



Baseline Surface and Groundwater Monitoring Report – Myara North and Holyoake 2020-2023

Alcoa of Australia Limited



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Abbreviations

Abbreviations	Definition
ADWG	Australian Drinking Water Guidelines
ANZG	Australia New Zealand Guidelines
BoM	Bureau of Meteorology
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CDFM	Cumulative Departure from Mean
DE	Development Envelope
DWER	Department of Water and Environmental Regulation
EC	Electrical Conductivity
EPA	Environmental Protection Authority Western Australia
EP Act	Environmental Protection Act 1986
EPBC Act	Environmental Protection and Biodiversity Conservation Act
GDE	Groundwater Dependent Ecosystem
km	Kilometres
LOR	Limit of reporting
MBAS	Methylene Blue Active Substances
mBGL	Metres Below Ground Level
µS/cm	Microsiemens Per Centimetre
mg/L	Milligrams Per Litre
ML	Megalitre
ML1SA	Mineral Lease 1SA
NATA	National Association of Testing Authorities
NTU	Nephelometric Turbidity Units
PAH	Polycyclic Aromatic Hydrocarbons
PFAS	Per- and Polyfluoroalkyl Substances
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling Analysis Quality Plan
TDS	Total Dissolved Solids
TRH	Total Recoverable Hydrocarbons
WIR	Water Information Reporting

1. Introduction

1.1 Proposal background

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery (Refinery) by 5 per cent from 5.0 million tonnes per annum (Mtpa) to 5.25 Mtpa and transition the Huntly Bauxite mine to the proposed Myara North and Holyoake mine regions (the Proposal). The Proposal is located in the Peel region of Western Australia (WA), approximately 100 km south-east of Perth.

The Proposal will be subject to environmental impact assessment under Part IV of the WA *Environmental Protection Act 1986* (EP Act), and the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). The environmental impact assessment will be via a Public Environmental Review (PER).

Alcoa has engaged GHD to prepare the environmental approval documentation and supporting technical studies (the Project) for the Proposal under the EP Act and EPBC Act. The study area includes Myara North and Holyoake mine regions.

A desktop review of historical surface water and groundwater monitoring data was completed to provide a preliminary understanding of hydrological conditions within the Myara North and Holyoake mine regions. A baseline monitoring program commenced in August 2020 to further characterise the baseline surface water and groundwater conditions within the Myara North and Holyoake regions.

1.2 Purpose of this report

This report presents the results and analysis of the baseline monitoring program, including an overview of historical data for the Myara North and Holyoake mine regions, referred together as the survey area.

The report contains the following:

- Baseline monitoring program methodology
- Desktop assessment and summary of baseline monitoring program
- Baseline groundwater level data
- Baseline groundwater quality data
- Baseline surface water flow data
- Baseline surface water quality data

The report is intended to be read in conjunction with the Hydrology and Water Quality Assessment report.

1.3 Scope and limitations

This report: has been prepared by GHD for Alcoa of Australia Limited and may only be used and relied on by Alcoa of Australia Limited for the purpose agreed between GHD and the Alcoa of Australia Limited.

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Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

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2. Methodology

Baseline hydrological data relevant to the survey area comprise a combination of historical and published data collated as part of the desktop assessment, and project specific data collected as part of a baseline monitoring program of the survey area that commenced in August 2020.

2.1 Climate

Western Australia's south west region has a 'Mediterranean' type climate characterised by typically high winter rainfalls and an intense summer drought. A summary of the nearest Bureau of Meteorology (BoM) sites to the survey area is provided in Table 2-1. General climate data is drawn from the Karnet Station which is considered representative of both Myara North and Holyoake, while daily rainfall data is drawn from Jarrahdale or Dwellingup Stations where appropriate.

Table 2-1 Summary of nearest BoM climate stations

BoM Station	Station number	Distance from survey area	Data range
Serpentine Main Dam Station	009115	Within Myara North mine region	1963 to 2016 Rainfall
Jarrahdale	009023	Adjacent Myara North mine region	1907 to 2022 Rainfall
Karnet Station	009111	4 km south of Myara North mine region, 47 km north of Holyoake mine region	1963 to 2022 Rainfall, evaporation and solar radiation data
Dwellingup Station	009538	7 km from Holyoake mine region	1935 to 2022 Rainfall, evaporation and solar radiation data

2.2 Historical data sources

2.2.1 Groundwater levels and groundwater quality

Alcoa has been collating groundwater level and groundwater quality data within Mineral Lease 1SA (ML1SA) since the 1970's. Within the proposed Myara North and Holyoake mine regions this is the main source of available groundwater data, with public datasets not offering as complete a record for groundwater level and groundwater quality.

As further discussed and illustrated in Section 4, there is significantly more groundwater data available for Myara North mine region compared to Holyoake mine region. Within the Myara North mine region, historically available data tends to be concentrated within the eastern area of the mine region. Likewise for Holyoake mine region, where historical data is available, which is somewhat limited, this is also concentrated in the eastern area of the mine region. This tendency of monitoring bores in the eastern area is partly related to a focus of historical monitoring in areas east of the historic 1,100 mm isohyet. Whereas the overall time period of monitoring extends from the mid 1970's, data for specific locations tends to be limited, with monitoring bores often used for a specific project for a limited period of time. In general, groundwater level data is primarily recorded as manually dipped levels, with the monitoring frequencies ranging from weeks to months. Some locations only have spot depth measurements with no valid time series data available. Groundwater quality is predominately for field parameters with an emphasis on recording groundwater salinity. The groundwater quality records are less extensive than the groundwater level records.

2.2.2 Surface water level and flow

The Department of Water and Environmental Regulation (DWER) Water Information Reporting (WIR) database was reviewed to obtain surface water level and flow data relevant to the Myara North and Holyoake mine regions. The DWER WIR database identified that surface water level and flow were historically recorded at several gauging stations within, and in proximity to, the proposed mine regions. Details of the DWER WIR flow gauging stations are summarised in Table 2-2 for Myara North and Table 2-3 for Holyoake.

For the Myara North mine region there is one gauging station that is active and operated by DWER (Vardi Road, downstream of the mine region on Wungong Brook).

For the Holyoake mine region the Baden Powell gauging station located downstream of the mine region on the Murray River is active and operated by DWER, however this station is not representative of the Holyoake mine region with a largely agricultural upstream catchment, and is not considered further. Remaining gauging stations in proximity to Holyoake are inactive. The DWER WIR database identifies one additional gauging station for Holyoake mine region (South Dandalup River – Duncans Road Crossing) however this site has historical water level data for the period 1939 to 1941 only and was not considered further in this assessment.

2.2.3 Surface water quality

Alcoa has been monitoring surface water quality data within ML1SA since the mid 1970's. Historical surface water quality data were also obtained from the DWER WIR database.

As with groundwater data there is significantly more surface water data available for the Myara North mine region and surrounds, compared to the Holyoake mine region.

Water quality data within the Myara North mine region predominantly comprises laboratory measurements of salinity (as total dissolved solids (TDS) and/or electrical conductivity (EC)), turbidity and pH), and within Holyoake mine region comprises EC, turbidity and pH.

Initial screening of historical surface water monitoring data was completed to remove sites with less than 5 data points. DWER salinity data was available as uncompensated EC, with the compensated EC data (at 25 °C) calculated using corresponding temperature data. Within the Holyoake mine region some sites reported turbidity values of <1 NTU, and for the purposes of this assessment these samples were assigned a value of 0.5 NTU to enable inclusion in the summary reporting.

Table 2-2 Gauging stations relevant to Myara North mine region

Site ID	Site name	Flow record	Catchment area	Coordinates	Status
Serpentine Catchment					
614035	River Road	1982 – 1998 2008 - 2019	243 km ²	428739 6409049	Inactive
614031	Jack Rocks	1981 – 1998 2006 - 2016	55 km ²	420689 6417649	Inactive
Wungong Brook Catchment					
616041	Wungong Brook – Vardi Rd	1981-2023	81 km ²	416391 6431738	Active
616124	Wungong Brook – Chandler Rd	2005-2013	18 km ²	418139 6426899	Inactive
616058	Wungong Brook – Cobiac Rd	1992-1997 2005-2016	4 km ²	424727 6423583	Inactive
Note: Alcoa have installed water level loggers at River Road and Jack Rocks in the Serpentine Catchment however data was not available at time of reporting					

Table 2-3 Gauging stations relevant to Holyoake mine region

Site ID	Site name	Flow record	Catchment area	Coordinates	Status
South Dandalup Tributary					
614043	Pindalup	1984-1998	7 km ²	427414 6377918	Inactive
614059	Skeleton Road	1988-1998	19 km ²	420539 6386749	Inactive
614060	Gordon Catchment	1988-2018	2 km ²	430139 6389249	Inactive
Murray River and Tributaries					
614045	Chadoora (Swamp Oak Tributary)	1984-1997	5 km ²	430119 6375398	Inactive
614047	Davis Brook – Murray Valley Plantation (Murray River Tributary)	1954-2002	66 km ²	415689 6375448	Inactive

2.3 Baseline monitoring program summary

A Baseline Hydrology Monitoring Program and Sampling Analysis and Quality Plan (SAQP) (GHD 2020a) was developed for the project. The SAQP documents the development of the baseline monitoring program; the sampling program; and analytical work for the collection and validation of field data and should be read in conjunction with this report. The SAQP is supported by a Surface and Groundwater Installation Report (GHD 2020b).

The key aims of the program were to provide sufficient data on groundwater levels and quality, and surface water flows and quality to characterise the hydrological conditions within the Myara North and Holyoake mine regions. A summary of the monitoring program is provided in Appendix A and outlined in the sections below. The SAQP and Surface and Groundwater Installation Report are included as Appendix M and Appendix N, respectively.

2.3.1 Monitoring locations

Baseline monitoring locations were selected based on review of historical data and site characteristics:

- Groundwater monitoring locations were selected to provide spatial distribution across the Myara North and Holyoake mine regions with new monitoring bores installed to infill gaps in the existing network where required.
- Surface water quality and logger installation locations were selected based on desktop review of historical monitoring data, proposed project activities at the time of monitoring program design, suitability for installation of monitoring equipment (where relevant), representative locations both upstream and downstream of the proposed mining operations.

An overview of the groundwater monitoring locations and surface water quality locations and logger installation locations is provided in Table 2-4. Tables and figures summarising the groundwater and surface water locations are provided in Appendix B.

Table 2-4 Groundwater and surface water monitoring locations

Mine region	Groundwater monitoring*		Surface water monitoring	
	Existing bores	New bores	Surface water grab sample	Surface water logger^
Myara North	7 (25*)	18	20	6
Holyoake	4 (8*)	17	15	3
Note:	* Groundwater monitoring bores where groundwater quality samples were taken. Values in parentheses are total number of bores where groundwater levels were taken			
	^ Surface water logger locations comprised water level logger, and turbidity and/or electrical conductivity logger			

2.3.2 Baseline groundwater monitoring program

As part of the Baseline Hydrology Monitoring Program a groundwater monitoring program was established to determine baseline groundwater conditions across the Myara North and Holyoake mine regions. The following sections provide an overview of the groundwater monitoring program methods.

2.3.2.1 Hydraulic testing

Prior to the first groundwater monitoring round, slug test tests were undertaken on the monitoring bores. Slug tests provide indicative values for hydraulic conductivity. Because the test is influenced only by immediate surroundings of the test bore (and also the gravel-pack or other construction details) its value as indicator of aquifer permeability cannot be compared to data obtained from pumping tests. In this context, the value of slug test data is used as a means of inter-site comparison and spatial variability in hydraulic conductivity.

Slug tests were completed using a rising head method whereby a 'slug' of water is quickly removed from the bore's water column using a plastic one litre bailer, causing an initial drop in water levels and subsequent groundwater level recovery. During the tests groundwater levels were recorded using a data logger set to record levels every 1 second. A summary of the slug tests results is presented in Section 4.

2.3.2.2 Groundwater levels

Groundwater levels were measured monthly in all new groundwater monitoring bores and selected existing bores between August 2020 to February 2023. Groundwater levels were measured using an electronic water level meter prior to collection of all groundwater samples during all groundwater monitoring events.

Groundwater level data loggers were installed at Myara North mine region monitoring bores B12S and B12D (shallow and deep bores). Continuous groundwater level data (hourly) was recorded between October 2020 and February 2023.

2.3.2.3 Groundwater quality

Groundwater quality parameters were recorded monthly in selected groundwater monitoring bores from August 2020 to February 2023. Field measurements were measured using a calibrated water quality meter.

Groundwater quality samples were collected for laboratory analysis during two groundwater monitoring events (GWME) completed in October 2020 and February 2023. The timing of events was aligned to represent the seasonal periods of later winter annual groundwater level maximum, and the late summer groundwater level minimum.

Groundwater monitoring bores were purged prior to collection of groundwater samples to provide a representative sample *in-situ* groundwater. Purging of groundwater monitoring bores was based on AS/NZS 5667.11 – 1998 (Standards Australia 1998), with bores purged until stabilisation of field parameters. Groundwater samples were collected using low density polyethylene tubing coupled to an electric pumping system (high flow submersible pump) or using a bailer, with sampling method dependent on the bore type (i.e. diameter) and pump yield.

The groundwater field and laboratory program are summarised in Table 2-5 . The groundwater suite parameters were selected based on review existing activities within the Myara North and Holyoake mine regions as well as activities that may occur under the Project and identified potential contaminants of concern.

Table 2-5 Groundwater field and laboratory program

Suite	Field Parameters [^]	Laboratory parameters [#]
Groundwater suite	pH, EC, temperature	Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), hydrocarbons, PFAS, explosives
Notes	^ Field parameters measured monthly	
	# Laboratory parameters measured in October 2020 and February 2023.	

2.3.3 Baseline surface water monitoring program

As part of the Baseline Hydrology Monitoring Program a surface water monitoring program was established in August 2020 to determine baseline surface water conditions across the Myara North and Holyoake mine regions.

2.3.3.1 Surface water level and flow duration

Water level loggers were installed at five surface water locations within Myara North mine region and three surface water locations within Holyoake mine region to establish baseline surface water levels and flow duration for representative river reaches.

Surface water logger installation was delayed until mid to late September due to some equipment delays during 2020.

2.3.3.2 Surface water quality

Surface water grab samples were collected from selected surface water monitoring locations when flowing water was present during the monthly surface water monitoring events between August 2020 to November 2022.

The field and laboratory program included an extended field and laboratory parameter suite (SW extended suite) during the wetter months of August, September and October, with a shorter field and laboratory parameter suite collected during the drier months (SW short suite) as summarised in Table 2-6 and Appendix A. The SW extended suite parameters were selected based on review existing activities within the survey area as well as activities that may occur under the Project and identified potential contaminants of concern.

Field measurements for the SW extended suite were measured using a YSI Sonde multiparameter meter. During the SW short suite, the field physico-chemical parameters did not include turbidity, with additional field samples collected for analysis immediately following sampling in the Alcoa laboratory.

Surface water quality monitoring data collected under the current baseline monitoring program were screened and interpreted in accordance with ANZG (2018).

Table 2-6 Surface water field and laboratory program

Suite	Timing	Field parameters	Laboratory parameters
Surface water extended suite	Wetter months (August, September, October 2020)	pH, EC, temperature, turbidity	Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), microbiological, surfactants, hydrocarbons, PFAS, explosives
Surface water short suite	Drier months (November, December 2020, January 2021)	pH, EC, temperature	Physical parameters, major cations, and anions
Surface water field	Two sampling rounds; August to December 2021, August to November 2022.	Temperature, pH, dissolved oxygen, Electrical	

Suite	Timing	Field parameters	Laboratory parameters
		conductivity, and turbidity	
Surface water lab	Two sampling rounds: August to December 2021 and August to November 2022		Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), microbiological

3. Quality assurance and quality control summary

3.1 Framework

3.1.1 Guidelines

The surface water and ground water sampling was undertaken with reference to the following guidelines:

- Australian Standard 5667 (1998 – reconfirmed 2016) Water quality – Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

3.1.2 Assessment criteria

The following assessment criteria were adopted for the baseline assessment:

- Australian Drinking Water Guidelines (ADWG) (NHMRC 2011, Version 3.5)
- PFAS National Environmental Management Plan Version 2.0 (HEPA, 2020). At this stage Version 3.0 is still in draft and has not been adopted.
- Ecological freshwater guidelines at 95% and 99% level of protection (ANZG 2018)
- Upland freshwater criteria for SW Australia (ANZECC 2000).

3.2 Field QA/QC

Field Quality Assurance and Quality Control (QA/QC) procedures and compliance during the investigation are summarised in Table 3-1 with exceptions detailed in the following subsections.

Table 3-1 Summary of field QA/QC compliance

QA/ QC element	Requirement	Adhered to?	Acceptable?
Record keeping	Detailed records of field activities maintained (e.g. standardised field sheets, etc.).	Yes	Yes
Chain of Custody documentation	Completed	Yes	
Equipment calibration	Equipment appropriately calibrated.	Yes. Calibration certificates provided in Appendix C	
Sample labelling	Samples properly labelled (sample ID, date and sample type, preservation techniques, etc.).	Yes	
Sample vessels	Samples collected in appropriate containers with appropriate preservation used.	Yes	
Sample storage and transport	Samples stored in a chilled container immediately after sampling and during transport to the laboratory under chain of custody documentation.	Yes	
Duplicate and split samples	Duplicate samples collected for analysis at a rate of one duplicate sample per 20 primary samples.	Yes 15 duplicate samples 10 rinsate samples	

QA/ QC element	Requirement	Adhered to?	Acceptable?
	Relative percent differences (RPD) between 0-30%.	Yes, with exceptions (see Appendix C)	

3.3 Laboratory QA/QC

Laboratory QA/ QC procedures and compliance during the investigation are summarised in Table 3-2. Analytical methods for all analyses performed are detailed in laboratory analytical certificates provided in Appendix C.

Table 3-2 Summary of laboratory QA/QC compliance

QA/ QC element	Requirement	Adhered to?	Acceptable?
National Association of Testing Authorities (NATA) accreditation	Analysis performed under NATA accreditation.	Yes	Yes
Analytical methodologies	To be relevant with regards to Schedule B(3) of the ASC NEPM.	Yes	
Laboratory limits of reporting (LOR)	Laboratory LORs to be below adopted assessment criteria.	Yes, with exceptions for some dissolved metals ¹	
Sample analysis and extraction holding times	Comply with holding times	Yes, with exceptions (see section 2.4.2)	
Acceptable laboratory QC results/ procedures	Laboratory duplicate sample analysis at the rate of one per ten samples.	Yes	
	Method blanks at the rate of one per 20 samples.	Yes	
	Laboratory control spike recovery analysis at the rate of one per 20 samples.	Yes	
	Matrix spike recovery analysis at the rate of one per 20 samples.	Yes	

3.3.1 General laboratory QA/QC

The following summarises general laboratory QA/QC results, with further detail including summary tables provided in Appendix C:

- Laboratory Control: No laboratory control outliers occur.
- Relative Percentage Difference (RPD): The RPD is a measure of the representativeness of duplicate samples and may be used to identify issues with laboratory analysis or field sampling methods. The acceptable range of RPDs is between 0-50%. This level of reproducibility is generally considered acceptable and could be due to things outside of the laboratory's control like sample or sub-sample variability. RPDs above 50% are routinely investigated to see if there is an underlying quality issue.
 - RPD exceedances for surface water samples and groundwater samples are summarised in Appendix C.
 - Calculated RPD exceedances outside this range correspond with microbial parameters and turbidity for Myara North mine region, and low concentrations of total nitrogen parameters in Holyoake mine region surface water samples.
 - In groundwater samples at both sites RPD exceedances typically correspond with organics and low concentrations of analytes.
 - As a conservative measure, for the RPD exceedances the higher value between the primary and duplicate sample has been utilised in the assessment of results.

¹ ANZG 99% freshwater species protection criteria lower than the LOR for arsenic, boron cadmium, chromium, mercury, nickel, selenium, zinc.

- Laboratory Limits of Reporting (LOR): No LOR values were noted to be above the adopted assessment criteria.
- Laboratory holding times: Holding times were breached for some parameters due to travel time from Site to the laboratory for analysis.
 - pH, with a holding time of 6 hours, was measured in-situ during sample collection, with similar results giving confidence in laboratory results.
 - methylene blue active substances (MBAS) surfactants was not detected in any surface water samples, which is consistent with the location in State Forest.
 - Other breaches occurred due to delayed extraction outside of the holding time. The holding time breaches were considered when interpreting results. Holding time exceedances are summarised in Appendix C. (Table C-5).
- Matrix spikes were carried out to test the potential for contamination of a sample (or samples) during sample collection. Matrix spike recovery was not determined for several analytes during the surface water and ground water sampling events. This is due to the sampled environment and is outside of GHD's and laboratory's control. The matrix spike outliers are outlined in Appendix C.

3.4 Assessment of data quality

A review of field and laboratory QA/QC data and procedures confirms an acceptable level of compliance with the general project requirements as per the guidelines referenced in Section 3.1.1 of this report. While there are minor variations and anomalies the analytical results are considered of an acceptable quality for interpretive use and considered suitable for the purposes of the baseline assessment.

4. Myara North monitoring results

4.1 Baseline monitoring program groundwater results

4.1.1 Hydraulic testing

The AQTESOLV (Software for the design and interpretation of aquifer tests by HydroSOLVE Inc, 2023) outputs, showing the groundwater level recovery data for each monitoring bore, and the resulting calculated hydraulic conductivity are presented in Appendix F. All results were assessed using the Bouwer-Rice (1976) model for a slug test. The results are summarised in Figure 4-1. The following observations are made:

- Broadly, the slug test results showed a relatively close range of hydraulic conductivity values ranging from around 0.1 to 1.2 m/d (excluding outliers). This is consistent with values for a clayey sand/fine grained sand.
- The highest hydraulic conductivities align with those bores that had the greatest air lift yields. Bores such as B11, B12 and B17 are all screened in the basement saprock units where gravel rich basal saprock was present. Those sites with lower hydraulic conductivities align with screened units with less courser gravels and more clay dominant. There is no discernible spatial relationship between the bore's location and its hydraulic conductivity.

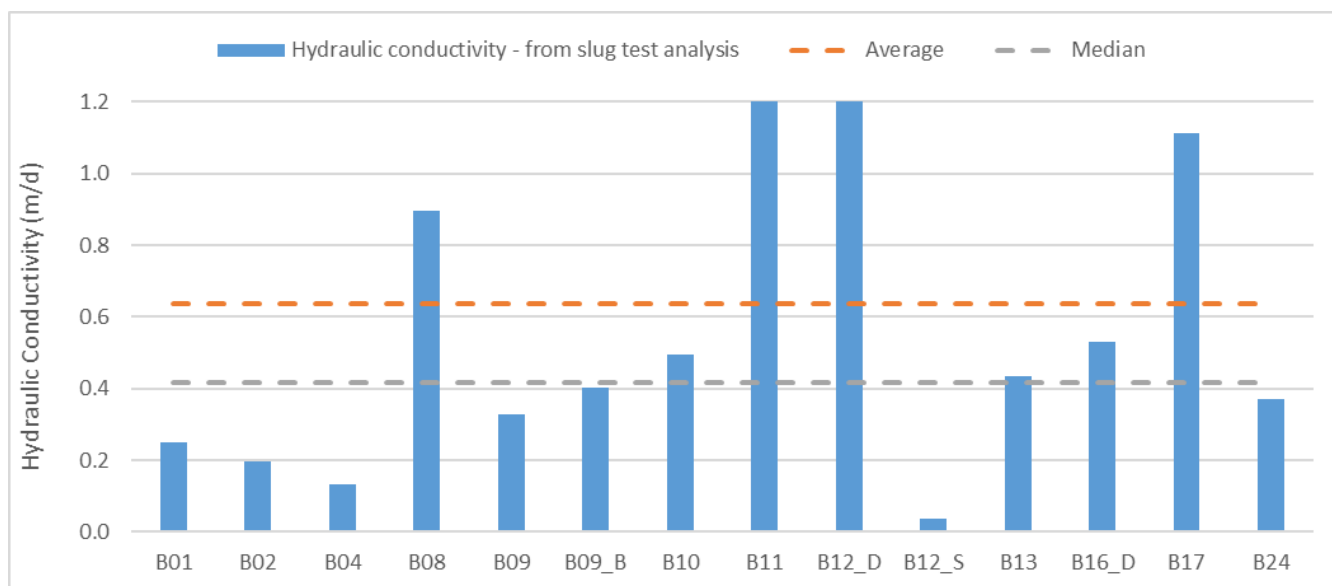


Figure 4-1 Myara North slug test results (hydraulic conductivity)

4.1.2 Groundwater levels – Long term monitoring

As noted in Section 2.2.1, groundwater levels have been recorded in the Myara North region for some monitoring bores since the 1970's. A spatially representative selection of historical monitoring bores were identified (i.e. they could be found in the field and were still useable) for existing monitoring. The location of these monitoring bores is shown on Figure B-7-1.

The distribution of long term monitoring bores has historically been focused on specific Alcoa project areas. These had a tendency to be in the east of the Myara North mine region. As such, the following observations generally apply to the eastern areas only. Groundwater level hydrographs for these bores are presented in Appendix J. The hydrographs include Rainfall data presented as 'Cumulative Departure from the Mean' (CDFM). This allows comparison of groundwater levels to changes in rainfall. The following provides a summary of the key observations from the Myara North hydrographs:

- The bores presented for Myara North in Appendix J have sufficient frequency of historical monitoring data to assess seasonal variation. This shows that the majority of bores show a typical strong seasonal variation, with groundwater levels typically varying by 1 to 5 metres over an annual cycle.

- Monitoring bores that have a relatively greater depth to groundwater (i.e. more than 10 m) have a tendency to have a less significant seasonal variation.
- The majority of the bores show a significant reduction in groundwater levels over their monitoring period. Most of the bores presented have monitoring data over a period from the early 1990's. As shown on the graphs, this represents a period of relatively high rainfall, with rainfall then decreasing from this point forward. The reduction in rainfall is well mirrored by the trends in decreasing groundwater levels. This has resulted in levels recorded in 2020-2021 being up to 10 m lower than levels in the early 1990's.
- All bores with time series in the 1990's and the most recent monitoring have observed groundwater level declines. There does not appear to be a particular spatial relationship to the ranges of groundwater level decline, however the largest groundwater level declines are generally noted in bores where the 1990's depth to groundwater is 10 m or more. This is illustrated by the data presented in Figure 4-2 which plots the depths to groundwater in 2020 against the decline in groundwater levels over the period 1990 to 2020. The data shows that the greatest levels of groundwater decline are found in bores with the greatest depth to groundwater.
- Specific examples highlighting the groundwater level decline include the following (refer to the hydrographs in Appendix J for illustrations of these trends):
 - MK40191A recorded monthly to bi-monthly data between 1991 and 2009, showing a seasonal range of around 2 m and a general decline in levels from 0-2 metres in in the mid 1990's, to 2-6 mBGL in the early 2000's and then measuring around 8 mBGL during the monitoring completed for this program (2020-2021).
 - There is less data for MK40182A with comparison to MK40191A, but the data also shows levels reducing consistently from less than 5 mBGL in the late 1990's to over 15 mBGL for the last 6 rounds of monitoring in 2020-2021
- Bores MK37171A, MK40182A, MK40191A and MK40261A have limited data from the late 1970's. This coincides with a period of increasing rainfall (as demonstrated by the CDFM plots), and a rise in groundwater levels is generally seen to coincide with this increase in rainfall. All four of these sites recorded groundwater peaks in the late 1980's/early 1990's that have since reduced by several metres.

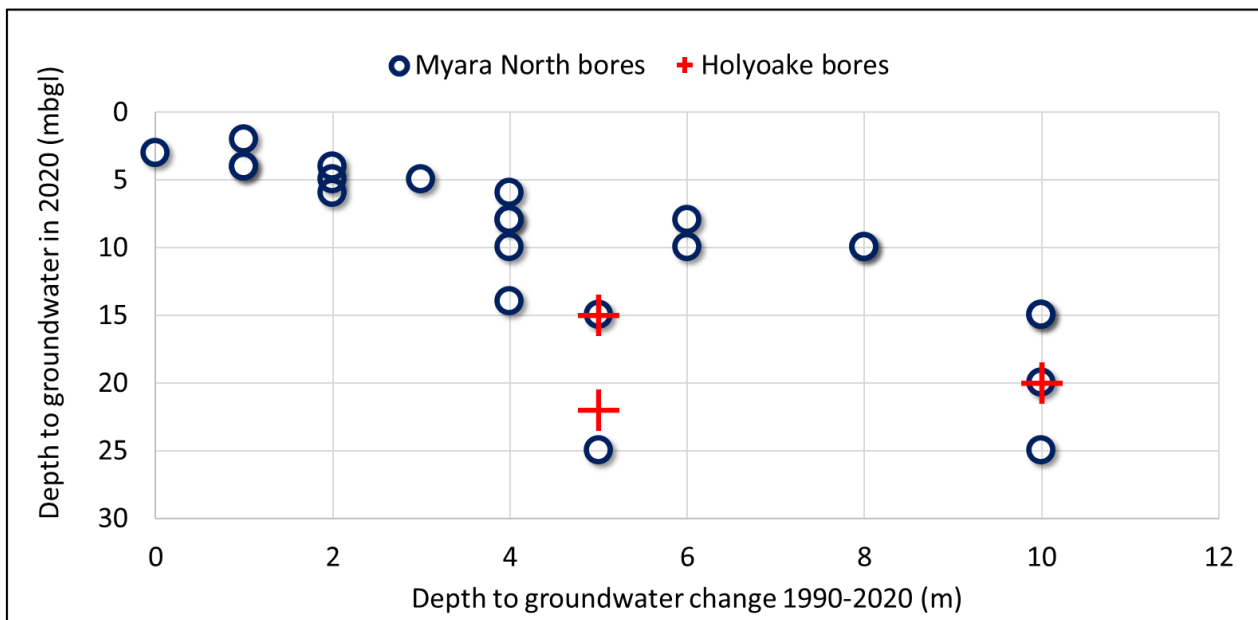


Figure 4-2 Groundwater level change and bore depth

4.1.3 Groundwater levels – New monitoring sites

New groundwater monitoring bores were installed at 16 locations, as detailed in the installation report (GHD, 2020b). The location of the monitoring bores (Figure B-7-1) was selected to provide site wide coverage of groundwater conditions, and as the eastern side of the Myara North project area already had a significant

groundwater monitoring network, the distribution of the new monitoring bores was generally more focused on the central and western areas of the Myara North project area.

As noted in Section 2, groundwater levels for the new monitoring bores were recorded on a nominal monthly frequency between October 2020 and February 2023. Hydrographs for this monitoring period are presented as Appendix K, which also includes the field TDS data.

The groundwater level data for the new monitoring bores indicates the following:

- Groundwater is generally shallow (<10 mBGL) at the majority of monitoring sites. The only sites where groundwater is measured at depths of more than 10 m is in the far south (B02, B03 and B04), and B10 in the far east of the mine region.
- Groundwater levels are generally seen to reduce over the monitoring period (September 2020 to February 2023), consistent with a seasonal change from late winter groundwater highs to summer groundwater lows. The reduction in groundwater levels resulted in the drying out of five of the monitoring bores. Of these, two (B12S and B16S) are shallow screened bores. These bores were installed to represent the perched or upper groundwater unit. At these locations the adjacent deep bore also records a reducing groundwater level but did not dry out. Bores B01, B09, B18 also dry out during the summer monitoring, however these bores are installed just above the basement rock, indicating the absence of a saturated profile in these areas during summer periods.
- The average seasonal groundwater level decline for all new bores is 1.9 m, with over 3.5 m range recorded in four bores (B01, B12D, B13, B18, B24). The least seasonal variation is seen in bores B02, B03 and B04 which are also the three bores with the deepest depth to groundwater.

4.1.4 Groundwater levels – Continuous data

Groundwater level data loggers installed at monitoring bores B12S (shallow bore) and B12D (deep bore) highlight the reduction in groundwater levels between the end of the winter and the summer (see Figure 4-3). For the deep bore, screened from 18.5 m to 24.5 m below ground level, groundwater levels are seen to reduce by 6 m over the two years of monitoring. The groundwater level in the shallow bore (screened between 0.3 to 3.5 m below ground level) also recedes at the same rate as the deep bore. This results in the bore being recorded as dry from late December onwards i.e. groundwater levels have reduced below the base of the bore screen depths.

The logger data also indicates a slightly confined deeper aquifer with groundwater elevations being marginally higher in the deep bore with comparison to the shallow bore. Both bores show a similar response to rainfall events, with levels seen to rise by up to around 1 m after rainfall events of 10+ mm.

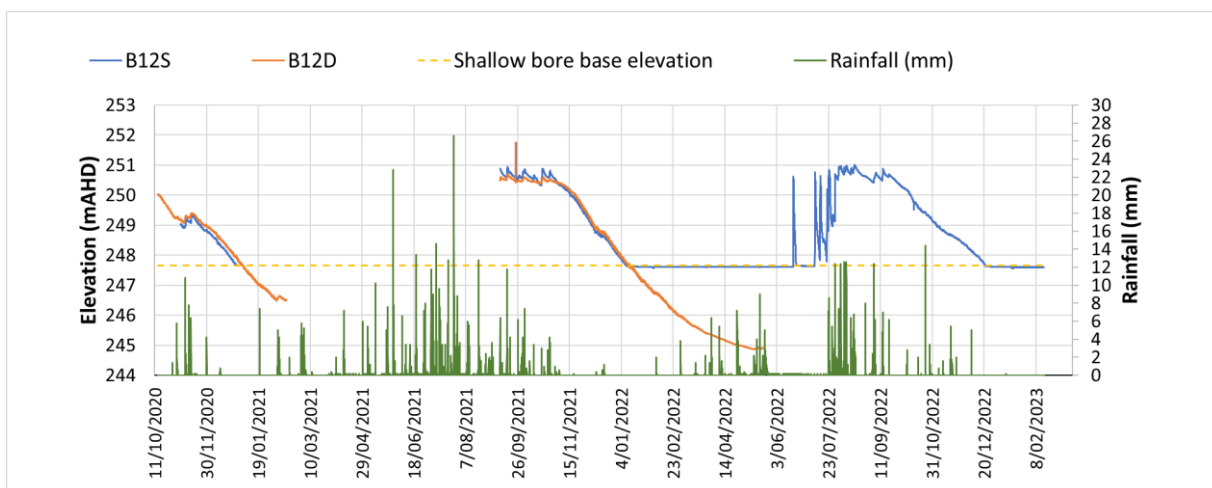


Figure 4-3 B12 groundwater levels (logger data) and rainfall

4.1.5 Groundwater quality - long term monitoring data

Groundwater quality, specifically salinity, is available for most of the historical bores that were monitored in 2020-2023. Review of this data allows some limited assessment of long term groundwater quality changes. The field

salinity (as TDS) is presented on the hydrographs presented in Appendix J. The following observations are made from the historical range of salinity data:

- Long term salinity data is available for 17 of the bores within Myara North (i.e. data available from the 1990's and from recent data). As noted in previous sections, these bores are concentrated in the east of the project area. There is a relatively large range in salinities measured in the 1990's with TDS data in the range of 100 to 2000 mg/L (average of 450 mg/L). Within the limited spatial extent of the data, there does not appear to be a relationship between bore salinity and location with salinity ranges within each catchment being as variable as those between catchments.
- Where there is sufficient data to determine salinity trends between the historical data and contemporary data, the majority (10 out of 17) of bores show a generally stable salinity. Three bores show a defined increase in salinity, whereas four bores show a decrease in salinity albeit with more erratic and/or poor record of data.

4.1.6 Groundwater quality – 2020-2023 sampling data – field data

As detailed in Section 2, groundwater quality field data was collected at existing historical bores, and at the new monitoring bore sites on up to seven sampling rounds between September 2020 and February 2021, October 2022, and February 2023. Of these sampling events, two included more comprehensive monitoring rounds when a full groundwater laboratory suite was analysed. Data for field salinity (as TDS) is included on the hydrographs presented for the new bores in Appendix K. The following observations are made from the new bores field water quality data:

- Groundwater is consistently fresh (< 500 mg/L TDS) for the majority of bores and for the majority of sampling rounds. The average of the maximum salinity per bore is 474 mg/L, compared the average of the minimum salinity per bore of 260 mg/L. Bore B02 is an outlier for salinity, with a TDS of 1500 and 2000 mg/L.
- The graphed data does show some general variation for bore salinity over the monitoring period, however it should be noted that salinity for the October and February sampling rounds were taken after full purging of bore water (Alcoa old bores only, as these are not suitable for low-flow pump sampling), whereas the other sampling records only included limited bore purging using low-flow pump suitable for PFAS sampling.
- Groundwater pH in Myara North is relatively uniform, with an overall field average of 5.3. Recent data for the historical bore subset is consistent with an average pH variation for each bore of less than 0.5. For the new bores the variance is more pronounced, with an average range of 2 pH units. This larger range is possibly related to the influence of bore construction materials (alkaline grouts and cements) and the subsequent stabilisation of groundwater conditions. Therefore, this first set of monitoring data is reflective of the baseline groundwater quality.

4.1.7 Groundwater laboratory results

Groundwater quality analytical results for Myara North are presented in tabular format Appendix L. The tabulated data is presented for the two sampling rounds undertaken in October 2020, February 2021, September 2021, February 2022, October 2022, February 2023. As summarised in Section 2, the sampling rounds included all of the new monitoring bores ("B" prefix) and a selection of existing Alcoa (historical) monitoring bores. The laboratory results are compared to various assessment criteria. The assessment criteria include Australian Drinking Water Guidelines (NHMRC, 2011) including PFAS for drinking water and recreational water and ANZG Freshwater species protection guidelines (ANZG, 2018).

The following observations are made for the two rounds of baseline groundwater data:

- Physical and major ion parameters
 - Laboratory results for pH and salinity/EC are in-line with the field data that has been discussed in the sections above. Groundwater pH is generally uniform with no discernible change between sampling rounds, with an average pH of 5.9. Groundwater EC is generally uniform within and between bores, with an average EC of 575 $\mu\text{S}/\text{cm}$.
 - Two sites are significantly elevated with B02 having an EC of 2700-3020 $\mu\text{S}/\text{cm}$ and J4012-1A having an EC of 3900 $\mu\text{S}/\text{cm}$ (single value only, dry on follow up sampling round). Of note is that B01, within the same catchment as B02 does not show elevated EC/salinity data. J4012-1A is the only active monitoring bore within its catchment.

- The consistent EC and pH is reflected in the alkalinity and major ions, with sites B02 and J4012-1A being the outliers.
- Metals
 - Metal concentrations were below the LOR for all samples for arsenic, beryllium, mercury, selenium and vanadium.
 - Where metal concentrations were detected, they were generally above the ANZG 99% freshwater species protection assessment criteria. This includes metals boron, cadmium, chromium, copper, manganese, nickel and zinc. However, the freshwater assessment criteria are generally at concentrations below the LOR, and given the context only appropriate for a comparative assessment of groundwater conditions.
 - The drinking water assessment criteria for metals was exceeded at two monitoring bores. At B02, Manganese was detected between 1.0 mg/L and 1.63 mg/L, exceeding the 0.5 mg/L criterion. The single sample taken at K4106-1A (dry on subsequent monitoring round) recorded a lead concentration of 0.041 mg/L, exceeding the 0.01 mg/L criterion.
 - In general, the variable metal concentrations are typical of 'natural' conditions and representative of the geological setting.
 - The marginally elevated metal conditions seen at B02 are consistent with other parameters and possibly relates the concentration of metals in this more saline groundwater.
- Nutrients
 - Nutrient concentrations are low and consistent with the land-use type (i.e. lack of applied nutrients or sources). Where assessment criteria are available, all parameters are significantly below the criteria (i.e. an order of magnitude or more). However, B02, B07, B09, B09-B, and B12-S were more than the laboratory limits of reporting (LOR) in Nitrogen (Total) and Phosphorus (Total).
- PFAS –
 - PFAS compounds were below the laboratory limits of reporting (LOR) in all but four locations. In the October 2020 monitoring round PFAS was detected in B12_S (but not B12_D), K4106-1A and K4009-3A. In the February 2021 monitoring round, detections were only observed in K4009-3A and in K4104-1A (no detect in October).
 - All detections were significantly below the drinking water assessment criteria. The maximum Perfluorooctanoic acid (PFOA) concentration was 0.001 µg/L, compared to the assessment criterion of 0.56 µg/L, and the maximum Sum of PFHxS and PFOS concentration detection was 0.0006 µg/L, compared to the assessment criterion of 0.07 µg/L.
- Hydrocarbons:
 - All samples analysed for BTEX compounds returned results less than LOR.
 - All samples analysed for pesticide returned results less than the LOR.
 - With the exception of two samples, all explosive analytes were below the LOR. Very low concentrations of PETN were detected (9 µg/L) in the first round at B07, with the follow up round recording levels less than LOR. Low levels (8 µg/L) were also detected in K4011-1A, but only one sampling round was completed on this bore (dry in the follow up round).
 - TRH was detected at low concentrations in B03, B04, B07, B09, B09B, B17, J3803-4A, K4011-1A, K4106-1A, and L4009-3A. The low levels, and detection in historical monitoring bores suggests possible low levels of cross contamination from sampling sources.
 - PAH was more than LOR in nine samples mostly in October and February 2022 in B02, B03, B04, B09, B012, K4011-1A, K4104-1A, and L4009-3A.

The PAH values were significantly more than the PAH total ADWG Health criterion of 0.01 µg/L. The highest value was recorded at K4104-1A (0.384 µg/L) in February 2022. The presence of high level levels of PAH, and their more numerous detections in the six rounds of monitoring possibly suggests they are related to the drilling activities, or alternatively could be related to sources from bush fires.

4.2 Baseline monitoring program surface water results

4.2.1 Surface water flows – Long term monitoring

The flow gauging stations with historical data relevant to Myara North are summarised in Table 2-2, with large areas of the Myara North mine region having no flow gauging data.

Appendix G presents annual flows and trends in monthly streamflow data over the period of record for these gauging stations. Annual and monthly streamflow data are presented to account for observed step changes in streamflow (post 1975 and post 2000).

Flow seasonality at the River Road and Jack Rocks gauging stations of the Serpentine catchment demonstrates flow is typically observed between June and November. Within the Wungong Brook catchment the smaller catchments in proximity to the Myara North mine region (Chandler Road and Cobiac Road – flow seasonality not shown) typically have flows between July and November, with the larger Vardi Road catchment downstream of the Myara North mine region typically experiencing a slightly longer flow period.

Baseflow is the portion of streamflow that is sustained between precipitation events but also forms part of the flow during rainfall events. Interflow represents lateral movement of water in the unsaturated zone. It is usually considered a component of baseflow, depending on the response time – and in this case in position with respect to the stream.

For the Serpentine catchment, Bari et al. (2010) used a model to estimate that interflow is the largest contributor to streamflow followed by groundwater connected baseflow and surface runoff. This is supported by Kitsios, et al. (2009), who also used a model to estimate that under the current climate, interflow represents 75% of the total Serpentine catchment's streamflow, before transmission and evaporation losses.

Barlow et al. (2014) describes a number of baseflow separation methods, including:

- The HYSEP-Slide method – this method uses a sliding interval of 5-days to draw connecting lines between low points of the streamflow hydrograph.
- The PART method – this method equates baseflow to streamflow on days that are designated as being unaffected by surface runoff or interflow (stormflow), and linearly interpolates between these days to determine baseflow for the remainder of the hydrograph.
- The digital filter method which partitions the streamflow data into 2-day intervals to identify and compared adjacent minimums to determine “turning points”. If 90% of a given minimum (the “turning point test factor”) is less than both adjacent minimums, then that minimum is a turning point.

Data analysis by GHD using methods described by Barlow et al. (2014) for the gauging stations located in the study area indicates that baseflow represents between 45% and 67% of streamflow, depending on location and baseflow separation methodology (Appendix G). The baseflow analysis was undertaken for the full streamflow record, varying between sites, between 1982 and 2018.

For the O'Neil Road station (Big Brook, located to south of Myara North mine region), representing the largest catchment of the Serpentine River and longest record, the baseflow proportion of runoff has a weak downward trend (Appendix G). This contrasts to the prediction by Kitsios, et al., (2009) that future climate change will significantly reduce the volume of baseflow but not the baseflow proportion.

4.2.2 Surface water flows – Baseline monitoring

The flow conditions at surface water sampling locations (Figure B-7-1) were recorded during monthly surface water sampling events. The observed surface water flow conditions across the Myara North mine region are summarised in Table 4-1.

Table 4-1 Myara North summary of surface water sampling event flow conditions

Site	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Aug-22	Nov-22
Wungong Brook													
WG54	D	F	D	D	D	D	F	F	F	F	D	F	F
WG42	D	F	F	D	D	D	F	F	F	D	D	F	D
Gooralong Brook													
GG03	D	F	NF	D	D	D	F	F	F	F	D	F	D
SW06+	F	F+	F	F	F	D	F	F	F	F	D	F	D
Pipehead Dam – minor tributary													
SW05	F	F	F	F	F	F^	F	F	F	F	F	F	F
Serpentine Reservoir – minor tributary													
SW04	D	F	D	D	D	D	F	F	F	U+	D	F	D
39 Mile Brook													
TN34	F	F	F	D	D	D	F	F	F	D	D	F	D
TN01	D	F	D	D	D	D	F	F	F	U+	D	F	D
TN14	F	F	F	F	F	D	F	F	F	U+	F	F	D
SW03	D	F	NF	NF#	D	D	F	F	F	U+	D	F	F
Banksia Gully													
SN01	F	F	F	D	D	D	F	F	F	U+	D	F	D
6141121	D	F	D	D	D	D	F	F	F	U+	D	F	D
Goldmine Gully													
SN02	F	F	F	D	D	D	F	F	F	U+	D	F	F
6141125	F	F	F	D	D	D	F	F	F	U+	D	F	D
Serpentine River – eastern tributaries													
SW02	F	F	F	D	D	D	F	F	F	U+	D	F	D
SN04	D	F	F	F	D	D	F	D	D	D	D	F	NA
SW01	F	F	D	D	D	D	F	F*	F	F	F	F	D
BF04	D	D	D	D	D	D	D	D	D	D	D	D	D
SW07	F	F	D	D	D	D	F	F	F	D	D	F	D
Serpentine River													
SW08	-	F	F	D	D	D	F	F	F	U+	F	-	-

D= Dry, F= Flowing, U= Unknown, NF= Standing water with no flow, “-“ removed from the program, NA= No access
 ^ Upwelling water observed at the sampling site indicating a local groundwater source that was previously unobserved
 # Sites sampled from a disconnected pool of standing water
 + Controlled burns in the area
 * Original location difficult to access, new location sampled downstream from August onwards at E429750 / N 6409823

Surface water level loggers were installed in mid to late September 2020 at selected Myara North surface water monitoring locations. A summary of surface water logger data is provided in **Error! Not a valid bookmark self-reference.**, with logged surface water levels presented in **Error! Reference source not found.** (A-E).

Table 4-2 Myara North surface water logger data summary

Site	Sub-catchment	Installation date	Cease to flow (2020 season)	Cease to flow (2021 season)	Cease to flow (2022 season)
GG03	Gooralong Brook	September 2020	Mid -October 2020	December 2021	November 2022
SW04	Unnamed minor tributary of Serpentine Main Dam		October - 2020	December 2021	October 2022
SW03	39 Mile Brook		October - 2020	November 2021	December 2022
6141121	Banksia Gully		October - 2020	November 2021	September 2022
6141125	Goldmine Gully		November - 2020	November 2021	-

The key trends in the surface water flow data include:

- The observed surface water flows varied across the Myara North mine region with site BF04 (minor tributary into upper Serpentine River) observed to be dry during all sampling events, while site SW05 (minor tributary into Pipehead Dam) with flow observed during all sampling events.
- The summary of observed surface water flow conditions during surface water monitoring events aligns with the observed flow duration at sites with water level loggers installed. Flowing water was present in August preceding logger installation (site 6141125, downstream end of Goldmine Gully). Some logger installation sites that were dry in August prior to logger installation had upstream locations with flowing surface water, including 6141121 at downstream end of Banksia Gully (upstream site SN01 had flowing water present) and SW03 at downstream end of 39 Mile Brook (upstream sites TN14 and TN34 had flowing water present).
- Surface water was present at site SW05 (minor tributary to Serpentine Pipehead Dam) on all monitoring occasions between August 2020 and November 2022. Upwelling of water observed during the January 2021 sampling event inferred the presence of a local groundwater discharge.
- Varying water level response between Myara North sites following installation in mid to late September. Flows in the minor unnamed tributary (SW04) are rapid and flashy. Flows at other locations are more sustained with a gradual decline towards cease to flow ranging from early October in Banksia Gully (6141121) and late October in 39 Mile Brook (SW03).

