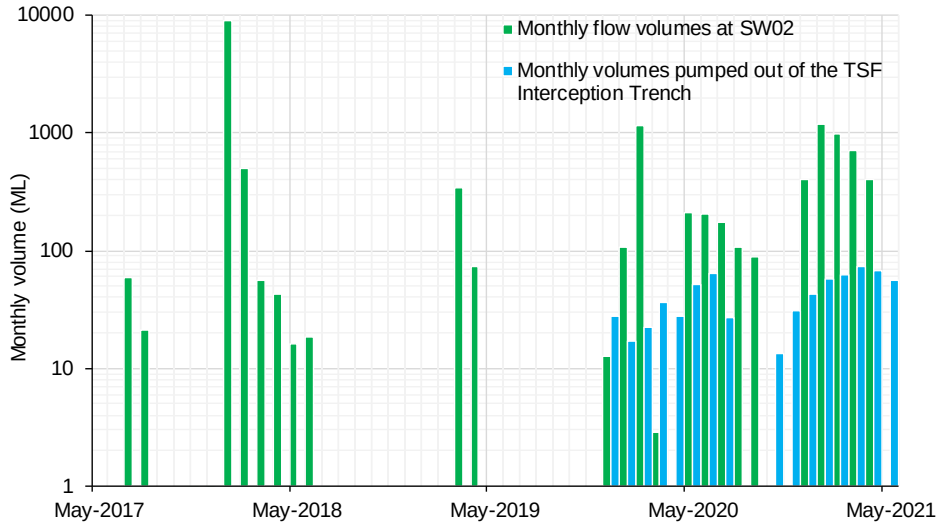

Figure 3 - Recorded monthly streamflows volumes in Surprise Creek at SW02 and monthly volumes pumped out of the TSF interception trench

Review of natural surface water sites

Figure 4 to Figure 8 show the TSF Interception Trench pumped volumes and the water quality in Surprise Creek for the following analytes:

- pH
- Electrical conductivity
- Sulphate
- Filtered thallium; and
- Filtered zinc.

The following is of note regarding these results:

- Analyte levels at natural surface water monitoring locations adjacent to the TSF are generally elevated in the dry season and reduce during the wet season due to dilution from natural surface water and groundwater sources;
- For the upstream natural surface water monitoring locations (SW29 and SW23):
  - The operation of the TSF Interception Trench appears to have a negligible effect on analyte levels.
- For the downstream natural surface water monitoring locations (SW01, SW02 and SW33):
  - The operation of the TSF Interception Trench appears to have a negligible effect on pH levels;
  - The operation of the TSF Interception Trench appears to have reduced EC and sulphate levels in 2020 and 2021 at SW01, SW02 and SW33. This is most noticeable in 2021 where EC and sulphate levels remained below an EC level of 1500 µS/cm and a sulphate level of 400 mg/L during the 2020/21 wet season; and
  - The operation of the TSF Interception Trench appears to have reduced filtered thallium and filtered zinc levels in 2020 and 2021 at SW01, SW02 and SW33. Filtered thallium and filtered zinc levels were

generally below the limit of reporting (LoR) after pumping from the interception trench began in late 2019;

- Analyte levels (except pH) at SW33 were generally lower than at SW02 in 2021, which is the opposite of what was observed in previous years; and
- Analyte levels at SW01 have trended down towards levels recorded at upstream surface water monitoring locations in 2020 and 2021 due to the operation of the TSF Interception Trench.

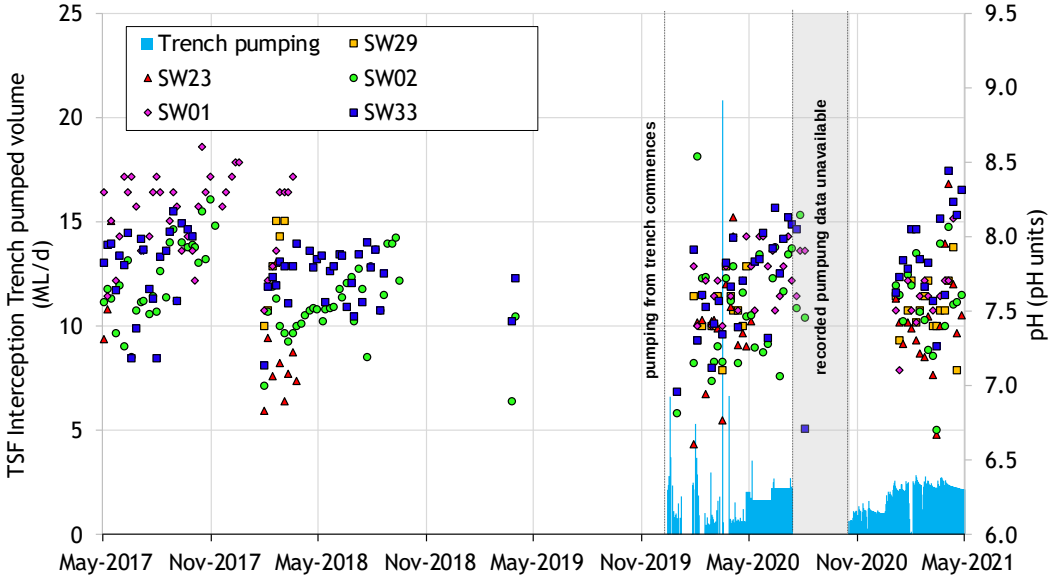

Figure 4 - Recorded pH in Surprise Creek and TSF Interception Trench pumped volumes to TSF Cell 1

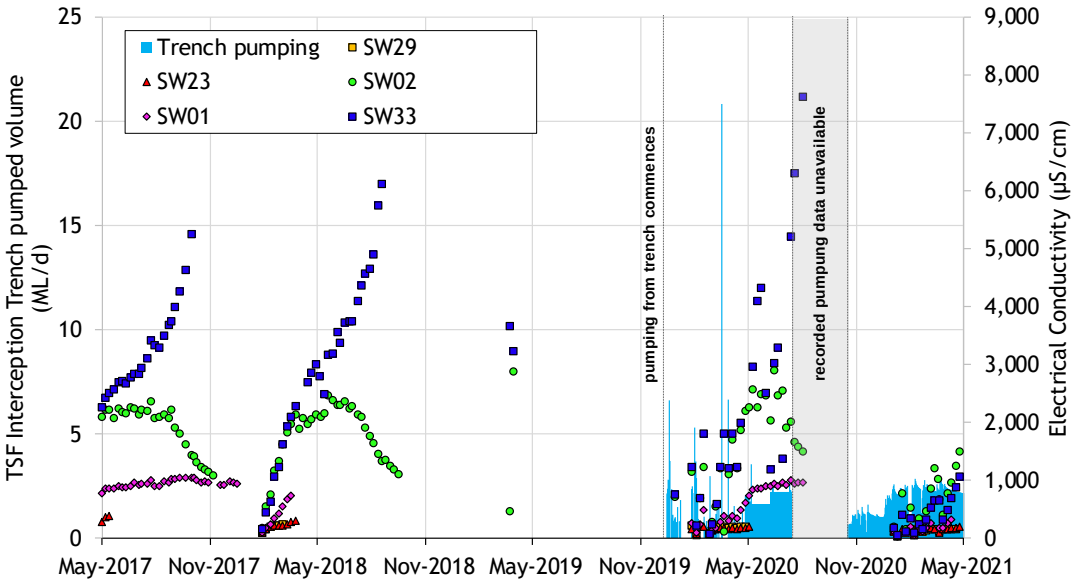

Figure 5 - Recorded EC in Surprise Creek and TSF Interception Trench pumped volumes to TSF Cell 1

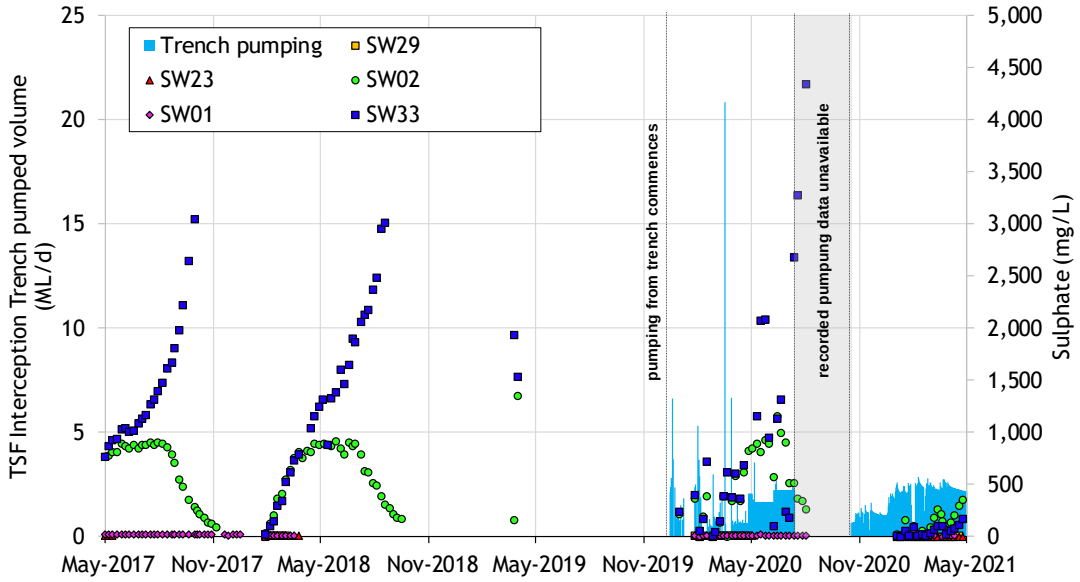

Figure 6 - Recorded sulphate in Surprise Creek and TSF Interception Trench pumped volumes to TSF Cell 1

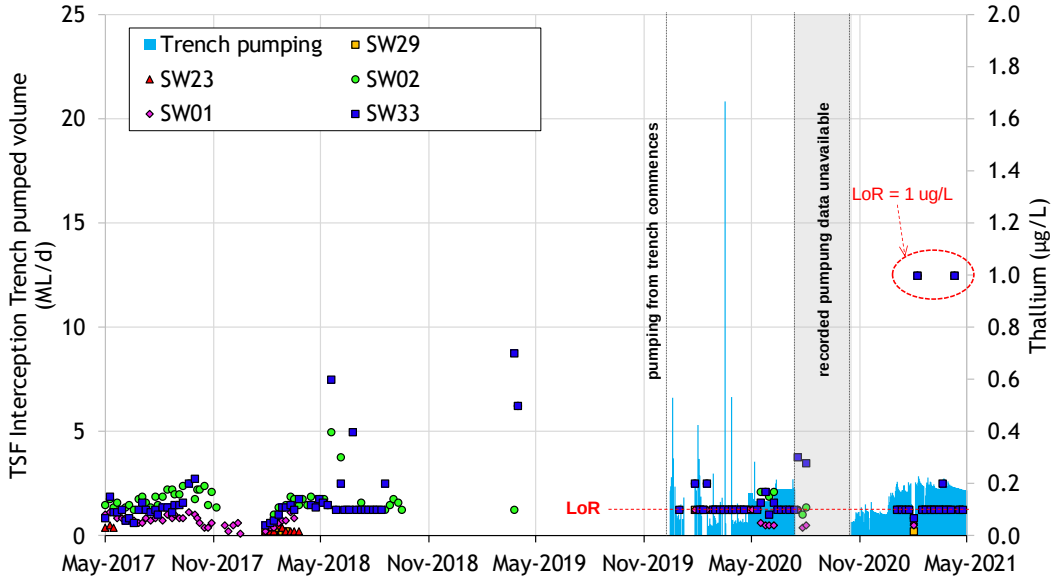

Figure 7 - Recorded filtered thallium in Surprise Creek and TSF Interception Trench pumped volumes to TSF Cell 1

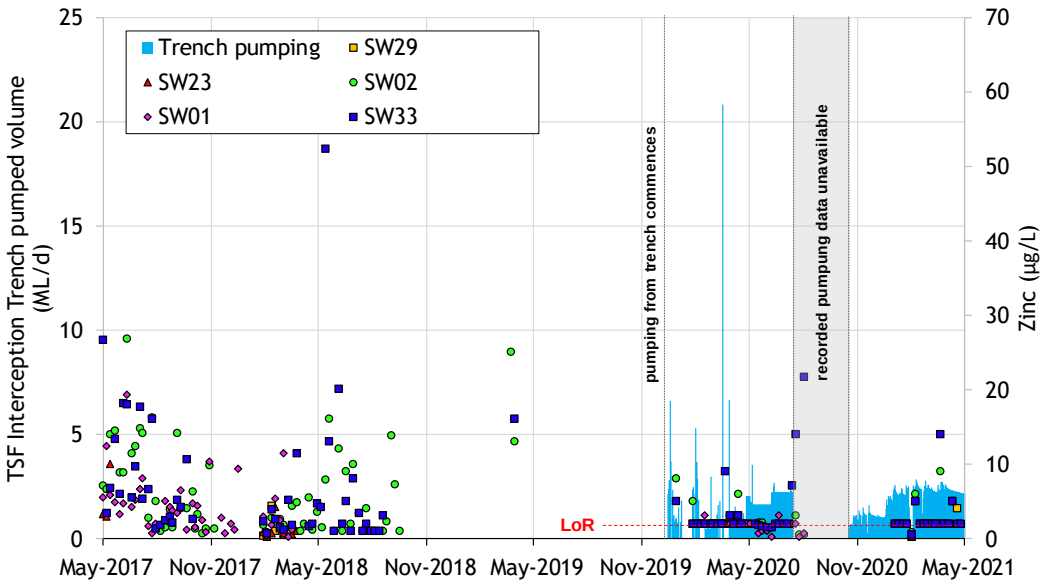

Figure 8 - Recorded filtered zinc in Surprise Creek and TSF Interception Trench pumped volumes to TSF Cell 1

Review of artificial surface water sites

Figure 9 to Figure 13 shows the water quality for the Artificial Surface Water (ASW) locations TSF Cell 1, Cell 2A, Cell 2B and the TSF Interception Trench Sump (TSF ITS) for the following analytes:

- pH;
- EC;
- Sulphate;
- Filtered thallium; and
- Filtered zinc.

The following is of note regarding the results:

- There is no discernible difference between the pH levels in the TSF ITS and the pH levels in TSF Cells. Further the pH levels recorded in the TSF ITS and TSF Cells do not differ significantly from Surprise Creek natural baseline pH levels (recorded at SW23 and SW29).
- EC, sulphate, filtered thallium and filtered zinc levels recorded in the TSF ITS are notably higher the Surprise Creek natural baseline levels. This suggests that the trench is collecting seepage from the TSF Cells. The following is of note regarding the quality of seepage collected:
    - For electrical conductivity and sulphate, the TSF ITS levels are around 2 to 3 times lower than levels recorded in the TSF Cells.
    - For filtered zinc and filtered thallium, the TSF ITS levels are up to 130 times lower than the levels recorded in the TSF Cells. This suggests that metals are being attenuated in the groundwater.

These results suggest that the water collected in the TSF ITS is a combination of TSF Cell seepage and the natural Surprise Creek baseflow. Based on the water quality data, it appears that the trench is acting as intended by intercepting TSF Cell seepage water before it can enter Surprise Creek.