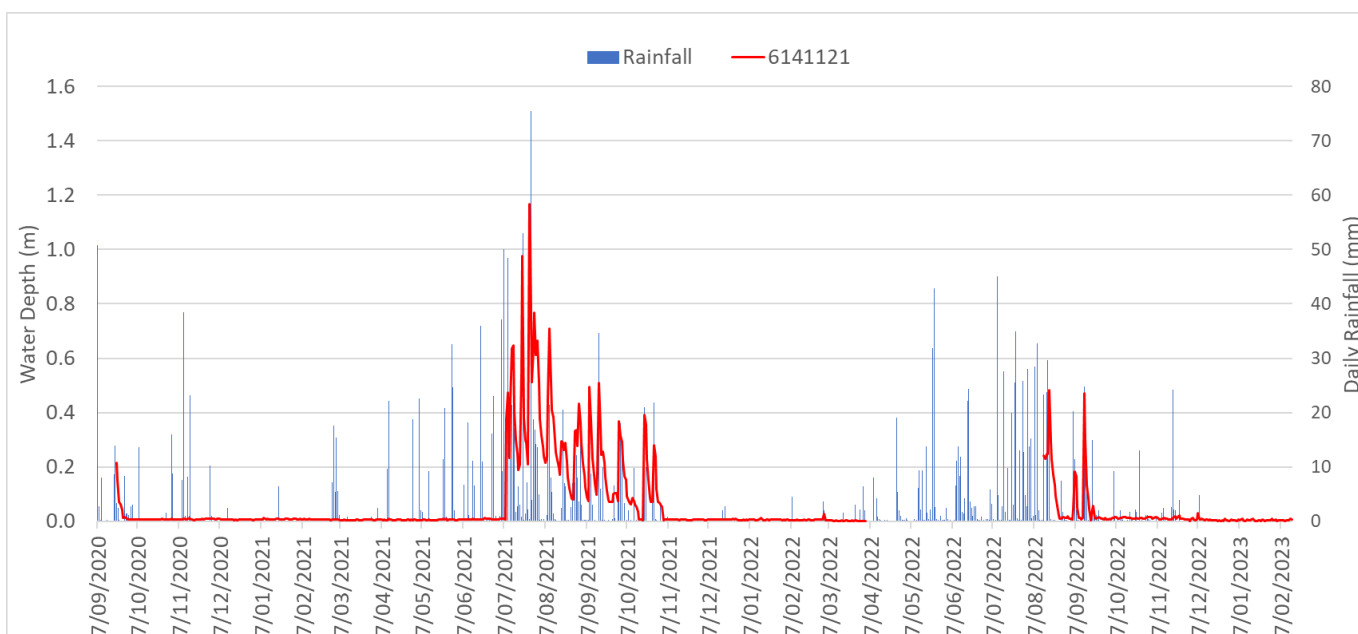


Figure 4-4 Myara North - 6141121 logged water levels (from date of installation) (A)

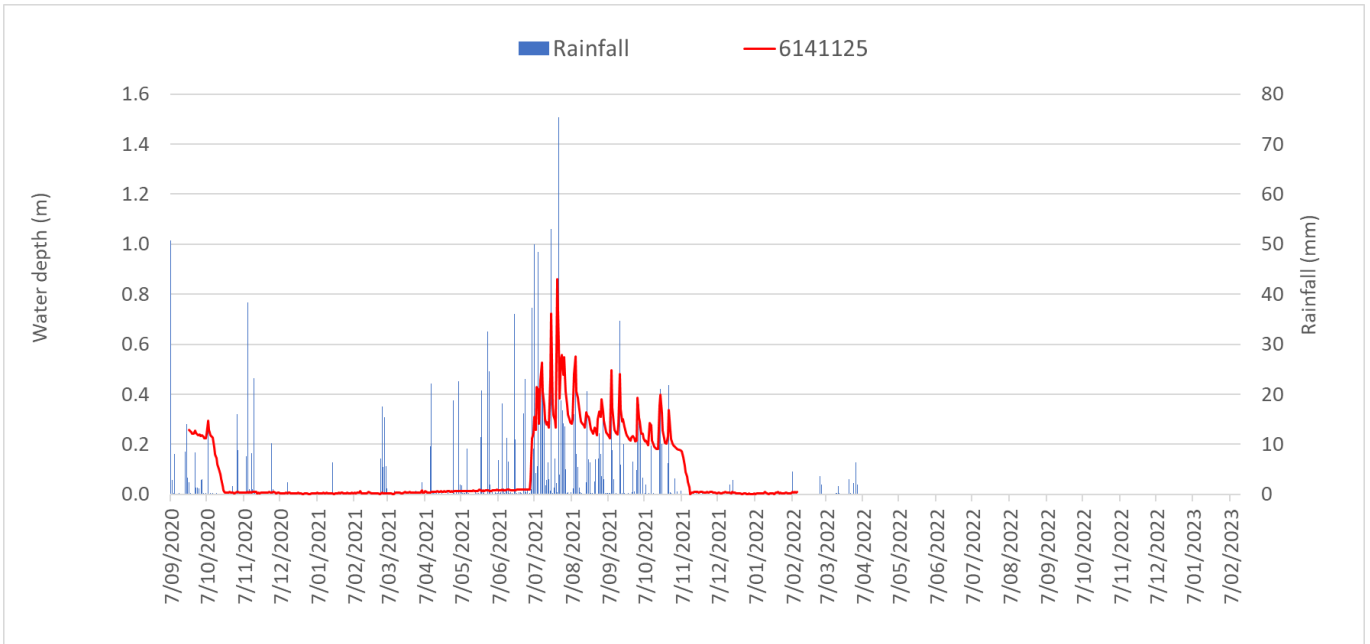


Figure 4-4 Myara North - 6141125 logged water levels (from date of installation to last year's monitoring round) (B)

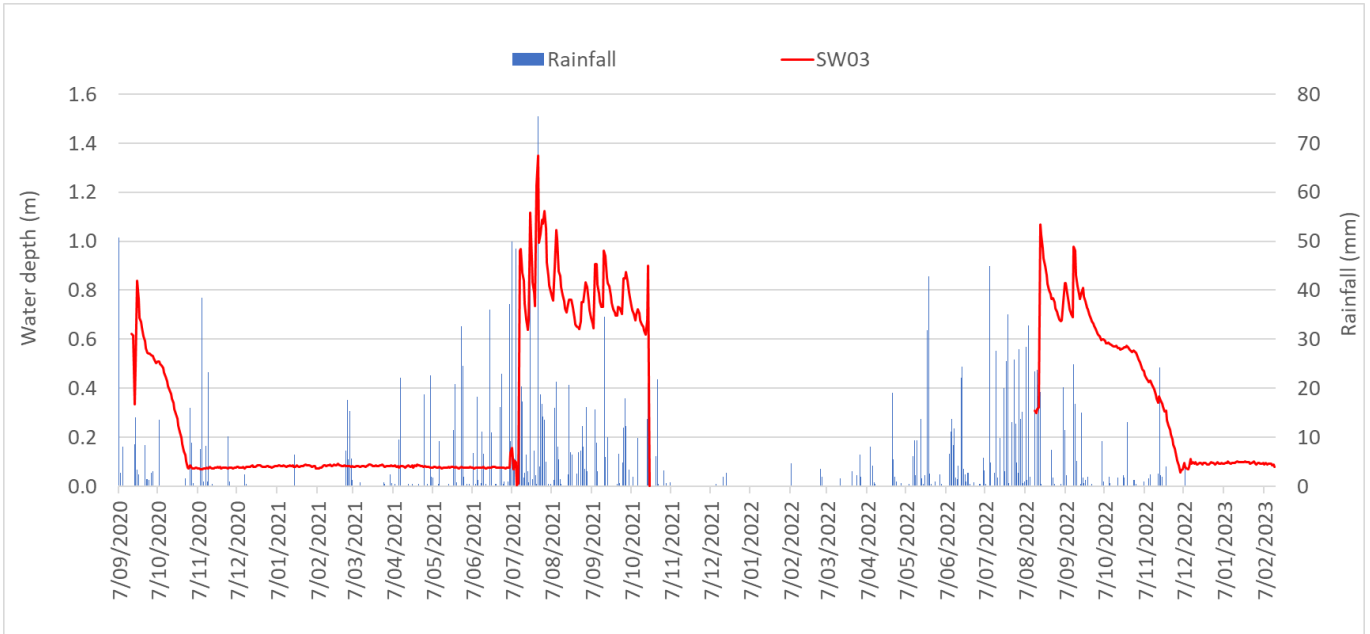


Figure 4-4 Myara North - SW03 logged water levels (from date of installation) (C)

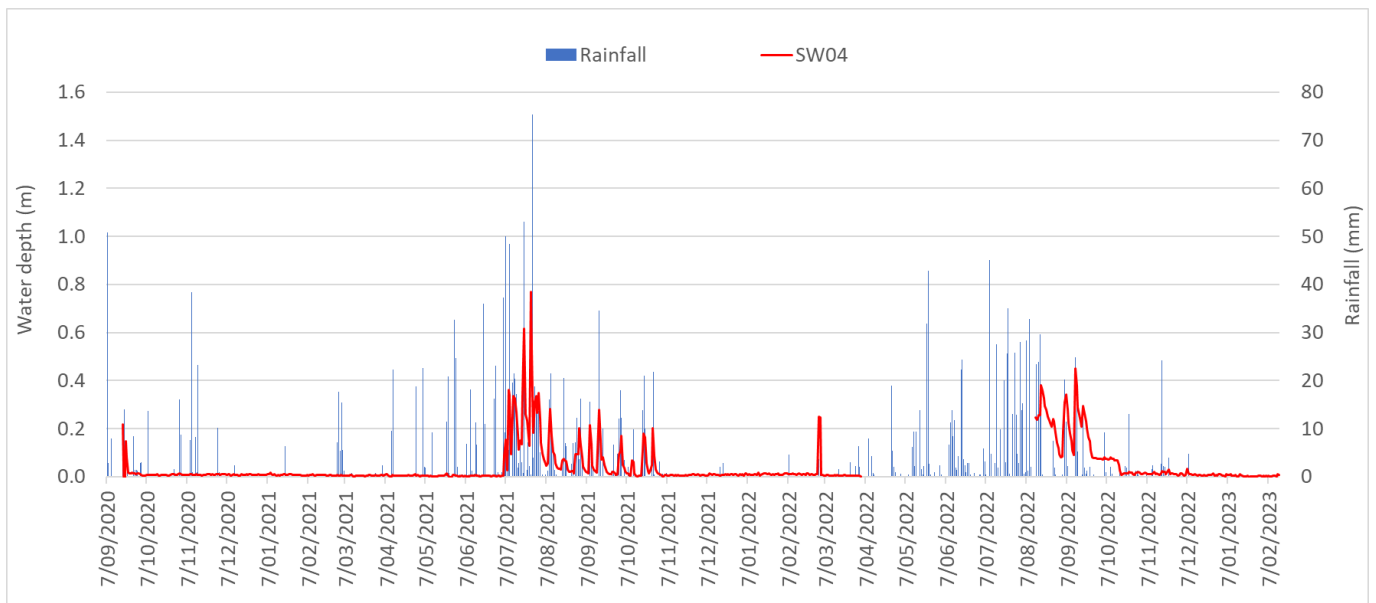


Figure 4-4 Myara North - SW04 logged water levels (from date of installation) (D)

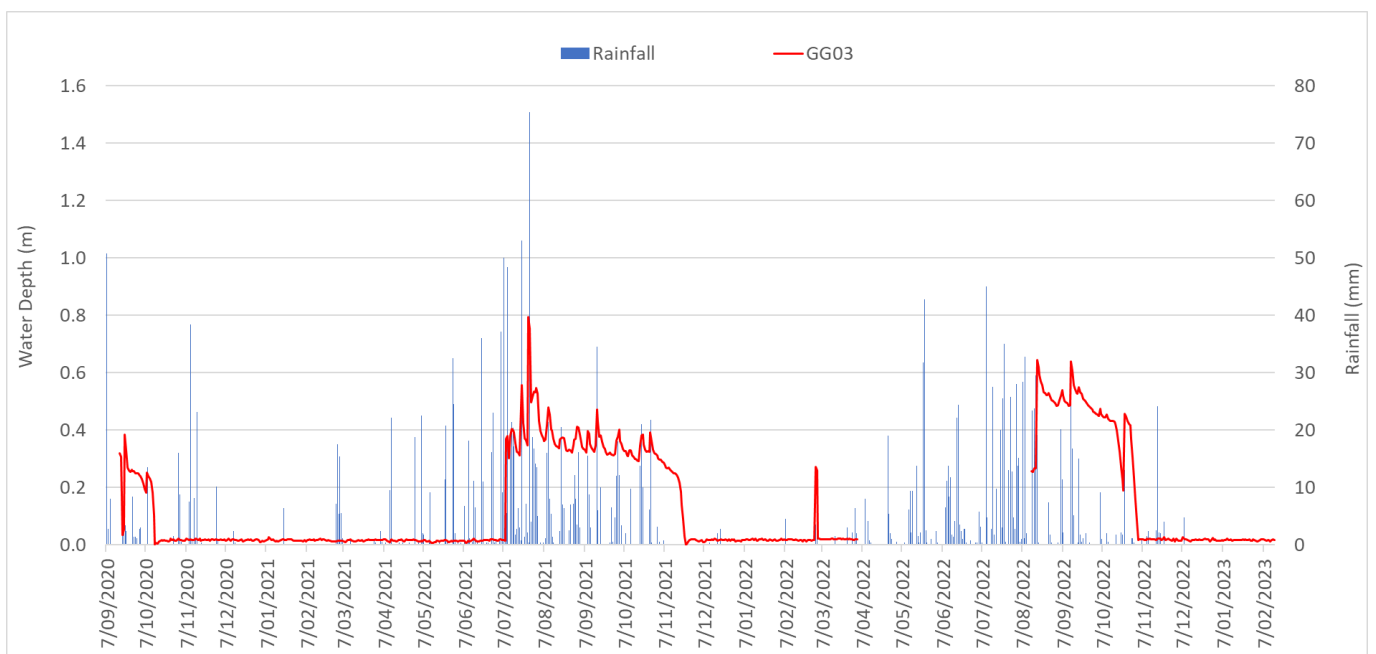


Figure 4-4 Myara North - GG03 logged water levels (from date of installation) (E)

4.2.3 Surface water quality – Long term monitoring

Historical surface water quality monitoring data from Alcoa and DWER were reviewed with summary statistics of key parameters provided in Appendix H. Historical data indicate the following key trends:

- pH data indicates a neutral to moderately acidic pH range (Minimum pH=5 and maximum pH= 8.6).
- Surface water salinity is fresh (80-486 mg/L TDS) in the surface water tributaries.
- EC values identify a similar trend to TDS, with max and minimum of values 137 and 938 $\mu\text{S}/\text{cm}$, respectively.
- Turbidity data for the Myara North mine region indicate that median turbidity is typically below 1 NTU, with occasional values exceeding 25 NTU at some locations on Goralong Brook, 39 Mile Brook and Banksia Gully.

4.2.4 Surface water quality

4.2.4.1 Surface water sampling events

Surface water sampling events were completed monthly between August 2020, January 2021, December 2021, August 2022, and November 2022. Table 2-6 summarises the field and laboratory parameters across sampling events.

4.2.4.2 Surface water field physico-chemical parameters

The physico-chemical parameters measured for surface water are summarised as follows:

- pH: Moderately acidic to neutral conditions across all sites ranging between 5.9 (WG42, August 2022) to 6.73 (SN02 August 2022). The acceptable range of ANZECC 2000 SW Aust is 6.5-8.
- EC: Typically ranged between 115 $\mu\text{S}/\text{cm}$ (6141121, August 2022) and 583 $\mu\text{S}/\text{cm}$ (WG54, October 2021) indicating fresh water.
- Site SN02 is the only exception recording higher salinity in November 2022 with 1801 $\mu\text{S}/\text{cm}$. This is one order of magnitude higher than the reading in August 2022 of 169.9 $\mu\text{S}/\text{cm}$ and all other locations. The August reading is comparable to other locations, but salinity significantly increases with the onset of the summer months at this one location.
- Turbidity: Relatively clear conditions across all sites ranging from <31 NTU (SW02, October) and 10 NTU (SN01, October). Maximum of 43 NTU recorded at site SW03 in October.

4.2.4.3 Surface water laboratory results

A summary of the surface water laboratory results is provided in Appendix M. Key observations from the laboratory results from the baseline sampling program include:

- Physicochemical parameters (all sampling events):
 - pH: With average of 6.7, moderately acidic to neutral conditions across all sites ranging from 5.84 (GG03, September 2021), and 7.51 (SN02 October 2021).
 - EC: Typically ranged between 109 $\mu\text{S}/\text{cm}$ (SN04 and 6141121, August 2022) and 641 $\mu\text{S}/\text{cm}$ (SN02, October 2020) indicating fresh water. An outlier of 2,800 $\mu\text{S}/\text{cm}$ was measured from site SN02 in November 2020 with the sample collected from a standing pool which may indicate evapo-concentration.
 - Turbidity: Relatively clear conditions across all sites ranging from 0.2 NTU (multiple occurrences) to 16 NTU (SN02, November 2022). The observed results are within the observed range of historical turbidity monitoring across the Myara North mine region (Appendix I).
 - Total suspended solids: <5 mg/L across sites for all surface water monitoring events, with the exception of reported values of 6 mg/L (WG54, SN01, September 2020 and 2021), and 76 mg/L (SW05, December 2021).
 - Water hardness: Water hardness was consistently within the soft range (0-60 mg CaCO_3 , ANZG 2018). Marginally higher hardness was reported at site SN02 in October 2020 (76 mg/L CaCO_3)² and November 2020 (363 mg/L CaCO_3)³.
- Metals (extended suite sampling events):
 - Metal concentrations were below the LOR for all samples for arsenic, beryllium, boron, cadmium, chromium, mercury, selenium, vanadium.
 - Where metal concentrations were detected, they were below drinking water guidelines.
 - The ANZG 99% freshwater species protection criteria for zinc was exceeded on two occasions at TN14 (August and October 2020). No other exceedances of the ANZG 95% or 99% freshwater species protection criteria were reported.

² The moderate range hardness factor was applied for the purpose of calculating filtered metals hardness modified trigger values for SN02 samples for October monitoring round.

³ Sample taken from standing pool, laboratory sample for SW short suite.

- In general, the surface water metal concentrations are typical of 'natural' conditions and representative of the geological setting.
- Nutrients (extended suite sampling events):
 - Nutrient concentrations are typically low and consistent with national park land use (i.e. lack of applied nutrients or sources). At the majority of sample sites nutrient concentrations reported less than the LOR or below available criteria.
 - All samples for nitrite-N returned results less than LOR. Ammonia-N returned only one result above LOR, which was 0.07 mg/L at SN02 (November), and was above the assessment criterion of 0.06 mg/L. Nitrate-N was detected in most bores but was not above the assessment criterion at any of the locations.
 - Detections of Nitrogen (total oxidised nitrogen and total nitrogen) below assessment criterion were noted at most locations. Nitrogen (total oxidised) above the assessment criterion (0.2 mg/L) was detected at GG03 (0.69, August) and SW07 (0.32, August). Nitrogen (total) above the assessment criterion (0.45 mg/L) was detected at GG03 (0.9, August), SN02 (0.7, November), and WG54 (0.7, November).
 - Elevated nitrogen parameters (total oxidised nitrogen and total nitrogen) were detected at site GG03, which is the downstream extent of the Gooralong Brook at the Myara North mine region boundary. Gooralong Brook has some small landholdings within the upstream catchment.
 - Nine samples from sites SN02, SW01, SW03, SW04, SW05, SW08, GW54, AND TN34 reported a total phosphorus concentration that marginally exceeded the ANZECC upland rivers default trigger value. Phosphorus (total) returned 6 detects above LOR with four above the assessment criterion of 0.02 mg/L. The four detects were in SN02 (November), SW03 (November), SW05 (November) and WG54 (November) and ranged from 0.03 mg/L to 0.06 mg/L.
- Microbiological (extended suite sampling events):
 - Microbiological parameters enterococci and E. coli were detected at all sampling sites. Widespread detection of microbiological parameters is consistent with the presence of fauna species within the land use setting.
 - E. coli concentrations ranged from < 1 orgs/100mL to 1500 orgs/100mL (site SN02, September, 2021).
 - Enterococci concentrations ranged from < 1 orgs/100mL to 3100 orgs/100mL (site SN02, September, 2021).
- Other potential contaminants of concern (extended suite sampling events):
 - All samples analysed for surfactants returned results less than LOR.
 - All samples analysed for BTEX compounds returned results less than LOR.
 - All samples analysed for total recoverable hydrocarbons compounds returned results less than LOR.
 - All samples analysed for explosives returned results less than LOR.
 - PFAS compounds were below LOR in all but four locations. In the August 2020 monitoring round PFAS was detected at 6141125 and TN34. In the September 2020 monitoring round PFAS was detected at WG42, 6141125 and SW08. All detections were significantly below the drinking water assessment criteria.
 - Samples analysed for pesticides were below the LOR in all but one location. Dieldrin was detected at SW01 (August 2020) with the sample concentration significantly lower than the drinking water assessment criteria.
 - Samples analysed for PAHs were below the LOR in all but one location. At SW06 (October 2020) the Sum of PAHs exceeded the drinking water guideline of 0.01 µg/L with a concentration of 0.039 µg/L comprising predominantly naphthalene. This site was in the catchment of a controlled burn in late September 2020, with the PAH detection possibly related to residual ash, with field notes from October 2020 sampling event note '*surrounding forest still smoking, smell of recent fire*'. Wildfire is a natural source of PAHs, with studies noting that burned soil and wildfire ash report concentrations of PAHs, particularly naphthalene (Choi 2014).

4.2.4.4 Surface water logger quality data

Electrical conductivity logger data

EC for the period of September 2020 (Figure 4-4):

- EC loggers were installed in the lower reaches of two eastern tributaries, Banksia Gully and Goldmine Gully. The logger record at Banksia Gully (site 6141121) was limited to four days due to rapid decline in water levels at this site below the logger installation height. EC during the limited logger record was stable with an average EC of 167.1 $\mu\text{S}/\text{cm}$.
- The logger record for Goldmine Gully (site 6141125) was four weeks with the logged EC steadily rising during this period, ranging between 236.2 and 377.6 $\mu\text{S}/\text{cm}$.

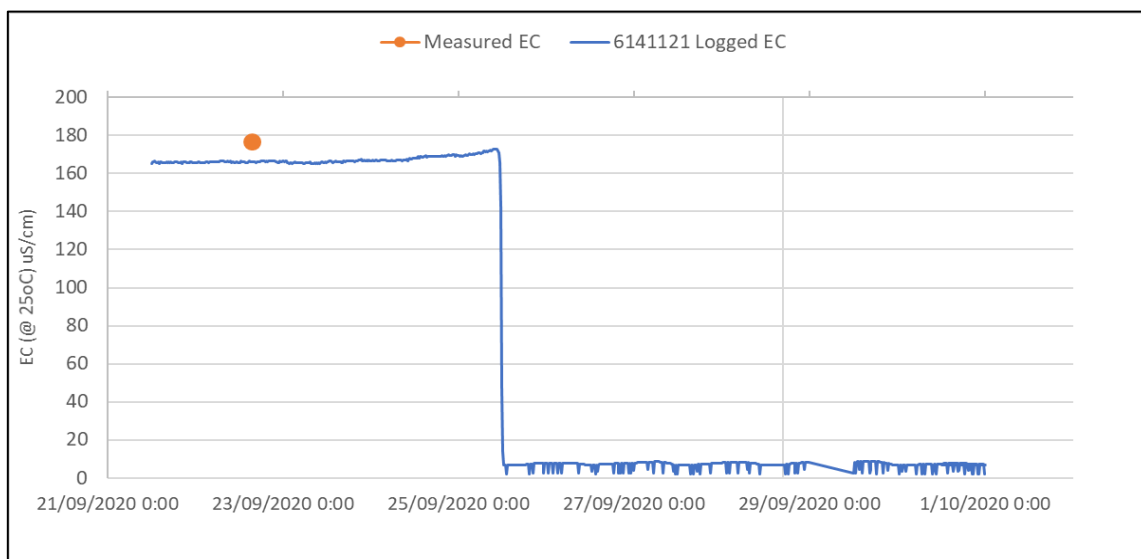


Figure 4-5 Myara North-6141121 logged EC data (A)

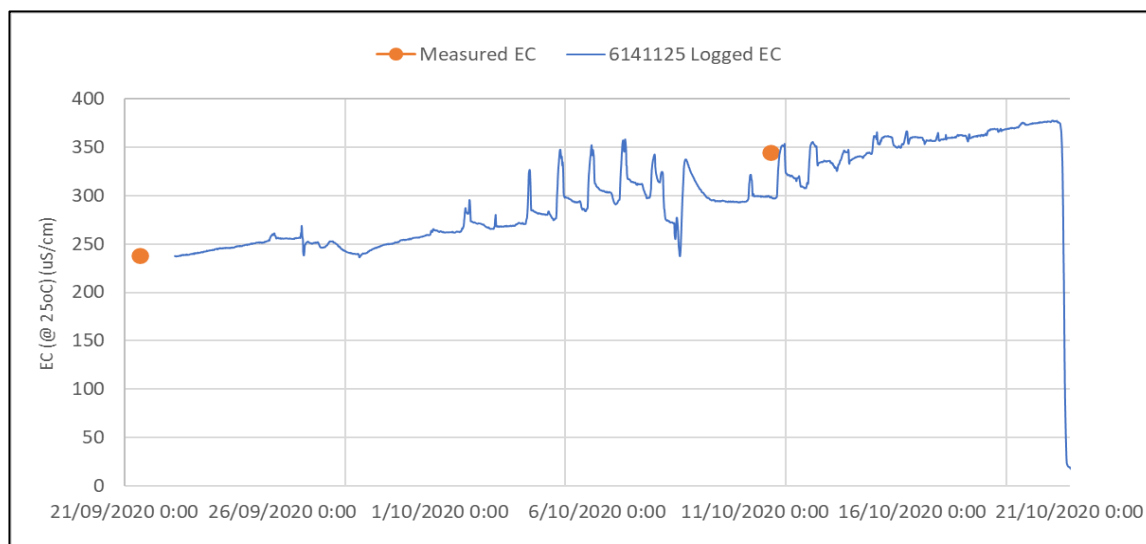


Figure 4-4 Myara North-6141121 logged EC data (B)

EC for the period of July 2021 (**Error! Reference source not found.**)**Error! Reference source not found.**:

- The logger record at Banksia Gully (site 6141121) was between July 2021 and August 2021. EC during the logger record ranged between 50.2 $\mu\text{S}/\text{cm}$ and 201.3 $\mu\text{S}/\text{cm}$.
- The logger record for Goldmine Gully (site 6141125) was four months with the logged EC ranging between 49.5 $\mu\text{S}/\text{cm}$ and 338.66 $\mu\text{S}/\text{cm}$ between July and early October 2021. EC progressively increased to 663.4 $\mu\text{S}/\text{cm}$ in mid-October and then decreased to typical range in late October 2021. If the concentration of

dissolved ions in the soil or water increases during the dry season due to processes like evaporation, the electrical conductivity may increase. This is because ions facilitate the flow of electric current.

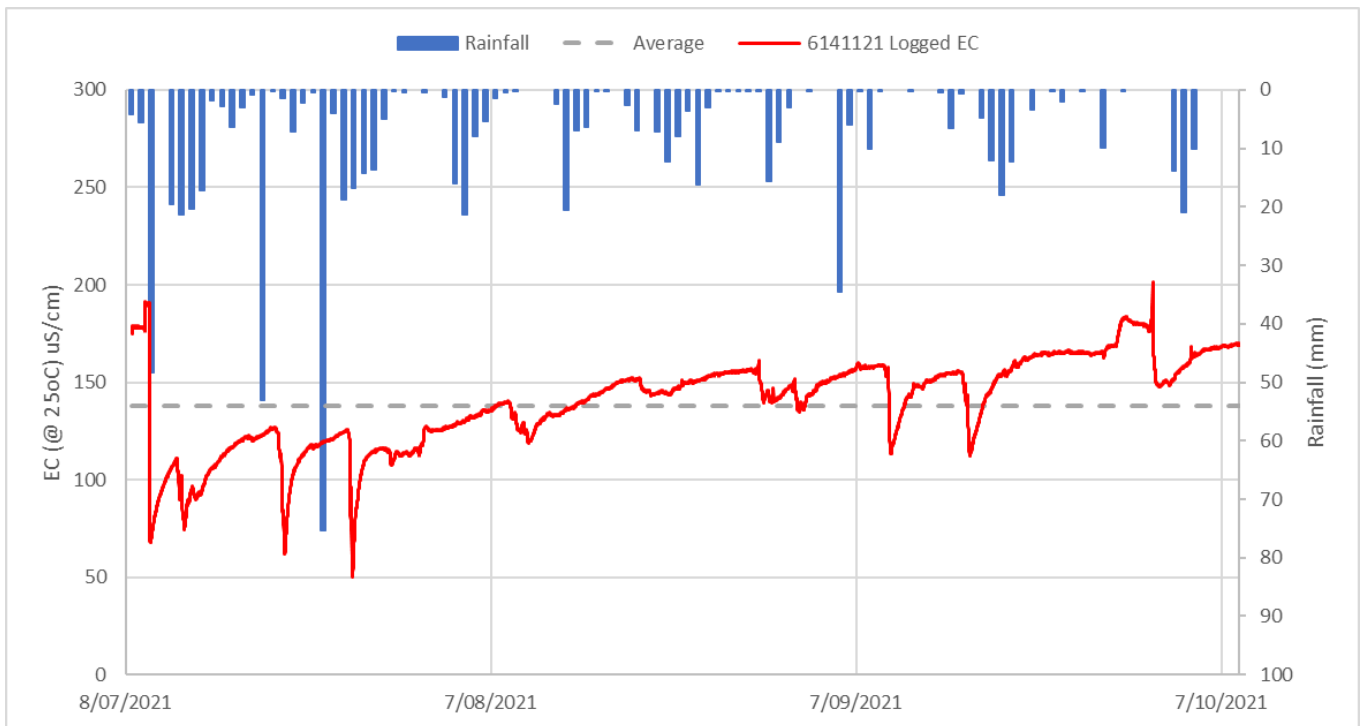


Figure 4-6 Myara North-6141121 logged EC data (2021) (A)

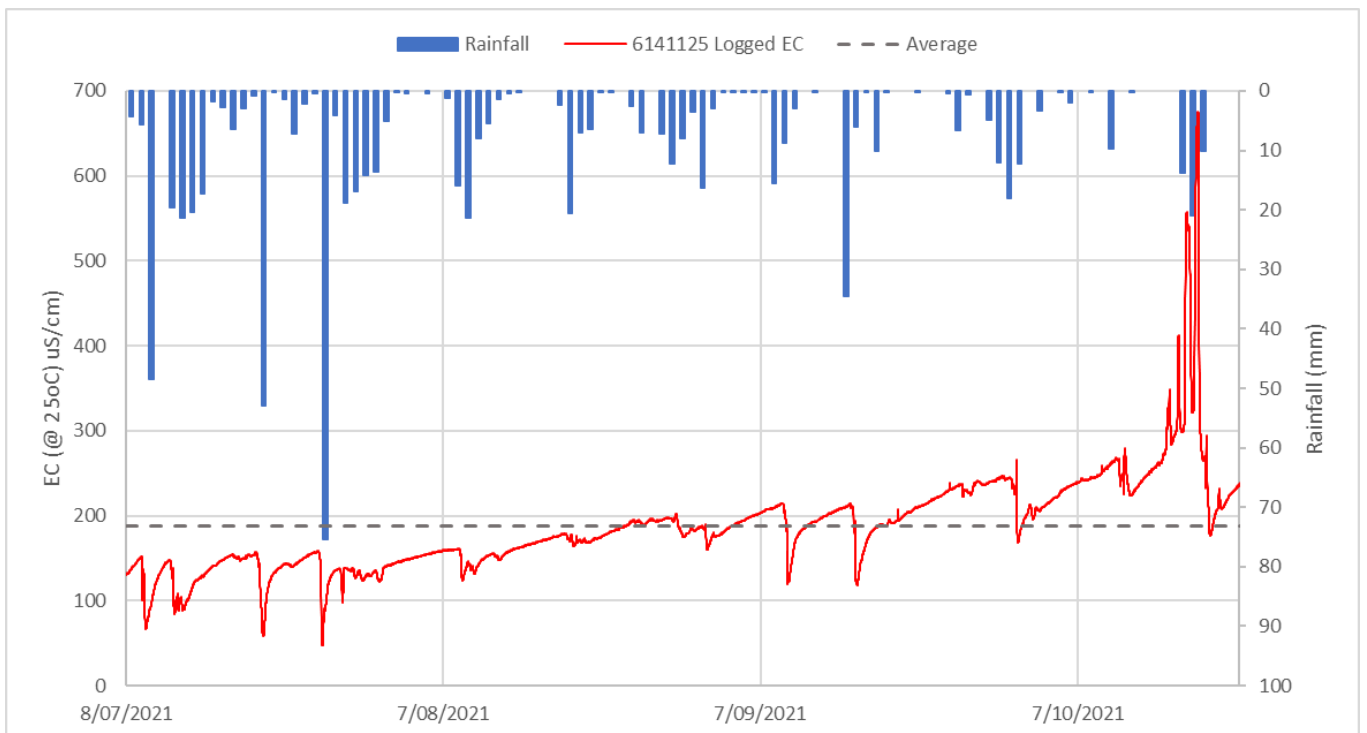


Figure 4-5 Myara North-6141125 logged EC data (2021) (B)

Turbidity logger data

Turbidity for the period of September 2020 (Figure 4-6):

- Turbidity loggers were installed at two tributary inflows to the Serpentine Dam (lower reach of 39 Mile Brook (site SW03) representing a large tributary, and the lower reach of a minor unnamed tributary (site SW04)), on the Goolagong Brook just downstream of the Myara North mine region boundary (site GG03) and on the main branch of the Serpentine River downstream of the proposed conveyor crossing location (site SW08). The data from the minor unnamed tributary (site SW04) is not presented as data do not correspond with limited flashy flow data for this location and may represent errors due to dry site conditions.
- At the remaining sites logged turbidity data is available for a week, with the median turbidity at these sites ranging between 0.4 NTU (GG03) and 1.9 NTU (SW03). Pulses of elevated turbidity were recorded at all sites (ranging from 86 NTU at GG03 to 138.7 NTU at SW03), corresponding with rainfall events during the available record. All pulses were isolated within the observed record, rapidly returning to background levels (loggers set to record at 15-minute intervals).

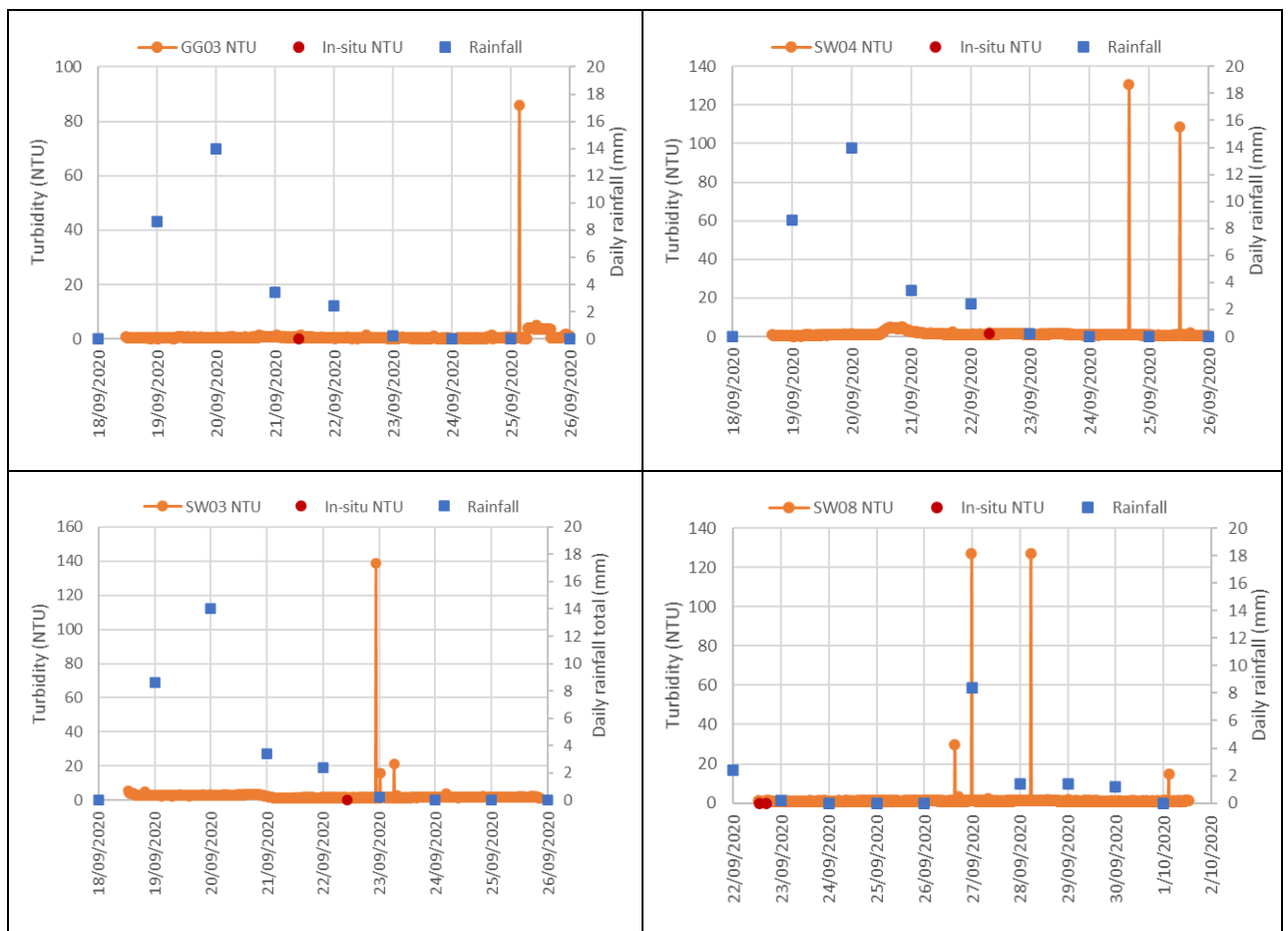


Figure 4-6 Myara North Turbidity-GG03 logger data

Turbidity for the period between August 2022 and February 2023 (Figure 4-7 and Figure 4-8):

- Turbidity loggers were installed at two tributary inflows to the Serpentine Dam. Location TN14/614031 is upstream of 39 Mile Brook representing a large tributary, and location 614035 is at a DWER stream gauging site upstream of Serpentine River – River Rd. Key observations for this monitoring round are:
 - At TN14, turbidity ranged from -0.9 to 98.9 NTU with an average of 2.44 NTU (Figure 4-7).
 - At 614035, turbidity ranged from -0.9 to 60.2 NTU with an average of 3.92 NTU (Figure 4-8).
 - Pulses of elevated turbidity were recorded at both sites; some measurements correspond with rainfall events. The logger is set with 10-minute record interval, and during data analysis, pulses which remained for more than two intervals were deemed to be real values.

- Some of the turbidity spikes could correspond to water disturbances that occur during sampling and servicing of instrumentation. These were cleaned from the observed record.

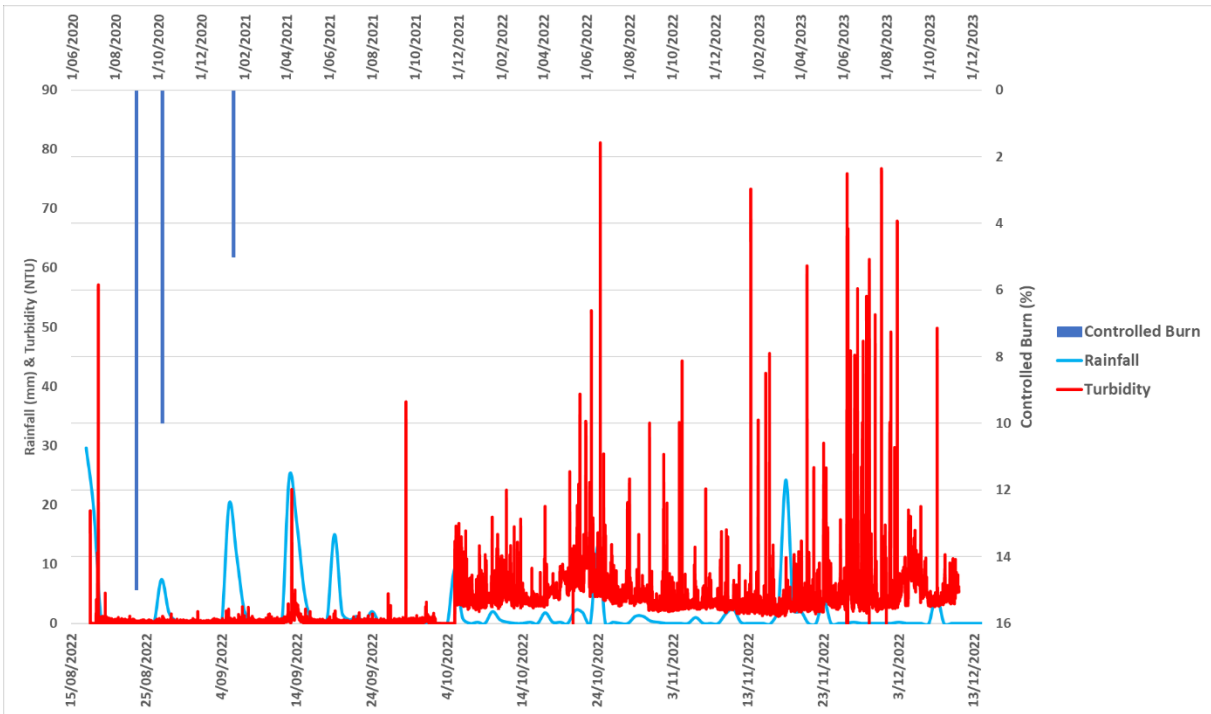


Figure 4-7 Myara North turbidity logger TN14/614031, 39 Mile Brook) -2022

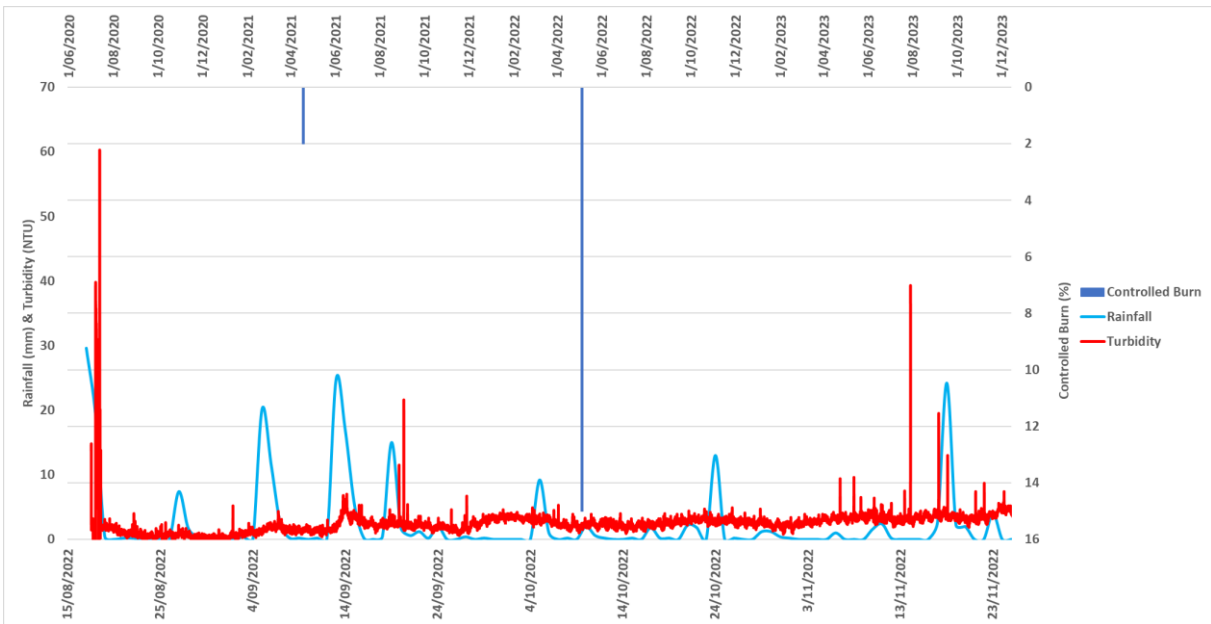


Figure 4-8 Myara North turbidity logger for 614035, River Rd

5. Holyoake monitoring results

5.1 Baseline monitoring program groundwater results

5.1.1 Hydraulic testing

The slug test data was analysed using AQTESOLV software. The AQTESOLV outputs, showing the groundwater level recovery data for each bore, and the resulting calculated hydraulic conductivity are presented in Appendix F. All results were assessed using the Bouwer-Rice (1976) model for a slug test. The results are summarised in Figure 5-1 below. The following observations are made:

- Bores with the highest hydraulic conductivity such as BH03 and BH14 are screened in the basement saprock/highly weathered granite. The higher hydraulic conductivity values here likely relate to discrete higher permeable zones within this unit.
- The average hydraulic conductivity for Holyoake mine region is 0.3 m/d compared to 0.6 m/d for Myara North mine region. The lower average hydraulic conductivity at Holyoake mine region than Myara North mine region is consistent with the described lithology and drilling. In Myara North mine region higher groundwater flows, associated with the basement/saprock profile, were more common.

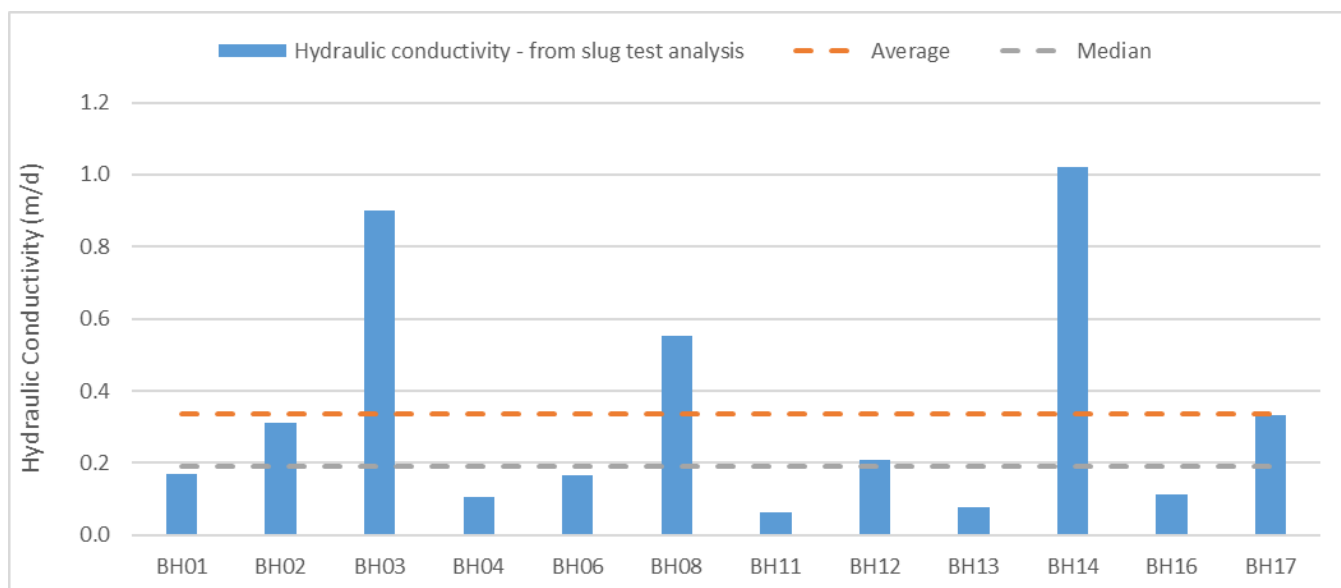


Figure 5-1 Holyoake slug test results (hydraulic conductivity)

5.1.2 Groundwater levels – Long term monitoring

As noted in Section 2, whereas groundwater monitoring data for Myara North mine region has been ongoing since the 1970, data for Holyoake mine region is less available. A review of the historical data and site reconnaissance was able to locate a total of six monitoring bores that had both historical data and were suitable for further testing. A further two existing bores were identified but did not have historical data available (H4821-2.4 and J4908-4.9). The location of these monitoring bores is shown in Figure B-7-2. Those bores with historical monitoring data are located marginally outside of the Myara North mine region but are still suitable for developing baseline conditions for the area.

Groundwater level hydrographs for the long-term Holyoake mine region bores are presented in Appendix J. The hydrographs include rainfall data presented as 'Cumulative Departure from the Mean'. This allows comparison of groundwater levels to changes in rainfall. The following provides a summary of the key observations from the Holyoake mine region hydrographs:

- Of the six bores presented for Holyoake in Appendix J, four have sufficient frequency of historical monitoring data to assess seasonal variation. These bores show a seasonal variation of around 1 to 2 m.

- The Holyoake mine region historic bores generally have a greater depth to groundwater than Myara North mine region bores. All bores recorded groundwater of between 10 to 15 mBGL during the 1990's monitoring, with all bores then showing a significant reduction in groundwater levels for more recent data. The reduction in groundwater levels is shown on Figure 4-2 (in Myara North Section 4.1.2). The reduction in levels is greater than 5 m in all bores over the completed monitoring record, and broadly aligns with the reduction in rainfall seen over this period.
- The most complete monitoring record is available for MK46101A which has groundwater level data from the mid 1990's until present and shows a near linear reduction from 10 mBGL to 25 mBGL for the latest reading.

5.1.3 Groundwater levels – New monitoring sites

New groundwater monitoring bores were installed at 17 locations, as detailed in the installation report (GHD, 2020b). The location of the monitoring bores (Figure B-7-2) was selected to provide site wide coverage of groundwater conditions. Due to the change in project area, bores BH15, BH16 and BH17 are now located south of the Holyoake mine region.

As noted in Section 2, groundwater levels for the new monitoring bores were recorded on a nominal monthly frequency between October 2020 and February 2023 (up to four monitoring rounds). Hydrographs for this monitoring period are presented as Appendix K, which also includes the field TDS data.

The groundwater level data for the new monitoring bores indicates the following:

- Groundwater is generally not as shallow with comparison the Myara North mine region. The average depth to water is 14.5 mBGL. BH12 is the only bore recording a consistently shallow depth to water of less than 5 m, whereas the other bores recorded depth to water of 9 m to 25 m. BH12 is also the shallowest bore, installed to 6.1 m with fresh basement rock (quartzite/granite) from 4 m. During rainfall events, the shallow well immediately responds with a rise in groundwater level, whereas the deeper well has a muted response.
- Groundwater levels reduce over the monitoring period (October 2020 to February 2023) in more than 60% of the monitoring bores, consistent with a seasonal change from late winter groundwater highs to summer groundwater lows. The reduction in groundwater levels results the drying out of BH15 with groundwater level reducing beyond the base of bore at 8 m, indicating the absence of a saturated profile at this location during summer.
- Groundwater levels in the B16 nested wells responded differently to seasonal variations. The shallow well fluctuated in response to individual rainfall events. The deep well did respond to individual rainfall events but the overall trend continued a steady increase beyond the wet season, levelling from September through to mid-December before groundwaters declined in response to the onset of summer.
- The average seasonal groundwater level decline for all new bores is 0.7 m, significantly less than Myara North mine region (1.9 m for Myara North mine region bores). The lesser range in seasonal variation is consistent with deeper bores (i.e. shallower bores tend to have a greater seasonal range in groundwater levels).

5.1.4 Groundwater quality - long term monitoring data

Groundwater quality, specifically salinity, is available for four of the six historical bores that were monitored in 2020-2023. Review of this data allows some limited assessment of long term groundwater quality changes. The field salinity (as TDS) is presented on the hydrographs presented as Appendix J. The following observations are made from the historical range of salinity data:

- There is a relatively large range in salinities measured in the 1990s with TDS data in the range of 150 mg/L to 2000 mg/L (average of 850 mg/L). The spatial extent of the bores is limited, but the two bores with high salinities (MK49162A and ML49131A) are located 400 m apart just outside of the south east of the project area.
- Of the four bores with salinity data, three show a marginally increasing trend, with the fourth being stable.

5.1.5 Groundwater quality – 2020-2023 sampling data – field data

As detailed in Section 2, groundwater quality field data was collected at existing historical bores, and at the new monitoring bore sites on up to four sampling rounds in October 2020, February 2021, February 2022, and February 2023. Of these sampling events, two included more comprehensive monitoring rounds when a full groundwater laboratory suite was analysed. Data for field salinity (as TDS) is included on the hydrographs presented for the new bores in Appendix K. The following observations are made from the new bores field water quality data:

- Groundwater is consistently fresh for the majority of bores and for the majority of sampling rounds. Of the 16 new monitoring bores, the average TDS is around 580 mg/L. Three bores have a relatively high TDS of between 1000-1770 mg/L (BH03, BH05 and BH12). Two of these sites (BH03 and BH05) are located relatively close together (1.8 km) along the same drainage line in the far north east of the project area.
- Groundwater pH in Holyoake is relatively uniform, with an overall average field pH of 6.5. Recent data for the historical bore subset is consistent with an average pH variation for each bore of less than 0.5. For the new bores the variance is more pronounced, with an average range of 1.2 pH units. This larger range is possibly related to the influence of bore construction materials (alkaline grouts and cements) and the subsequent stabilisation of groundwater conditions.

5.1.6 Groundwater laboratory results

Groundwater quality analytical results for Holyoake are presented in tabular format in Appendix L. The tabulated data is presented for the two sampling rounds undertaken in October 2020, February 2021, November 2022, and February 2023. As summarised in Section 2, the sampling rounds included all of the new monitoring bores (prefix “BH”) and a selection of existing Alcoa (historical) monitoring bores. The laboratory results are compared to various assessment criteria. The assessment criteria include Australian Drinking Water Guidelines including PFAS for drinking water and recreational water and ANZG Freshwater species protection guidelines.