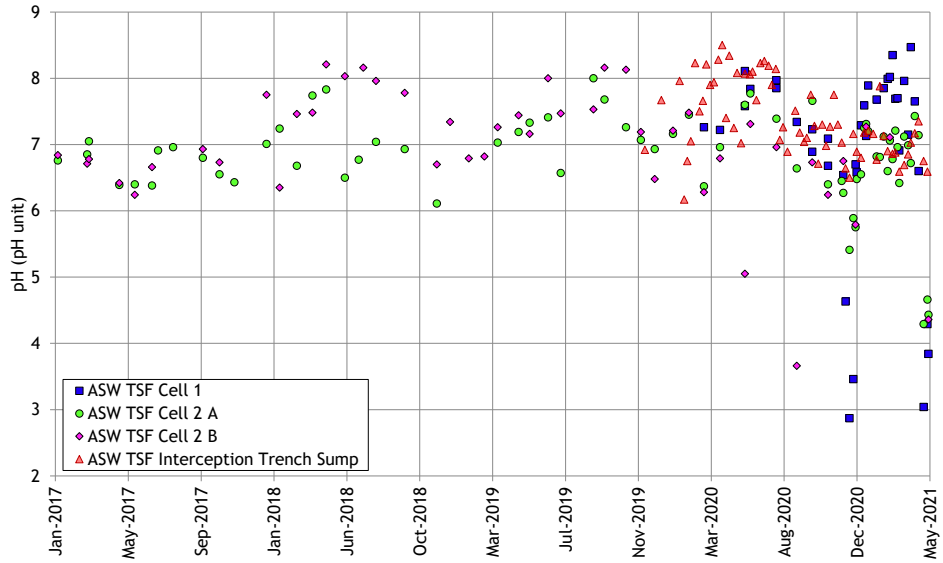

Figure 9 - Recorded pH in TSF Cells 1, 2A, 2B and the TSF Interception Trench Sump

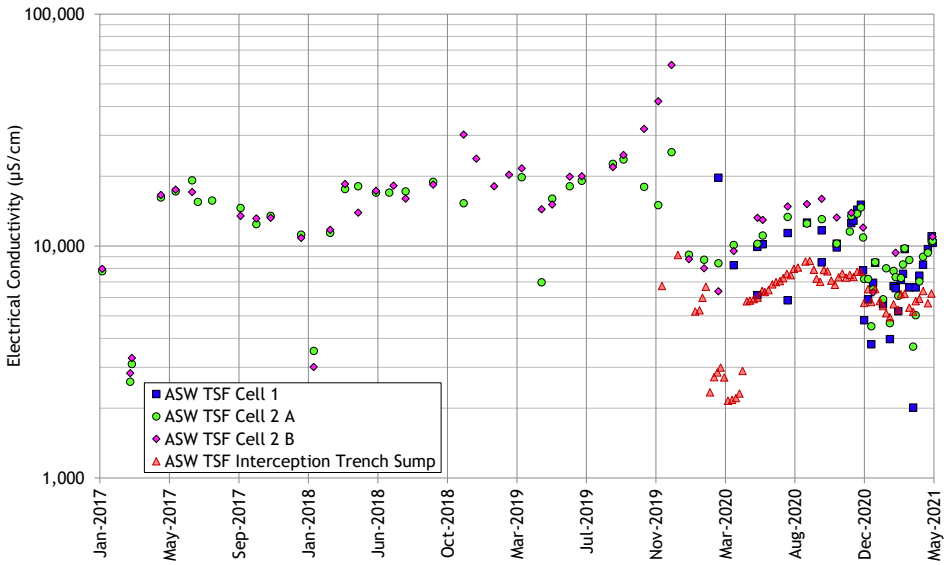

Figure 10 - Recorded EC in TSF Cells 1, 2A, 2B and the TSF Interception Trench Sump

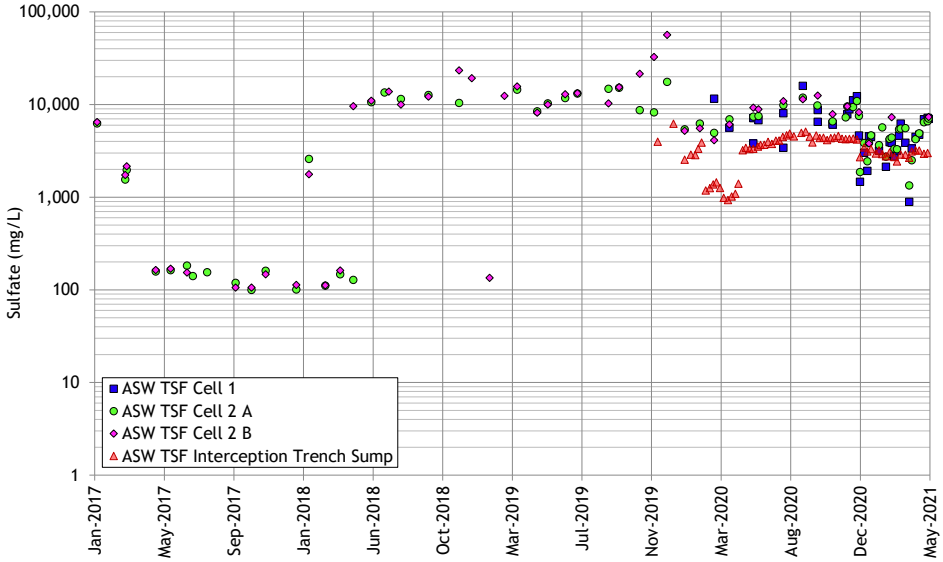

Figure 11 - Recorded sulphate in TSF Cells 1, 2A, 2B and the TSF Interception Trench Sump

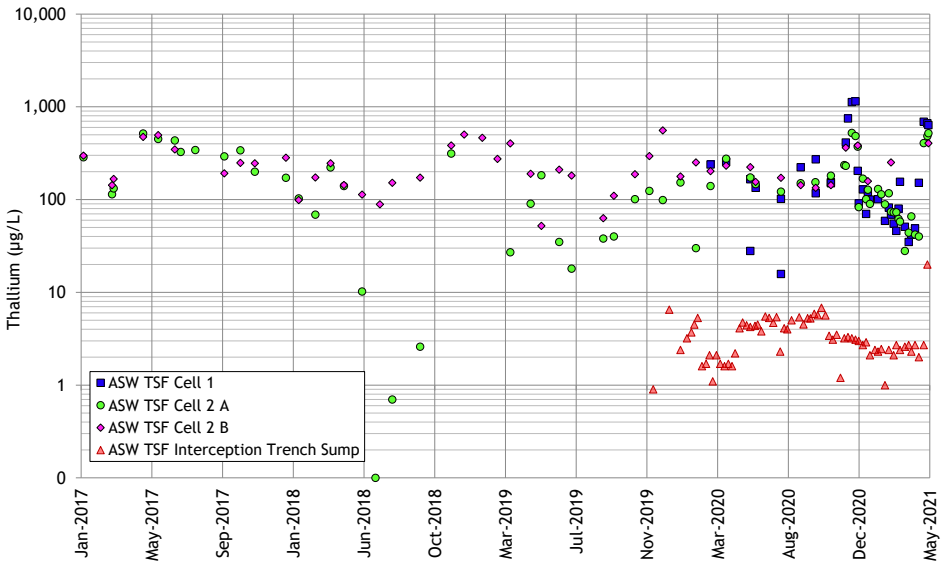

Figure 12 - Recorded filtered thallium in TSF Cells 1, 2A, 2B and the TSF Interception Trench Sump

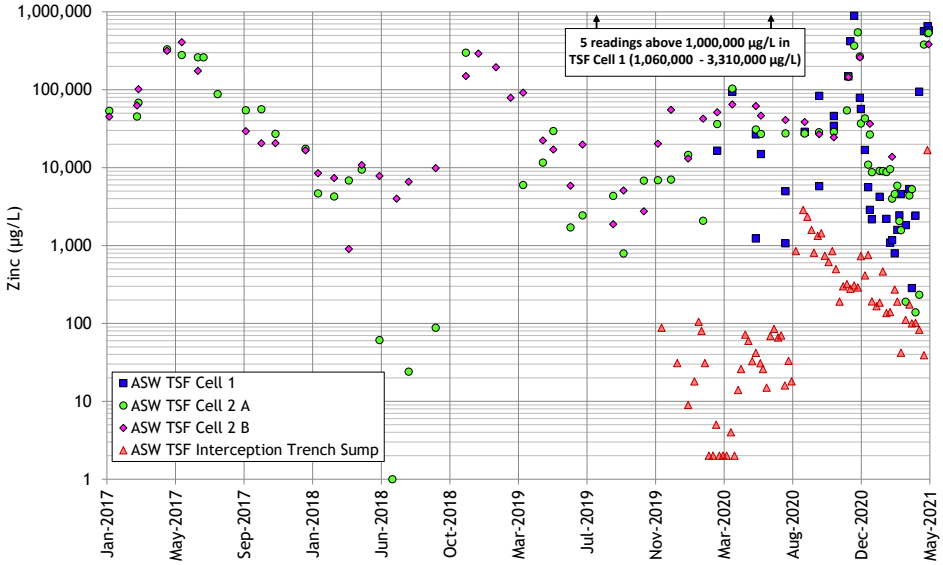

Figure 13 - Recorded filtered zinc in TSF Cells 1, 2A, 2B and the TSF Interception Trench Sump

Limitations

The memorandum provides a brief summary of the potential change in Surprise Creek water quality due to the operation of the Tailings Storage Facility (TSF) Interception Trench. It is understood that MRM's Low Flow Monitoring Plan will enable Surprise Creek low flows to be monitored to estimate the downstream analyte load reductions due to the operation of the TSF Interception Trench.

Further, it is likely that stronger trends in the TSF Interception Trench effect on Surprise Creek water quality monitoring data will develop in the coming years.

I trust this advice is of assistance. Please don't hesitate to contact me if you would like to discuss the results.

For and on behalf of
WRM Water & Environment Pty Ltd

Julian Orth
Principal Engineer

Appendix E - Little Barney Creek geomorphic characteristics

Memorandum

Date	19 November 2020	Pages	11
Attention	Craig Dobson		
Company	McArthur River Mining Pty Ltd		
Job No.	0790-94-B		
Subject	Review of Little Barney Creek geomorphic characteristics		

1 Introduction

WRM Water & Environment Pty Ltd (WRM) was requested by McArthur River Mining Pty Ltd (MRM) to undertake a review of Little Barney Creek geomorphic characteristics downstream of the authorised discharge / release point located at the Tailings Storage Facility (TSF) Water Management Dam (WMD). Figure 1 shows the location of the TSF WMD release point (WMDRP) and the local drainage features within the vicinity of Little Barney Creek.

2 Available data

The available aerial and ground survey data used for the review of Little Barney Creek was provided by MRM and is summarised in Table 1.

Table 1 - Available aerial and LiDAR data for the review

Date captured	Aerial image	LiDAR ground survey
October 2018	McArthur-River-Mine_10May2018_10cm_MGA53	181204_McArthurRiverMine
August 2019	MRM_20190802_10cm_MGA53	MRM_LiDAR_Aug2019_1m
August 2020	MRM_10cm_MGAz53	MRM_LiDAR_1M_DEM_20200824_28_MGA53_AHD

3 Findings

General

The geomorphic characteristics of Little Barney Creek was assessed by comparing aerial images and LiDAR survey for any potential changes to channel morphology since 2018 at two locations:

- The Carpentaria Highway culvert crossing of Little Barney Creek; and
- The reach between the Carpentaria Highway and Barney Creek.

Carpentaria Highway crossing

Figure 2 provides a comparison of LiDAR data captured in 2018, 2019 and 2020 of the Little Barney Creek upstream and downstream of the Carpentaria Highway culverts.

Figure 3 shows the location of the cross sections taken upstream (see Figure 4) and downstream (see Figure 5) of the culverts. The cross sections for each year were

Level 9, 135 Wickham Terrace, Spring Hill
PO Box 10703, Brisbane Adelaide St Qld 4000

Tel 07 3225 0200
wrmwater.com.au

ABN 96 107 404 544

compared and show that minor aggradation has occurred within the base of the main channel and along the northern banks of Little Barney Creek as shown by the slightly higher cross-sectional elevations in 2020 compared to 2018 and 2019. The southern banks of Little Barney Creek channel show little to no change since 2018.

The comparison also shows that little to no erosion occurred in the vicinity of the culvert crossing and therefore it is expected that no major geomorphic changes have occurred as a result of any authorised discharge from the WMDRP.

Downstream of the Carpentaria Highway

The longitudinal section along the invert of Little Barney Creek downstream of the Carpentaria Highway was mapped from the 2018, 2019 and 2020 LiDAR ground surveys to compare the potential horizontal and vertical changes along the channel bed. Figure 6 shows the areas of interest along the longitudinal section along Little Barney Creek. Figure 7 shows the channel invert levels for the longitudinal section assessment. Figure 8 to Figure 10 shows an aerial image comparison at each site for the three years.

When accounting for natural variation in the channel and inherent uncertainties in aerial ground survey, there has been insignificant changes in the Little Barney Creek channel with little to no bed erosion along the length of the channel since 2018. This is confirmed with the aerial photography, which shows little to no evidence of significant erosion or aggradation along Little Barney Creek.

4 Summary

Based on the available aerial photography and LiDAR ground survey information there has been no significant change to the Little Barney Creek channel bed and banks downstream of the WMDRP. On this basis, any discharges from the WMDRP undertaken since 2018 has not resulted in a significant change in geomorphic characteristics of Little Barney Creek.