The following observations are made for the four rounds of baseline groundwater data:

- Physical and major ion parameters:
 - Laboratory results for pH and salinity/EC are in-line with the field data that has been discussed in the sections above. Groundwater pH is generally uniform with an average of 6.5. Some bores show a higher pH for the first round, possibly showing the influence of bore construction materials (cements and grouts).
 - Groundwater EC is generally uniform with an average of 1015 $\mu\text{S}/\text{cm}$. Five sites (BH03, BH05, BH06, BH12 and K4916-2A) have EC above 1000 $\mu\text{S}/\text{cm}$ and up to 3030 $\mu\text{S}/\text{cm}$ (K4916-2A). The spatial distribution of these sites does not indicate a particular area where more elevated EC is prevalent.
- Metals:
 - Metal concentrations were below the LOR for all samples for beryllium and selenium, except for BH06 and K4916-2A in September 2021. Minor above LOR detects (less than three results) were recorded for arsenic, cadmium, lead, mercury and vanadium.
 - Where metal concentrations were detected, they were generally above the ANZG 99% freshwater species protection assessment criteria. This includes metals arsenic, cadmium, chromium, copper, lead, manganese, nickel and zinc. However, the freshwater assessment criteria are generally at concentrations below the LOR, and given the context, only appropriate for a comparative assessment of groundwater conditions.
 - The drinking water assessment criteria for metals were exceeded only for manganese with four detects above the 0.5 mg/L criterion. This was at locations BH01, BH05, BH12 and BH16 which show a widespread spatial distribution (i.e. no locally impacted groundwater).
 - In general, the variable metal concentrations are typical of ‘natural’ conditions and representative of the geological setting.
- Nutrients:
 - Nutrient concentrations are low and consistent with the land-use type (i.e. lack of applied nutrients or sources). Nutrient concentrations are generally higher in the first round of monitoring, however the

reason for this is unclear. Nitrogen species concentrations at BH10 are elevated with comparison to other monitoring bores, with Total Nitrogen of 11.8 mg/L. Also, the high Phosphorus (Total) is recorded for BH05 (9.18 mg/L) in February 2021 and BH17 (8.96 mg/L) in October 2020. However, where assessment criteria are available, all parameters are significantly below the criteria (e.g., ADWG 2011 Health (v3.7 updated 2022)).

– PFAS:

- PFAS compounds were below the laboratory LOR in all but five locations. In the October 2020 monitoring round PFAS was detected in BH09, BH10, BH12, BH17 and K4916-2A. In the February 2021 monitoring round, detections were only observed BH12.
- All detections were significantly below the drinking water assessment criteria with maximum Perfluorooctanoic acid (PFOA) concentration detection of 0.021 µg/L, compared to the assessment criterion of 0.56 µg/L, and a maximum Sum of PFHxS and PFOS concentration detection of 0.0046 µg/L, compared to the assessment criterion of 0.07 µg/L.

– Hydrocarbons:

- All samples analysed for BTEX compounds returned results less than LOR except for K4916-2A in November 2022 where a Naphthalene concentration of 0.005 µg/L was detected which did not exceed any guidelines.
- All samples analysed for explosive compounds returned results less than LOR.
- TRH was detected at low concentrations in BH02, BH05, BH10, BH12 and K4916-2A. BH05 had five detections in November 2022 ranging from 120 to 520 µg/L, and six detections in February 2023 ranging from 250 to 6440 µg/L. K4916-2A had five detections in November 2022 ranging from 110 to 310 µg/L and was dry during the February round. The low levels, and detection in historical monitoring bores suggests possible low levels of cross contamination from sampling sources. PAH was detected in more than half of the samples analysed. The most prevalent detection was pyrene, with 21 detects of the 34 samples analysed. The ADWG Health criteria of 0.01 µg/L was exceeded on 10 occasions from locations BH01, BH04, BH05, BH11, BH12, BH16, BH17, J4904-4.25 and K4916-2A. Where detected during both sampling rounds, the concentrations in the first round are significantly higher. This possibly suggests that the detections are related to the drilling activities, with some subsequent cross contamination of the two historical bores. Alternatively, the widespread detection could relate to a source from bush fires, however reason for the varying concentrations between rounds remains uncertain.

5.2 Baseline monitoring program surface water results

5.2.1 Surface water flows – Long term monitoring

The flow gauging stations with historical data relevant to Holyoake mine region are summarised in Table 2-2. The majority of flow gauging stations relevant to Holyoake mine region hold around 15 years of data from mid 1980s through to late 1990s. The Gordon Rd site is the exception, with a 30-year record available from 1988 to 2018. As with Myara North mine region, large areas of the Holyoake mine region have no flow gauging data.

Appendix G presents annual flows and trends in monthly streamflow data over the period of record for these sites. Annual and monthly streamflow data are presented to account for observed step changes in streamflow (post 2000).

Flow seasonality is typically observed between July and September within the smaller eastern sub-catchments (Gordon and Pindalup). The larger western sub-catchments (Skeleton Rd upstream and Davis Brook downstream of the Holyoake mine region) observe longer flow periods between June and November.

Data analysis for the gauging stations located in the study area indicates that baseflow and interflow represents between 37% and 80% of streamflow, depending on location and baseflow separation methodology (Appendix G).

The analysis was undertaken for the full streamflow record, varying between sites, between 1980 and 2018. These gauging stations are for much smaller catchments than those used for Serpentine Catchment (Appendix G) and represent a wider range of results.

5.2.2 Surface water flows – Baseline monitoring

The flow conditions at surface water sampling locations were recorded during monthly surface water sampling events. The observed flow conditions across the Holyoake mine region are summarised in Table 5-1.

Table 5-1 Holyoake mine region summary of surface water sampling event flow conditions

Site	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Aug-22	Nov-22
Unnamed northern tributary													
6141333	F	F	D	F	D	D	F	F	F	D	D	F	D
HSW05	F	F	D	D	D	D	F	F+	F	D	D	F	D
South Dandalup River and tributaries													
HSW01	F	F	F	F	D	D	F	F+	F	D	D	F	D
BF20	F	D	D	D	D	D	NF	D	D	D	D	D	D
6141352	F	D	D	D	D	D	NA	NA	NA	D	D	NA	NA
6141349	F	F	F	D	D	D	F	F#	F	D	D	F	D
HSW04	F	F	D	D	D	D	NF	NF	D	D	D	NF	D
6141005	F	F	D	D	D	D	F	F	F	D	D	F	D
Central South Dandalup – Pindalup tributary													
SD31	D	F	D	D	D	D	F	NF	D	D	D	NF	D
6141340	D	D	D	D	D	D	D	D	D	D	D	D	D
Minor tributary of South Dandalup Dam													
6141325	D	D	D	D	D	D	D	D	D	D	D	D	D
Davis Brook													
DV04	D	F	D	D	D	D	F	F	F	F	D	F	D
Swamp Oak Brook													
HSW02	F	F	D	D	D	D	F	F	F	F	D	F	D
6141470	D	D	D	D	D	D	-	-	-	-	-	-	-
HSW03	D	D	D	D	D	D	-	-	-	-	-	-	-
D= Dry, F= Flowing, U= Unknown, NF= Standing water with no flow, “-“ removed from the program, NA= No access + Site within catchment of controlled burn occurring at this time # Very minor flows – water almost stagnant.													

Surface water level loggers were installed in late September at selected Holyoake surface water monitoring locations. A summary of surface water logger data is provided in Table 5-2, with logged surface water levels presented in Figure 5-2 (A-B).

The key trends in the surface water flow data include:

- The observed surface water flows varied across the Holyoake mine region with multiple sites observed to be dry during all sampling events (including logger location HSW03, a minor eastern tributary at site 6141470 and a minor tributary inflow to the South Dandalup Dam at site 6141325). The most downstream site of the central tributary through the Holyoake mine region (site 6141340) was also dry during all sampling events, while its upstream location at site SD31 was observed to be flowing on one sampling event (September 2020).
- Flowing water was present in August preceding logger installation at sites 6141005 and HSW05. Some sites upstream of site HSW05 had observed surface water flows in late October surface water sampling (site HSW01 and site 6141349), as well as November (site HSW01), extending beyond the cease to flow at HSW05 in mid-October.

- Only two sites were flowing in November 2022; DV04 and HSW02 but were dry by December 2022.
- Logger data indicates a direct response to rainfall events and surface water levels. An increase in surface water level in response to rainfall occurs within 1 – 3 days.
- Varying water level response to seasonal rainfall events was observed in the limited logger record.

Table 5-2 Holyoake mine region surface water logger data summary

Site	Sub-catchment	Installation date	Cease to flow (2020)	Cease to flow (2021)	Cease to flow (2022)
6141005	South Dandalup River	September 2020	October	November	By November
HSW05	Unnamed northern tributary of South Dandalup River		October	November	By November

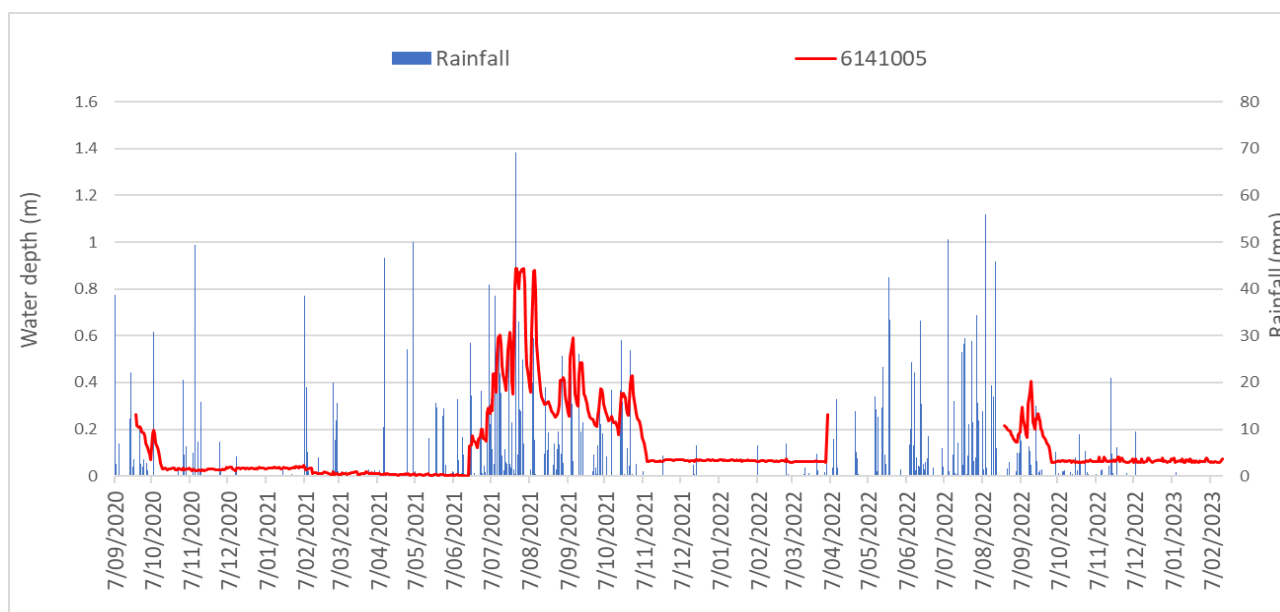


Figure 5-2 Holyoake – 6141005 logged water levels (from date of installation) (A)

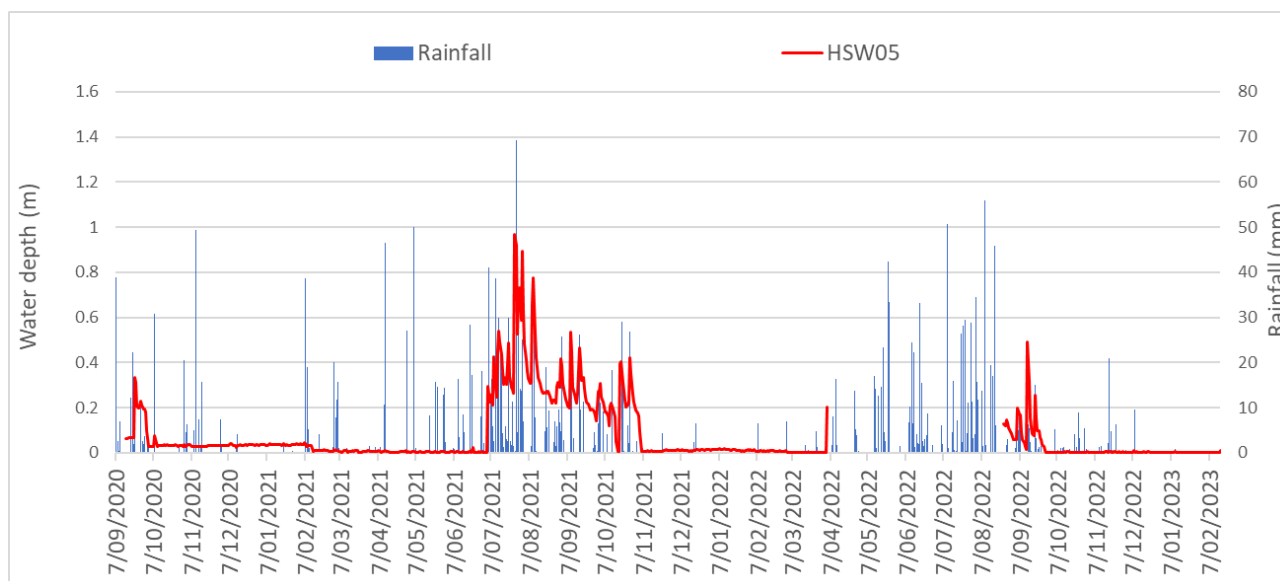


Figure 5-2 Holyoake – HSW05 logged water levels (from date of installation) (B)

5.2.3 Surface water quality – Long term monitoring

Historical surface water quality monitoring within the proposed Holyoake mine region has primarily been undertaken by DWER, with Alcoa monitoring in this region limited to one site on Davis Brook (DV04) with sufficient data for review. Summary statistics of key parameters are provided in Appendix H, with historical data indicating the following key trends:

- The limited pH data available for the South Dandalup River indicates that the average pH was neutral.
- EC values are predominantly available for sites on the main and minor tributaries of the South Dandalup River, with median EC ranging from 169 $\mu\text{S}/\text{cm}$ (site 614060) to 699 $\mu\text{S}/\text{cm}$ (site 6141005, limited data from 1972 and 1975). The limited EC for tributaries of the Murray River indicate higher historical median EC concentrations (Swamp Oak Brook, 763 $\mu\text{S}/\text{cm}$; Davis Brook, 646 $\mu\text{S}/\text{cm}$).
- Turbidity data for sites on the main and minor tributaries of the South Dandalup River indicate that median turbidity ranged from 0.9 NTU (site 6141340) to 7.3 NTU (site 6141344). Occasional discrete samples exceeded 25 NTU.

5.2.4 Surface water quality

5.2.4.1 Surface water sampling events

Surface water sampling events were completed monthly in August 2020, September 2020, October 2020, August 2021, September 2021, October 2021, August 2022. Table 2-6 summarises the field and laboratory parameters across sampling events.

5.2.4.2 Surface water field physico-chemical parameters

The physico-chemical parameters measured for surface water are summarised as follows:

- pH: Mildly acidic conditions across all sites ranging between 5.51 (6141333, November 2020) and 7.5 (6141005, August 2020).
- EC: Typically ranged between 104 $\mu\text{S}/\text{cm}$ (6141333, August 2022) and 1300 $\mu\text{S}/\text{cm}$ (6141349, October 2021) indicating fresh water.
- Turbidity: Relatively clear conditions across all sites with values typically ranging from -27 NTU⁴ (HSW01, October 2020) and 4.7 NTU (6141005, September 2020). Slightly higher values reported from site 6141349 in September (14.2 NTU) and October (15 NTU) with conditions at this site reported as cloudy. Maximum of 40 NTU was recorded at HSW04 (September 2020).

5.2.4.3 Surface water laboratory results

A summary of the surface water laboratory results is provided in Appendix M and L. Key observations from the laboratory results from the baseline sampling program include:

- Physicochemical parameters (all sampling events):
 - pH: Neutral conditions across all sites ranging from 6.5 (BF20, September 2020), and 7.28 (6141349, September 2020).
 - EC: Typically ranged between 109 $\mu\text{S}/\text{cm}$ (BF20, August 2020) and 368 $\mu\text{S}/\text{cm}$ (DV04, September 2020) indicating fresh water.
 - Turbidity: Relatively clear conditions across all sites ranging from 0.2 NTU (HSW02, September 2020) to 90 NTU (6141349, September 2021).
 - Total suspended solids: <5 mg/L across sites during all sampling events, with exception of site 6141005 and 6141349 in September 2021 (41 mg/L) and September 2021 (308 mg/L).
 - Water hardness: Water hardness was consistently within the soft range (0-60 mg/L CaCO_3 , ANZG 2018).
- Metals (extended suite sampling events):

⁴ Negative turbidity values measured under field conditions considered a result of low turbidity conditions.

- Metal concentrations were below the LOR for all samples for arsenic, beryllium, boron, cadmium, chromium, mercury, selenium, vanadium.
 - Where metal concentrations were detected, they were below drinking water guidelines (Appendix L).
 - The ANZG 95% freshwater species protection assessment criteria was exceeded for zinc at site DV04 (August 2021), and for copper at site BF20 (August 2021). There were three exceedances of the ANZG 99% freshwater species protection assessment criteria for zinc (site 6141349, August 2021; site BF20, August 2021, and DV04, August 2021), and one for copper (site HSW02, September 2020). No other exceedances of the ANZG 95% or 99% freshwater species protection criteria were reported.
 - In general, the variable metal concentrations are typical of 'natural' conditions and representative of the geological setting.
- Nutrients (extended suite sampling events):
- Nutrient concentrations are typically low and consistent with national park land use (i.e. lack of applied nutrients or sources).
 - Several samples were marginally elevated (0.5 to 0.7 mg/L) above the ANZECC South-western Australia default guideline values for total nitrogen and total Kjeldahl nitrogen, with two samples at site HSW05 (September 2020) and 6141349 (September 2021) reporting a total nitrogen concentration of 1.2 and 1.4 mg/L, respectively.
 - Three samples reported total phosphorus concentrations above the ANZECC South-western Australia default guideline values, with two very high sample concentrations reported at site HSW01 (0.68 mg/L, September 2020) and DV04 (3.4 mg/L, September 2020).
- Microbiological (extended suite sampling events):
- Microbiological parameters enterococci and E. coli were detected at all sampling sites. Widespread detection of microbiological parameters is consistent with the presence of fauna species within the land use setting.
 - E. coli concentrations ranged from < 1 orgs/100mL to 550 orgs/100mL (site 6141349, October 2021).
 - Enterococci concentrations ranged from 2 orgs/100mL (site HSW02, August 2020) to 270 orgs/100mL (site HSW01, October 2021).
- Other potential contaminants of concern (extended suite sampling events):
- All samples analysed for surfactants returned results less than LOR.
 - All samples analysed for BTEX compounds returned results less than LOR.
 - All samples analysed for total recoverable hydrocarbons compounds returned results less than LOR.
 - All samples analysed for PAHs returned results less than LOR.
 - All samples analysed for explosives returned results less than LOR.
 - All samples analysed for OC Pesticides returned results less than LOR.
 - PFAS compounds were below the LOR in all but five locations. In the August 2020 monitoring round PFAS was detected at HSW05. In the September 2020 monitoring round PFAS was detected at 6141005, 6141439, HSW02 and HSW04. Also, in September 2022, PFAS was detected at HSW01, HSW02, and HSW04. All detections were significantly below the drinking water assessment criteria.

5.2.4.4 Surface water logger quality data

Electrical conductivity logger data

EC data for the period of September 2020 (

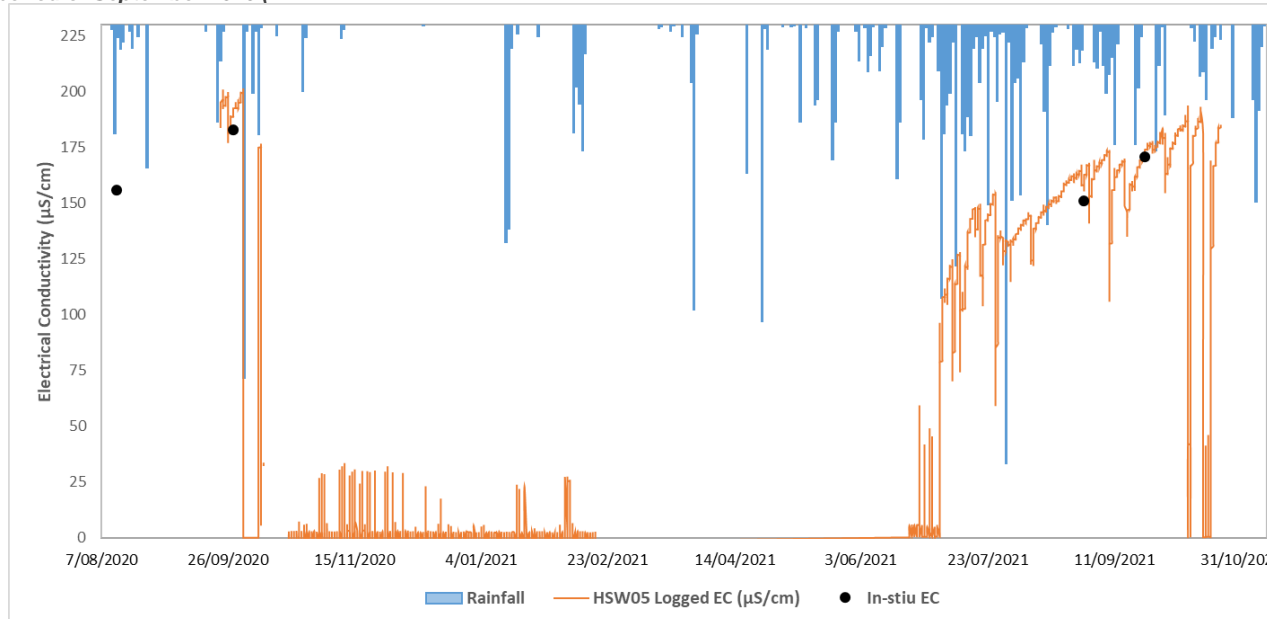


Figure 5-3):

- EC loggers were installed in the lower reaches of the South Dandalup River (site 6141005) and an unnamed northern tributary of South Dandalup River (site HSW05), and at the outflow of the Holyoake mine region to the Swamp Oak Tributary of the Murray River (site HSW03).
- No data was collected from site HSW03 due to dry conditions at this location.
- The EC logger record for the few weeks representing end of season flow reported similar median values for sites 6141005 (197.7 $\mu\text{S}/\text{cm}$) and HSW05 (186.7 $\mu\text{S}/\text{cm}$). The EC record at site 6141005 steadily rose prior to cease to flow periods, and reported a marginally higher maximum EC (244.6 $\mu\text{S}/\text{cm}$) than the more stable EC record at site HSW05 (201.5 $\mu\text{S}/\text{cm}$).

EC data for the period of July 2021 (**Error! Reference source not found.**):

- The logger record for site HSW05 and 614005 was approximately four months.
- The logged EC at site HSW05 ranged between 33.9 $\mu\text{S}/\text{cm}$ and 193.9 $\mu\text{S}/\text{cm}$ between July and mid October 2021 with an average of 149.9 $\mu\text{S}/\text{cm}$.
- The logged EC at site 6141005 ranged between 74 $\mu\text{S}/\text{cm}$ and 225.9 $\mu\text{S}/\text{cm}$ between July and mid October 2021 with an average of 156.3 $\mu\text{S}/\text{cm}$.
- Gradual increases in EC are indicative of increasing groundwater contribution. Sudden decreases in EC are indicative of surface water runoff events.

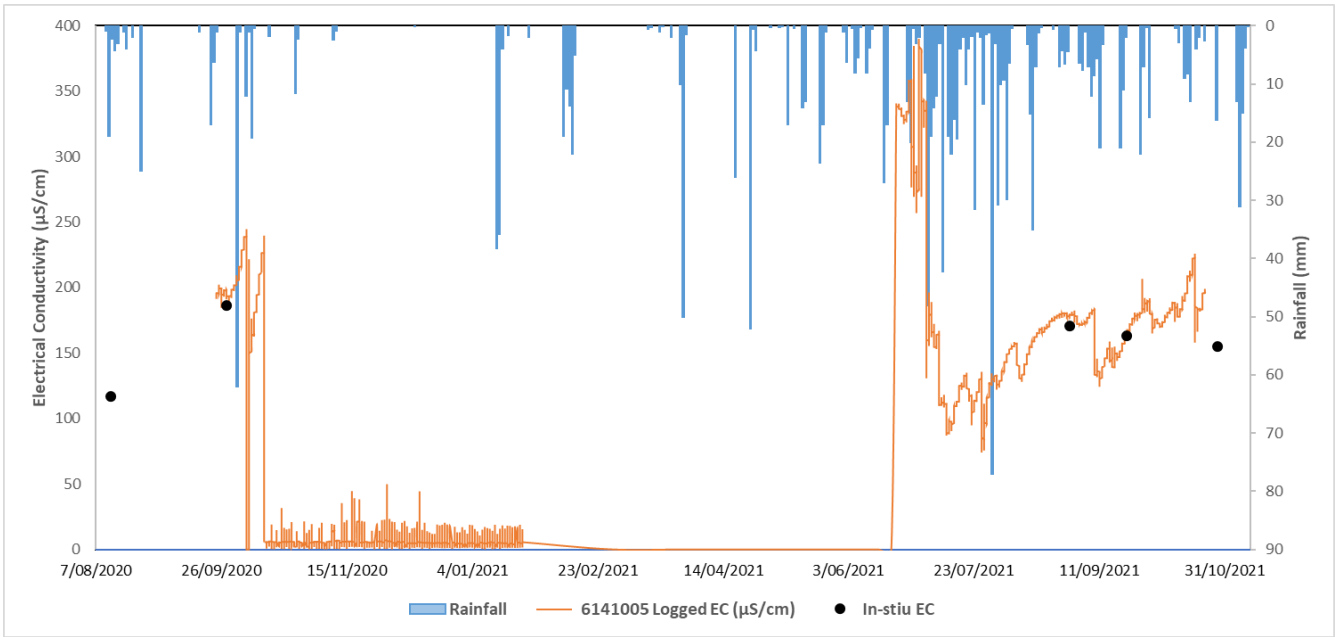


Figure 5-3 Holyoake-6141005 logged EC data (2020 – 2022) (A)

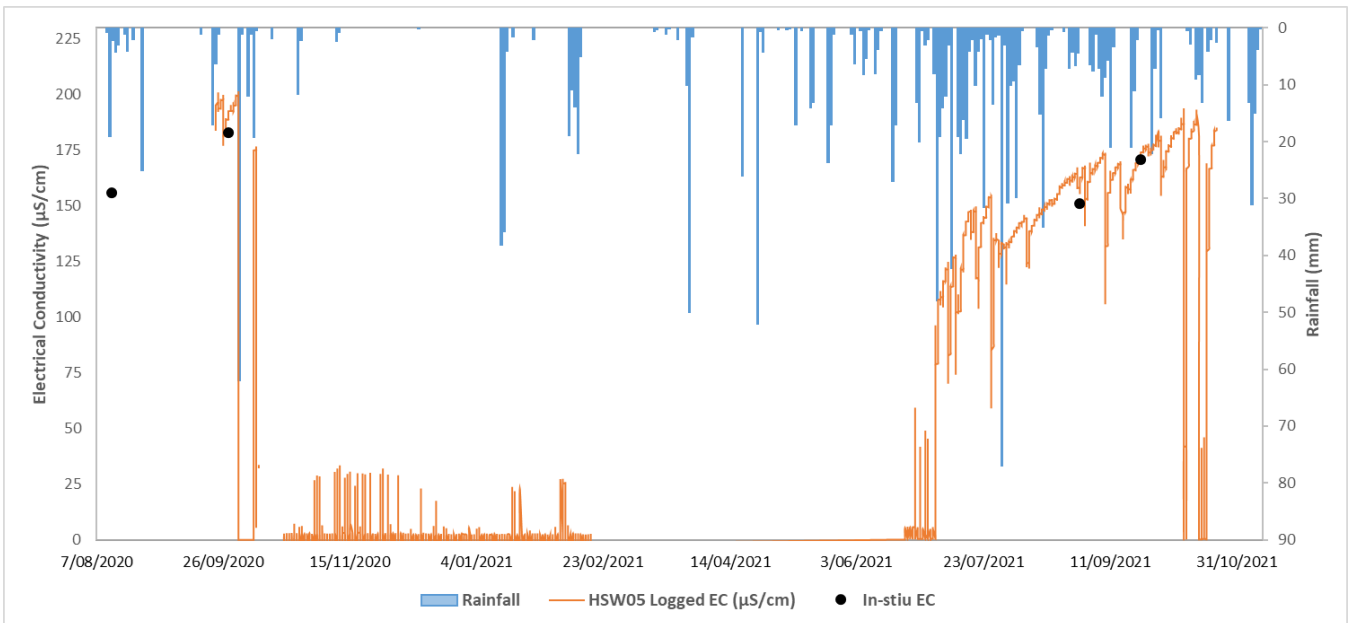


Figure 5-3 Holyoake-HSW05 logged EC data (2020 – 2022) (B)

Turbidity logger data

Turbidity loggers were installed at the same locations as the EC loggers in the Holyoake mine region. No data was collected from site HSW03, with this site dry for the duration of logger installation.

Turbidity for the period of September 2020 (Figure 5-):

- The logged turbidity data at sites is available for a week, with median turbidity of 4 NTU at site 6141005 and 6 NTU at site HSW05.
- Average turbidity at site 6141005 over the week was 25.9 NTU, primarily due to some long duration turbidity events, and a logged maximum of 130 NTU.
- Site HSW05 had shorter duration events with elevated turbidity, and a maximum of 129.2 NTU.

- Unlike the short pulses measured at Myara North mine region, these longer pulses are representative of a real turbidity spike. The pulses correspond to storm events.
- The source of the turbidity is unknown but may be a relic of prescribed burns in the catchment conducted in late 2018.

Turbidity for the period of August 2021 (**Error! Reference source not found.**):

- Turbidity data is available from mid-August 2022 to mid-February 2023 and key observations for the 2022 monitoring round are:
 - HSW05: Turbidity ranged from 0.3 to 73.3 NTU with an average of 6.17 NTU.
 - 6141005: turbidity ranged from 0.6 to 223.4 NTU with an average of 12.69 NTU from August to October 2022. Then turbidity values increase in November 2022 with a range of 86.9 to 313.4 NTU and an average of 199.07 NTU (Figure 5-4).
- Pulses of elevated turbidity were recorded; some measurements correspond with rainfall events. The logger is set with 10-minute record interval, and during data analysis, pulses which remained for more than two intervals were deemed to be real values.
- Some of the turbidity spikes could correspond to water disturbances that occur during sampling and servicing of instrumentation while others are unexplained.

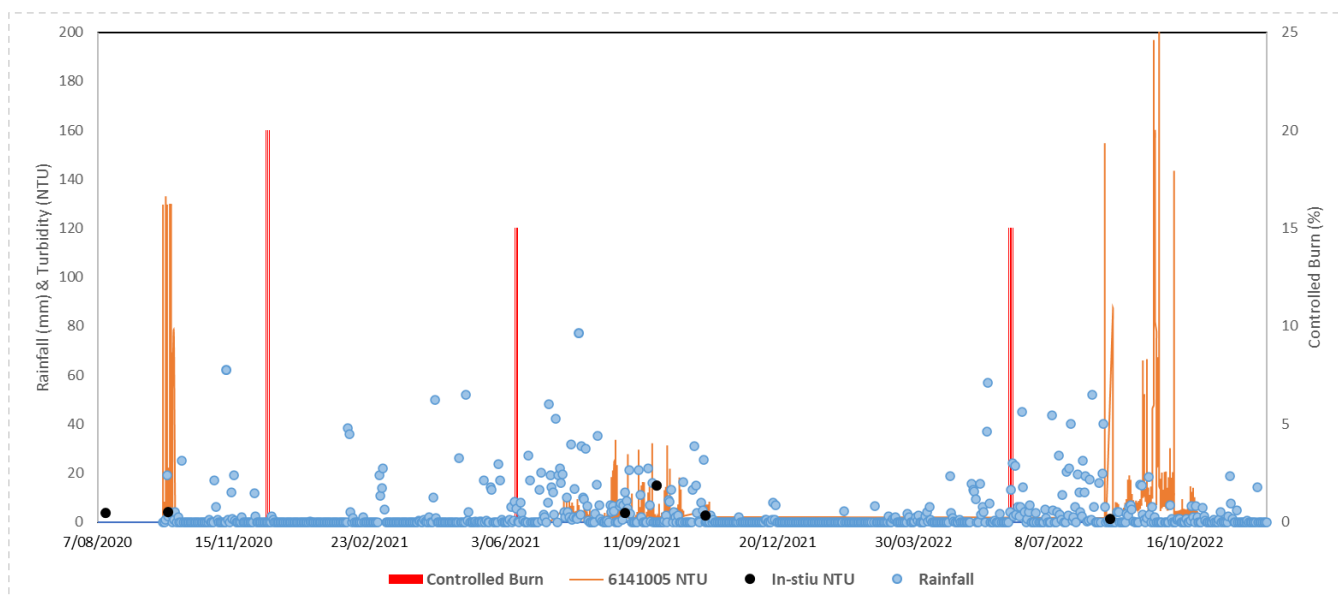


Figure 5-4 Holyoake-HSW05 logged Turbidity data (2020 – 2022) (A)

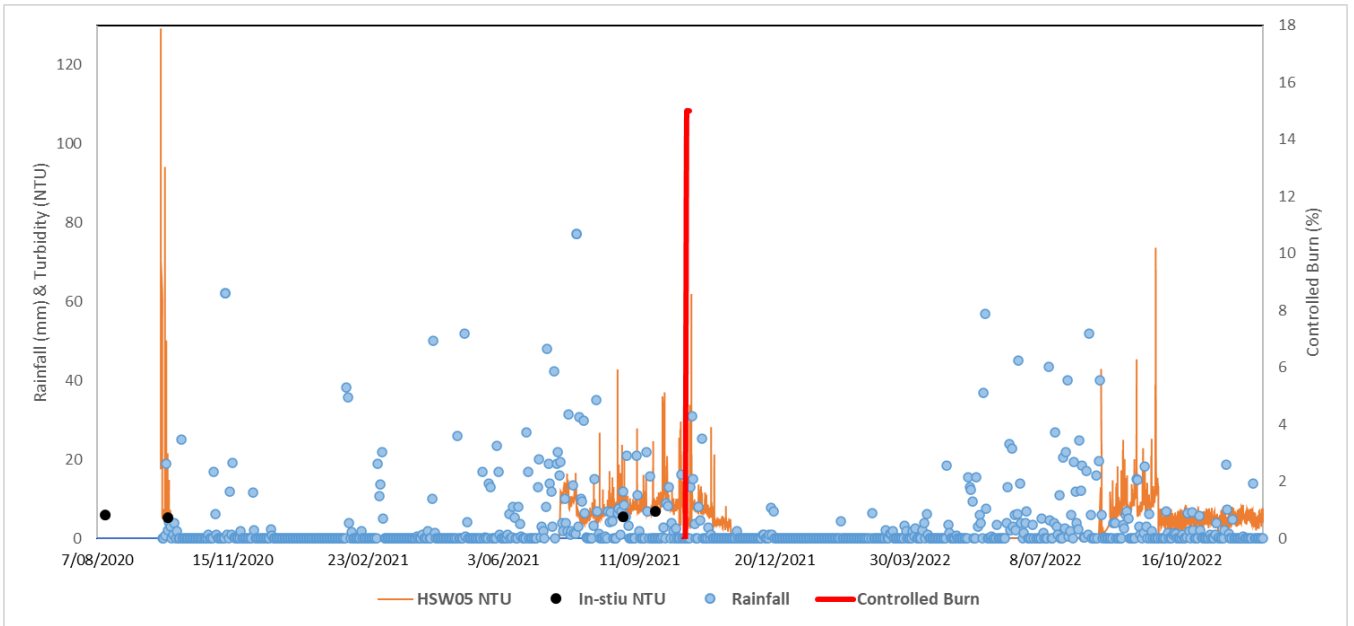


Figure 5-4 Holyoake-6141005 logged Turbidity data (2020 – 2022) (B)

6. Baseline assessment summary

6.1 Myara North

6.1.1 Groundwater

6.1.1.1 Groundwater levels

Groundwater levels within the Myara North mine region are broadly related to topography, with greatest depth to groundwater generally found higher up in the slope profile. Groundwater levels show a strong seasonal variation, with the variation being the greatest for those bores lower in the slope profile where groundwater tends to be shallower. Depending on location, groundwater levels are seen to vary by 1 to 5 m over an annual cycle.

The strong seasonal variation observed during the monitoring undertaken for this program, identified locations where at paired sites (deep and shallow bores) the shallow bores dried out (groundwater level reducing below bottom of screened unit). Additionally, some fully penetrating bores (screened just above the basement rock) were observed to dry out, indicating a seasonal unsaturated profile, generally observed where basement rock is relatively shallow.

A review of the historical groundwater levels with comparison to the latest levels indicated that from around the early 1990's until present groundwater levels show an overall declining trend, i.e. depth to groundwater is now greater than it was in the 1990's. The groundwater level decline aligns with a period of reduced rainfall. The reduction in groundwater levels is most significant in those bores with a deeper depth to water, where groundwater levels have reduced by up to 10 m over the past 30 year period.

6.1.1.2 Groundwater quality

Groundwater quality within the Myara North mine region is typically fresh, unimpacted by anthropogenic activities and consistent with the current setting within the state forest. The majority of the monitoring data for the areas, available for some sites since the 1970's, indicates generally fresh conditions with an average salinity of around 450 mg/L. However, there is some variability within the salinity dataset with isolated bore locations having salinities around 2000 mg/L.

Within the limited spatial extent of the data, there does not appear to be a relationship between bore salinity and location with salinity ranges within each catchment being as variable as those between catchments. Whereas there has been a definite reduction in site wide groundwater levels, the groundwater quality data, albeit less comprehensive, does not show any widespread long-term trends.

The groundwater quality sampling rounds undertaken for this assessment included the laboratory assessment for a wide range of water quality parameters. Sampling rounds were undertaken in late winter 2020-2022 and summer 2021-2023. The data indicated no discernible seasonal change in groundwater quality, however some effects of sampling soon after drilling of the bores was noted.

The results showed very low nutrient levels, typical for the land-use, suggesting lack of applied nutrients. Metal concentrations were typical of 'natural' conditions and representative of the geological setting. Very low concentrations of PFAS were detected in four of the sampled bores, however all detections were significantly below the drinking water assessment criteria. Minor detection of TRH and PAH was noted, with concentrations reducing in the second sampling round, possibly indicating that the drilling was the source or the low levels are associated with bush fire effects.

6.1.2 Surface water

6.1.2.1 Surface water flow duration

Surface water flow data across the majority of the Myara North mine region show a strong seasonality of stream flow. Short periods (October-May) of flow were observed at some sites, with other sites sustaining flows over longer periods (May-September). The observed periods of flow during the baseline monitoring program align with

historical seasonality of flow observed across the proposed Myara North mine region, and more recent observations from monitoring of the current Myara mine region of the Huntly Mine.

One site (SW05) sustained flows during the surface water sampling round in January 2021, with upwelling water (groundwater discharge) observed in addition to surface flow at this site which may indicate a local groundwater source. Sustained flows were also observed at site SW06 (cease to flow in November 2020) within the upper Gooralong Brook catchment. This site was located in the catchment of a controlled burn completed in late September 2020.

6.1.2.2 Surface water quality

The baseline surface water quality is generally similar across the Myara North mine region, reflecting the uniform hydrological and hydrogeological conditions across the area. As with groundwater quality data the surface water quality is typically fresh, unimpacted by anthropogenic activities and typical of the location within state forest.

The field and laboratory surface water physico-chemical data collected during the baseline monitoring program are similar to historical observations across the Myara North mine region. Surface water is non-saline and moderately acidic, with marginally elevated surface water salinity observed in some samples during late season monitoring or when sampling occurred from pools. Surface water samples typically had low turbidity and low total suspended solids. The low background turbidity was also observed in a short continuous turbidity logger record at four sites, with short pulses of elevated turbidity rapidly returning to background levels. The turbidity data observed during the baseline monitoring period is consistent with the historical data record for the various sub-catchments of the Myara North mine region (Appendix I).

An extended suite of surface water quality parameters was also sampled during the sampling in (August, September and October) 2020, (September, October and November) 2021, and (August and November) 2022. As with groundwater within the Myara North mine region the surface water results had low nutrient levels, and metal concentrations representative of the geological setting.

- Eight samples from sites SN02, SW01, SW03, SW04, SW05, SW08, GW54, and TN34 reported a total phosphorus concentration that marginally exceeded the ANZECC upland rivers default trigger value.
- Microbiological parameters were detected at all sampling sites, with widespread detection consistent with the presence of fauna species within the national park setting.
- Site SN02 is the only site recording higher salinity in November 2022 with 1801 $\mu\text{S}/\text{cm}$. This is one order of magnitude higher than the reading in August 2022 of 169.9 $\mu\text{S}/\text{cm}$ and all other locations. The August reading is comparable to other locations, but salinity significantly increases with the onset of the summer months at this one location.
- Very low concentrations of PFAS were detected at four sites, however all detections were significantly below the drinking water assessment criteria.

Detection of PAHs elevated above the drinking water guideline was reported at site SW06 in October 2020, with the PAH concentration dominated by naphthalene and attributed to natural introduction of PAHs from a controlled burn in the catchment in late September. Dieldrin was detected in a single sample at a concentration significantly lower than the drinking water assessment criteria.

For other contaminants of potential concern, including surfactants, BTEX compounds, TRH and explosives, all samples analysed returned results less than LOR.

6.2 Holyoake

6.2.1 Groundwater

6.2.1.1 Groundwater levels

Groundwater levels within the Holyoake mine region are broadly related to topography, consistent with Myara North mine region. However, within the Holyoake mine region there is a tendency of depth to groundwater being somewhat greater than Myara North mine region. The greater depth to groundwater is typical of the generally

thicker weathered profile found within Holyoake i.e. the depth to basement rock is also deeper in Holyoake mine region compared to Myara North mine region.

The greater depth to groundwater also relates to a more muted seasonal variation at Holyoake. Typical seasonal variations are around 1 to 2 m. However, good time-series historical groundwater data is lacking in Holyoake mine region, with only a very limited number of historical monitoring bores, most of which are marginally outside of the of the study area. Where data is available, the trend of significantly reducing groundwater levels over the last 30 years is strongly apparent, consistent with the Myara North mine region data.

6.2.1.2 Groundwater quality

Groundwater quality within the Holyoake region is typically fresh, unimpacted by anthropogenic activities and reflects the current site setting within State forest. The data is broadly uniform with Myara North mine region data, with a slightly higher average salinity. Unlike Myara North mine region, there is a lack of good historical monitoring data, but where data is available there is no discernible long-term trend in water quality. Similarly to Myara North mine region, there does not appear to be a relationship between bore salinity and location with salinity ranges within catchments being as variable as those between catchments.

Data from the four comprehensive monitoring rounds undertaken for this study indicated no discernible seasonal change in groundwater quality, however some effects of sampling soon after drilling of the bores was noted. The results showed low nutrient levels, albeit marginally higher than Myara North mine region. Metal concentrations were also marginally higher than Myara North mine region but still typical of 'natural' conditions and representative of the geological setting. Very low concentrations of PFAS were detected in five of the sampled bores, however all detections were significantly below the drinking water assessment criteria. Low level detection of PAH (pyrene) was noted in the majority of bores in the first minoring round, with concentrations reducing in the second sampling round, possibly indicating that the drilling was the source, or that the PAHS source was related to bush fires.

6.2.2 Surface water

6.2.2.1 Surface water flow duration

Surface water flow occurrence varied across the Holyoake mine region with dry conditions observed during all sampling events at several sites. Where flow was observed the strong seasonal flow periods aligned with available historical data.

6.2.2.2 Surface water quality

The baseline surface water quality is generally uniform across the Holyoake mine region. As with groundwater quality data the surface water quality is typically fresh, unimpacted by anthropogenic activities and reflects the location within state forest.

The in-situ field and laboratory surface water physico-chemical data collected during the baseline monitoring program are similar to historical observations for the Holyoake mine region. Surface water is non-saline with neutral pH. Surface water samples typically had low to moderate turbidity and low total suspended solids. A short continuous turbidity logger record at two sites identified pulses of elevated turbidity that were sustained for up to several hours before returning to background levels.

An extended suite of surface water quality parameters were sampled during the sampling in August, September and October 2020, August, September and October 2021 and August 2022. Total nutrient levels in surface water of the Holyoake mine region were higher in Holyoake mine region compared to the Myara North mine region. Metals concentrations were representative of the similar geological setting, with ANZECC guideline exceedances reported for zinc and copper in limited samples. Similar to Myara North mine region microbiological parameters were detected at all sampling sites, with higher maximum detections reported at Holyoake mine region.

Very low concentrations of PFAS were detected at five sites, however all detections were significantly below the drinking water assessment criteria.

For other contaminants of potential concern, including surfactants, BTEX compounds, TRH, PAH, OC Pesticides and explosives, all samples analysed returned results less than LOR.

7. References

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Appendices

Appendix A

Monitoring Summary

Table A-1 Monitoring summary

Parameters	Analytes	Monitoring locations	Schedule
Surface water			
Surface water extended suite	Field – temperature, pH, dissolved oxygen, redox potential (ORP) and turbidity. Lab - Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), microbiological, surfactants, hydrocarbons, PFAS, explosives	<u>Myara North</u> All 20 SW sites <u>Holyoake</u> All 15 SW sites	Wetter months (Aug, Sept, Oct 2020)
Surface water short suite	Field – EC Lab – Physical parameters, Major cations and anions	<u>Myara North</u> All 20 SW sites <u>Holyoake</u> All 15 SW sites	Drier months (November, December 2020, January 2021)
Surface water field	Temperature, pH, dissolved oxygen, Electrical conductivity, and turbidity.	<u>Myara North</u> 19 SW sites <u>Holyoake</u> 13 SW sites	Two sampling rounds; August to December 2021, August to November 2022.
Surface water lab	Lab - Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), microbiological	<u>Myara North</u> 19 SW sites <u>Holyoake</u> 13 SW sites	Two sampling rounds: August to December 2021 and August to November 2022
Groundwater			
Groundwater field	Water level, EC or TDS, and temperature	<u>Myara North</u> 18 GHD 2020 wells 5 existing Alcoa wells <u>Holyoake</u> 17 GHD 2020 wells 2 existing Alcoa wells	Monthly until January 2021, Monitoring rounds completed in September / October 2021 and February 2022, November 2022 and February 2023
Groundwater lab	Physical parameters, major cations and anions, nutrients, dissolved metals (filtered metals), hydrocarbons, PFAS, explosives	<u>Myara North</u> 18 GHD 2020 wells 7 existing Alcoa wells <u>Holyoake</u> 18 GHD 2020 wells 2 existing Alcoa wells	Six events (<u>October 2020, February 2021, September / October 2021 and February 2022, November 2022, and February 2023</u>)
Surface water instrumentation			
Suspended solids and turbidity	Greenspan TS1000 turbidity logger	<u>Myara North</u> GG03 SW04 SW03 SW08 TN14 614035 <u>Holyoake</u> HSW05 6141005 HSW03	Continuous logging from: September to December 2020, July to January 2021, August 2022 to February 2023
Salinity	Hobo U24 EC logger	<u>Myara North</u> 6141121	Continuous logging from: September to December

Parameters	Analytes	Monitoring locations	Schedule
		6141125 <u>Holyoake</u> HSW05 6141005 HSW03	2020 and July to October 2021
Water level	Diver water level logger	All logger locations	Continuous logging with a break from 5/4/2022 to 24/8/2022.

Appendix B

Surface water and groundwater locations

Table B-1 Groundwater monitoring locations

Type	ID	Sampling type	Easting (MGA50)	Northing (MGA50)	RL (mAHD)	Top of screen	Base of screen
						mBGL	
Myara North							
GHD	B01	Water quality and levels	427,687	6,410,644	225.7	4.4	7.7
GHD	B02	Water quality and levels	428,166	6,411,595	246.3	22.5	28.5
GHD	B03	Water quality and levels	429,882	6,412,459	285.5	17.9	23.9
GHD	B04	Water quality and levels	430,634	6,413,444	295.8	29.2	35.2
GHD	B07	Water quality and levels	417,322	6,419,415	260.5	5	8
GHD	B08	Water quality and levels	415,948	6,417,938	242.7	7.1	13.1
GHD	B09	Water quality and levels	420,091	6,418,115	251.7	0.7	3.2
GHD	B09_B	Water quality and levels	419,195	6,418,601	236.5	5.9	8.9
GHD	B10	Water quality and levels	426,297	6,419,709	295.4	15.2	21.2
GHD	B11	Water quality and levels	414,752	6,416,768	258.6	11	14
GHD	B12D	Water quality and levels	421,659	6,418,965	251.8	18.5	24.5
GHD	B12S	Water quality and levels	421,659	6,418,965	251.7	0.5	3.5
GHD	B13	Water quality and levels	413,156	6,421,906	226.9	9.4	18.4
GHD	B16D	Water quality and levels	420,801	6,421,111	266.5	11.5	17.5
GHD	B16S	Water quality and levels	420,800	6,421,111	266.4	1	4
GHD	B17	Water quality and levels	422,519	6,421,795	284.8	4.7	10.7
GHD	B18	Water quality and levels	426,132	6,425,478	348.0	1.8	7.8
GHD	B24	Water quality and levels	423,557	6,418,440	264.0	12.3	24.3
ALCOA	J3803-4A	Water quality and levels	423,857	6,425,953	298.0	9.9	12.9
ALCOA	J4012-1A	Water quality and levels	424,314	6,416,012	265.0	1.8	7.3
ALCOA	K3917-1A	Water quality and levels	425,580	6,419,008	283.0	4.93	29.93
ALCOA	K4011-1A	Water quality and levels	427,345	6,416,326	290.1	9.9	16.5
ALCOA	K4104-1A	Water quality and levels	428,407	6,413,122	270.0	1.98	13.98
ALCOA	K4106-1A	Water quality and levels	425,980	6,412,606	239.6	19	22
ALCOA	L4009-3A	Water quality and levels	428,915	6,416,135	320.6	5.5	8.5
ALCOA	J3803-3A	Water levels	423,445	6,425,994	283.5	2.8	5.8
ALCOA	J3922-2A	Water levels	422,468	6,418,491	278.3	4.33	26.23
ALCOA	J4108-1A	Water levels	424,370	6,412,792	240.6	3.7	6.7
ALCOA	K3825-11A	Water levels	425,729	6,421,999	307.0	2.9	5.9
ALCOA	K3918-1A	Water levels	426,264	6,419,167	293.6	9	12
ALCOA	K3919-1A	Water levels	426,866	6,418,916	299.6	9.25	15.25
ALCOA	K4010-2A	Water levels	426,364	6,416,172	297.0	15.62	24.62
ALCOA	K4018-1A	Water levels	426,371	6,414,800	270.0	2.53	12.23
ALCOA	K4018-2A	Water levels	426,145	6,415,171	278.6	5.2	20.2
ALCOA	K4019-1A	Water levels	427,280	6,414,986	278.3	3.64	10.64
ALCOA	K4025-1A	Water levels	424,925	6,413,867	250.0	5	14.5
ALCOA	K4025-2A	Water levels	425,664	6,413,655	260.6	21.8	24.8

Type	ID	Sampling type	Easting (MGA50)	Northing (MGA50)	RL (mAHD)	Top of screen	Base of screen
						mBGL	
ALCOA	K4026-1A	Water levels	425,841	6,413,802	250.0	2.2	6.2
ALCOA	L4009-2A	Water levels	429,079	6,416,547	330.4	5.85	9.85
ALCOA	L4013-1A	Water levels	428,936	6,415,647	310.5	23	29
ALCOA	L4019-1A	Water levels	430,845	6,415,054	340.6	NA	10.78
ALCOA	L4027-1A	Water levels	430,770	6,413,886	319.3	NA	29.22
ALCOA	L4101-1A	Water levels	429,036	6,413,478	280.0	3.57	21.57
Holyoake							
GHD	BH01	Water quality and levels	424,054	6,390,718	278.9	20.5	29.5
GHD	BH02	Water quality and levels	424,192	6,388,696	270.0	12.5	17.5
GHD	BH03	Water quality and levels	426,806	6,387,108	274.7	28.2	40.2
GHD	BH04	Water quality and levels	424,015	6,386,978	257.7	23.7	29.7
GHD	BH05	Water quality and levels	428,234	6,386,651	264.1	12.2	14.2
GHD	BH06	Water quality and levels	425,573	6,384,809	272.2	34.3	40.3
GHD	BH07	Water quality and levels	424,805	6,383,732	256.5	12	18
GHD	BH08	Water quality and levels	422,941	6,381,445	259.0	13	19
GHD	BH09	Water quality and levels	429,106	6,381,269	273.7	22.2	28.2
GHD	BH10	Water quality and levels	426,113	6,381,245	293.4	11.5	18.2
GHD	BH11	Water quality and levels	419,714	6,379,933	232.0	13.5	22.5
GHD	BH12	Water quality and levels	424,142	6,379,814	272.8	3.1	6.1
GHD	BH13	Water quality and levels	426,917	6,377,918	296.4	28	34
GHD	BH14	Water quality and levels	419,640	6,377,768	228.3	26.6	38.6
GHD	BH15	Water quality and levels	420,847	6,376,506	230.6	4.2	8.2
GHD	BH16	Water quality and levels	422,958	6,375,535	248.2	28	34
GHD	BH17	Water quality and levels	422,522	6,372,129	209.0	19.2	25.2
ALCOA	K4916-2A	Water quality and levels	428,489	6,377,903	303.0	NA	24.33
ALCOA	J4904-4.25	Water quality and levels	424,091	6,379,273	NA	NA	9.68
ALCOA	H4821-2.4	Water levels	418,441	6,380,573	255.1	NA	15.77
ALCOA	J4607-1A	Water levels	423,285	6,391,928	316.2	16	22
ALCOA	J4607-1B	Water levels	423,287	6,391,930	315.1	15.95	18.95
ALCOA	J4908-4.9	Water levels	424,357	6,378,864	298.5	NA	23.55
ALCOA	K4605-1A	Water levels	425,037	6,391,511	300.5	17.9	21.9
ALCOA	K4610-1A	Water levels	425,967	6,391,100	290.6	23.2	26.2
ALCOA	L4913-1A	Water levels	428,774	6,378,098	308.0	20	32

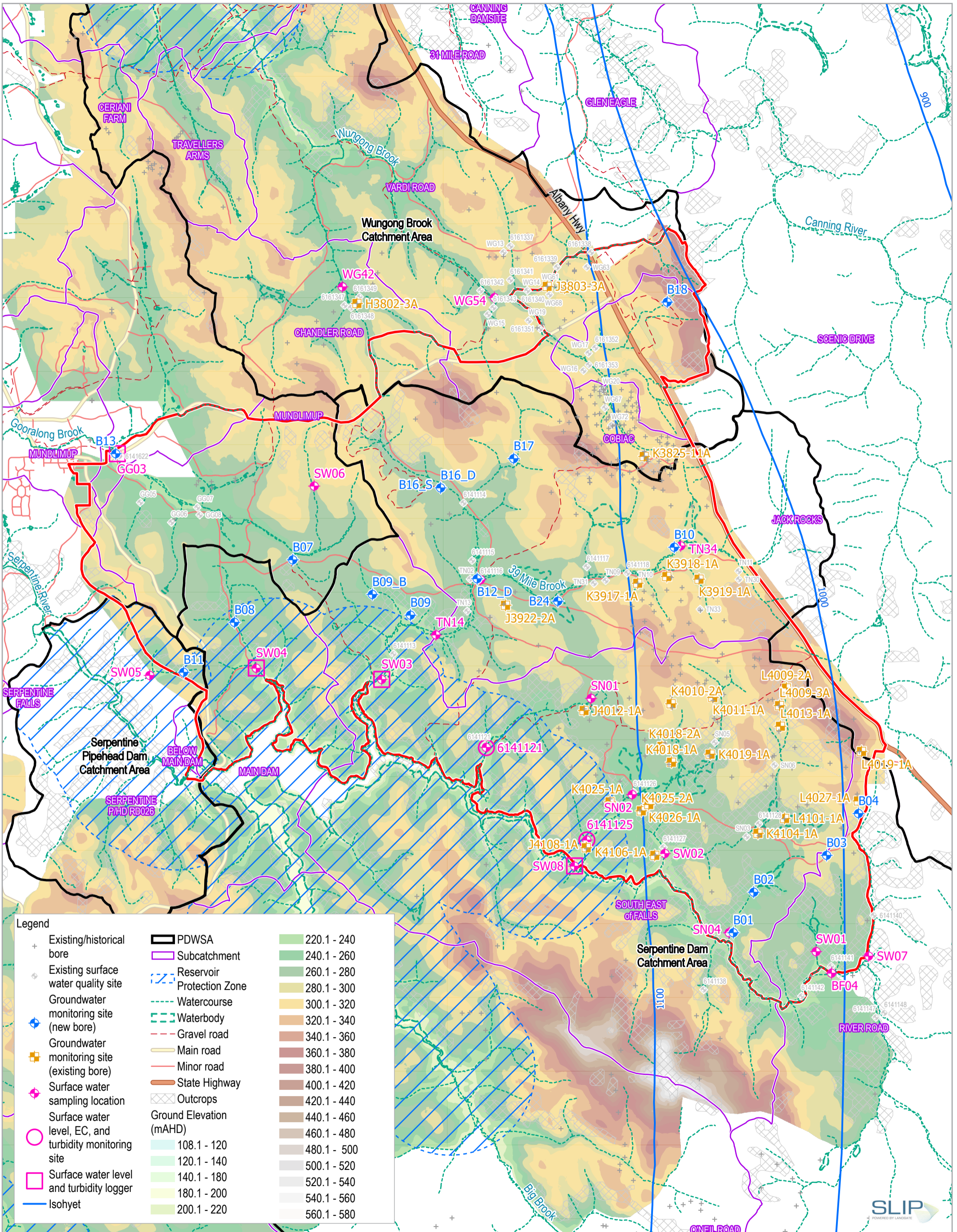
Table B-2 Surface water monitoring locations

Site ID	Type	Category	Rationale	Easting (MGA50)	Northing (MGA50)
Myara North					
WG54	SW grab	Existing Alcoa	Wungong/Cobiac subcatchment Downstream of confluence of tributaries that have proposed mining	422,064	6,425,587
WG42	SW grab	Existing Alcoa	Wungong/Chandler Rd subcatchment Downstream of confluence of tributaries that have proposed mining	418,488	6,425,833
GG03	SW grab Turbidity WQ logger Diver WL logger	Existing Alcoa	Downstream extent of Gooralong Brook near study boundary (DWER site Gooralong Brook 12) Site located in proximity to Jarrahdale Rd	413,191	6,421,910
SW06	SW grab	New	Upstream tributary of Gooralong Brook Possible no upstream mining	417,826	6,421,144
SW05	SW grab	New	Minor tributary along western mining margin Direct flow into lower reach of Serpentine River Pipehead Dam	413,955	6,416,689
SW04	SW grab Turbidity WQ logger Diver WL logger	New	Minor tributary Direct flow into Serpentine River Pipehead Dam	416,461	6,416,868
TN34	SW grab	Existing Alcoa	39 Mile Brook upper catchment Background/control monitoring location Monitoring at suspected groundwater dependent ecosystem (GDE) location	426,450	6,419,745
TN01	SW grab	Existing DWER	39 Mile Brook - mid catchment Monitoring at suspected GDE location	421,739	6,418,949
TN14	SW grab	Existing Alcoa Existing DWER	39 Mile Brook Jack Rocks stream gauging Equipment installed by Alcoa	420,689	6,417,649

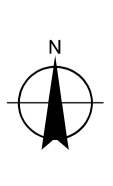
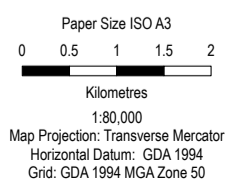
Site ID	Type	Category	Rationale	Easting (MGA50)	Northing (MGA50)
SW03	SW grab Turbidity WQ logger Diver WL logger	New	Downstream extent of 39 Mile Brook catchment	419,652	6,416,696
SN01	SW grab	Existing Alcoa	Upstream Banksia Gully Monitoring at suspected GDE location	424,339	6,416,149
6141121	SW grab EC WQ logger Diver WL logger	Existing DWER	Banksia Gully (DWER site Serpentine 22) Mining in upper extent of catchment extends into 1100mm isohyet	421,839	6,415,049
SN02	SW grab	Existing Alcoa	Goldmine Gully - mid catchment Monitoring at suspected GDE location	425,306	6,413,889
6141125	SW grab EC WQ logger Diver WL logger	Existing DWER	Central tributary Goldmine Gully (DWER site Serpentine 26) Subcatchment crosses 1100 mm isohyet Mining proposed in lower and upper sections of catchment	424,189	6,412,849
SW02	SW grab	New	Eastern tributary with limited mining activity identified	426,078	6,412,502
SN04	SW grab	Existing Alcoa	Minor tributary with no mining identified in catchment Proposed background location	427,589	6,410,640
SW01	SW grab	New	Minor eastern tributary with limited mining activity identified	429,636	6,410,191
BF04	SW grab	Existing Alcoa	Minor eastern tributary with limited mining activity identified	430,000	6,409,690
SW07	SW grab	New	Probable upstream mining (south east boundary)	430,870	6,410,090
SW08	SW grab Turbidity WQ logger Diver WL logger	New	Downstream proposed Serpentine River conveyor crossing location	423,946	6,412,188

Site ID	Type	Category	Rationale	Easting (MGA50)	Northing (MGA50)
Holyoake					
6141333	SW grab	Existing DWER	Northern South Dandalup tributary	422,939	6,388,649
HSW05	SW grab Turbidity WQ logger EC WQ logger Diver WL logger	New	Northern South Dandalup tributary Downstream proposed conveyor crossing location	423,041	6,386,536
HSW01	SW grab	New	Monitoring location sited to capture upstream contributing catchment	428,385	6,386,875
BF20	SW grab	Existing Alcoa	Minor internal tributary of South Dandalup River	428,128	6,386,529
6141352	SW grab	Existing DWER	Location sited to capture upstream Duncans Rd Crossing catchment	428,089	6,384,999
6141349	SW grab	Existing DWER	South Dandalup River Location sited along eastern boundary of survey area	426,439	6,384,349
HSW04	SW grab	New	Location sited to capture two external tributaries	429,199	6,381,349
6141005	SW grab Turbidity WQ logger EC WQ logger Diver WL logger	Existing DWER	South Dandalup River Location sited along western boundary of survey area Existing data: 1970s, CI data, limited EC and turbidity	424,563	6,383,974
SD31	SW grab	Existing Alcoa	Upstream boundary on central South Dandalup – Pindalup tributary. Just downstream of 614043 DWER gauging station (flow data to 1998)	427,208	6,377,990
6141340	SW grab	Existing DWER	Downstream location on South Dandalup – Pindalup tributary Existing data: 1975-1995, EC and turbidity	422,889	6,381,448
6141325	SW grab	Existing DWER	Minor southern tributary Direct discharge into South Dandalup Dam	419,089	6,382,349

Site ID	Type	Category	Rationale	Easting (MGA50)	Northing (MGA50)
DV04	SW grab	Existing Alcoa	Characterise discharge of survey area to Davis Brook (Murray River)	417,714	6,377,514
HSW02	SW grab	New	Location sited to capture upstream and external contributing catchment (Oak Brook)	426,143	6,374,994
6141470	SW grab	Existing DWER	Located on southern boundary of survey area	423,589	6,372,898
HSW03	SW grab Turbidity WQ logger EC WQ logger Diver WL logger	New	Characterise discharge from survey area to Swamp Oak Brook (Murray River) Located upstream of Lane Poole Reserve which has high social value	422,381	6,371,886



Legend	
+	Existing/historical bore
◇	Existing surface water quality site
◇	Groundwater monitoring site (new bore)
□	Groundwater monitoring site (existing bore)
◇	Surface water sampling location
○	Surface water level, EC, and turbidity monitoring site
□	Surface water level and turbidity logger
—	Isohyet
—	PDWSA
—	Subcatchment
—	Reservoir Protection Zone
—	Watercourse
—	Waterbody
—	Gravel road
—	Main road
—	Minor road
—	State Highway
—	Outcrops
—	Ground Elevation (mAHD)
—	108.1 - 120
—	120.1 - 140
—	140.1 - 180
—	180.1 - 200
—	200.1 - 220
—	220.1 - 240
—	240.1 - 260
—	260.1 - 280
—	280.1 - 300
—	300.1 - 320
—	320.1 - 340
—	340.1 - 360
—	360.1 - 380
—	380.1 - 400
—	400.1 - 420
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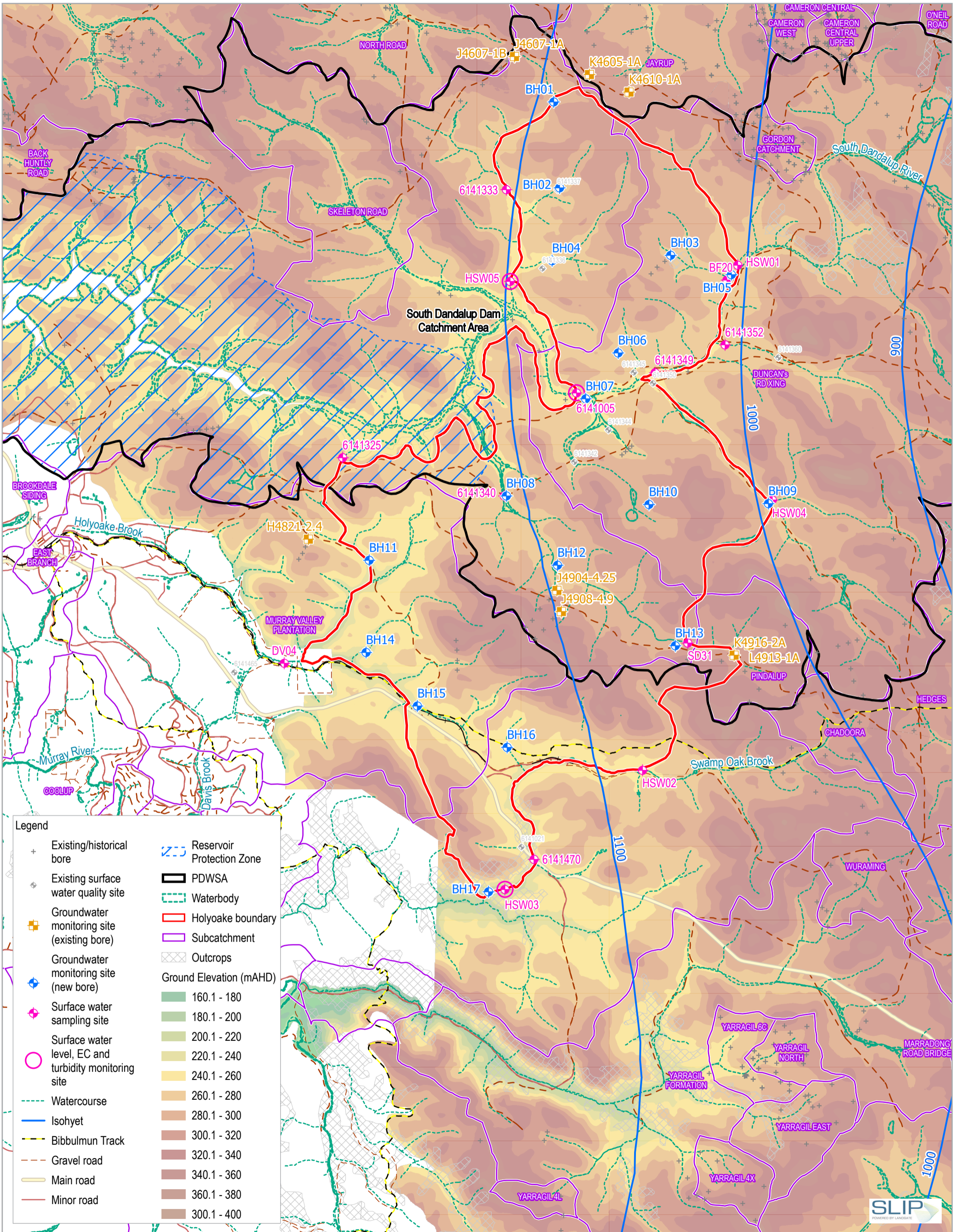
Alcoa of Australia Limited
Hydrology Baseline Monitoring Report

Project No. 125120591
Revision No. 0
Date 12/01/2022

**Myara North Water
Monitoring Locations**

FIGURE B-1

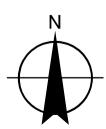
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Print date: 12 Jan 2022 - 16:44
Data source: GHD: Proposed sites - 20200624; Subcatchments - 20200624; Alcoa: Myara North Boundary - 20200618; LiDAR Elevation - 20200626; Reservoir Protection Zone; Isohyet - 20200225; Streams - 20200617; GA: SRTM - 20200526; DWER: Existing Monitoring Sites - 20200629; DoW: PDWSA - 20160607; Landgate: Roads - 20190128; . Created by: rbrown3



Legend

+ Existing/historical bore	Reservoir Protection Zone
Existing surface water quality site	PDWSA
Groundwater monitoring site (existing bore)	Waterbody
Groundwater monitoring site (new bore)	Holyoake boundary
Surface water sampling site	Subcatchment
Surface water level, EC and turbidity monitoring site	Outcrops
Watercourse	Ground Elevation (mAHD)
Isohyet	160.1 - 180
Bibbulmun Track	180.1 - 200
Gravel road	200.1 - 220
Main road	220.1 - 240
Minor road	240.1 - 260
	260.1 - 280
	280.1 - 300
	300.1 - 320
	320.1 - 340
	340.1 - 360
	360.1 - 380
	300.1 - 400

Paper Size ISO A3
 0 0.5 1 1.5 2
 Kilometres
 1:80,000
 Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 50



Alcoa of Australia Limited
 Hydrology Baseline Monitoring Report

Project No. 125120591
 Revision No. 0
 Date 12/01/2022

**Holyoake Water
 Monitoring Locations**

FIGURE B-2

G:\6112520591\GIS\Map\Working\12520591-MAP-A-SW112520591_Hydrology_Overview_P.H.aprx\12520591_A-2_SAO_P_HolyoakeWaterMonitoringLocations_RevA
 Print date: 12 Jan 2022 - 16:51
 Data source: GHD: Proposed monitoring sites - 20200825; Subcatchments - 20200624; Alcoa: Myara North Boundary - 20200618; LIDAR Elevation - 20200626; Reservoir Protection Zone, Isohyet - 20200225; Streams - 20200617; GA: SRTM - 20200526; DWER: SW Monitoring Sites - 20200629; DoW: PDWSA - 20160607; Landgate: Roads - 20190128; - Created by: rbrown3

Appendix C

**Laboratory and field duplicate QA/QC
analysis summary**

Overview

The following sections describe laboratory and field duplicate QA/QC, including summary tables of exceedances and outliers.

Relative percentage difference

The Relative Percentage Differences (RPD) is a measure of the representativeness of duplicate samples. Typical RPDs are expected to range between 0-50% however variation in RPDs may occur for organic analytes, as well as where concentrations of an analyte are very low and close to the laboratory limit of reporting, which exaggerates the percentage differences.

Where a result was reported below the LOR for one of the duplicate pair samples, the sample will be assigned the concentration of the LOR for RPD calculation purposes.

RPD results are summarised in Tables C-1 to C-4. As a conservative measure, for the RPD exceedances the higher value between primary and duplicate sample has been utilised in the assessment of results.

Holding times

Required holding times were breached for the surface water and ground water analysis outlined in Table C-5.

Samples could not be delivered to the laboratory within the holding time for pH (6 hours) due to the remoteness of the monitoring sites. Field analyses were also undertaken for pH for all samples to account for this.

Two and three day holding time exceedances for MBAS were unavoidable due to the analysis only being able to be undertaken in Sydney. No surface water sample exceeded LOR for MBAS which is considered consistent with the location in State forest.

Aside from the above parameters, samples were delivered to the laboratory within the holding time, however extraction occurred one day outside of the required holding time. This is outside of GHD's control and is considered to be a nonconformance from the laboratory. Nevertheless, this will be considered when interpreting results.

Matrix spikes

Matrix spikes were carried out to test the potential for contamination of a sample (or samples) during sample collection. Matrix spike recovery was not determined for several analytes during the surface water and ground water sampling events. This is due to the sampled environment and is outside of GHD's and laboratory's control.

Recovery less than the lower data quality objective was reported for three samples, indicating the potential for under-reporting of sample concentration. It is noted that the concentration of these samples was below the detection limit, and therefore this low recovery is unlikely to impact suitability of the data.

The matrix spike outliers are outlined in Table C-6.

Table C-1 Myara North surface water summary of RPD exceedances

Analyte	Date	Primary sample	QC Sample	RPD %		
E. coli (orgs/100mL)	12/10/2020	GG03	22	QA09	11	67
	1/09/2021	SW07	1	QA02	2	11
Enterococci (orgs/100 ml)	12/10/2020	GG03	43	QA09	20	73
	1/09/2021	SW07	1	QA02	2	67
	09/11/2022	SW03	4	MN_QC03	7	55
Turbidity (NTU)	9/12/2020	SW05	0.2	QA15	1.0	133
	1/09/2021	SW07	3.2	QA02	2	46

Table C-2 Holyoake surface water summary of RPD exceedances

Analyte	Date	Primary sample	QC Sample	RPD %		
Nitrogen (Total) (mg/L)	28/09/2020	6141333	0.4	QA07	0.2	67
	23/09/2021	HSW04	0.1	QA04	0.2	67
Total Kjeldahl Nitrogen (mg/L)	28/09/2020	6141333	0.4	QA07	0.2	67
	23/09/2021	HSW04	0.1	QA04	0.2	67

Table C-3 Myara North ground water summary of RPD exceedances

Analyte	Date	Primary sample	QC Sample	RPD %		
Sulfate (filtered) (mg/L)	13/10/2020	B07	24	FD01	7	110
	18/02/2022	B07	6	QA05	32	137
Phenanthrene (µg/L)	13/10/2020	B07	0.004	FD01	<0.002	67
PAHs (Sum of total) (µg/L)	13/10/2020	B07	0.004	FD01	<0.001	120

Table C-4 Holyoake ground water summary of RPD exceedances

Analyte	Date	Primary sample	QC Sample	RPD %		
Pyrene (µg/L)	19/10/2020	BH07	0.002	FD02	<0.001	67
Fluoranthene (µg/L)	19/10/2020	BH07	0.002	FD02	<0.001	67
PAHs (Sum of Total) – Lab Calc (µg/L)	19/10/2020	BH07	0.004	FD02	<0.001	120

Table C-5 Holding time outliers

Analyte	Holding time (exceedance)	Sampling Event	Location	Sample ID(s)
pH	6 hrs (> 6 hrs)	All sampling events	Myara North/ Holyoake	All samples
Total Kjeldahl Nitrogen	2 days (1 day)	September 2020	Myara North	TN14
Organochlorine Pesticides	7 days (1 day)	September 2020	Myara North	SW02, SW03, SW04, SW05, SW06, 6141121, 6141125, SN01, SN02, QA06, SW08
Polynuclear Aromatic hydrocarbons	7 days (1 day)	September 2020	Myara North	SW02, SW03, SW04, SW05, SW06, 6141121, 6141125, SN01, SN02, QA06, SW08
	7 days (1 day)	October 2020	Myara North	B08, B10, B11, B24, J3803-4A, K3917-1A
Polynuclear Aromatic hydrocarbons (super trace)	7 days (1 day)	September 2020	Myara North	SW02, SW03, SW04, SW05, SW06, 6141121, 6141125, SN01, SN02, QA06, SW08
	7 days (1 day)	October 2020	Myara North	B08, B10, B11, B24, J3803-4A, K3917-1A
Explosives	7 days (3 days)	October 2020	Myara North	SW02, 6141125, GG03, SN01, SN02, SN04, TN14, TN34, WG42, QA09
	7 days (1 day)	October 2020	Holyoake	BH11, BH14, K4916-2A J4904-4.25
	7 days (1 day)	February 2021	Holyoake	BH07, BH09, BH13, BH12, BH08
Sulfonylurea Herbicides	7 days (1 day)	October 2020	Myara North	SW02, 6141125, GG03, SN01, SN02, SN04, TN14, TN34, WG42, QA09
Anionic Surfactants as MBAS	4 days (2 days)	October 2020	Myara North	SW08
	4 days (3 days)	August 2020	Holyoake	HSW05, 6141005, 6141333
Enterococci	1 day (1 day)	October 2020	Holyoake	HSW01, 6141349, QA11
Turbidity	2 day (5 days)	December 2020	Myara North	SW05, QA15, TN14, SW06,

Table C-6 Matrix spike outliers

Analyte	Sampling event	Location	Site	Comment
Mercury	August 2020	Myara North	SW05	Recovery less than lower data quality objective
Sulfate as SO ₄ ²⁻ -Turbidimetric	September 2020	Myara North	WG42	MS recovery not determined, background level greater than or equal to 4x spike level.
	October 2020	Myara North	B12_D	
	August 2020	Holyoake	SW05	
Ammonia as N	September 2020	Myara North	WG42	
	October 2020	Myara North	B12_D	
	August 2020	Holyoake	HSW01	
Chloride	September 2020	Myara North	WG42	
Nitrite plus Nitrate as N	September 2020	Myara North	WG42	
	October 2020	Myara North	B12_D	
	August 2020	Holyoake	HSW01	
Manganese	October 2020	Myara North	B12_D	
	February 2021	Holyoake	BH05	
Mercury	August 2020	Holyoake	HSW01	Recovery less than lower data quality objective
Polynuclear Aromatic Hydrocarbons	February 2021	Myara North	B24	Recovery less than lower data quality objective

Appendix D

Calibration Certificates

EQUIPMENT INFORMATION

 Instrument: YSIProDSS-1A
 Serial Number: 17K102848 (Display)
 17K103853(Sonde)

EQUIPMENT CHECK

	Enclosed	Comment
YSI Pro DSS Display	<input checked="" type="checkbox"/>	
YSI 4 port Sonde	<input checked="" type="checkbox"/>	
- YSI pH / ORP probe	<input checked="" type="checkbox"/>	
- YSI-Turbidity Probe	<input checked="" type="checkbox"/>	
- YSI Cond/Temp Probe	<input checked="" type="checkbox"/>	
- YSI ODO Sensor	<input checked="" type="checkbox"/>	
Flow Cell	<input checked="" type="checkbox"/>	
Probe Guard & weight	<input checked="" type="checkbox"/>	
Storage/Calibration Sleeve (with Gasket)	<input checked="" type="checkbox"/>	
Charger & PC Cable	<input checked="" type="checkbox"/>	
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>	
Battery Charged 100%	<input checked="" type="checkbox"/>	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature		Factory Calibrated	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/>	100% Saturation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Pressure Compensation 1022 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/>	1288mS/cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	Check linearity at 1.4mS/cm	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity		Auto Calibrated	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/>	pH 7.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	pH 4.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/>	229 mV at 25 °C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Turbidity		0, 124 NTU / FNU	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Sonde – 17K103332	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 31.07.2020



Environmental monitoring
& sampling equipment
Rentals and sales.

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fax: +61 8 9328 2677
eco@ecoenvironmental.com.au
www.ecoenvironmental.com.au
214 Lord St Perth WA 6000

EQUIPMENT INFORMATION

Instrument: YSIPP6B
Serial Number: 17F104994 (Display)
Lot Number: 12C100157 (Sonde)

EQUIPMENT CHECK

	Enclosed	Comment
YSI Pro Plus Display	<input checked="" type="checkbox"/>	
YSI Quatro Sonde	<input checked="" type="checkbox"/>	
Flow Cell	<input checked="" type="checkbox"/>	
Probe Guard	<input checked="" type="checkbox"/>	
Rubber Storage/Calibration	<input checked="" type="checkbox"/>	
Sleeve Calibration Cup + Cap	<input checked="" type="checkbox"/>	
YSI Pro Series ProComm II Kit	<input checked="" type="checkbox"/>	
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>	
Spare Batteries (x 2)	<input checked="" type="checkbox"/>	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	$\pm 2\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1025 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	$\pm 1\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 242 mV at 19 °C	$\pm 20\text{mV}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Tim Collins

ECO Environmental Equipment Specialist

Date: 06.08.2020

EQUIPMENT INFORMATION

Instrument: YSIProDSS-2P

Serial Number: 15H104162 (Display)

17K103332 (Sonde)

EQUIPMENT CHECK

	Enclosed	Comment
YSI Pro DSS Display	<input checked="" type="checkbox"/>	
YSI 4 port Sonde	<input checked="" type="checkbox"/>	
- YSI pH / ORP probe	<input checked="" type="checkbox"/>	
- YSI-Turbidity Probe	<input checked="" type="checkbox"/>	
- YSI Cond/Temp Probe	<input checked="" type="checkbox"/>	
- YSI ODO Sensor	<input checked="" type="checkbox"/>	
Flow Cell	<input checked="" type="checkbox"/>	
Probe Guard & weight	<input checked="" type="checkbox"/>	
Storage/Calibration Sleeve (with Gasket)	<input checked="" type="checkbox"/>	
Charger & PC Cable	<input checked="" type="checkbox"/>	
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>	
Battery Charged 100%	<input checked="" type="checkbox"/>	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	±0.2°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	+2%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1020 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	±0.5%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	±0.5%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	±1%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 240 mV at 20 °C	±20mV	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Turbidity	0, 124 NTU / FNU Sonde – 15H101896	±0.3 NTU/FNU	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 04.09.2020

EQUIPMENT INFORMATION

Instrument: YSIProDSS-2P

Serial Number: 15H104162 (Display)

17K103332 (Sonde)

EQUIPMENT CHECK	Enclosed	Comment
YSI Pro DSS Display	<input checked="" type="checkbox"/>	
YSI 4 port Sonde	<input checked="" type="checkbox"/>	
- YSI pH / ORP probe	<input checked="" type="checkbox"/>	
- YSI-Turbidity Probe	<input checked="" type="checkbox"/>	
- YSI Cond/Temp Probe	<input checked="" type="checkbox"/>	
- YSI ODO Sensor	<input checked="" type="checkbox"/>	
Flow Cell	<input checked="" type="checkbox"/>	
Probe Guard & weight	<input checked="" type="checkbox"/>	
Storage/Calibration Sleeve (with Gasket)	<input checked="" type="checkbox"/>	
Charger & PC Cable	<input checked="" type="checkbox"/>	
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>	
Battery Charged 100%	<input checked="" type="checkbox"/>	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	<input type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	$\pm 2\%$	<input type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1013 hPa	<input type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	$\pm 0.5\%$	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	$\pm 0.5\%$	<input type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	$\pm 1\%$	<input type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 236 mV at 22 $^{\circ}\text{C}$	$\pm 20\text{mV}$	<input type="checkbox"/>	<input type="checkbox"/>
Turbidity	0, 124 NTU / FNU	$\pm 0.3 \text{ NTU/FNU}$	<input type="checkbox"/>	<input type="checkbox"/>
	Sonde – 15H101896			

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 01.10.2020



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EQUIPMENT INFORMATION

Instrument: H1001
Serial Number: 0742-T2

Equipment Check

	Enclosed	Returned	Comment
Heron Water Level Meter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Heron Carry Bag	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spare battery 9v	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Inspection Details

	Pass	Fail	Comment
De-con wash of tape (100m)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
De-con wash of reel	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Inspection for faults, corrosion, damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Meter in good working order, clean and ready for use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

This is to certify that where possible this instrument has been cleaned in accordance with the manufacture's general maintenance procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

Equipment Specialist
ECO Environmental

Date: 09.10.2020



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EQUIPMENT INFORMATION

Instrument: WATERRA Power Pack: WPP1

Equipment Check	Enclosed	Returned	Comment
Waterra Power Pack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Waterra Back Pack Frame	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Aluminium Carry Case	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Jerry Can (10L)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Instruction Manual	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Inspection Details	Pass	Fail	Comment
De-con wash of Waterra Power Pack	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
De-con wash of carry case	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Inspection for faults, corrosion, damage	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Unit in good working order, clean & ready for use	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

This is to certify that where possible this instrument has been cleaned in accordance with the manufacture's general maintenance procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

T. Collins

Equipment Specialist ECO Environmental

Date: 15.09.2020



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EQUIPMENT INFORMATION

Instrument: WATERRA Power Pack: WPP1

Table with 4 columns: Equipment Check, Enclosed, Returned, Comment. Rows include Waterra Power Pack, Waterra Back Pack Frame, Aluminium Carry Case, Jerry Can (10L), and Instruction Manual.

Table with 4 columns: Inspection Details, Pass, Fail, Comment. Rows include De-con wash of Waterra Power Pack, De-con wash of carry case, Inspection for faults, corrosion, damage, and Unit in good working order, clean & ready for use.

This is to certify that where possible this instrument has been cleaned in accordance with the manufacture's general maintenance procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

Equipment Specialist ECO Environmental

Date: 09.10.2020

EQUIPMENT INFORMATION

Instrument: YSIPP6B
Serial Number: 17F104994 (Display)
Lot Number: 12C100157 (Sonde)

EQUIPMENT CHECK	Enclosed	Comment
YSI Pro Plus Display	<input checked="" type="checkbox"/>	
YSI Quatro Sonde	<input checked="" type="checkbox"/>	
Flow Cell	<input checked="" type="checkbox"/>	
Probe Guard	<input checked="" type="checkbox"/>	
Rubber Storage/Calibration	<input checked="" type="checkbox"/>	
Sleeve Calibration Cup + Cap	<input checked="" type="checkbox"/>	
YSI Pro Series ProComm II Kit	<input checked="" type="checkbox"/>	
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>	
Spare Batteries (x 2)	<input checked="" type="checkbox"/>	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	±0.2°C	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	±2%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1016 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	±0.5%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	±0.5%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	±1%	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 236 mV at 22 °C	±20mV	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Jacques Couronne

ECO Environmental Equipment Specialist

Date: 12.02.2021

Appendix E

Borehole logs



BOREHOLE LOG

MONITORING WELL B01

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 11/09/2020 - 11/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 7.70 Diameter (mm) 135	Easting, Northing 427679, 6410639 Grid Ref GDA94_MGA_zone_50 Elevation 264 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AH				Clayey gravel. Pea gravel and cobbles, 5-30mm sub rounded with significant silt and clay. Light brown, moist, loose .		263.
1							263
1.5			Grout Depth: 0.0 - 3.0				262.
2					Clay . Very stiff clay, plastic when moist. Minor iron cementing. Mottled white to bluish grey, slightly moist, stiff .		262
2.5							261.
3			Slow release bentonite pellets Depth: 3.0 - 3.7				261
3.5							260.
4		∇					260
4.5							259.
5							259
5.5			Gravel pack: 3.2-6.4 mm. Depth: 3.7 - 7.7				258.
6							258
6.5					Weathered dolerite. Weathered to extremely weathered medium grained dolerite. Significant silty and clay (weathering), red to brown, slightly moist, very stiff .		257.
7							257
7.5					Dolerite. No sample - assumed fresh dolerite, wet, hard .		256.
					Termination Depth at: 7.70 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B02

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 09/09/2020 - 09/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 28.50 Diameter (mm) 135	Easting, Northing 428185, 6411584 Grid Ref GDA94_MGA_zone_50 Elevation 220 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AH				Gravel. Pea gravel, 2-20mm sub rounded with significant silt and clay. Light brown, moist, medium dense .		218
4					Caprock. Iron cemented caprock, with up to 20% fine grained sands. Red, slightly moist, dense .		216
6					Clayey silt. Sandy clayey silt. Beige, slightly moist, medium dense .		214
8					Sandy silt. Sandy silt with minor sand (fine grained). White, slightly moist, medium dense .		212
10			Grout Depth: 0.0 - 19.0		Clayey silt. Clayey silt with minor sand (fine grained). White/ red, slightly moist, medium dense .		210
12					Silty clay. Silty clay. Medium plasticity. Reddish., moist, soft .		208
14							206
16							204
18							202
20			Slow release bentonite pellets Depth: 19.0 - 21.2				200
22					Silty clay. Silty clay with minor coarse sand (quartz). Medium plasticity. Green., very moist, soft .		198
24			Gravel pack: 3.2-6.4 mm. Depth: 21.2 - 28.5				196
26					Silty clay. Silty clay with minor coarse sand (quartz). Medium plasticity. Beige., wet/saturated, soft/loose .	Saturated at 26.5, first groundwater collected (2L/min), pH = 7.3, TDS = 460 mg/L, EC = 716 uS/cm	194
28					Weathered granite. Extremely weathered granite, quartz rich, weakly cemented. White, saturated, medium dense .	Flow at 28.5 (3L/min), pH = 6.1, TDS = 734 mg/L, EC = 1124 uS/cm	192
					Granite. Granite, dry, hard .		
					Termination Depth at: 28.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

MONITORING WELL B03

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client Alcoa of Australia	Drill Co. Proline	Easting, Northing 429880, 6412496
Project Alcoa Huntly Expansion	Driller Stuart Birnie	Grid Ref GDA94_MGA_zone_50
Project No. 12520591	Rig Type Comacchio Geo 305	Elevation 251.5
Site Myara North	Drill Method Air	Collar RL TBC
Location Myara North	Total Depth (m) 23.90	Logged By AO
Date Drilled 08/09/2020 - 08/09/2020	Diameter (mm) 135	Checked By AO/DB

Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH	-			Top soil. Grey silty sand with organic matter. Medium grained, poorly graded, moist, soft/firm .	Drilled to 23.5m, after 1h no water present	251
2					Silty gravelly sand. Grey Silty gravelly sand, minor clay. Medium grained, poorly graded, moist, soft/firm		250
3					Gravelly sandy silt. Transitioning to silty clay, grey to light orange, slightly moist, medium dense/firm .		249
4					Silty Clay. Silty clay, fine. Partly cemented. Light orange to white, dry, medium dense/firm .		248
5							247
6							246
7							245
8							244
9							243
10							242
11							241
12							240
13		239					
14		238					
15		237					
16		236					
17		235					
18		234					
19		233					
20		232					
21		231					
22		230					
23	DC				Sandy Clay. Sandy Clay. Orange, moist, soft/firm .		229
23					Sandy clay. Sandy Clay. Blue/grey, moist, soft/firm .		228
24					Termination Depth at: 23.90 m		227

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B04

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 07/09/2020 - 08/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 36.00 Diameter (mm) 135	Easting, Northing 430635, 6413463 Grid Ref GDA94_MGA_zone_50 Elevation 269 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AH				Gravel. Pea gravel, iron cemented, 2-20mm sub rounded with limited silt and clay. Brown, moist, loose .		268
4					Caprock. Caprock, weakly cemented, dark red to brown, moist, medium dense .		266
6					Silty Clay. Silty clay, fine. Partly cemented. Beige, slightly moist, medium dense/firm .		264
8					Silty Clay. Silty clay, fine, powdery. Not cemented. White, slightly moist, medium dense/firm .		262
10					Silty Clay. Silty clay with sand, fine. Not cemented. White. Becoming grainy , slightly moist, medium dense/firm .		260
12			Grout Depth: 0.0 - 23.5		Silty Clay. As above, red/white/brown, slightly moist, medium dense/firm .		258
14							256
16							254
18							252
20							250
22							248
24			Slow release bentonite pellets Depth: 23.5 - 27.5				246
26							244
28							242
30					Sandy clay. As above, light yellow becoming grainy (fine sand) and moist, moist, medium dense/firm .		240
32			Gravel pack: 3.2-6.4 mm. Depth: 27.5 - 35.5		Clayey Gravel. Weathered rock/saprock. Weakly cemented coarse sand with significant clay at 30-31 and 32.5-33. Gravel is angular quartz and feldspar, wet/saturated, soft/firm .	Wet/saturated (3L/min), pH = 7.18, TDS = 208 mg/L, EC = 321 uS/cm	238
34			Backfill Depth: 35.2 - 36.0				236
36					Termination Depth at: 36.00 m	Collapse, well installed at 35.2 Water level 22.9 mbgl after air lifting.	234

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL B07

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 19/08/2020 - 19/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 8.00 Diameter (mm) 135	Easting, Northing 417332, 6419413 Grid Ref GDA94_MGA_zone_50 Elevation 292 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AH		Grout Depth: 0.0 - 3.0		Top soil. Silty gravel, coarse 5-10mm, poorly graded. Brown, moist, medium dense .		291.
1					Silty gravel. Course 10-30mm, poorly graded. Brown, moist, medium dense .		291
1.5					Silty gravel. Course 30-50mm, poorly graded. Red/brown, slightly moist, dense .		290.
2					Clayey sand. Clayey sand with minor gravel, transitioning to fine sandy clay, plastic. Red to beige, slightly moist, firm .		290
2.5					Lateritic caprock. Cemented sands and gravels. Red, dry, hard .		289.
3	DC	▽	Slow release bentonite pellets Depth: 3.0 - 4.0		Sandy clay. Medium grained sands, poorly graded. Grey, slightly moist, firm .		289
3.5						288.	
4					Sandstone. Iron cemented sands and gravels. Red/yellow, dry, hard .		288
4.5						287.	
5						287	
5.5			Gravel pack: 3.2-6.4 mm. Depth: 4.0 - 8.0		Dolerite. Weathered dolerite. Iron stained, coarse grained, fractured. Grey/black, saturated, hard .	Diamond core from 6.5 m. Saturated, minor flow (0.01 L/s), pH = 7.44, TDS = 377 mg/L, EC = 576 uS/cm	286.
6		286					
6.5		285.					
7					Dolerite. Fresh dolerite with minor fractures. Dark grey, saturated, very hard .(diamond)		285
7.5						End of hole in hard basement dolerite. Flow from above. (0.01 L/s), pH = 5.34, TDS = 352 mg/L, EC = 542 uS/cm	284.
8					Termination Depth at: 8.00 m		284

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B08

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 04/09/2020 - 04/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 13.10 Diameter (mm) 135	Easting, Northing 415946, 6417938 Grid Ref GDA94_MGA_zone_50 Elevation 223 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH		Grout Depth: 0.0 - 0.7		Ferricrete/caprock. Pea gravel, iron cemented, 2-20mm sub rounded with significant silt and clay. Light brown, moist, loose .		222
2					Clay. Mottled clay, stiff, minor silt/sand iron cementing. Light brown to cream, slightly moist, stiff .		221
3			Slow release bentonite pellets Depth: 0.7 - 6.1		Gravelly clay. Clay, variably stiff, with up to 50% angular quartz gravel, weakly cemented/brittle. Cream, saturated/moist, medium dense .		220
4					Clayey gravel (Saprock). Saprock, gravel quartz, angular, weakly cemented, with clay/silt. White, saturated, medium dense .		219
5					Clayey gravel (Saprock). Saprock, gravel quartz, angular, weakly cemented, with clay/silt. White, saturated, medium dense .		218
6					Clayey gravel (Saprock). Saprock, gravel quartz, angular, weakly cemented, with clay/silt. White, saturated, medium dense .		217
7					Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .	Flow at 7 m (5L/30sec), pH = 7.04, TDS = 422 mg/L, EC = 585 uS/cm	216
8					Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .	Flow at 8.5 m (5L/30sec), pH = 6.5, TDS = 349 mg/L, EC = 555 uS/cm	215
9					Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .		214
10			Gravel pack: 3.2-6.4 mm. Depth: 6.1 - 13.		Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .	Flow at 10 m (1L/s), pH = 6.4, TDS = 448 mg/L, EC = 694 uS/cm	213
11					Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .	Drop in flow 11-12m with more silty rock structure	212
12					Clayey gravel (Saprock). As above, increase in iron mineralisation, mottled. Brittle becoming hard. Brown, saturated, medium dense .		211
13					Quartzite/metamorphic?. Quartz dominant rock. Very fine grained/glassy. Significant mafic minerals. Very hard with depth. White/dark brown, saturated, hard .	End of hole flow (1L/s), pH = 6.8, TDS = 422 mg/L, EC = 650 uS/cm	210
					Termination Depth at: 13.10 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B09

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 28/08/2020 - 28/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 3.20 Diameter (mm) 135	Easting, Northing 420093, 6418114 Grid Ref GDA94_MGA_zone_50 Elevation 230 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	AH		Grout Depth: 0.0 - 0.3		Silty sand. Medium grained sand, sub angular, with significant pea gravel. Light brown. , moist, loose .		229.
0.4			Slow release bentonite pellets Depth: 0.3 - 0.5				229.
0.6							229.
0.8							229.
1.0	DC				Granite. Fresh to slightly weathered granite, coarse grained. Minor sub vertical fracture at 2.4m, moist, hard .(diamond)		229.
1.2							228.
1.4							228.
1.6							228.
1.8			Gravel pack: 3.2-6.4 mm. Depth: 0.5 - 3.2				228.
2.0							228.
2.2							227.
2.4							227.
2.6							227.
2.8							227.
3.0							227.
3.2					Termination Depth at: 3.20 m	Minor seepage only from airlift (<1L/min), pH = 7.3, TDS = 399 mg/L, EC = 615 uS/cm	226.
3.4							226.
3.6							226.
3.8							226.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B09_B

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 10/09/2020 - 10/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 8.90 Diameter (mm) 135	Easting, Northing 419196, 6418601 Grid Ref GDA94_MGA_zone_50 Elevation 255 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AH				Gravel. Pea gravel and cobbles, 5-30mm sub rounded with significant silt and clay. Light brown, moist, loose .		254.
1			Grout Depth: 0.0 - 1.8				254
1.5					Sandy silt. Coarse sand and brown to white silt, slightly moist, stiff .		253.
2							253
2.5							252.
3			Slow release bentonite pellets Depth: 1.8 - 5.0		Sandy silt. Sandy silt with minor clay. Red/white/beige, slightly moist, stiff .		252
3.5							251.
4							251
4.5							250.
5							250
5.5							249.
6							249
6.5			Gravel pack: 3.2-6.4 mm. Depth: 5.0 - 8.9				248.
7							248
7.5							247.
8		▽			Sandy silt. Weathered granite, quartz rich. Brown to white, wet/saturated, firm .	Wet/saturated, water level recorded at 7.55 m bgl	247
8.5							246.
9					Termination Depth at: 8.90 m		246
9.5							245.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL B10

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 25/08/2020 - 26/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 21.50 Diameter (mm) 135	Easting, Northing 426297, 6419709 Grid Ref GDA94_MGA_zone_50 Elevation 292 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH				Gravel. Pea gravel, fine grained cemented clasts 2-15mm, sub rounded. Silt matrix 20%. Light brown, moist, very loose .		291
2					Ferricrete/caprock. Iron cemented caprock. Significant silt/uncemented. Brown, moist, hard .		290
3					Ferricrete/caprock. As above, less cemented, moist, very stiff .		289
4					Silty clay. Clay with significant silt and minor sands. Light brown, dry/slightly moist, soft/firm .		288
5					Silty clay. Clay with significant iron cementation. Red, dry/slightly moist, soft/firm .		287
6			GROUT Depth: 0.0 - 12.		Silty clay. As above. Colour change to red/brown, dry/slightly moist, soft/firm .		286
7					Silty clay. As above. Grading to pink/orange, slightly moist, soft/firm .		285
8					Silty clay. As above. Minor cemented white mottled clays, occasionally gravelly. Red/brown, very moist, firm .		284
9					Gravelly clay. Clay with variably cemented gravels, mottled red/white. Increasingly hard with depth and rock texture, wet, very stiff .		283
10							282
11							281
12							280
13			Slow release bentonite pellets Depth: 12. - 14.				279
14							278
15							277
16							276
17			Gravel pack: 3.2-6.4 mm. Depth: 14. - 21.				275
18							274
19							273
20							272
21			Backfill Depth: 21. - 21.			Very hard at 21.5m, basement. Very minor seepage. (1L/2 mins), pH = 7.8, TDS = 357 mg/L, EC = 546 uS/cm	271
					Termination Depth at: 21.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL B11

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 04/09/2020 - 04/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 14.10 Diameter (mm) 135	Easting, Northing 414746, 6416766 Grid Ref GDA94_MGA_zone_50 Elevation 257 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH		Grout Depth: 0.0 - 0.5		Gravel. Pea gravel, iron cemented, 2-20mm sub rounded with significant silt and clay. Light brown, moist, loose .		256
2					Ferricrete/caprock. Strongly cemented caprock, massive, dark red to brown, slightly moist, hard .		255
3					Silty clay. Clay, generally firm. Occasional gravel/iron cemented mottled. Light brown, cream with depth, moist, firm .	Becoming wet at 3m	254
4			Backfill Depth: 0.5 - 7.5				253
5							252
6							251
7							250
8			Slow release bentonite pellets Depth: 7.5 - 10.			Saturated at 7.5	249
9					Gravelly clay. Brittle cemented quartz gravel and sand with 40% clay/ weathered quartz. White to cream, moist, soft/firm .		248
10					Clayey sand. Coarse grained angular quartz sand, with significant silt and clay. Occasionally iron cemented zones. Red to dark brown, saturated, soft/firm .	Flow at 10m, slop only (<1L/10 secs), pH = 6.3, TDS = 84 mg/L, EC = 125 uS/cm	247
11						Flow at 11.5m (4L/15 secs), pH = 5.3, TDS = 140 mg/L, EC = 215 uS/cm	246
12			Gravel pack: 3.2-6.4 mm. Depth: 10. - 14.		Gravelly clay. Extremely weathered rock/saprock. Weakly cemented gravel with significant clay. Gravel is angular quartz and feldspar. Iron stained, brown, saturated, soft/firm .		245
13							244
14			Backfill Depth: 14. - 14.		Granite?. Refusal. No sample. Likely granite, .	Flow at 14m (1 L/s), pH = 5.4, TDS = 131 mg/L, EC = 190 uS/cm	243
					Termination Depth at: 14.10 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B12_D

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 20/08/2020 - 21/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 24.50 Diameter (mm) 135	Easting, Northing 421673, 6418956 Grid Ref GDA94_MGA_zone_50 Elevation 228 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH				Gravel. Gravel 5-50mm, with minor sand and silt. Red, saturated, Loose .	Minor flow in perched unit. (<0.01 L/s), pH = 6.13, TDS = 59 mg/L, EC = 92.5 uS/cm	227
2					Sandy clay. Clay with medium to fine grained sands and silts, poorly graded. Light Beige/brown, slightly moist, medium dense .		226
3					Silty clay. As above, increase in clay, light beige. , moist, medium dense .		225
4					Sandy clay. As above, minor increase in sand. Light brown/reddish brown, moist, medium dense .		224
5							223
6							222
7							221
8			Grout Depth: 0.0 - 16.				220
9					Sandy clay. As above, some cementing of sands, minor gravel. Light brown, saturated, soft .		219
10						Minor flow at 11m, possibly from above. (7L/min), pH = 5.65, TDS = 364 mg/L, EC = 560 uS/cm	218
11							217
12							216
13					Sandy clay. As above, slight increase in sands/gravel 1-5mm. , wet, soft .		215
14							214
15					Silty/gravelly clay. As above, minor cementing and gravels. Occasionally very firm and dry. , moist, medium dense .		213
16							212
17			Slow release bentonite pellets Depth: 16. - 17.				211
18							210
19							209
20							208
21			Gravel pack: 3.2-6.4 mm. Depth: 17. - 24.				207
22						Flow in weathered basement/sands. (40L/min), pH = 6.26, TDS = 416 mg/L, EC = 642 uS/cm	206
23					Granite. Coarse sand, and weathered granite, iron stained, weakly cemented. , wet, medium dense .		205
24					Granite. Fresh granite. Minor iron staining. , wet, hard .		204
					Termination Depth at: 24.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B12_S