For and on behalf of

WRM Water & Environment Pty Ltd

Julian Orth

Principal Engineer

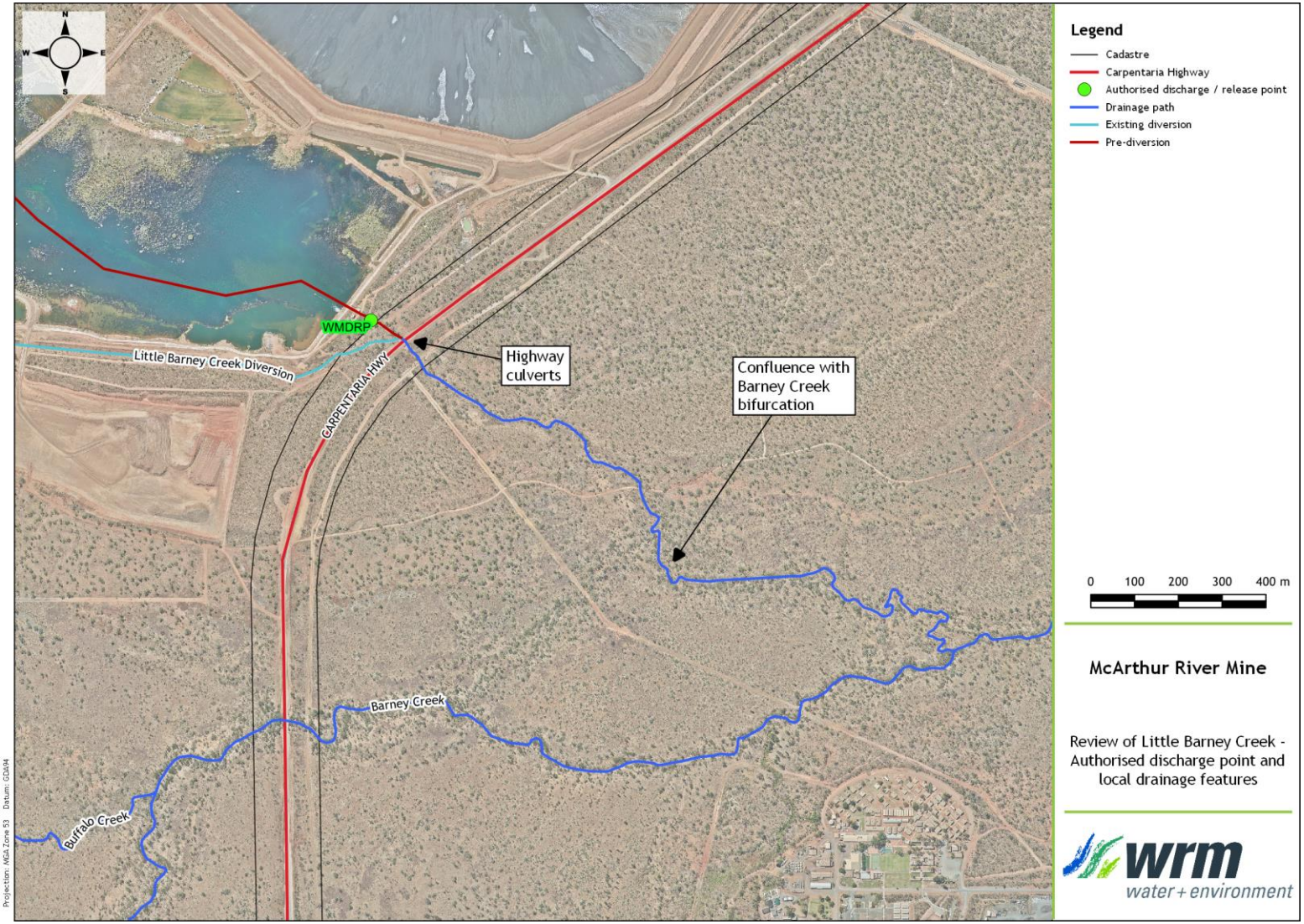

Figure 1 – Authorised discharge point and local drainage features

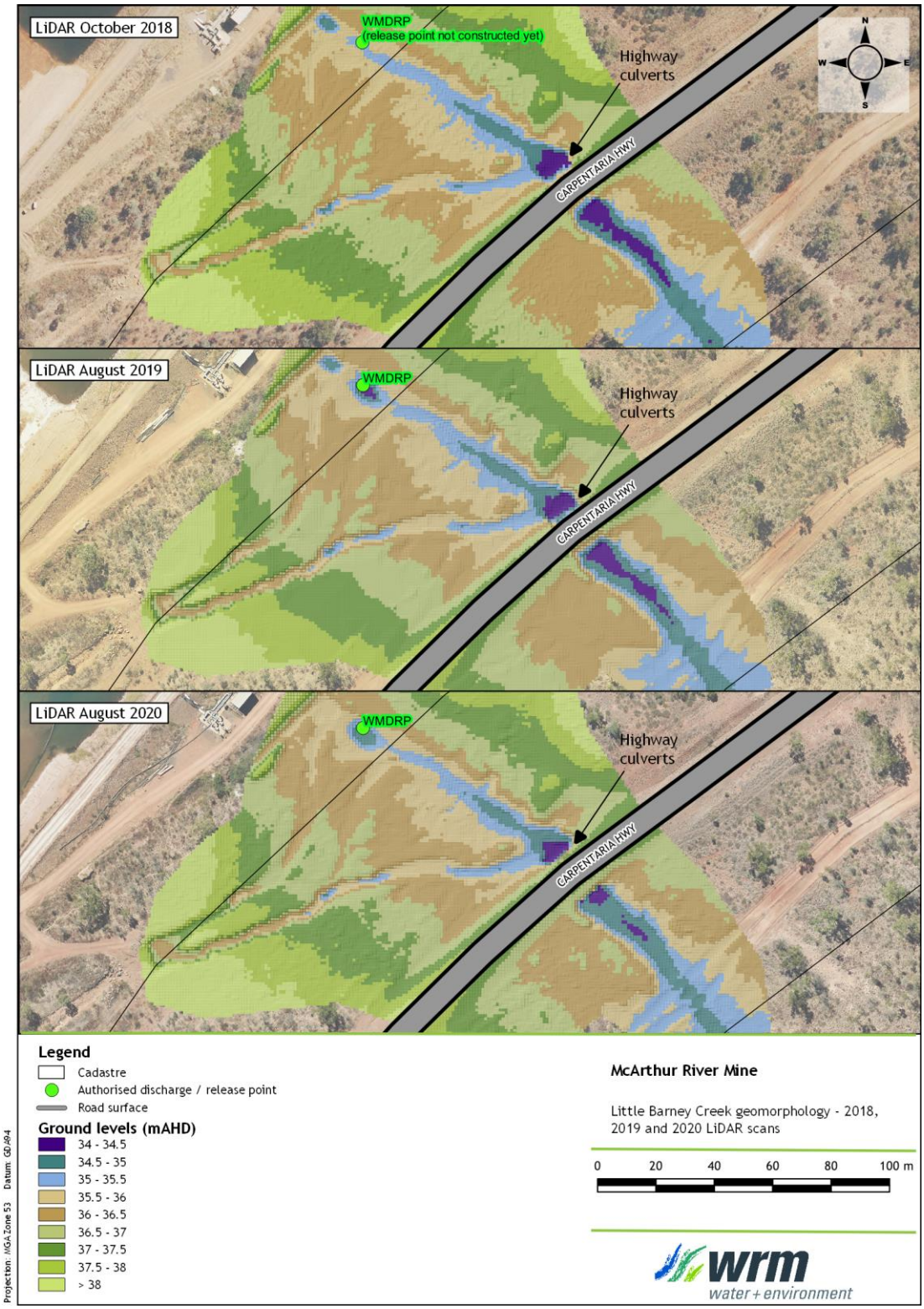

Figure 2 – 2018, 2019 and 2020 LiDAR survey scan comparison

Figure 3 - Location of cross sections taken upstream and downstream of the Carpentaria Highway culverts

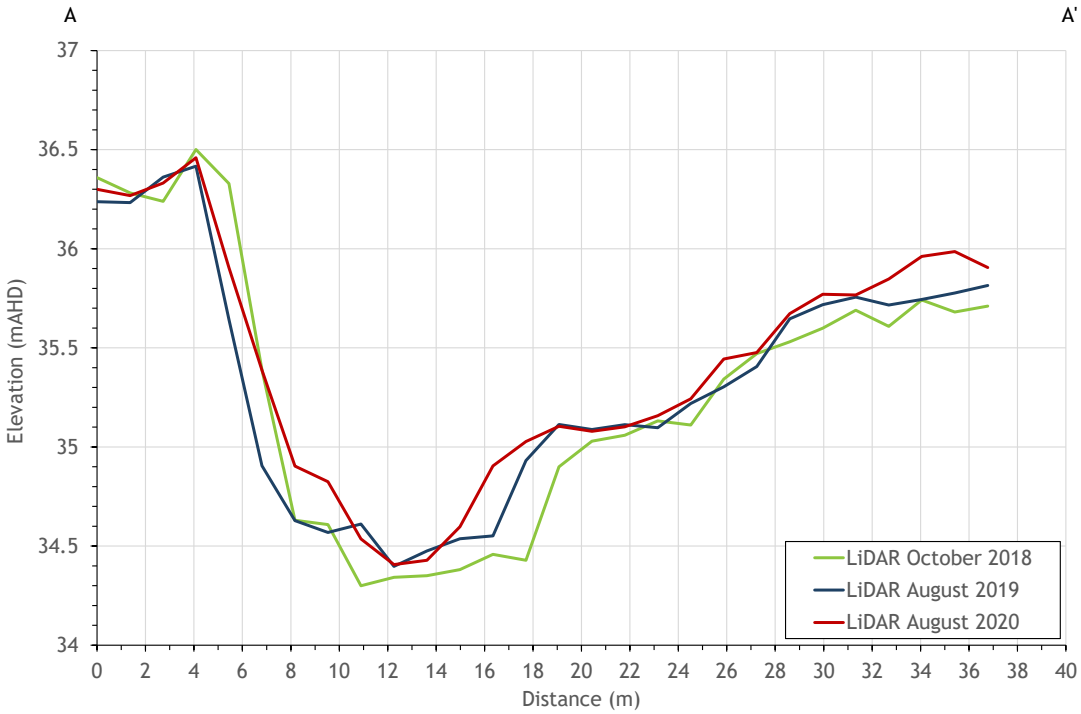

Figure 4 - Cross section A, upstream of Carpentaria Highway

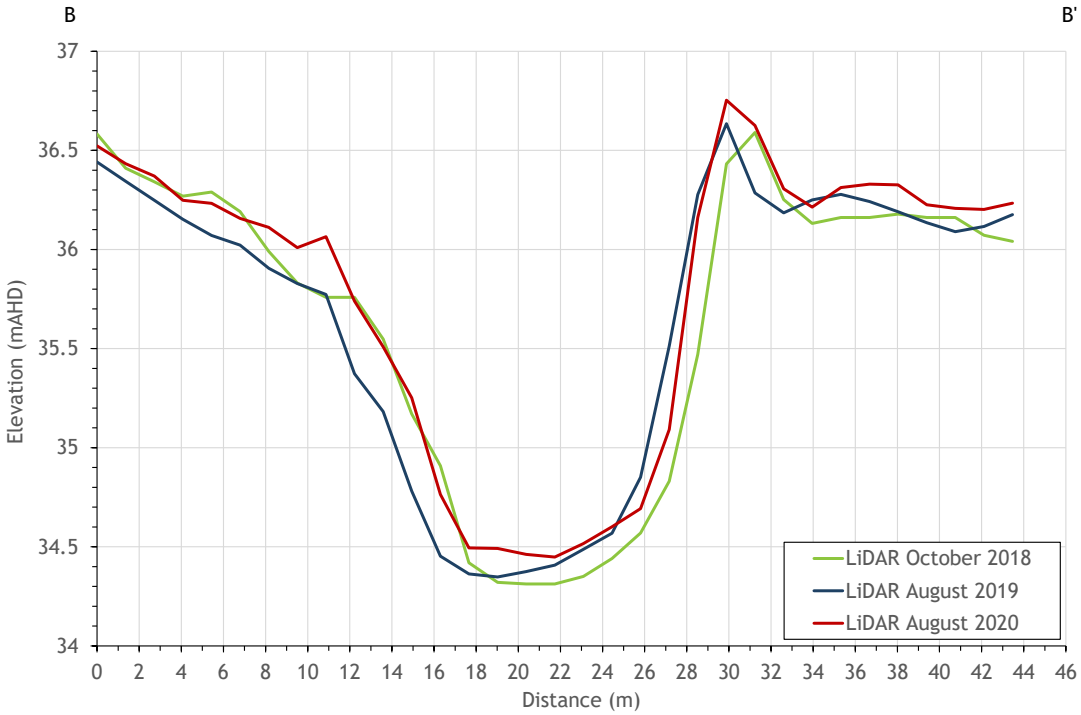

Figure 5 - Cross section B, downstream of Carpentaria Highway

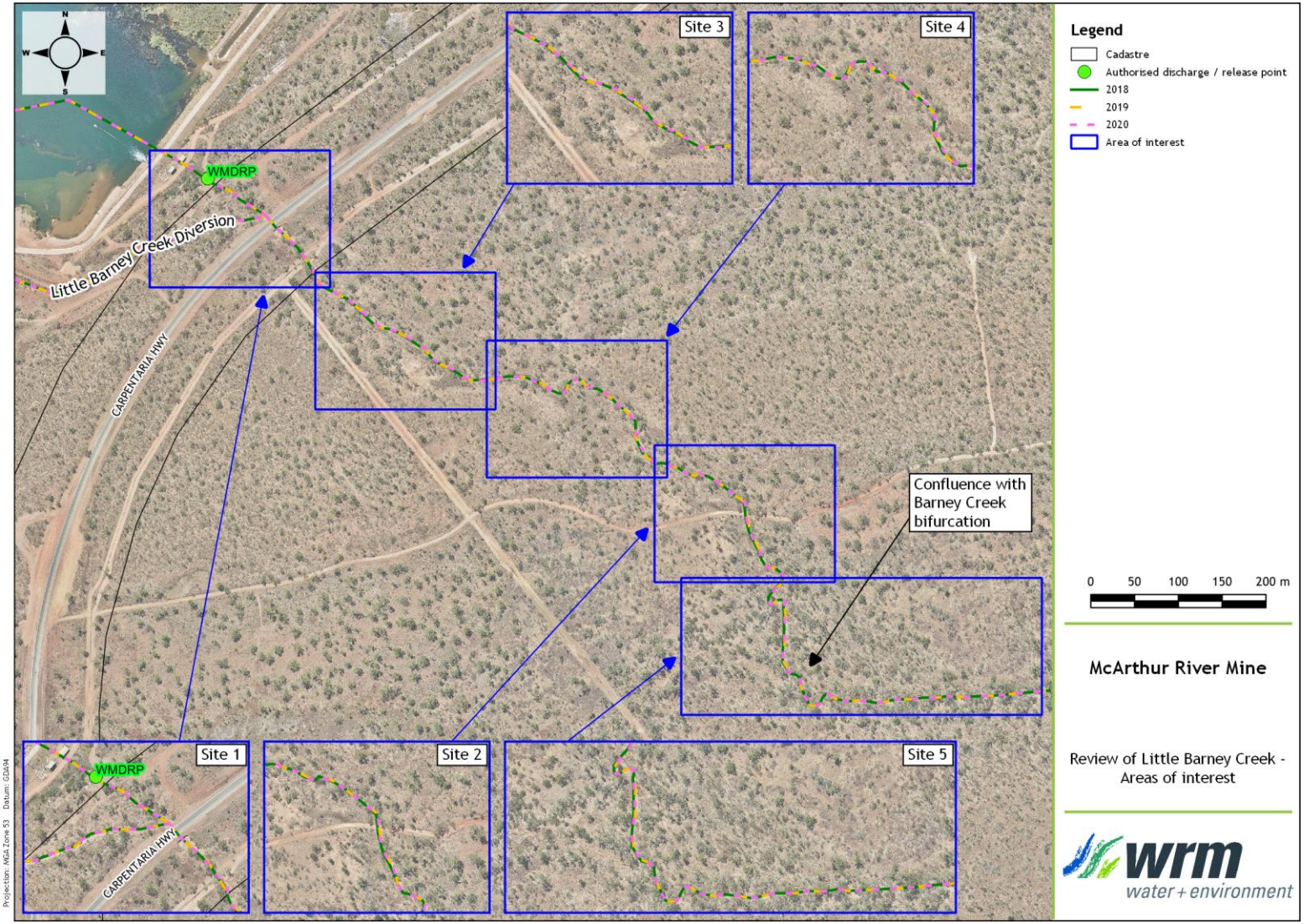

Figure 6 – Areas of interest along Little Barney Creek

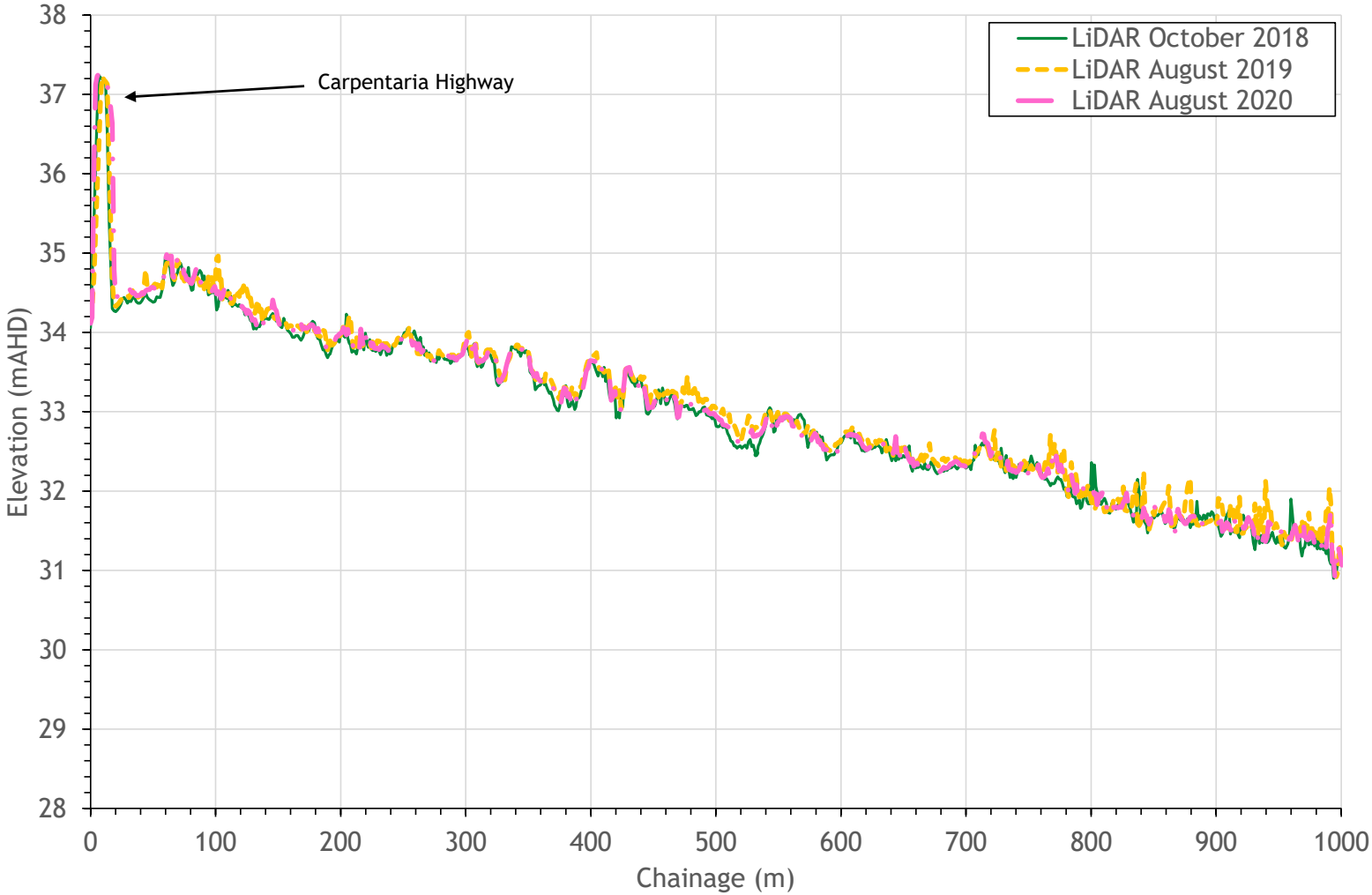

Figure 7 - Longitudinal section of Little Barney Creek channel invert for 2018, 2019 and 2020

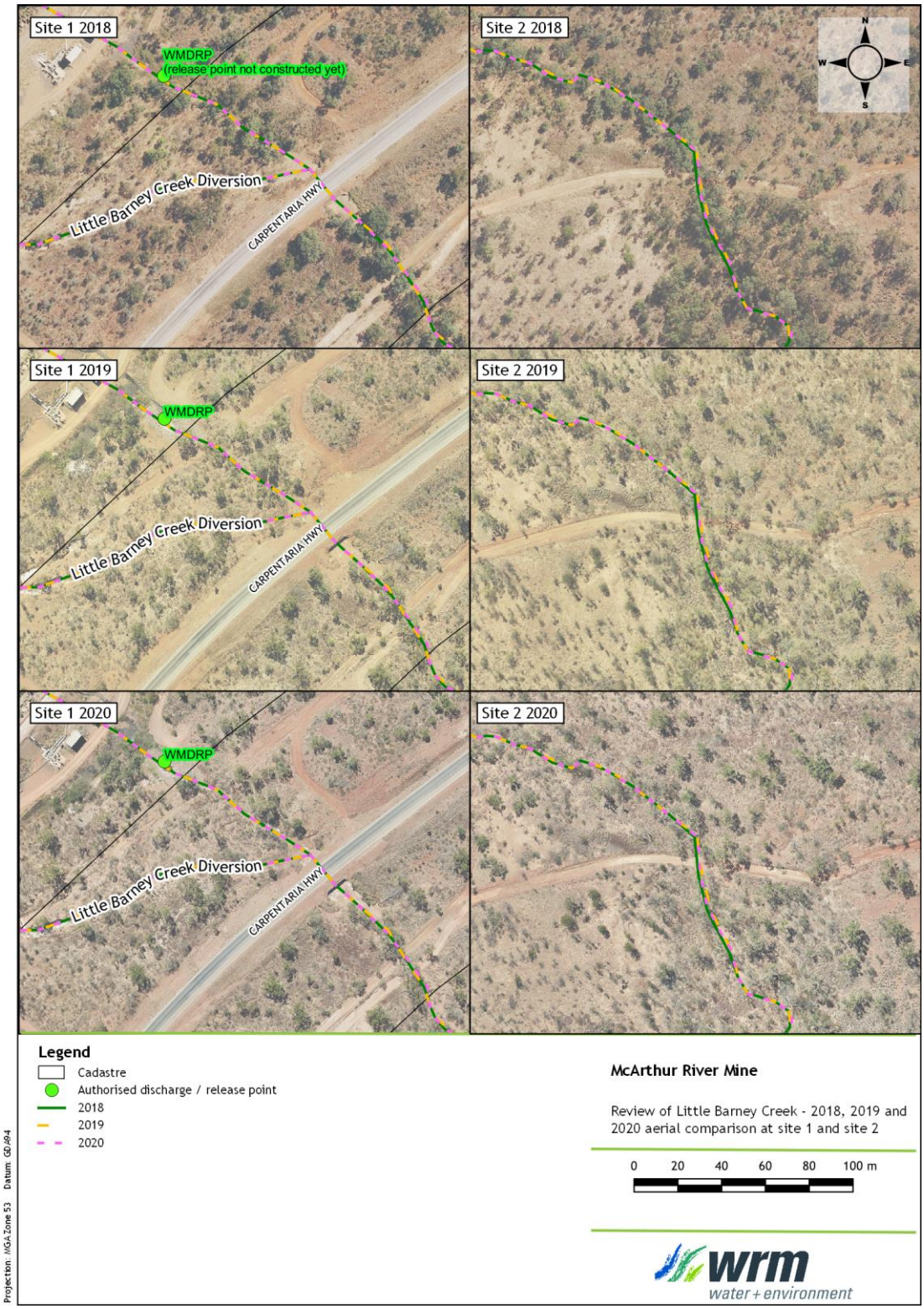

Figure 8 - 2018, 2019 and 2020 aerial comparison at site 1 and site 2

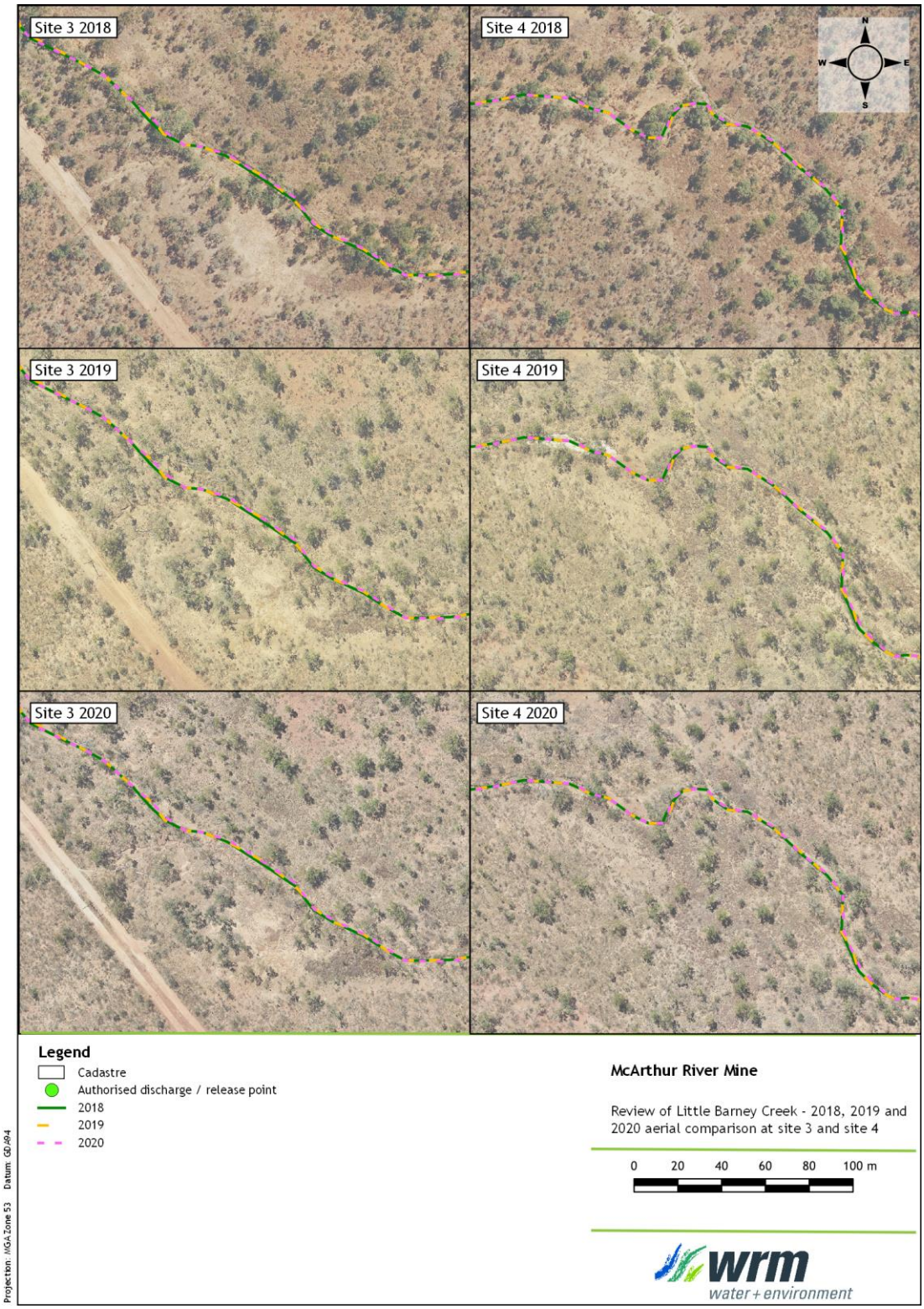

Figure 9 - 2018, 2019 and 2020 aerial comparison at site 3 and site 4

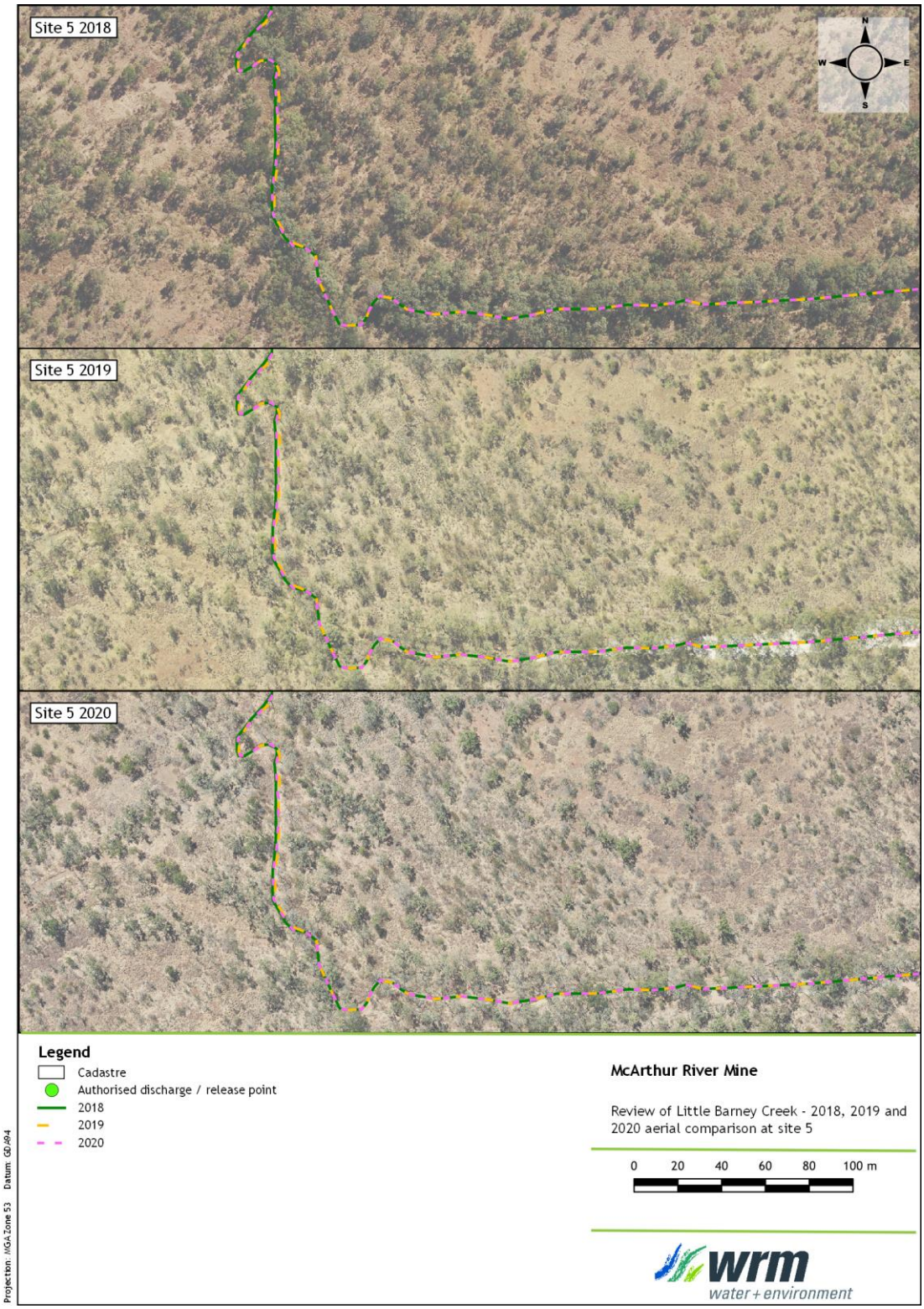

Figure 10 - 2018, 2019 and 2020 aerial comparison at site 5

Attachment 4

2020/21 Mine derived Analyte Loads Assessment

2020/21 Mine Derived Analyte Loads Assessment

McArthur River Mine

McArthur River Mining Pty Ltd
0790-105-B3, 8 July 2021

Report Title	2020/21 Mine Derived Analyte Loads Assessment, McArthur River Mine
Client	McArthur River Mining Pty Ltd
Report Number	0790-105-B3

Revision Number	Report Date	Report Author	Reviewer
0	28/6/2021	AMC	JO
1	1/7/2021	AMC	JO
2	2/7/2021	AMC	JO
3	8/7/2021	AMC	JO

For and on behalf of WRM Water & Environment Pty Ltd
Level 9, 135 Wickham Tce, Spring Hill
PO Box 10703 Brisbane Adelaide St Qld 4000
Tel 07 3225 0200

Julian Orth

Principal Engineer

NOTE: This report has been prepared on the assumption that all information, data and reports provided to us by our client, on behalf of our client, or by third parties (e.g. government agencies) is complete and accurate and on the basis that such other assumptions we have identified (whether or not those assumptions have been identified in this advice) are correct. You must inform us if any of the assumptions are not complete or accurate. We retain ownership of all copyright in this report. Except where you obtain our prior written consent, this report may only be used by our client for the purpose for which it has been provided by us.

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1 Introduction

1.1 OVERVIEW

WRM Water & Environment (WRM) was commissioned by McArthur River Mining Pty Ltd (MRM) to estimate mine derived analyte loads produced by the McArthur River Mine (the Mine) during the 12-month reporting period between 1 May 2020 and 30 April 2021. The reporting period was selected to provide a single loads assessment to satisfy conditions in Waste Discharge Licence 174-11 and Variation of Authorisation 0059. The loads assessment was undertaken to:

- estimate the actively discharged mine derived analyte loads produced by the Mine from managed releases during the current reporting period;
- compare the annual managed release loads discharged since 2017/18 reporting period;
- compare the McArthur River loads at locations upstream and downstream of the mine during the current reporting period; and
- estimate the Glyde River and Emu Creek weekly flow volumes based on measured water level data, where available, during the current reporting period.

1.2 AVAILABLE INFORMATION

Analyte loads were estimated based on the following monitoring information provided by MRM:

- metered managed release flow volumes from mine water storages;
- recorded natural and artificial surface water quality data;
- gauged McArthur River water levels at downstream gauging station (DSGS) at SW11;
- gauged Emu Creek water levels at SW26; and
- gauged Glyde River water levels at SW09.

McArthur River water levels recorded at the M.I.M. Pump station gauge were provided by the Northern Territory (NT) Department of Environment, Parks and Water Security (DEPWS).

Daily rainfall data was obtained for the MRM Airport site (Station No. 14704) from the SILO Patched Point Data Service.

1.3 REPORT STRUCTURE

This report details the methodology and results of the loads assessment. The report is structured as follows:

- Section 2 presents the contributing sources of flow and analyte load to the McArthur River at the Mine;
- Section 3 presents the methodology and results of the 2020/21 surface water flow volume estimates for each reporting location;
- Section 4 presents the estimated McArthur River loads during the current reporting period;
- Section 5 presents the calculated Glyde River and Emu Creek flows;
- Section 6 presents a summary of recommendations and findings;
- Section 7 presents the limitations of the adopted analyte loads assessment methodology and results;
- Section 8 is a list of references;
- Appendix A shows the adopted McArthur River flow rating curves;

- Appendix B presents an assessment of the 2020/21 wet season severity; and
- Appendix C shows the calculation steps used to estimate analyte loads.

2 Hydrology and water quality

2.1 SITE HYDROLOGY AND CONCEPTUAL TRANSPORT MODEL

Figure 2.1 shows the natural and Mine water flow network and analyte load sources that report to the McArthur River downstream of the Mine (at SW11). For the purpose of this assessment, results upstream of the Mine (at SW21) are referred to as 'pre-mine' and results downstream of the Mine (at SW11) are referred to as 'post-mine'. Figure 2.2 shows a conceptual schematic of these sources, which include:

- Natural surface water sources:
  - The McArthur River;
  - Surprise Creek;
  - Barney Creek;
  - Emu Creek;
  - Bull Creek; and
  - The Glyde River.
- Mine derived sources:
  - Managed releases from the Mine including:
    - Mine Levee Discharge Point (MLDP);
    - South East Levee 1 Discharge Point (SEL1 DP); and
    - Water Management Dam Release Point (WMD RP).
  - Other mine lease contributions including:
    - On lease catchment erosion/runoff;
    - Sediment trap releases;
    - Natural baseflow including baseflow from natural mineralised zones;
    - the McArthur River and Barney Creek diversions;
    - Mine affected baseflow; and
    - Dust.