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 21/08/2020 - 21/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 3.50 Diameter (mm) 135	Easting, Northing 421673, 6418956 Grid Ref GDA94_MGA_zone_50 Elevation 223 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	AH	∇	Grout Depth: 0.0 - 0.2		Gravel. Gravel 5-50mm, with minor sand and silt. Red, saturated, Loose .		222
0.4			Slow release bentonite pellets Depth: 0.2 - 0.5				222
0.6							222
1.0					Sandy clay. Clay with medium to fine grained sands and silts, poorly graded. Light Beige/brown, slightly moist, medium dense .	Minor flow in perched unit. (<0.01 L/s), pH = 6.13, TDS = 59 mg/L, EC = 92.5 uS/cm	222
1.2							221
1.4							221
1.6							221
1.8							221
2.0			Gravel pack: 3.2-6.4 mm. Depth: 0.5 - 3.5		Silty clay. As above, increase in clay, light beige. , moist, medium dense .		221
2.2							220
2.4							220
2.6							220
2.8							220
3.0							220
3.2							219
3.4							219
3.6					Termination Depth at: 3.50 m		219
3.8							219

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL B13

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 31/08/2020 - 31/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 18.50 Diameter (mm) 135	Easting, Northing 413149, 6421902 Grid Ref GDA94_MGA_zone_50 Elevation 228 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH		<p style="font-size: small;">Grout Depth: 0.0 - 7.5</p> <p style="font-size: small;">Slow release bentonite pellets Depth: 7.5 - 8.5</p> <p style="font-size: small;">Gravel pack: 3.2-6.4 mm. Depth: 8.5 - 18.</p>		Clayey gravel. Pea gravel, iron cemented, 2-20mm sub rounded with significant silt and clay. Light brown, wet/moist, loose .		227
2					Sandy clay. Clay with significant fine to medium grained sand/silt, cemented in parts, clay increasing with depth. Light brown. , moist, soft .		226
3					Sandy clay. As above, becoming cream to white, moist, soft .		225
4							224
5							223
6							222
7							221
8					Gravelly clay. Kaolinitic clay, with up to 40% quartz sand and gravel, angular. Partly cemented. White, saturated, soft .	Minor flow from 5.5m (3L/30 sec), pH = 7.5, TDS = 154 mg/L, EC = 227 uS/cm	220
9							219
10							218
11					Gravelly clay. As above, increase in feldspar gravel, brown, saturated, medium dense .	Flow increasing with depth, gravel zones (5L/12 sec), pH = 7.3, TDS = 144 mg/L, EC = 220 uS/cm	217
12							216
13							215
14					Silty gravel. Feldspar and quartz angular gravel and weakly cemented/fractured rock, angular to blocky, with significant sand and minor clay. Light brown, saturated, medium dense .		214
15							213
16							212
17							211
18					Quartzite. Quartz and feldspar rock. Massive with milky to opaque zones, highly fractured, hard with depth. Brown, saturated, very dense .	High flow 14-16m in fractures and gravels (1 L/s), pH = 5.5, TDS = 133 mg/L, EC = 205 uS/cm	210
					Termination Depth at: 18.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B16_D

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 27/08/2020 - 28/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 17.50 Diameter (mm) 135	Easting, Northing 420800, 6421112 Grid Ref GDA94_MGA_zone_50 Elevation 264 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH				Clayey gravel. Pisolithic/pea gravel, well rounded, 2-15mm with 30% silt and fine grained sand. Light brown, moist, loose .		263
2					Clay. Kaolinitic clay, partly stiff. Minor sand 1.5-2.0m, uniform from 2m. , slightly moist, soft/firm .		262
3							261
4							260
5							259
6							258
7							257
8							256
9							255
10							254
11						First water strike, seepage only	253
12					Sandy clay. Clay with fine grained to coarse grained sand and iron cemented silt/gravel. Mottled red to white. , saturated, soft/firm .		252
13						Good flow (4L/30 sec), pH = 6.1, TDS = 420 mg/L, EC = 650 uS/cm	251
14					Gravel pack: 3.2-6.4 mm. Depth: 10. - 17.		250
15					Gravelly sand. Weakly cemented sand and gravel, coarse grained sand to 2 mm, sub angular, felsic and quartz. With significant slit and clays. Extremely weathered granite. Brown to white, saturated, firm .		249
16							248
17					Granite. Slightly weathered to extremely weathered coarse grained granite, quartz dominant. , saturated, hard .	End of hole flow in weathered granite (8L/30 sec), pH = 6.06, TDS = 455 mg/L, EC = 686 uS/cm	247
					Termination Depth at: 17.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B16_S

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 28/08/2020 - 28/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 4.00 Diameter (mm) 135	Easting, Northing 420800, 6421112 Grid Ref GDA94_MGA_zone_50 Elevation 264 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	AH		Grout Depth: 0.0 - 0.1		Clayey gravel. Pisolithic/pea gravel, well rounded, 2-15mm with 30% silt and fine graded sand. Light brown, moist, loose . Clay. Kaolinic clay, partly stiff. Minor sand 1.5-2.0m, uniform from 2m. , slightly moist, soft/firm .		263.
0.4		Slow release bentonite pellets Depth: 0.1 - 0.5	263.				
0.6							263.
0.8							263.
1							263.
1.2							262.
1.4							262.
1.6							262.
1.8							262.
2							262.
2.2			Gravel pack: 3.2-6.4 mm. Depth: 0.5 - 4.0				261.
2.4							261.
2.6		∇					261.
2.8							261.
3							261.
3.2							260.
3.4							260.
3.6							260.
3.8							260.
4					Termination Depth at: 4.00 m		260.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B17

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 26/08/2020 - 26/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 10.70 Diameter (mm) 135	Easting, Northing 422519, 6421796 Grid Ref GDA94_MGA_zone_50 Elevation 280 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AH		Grout Depth: 0.0 - 0.9		Gravel. Course grained pisolitic/pea gravel, with silt and sand. Red/brown, moist, very loose .		279.
1					Ferricrete/caprock. Iron cemented caprock, cemented gravel concretions. Very hard, slightly moist, hard .		279
1.5					Silty/sandy clay. Clay with significant fine grained to medium grained sand and minor gravel. Sand and gravel is cemented lithic fragments, angular. Light brown/cream, moist, soft .		278.
2			Slow release bentonite pellets Depth: 0.9 - 3.5				278
2.5							277.
3							277
3.5							276.
4							276
4.5							275.
5							275
5.5							274.
6							274
6.5							273.
7			Gravel pack: 3.2-6.4 mm. Depth: 3.5 - 10.				273
7.5					Silty sand. Cemented sands, iron and partly cemented sands, with significant silt/minor clay, moist, stiff .		272.
8							272
8.5							271.
9					Gravelly clay. Extremely weathered granite/saprock, quartz rich, weakly cemented. White, wet, firm .		271
9.5							270.
10					Gravel/Granite. Course grained angular quartz (2.4mm) with significant cream clays. Very hard at 10.7 in fresh granite, saturated, hard .	Seepage at 10m. (2L/30 sec), pH = 8.2, TDS = 157 mg/L, EC = 233 uS/cm	270
10.5						Flow increasing in gravel/granite refusal (5L/30 sec), pH = 6.2, TDS = 170 mg/L, EC = 263 uS/cm	269.
					Termination Depth at: 10.70 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B18

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 26/08/2020 - 26/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 8.20 Diameter (mm) 135	Easting, Northing 426132, 6425488 Grid Ref GDA94_MGA_zone_50 Elevation 339 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AH		Grout Depth: 0.0 - 0.4		Gravelly sand. Course grained sand/lateritic gravel, with significant silt. Light brown, moist, loose .		338.
1			Slow release bentonite pellets Depth: 0.4 - 1.0		Sandy clay. Medium grained sand 30-50% with iron cemented nodules. Brown, , medium dense .		338
1.5							337.
2					Ferricrete/caprock. Iron cemented caprock, with up to 50% fine grained sands, significant silty clay white to brown, increasing with depth. Brown, moist, firm .		337
2.5							336.
3							336
3.5							335.
4							335
4.5			Gravel pack: 3.2-6.4 mm. Depth: 1.0 - 7.8		Silty clay. Stiff clay, mottled white to light brown, dry/slightly moist, firm/soft .		334.
5							334
5.5							333.
6							333
6.5							332.
7					Sandy clay. Clay with significant quartz sand, occasionally cemented and remnant rock fabric. Yellow/light brown, moist, stiff .		332
7.5					Granite. Coarse grained, quartz rich. Significant iron staining. Fresh with depth. Grey, moist, hard .	Basement granite, very minor seepage only. No flow	331.
8			Backfill Depth: 7.8 - 8.2				331
8.5					Termination Depth at: 8.20 m		330.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL B24

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Myara North Location Myara North Date Drilled 21/08/2020 - 25/08/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 24.90 Diameter (mm) 135	Easting, Northing 423558, 6418439 Grid Ref GDA94_MGA_zone_50 Elevation 255 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AH				Silty/gravelly clay. Clay with significant gravel, sand and silt. Gravel is ferricrete/pea gravel to 40mm. Light brown. , moist, loose .		254
2					Ferricrete/caprock. Iron cemented caprock. Vuggy to 20mm. Minor clay. Red/brown, moist, hard .		253
3					Silty clay. Mottled clay with silt. Red brown to white, moist, firm/soft .		252
4					Clay. Plastic clay, with minor sand and silt (Saprolitic clay). White to light grey, moist, firm/soft .		251
5			Grout Depth: 0.0 - 9.5				250
6						Seepage at 7m. Very silty. (10L/4mins), pH = 6.2, TDS = 172 mg/L, EC = 265 uS/cm	249
7							248
8							247
9						Seepage at 10m. (1L/min), pH = 5.3, TDS = 165 mg/L, EC = 253 uS/cm	246
10			Slow release bentonite pellets Depth: 9.5 - 11.		Silty clay. Clays with minor iron cementing. Becoming mottled clay. Grey to red/brown, moist/dry, firm/soft .		245
11							244
12					Clay. Plastic clay, minor silt. Mottled. Cream. Dry in parts. , moist/dry, firm/soft .		243
13							242
14					Clay. Plastic clay, minor silt. Minor iron cementing. Red/brown, moist, firm/soft .		241
15							240
16							239
17							238
18			Gravel pack: 3.2-6.4 mm. Depth: 11. - 24.				237
19							236
20					Gravelly clay. Extremely weathered rock, clays and cemented clays. Significant quartz in clay matrix. , saturated, dense .		235
21							234
22							233
23							232
24					Granite. Weathered granite. Brittle to hard. Quartz dominant. Iron stained. White to grey. , saturated, hard .	EOH in granite. Minor flow. (4L/min), pH = 5.22, TDS = 261 mg/L, EC = 387 uS/cm	231
25					Termination Depth at: 24.90 m		230

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH01

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 12/10/2020 - 13/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 29.50 Diameter (mm) 135	Easting, Northing 424054, 6390718 Grid Ref GDA94_MGA_zone_50 Elevation 259 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Silty gravel. Topsoil, silty sand, with minor pea gravel, brown., moist, loose.		258
4					Caprock/clayey gravel. Lateritic caprock, iron cemented, fine grained, with 40% clay and silty clay. Brown, slightly moist, very stiff.		256
6					Clay/Silty clay. White clay/silty clay. Stiff at first, then powdery. White, dry, soft.		254
8					Silty clay. As above, transition to yellow/light brown, dry, soft.		252
10							250
12					Silty/Sandy clay. Silty clay with minor quartz angular sand. Pink to orange, very moist, soft.		248
14					Gravelly clay. Silty clay with significant quartz gravel and sand. Bands of angular quartz, milky to white. Sugary 13-13.5m. Occasionally rock texture., saturated, soft/firm.	Minor flow	246
16							244
18					Clay/sandy clay. As above, increase in clay. Fine grained sand and gravel to 10%. Brown, saturated, soft/firm.	Flow increasing slightly	242
20					Quartz/clay. Quartz vein, milky to translucent quartz, dark mineral veins, with 30% clay, saturated, stiff.		240
22					Sandy clay. Silty clay with significant quartz gravel and sand. Occasionally weak rock structure. Sand to 30%. Light brown, saturated, medium dense.		238
24							236
26					Clayey gravel. Extremely weathered rock (granite assumed). Quartz and feldspar angular gravel. Firm with depth. Light brown., saturated, dense.		234
28							232
30					Termination Depth at: 29.50 m	Flow increasing in basement gravels End of hole in transition to basement. No basement rock sampled.	230

Notes
This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH02

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 02/10/2020 - 12/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 17.50 Diameter (mm) 135	Easting, Northing 424192, 6388696 Grid Ref GDA94_MGA_zone_50 Elevation 260 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm, brown, wet, loose .		259
2					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard .		258
3					Clayey Silt. Pale brown, silt dominant fines, weakly cemented, dry, dry, soft .		257
4					Clayey Silt. White, silt dominant fines, strongly cemented, dry, dry, soft .		256
5					Clayey Silt. White, silt dominant fines, very weakly cemented, dry, dry, soft .		255
6					Clayey Silt. Red, silt dominant fines, weakly cemented, dry, increasing clay content with depth, dry, soft .		254
7					Clayey Silt. Red, silt dominant fines, weakly cemented, dry, increasing clay content with depth, dry, soft .		253
8					Silty Clay. Grey and brown, soft, moderate plasticity, moist, moist, soft .		252
9					Silty Clay. Brown, very moist, soft, high plasticity, highly weathered granite fragments (1-60mm), very moist, soft .		251
10					Silty Clay. Brown, very moist, soft, high plasticity, highly weathered granite fragments (1-60mm), very moist, soft .		250
11			Grout Depth: 0.0 - 10.5		Silty Clay. Brown, very moist, soft, high plasticity, highly weathered granite fragments (1-60mm), very moist, soft .		249
12			Slow release bentonite pellets Depth: 10.5 - 11.5		Silty Clay. Brown, very moist, soft, high plasticity, highly weathered granite fragments (1-60mm), very moist, soft .		248
13					Clayey Sand. Grey/brown, fine to coarse grained, well graded, poorly sorted, highly weathered granite/quartz, angular (1-25mm), wet, soft .		247
14			Gravel pack: 3.2-6.4 mm. Depth: 11.5 - 17.7		Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, wet, soft .		246
15					Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, wet, soft .		245
16					Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, wet, soft .		244
17					Weathered Granite. Weathered quartz rich granite, medium grained,		243
					Termination Depth at: 17.50 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH03

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 29/09/2020 - 30/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 40.20 Diameter (mm) 135	Easting, Northing 426806, 6387108 Grid Ref GDA94_MGA_zone_50 Elevation 274 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Sand. Pale grey to brown, fine to medium grained, poorly graded, well sorted, subangular/subrounded, wet, loose .		272
4					Sandy Clay. Brown, soft, moderate plasticity, moist, soft .		270
6					Clayey Silt. White, silt dominant fines, weak cementation, dry, soft .		268
8					Clayey Silt. Brown/orange, silt dominant fines, weak cementation, increasing clay content with depth, dry, soft .		266
10							264
12			Grout Depth: 0.0 - 24.0				262
14							260
16							258
18							256
20					Silty Clay. Brown, clay dominant fines, weakly cemented, soft, moderate plasticity, moist, soft .		254
22							252
24			Slow release bentonite pellets Depth: 24.0 - 26.5		Clay. Brown, soft, moderate plasticity, minor granite and quartz fragments (1-5mm), wet, soft .		250
26						Flow increasing in the weathered basement, high yield	248
28					Highly weathered granite. Highly weathered quartz rich granite, very grainy (1-5mm, angular) in brown clay matrix, wet, hard .		246
30							244
32			Gravel pack: 3.2-6.4 mm. Depth: 26.5 - 40.2				242
34							240
36							238
38							236
40					Granite. Medium grained granite, weathered, high quartz component, wet, hard .		234
					Termination Depth at: 40.20 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH04

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 01/10/2020 - 01/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 29.70 Diameter (mm) 135	Easting, Northing 424015, 6386978 Grid Ref GDA94_MGA_zone_50 Elevation 242 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm, brown, wet, loose .		240
4					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard .		238
6					Clayey SAND. Pale brown, fine to coarse grained, well graded, poorly sorted, angular. Weathered quartz fragments, 1-50mm, moist, loose .		236
8					Clayey Silt. Pale yellow/cream, very weakly cemented, silt dominant fines, dry, soft .		234
10			Grout Depth: 0.0 - 19.0		Clayey Silt. White, silt dominant fines, uncemented, dry, soft .		232
12					Clayey Silt. Brown/red, silt dominant fines, weakly cemented, clay content increasing with depth, dry, soft .		230
14					Clayey Silt. Brown/red, silt dominant fines, weakly cemented, clay content increasing with depth, moist, soft .		228
16					Clayey Silt. Brown/red, silt dominant fines, weakly cemented, clay content increasing with depth, very moist, soft .		226
18					Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, increasing clay content with depth, very moist, soft .		224
20			Slow release bentonite pellets Depth: 19.0 - 22.0		Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, increasing clay content with depth, very moist, soft .		222
22					Silty Clay. Brown, clay dominant fines, soft, moderate plasticity, increasing clay content with depth, very moist, soft .		220
24					Sandy Clay. Brown, very soft, moderate plasticity, clay dominant fines, wet, soft .		218
26			Gravel pack: 3.2-6.4 mm. Depth: 22.0 - 29.7		Clayey Sand. Highly weathered quartz (1-2mm), angular, fine to coarse grained, well graded, poorly sorted, wet, loose .		216
28					Sandy Clay. Brown, very soft, moderate plasticity, clay dominant fines, highly weathered quartz (1-2mm), angular, wet, soft .		214
30					Clayey Sand. Highly weathered quartz (1-2mm), angular, fine to coarse grained, well graded, poorly sorted, wet, loose .	Flow increasing in weathered basement, low yield	212
32					Highly weathered granite. Highly weathered quartz rich granite, very grainy (1-5mm, angular) in brown clay matrix, wet, hard .		210
34					Granite. Medium grained granite, weathered, high quartz component, wet, hard .		208
Termination Depth at: 29.70 m							

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH05

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 29/09/2020 - 29/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 14.20 Diameter (mm) 135	Easting, Northing 428234, 6386651 Grid Ref GDA94_MGA_zone_50 Elevation 233 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose .		232
2					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard .		231
3					Clayey Gravel. Red/brown, brown, iron cemented gravel, subrounded, moist, loose .		230
4					Clayey Silt. Pale red, turning white at 3m, silt dominant fines, weak cementation, minor ferrite band at 4m, dry, soft .		229
5							228
6			Grout Depth: 0.0 - 4.8				227
7			Slow release bentonite pellets Depth: 4.8 - 6.9		Clayey Silt. Dark red, silt dominant fines, very weak cementation, dry, soft .		226
8					Clayey Silt. Orange, silt dominant fines, very weak cementation, moist, soft .		225
9					Silty Clay. Clay dominant fines, brown, soft, moderate plasticity, moist, soft .		224
10							223
11			Gravel pack: 3.2-6.4 mm. Depth: 6.9 - 14.				222
12					Clay. Clay dominant fines, brown, high plasticity, soft, highly weathered granite and quartz fragments (2-3mm), angular, wet, soft .		221
13					Highly weathered granite. Highly weathered granite/quartz in a brown clayey matrix, fragments (4-10mm), angular, wet, hard .		220
14					Granite. Medium grained granite, unweathered, minor quartz component, wet, hard .	Flow increasing in the weathered basement, low yield	219
					Termination Depth at: 14.20 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH06

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 24/09/2020 - 25/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 40.30 Diameter (mm) 135	Easting, Northing 425573, 6384809 Grid Ref GDA94_MGA_zone_50 Elevation 272 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose .		270
4					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard .		268
6					Clayey Silt. silt dominant fines, very weak cementation pale brown getting lighter with depth to white, increasing clay content with depth, slightly moist, soft .		266
8							264
10					Clayey Silt. silt dominant fines, very weak cementation pale red, turning white (11-12.5), increasing clay content with depth, slightly moist, soft .		262
12							260
14							258
16			Grout Depth: 0.0 - 30.8				256
18					Silty Clay. clay dominant fines, very weak cementation, soft, moderate plasticity. Orange/dark red. Increasing clay content with depth, slightly moist, soft .		254
20							252
22					Silty Clay. Clay dominant fines, red/brown, with white clay clods + quartzite grains, soft, high plasticity, moist, soft .		250
24							248
26					Silty Clay. Clay dominant fines, red/brown very grainy with quartzite in soft brown clayey matrix, wet, soft .		246
28							244
30							242
32			Slow release bentonite pellets Depth: 30.8 - 33.1				240
34							238
36			Gravel pack: 3.2-6.4 mm. Depth: 33.1 - 40.3				236
38					Highly weathered granite. Highly weathered quartz rich granite, very grainy in brown clay matrix, wet, soft .		234
40						Flow increasing in the weathered basement	232
					Termination Depth at: 40.30 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL BH07

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 23/09/2020 - 23/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 18.00 Diameter (mm) 135	Easting, Northing 424805, 6383732 Grid Ref GDA94_MGA_zone_50 Elevation 251 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose .		250
2					Clayey Silt. silt dominant fines, very grainy and high in quartzite, soft. Brown getting lighter with depth, moist, soft .		249
3					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, dry, hard .		248
4			Grout Depth: 0.0 - 8.7		Silty Clay. Dark red, soft with a moderate plasticity. weakly cemented. Turning pale brown/yellow from 4.5m with a ferrite band at 6m, dry, soft .		247
5							246
6							245
7					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, dry, hard .		244
8					Clayey Silt. silt dominant fines, weakly cementing, dark red/brown, slightly moist, soft .		243
9			Slow release bentonite pellets Depth: 8.7 - 10.		Silty Clay. clay dominant fines, weakly cementation, soft, moderate plasticity, dark red/brown, clay content increasing with depth, moist, soft .		242
10							241
11							240
12							239
13							238
14			Gravel pack: 3.2-6.4 mm. Depth: 10. - 18.		Silty Clay. clay dominant fines, weak cementation, soft, moderate plasticity, dark red/brown, clay content increasing with depth. Highly weathered granite/quartzite at 13-14m. Colour change 16-17m(brown), wet, soft .		237
15							236
16							235
17							234
18					Clayey Silt. silt dominant fines, very weak cementation, brown, moist, soft .	Flow decreasing with depth	233
19					Granite. Medium grained granite, unweathered, rich in quartz, wet, hard .		232
					Termination Depth at: 18.00 m		232

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL BH08

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 17/09/2020 - 17/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 19.00 Diameter (mm) 135	Easting, Northing 422941, 6381445 Grid Ref GDA94_MGA_zone_50 Elevation 246 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AR				Silty gravel. Lateritic gravel and cobbles, 5-60mm, sub rounded. With silt and sand. Brown, moist, loose		245
2					Caprock/duricrust. Fine grained cemented ferricrete/caprock. Increasing clay and silt with depth. Occasionally very hard. Light brown to brown, moist, hard .		244
3					Silty clay. Clay and silt, occasionally granular and weakly cemented. White, dry , soft/firm .		243
4							242
5			Grout Depth: 0.0 - 9.0		Clay/ferricrete. Clay and weakly cemented ferricrete/fine grained sand. Clays are iron stained. Ferricrete occasionally very hard. Red/brown, moist, very stiff .		241
6							240
7					Clay . Medium plasticity clay. White to mottled pink 6-8m. Darker with depth. Micaceous. Minor quartz increasing from 13m. Quartz vein at 13.5m. Light orange/brown, moist, soft .		239
8							238
9							237
10			Slow release bentonite pellets Depth: 9.0 - 11.5				236
11							235
12							234
13						First seepage. Slop only	233
14							232
15			Gravel pack: 3.2-6.4 mm. Depth: 11.5 - 19.0				231
16							230
17							229
18					Granite. Weathered granite, course grained 2mm, quartz rich. Very hard with depth. Pink, wet, ver dense .	Flow increasing in weathered basement.	228
19					Termination Depth at: 19.00 m		227

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH09

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 22/09/2020 - 23/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 28.20 Diameter (mm) 135	Easting, Northing 429106, 6381269 Grid Ref GDA94_MGA_zone_50 Elevation 275 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose .		274
2					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard .		272
4					Silty Clay. clay dominant fines, weakly cementing, pale red to white, firm, high plasticity, moist, firm .		270
4					Clayey Silt. Silt dominant fines, weakly cementing, pale brown/cream, dry, soft .		268
6					Silty Clay. Clay and silt, occasionally granular and weakly cemented. White, dry, soft .		266
6					Clayey Silt. Silt dominant fines, weakly cementing, brown/dark red, dry, soft .		264
10			Grout Depth: 0.0 - 19.1		Silty Clay. Clay dominant fines, weakly cementing, soft, moderate plasticity, moist, soft .		262
14							260
16							258
18							256
20			Slow release bentonite pellets Depth: 19.1 - 21.0		Clay. Brown clay, very soft, high plasticity weak cementation from 19.5m, wet, very soft .	Flow decreasing with depth - highest in the highly cemented clays	254
22					Weathered granite. Medium grained granite, highly weathered with Strongly cemented hard clays, wet, hard .		252
24			Gravel pack: 3.2-6.4 mm. Depth: 21.0 - 282.		Weathered granite. Coarse grained, highly weathered granite, very gritty in a soft brown clay matrix, wet, hard .		250
26					Weathered granite. Highly weathered granite with weakly cemented hard clays, in very soft and very plastic clay matrix, wet, hard .		248
28					Termination Depth at: 28.20 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL BH10

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 18/09/2020 - 21/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 18.20 Diameter (mm) 135	Easting, Northing 426113, 6381245 Grid Ref GDA94_MGA_zone_50 Elevation 292 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)	
1	AR		<p>Grout Depth: 0.0 - 9.0</p> <p>Slow release bentonite pellets Depth: 9.0 - 10.5</p> <p>Gravel pack: 3.2-6.4 mm. Depth: 10.5 - 18.2</p>		Silty gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose . Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, moist, hard . Clayey silt. Silt dominant fines, minor cementing. Light brown, lighter with depth. , slightly moist, soft . Ferricrete/silt. Iron cemented silt/clay, weakly cemented. Red/brown, dry, very stiff . Clayey silt. Silt dominant fines, minor cementing. Light brown, lighter with depth. , slightly moist, soft . Ferricrete/silt. Iron cemented silt/clay, weakly cemented. Red/brown, dry, very stiff . Clayey silt. Silt dominant fines, minor cementing. Light brown, lighter with depth. , slightly moist, soft . Ferricrete/silt. Iron cemented silt/clay, weakly cemented. Red/brown, dry, very stiff . Silty sand. Fine grained sand and silt, angular, quartz. Possibly sandy with depth. Cream to red/brown., moist, loose . Weathered granite. Medium grained granite, moderately to well weathered, quartz veins. , wet, hard . Granite. Medium grained granite, unweathered, minor quartz component, wet, hard .(diamond)		291	
2								290
3								289
4								288
5								287
6								286
7								285
8								284
9								283
10								282
11								281
12								280
13								279
14								278
15							277	
16	DC						276	
17							275	
18						No flow due to diamond core	274	
					Termination Depth at: 18.20 m			

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Push tube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH11

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 15/10/2020 - 19/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 33.00 Diameter (mm) 135	Easting, Northing 419714, 6379933 Grid Ref GDA94_MGA_zone_50 Elevation 258 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Gravelly clay. Pea gravel 5-15mm, sub rounded with 40% clay and silt. Brown, wet/very moist, loose .		256
4			Grout Depth: 0.0 - 8.2		Caprock. Iron cemented caprock. 20% silt and clay. Brown, moist, hard .		254
6					Clay. Stiff clay, mottled cream to brown, slightly moist, soft/firm .		252
8			Slow release bentonite pellets Depth: 8.2 - 10.5		Silty clay/silt. Powdery silt to clay, occasionally partly cemented and iron stained. White, dry, loose .		250
10					Clayey silt. As above, becoming orange to brown, slightly moist, loose .		248
12					Clay. Plastic clay with trace of fine grained sand. Brown to red, saturated, loose/medium dense .		246
14					Clay. As above, grading to orange. , very moist, loose/medium dense .		244
16			Gravel pack: 3.2-6.4 mm. Depth: 10.5 - 22.5		Clay. As above, grading to red/pink orange, very moist, loose/medium dense .		242
18					Clay. As above grading to light brown, very moist, loose/medium dense .		240
20							238
22							236
24							234
26							232
28			Backfill Depth: 22.5 - 33.0				230
30						High torque forcing end of hole. Moist clays to base from 8.5m. Dipped static in rods of 9m.	228
32							226
					Termination Depth at: 33.00 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH12

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 17/09/2020 - 18/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 6.10 Diameter (mm) 135	Easting, Northing 424142, 6379814 Grid Ref GDA94_MGA_zone_50 Elevation 268 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AR		Grout Depth: 0.0 - 0.3		Silty gravel. Pea gravel with significant cobbles 5-50mm. Occasionally massive caprock. Dark brown, moist, loose/medium dense .		267.
1			Slow release bentonite pellets Depth: 0.3 - 1.9		Clay. Stiff clay, plastic. Mottled cream. Quartz vein at 3.5m. , moist, medium dense .		267
1.5							266.
2							266
2.5							265.
3							265
3.5							264.
4	AR	∇	Gravel pack: 3.2-6.4 mm. Depth: 1.9 - 6.1		Quartzite/Granite. Quartz rich granite. Quartz phenocrysts to 50mm. Large quartz vein at 4m. , moist, hard .(diamond)		264
4.5							263.
5							263
5.5							262.
6						No flow due to diamond core	262
6.5					Termination Depth at: 6.10 m		261.

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH13

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 21/09/2020 - 22/09/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 34.00 Diameter (mm) 135	Easting, Northing 426917, 6377918 Grid Ref GDA94_MGA_zone_50 Elevation 289 Collar RL TBC Logged By EL Checked By AO
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Silty Gravel. Pea gravel with significant cobbles 5-50mm. Light brown, moist, loose .		288
4					Caprock/silty gravel. Lateritic caprock, fine grained iron cemented. Occasionally massive, occasionally pisolitic 5-10mm. Brown, dry, hard .		286
6					Clayey Silt. Silt dominant fines, minor cementing. Light brown, lighter with depth. Light brown clay clods present from 5-6m, dry, soft .		284
8							282
10					Ferricrete/silt. Iron cemented silt/clay, weakly cemented. Red/brown, dry, very stiff .		280
12					Clayey Silt. Silt dominant fines, very weak cementing. Light brown, lighter with depth., moist, soft .		278
14			Grout Depth: 0.0 - 24.5		Silty Clay. Clay dominant fines, very weak cementing. Dark red/brown. White (with red mottles) clay clods present from 14-16m and 19m. Clay content increasing with depth, moist, soft .		276
16							274
18							272
20							270
22					Silty Clay. Clay dominant fines, weak cementing. Brown/green. White (with red and black mottles (minor granite component?) clay clods @ 20m, moist, soft .		268
24							266
26			Slow release bentonite pellets Depth: 24.5 - 26.9				264
28							262
30			Gravel pack: 3.2-6.4 mm. Depth: 26.9 - 34.0		Silty Clay. Clay dominant fines, weak cementation, brown, very soft with moderate plasticity. Very granular with highly weathered quartz, wet, soft .		260
32							258
34					Weathered Granite. Medium grained granite, rich in quartz in a soft brown silty clay matrix, wet, hard .	Flow increasing in weathered basement	256
					Mica Schist. dark grey schist with mica - layers easily broken with finger pressure, wet, hard .		254
					Termination Depth at: 34.00 m		

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH14

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 14/10/2020 - 15/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 38.60 Diameter (mm) 135	Easting, Northing 419640, 6377768 Grid Ref GDA94_MGA_zone_50 Elevation 224 Collar RL TBC Logged By DB Checked By AO
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2					Gravel, red/brown, well graded, sub rounded, with orange, plastic clay, dry, loose .		222
4					Clay with fine gravel, dry, loose .		220
6					Sandy clay, white, moist, moderate plasticity, with sub rounded quartz grains , moist, soft/firm .		218
8					Clay with gravel. Clay, white/yellow mottled, with coarse, sub rounded quartz grains, moist, soft/firm .		216
10					Clay, white, moist, moderate plasticity, moist, soft/firm .		214
12			Grout Depth: 0.0 - 22.7		Sandy clay, red, moist, moderate to highly plastic, moist, soft/firm .		212
14					Clay with sand, indurated, weakly to moderately cemented, minor vugs, moist, soft/firm .		210
16					Sandy clay, orange, moderate plasticity, moist, moist, soft/firm .		208
18					Clay (kaolinite), high plasticity, moist, soft/firm .		206
20					Clay with trace sand, red/orange, moderate to high plasticity, saturated, soft/firm .		204
22					Clay, orange, highly plastic, saturated, soft/firm .		202
24			Slow release bentonite pellets Depth: 22.7 - 25.3		Quartzite, saturated, hard .		200
26					Clay, orange, highly plastic, saturated, stiff .		198
28					Granite, highly weathered, with quartz grains, saturated, hard .	10L/min	196
30			Gravel pack: 3.2-6.4 mm. Depth: 25.3 - 38.6				194
32							192
34							190
36							188
38							186
Termination Depth at: 38.60 m							

Notes
This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL BH15

Page 1 of 1

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 13/10/2020 - 14/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 9.30 Diameter (mm) 135	Easting, Northing 420847, 6376506 Grid Ref GDA94_MGA_zone_50 Elevation 212 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC **Screen** 0.5 mm slots, CL18 PVC **Surface Completion** Monument cover

Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.5	AR				Silty gravel. Pea gravel, rounded, 10-20mm, with silt and sand. Dark brown, moist, loose .		211.
1							211
1.5			Backfill Depth: 0.0 - 2.7				210.
2					Clay. Stiff clay, grey to mottled . , dry, very stiff .		210
2.5							209.
3			Slow release bentonite pellets Depth: 2.7 - 3.4				209
3.5							208.
4							208
4.5							207.
5					Silty clay. Transition from above into loose silty clay/silt. Powdery, white, dry, loose .		207
5.5							206.
6							206
6.5			Gravel pack: 3.2-6.4 mm. Depth: 3.4 - 9.3				205.
7	DC				Diorite/diabase/dolerite?. Sudden transition to fresh intrusive rock. Minor weathering for 50mm. Fine grained, dominance of quartz and dark minerals. Quartz bands of phenocrysts at 7m. Dark mineral phenocrysts at 9-9.4m. Sub horizontal quartz veins. No open fractures. , dry, hard .(diamond)	Very minor moisture at top of basement rock.	205
7.5							204.
8							204
8.5							203.
9							203
9.5					Termination Depth at: 9.30 m		202.

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH16

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 19/10/2020 - 20/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 34.00 Diameter (mm) 135	Easting, Northing 422958, 6375535 Grid Ref GDA94_MGA_zone_50 Elevation 261 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
2	AR				Sand. Fine to medium grained sand. Quartz dominant. Light brown/grey, moist, loose .		260
4					Clayey sand. As above with significant clay/silty to 40%, partly cemented/stiff. Grey, moist, stiff .		258
6					Silt. Powdery silt. Minor cementing and iron stained, trace to 10% fine grained quartz. White, slightly moist, soft .		256
8					Silt. As above, more floury, orange brown, slightly moist, soft .		254
10					Silt. As above, significant band of quartz, weakly cemented. White, slightly moist, stiff .		252
12					Silt. As above, floury silt, white, dry/slightly moist, loose .		250
14			Grout Depth: 0.0 - 25.5				248
16							246
18					Quartz. Possible pegmatite/quartz, white crystalline, friable, slightly moist, very stiff .		244
20					Silt/clay. Silt like above, becoming moist, minor quartz bands, weakly cemented in part. White to light orange, moist, soft .		242
22							240
24						Becoming saturated in clays	238
26			Slow release bentonite pellets Depth: 25.5 - 27.5		Sandy clay. Grading from above with increase in quartz, gravel to and sand to 5 mm, angular. White to light brown, wet, stiff .		236
28							234
30			Gravel pack: 3.2-6.4 mm. Depth: 27.5 - 34.0				232
32					Gravelly clay. Grading from above with increase in quartz gravel to 10 mm, angular. White to light brown, wet, stiff .		230
34						Seepage only	228
					Termination Depth at: 34.00 m	End of hole, close to basement, difficult drilling with clays/gravel blocking inner tubes.	226

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL BH17

ENVIRONMENTAL-GROUNDWATER

Client Alcoa of Australia Project Alcoa Huntly Expansion Project No. 12520591 Site Holyoake Location Holyoake Date Drilled 20/10/2020 - 20/10/2020	Drill Co. Proline Driller Stuart Birnie Rig Type Comacchio Geo 305 Drill Method Air Total Depth (m) 25.20 Diameter (mm) 135	Easting, Northing 422522, 6372129 Grid Ref GDA94_MGA_zone_50 Elevation 221 Collar RL TBC Logged By AO Checked By AO/DB
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Casing 50 mm CL18 PVC	Screen 0.5 mm slots, CL18 PVC	Surface Completion Monument cover
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Depth (m)	Drilling Method	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	COMMENTS/ ENVIRONMENTAL CONDITIONS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
1	AR				Gravelly clay. Clay/silt/sandy clay with 20-40% pea gravel 5-30mm, weakly cemented. Dark brown, moist, loose .		220
2					Clay. Plastic clay, occasionally weakly cemented. Minor quartz gravel 2-10mm. Light brown, slightly moist, medium dense .		219
3							218
4					Ferricrete. Fine grained iron cemented sands, very hard in parts, slightly moist, loose/medium dense .		217
5					Silty clay. Silt and clay, with very minor cementing/iron staining. Pink to white, dry, loose .		216
6							215
7					Silty clay. As above, grading to orange, dry, loose .		214
8			Grout Depth: 0.0 - 15.7				213
9							212
10							211
11							210
12							209
13							208
14							207
15							206
16			Slow release bentonite pellets Depth: 15.7 - 17.5		Clay. Grading from above, becoming moist, moist, loose .		205
17							204
18					Gravelly clay. Clay with up to 30% quartz gravel to 10mm. Angular, mostly friable, wet, loose/medium dense .		203
19							202
20						Minor seepage	201
21			Gravel pack: 3.2-6.4 mm. Depth: 17.5 - 25.2				200
22							199
23					Clay. As above, drop in quartz gravel, wet, loose/medium dense .		198
24						End of hole minor flow only. End due to difficult drilling in clays.	197
25					Termination Depth at: 25.20 m		196

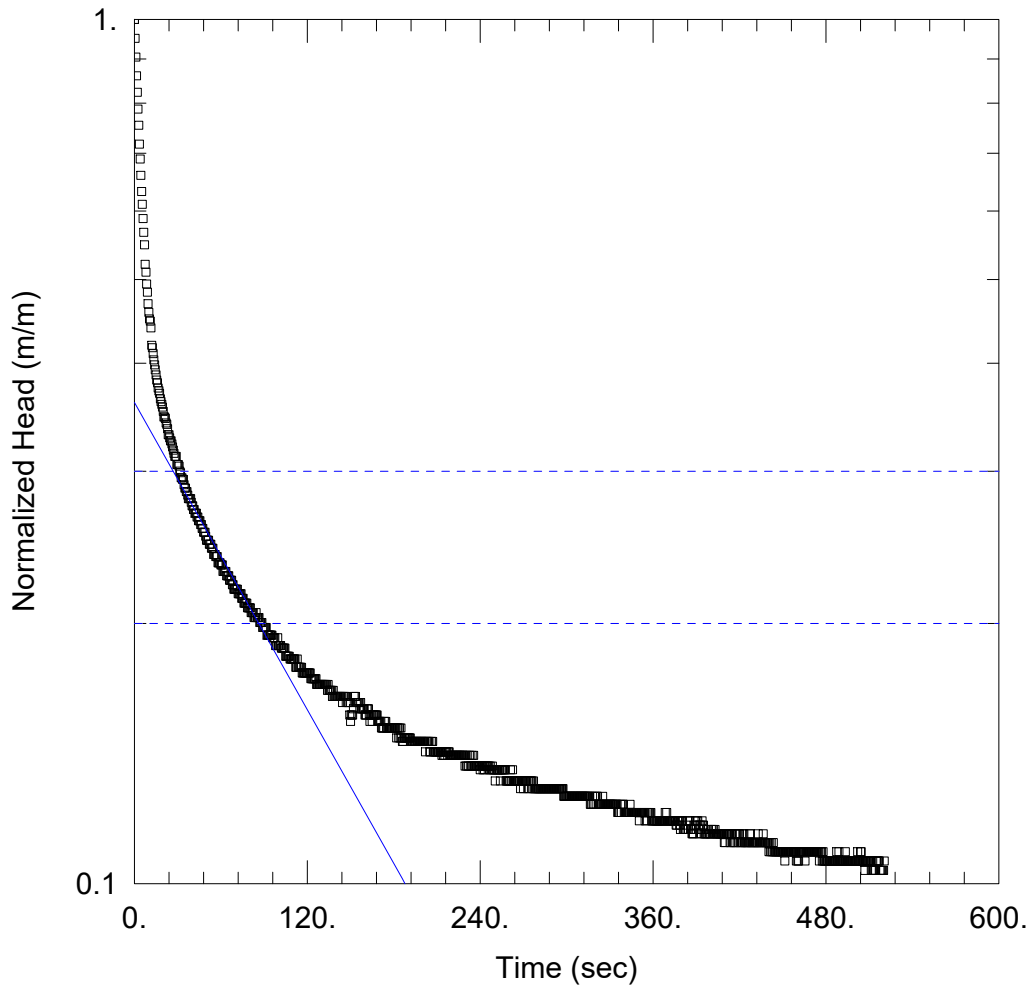
Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense	Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix F

Slug test analysis



WELL TEST ANALYSIS

Data Set: \...\B01.aqt
Date: 12/09/20

Time: 09:22:15

PROJECT INFORMATION

Test Well: B01

AQUIFER DATA

Saturated Thickness: 3.7 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B01)

Initial Displacement: 0.753 m
Total Well Penetration Depth: 3.4 m
Casing Radius: 0.025 m

Static Water Column Height: 3.7 m
Screen Length: 3. m
Well Radius: 0.025 m

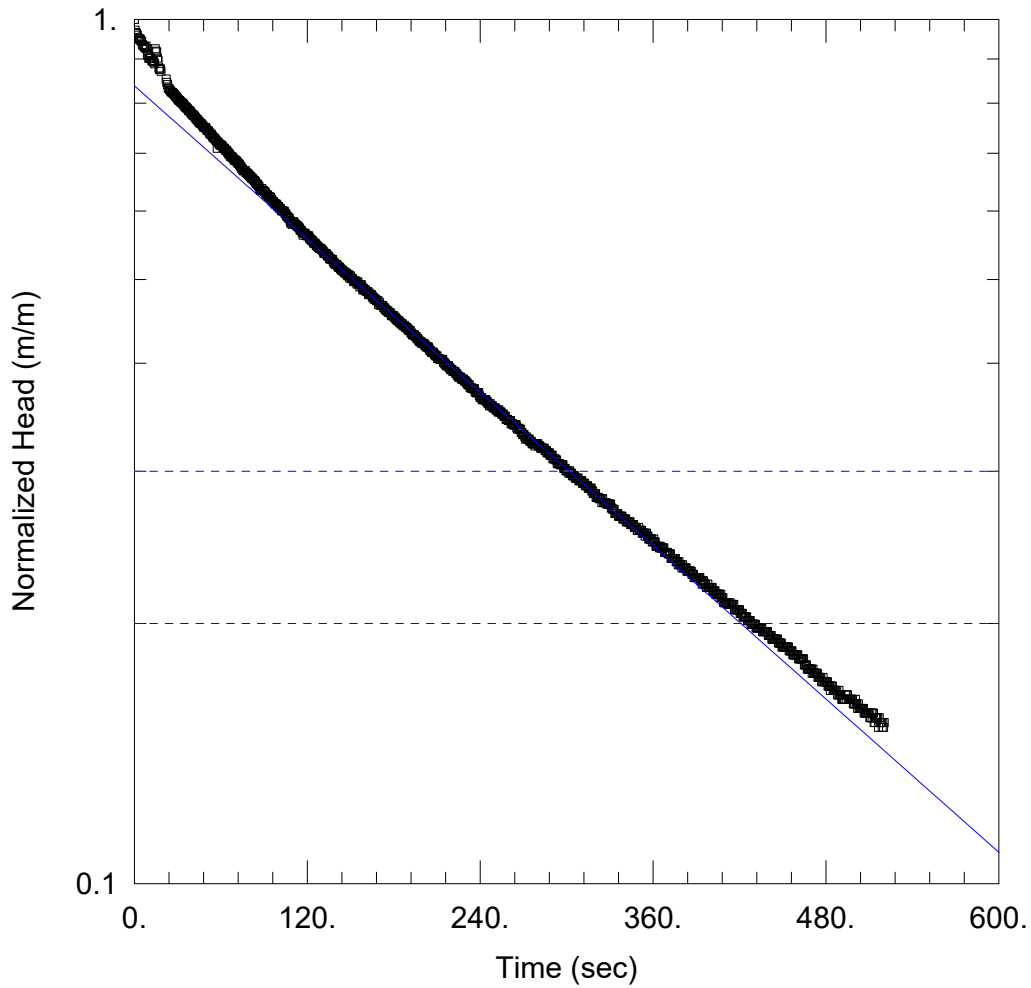
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 0.2185 m/day

y0 = 0.2714 m



WELL TEST ANALYSIS

Data Set: ...\B02.aqt
 Date: 12/09/20

Time: 09:24:16

PROJECT INFORMATION

Test Well: B02

AQUIFER DATA

Saturated Thickness: 12.48 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B02)

Initial Displacement: 1.022 m
 Total Well Penetration Depth: 12.48 m
 Casing Radius: 0.025 m

Static Water Column Height: 12.48 m
 Screen Length: 6. m
 Well Radius: 0.025 m

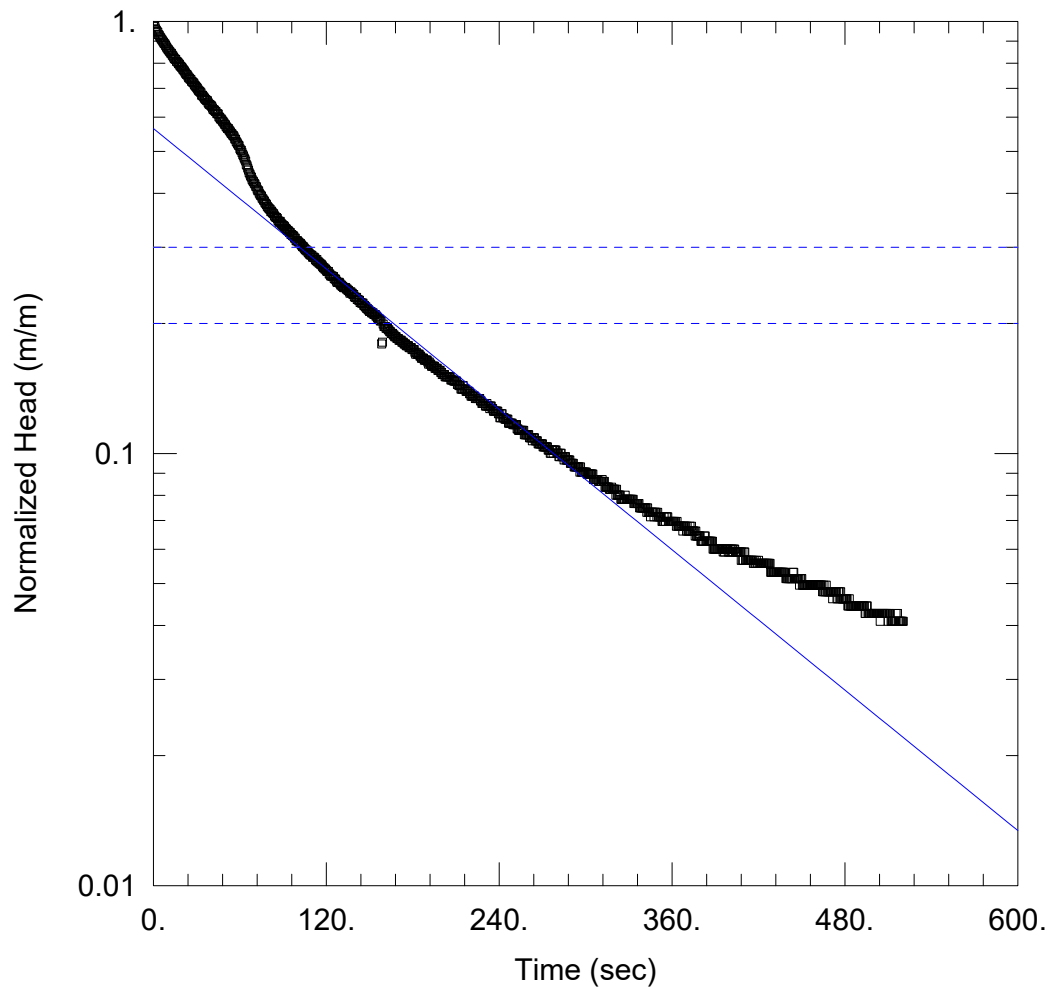
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 0.07328 m/day

y0 = 0.8561 m



WELL TEST ANALYSIS

Data Set: ...\B04.aqt
 Date: 12/09/20

Time: 09:25:54

PROJECT INFORMATION

Test Well: B04

AQUIFER DATA

Saturated Thickness: 13.32 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B04)

Initial Displacement: 1.149 m
 Total Well Penetration Depth: 12.52 m
 Casing Radius: 0.025 m

Static Water Column Height: 13.32 m
 Screen Length: 6. m
 Well Radius: 0.025 m

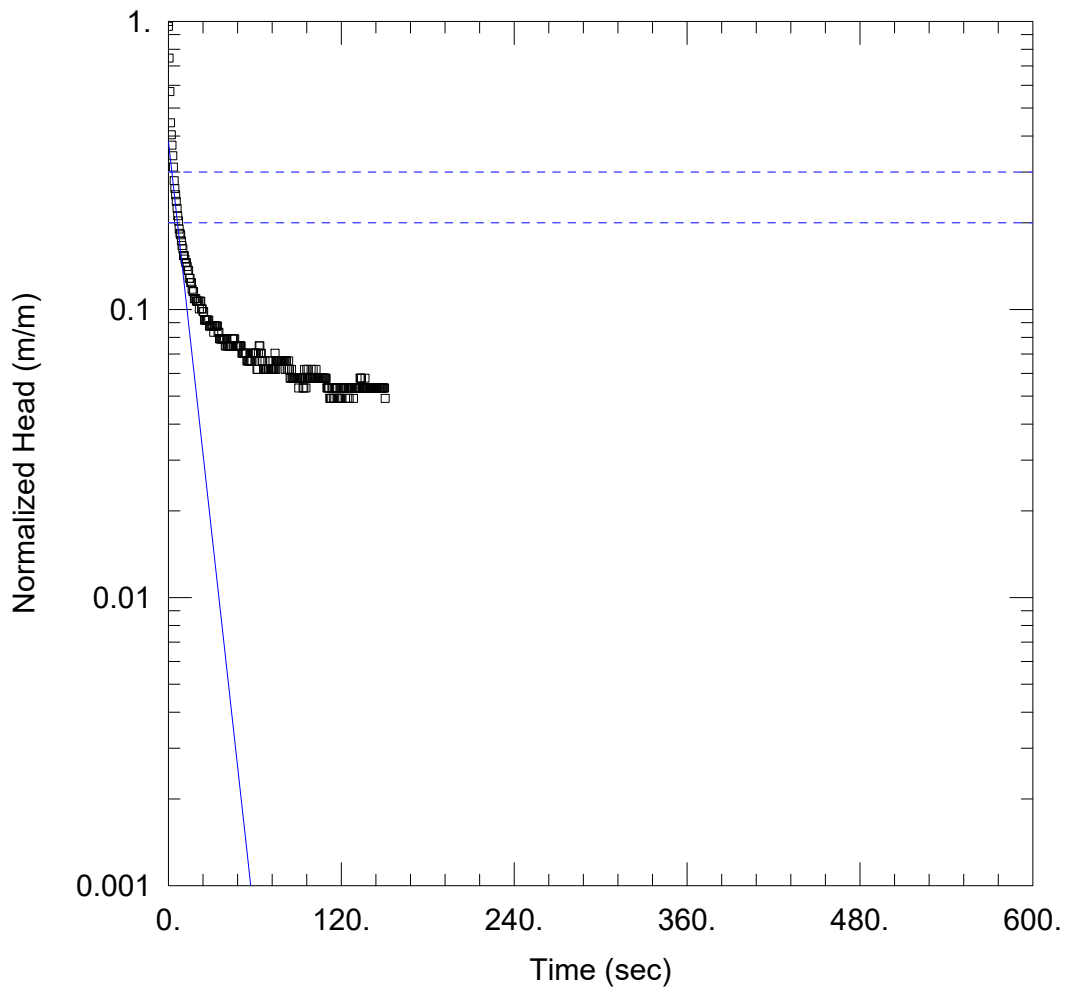
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1257 m/day

y0 = 0.6492 m



WELL TEST ANALYSIS

Data Set: ...\B08.aqt
 Date: 12/10/20

Time: 10:32:11

PROJECT INFORMATION

Test Well: B08

AQUIFER DATA

Saturated Thickness: 9.05 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B08)

Initial Displacement: 0.468 m
 Total Well Penetration Depth: 9.05 m
 Casing Radius: 0.025 m

Static Water Column Height: 9.05 m
 Screen Length: 6. m
 Well Radius: 0.025 m

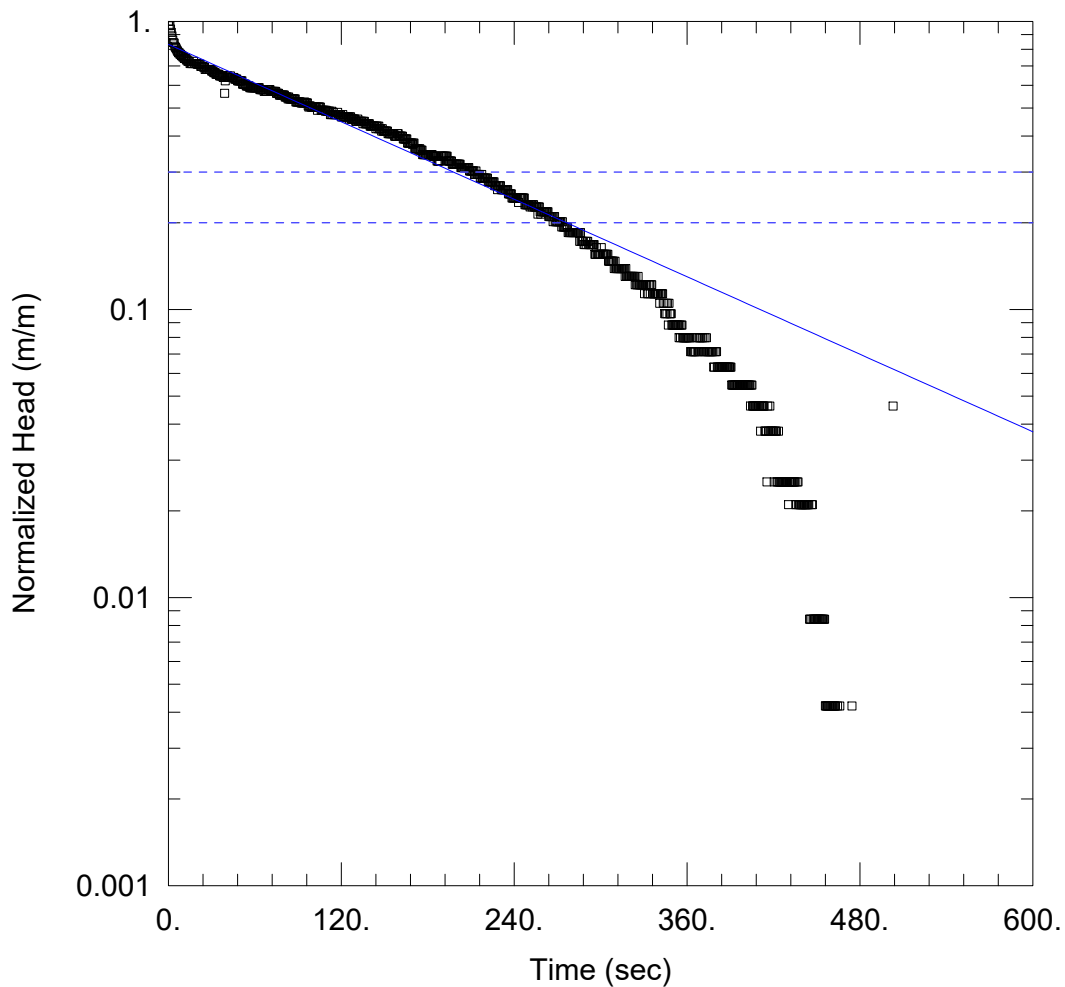
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 2.143 m/day

y0 = 0.1794 m



WELL TEST ANALYSIS

Data Set: \\...\B09.aqt
 Date: 12/09/20

Time: 09:29:19

PROJECT INFORMATION

Test Well: B09

AQUIFER DATA

Saturated Thickness: 1.28 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B09)

Initial Displacement: 0.238 m
 Total Well Penetration Depth: 1.28 m
 Casing Radius: 0.025 m

Static Water Column Height: 1.28 m
 Screen Length: 1.28 m
 Well Radius: 0.025 m

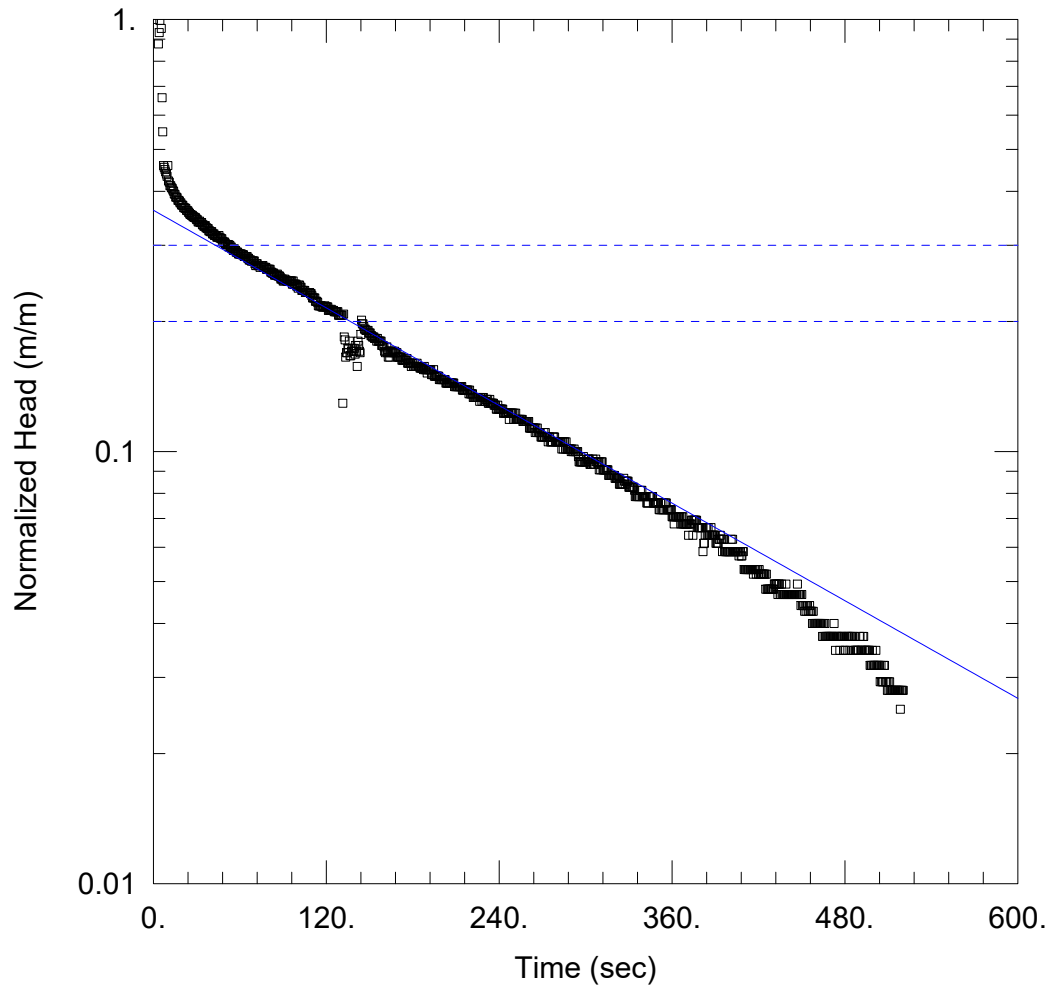
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.3281 m/day

y0 = 0.1982 m



WELL TEST ANALYSIS

Data Set: \\...\B09_B.aqt
 Date: 12/09/20

Time: 09:31:17

PROJECT INFORMATION

Test Well: B09_B

AQUIFER DATA

Saturated Thickness: 0.75 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B09_B)

Initial Displacement: 0.75 m
 Total Well Penetration Depth: 0.75 m
 Casing Radius: 0.025 m

Static Water Column Height: 1.28 m
 Screen Length: 0.75 m
 Well Radius: 0.025 m

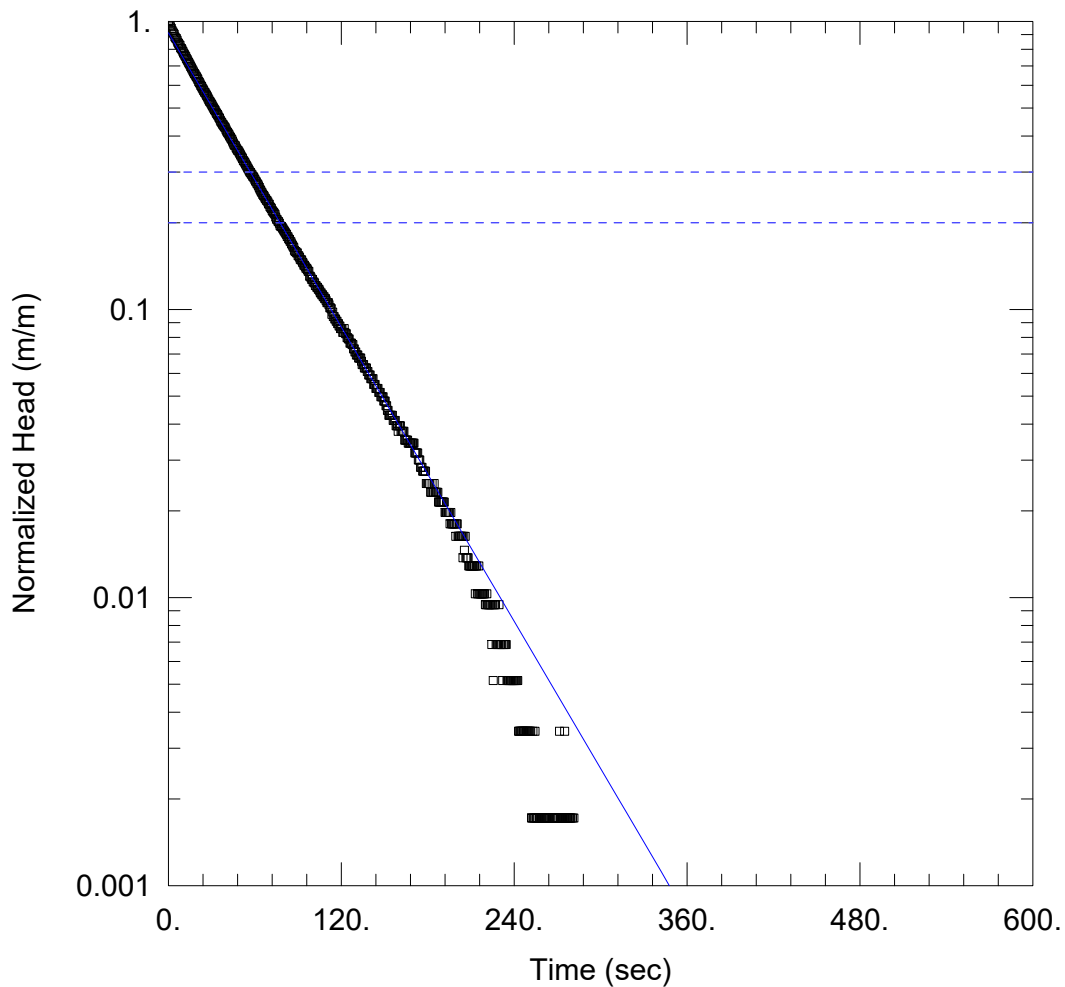
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.4011 m/day

y0 = 0.2712 m



WELL TEST ANALYSIS

Data Set: \\...\B10.aqt
 Date: 12/09/20

Time: 09:33:32

PROJECT INFORMATION

Test Well: B10

AQUIFER DATA

Saturated Thickness: 10.2 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B10)

Initial Displacement: 1.165 m
 Total Well Penetration Depth: 9.9 m
 Casing Radius: 0.025 m

Static Water Column Height: 10.2 m
 Screen Length: 6. m
 Well Radius: 0.025 m

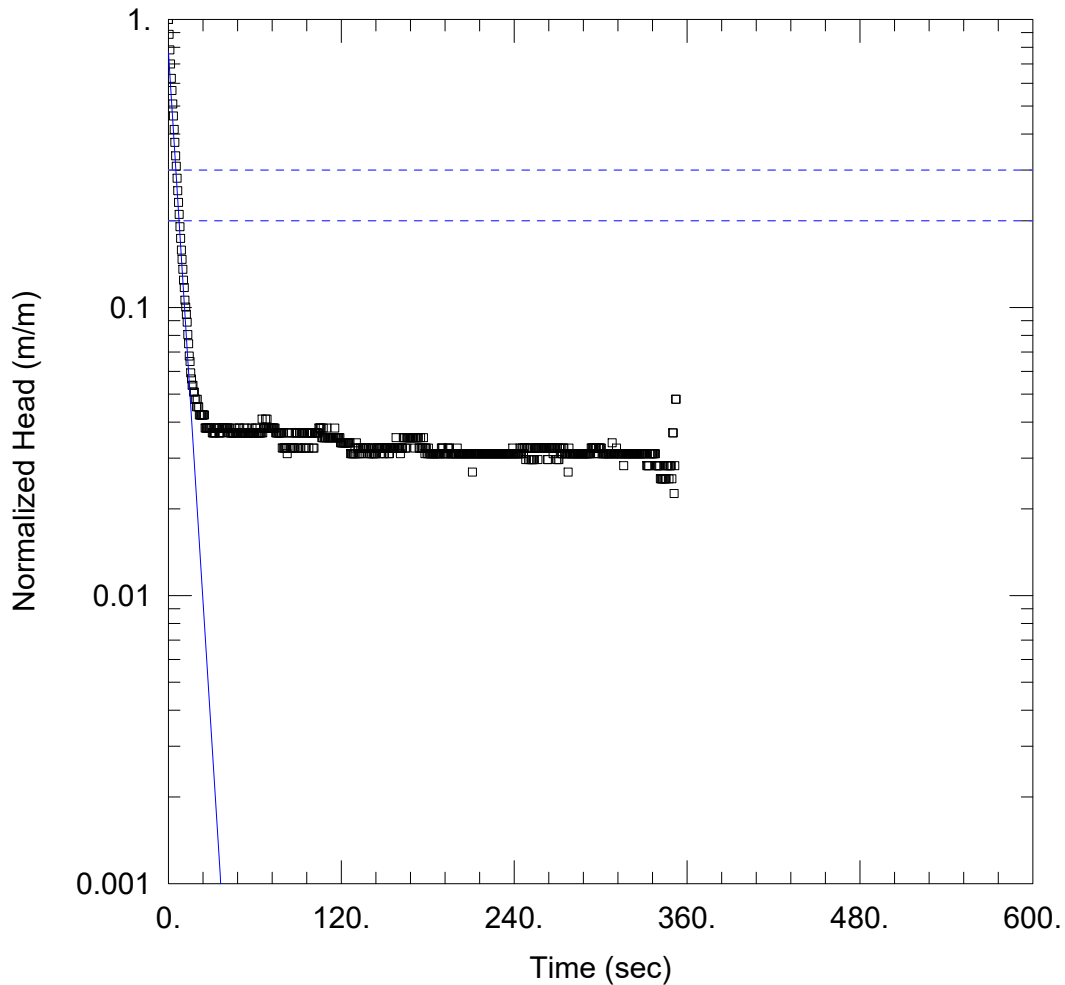
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.3923 m/day

y0 = 1.063 m



WELL TEST ANALYSIS

Data Set: \\...\B11.aqt
 Date: 12/10/20

Time: 09:33:40

PROJECT INFORMATION

Test Well: B11

AQUIFER DATA

Saturated Thickness: 6.72 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B11)

Initial Displacement: 0.708 m
 Total Well Penetration Depth: 6.72 m
 Casing Radius: 0.025 m

Static Water Column Height: 6.72 m
 Screen Length: 3. m
 Well Radius: 0.025 m

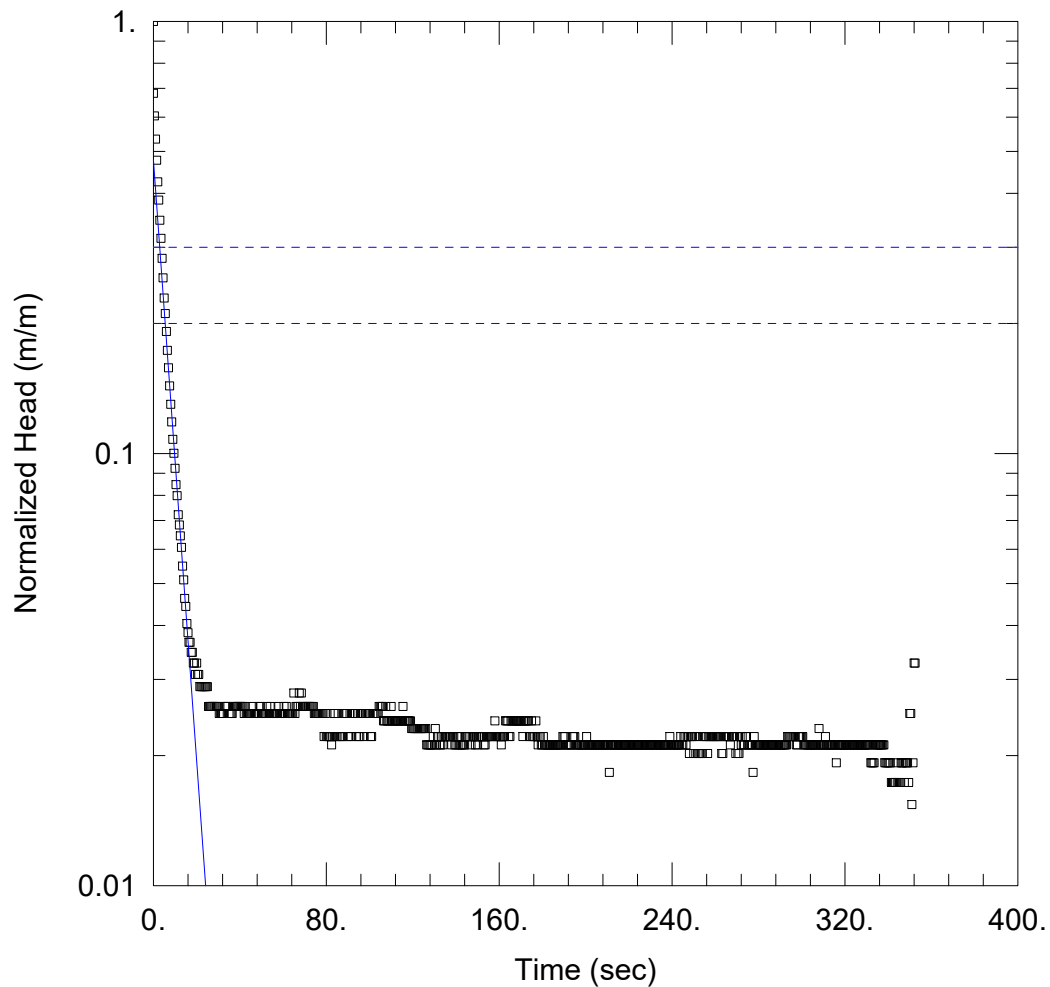
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 6.926 m/day

y0 = 0.5453 m



WELL TEST ANALYSIS

Data Set: \\...\B12_D.aqt
 Date: 12/10/20

Time: 10:43:18

PROJECT INFORMATION

Test Well: B12_D

AQUIFER DATA

Saturated Thickness: 23.14 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (B12_D)

Initial Displacement: 1.039 m

Static Water Column Height: 23.14 m

Total Well Penetration Depth: 23.14 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.025 m

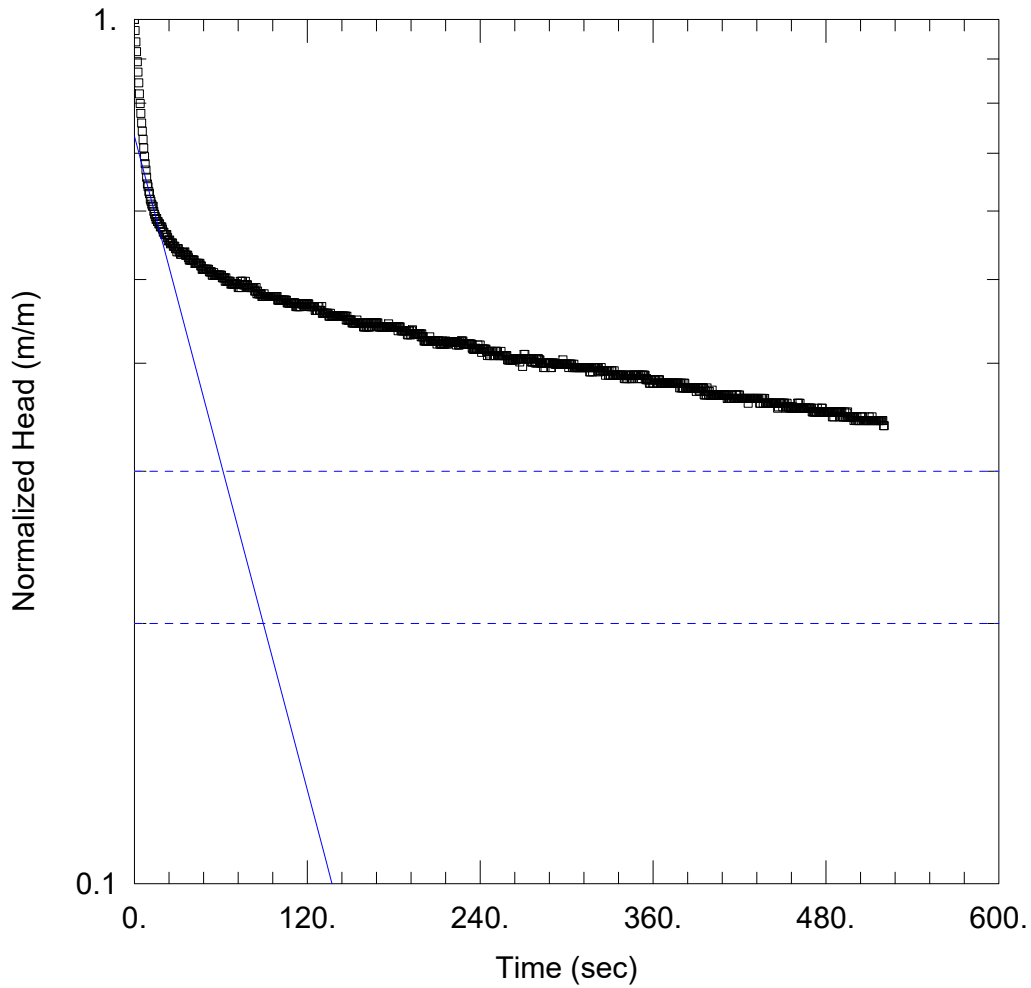
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 3.733$ m/day

$y_0 = 0.4964$ m



WELL TEST ANALYSIS

Data Set: \\...\B12_S.aqt
 Date: 12/09/20

Time: 09:38:45

PROJECT INFORMATION

Test Well: B12_S

AQUIFER DATA

Saturated Thickness: 2.06 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B12_S)

Initial Displacement: 0.503 m
 Total Well Penetration Depth: 2.06 m
 Casing Radius: 0.025 m

Static Water Column Height: 2.06 m
 Screen Length: 2.06 m
 Well Radius: 0.025 m

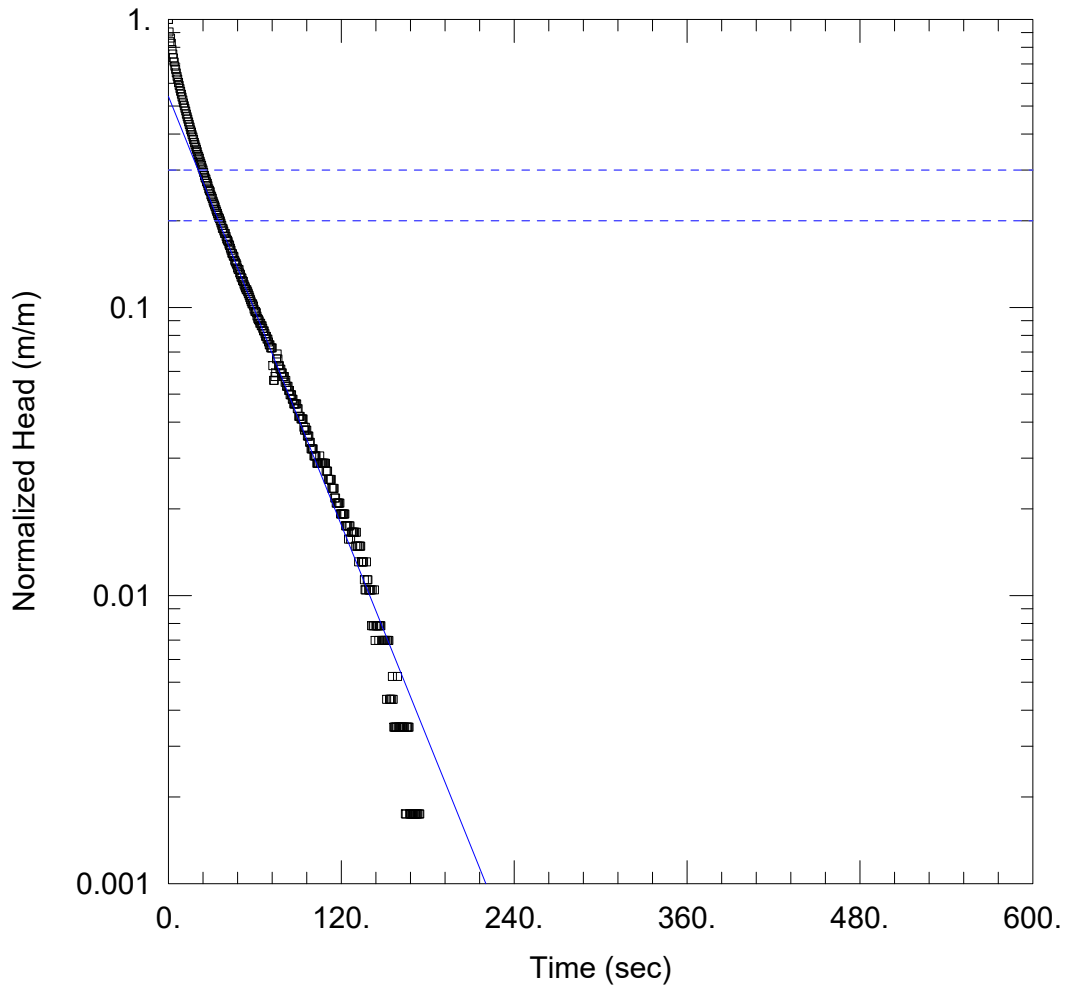
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.645 m/day

y0 = 0.3685 m



WELL TEST ANALYSIS

Data Set: \\...\B13.aqt
 Date: 12/09/20

Time: 09:40:34

PROJECT INFORMATION

Test Well: B13

AQUIFER DATA

Saturated Thickness: 16.81 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B13)

Initial Displacement: 1.146 m
 Total Well Penetration Depth: 16.71 m
 Casing Radius: 0.025 m

Static Water Column Height: 16.81 m
 Screen Length: 9. m
 Well Radius: 0.025 m

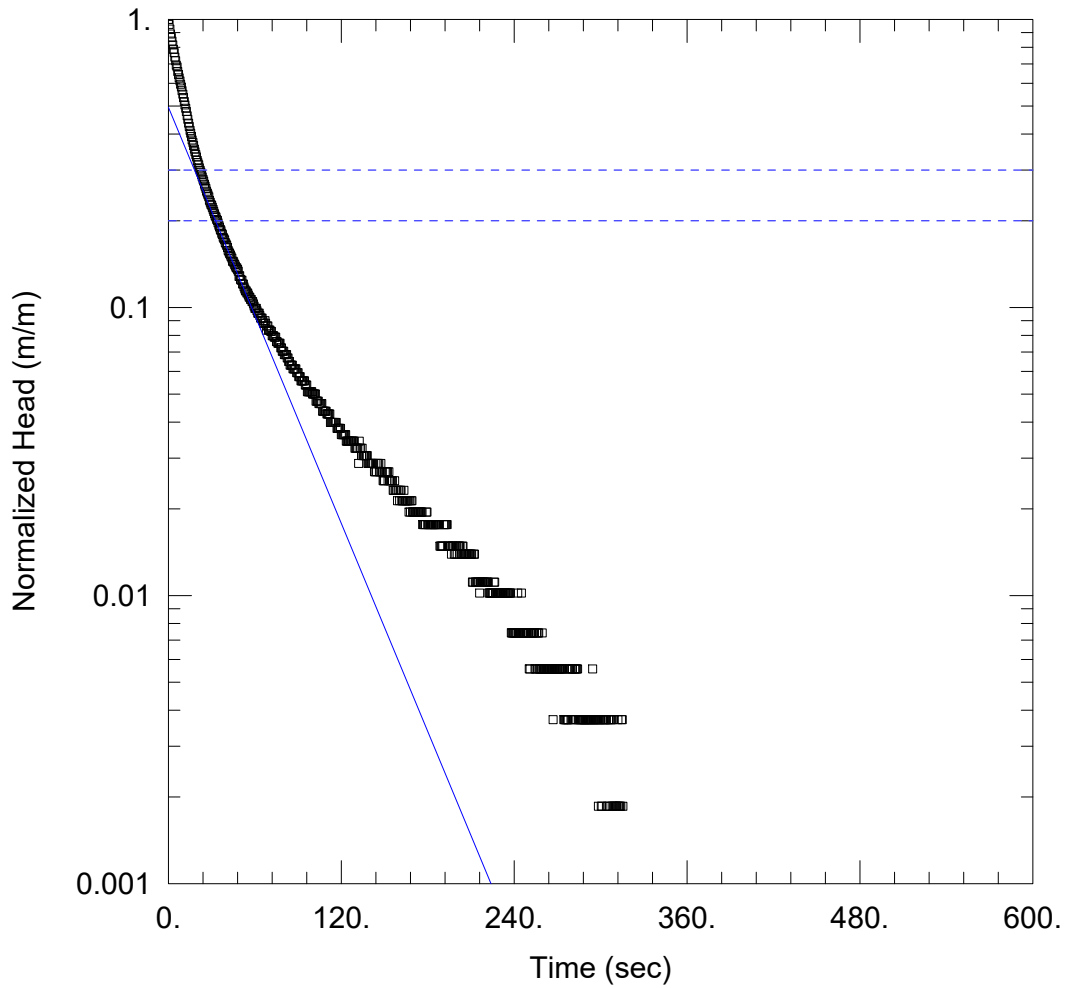
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.4358 m/day

y0 = 0.6192 m



WELL TEST ANALYSIS

Data Set: \\...\B16_D.aqt
 Date: 12/09/20

Time: 09:42:55

PROJECT INFORMATION

Test Well: B16_D

AQUIFER DATA

Saturated Thickness: 9.61 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (B16_D)

Initial Displacement: 1.078 m
 Total Well Penetration Depth: 9.61 m
 Casing Radius: 0.025 m

Static Water Column Height: 9.61 m
 Screen Length: 6. m
 Well Radius: 0.025 m

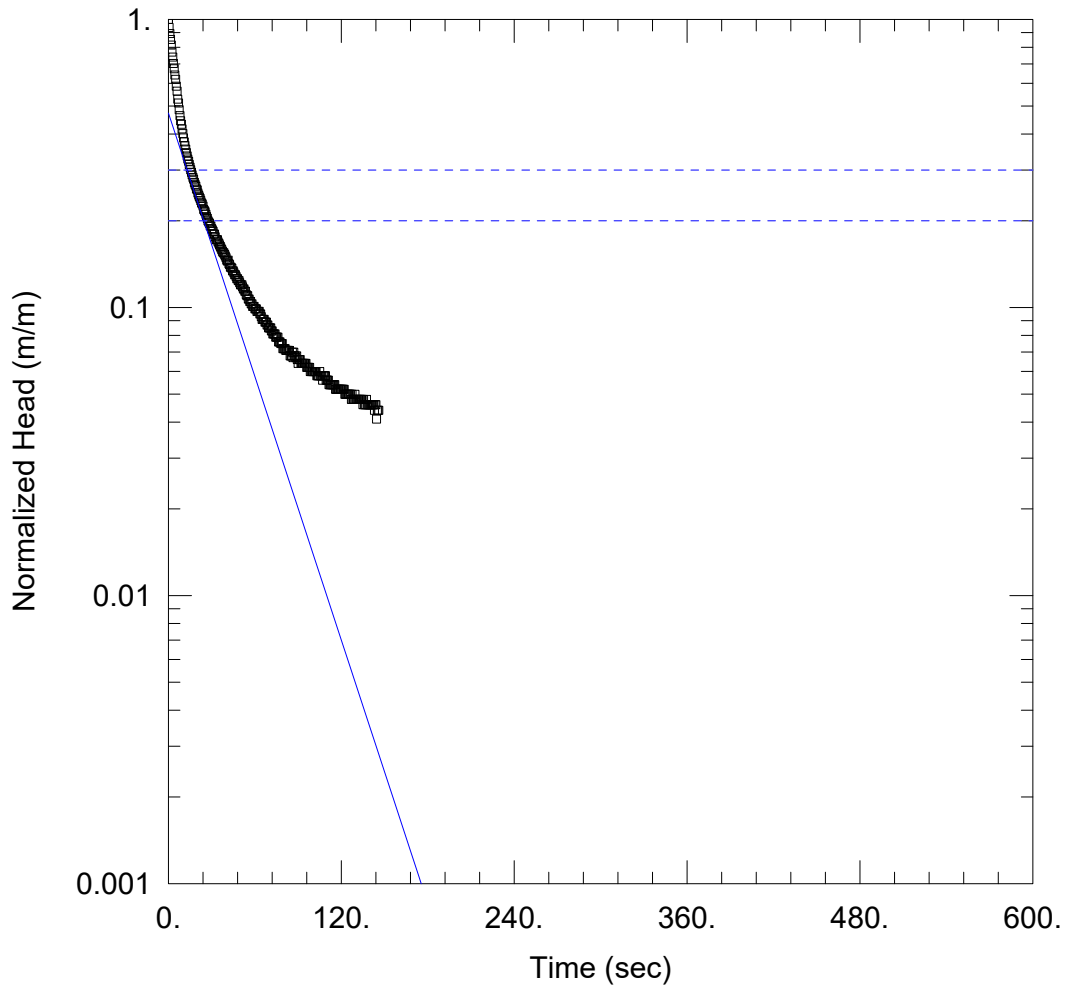
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K =$ 0.5753 m/day

$y_0 =$ 0.5335 m



WELL TEST ANALYSIS

Data Set: \\...\B17_2.aqt
 Date: 12/10/20

Time: 10:51:09

PROJECT INFORMATION

Test Well: B17_2

AQUIFER DATA

Saturated Thickness: 3.55 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B17_2)

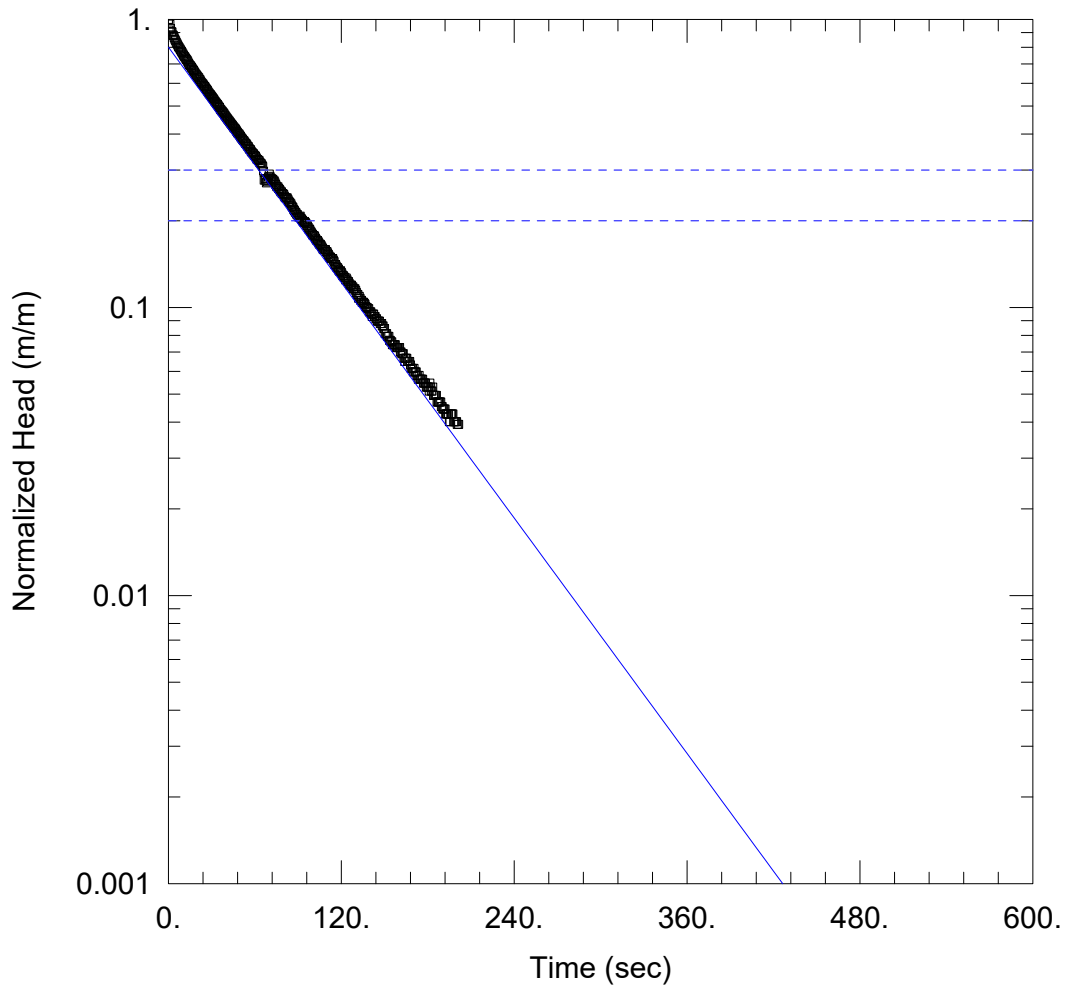
Initial Displacement: 1.001 m
 Total Well Penetration Depth: 6. m
 Casing Radius: 0.025 m

Static Water Column Height: 3.55 m
 Screen Length: 6. m
 Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
 K = 1.114 m/day

Solution Method: Bouwer-Rice
 y0 = 0.4736 m



WELL TEST ANALYSIS

Data Set: ...\B24.aqt
 Date: 12/09/20

Time: 09:47:52

PROJECT INFORMATION

Test Well: B24

AQUIFER DATA

Saturated Thickness: 21.88 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B24)

Initial Displacement: 1.171 m
 Total Well Penetration Depth: 21.88 m
 Casing Radius: 0.025 m

Static Water Column Height: 21.88 m
 Screen Length: 12. m
 Well Radius: 0.025 m

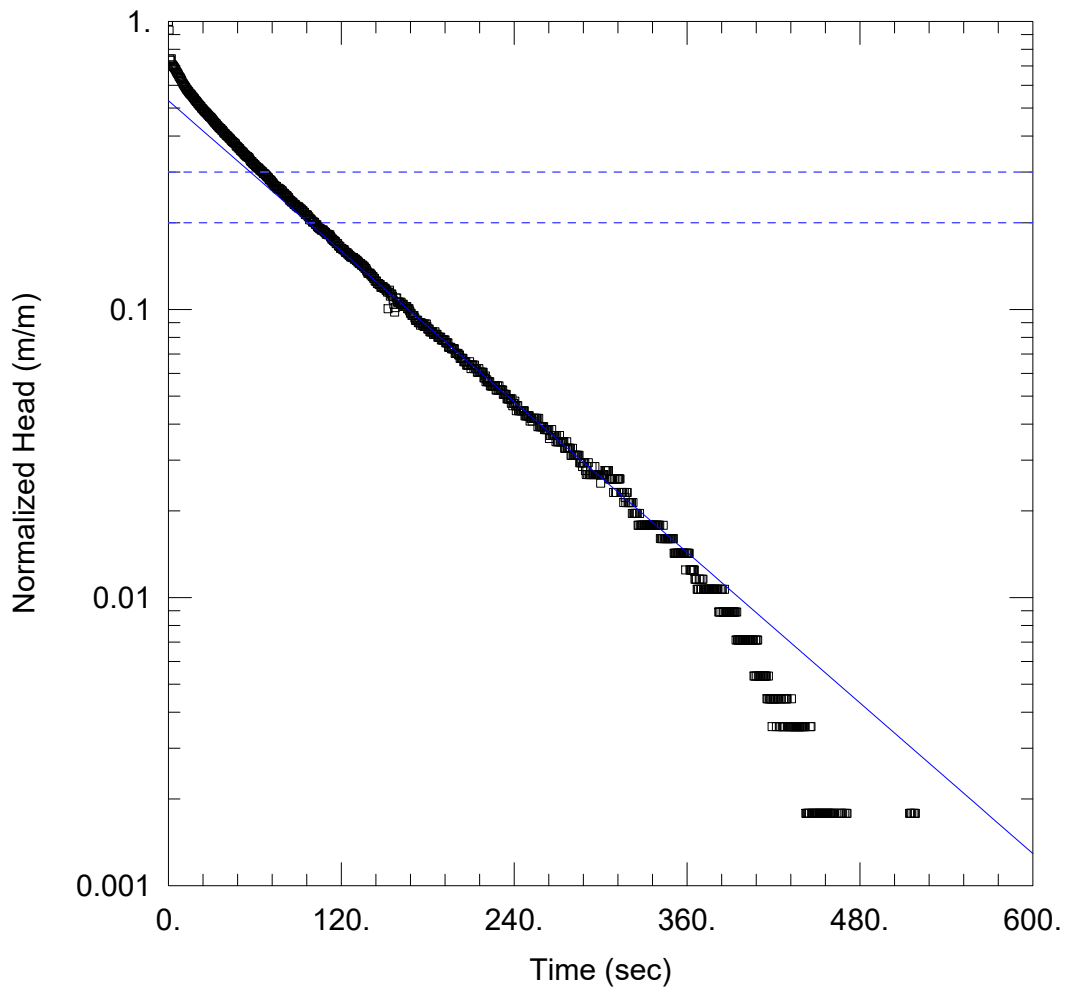
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1916 m/day

y0 = 0.9376 m



WELL TEST ANALYSIS

Data Set: \\...\BH01.aqt
 Date: 12/09/20

Time: 08:51:07

PROJECT INFORMATION

Test Well: BH01

AQUIFER DATA

Saturated Thickness: 20.95 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH01)

Initial Displacement: 1.123 m
 Total Well Penetration Depth: 20.95 m
 Casing Radius: 0.025 m

Static Water Column Height: 20.95 m
 Screen Length: 9. m
 Well Radius: 0.025 m

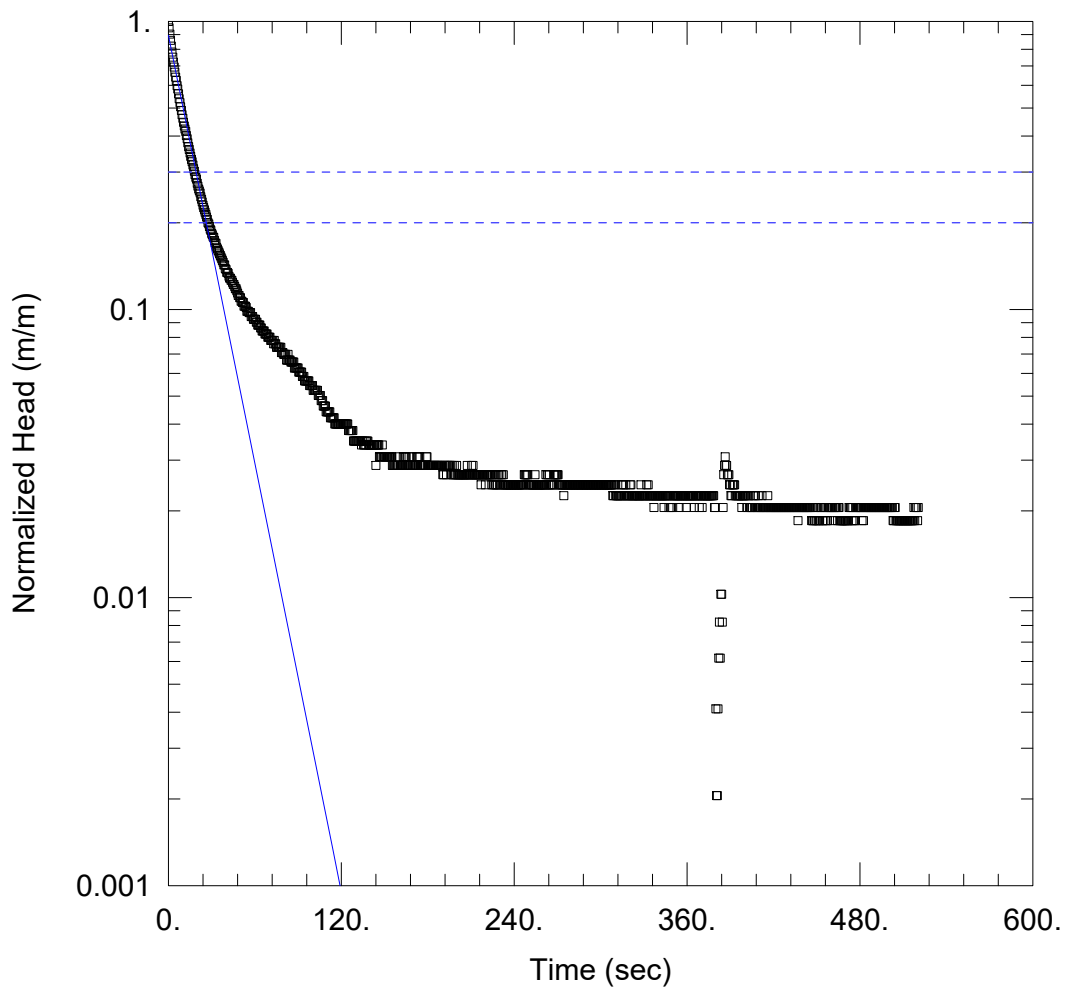
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1705 m/day

y0 = 0.5955 m



WELL TEST ANALYSIS

Data Set: \\...\BH02.aqt
 Date: 12/10/20

Time: 09:56:43

PROJECT INFORMATION

Test Well: BH02

AQUIFER DATA

Saturated Thickness: 5.47 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH02)

Initial Displacement: 0.974 m

Static Water Column Height: 5.47 m

Total Well Penetration Depth: 5.472 m

Screen Length: 5. m

Casing Radius: 0.025 m

Well Radius: 0.025 m

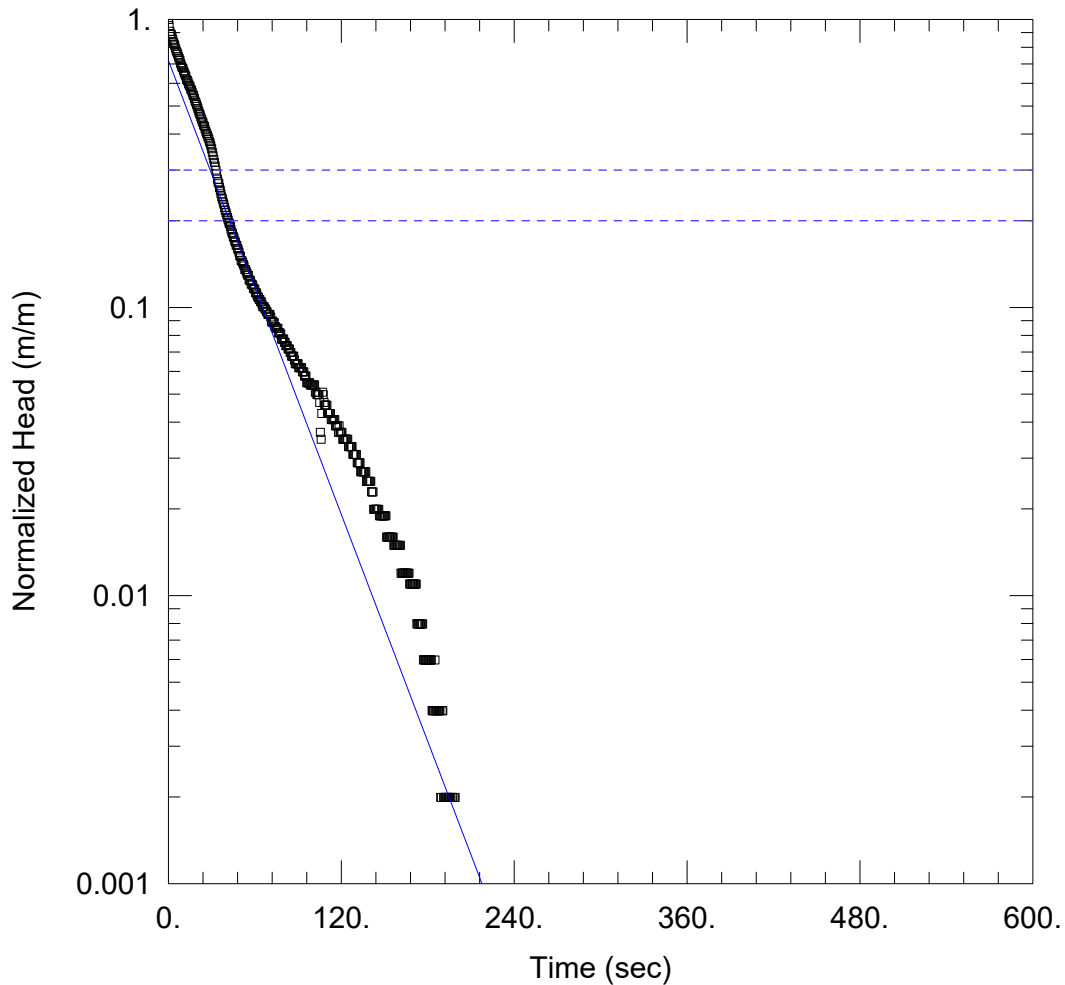
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.29 m/day

y0 = 0.8706 m



WELL TEST ANALYSIS

Data Set: ...\BH03.aqt
 Date: 12/09/20

Time: 08:59:53

PROJECT INFORMATION

Test Well: BH03

AQUIFER DATA

Saturated Thickness: 19.72 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH03)