For the purpose of this assessment, the following natural surface water reporting locations were selected for the analyte load estimation:

- McArthur River at SW21 was selected as the representative pre-mine location; and
- McArthur River at SW11 was selected as the representative post-mine location.

Note that the contribution of loads from the Glyde River was not assessed as part of this study because the available flow monitoring data was incomplete for the reporting period.

In addition, the following Mine derived sources were selected for the analyte load estimation:

- MLDP;
- SEL1 DP; and
- WMD RP.

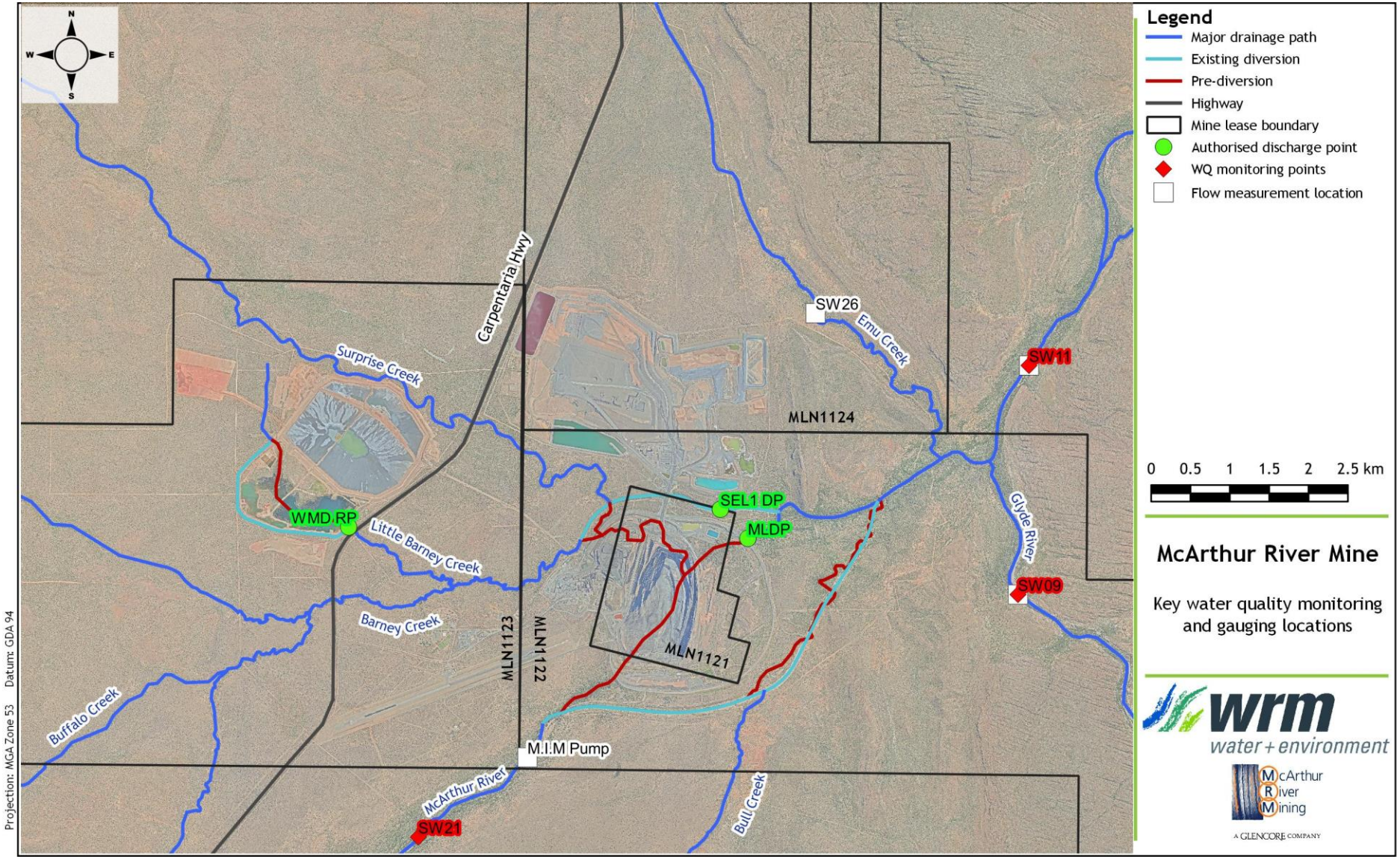

Figure 2.1 – Location of key surface water quality monitoring sites and streamflow gauging stations

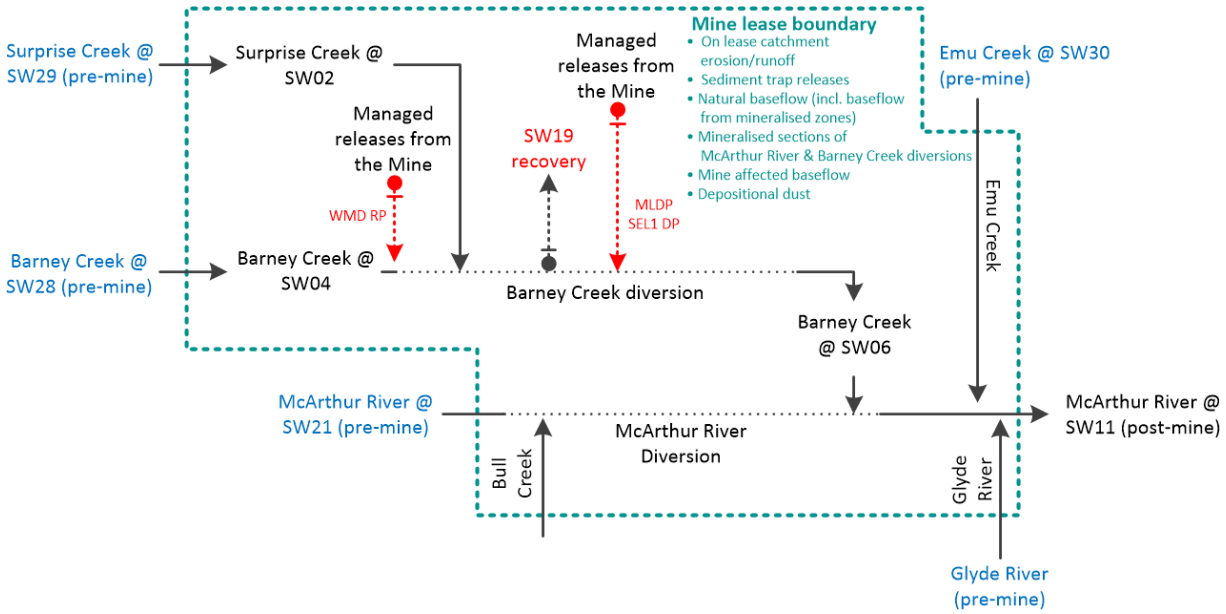

Figure 2.2 – Conceptual schematic of surface water flow and analyte load sources to the McArthur River

3 Estimation of 2020/21 Surface Water Flow Volumes

3.1 NATURAL SURFACE WATERS

3.1.1 Gauging Stations

Daily streamflow volumes at pre-mine and post-mine locations were estimated using water level data recorded at the following stream gauges in the vicinity of the Mine:

- McArthur River at M.I.M. Pump station (representing flows at SW21); and
- McArthur River at SW11 (the DSGS).

Validation of the adopted rating curves against stream gaugings is provided in Appendix A.

3.1.2 Estimated Streamflow

Table 3.1 shows the estimated flow volumes at each stream gauging station for the period between 1 May 2020 and 30 April 2021. Figure 3.1 shows the recorded daily McArthur River streamflow at M.I.M. Pump Station and SW11, as well as rainfall at MRM Airport. The surface water flow volumes were estimated using the validated rating curves (see Appendix A) and recorded water level and flow information provided by MRM and DEPWS.

An assessment of the severity of recorded streamflow volumes and rainfall at the Mine during the 2020/21 reporting period is presented in Appendix B to provide context for the magnitude of the reporting period when compared with historical wet seasons. A total rainfall depth of 854.6 mm was recorded during the 2020/21 reporting period, which is 175 mm greater than a median rainfall year (680 mm).

Table 3.1 – Estimated surface water flow volumes along the McArthur River at M.I.M. Pump Station and SW11 – 1 May 2020 to 30 April 2021

Gauging station	Catchment Area (km^2)	Estimated surface water flow volume (ML)
McArthur River (M.I.M. Pump Station)	9,600	426,374
McArthur River at SW11	12,920	1,526,049

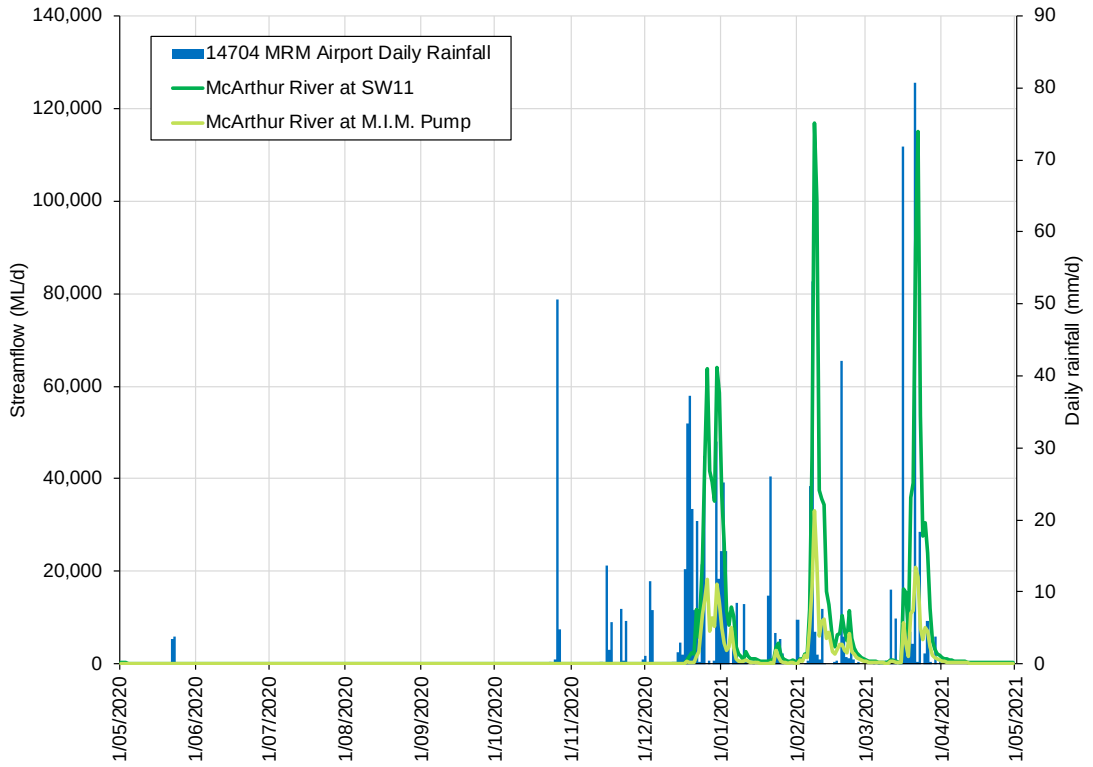

Figure 3.1 – Recorded McArthur River daily streamflows and rainfalls at MRM Airport – 1 May 2020 to 30 April 2021

3.2 MANAGED RELEASES FROM THE MINE

3.2.1 Managed Release Locations

Total discharge volumes were provided by MRM for the following managed release locations:

- MLDP;
- SEL1 DP; and
- WMD RP.

3.2.2 MLDP, SEL1 DP and WMD RP Managed Release Volumes

Table 3.2 shows the releases from MLDP, SEL1 DP and WMD RP to the McArthur River receiving waters between 1 May 2020 and 30 April 2021. A total of approximately 2037.7 ML was released from authorised discharge points during the 2020/21 reporting period. This included:

- approximately 711.3 ML via the MLDP (from TSF WMD and OP P2);
- approximately 18.0 ML via the SEL1 DP (from NOEF SEL1); and
- approximately 1,308.4 ML via the WMD RP (from the TSF WMD syphons).

Table 3.2 – MLDP, SEL1 DP and WMD RP managed releases (sorted by release start date)

Discharge event ID	Managed Release Point	Location Site ID	Release Start Date / Time	Release Finish Date / Time	Release flow rate* (l/s)	Duration	Total Release (ML)
1	MLDP	P2	20/12/2020 7:26	20/12/2020 16:00	304	9 hrs	9
2	MLDP	WMD	20/12/2020 7:46	20/12/2020 20:00	298	12 hrs	13
3	MLDP	WMD	22/12/2020 8:30	8/01/2021 16:59	283	17.4 days	425
4	SEL1	SEL1	24/12/2020 14:00	28/12/2020 12:15	53	3.9 days	18
5	WMD RP	WMD	25/12/2020 16:40	28/12/2020 11:35	1,149	2.8 days	274
6	WMD RP	WMD	30/12/2020 8:15	4/01/2021 14:00	1,047	5.2 days	475
7	MLDP	WMD	22/02/2021 13:20	24/02/2021 16:57	301	2.2 days	56
8	WMD RP	WMD	22/02/2021 13:35	23/02/2021 14:35	916	1 days	82
9	WMD RP	WMD	21/03/2021 11:57	29/03/2021 17:41	670	8.2 days	477
10	MLDP	WMD	21/03/2021 12:52	29/03/2021 14:27	298	8.1 days	208

* Average over release period

4 Estimation of 2020/21 Analyte Loads

4.1 OVERVIEW

Analyte loads were estimated for the McArthur River upstream of the Mine at SW21, managed releases from the Mine and the McArthur River downstream of the Mine at SW11 for the period between 1 May 2020 and 30 April 2021. Estimated managed release flows and analyte loads from the Mine were then compared with background McArthur River flows and loads upstream of the Mine (pre-mine) at SW21.

The analyte loads in the McArthur River, as well as at the selected mine reporting locations were estimated using daily surface water flow volumes and weekly water quality monitoring data (sub-weekly water quality data was recorded during discharge events) provided by MRM. Analyte loads were estimated for the period between 1 May 2020 and 30 April 2021. The calculation steps used for estimating analyte loads are provided in Appendix C.

4.2 RESULTS

4.2.1 McArthur River Analyte Loads

Table 4.1 shows the estimated surface water flow volumes and analyte loads upstream of the Mine at SW21 (pre-mine) and downstream of the Mine at SW11 (post-mine) for the period between 1 May 2020 and 30 April 2021.

4.2.2 Actively Discharged Mine Derived Analyte Loads

Table 4.1 shows the estimated managed release volumes and analyte loads between 1 May 2020 and 30 April 2021.

Table D.1 in Appendix D shows the estimated mine water release volumes and analyte loads at each managed mine water release location for the assessment period. MLDP, SEL1 DP and WMD RP represent the managed releases of all mine derived water that was released via these locations. All managed releases of mine derived water via these discharge points occurred during the 2020/21 wet season.

4.2.3 Relative Contribution of Actively Discharged Mine Derived Analyte Loads

Table 4.2 shows the relative contribution of managed releases from the Mine when compared with pre-mine loads in the McArthur River at SW21 for the period between 1 May 2020 and 30 April 2021. The following is of note regarding the results of this assessment:

- Increases in estimated analyte loads due to managed releases from the Mine were generally less than 10% except for sulphate, TDS, manganese (filtered) and thallium (total and filtered). The results show that estimated analyte load increased by approximately 870% for sulphate;
- Significant increases in sulphate, TDS, manganese (filtered) and thallium (total and filtered) were mainly due to managed releases via the MLDP and WMD RP; and
- For the one week period beginning on 6 February 2021, the portion of estimated annual loads for filtered lead, total lead, filtered zinc and total zinc was 36%, 30%, 40% and 33% respectively at SW21.