Initial Displacement: 1.004 m
 Total Well Penetration Depth: 19.72 m
 Casing Radius: 0.025 m

Static Water Column Height: 19.72 m
 Screen Length: 12. m
 Well Radius: 0.025 m

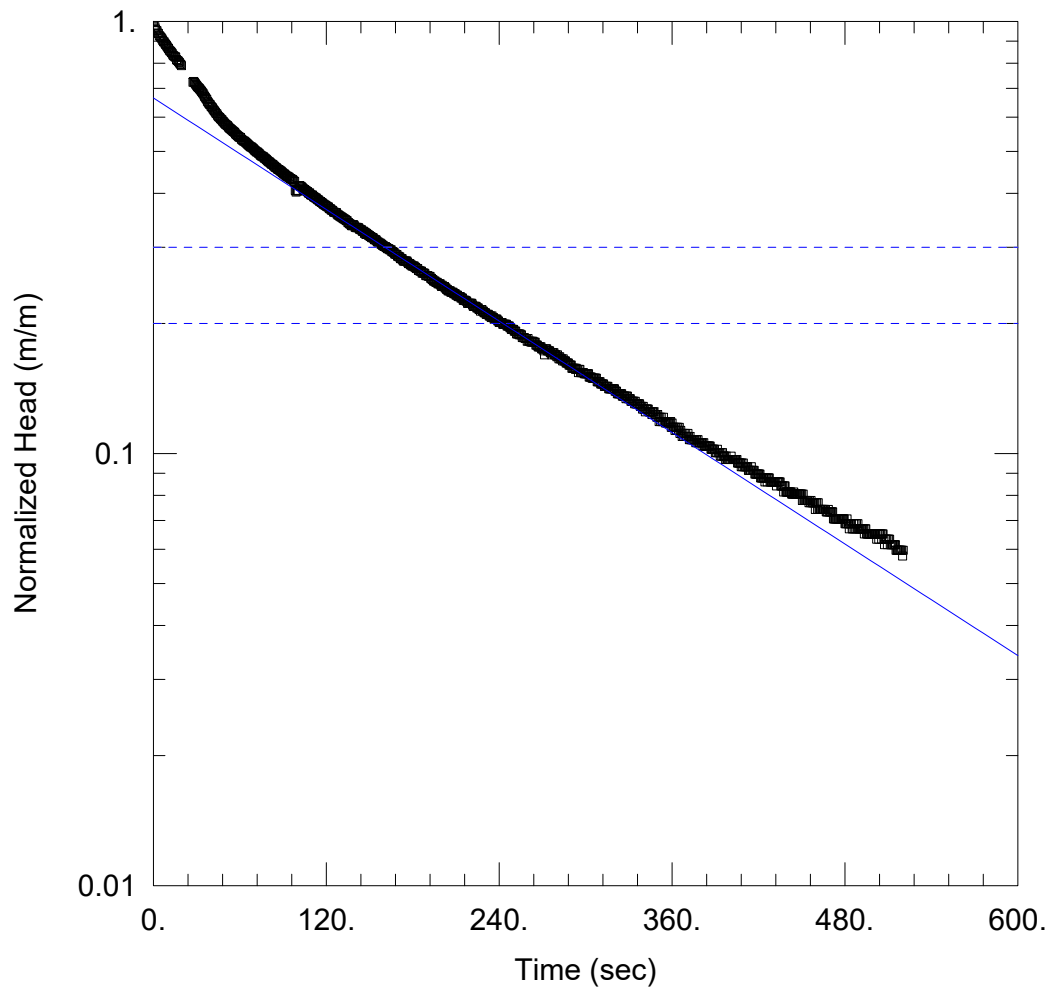
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.3891 m/day

y0 = 0.7219 m



WELL TEST ANALYSIS

Data Set: ...\BH04.aqt
 Date: 12/09/20

Time: 09:02:08

PROJECT INFORMATION

Test Well: BH04

AQUIFER DATA

Saturated Thickness: 14.01 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH04)

Initial Displacement: 1.105 m

Static Water Column Height: 14.01 m

Total Well Penetration Depth: 14.01 m

Screen Length: 6. m

Casing Radius: 0.025 m

Well Radius: 0.025 m

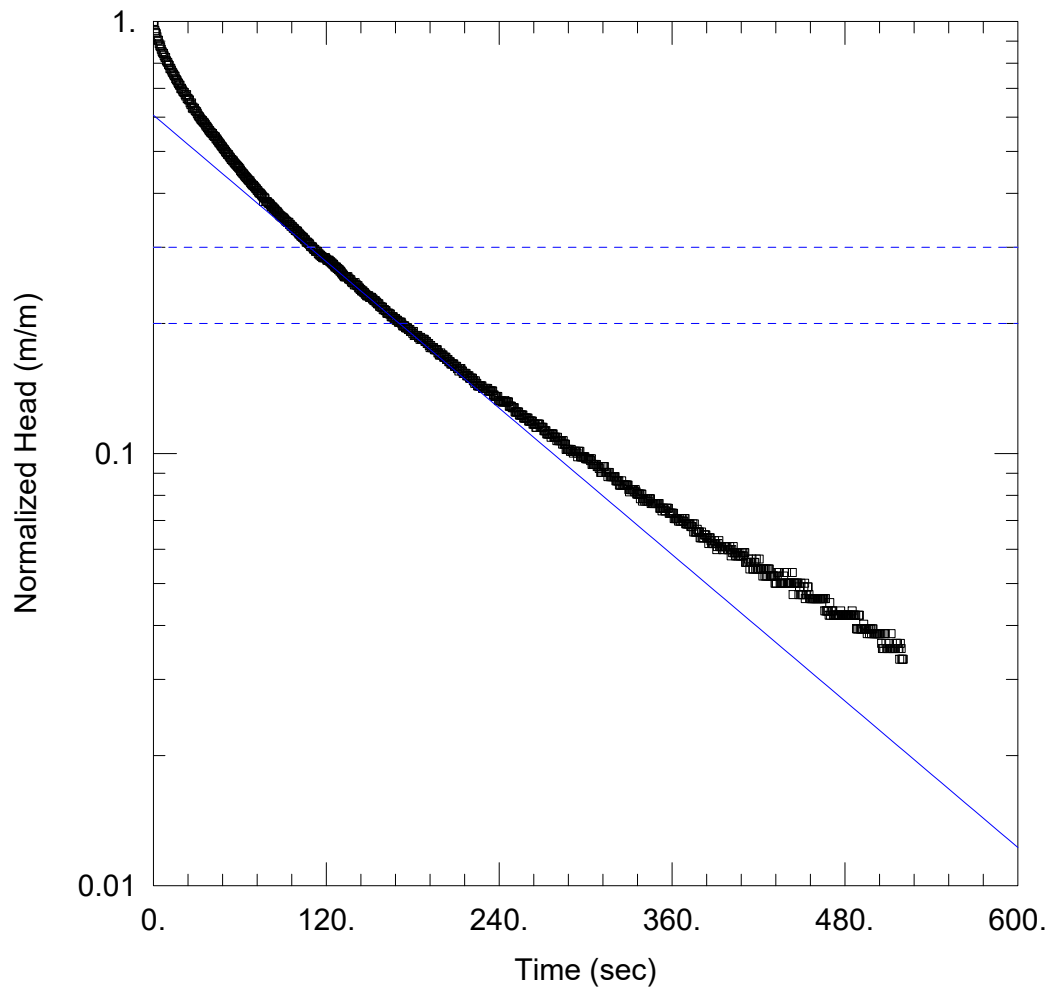
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1166 m/day

y0 = 0.7346 m



WELL TEST ANALYSIS

Data Set: ...\BH06.aqt
 Date: 12/09/20

Time: 09:04:21

PROJECT INFORMATION

Test Well: BH06

AQUIFER DATA

Saturated Thickness: 15.03 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH06)

Initial Displacement: 1.018 m
 Total Well Penetration Depth: 15.03 m
 Casing Radius: 0.025 m

Static Water Column Height: 15.03 m
 Screen Length: 6. m
 Well Radius: 0.025 m

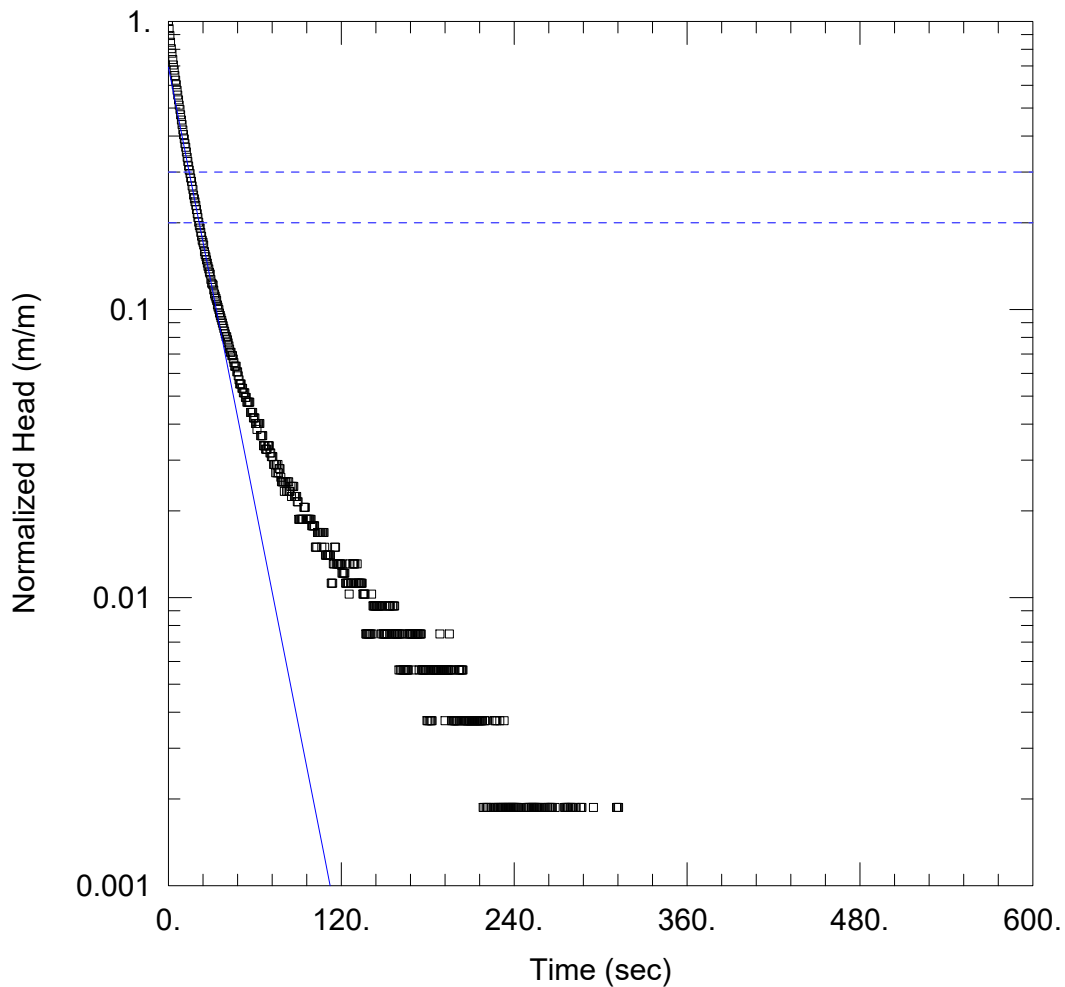
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1612 m/day

y0 = 0.6176 m



WELL TEST ANALYSIS

Data Set: ...\BH08.aqt
 Date: 12/10/20

Time: 10:00:38

PROJECT INFORMATION

Test Well: BH08

AQUIFER DATA

Saturated Thickness: 10.65 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH08)

Initial Displacement: 1.07 m
 Total Well Penetration Depth: 10.65 m
 Casing Radius: 0.025 m

Static Water Column Height: 10.65 m
 Screen Length: 6. m
 Well Radius: 0.025 m

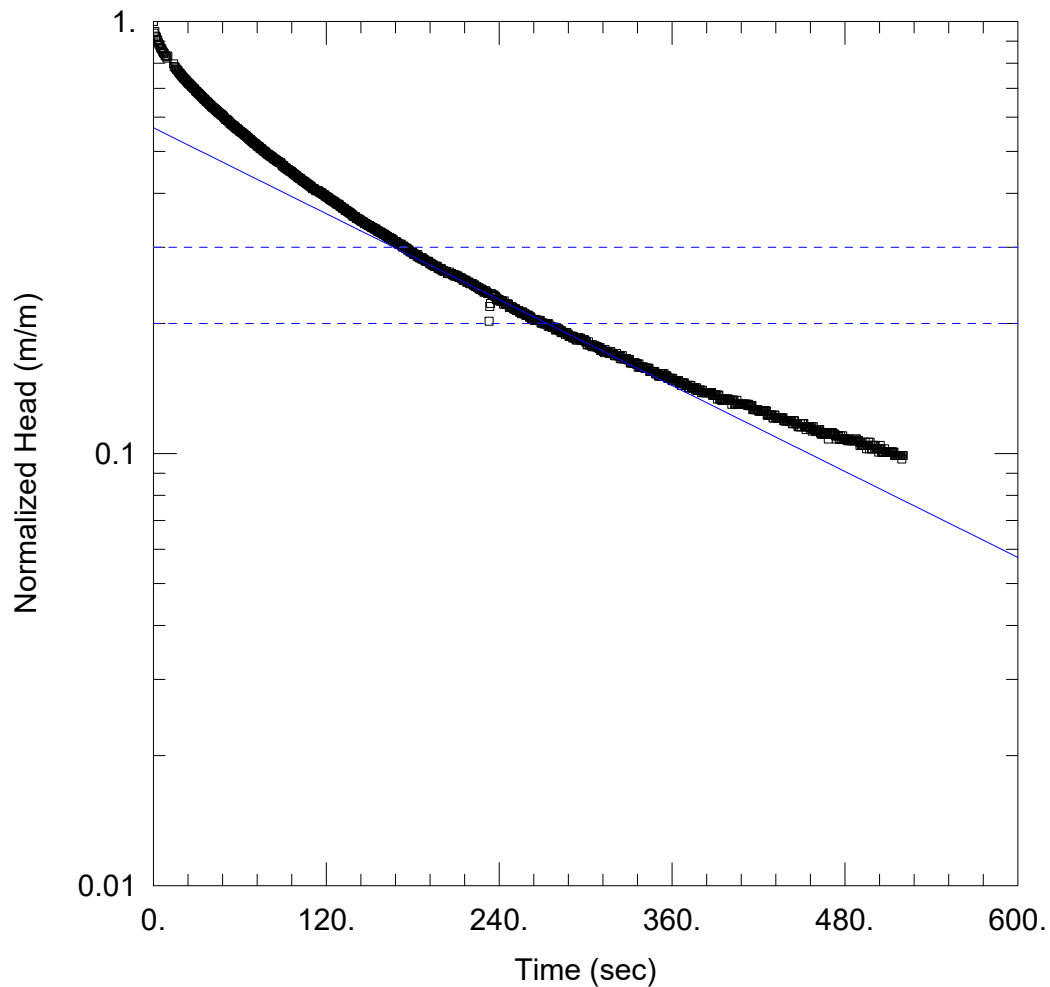
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.37 m/day

y0 = 0.7414 m



WELL TEST ANALYSIS

Data Set: \\...\BH11.aqt
 Date: 12/09/20

Time: 09:09:02

PROJECT INFORMATION

Test Well: BH11

AQUIFER DATA

Saturated Thickness: 23.3 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH11)

Initial Displacement: 1.092 m
 Total Well Penetration Depth: 12.8 m
 Casing Radius: 0.025 m

Static Water Column Height: 23.3 m
 Screen Length: 9. m
 Well Radius: 0.025 m

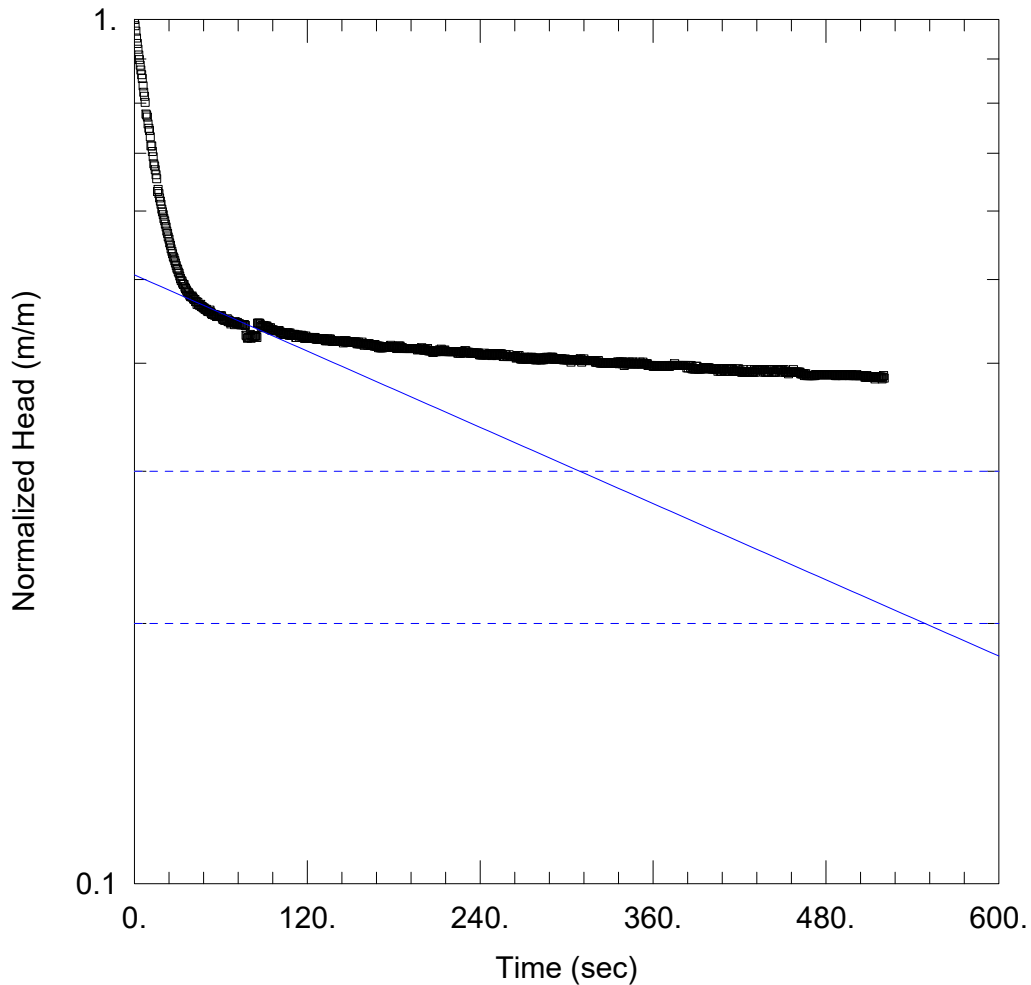
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.05066 m/day

y0 = 0.6194 m



WELL TEST ANALYSIS

Data Set: ...\BH12.aqt
 Date: 12/09/20

Time: 09:10:42

PROJECT INFORMATION

Test Well: BH12

AQUIFER DATA

Saturated Thickness: 1.9 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH12)

Initial Displacement: 1.139 m

Static Water Column Height: 1.9 m

Total Well Penetration Depth: 1.901 m

Screen Length: 1.901 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

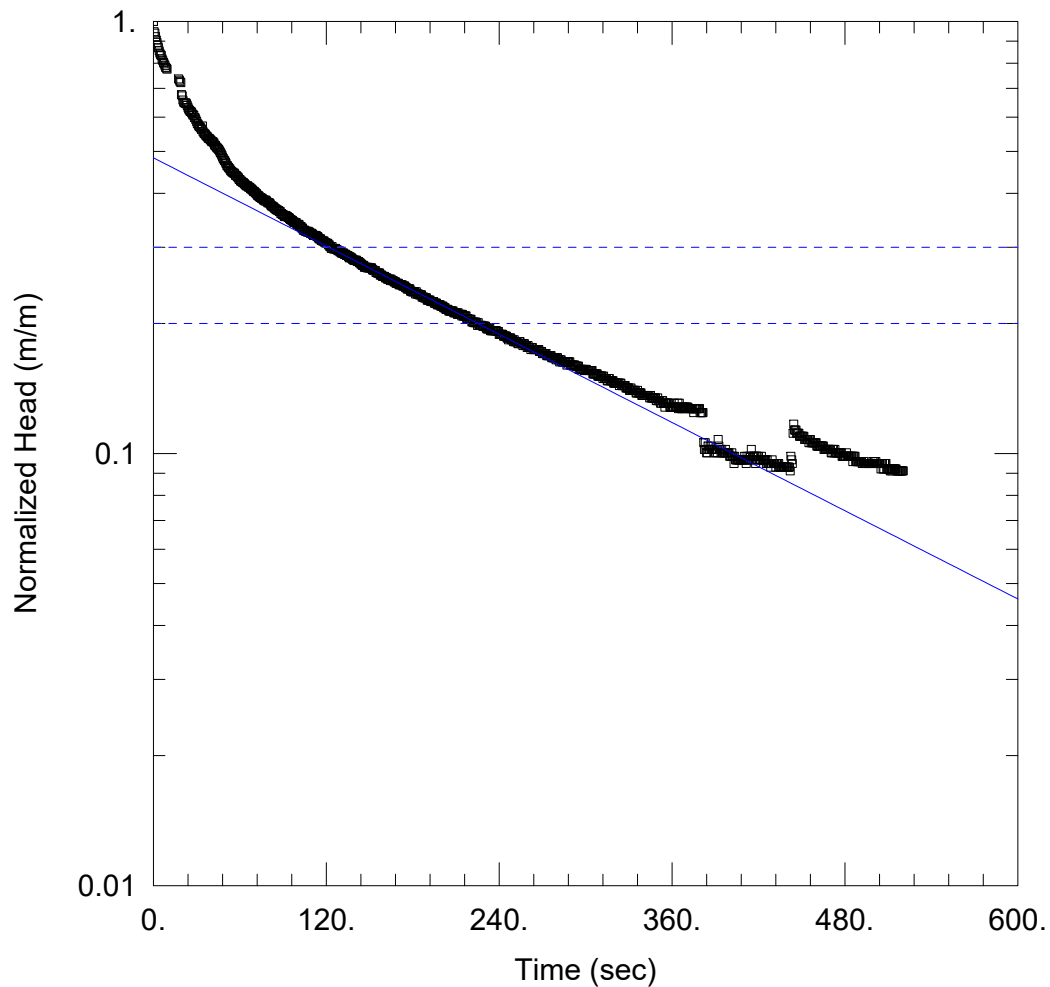
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.08002 m/day

y0 = 0.5766 m



WELL TEST ANALYSIS

Data Set: \\...\BH13.aqt
 Date: 12/09/20

Time: 09:15:32

PROJECT INFORMATION

Test Well: BH13

AQUIFER DATA

Saturated Thickness: 15.71 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH13)

Initial Displacement: 1.086 m
 Total Well Penetration Depth: 15.71 m
 Casing Radius: 0.025 m

Static Water Column Height: 15.71 m
 Screen Length: 6. m
 Well Radius: 0.025 m

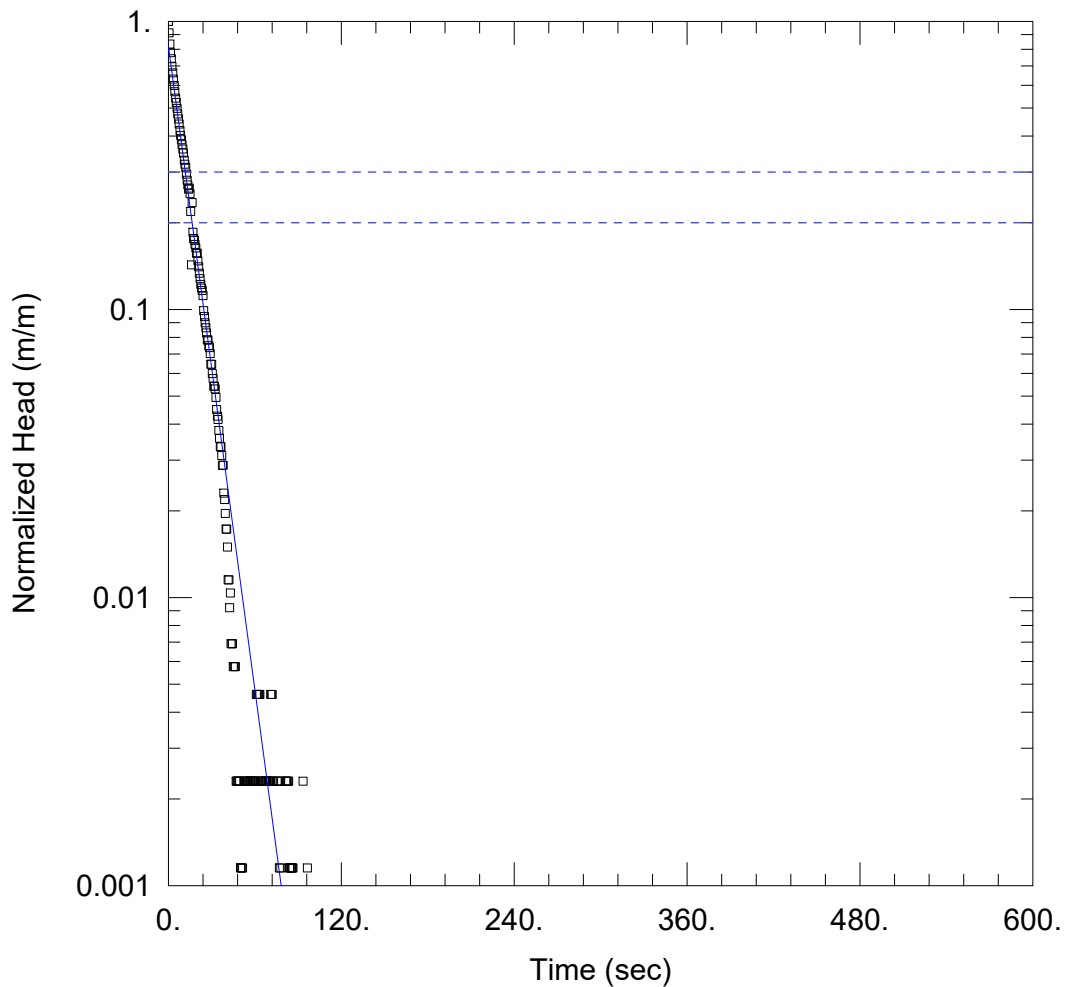
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.08698 m/day

y0 = 0.5248 m



WELL TEST ANALYSIS

Data Set: \\...\BH14.aqt
 Date: 12/09/20

Time: 09:17:15

PROJECT INFORMATION

Test Well: BH14

AQUIFER DATA

Saturated Thickness: 17.86 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH14)

Initial Displacement: 0.868 m
 Total Well Penetration Depth: 17.86 m
 Casing Radius: 0.025 m

Static Water Column Height: 17.86 m
 Screen Length: 12. m
 Well Radius: 0.025 m

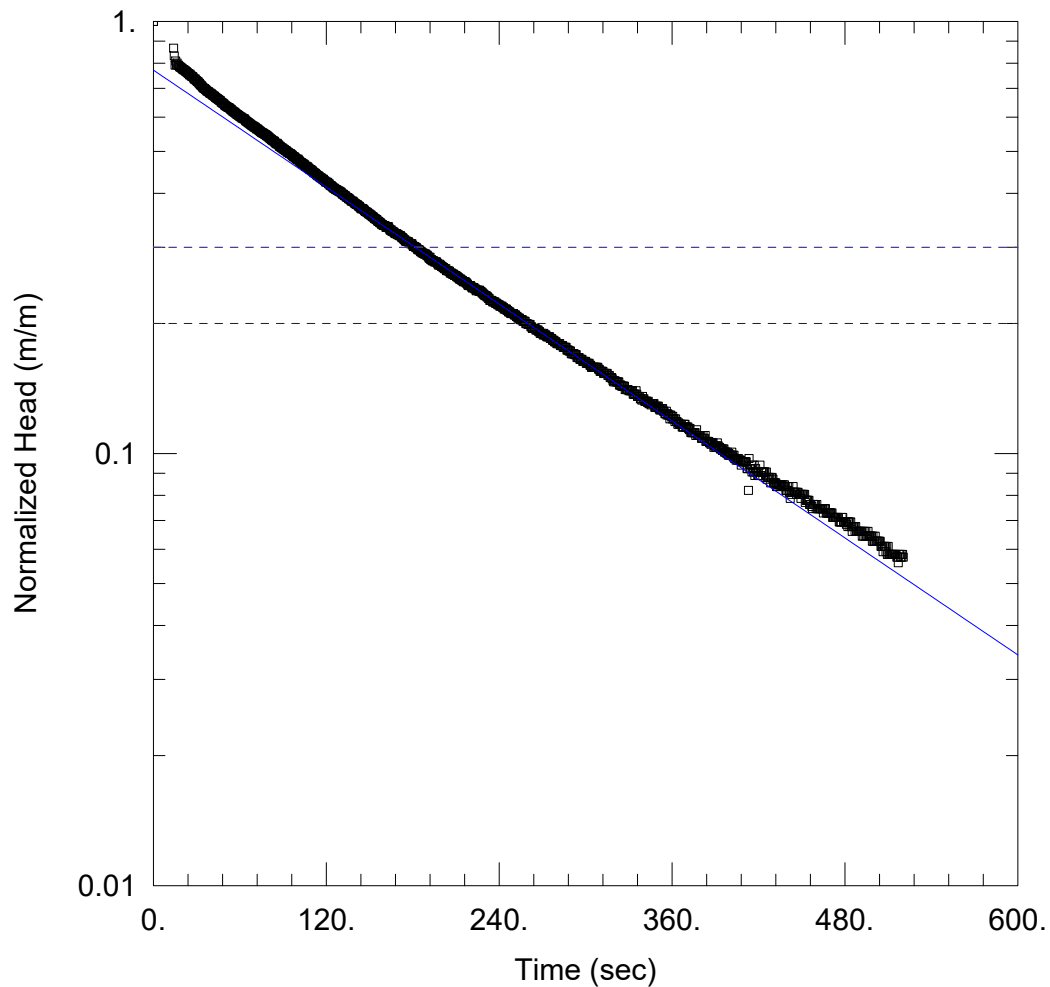
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 1.02 m/day

y0 = 0.7111 m



WELL TEST ANALYSIS

Data Set: \...\BH16.aqt
Date: 12/09/20

Time: 09:18:52

PROJECT INFORMATION

Test Well: BH16

AQUIFER DATA

Saturated Thickness: 11.87 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (BH16)

Initial Displacement: 1.181 m
Total Well Penetration Depth: 11.87 m
Casing Radius: 0.025 m

Static Water Column Height: 11.87 m
Screen Length: 6. m
Well Radius: 0.025 m

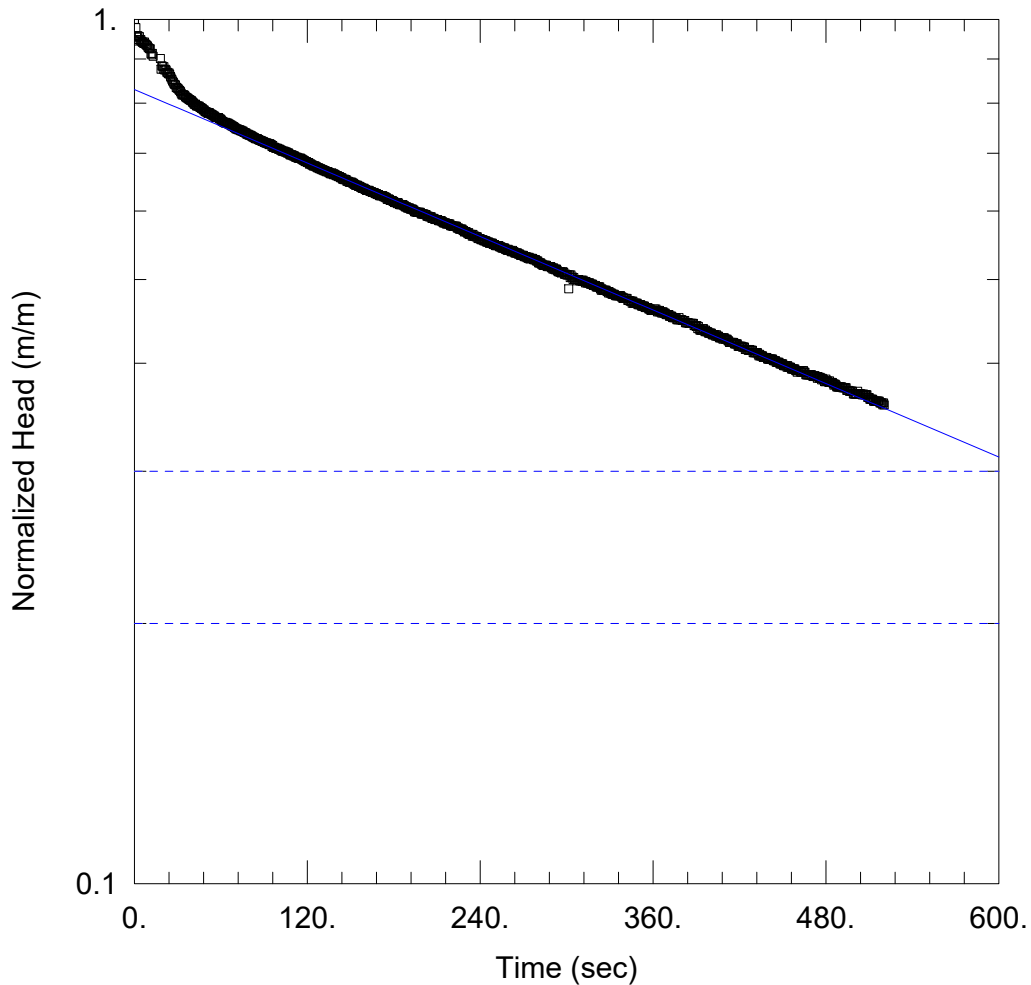
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.1186$ m/day

$y_0 = 0.9108$ m



WELL TEST ANALYSIS

Data Set: ...\BH17.aqt
 Date: 12/09/20

Time: 09:20:45

PROJECT INFORMATION

Test Well: BH17

AQUIFER DATA

Saturated Thickness: 11.6 m

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH17)

Initial Displacement: 1.142 m
 Total Well Penetration Depth: 11.6 m
 Casing Radius: 0.025 m

Static Water Column Height: 11.6 m
 Screen Length: 6. m
 Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
 K = 0.03479 m/day

Solution Method: Bouwer-Rice
 y0 = 0.9474 m

Appendix G

**Surface water flow data - long term
monitoring sites**

Myara North mine region streamflow gauging station

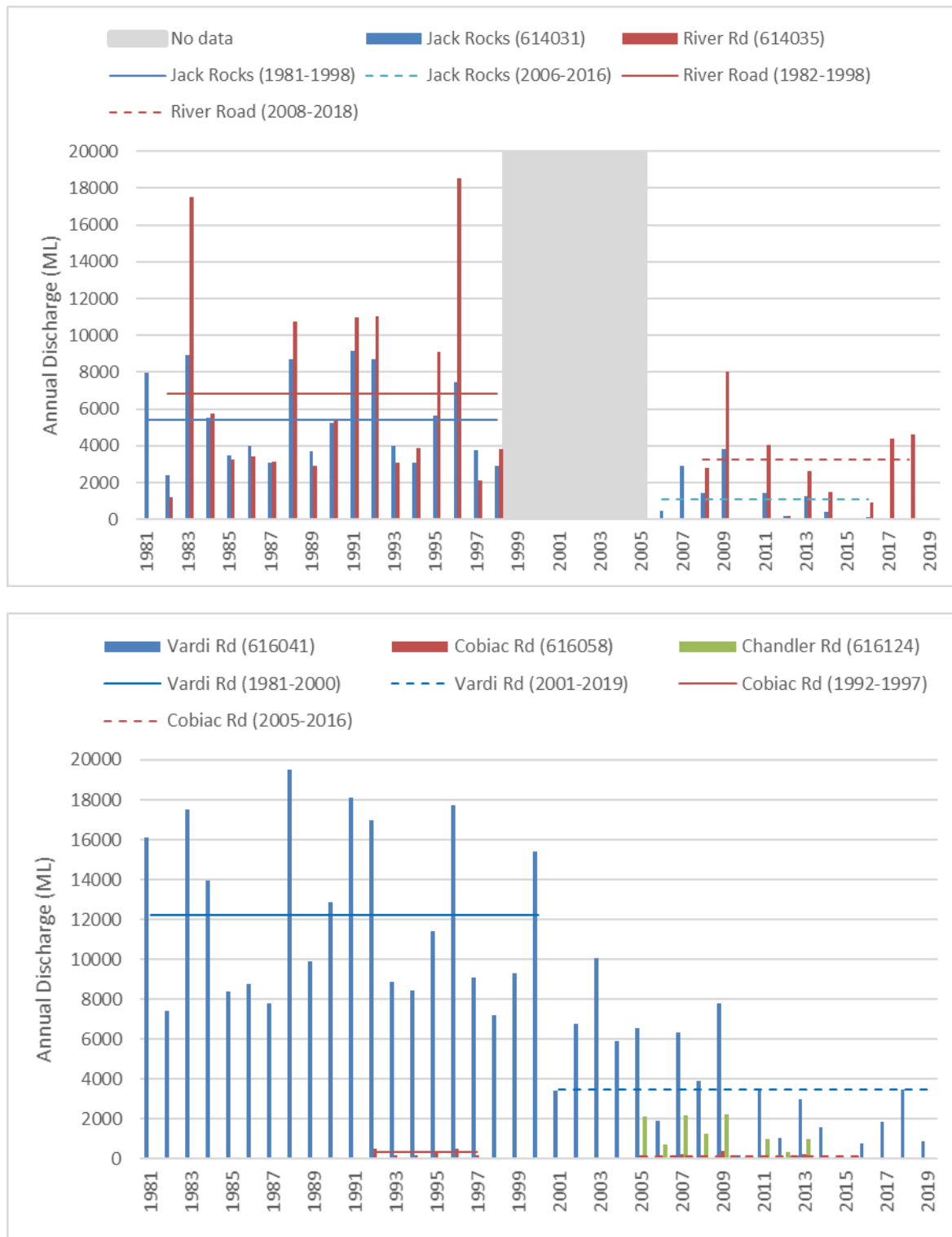


Figure G-1 Myara North mine region gauging station annual flows

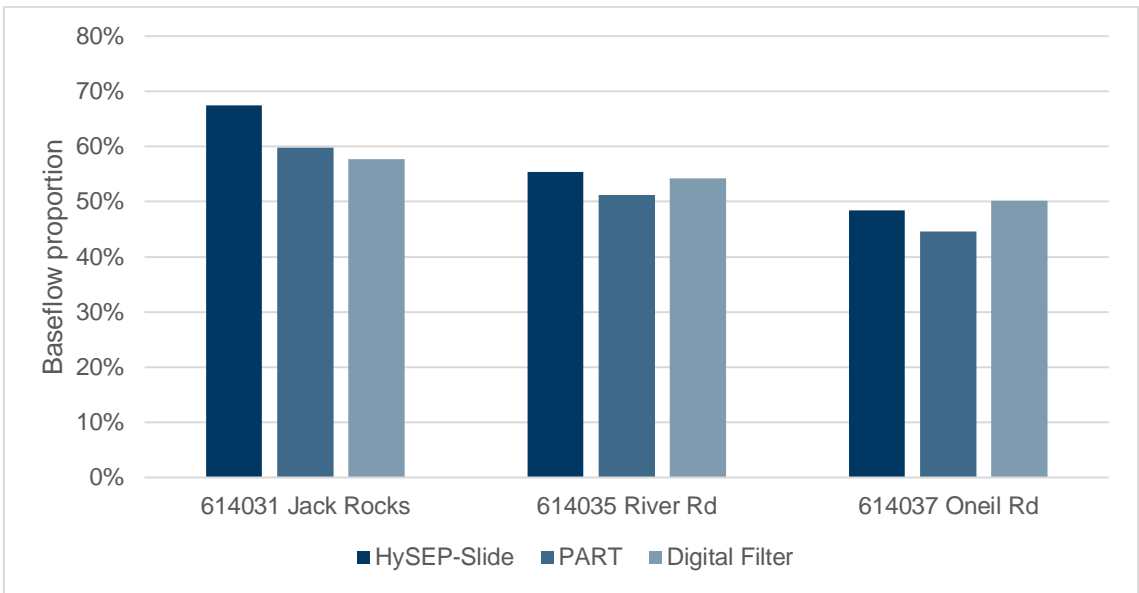


Figure G-2 Baseflow contribution to runoff

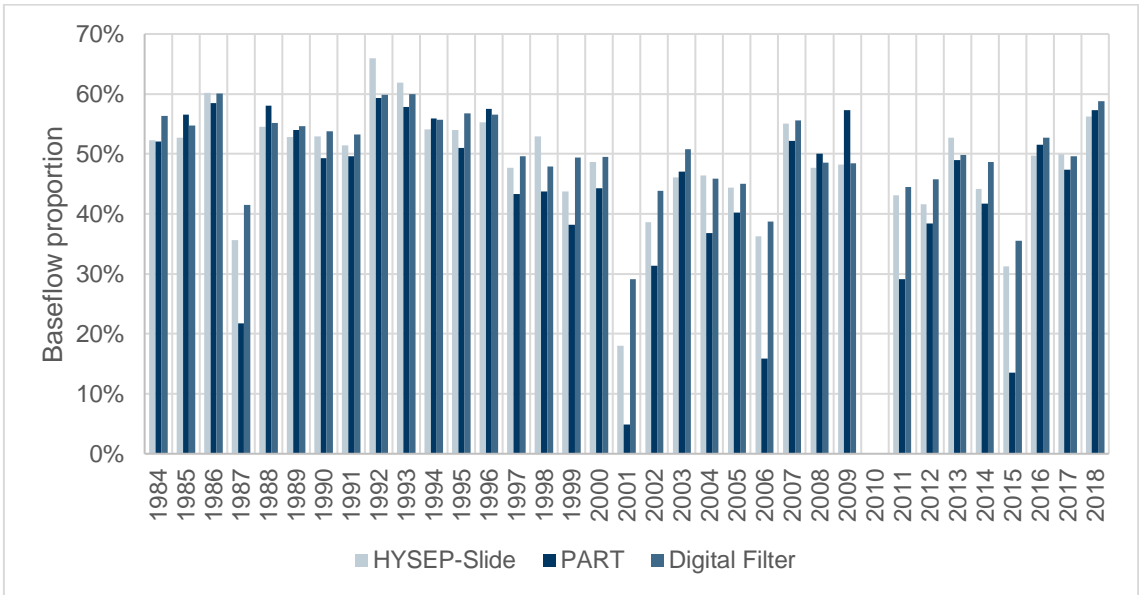


Figure G-3 Baseflow trends

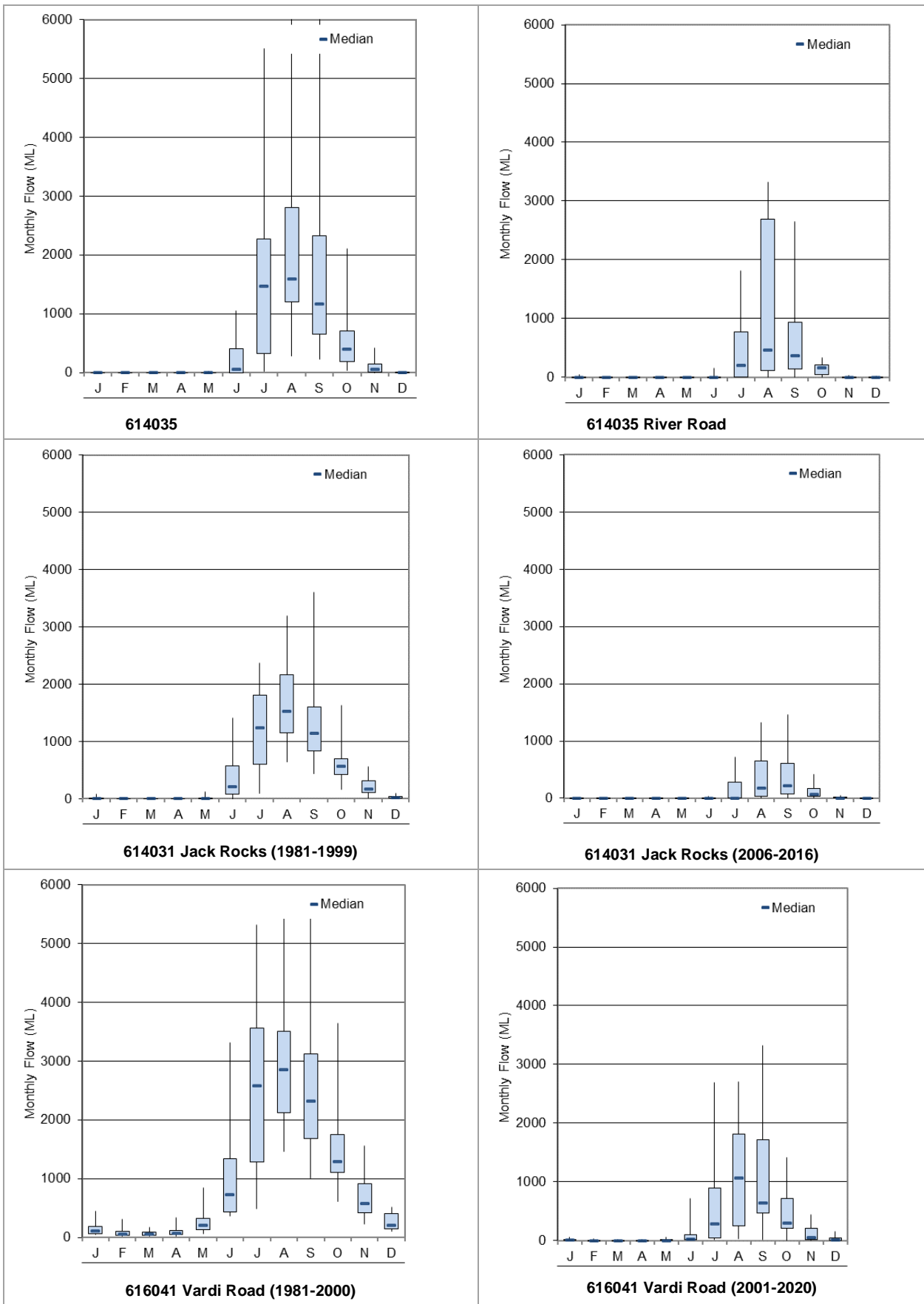


Figure G-4 Myara North mine region gauging station flow seasonality

Holyoake mine region streamflow gauging station

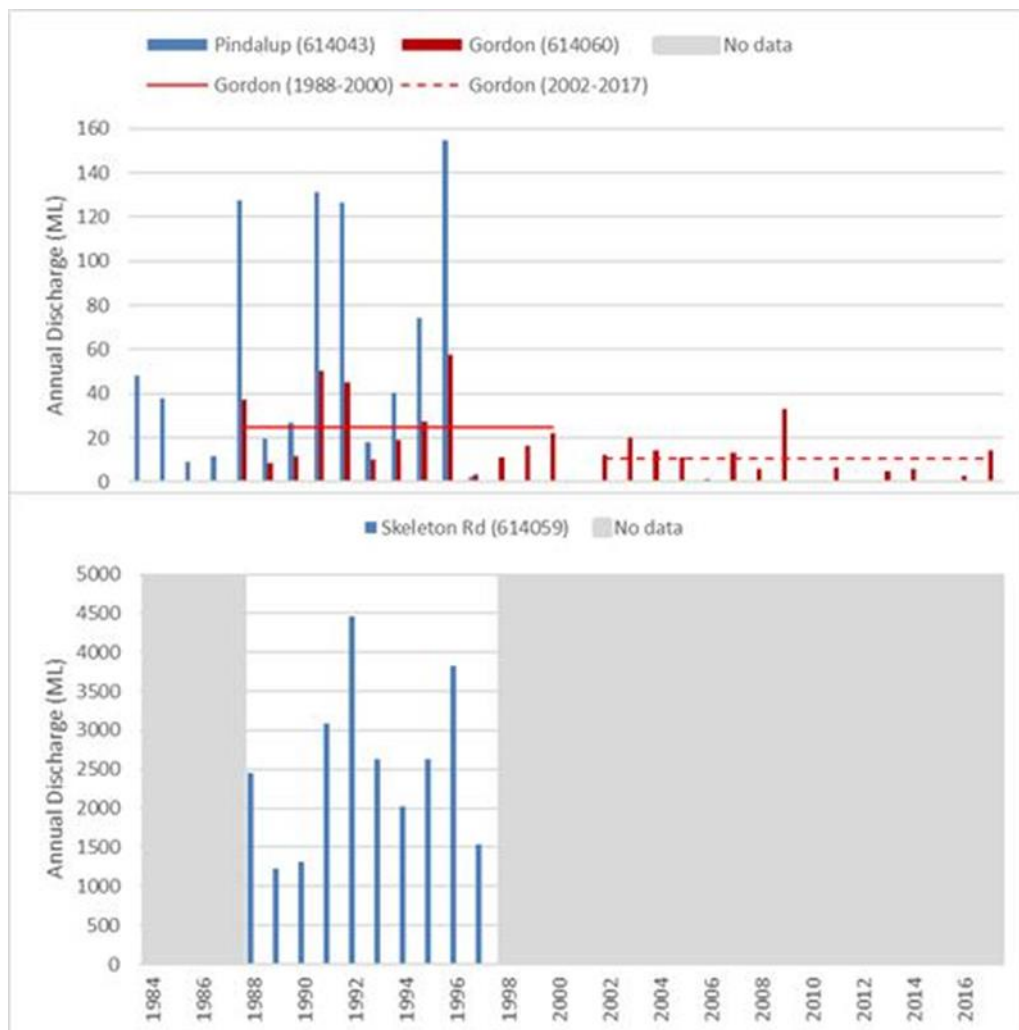


Figure G-5 Holyoake mine region (South Dandalup catchment) gauging station annual flows