Table 4.1 – Estimated surface water flow volumes and analyte loads for the period 1 May 2020 to 30 April 2021 – SW21 (pre-mine), managed releases from the Mine and SW11 (post-mine)

Parameters	SW21 (pre-mine)	Managed Releases from the Mine [a]	SW11 (post-mine)
Total Flow (ML)	426,374	2,038	1,526,049
Aluminium_F (kg)	75,879	10.8	128,999
Aluminium_T (kg)	8,314,779	760	9,883,259
Arsenic_F (kg)	267	4.61	931
Arsenic_T (kg)	2,002	8.33	2,679
Boron_F (kg)	11,067	1,146	33,922
Boron_T (kg)	16,098	1,309	40,339
Cadmium_F (kg)	75.7	0.43	272
Cadmium_T (kg)	75.7	0.44	302
Cobalt_F (kg)	421	2.10	1,513
Cobalt_T (kg)	3,401	2.40	3,918
Copper_F (kg)	425	2.04	1,518
Copper_T (kg)	5,900	2.33	6,202
Iron_F (kg)	110,777	15	247,081
Iron_T (kg)	9,350,634	975	9,663,173
Lead_F (kg)	253	1.14	906
Lead_T (kg)	4,325	7.71	5,011
Manganese_F (kg)	588	918	9,826
Manganese_T (kg)	120,475	1,242	150,643
Mercury_F (kg)	12.0	0.02	42.5
Mercury_T (kg)	25.4	0.10	90.9
Nickel_F (kg)	424	3.91	1,519
Nickel_T (kg)	6,100	4.89	6,655
Thallium_F (kg)	119	49.1	439
Thallium_T (kg)	164	50.2	491
Zinc_F (kg)	1,099	18.1	3,924
Zinc_T (kg)	15,290	56.9	20,126
Sulphate_F (tonnes)	1,282	11,164	17,326
Nitrate (kg)	66,054	738	487,497
Total Dissolved Solids (tonnes)	42,084	18,224	146,761
Total Suspended Solids (tonnes)	258,986	22	235,798

[a] Managed releases from the Mine = MLDP + SEL1 DP + WMD RP

Table 4.2 – Estimated percentage of managed releases from the Mine relative to pre mine (background) McArthur River loads at SW21 for the period 1 May 2020 to 30 April 2021

Parameters	Pre-mine (SW21)	Managed releases from the Mine [a]	Percentage increase [b]
Total Flow (ML)	426,374	2,038	0.48%
Aluminium_F (kg)	75,879	10.8	0.01%
Aluminium_T (kg)	8,314,779	760	0.01%
Arsenic_F (kg)	267	4.61	1.72%
Arsenic_T (kg)	2,002	8.33	0.42%
Boron_F (kg)	11,067	1,146	10.4%
Boron_T (kg)	16,098	1,309	8.1%
Cadmium_F (kg)	75.7	0.43	0.57%
Cadmium_T (kg)	75.7	0.44	0.58%
Cobalt_F (kg)	421	2.10	0.50%
Cobalt_T (kg)	3,401	2.40	0.07%
Copper_F (kg)	425	2.04	0.48%
Copper_T (kg)	5,900	2.33	0.04%
Iron_F (kg)	110,777	15	0.01%
Iron_T (kg)	9,350,634	975	0.01%
Lead_F (kg)	253	1.14	0.45%
Lead_T (kg)	4,325	7.71	0.18%
Manganese_F (kg)	588	918	156%
Manganese_T (kg)	120,475	1,242	1.03%
Mercury_F (kg)	12.0	0.02	0.17%
Mercury_T (kg)	25.4	0.10	0.40%
Nickel_F (kg)	424	3.91	0.92%
Nickel_T (kg)	6,100	4.89	0.08%
Thallium_F (kg)	119	49.1	41.5%
Thallium_T (kg)	164	50.2	30.7%
Zinc_F (kg)	1,099	18.1	1.65%
Zinc_T (kg)	15,290	56.9	0.37%
Sulphate_F (tonnes)	1,282	11,164	871%
Nitrate (kg)	66,054	738	1.12%
Total Dissolved Solids (tonnes)	42,084	18,224	43.3%
Total Suspended Solids (tonnes)	258,986	22	0.01%

[a] MLDP releases + SEL1 DP releases + WMD RP releases
[b] (MLDP releases + SEL1 DP releases + WMD RP releases) / (SW21)

4.2.4 Comparison of Previous Managed Release Loads

The annual 2020/21 managed release loads estimated in this report have been compared against the annual managed release loads estimated for the previous three years to show the variability of release loads since 2017/18 (as shown in Table 4.3). Figure 4.1 shows a comparison of the total annual loads for total zinc and total lead. The estimated 2020/21 total lead and total zinc managed release loads are less than the 2017/18 values reported in WRM (2019b). It should be noted that the 2020/21, 2019/20 and 2018/19 reporting periods were from May to April whereas the 2017/18 reporting period was from July to June.

Table 4.3 – Comparison of estimated 2017/18 and 2020/21 managed release loads

Parameters	Managed releases from the Mine		
	2020/21 (this report)	2017/18 (WRM, 2019)	Difference between 2020/21 and 2017/18
Total Flow (ML)	2,038	2,656	-618
Aluminium_F (kg)	10.8	9.7	1.07
Aluminium_T (kg)	760	713	47.0
Arsenic_F (kg)	4.61	5.59	-0.98
Arsenic_T (kg)	8.33	6.82	1.51
Cadmium_F (kg)	0.43	1.50	-1.07
Cadmium_T (kg)	0.44	2.29	-1.85
Copper_F (kg)	2.04	1.33	0.71
Copper_T (kg)	2.33	2.31	0.02
Iron_F (kg)	15.3	194	-179
Iron_T (kg)	975	1,036	-61.3
Lead_F (kg)	1.14	2.45	-1.31
Lead_T (kg)	7.71[a]	15.8	-8.09
Manganese_F (kg)	918	3,889	-2,971
Manganese_T (kg)	1,242	4,190	-2,948
Mercury_F (kg)	0.02	0.06	-0.04
Mercury_T (kg)	0.10	0.39	-0.29
Nickel_F (kg)	3.91	27.0	-23.1
Nickel_T (kg)	4.89	28.1	-23.2
Zinc_F (kg)	18.1	2,945	-2,927
Zinc_T (kg)	56.9[b]	3,429	-3,372
Sulphate_F (tonnes)	11,164	9,451	1,713
Nitrate (kg)	738	7,422	-6,684
Total Dissolved Solids (tonnes)	18,224	12,958	5,266
Total Suspended Solids (tonnes)	22.0	83.4	-61.4

[a] The estimated total lead managed release load for the 2020/21 reporting period is significantly less than the 15.80 kg released during the 2017/18 period (WRM, 2019)
[b] The estimated total zinc managed release load for the 2020/21 reporting period is significantly less than the 3,429 kg released during the 2017/18 period (WRM, 2019)

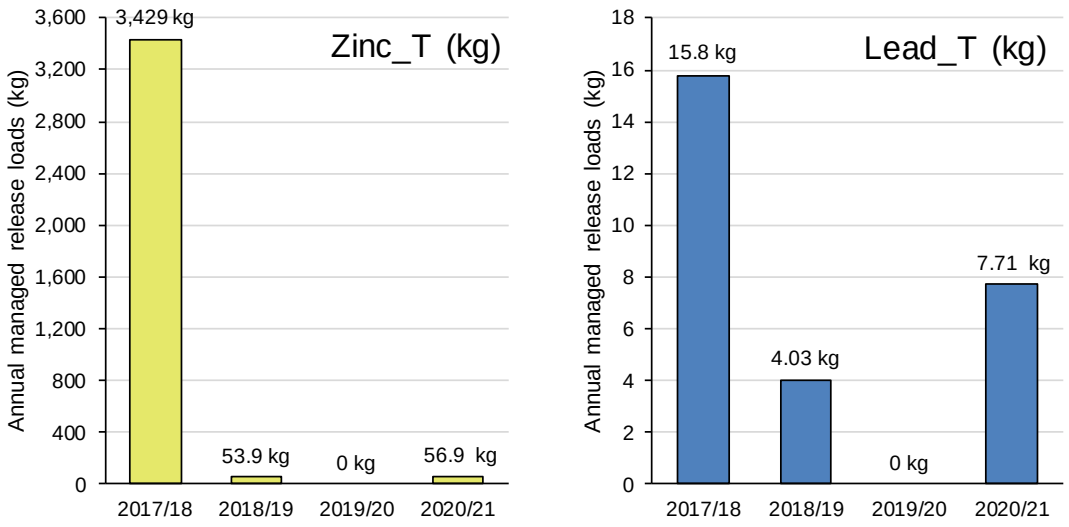

Figure 4.1 – Comparison of previous total zinc and lead loads in managed releases

4.2.5 Performance Over Reporting Period

The results of the 2020/21 analyte loads study have been assessed against the analytes load Trigger Action Response Plan (TARP) from MRM's Adaptive Management Plan. Table 4.4 shows the analyte loads TARP from the Adaptive Management Plan.

Based on the estimated managed release loads (see Section 4.2.4), the total zinc and lead loads released during the 2020/21 reporting period were less than 90% of the annual defined limit (the 2017/18 managed release loads). Hence, the analyte loads TARP remained in Level 1 for the duration of the 2020/21 reporting period. MRM have met the Level 1 monitoring and reporting requirements of the analyte loads TARP.

Table 4.4 – Analyte loads TARP

Environmental objective	Performance indicator	Monitoring site(s)	Parameters	Frequency/ sample size	Analysis/sampling methodology	Level	Triggers	Action/Response
Protect the McArthur River beneficial users and community values from mining impacts	Managed release loads in accordance with VOA total load conditions	Approved Release Points and Authorised Discharge Points in Figure 7 of the Adaptive Management Plan	Total lead and total zinc.	During discharge.	Samples are collected in accordance with MRM's Waste Discharge Procedure PRO-2200035 and WDL 174	Level 1	Load 90% of defined limit or less: Lead: Annual defined limit = 15.8 kg Zinc: Annual defined limit = 3,427 kg	Continue monitoring program. Annual reporting.
						Level 2	Load between 90% and 100% of defined limit.	Cease further managed release. Continue monitoring program. Annual reporting.
						Level 3	Load greater than 100% of defined limit.	Implement Level 3 investigation and response process as detailed in Section 5.1 of the Adaptive Management Plan. Consider potential sources and pathways, which may have contributed to the trigger exceedance. Undertake investigation to determine the performance of the environmental objective considering results from other monitoring programs and historical (Pre-Overburden Management Project) performance. Issue assessment report to DEPWS, DITT within 10 days of assessment completion. Consider implementation of management and contingency measures outlined in Section 6 of the Adaptative Management Plan.

4.2.6 Limitations and Uncertainties

There are a number of uncertainties associated with the calculation of annual analyte loads. The uncertainties associated with the current calculation method of annual analyte loads (outlined in Appendix C) included:

- The daily analyte loads have been estimated by interpolating the available water quality data, with some of the interpolation undertaken over extended periods (spanning several weeks); and
- Water quality values that were listed as below the LOR were assumed to be equal to the LOR value, which will likely overestimate the concentration (and therefore the estimated load). The range of recorded concentrations that were listed as below the LOR at the selected assessment locations is shown in Table C.1.

In addition, there are a number of issues that made it difficult to accurately measure water quality from background sources in the local catchments. These included:

- Impracticality of sampling creeks and rivers during the rising stage, peak and falling stage due to inaccessibility to some sample sites resulting in extended periods with no recorded water quality data. Hence, potential changes in water quality during significant flood events (which is when the majority of loads were transported) may not have been recorded;
- Inherent uncertainty in assuming uniform water quality across the waterway (both vertically and laterally) based on a sample taken at the water edge;
- Contamination and/or analytical error associated with laboratory, processing and testing; and
- Water quality samples were not always taken at the beginning of a significant flow event to capture the 'first flush' of an event, which is when a disproportionate amount of load can occur.

Given the array of inherent uncertainties in the measurement and calculation of annual analyte loads in natural systems, there are a number of limitations in the current assessment. These include:

- There is a naturally high uncertainty in estimating loads in natural systems such as the McArthur River due to their dynamic nature and natural variability. Weekly or even daily water quality measurements may not capture a number of the natural processes that affect water quality during a flow event. Hence, there is a level of uncertainty in the estimated annual analyte loads, particularly for natural surface water reporting locations; and
- It is very difficult to accurately measure every source of water in a dynamic system such as the McArthur River and the Mine to the point that the sum of pre-mine analyte loads and mine derived analyte loads will equal the post-mine loads. As such, it is impossible to achieve an accurate load balance.

5 Glyde River and Emu Creek Flow Volumes

5.1 OVERVIEW

Condition 62 of WDL174-11 requires MRM to provide average weekly flow and calculated volumes for Emu Creek and Glyde River in the annual monitoring report.

5.2 GLYDE RIVER

The water level logger on Glyde River at SW09 began recording water levels during the 2020/21 wet season on 13 November 2020. Water levels were recorded on a sub-daily basis, until the logger failed on 21 February 2021.

Daily streamflow volumes in Gylde River over the period of available data, were estimated using water level data provided by MRM. The adopted SW09 family of rating curves is documented in Appendix A.

Table 5.1 shows the average weekly flow and calculated volumes at SW09 for the period between 13 November 2020 and 21 February 2021. Figure 5.1 shows the recorded daily Glyde River streamflow at SW09, as well as rainfall at MRM Airport.

5.3 EMU CREEK

The water level logger on Emu Creek at SW26 began recording water levels during the 2020/21 wet season on 15 October 2020. Water levels were recorded on a sub-daily basis.

Daily streamflow volumes in Emu Creek over the period of available data, were estimated using water level data provided by MRM. Note that the SW26 water levels were shifted down by 0.9 m to correct for a datum shift that occurred around 15 December 2020. The adopted SW26 family of rating curves is documented in Appendix A.

Table 5.1 shows the average weekly flow and calculated volumes at SW26 for the period between 10 October 2020 and 30 April 2021. Figure 5.1 shows the recorded daily Emu Creek streamflow at SW26, as well as rainfall at MRM Airport.

Table 5.1 – Average weekly flow and calculated volumes for the period 13 November 2020 to 21 February 2021 – Glyde River at SW09

Date range	Duration (days)	Weekly flow (daily averaged) (ML/d)	Weekly flow volume (ML)
1/5/2020-13/11/2020	196	Logger offline	
13/11/2020-20/11/2020	7	0.2	1
20/11/2020-27/11/2020	7	0.0	0
27/11/2020-4/12/2020	7	6,052	42,362
4/12/2020-11/12/2020	7	1,450	10,149
11/12/2020-18/12/2020	7	144	1,005
18/12/2020-25/12/2020	7	46	324
25/12/2020-1/01/2021	7	1.0	7
1/01/2021-8/01/2021	7	2.9	20
8/01/2021-15/01/2021	7	25.36	178
15/01/2021-22/01/2021	7	19,637	137,460
22/01/2021-29/01/2021	7	25,385	177,693
29/01/2021-5/02/2021	7	190	1,330
5/02/2021-12/02/2021	7	1.4	10
12/02/2021-19/02/2021	7	2.4	17
19/02/2021-21/02/2021	2	1.7	3
21/02/2021-1/05/2021	69	Logger offline	

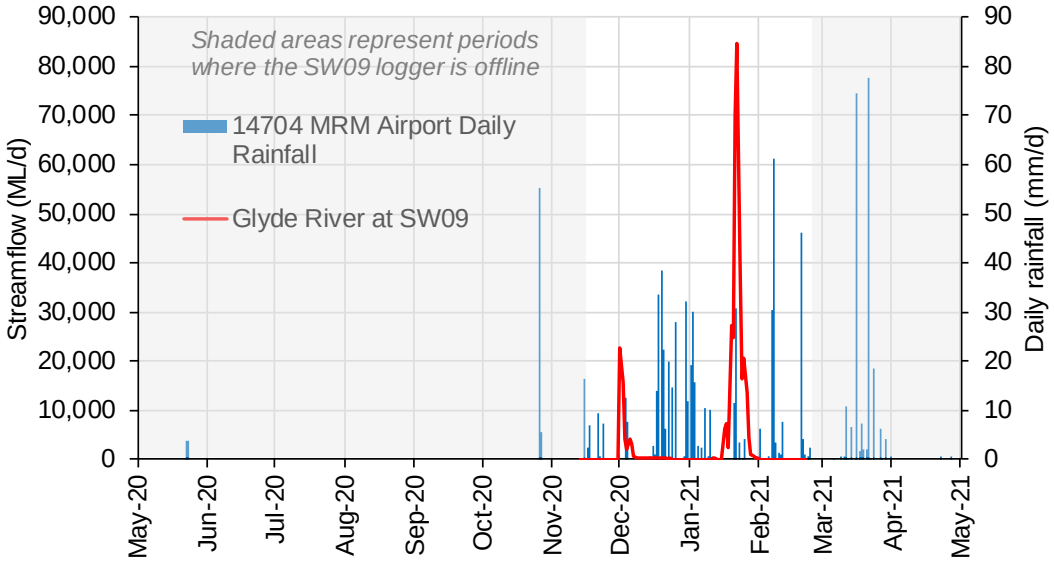

Figure 5.1 – Recorded Glyde River daily streamflows and rainfalls at MRM Airport – 13 November 2020 to 21 February 2021

Table 5.2 – Average weekly flow and calculated volumes for the period 10 October 2020 to 30 April 2021 – Emu Creek at SW26

Date range	Duration (days)	Weekly flow (daily averaged) (ML/d)	Weekly flow volume (ML)
1/5/2020-15/10/2020	167	Logger offline	
15/10/2020-22/10/2020	7	0.1	1
22/10/2020-29/10/2020	7	13.0	91
29/10/2020-5/11/2020	7	1	10
5/11/2020-12/11/2020	7	1	4
12/11/2020-19/11/2020	7	46	321
19/11/2020-26/11/2020	7	4	29
26/11/2020-3/12/2020	7	0.0	0
3/12/2020-10/12/2020	7	0.1	1
10/12/2020-17/12/2020	7	24	170
17/12/2020-24/12/2020	7	8	53
24/12/2020-31/12/2020	7	86	602
31/12/2020-7/01/2021	7	19	130
7/01/2021-14/01/2021	7	4	25
14/01/2021-21/01/2021	7	0	1
21/01/2021-28/01/2021	7	8	55
28/01/2021-4/02/2021	7	0	0
4/02/2021-11/02/2021	7	48	336
11/02/2021-18/02/2021	7	5	32
18/02/2021-25/02/2021	7	11	78
25/02/2021-4/03/2021	7	0	0
4/03/2021-11/03/2021	7	0	0
11/03/2021-18/03/2021	7	1	7
18/03/2021-25/03/2021	7	38	267
25/03/2021-1/04/2021	7	6	41
1/04/2021-8/04/2021	7	0	0
8/04/2021-15/04/2021	7	0	0
15/04/2021-22/04/2021	7	0	0
22/04/2021-30/04/2021	8	0	0

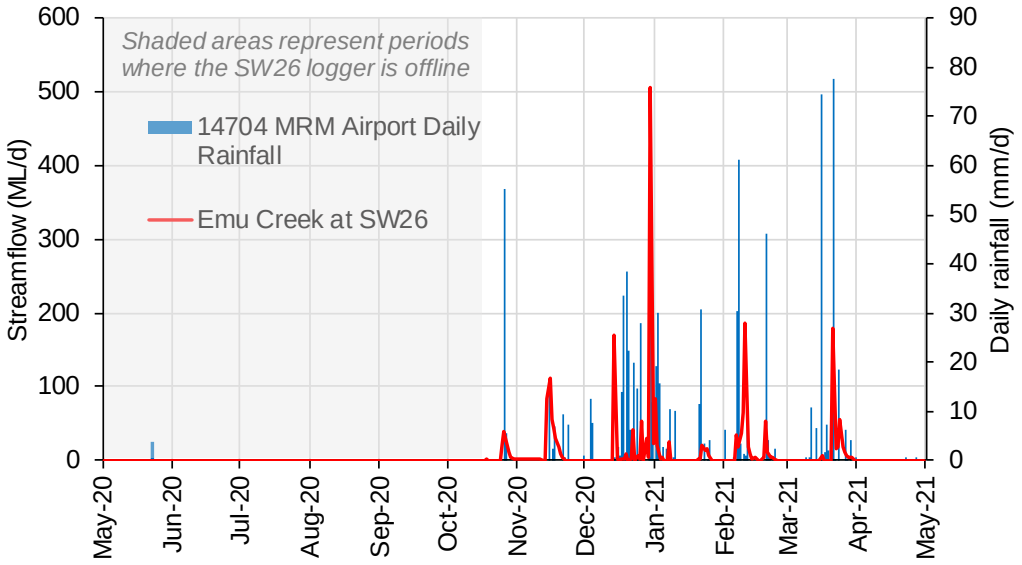

Figure 5.2 – Recorded Emu Creek daily streamflows and rainfalls at MRM Airport – 10 October 2020 to 30 April 2021

6 Summary of Findings and Recommendations

6.1 OVERVIEW

The McArthur River analyte loads were estimated for the 12-month reporting period between 1 May 2020 and 30 April 2021.

6.2 SUMMARY OF FINDINGS

Annual analyte loads for the McArthur River flows were determined using recorded water level and recorded water quality information. The estimated annual loads for analytes are presented in Table 4.1. Key findings of the analyte loads assessment for 2020/21 include:

- Increases in estimated analyte loads due to managed releases from the Mine were generally less than 10% except for sulphate, TDS, manganese (filtered) and thallium (total and filtered). The results show that estimated analyte load increased by more than 870% for sulphate;
- Significant increases in sulphate, TDS, manganese (filtered) and thallium (total and filtered) were mainly due to managed releases via the MLDP and WMD RP;
- The managed release loads estimated for the 2020/21 reporting period were generally lower than those estimated for the 2017/18 reporting period with the notable exceptions of sulphate and TDS; and
- The estimated 2020/21 total lead and total zinc managed release loads are significantly less than the 2017/18 values reported in WRM (2019), triggering a Level 1 TARP per the Adaptive Management Plan.

6.3 RECOMMENDATIONS

This assessment has highlighted the need to obtain accurate, regular flow and water quality data during high flow periods to get reliable load estimates. It is recommended that additional loggers are installed in Emu Creek and Gylde River, should the primary units fail. Additionally, it is recommended that MRM regularly obtain flows gauges of low, medium and high flows at the flow measurement devices to develop accurate flow rating curves at key measurement locations along the McArthur River, Glyde River, Barney Creek, Surprise Creek and Emu Creek.

References

MRM, 2020	*'Adaptive Management Plan – McArthur River Mine'*, McArthur River Mining Pty Ltd, January 2020
WRM, 2020	*'2019/20 Mine Derived Analyte Loads Assessment'*, prepared by WRM Water & Environment Pty Ltd for McArthur River Mine, doc. No. 0790-88-B2, August 2020
WRM, 2020a	*'Hydraulic assessment of the McArthur River at SW11, Glyde River at SW09 and Barney Creek diversion at SW20 water level monitoring stations'*, WRM Water & Environment Pty Ltd for McArthur River Mine, doc. No. 0790-90-B, December 2020
WRM, 2020b	*'Hydraulic assessment of the potential Emu Creek monitoring stations'*, WRM Water & Environment Pty Ltd for McArthur River Mine, doc. No. 0790-78-C, February 2020
WRM, 2019	*'2018/19 Mine Derived Analyte Loads Assessment'*, prepared by WRM Water & Environment Pty Ltd for McArthur River Mine, doc. No. 0790-68-C2, May 2019
WRM, 2019a	'2019/20 Site Water Balance for the McArthur River Mine', Ref. 0790-67-C1, 9 December 2019.
WRM, 2019b	*'2017/18 Mine Derived Analyte Loads Assessment'*, prepared by WRM Water & Environment Pty Ltd for McArthur River Mine, doc. No. 0790-49-D6, 1 February 2019
WRM, 2017	*Surface water impact assessment for the McArthur River Mine Overburden Management Project Environmental Impact Statement, prepared by WRM Water & Environment Pty Ltd, Ref. No. 0790-17-AD3, February 2017.*

Appendix A - Rating Curve Development

A1.1 UPSTREAM GAUGING STATION (M.I.M. PUMP)

The M.I.M. Pump Gauging Station flows for the period between May 2020 to April 2021 were obtained from the Department of Environment Parks and Water Security (DEPWS). The rating curve for this gauging station has been developed by DEPWS.

The pre-mine McArthur River flow volumes were estimated from M.I.M. Pump gauging station data provided by DEPWS.

Figure A.1 shows the DEPWS rating curve and the flow gaugings for the M.I.M. Pump Gauging Station. The flow gaugings ranged from 0.0005 m^3/s to 3008.1 m^3/s between 1970 and 2021 and as such should provide a reasonable estimate of low to high flow conditions in the McArthur River upstream of the Mine.

It is understood that the M.I.M. Pump Gauging Station rating curve adopted by DEPWS was developed prior to the construction of the McArthur River diversion. It is recommended that flow gaugings during medium to high flows are continued to be undertaken to determine whether or not the station has been impacted hydraulically by the diversion and, if necessary, update the rating curve.

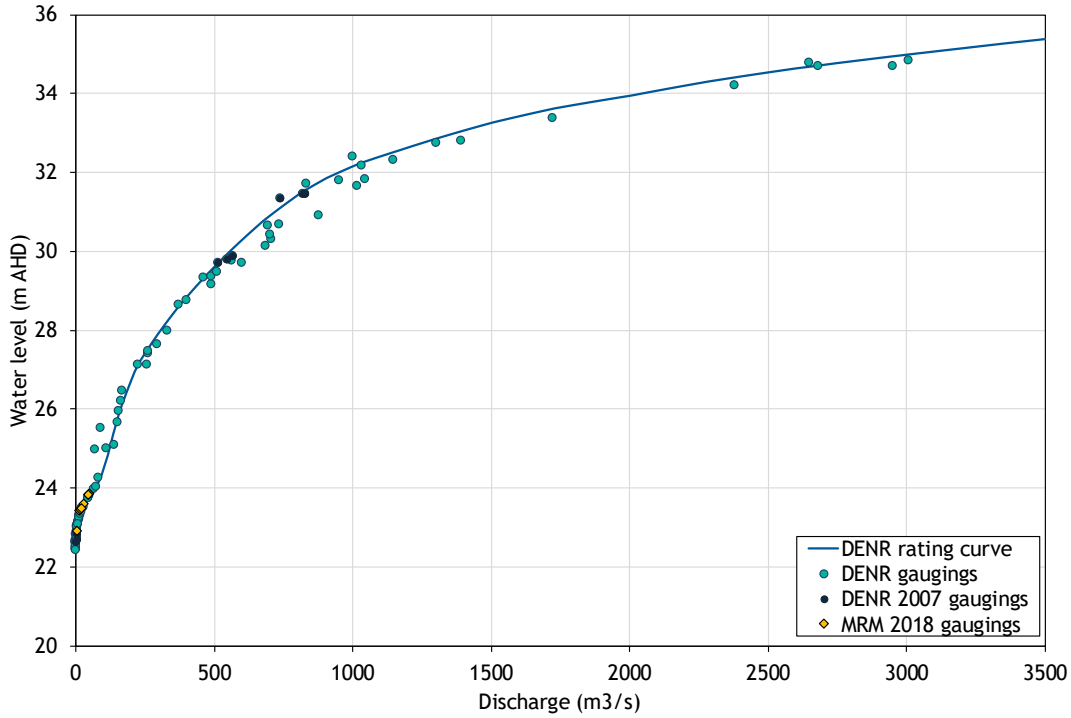

Figure A.1: McArthur River at M.I.M. Pump Station rating curve and flow gaugings

A1.2 DOWNSTREAM GAUGING STATION (SW11)

The Downstream Gauging Station at SW11 rating curve was updated in 2018 based on flow gaugings undertaken by ALS and MRM staff between 20 February and 6 June 2018. The adopted SW11 rating curve cease-to-flow level was 13.525 mAHD. Note that the cease-to-flow level changes from year to year as it is a sand bed-controlled section.

Figure A.2 shows the updated 2020 rating curve and the flow gaugings at SW11. The flow gaugings ranged from 0.305 m^3/s to 43.1 m^3/s and as such should provide a reasonable estimate of low to medium flow conditions in the McArthur River downstream of the Mine. Above the maximum gauged flow, the rating curve has been estimated using the McArthur River HEC RAS hydraulic model that was developed for the Phase 3 and Overburden Management Project Environmental Impact Statements and was updated for this assessment based on LiDAR survey taken in October 2020.

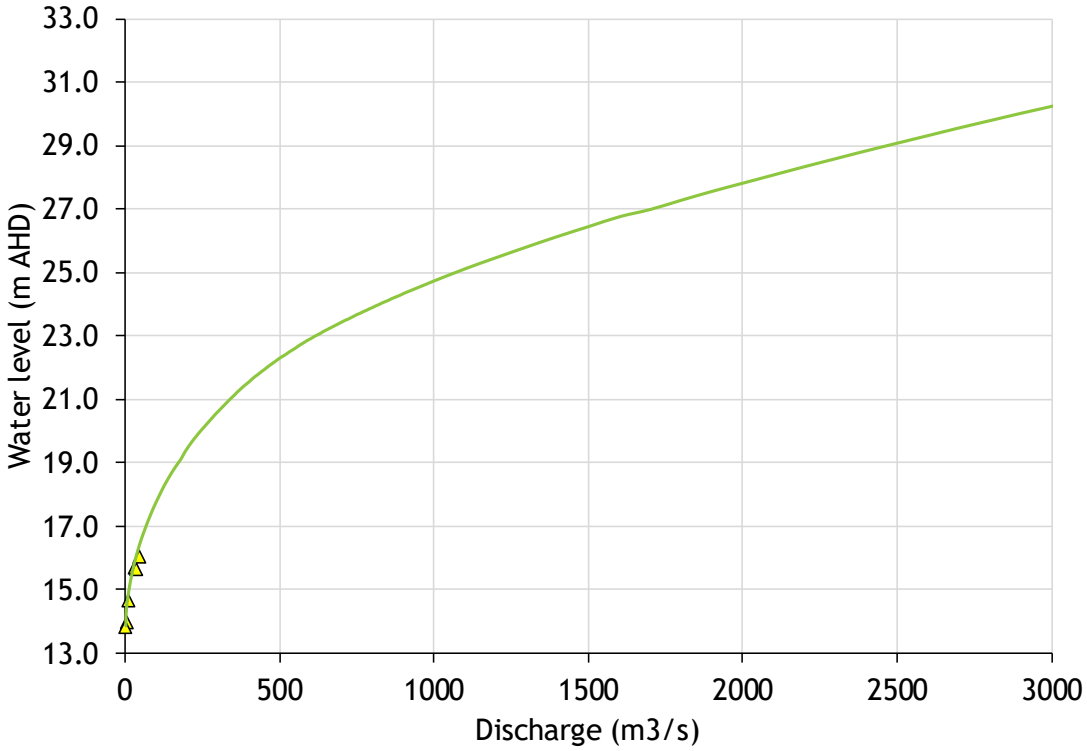

Figure A.2: McArthur River at SW11 rating curve and flow gaugings

A1.3 GLYDE RIVER (SW09)

The development of the Glyde River rating curve is documented in WRM (2020a). The Glyde River at SW09 is influenced by McArthur River tailwater water levels, hence a family of rating curves was developed to reflect this. Figure A.3 shows the modelled water level to discharge rating curves for the Glyde River at SW09 for a range of McArthur River water levels at SW11. The SW09 rating curves are affected by McArthur River flows when the water level at SW11 is greater than approximately 18 mAHD.

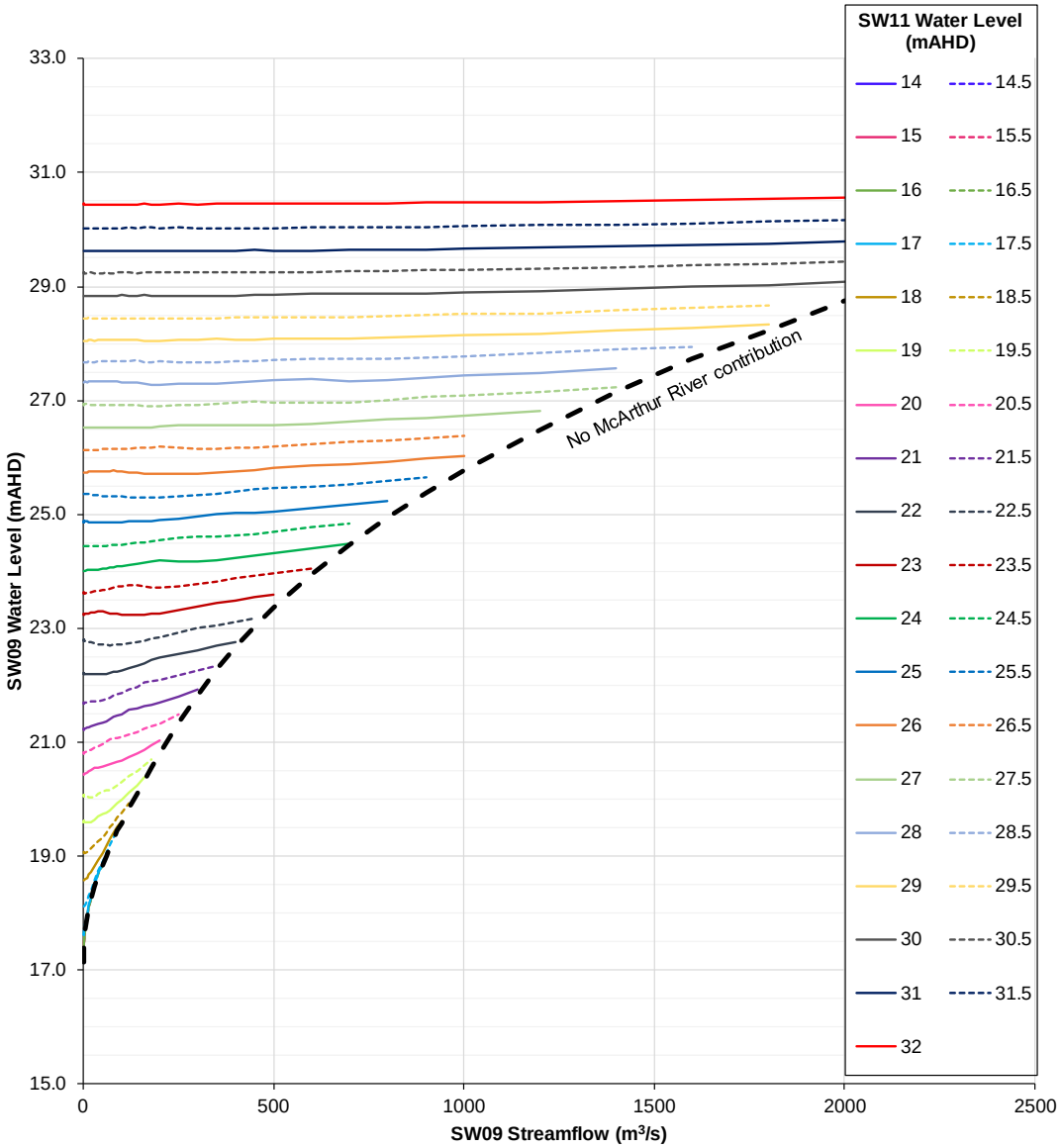

Figure A.3: Glyde River at SW09 rating curve

A1.4 EMU CREEK (SW26)

The development of the Emu Creek rating curve is documented in WRM (2020b). Emu Creek at SW26 is influenced by McArthur River tailwater water levels, hence a family of rating curves was developed to reflect this. Figure A.4 shows the modelled water level to discharge rating curves for Emu Creek at SW26 for a range of McArthur River flows at SW11. The SW26 rating curves are affected by McArthur River flows when the water level at SW11 is greater than approximately 22 mAHD.

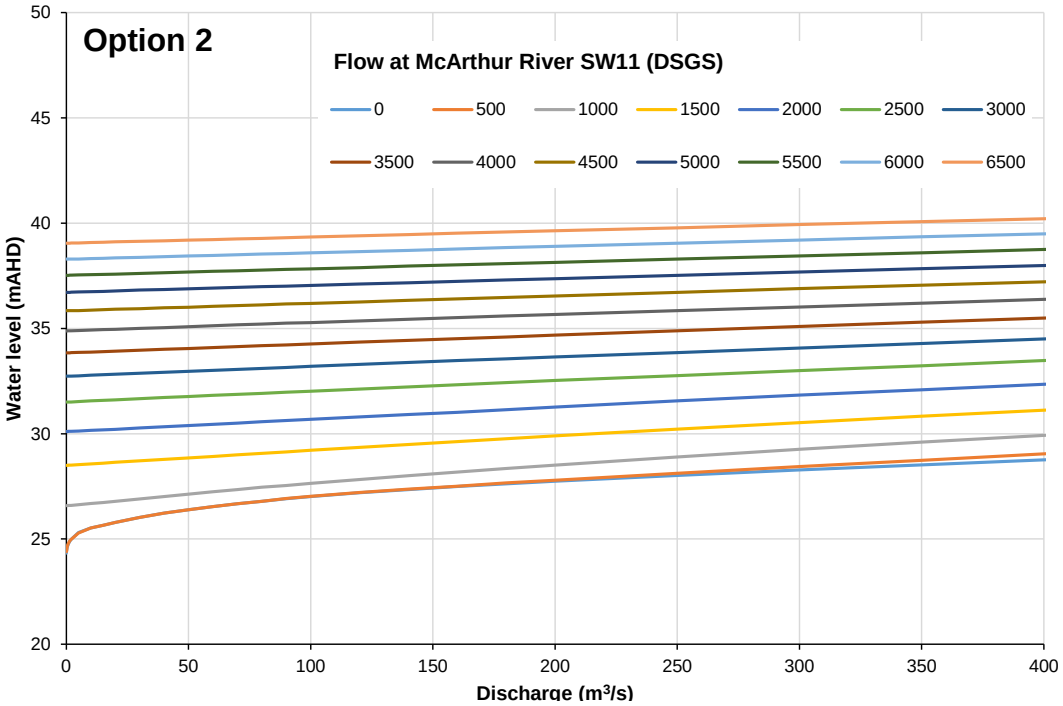

Figure A.4: Emu Creek at SW26 rating curve (from WRM, 2020b)

Appendix B - Estimation of 2020/21 wet season severity

B1.1 OVERVIEW

The severity of the 2020/21 wet season was estimated based on annual McArthur River flow volumes and mine site rainfalls to provide context to the 2020/21 McArthur River analyte loads.

B1.2 WET SEASON SEVERITY

Annual (1 July to 30 June) McArthur River flow volumes recorded at M.I.M. Pump station (obtained from the DEPWS) were used to develop a relationship between flow volume and wet season severity, expressed as an Annual Exceedance Probability (AEP). Figure B.1 shows the ranked annual flow volumes for McArthur River using recorded data for the period between 1969 and 2021 (52 years).

Figure B.2 shows the AEP for an extended flow volume dataset for the period between 1889 and 2021 (132 years). Modelled McArthur River flow volumes were adopted for the period before the M.I.M. Pump gauge was opened (1889-1969). The GOLDSIM model reported in (WRM, 2019a) was used to estimate the McArthur River flow volumes between 1889 and 1969.

Table B.1 summarises the severity of the 2020/21 wet season based on the annual McArthur River flow volumes. Table B.1 also shows the wet season severity based on annual rainfalls recorded at the MRM Airport station (obtained from the SILO Patch Point service). A total rainfall depth of 841.1 mm was recorded during the 2020/21 reporting period. The results suggest that the 2020/21 wet season had:

- an AEP of 48%, based on 52 years of recorded streamflow data (1969 to 2021) at the M.I.M. Pump gauge;
- an AEP of 37%, based on 132 years of extended streamflow data (M.I.M. Pump gauge plus modelled data) (1889 to 2021);
- an AEP of 38%, based on 52 years of SILO Patch Point rainfall data for MRM Airport station (1969 to 2021); and
- an AEP of 26%, based on 132 years of SILO Patch Point rainfall data for MRM Airport station (1889 to 2021).

Notwithstanding this, the McArthur River at SW11 experienced significantly higher flows due to inflows from natural surface waters including the Glyde River.

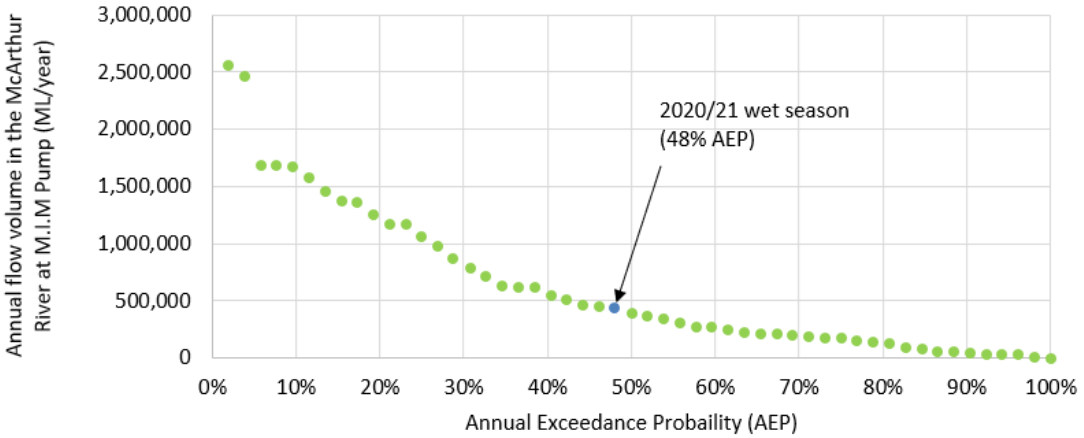

Figure B.1: Wet season severity based on 52 years of recorded flow data (1969-2021)

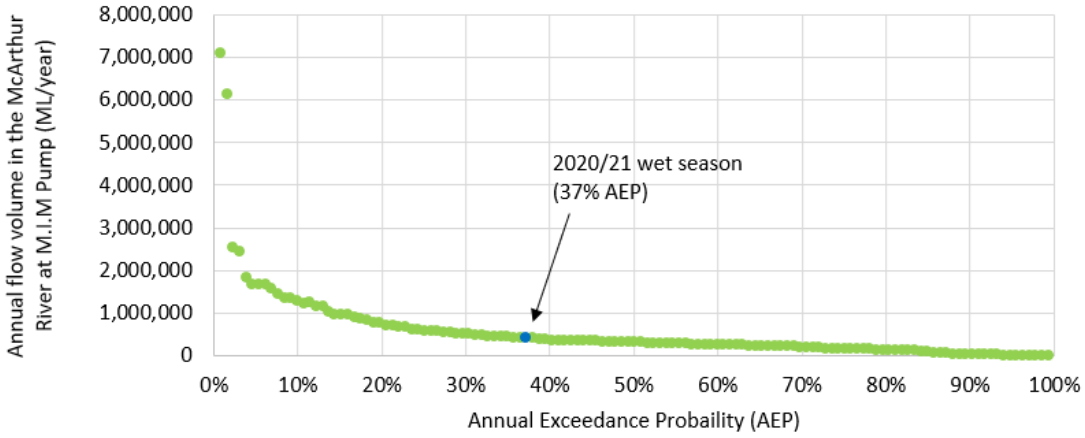

Figure B.2: Wet season severity based on 132 years of modelled and recorded flow data (1889-2021)

Table B.1: Severity of the 2020/21 wet season based on annual McArthur River flow volumes and MRM Airport rainfall data

Description	Estimated wet season severity
AEP based on recorded flow volumes (1969-2021)	48%
AEP based on MRM Airport rainfalls (1969-2021)	38%
AEP based on recorded and modelled flow volumes (1889-2021)	37%
AEP based on extended MRM Airport rainfalls (1889-2021)	26%

Appendix C - Analyte Loads Calculation Methodology

The managed release and McArthur River analyte loads for the 2020/21 reporting period were estimated using the following methodology:

1. Daily surface water volumes:
   a. The managed release daily discharge rates from managed release points were estimated using the data shown in Table 3.2. The daily rates were provided by MRM.
   b. Daily water level data at SW11 was provided by MRM. Water level data was converted to streamflow volumes using the rating curves presented in Appendix A.
   c. Daily streamflow volumes at M.I.M Pump were obtained from the NT Government website.
2. Daily analyte concentrations:
   a. Analyte concentrations were typically recorded on a weekly timestep. Daily concentrations were obtained by linearly interpolating between the recorded data points.
   b. Water quality values that were listed as below the limit of reporting (LOR) were assumed to be equal to the LOR value, which will likely overestimate the concentration (and therefore the estimated load). The ranges of recorded concentrations that were listed as below the LOR for SW21 and SW11 are shown in Table C.1.
3. Annual analyte load estimation:
   a. The annual analyte loads for a given period were estimated by:
      i. multiplying the interpolated daily concentrations by the interpolated daily flows to give an estimated daily load.
      ii. summing the estimated daily loads over the annual reporting period.

Table C.1: Range of recorded concentrations reported at or below the limit of reporting at SW21 and SW11 in the 2020/21 reporting period

Parameters	Limit of reporting
Aluminium_F (µg/L)	5-10
Aluminium_T (µg/L)	N/A
Arsenic_F (µg/L)	0.5-1
Arsenic_T (µg/L)	1
Cadmium_F (µg/L)	0.02-0.2
Cadmium_T (µg/L)	0.02-0.2
Copper_F (µg/L)	1
Copper_T (µg/L)	1
Iron_F (µg/L)	5*
Iron_T (µg/L)	N/A
Lead_F (µg/L)	0.01-1

Parameters	Limit of reporting
Lead_T (µg/L)	1
Manganese_F (µg/L)	0.5-1
Manganese_T (µg/L)	N/A
Mercury_F (µg/L)	0.01-0.1
Mercury_T (µg/L)	0.02-0.1
Nickel_F (µg/L)	1
Nickel_T (µg/L)	1
Zinc_F (µg/L)	0.01-2
Zinc_T (µg/L)	5
Sulphate_F (mg/L)	0.1-1
Nitrate (µg/L)	20-100
Total Dissolved Solids (mg/L)	N/A
Total Suspended Solids (mg/L)	10

N/A – not applicable because measured analyte concentrations did not fall below the limit of detection during the reporting period
* Two instances of a 50 ug/L LoR were reported

Appendix D - Estimated annual flow volumes and analyte loads

Table D.1: Estimated mine water release volumes and analyte loads at each mine water release location for the period 1 May 2020 to 30 April 2021

Parameters	MLDP	SEL1 DP	WMD RP
Total Flow (ML)	711.34	17.99	1,308.36
Aluminium_F (kg)	3.69	0.09	6.99
Aluminium_T (kg)	278.06	0.73	481.26
Arsenic_F (kg)	1.55	0.06	3.00
Arsenic_T (kg)	2.85	0.09	5.39
Boron_F (kg)	385.32	3.34	757.05
Boron_T (kg)	468.84	3.97	836.17
Cadmium_F (kg)	0.17	0.00	0.26
Cadmium_T (kg)	0.17	0.00	0.26
Cobalt_F (kg)	0.75	0.04	1.31
Cobalt_T (kg)	0.85	0.05	1.50
Copper_F (kg)	0.71	0.02	1.31
Copper_T (kg)	0.80	0.03	1.50
Iron_F (kg)	5.28	0.19	9.85
Iron_T (kg)	345.45	1.20	628.10
Lead_F (kg)	0.45	0.01	0.68
Lead_T (kg)	2.79	0.03	4.90
Manganese_F (kg)	337.00	5.48	575.50
Manganese_T (kg)	461.59	6.57	774.05
Mercury_F (kg)	0.01	0.00	0.01
Mercury_T (kg)	0.04	0.00	0.07
Nickel_F (kg)	1.34	0.11	2.46
Nickel_T (kg)	1.70	0.12	3.07
Thallium_F (kg)	17.88	0.05	31.20
Thallium_T (kg)	18.34	0.06	31.84
Zinc_F (kg)	7.98	1.64	8.51
Zinc_T (kg)	22.31	1.76	32.84
Sulphate_F (tonnes)	3,935.55	53.16	7,175.74
Nitrate (kg)	280.38	37.96	419.29
Total Dissolved Solids (tonnes)	6,414.79	93.93	11,715.01
Total Suspended Solids (tonnes)	7.99	0.08	13.92

PO Box 36821 · Winnellie · Northern Territory 0821 · Australia
34a Bishop Street · Stuart Park · Northern Territory 0820 · Australia
Tel +61 8 8975 8179 · Fax +61 8 8975 8170 · Web ww.mcarthurrivermine.com.au
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McArthur River Mining Pty Ltd ABN 90 008 167 815