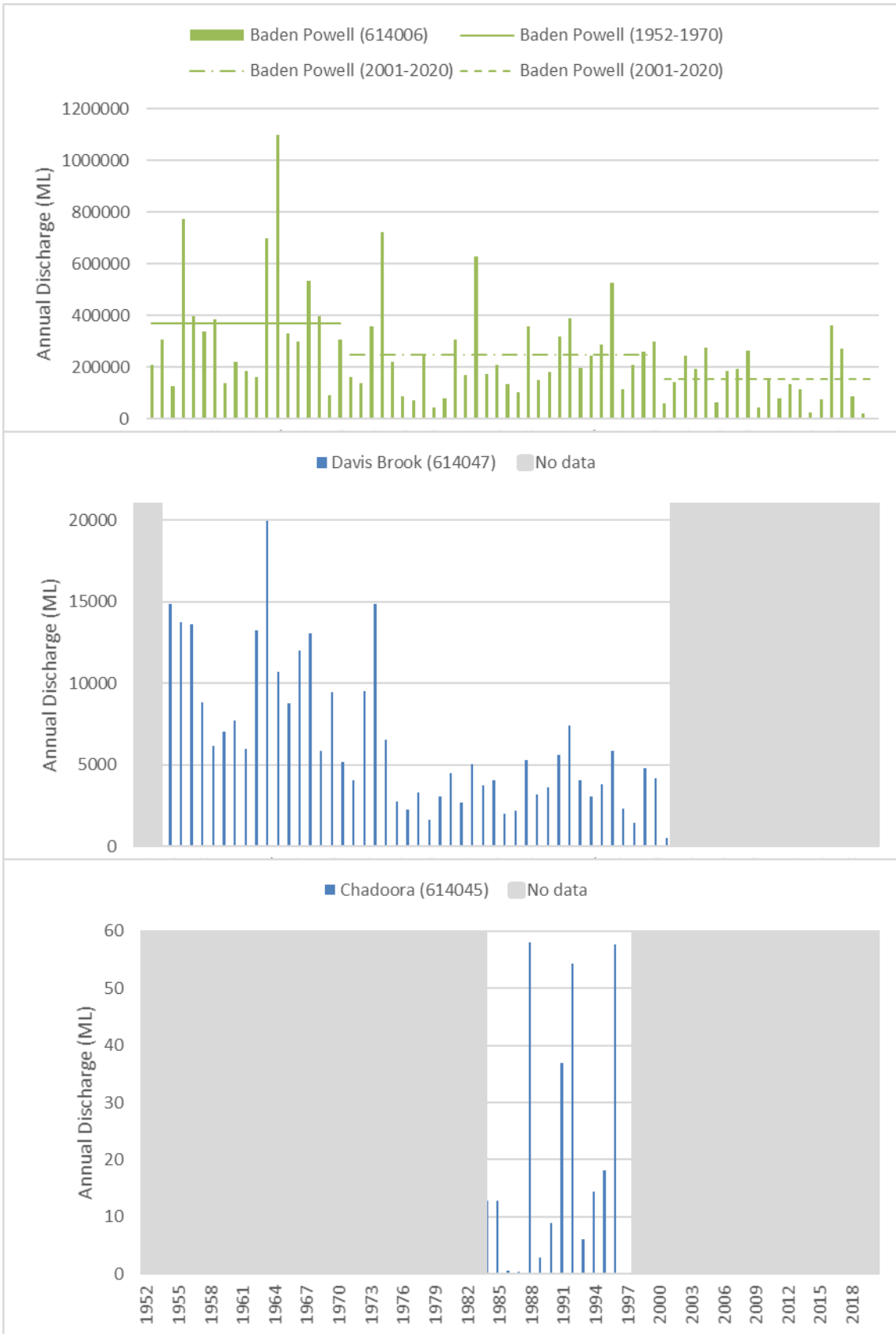


Figure G-6 Holyoake mine region (Murray catchment) gauging station annual flows

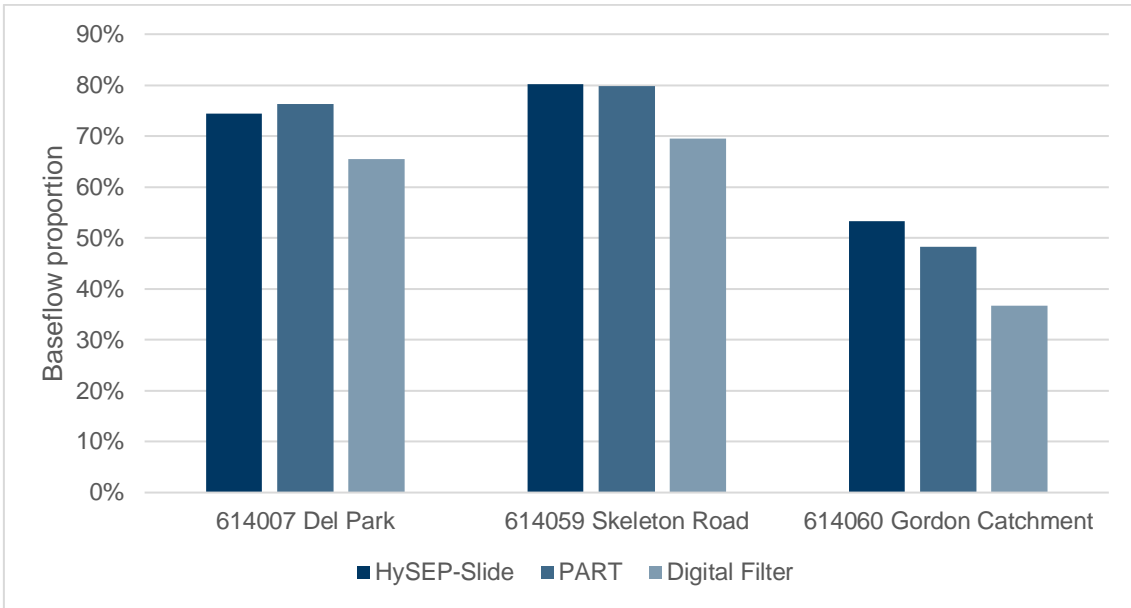


Figure G-7 Baseflow contribution to runoff

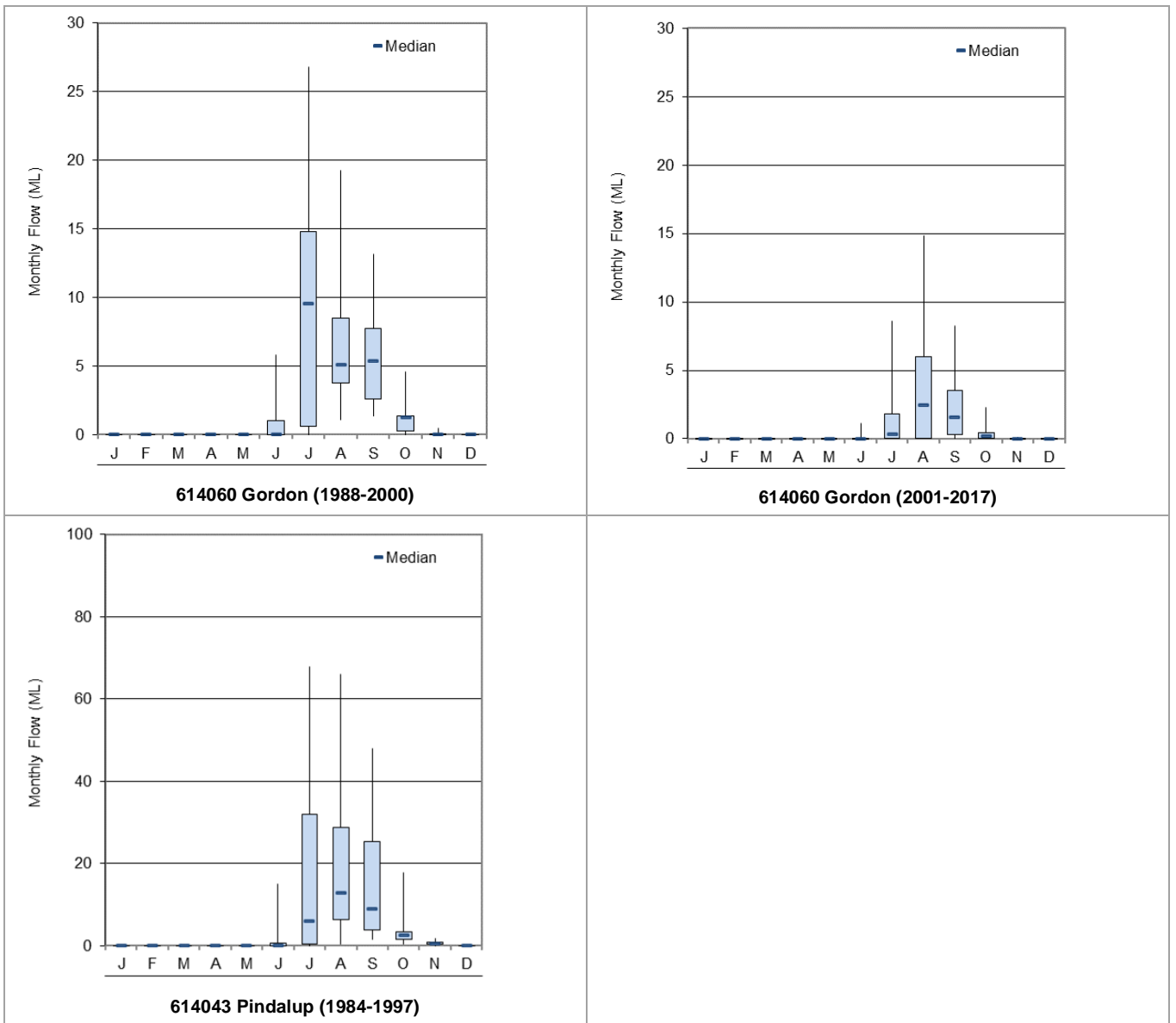


Figure G-8 Holyoake mine region gauging station flow seasonality

Appendix H

**Surface water quality summary statistics –
Long term monitoring sites**

Myara North

Table H-1 Myara North surface water TDS (mg/L) – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record	
Wungong Brook	WG72	26	113	147	142	191	1/09/1991	18/11/1997	
	WG67	9	115	154	130	230	1/01/1991	21/08/1996	
	WG20	36	112	158	149	230	22/12/1975	20/10/1997	
	WG16	8	131	217	218	285	22/12/1975	12/12/1978	
	WG17	12	184	312	334	398	22/12/1975	12/12/1978	
	WG19	20	148	276	294	334	24/08/1977	24/07/1991	
	WG63	22	103	206	211	282	1/07/1991	18/08/2000	
	WG61	27	96	183	189	275	1/01/1991	2/08/1999	
	WG68	13	80	103	95	205	1/07/1991	18/08/2000	
	WG14	33	141	232	243	305	27/07/1977	20/10/1993	
	WG13	12	155	226	228	280	22/12/1975	12/12/1978	
	WG54	14	157	237	239	296	25/01/1979	23/06/1994	
	WG15	9	134	209	206	293	22/12/1975	12/12/1978	
	Gooralong Brook	GG08	14	103	176	178	243	19/01/1976	11/12/1978
		GG07	14	121	171	165	231	19/01/1976	11/12/1978
GG06		9	108	132	128	162	19/12/1975	11/12/1978	
GG05		13	117	129	131	138	19/12/1975	11/12/1978	
GG03		52	89	151	153	247	19/12/1975	20/10/1993	
39 Mile Brook	TN11	28	103	177	178	265	4/11/1975	21/06/1994	
	TN30	13	131	183	190	231	4/11/1975	26/10/1993	
	TN34	6	157	179	173	225	1/09/1991	18/10/1993	
	TN33	17	178	255	267	306	22/11/1990	21/06/1994	
	TN10	24	118	188	187	284	22/11/1990	21/06/1994	
	TN09	20	123	250	250	357	18/10/1977	21/06/1994	
	TN31	16	133	226	197	343	19/11/1975	12/10/1992	
	TN01	60	116	255	261	419	30/10/1975	19/11/1993	
	TN02	52	114	216	219	330	4/11/1975	19/11/1993	
	TN13	9	113	212	217	280	18/10/1977	11/12/1978	
TN14	126	101	232	229	486	25/01/1979	13/02/1990		
East of 1100mm isohyet									
Banksia Gully	SN01	86	82	229	210	583	22/06/1981	8/09/1998	
Goldmine Gully	SN05	10	184	278	242	574	1/09/1991	2/06/1994	
	SN02	96	110	283	248	2078	22/06/1981	8/09/1998	
Eastern Trib 1	SN06	7	168	209	205	265	1/09/1991	18/10/1995	
	SN03	86	77	205	192	653	22/06/1981	8/09/1998	
Eastern Trib 2	SN04	45	59	173	109	728	1/07/1991	14/01/2020	

Table H-2 Myara North surface water EC (uS/cm) – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	WG72	26	204	269	261	356	1/09/1991	18/11/1997
	WG67	9	206	284	237	434	1/01/1991	21/08/1996
	WG20	36	201	292	275	434	22/12/1975	20/10/1997
	WG16	8	239	409	409	542	22/12/1975	12/12/1978
	WG17	12	343	595	639	764	22/12/1975	12/12/1978
	WG19	20	272	524	559	638	24/08/1977	24/07/1991
	WG63	22	182	387	396	537	1/07/1991	18/08/2000
	WG61	27	170	341	352	522	1/01/1991	2/08/1999
	WG68	13	137	184	167	385	1/07/1991	18/08/2000
	WG14	33	258	437	460	582	27/07/1977	20/10/1993
	WG13	12	286	426	431	533	22/12/1975	12/12/1978
	WG54	14	290	448	451	564	25/01/1979	23/06/1994
	WG15	9	245	392	387	557	22/12/1975	12/12/1978
	Gooralong Brook	GG08	14	182	327	331	459	19/01/1976
GG07		14	219	318	305	435	19/01/1976	11/12/1978
GG06		9	194	241	233	300	19/12/1975	11/12/1978
GG05		13	211	235	239	251	19/12/1975	11/12/1978
GG03		52	155	278	281	468	19/12/1975	20/10/1993
39 Mile Brook	TN11	28	184	328	332	503	4/11/1975	21/06/1994
	TN30	13	239	342	355	435	4/11/1975	26/10/1993
	TN34	6	290	334	320	423	1/09/1991	18/10/1993
	TN33	17	330	483	506	583	22/11/1990	21/06/1994
	TN10	24	213	351	349	540	22/11/1990	21/06/1994
	TN09	20	223	474	472	684	18/10/1977	21/06/1994
	TN31	16	243	427	368	657	19/11/1975	12/10/1992
	TN01	60	209	484	495	806	30/10/1975	19/11/1993
	TN02	52	206	407	411	630	4/11/1975	19/11/1993
	TN13	9	203	398	407	533	18/10/1977	11/12/1978
TN14	126	180	437	432	938	25/01/1979	13/02/1990	
East of 1100mm isohyet								
Banksia Gully	SN01	86	142	432	394	1129	22/06/1981	8/09/1998
Goldmine Gully	SN05	10	342	528	457	1113	1/09/1991	2/06/1994
	SN02	96	197	537	469	3874	22/06/1981	8/09/1998
Eastern Trib 1	SN06	7	311	391	385	503	1/09/1991	18/10/1993
	SN03	86	133	384	359	1268	22/06/1981	8/09/1998
Eastern Trib 2	SN04	45	98	322	195	1415	1/07/1991	14/01/2020

Table H-3 Myara North surface water EC (uS/cm) – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	6161352	24	307	596	607	714	4/05/1976	9/07/1980
	616058 ⁵	4138	0	124	22	479	3/04/1992	8/07/2013
	616058 ⁶	525	210	554	536	1180	25/06/1992	22/10/1997
	6161353	18	238	454	470	649	6/07/1976	4/10/1979
	6161351	21	298	513	510	682	21/10/1975	4/10/1979
	6161338	25	286	409	386	588	3/11/1975	4/10/1979
	6161339	23	298	489	481	867	3/11/1975	4/10/1979
	6161340	23	298	497	500	691	4/05/1976	4/10/1979
	6161337	23	286	424	423	540	3/11/1975	1/06/1983
	6161341	106	161	358	365	531	4/05/1976	13/12/1984
	6161343	108	286	344	326	598	4/05/1976	13/12/1984
	6161342	107	105	408	403	761	3/11/1975	13/12/1984
	6161349	103	122	255	253	488	3/11/1975	13/12/1984
	6161348	90	111	215	219	313	3/11/1975	13/12/1984
	6161347	113	106	214	215	314	3/08/1976	13/12/1984
Gooralong Brook	6141622	119	175	270	274	390	21/10/1975	15/12/1986
Minor tributary	6141104	207	120	306	318	547	28/10/1975	7/09/1995
39 Mile Brook	6141118	110	173	410	403	762	22/01/1976	19/12/1984
	6141117	105	176	360	330	806	27/05/1976	14/11/1984
	6141116	16	398	529	527	667	21/10/1975	22/11/1977
	6141114	16	218	328	343	378	27/05/1976	25/07/1978
	6141115	17	341	429	417	561	21/10/1975	12/09/1977
	614031 ⁷	290	0	513	505	928	30/05/1985	23/09/1998
	6141113	24	242	397	371	800	17/10/1979	17/09/1980
East of 1100mm isohyet								
Banksia Gully	6141120	84	23	365	352	833	10/08/1976	14/11/1984
	6141121	150	18	535	537	1216	28/10/1975	10/10/1994
Goldmine Gully	6141126	83	16	340	330	761	10/08/1976	7/09/1995
	6141125	114	28	468	437	1857	2/12/1975	10/10/1994
Eastern Trib 1	6141128	83	16	340	330	761	10/08/1976	10/10/1994
	6141127	22	171	387	384	689	17/10/1979	5/11/1980
Serpentine River	6141138	112	103	438	425	889	9/07/1980	7/09/1995
	614035 ⁸	269	152	579	557	1388	26/07/1982	14/10/1998
	6141142	84	130	441	390	1009	4/06/1981	11/11/1985
	6141141	86	130	431	441	840	4/06/1981	18/11/1985
	6141140	94	140	390.85	360	724	28/05/1981	18/11/1985
	6141147	104	120	511.09	447	1889	22/06/1976	1/10/1985

⁵ Wungong Cobiac gauging station continuous EC logging – summary of maximum EC values with 0 value representing no flow.

⁶ Wungong Cobiac gauging station discrete monitoring. Single sample recorded 24/01/2000.

⁷ 39 Mile Brook Jack Rocks gauging station location discrete monitoring.

⁸ Serpentine River River Road gauging station location discrete monitoring.

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
	6141148	117	41	401.48	370	833	9/10/1975	11/11/1985

Table H-4 Myara North surface water turbidity (NTU) – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	WG16	8	0.2	0.5	0.5	0.6	22/12/1975	12/12/1978
	WG17	12	0.1	0.4	0.3	1	22/12/1975	12/12/1978
	WG19	19	0.1	0.4	0.2	3.8	24/08/1977	24/07/1991
	WG14	20	0.1	0.3	0.2	0.9	27/07/1977	20/10/1993
	WG13	12	0.2	0.5	0.3	1.9	22/12/1975	12/12/1978
	WG54	5	0.2	0.2	0.2	0.3	25/01/1979	23/06/1994
	WG15	9	0.1	0.3	0.3	0.6	22/12/1975	12/12/1978
Gooralong Brook	GG08	7	0.4	1.0	0.9	1.8	19/01/1976	11/12/1978
	GG07	9	0.3	0.5	0.3	0.9	19/01/1976	11/12/1978
	GG06	5	0.2	0.3	0.3	0.5	19/12/1975	11/12/1978
	GG05	6	0.1	0.3	0.2	0.6	19/12/1975	11/12/1978
	GG03	32	0.2	0.7	0.5	5.4	19/12/1975	20/10/1993
39 Mile Brook	TN11	8	0.2	0.4	0.3	1	4/11/1975	21/06/1994
	TN09	9	0.1	1.9	0.9	10	18/10/1977	21/06/1994
	TN01	19	0.2	0.7	0.5	1.9	30/10/1975	19/11/1993
	TN02	12	0.2	0.9	0.3	3.2	4/11/1975	19/11/1993
	TN13	9	0.2	0.6	0.3	2.5	18/10/1977	11/12/1978
	TN14	126	0.2	1.8	0.9	45	25/01/1979	13/02/1990
Banksia Gully	SN01	47	0.3	1.7	1.2	8.8	22/06/1981	8/09/1998
Goldmine Gully	SN02	51	0.3	1.1	0.9	3.2	22/06/1981	8/09/1998
Eastern Trib 1	SN03	49	0.3	1.3	1.1	4.8	22/06/1981	8/09/1998

Table H-5 Myara North surface water turbidity (NTU) – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	6161352	17	0.2	1.1	0.5	10.0	4/05/1976	9/07/1980
	616058 ⁹	432	0.1	1.0	0.5	31.0	25/06/1992	22/10/1997
	6161353	14	0.2	0.6	0.5	1.4	6/07/1976	4/10/1979
	6161351	12	0.3	0.8	0.6	4.0	21/10/1975	4/10/1979
	6161338	16	0.3	0.9	0.7	5.0	3/11/1975	4/10/1979
	6161339	17	0.2	0.7	0.6	1.4	3/11/1975	4/10/1979
	6161340	17	0.2	0.6	0.5	2.4	4/05/1976	4/10/1979
	6161337	16	0.3	0.7	0.5	2.5	3/11/1975	1/06/1983
	6161341	99	0.1	0.8	0.6	8.8	4/05/1976	13/12/1984
	6161343	101	0.2	0.9	0.7	5.5	4/05/1976	13/12/1984
	6161342	101	0.2	1.3	1.0	21.0	3/11/1975	13/12/1984
	6161349	101	0.2	0.8	0.7	1.9	3/11/1975	13/12/1984
	6161348	84	0.2	1.1	0.9	7.2	3/11/1975	13/12/1984
	6161347	112	0.2	0.8	0.7	2.4	3/08/1976	13/12/1984
	Gooralong Brook	6141621	139	0.2	2.1	1.1	35.0	21/10/1975
6141622		124	0.3	1.1	0.7	13.0	21/10/1975	15/12/1986
Minor tributary	6141104	206	0.3	1.4	1.2	6.2	7/06/1977	7/09/1995
39 Mile Brook	6141118	103	0.3	0.9	0.7	3.2	22/01/1976	19/12/1984
	6141117	99	0.3	0.9	0.7	8.0	27/05/1976	14/11/1984
	6141116	5	0.3	0.7	0.5	1.8	21/10/1975	22/11/1977
	6141114	7	0.3	0.5	0.6	0.8	27/05/1976	25/07/1978
	614031 ¹⁰	243	0.2	0.8	0.5	4.3	30/05/1985	23/09/1998
	6141113	23	0.4	2.1	0.8	23.0	17/10/1979	17/09/1980
Banksia Gully	6141120	83	0.5	3.0	1.3	55.0	10/08/1976	14/11/1984
	6141121	175	0.2	2.3	1.2	54.0	28/10/1975	10/10/1994
Goldmine Gully	6141126	134	0.4	1.7	1.4	10.0	10/08/1976	7/09/1995
	6141125	274	0.4	1.6	1.3	14.0	2/12/1975	10/10/1994
Eastern Trib 1	6141128	110	0.3	1.4	1.1	10.0	10/08/1976	10/10/1994
	6141127	21	0.5	1.6	1.4	4.0	17/10/1979	5/11/1980
Serpentine River	6141138	148	0.3	2.4	2.0	7.9	9/07/1980	7/09/1995
	614035 ¹¹	220	0.5	2.3	1.7	18.0	26/07/1982	14/10/1998
	6141142	84	0.6	2.4	2.0	8.6	4/06/1981	11/11/1985
	6141141	86	0.8	2.3	2.1	7.1	4/06/1981	18/11/1985
	6141140	94	0.6	2.0	1.7	7.0	28/05/1981	18/11/1985
	6141147	102	0.1	3.3	2.6	14.0	22/06/1976	1/10/1985
	6141148	113	0.4	2.0	1.6	7.0	9/10/1975	11/11/1985

⁹ Wungong Cobiac gauging station discrete monitoring. Single sample recorded 24/01/2000.

¹⁰ 39 Mile Brook Jack Rocks gauging station location discrete monitoring.

Table H-6 Myara North surface water pH – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	WG17	5	6.2	6.4	6.4	6.7	22/12/1975	12/12/1978
	WG19	7	6.1	6.3	6.2	6.7	24/08/1977	24/07/1991
	WG14	7	6.1	6.4	6.3	6.8	27/07/1977	20/10/1993
	WG13	5	6.3	6.5	6.4	6.9	22/12/1975	12/12/1978
	WG15	5	6.2	6.5	6.4	6.8	22/12/1975	12/12/1978
Gooralong Brook	GG08	11	5.9	6.4	6.5	6.8	19/01/1976	11/12/1978
	GG07	10	5	6.2	6.05	6.8	19/01/1976	11/12/1978
	GG06	6	6.2	6.6	6.6	6.9	19/12/1975	11/12/1978
	GG05	9	5.6	6.2	6.2	6.9	19/12/1975	11/12/1978
	GG03	20	5.8	6.4	6.4	7.4	19/12/1975	20/10/1993
39 Mile Brook	TN01	30	5.4	6.3	6.4	7.3	30/10/1975	19/11/1993
	TN02	25	5.1	6.2	6.2	7.2	4/11/1975	19/11/1993
	TN14	19	6.2	7.1	7.1	8.5	25/01/1979	13/02/1990
Banksia Gully	SN01	6.0	5.2	6.1	6.2	6.6	22/06/1981	8/09/1998
Goldmine Gully	SN02	6.0	5.6	6.1	6.1	6.5	22/06/1981	8/09/1998
Eastern Trib 1	SN03	6.0	5.9	6.2	6.2	6.7	22/06/1981	8/09/1998
Eastern Trib 2	SN04	29	5.6	6.2	6.2	6.8	1/07/1991	14/01/2020

Table H-7 Myara North surface water pH – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Wungong Brook	616058 ¹²	62	6.30	6.82	6.90	7.00	30/06/1992	22/10/1997
	614031 ¹³	237	5.40	6.58	6.60	8.50	30/05/1985	23/09/1998
	614035 ¹⁴	240	5.60	6.49	6.40	8.60	26/07/1982	14/10/1998

¹² Wungong Cobiac gauging station monitoring. Single sample recorded 24/01/2000.

¹³ 39 Mile Brook Jack Rocks gauging station location discrete monitoring.

¹⁴ Serpentine River River Road gauging station discrete monitoring.

Holyoake

Table H-8 Holyoake surface water EC (uS/cm) – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Davis Brook	DV04	22	352	672	646	914	4/02/1976	29/11/1979

Table H-9 Holyoake surface water EC (uS/cm) – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
South Dandalup	614060 ¹⁵	226	122	175	169	789	21/06/1988	15/08/2000
	6141360	47	150	310	240	978	11/08/1976	27/09/1984
	6141352	67	151	307	265	1100	22/10/1975	20/09/1984
	6141349	10	278	489	308	2000	3/11/1975	14/10/1980
	6141350	65	142	309	263	950	22/10/1975	20/09/1984
	6141345	31	17	259	240	1064	6/10/1976	20/09/1984
	6141344	51	22	331	322	870	15/09/1976	20/09/1984
	6141342	55	19	209	216	479	11/08/1976	20/09/1984
	6141005	7	296	641	699	923	13/07/1972	25/09/1975
	6141333	7	150	342	316	682	22/10/1975	4/10/1984
	6141337	76	124	199	189	426	11/08/1976	4/10/1984
	6141336	56	17	210	216	272	25/06/1980	30/08/1984
	614043 ¹⁶	930	61	346	351	547	5/06/1984	26/09/1994
	6141340	86	26	350	335	681	22/10/1975	4/10/1984
Swamp Oak Brook	6141021	23	511	751	763	941	20/06/1972	22/11/1976

Table H-10 Holyoake surface water turbidity (NTU) – Alcoa sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
Davis Brook	DV04	16	0.7	1.8	1.8	3.5	4/04/1977	24/10/1979

Table H-11 Holyoake surface water turbidity (NTU) – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
South Dandalup	614060 ¹²	112	0.3	1.4	1.0	6.7	21/06/1988	15/08/2000
	6141360	44	0.8	4.5	2.6	23.0	24/08/1977	27/09/1984
	6141352	65	0.7	2.8	2.0	12.0	19/07/1978	20/09/1984
	6141349	37	0.5	3.4	2.2	9.8	11/08/1980	7/08/1995
	6141350	79	1.0	2.7	2.3	6.4	24/08/1977	13/09/1994
	6141345	30	0.1	1.7	1.6	5.0	19/07/1978	20/09/1984
	6141344	51	0.7	7.8	7.3	18.0	24/08/1977	20/09/1984
	6141342	55	1.1	3.7	2.5	41.0	19/07/1978	20/09/1984

¹⁵ South Dandalup Gordon Catchment gauging station discrete monitoring.

¹⁶ South Dandalup Pindalup gauging station discrete monitoring.

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
	6141333	101	0.8	3.1	2.6	12.0	27/07/1977	4/10/1984
	6141337	74	0.6	1.9	1.5	6.6	19/07/1978	4/10/1984
	6141336	56	0.7	1.9	1.6	8.2	25/06/1980	30/08/1984
	614043 ¹⁴	176	0.1	1.6	1.0	65.0	5/06/1984	26/09/1994
	6141340	106	0.3	1.1	0.9	12	24/08/1977	12/10/1994
Davis Brook	6141465	5	1.6	5.8	5.0	12.0	18/07/1978	17/07/1979

Table H-12 Holyoake surface water pH – DWER sites

Tributary	Site ID	Count	Min	Average	Median	Max	Start record	End record
South Dandalup	614060 ¹⁷	115	6.0	6.9	6.9	8.3	21/06/1988	26/09/2014
	614043 ¹⁸	223	6.1	7.1	7.1	8.2	6/06/1984	26/09/1994

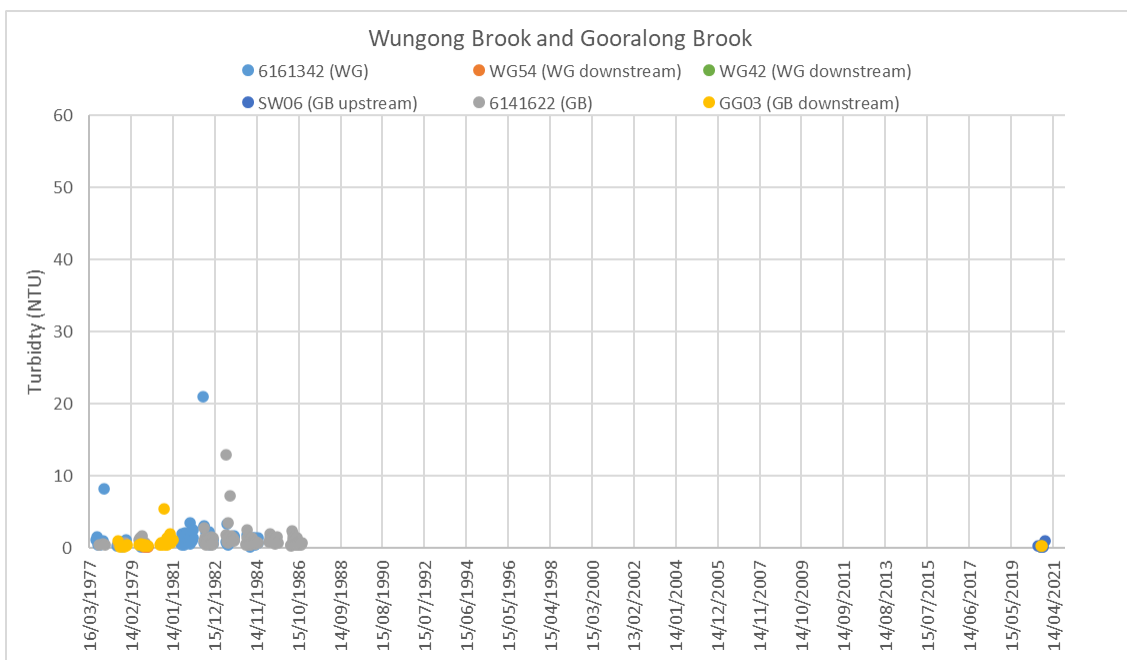
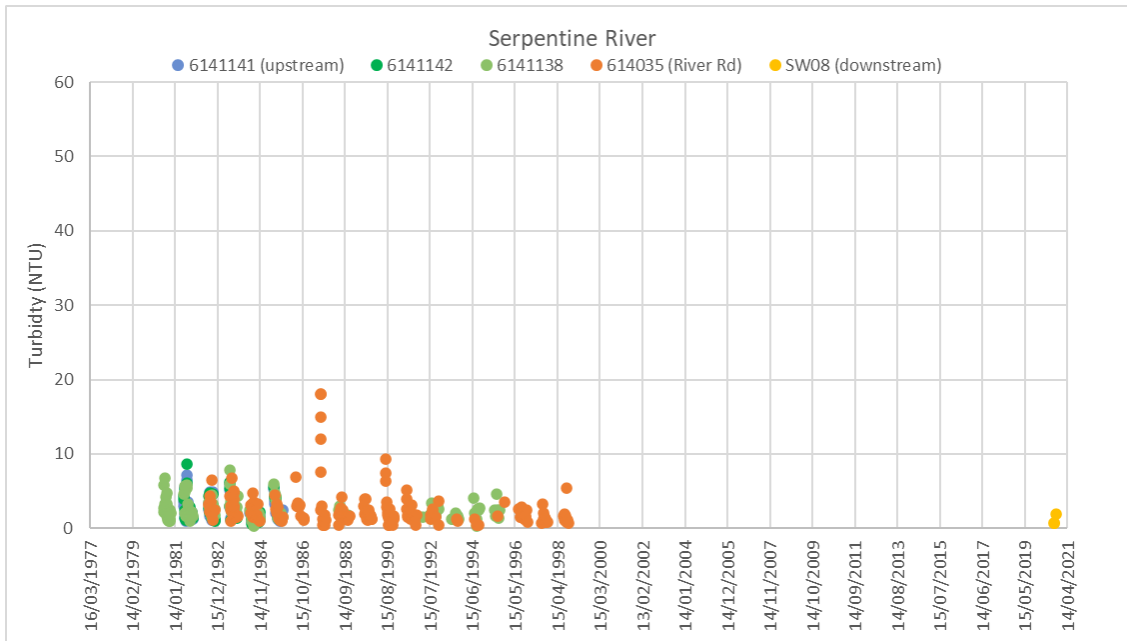
¹⁷ South Dandalup Gordon Catchment gauging station discrete monitoring.

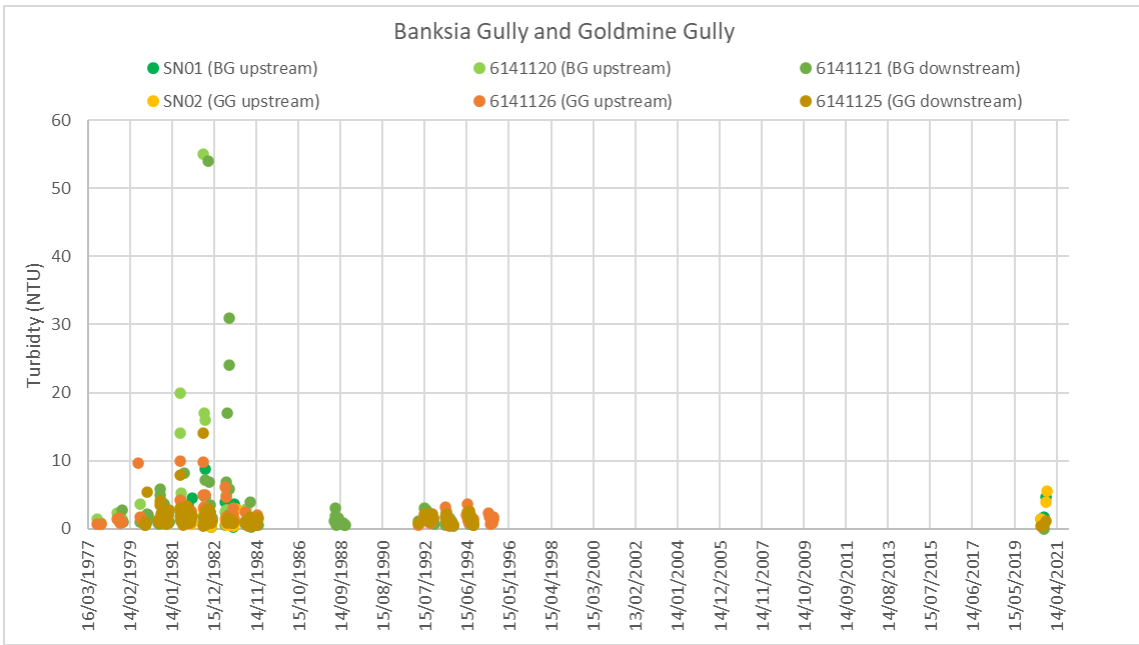
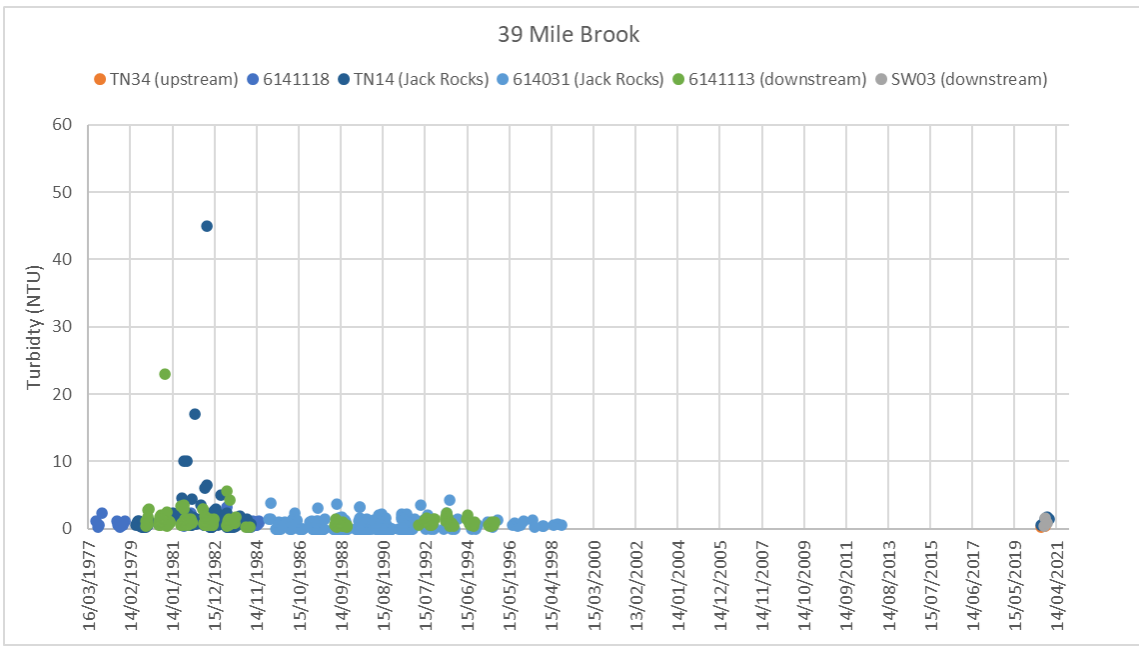
¹⁸ South Dandalup Pindalup gauging station discrete monitoring.

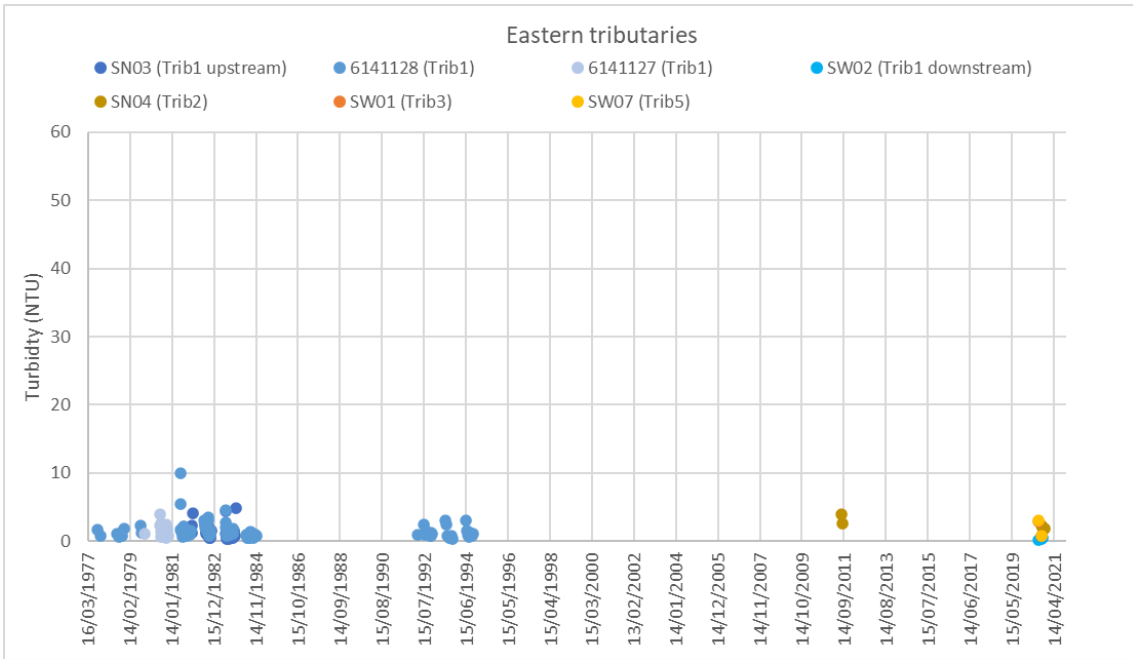
Appendix I

Surface water turbidity plots - long term monitoring sites

Myara North long term monitoring sites

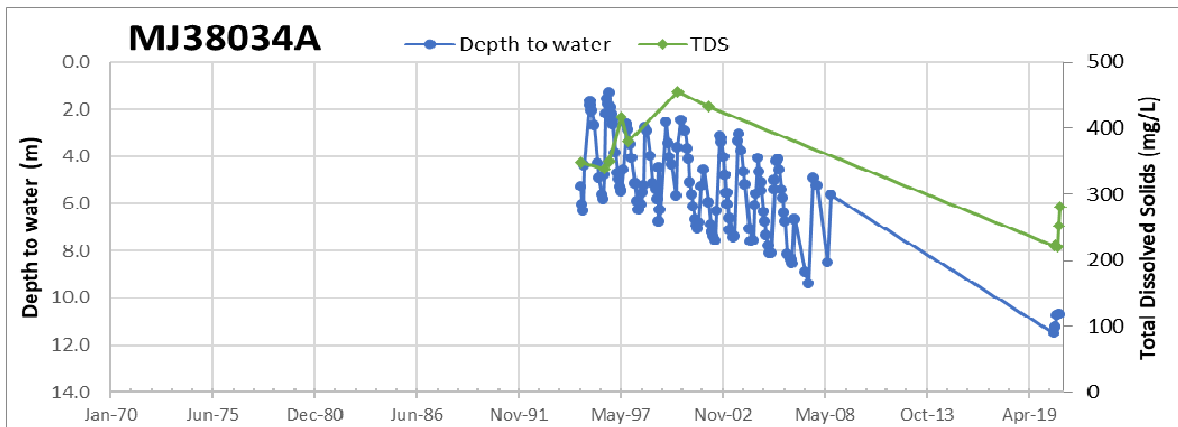
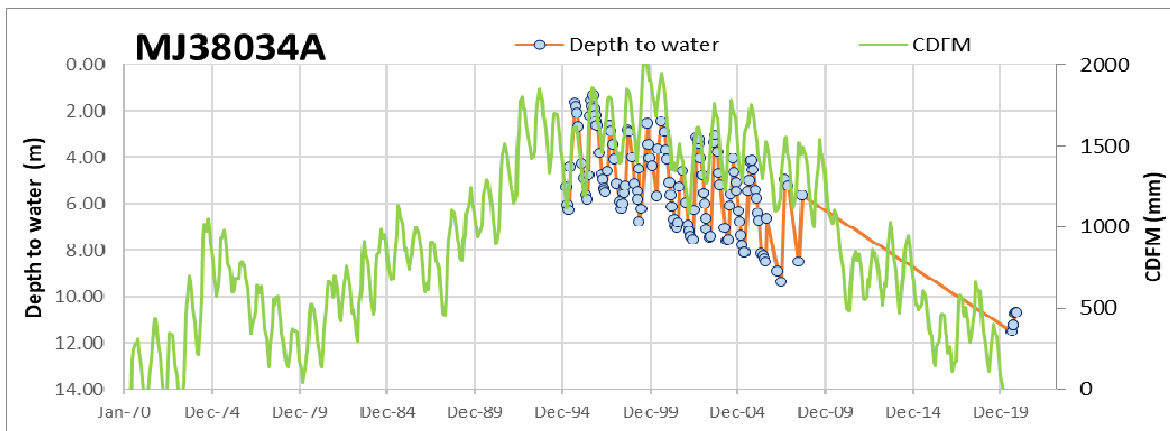
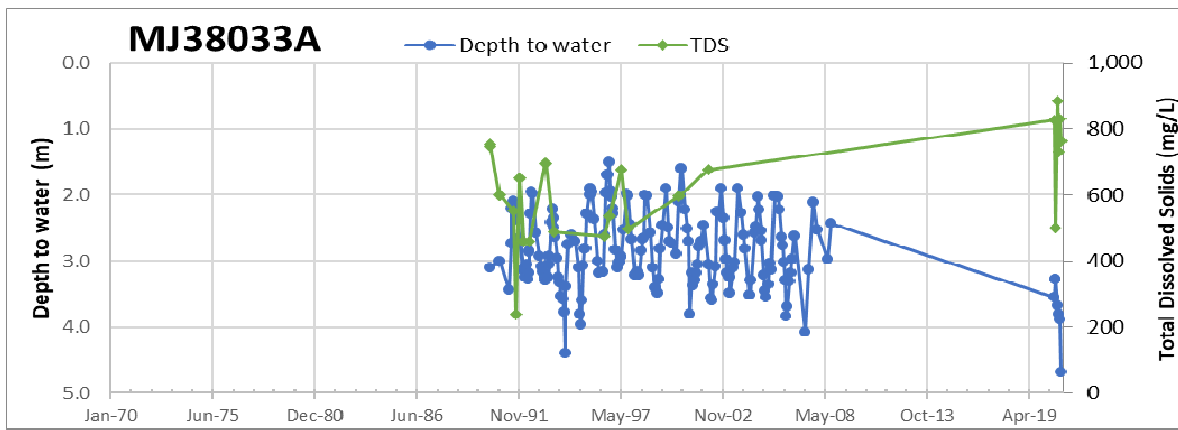
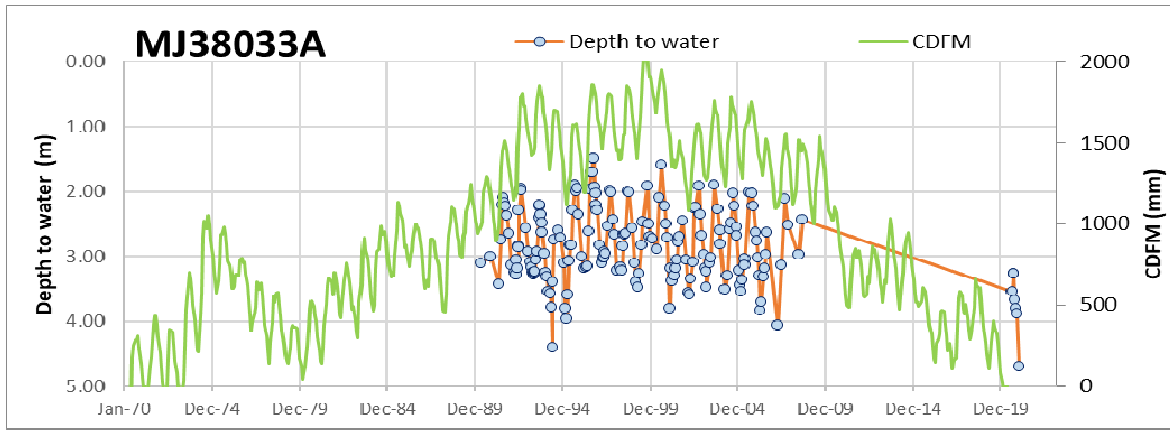


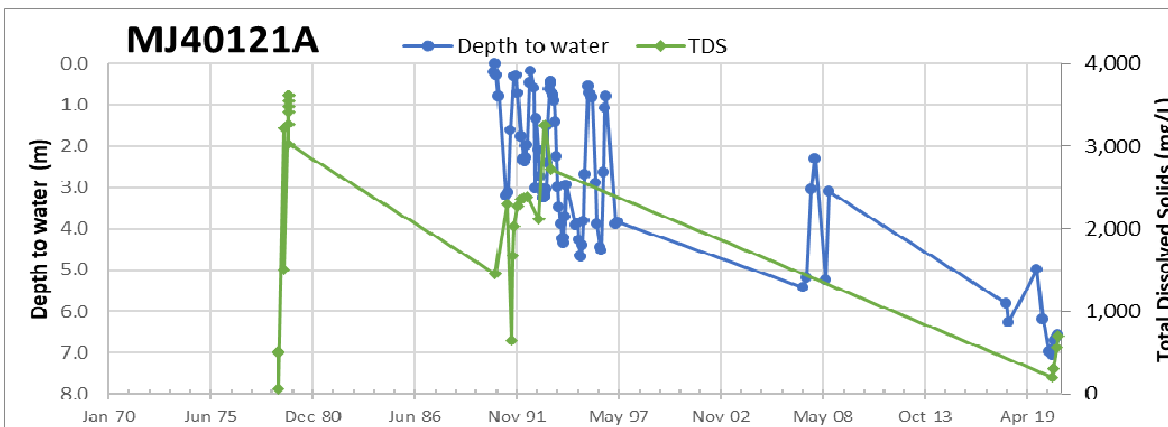
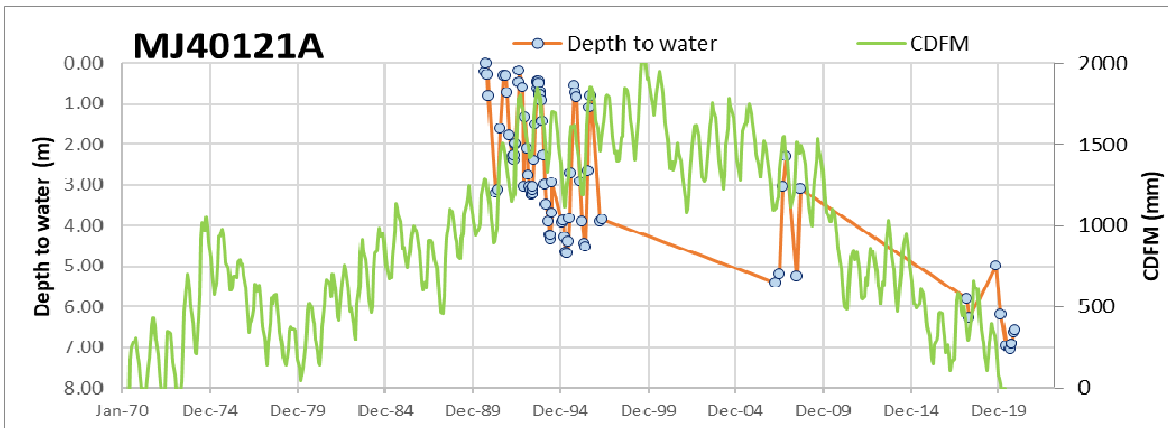
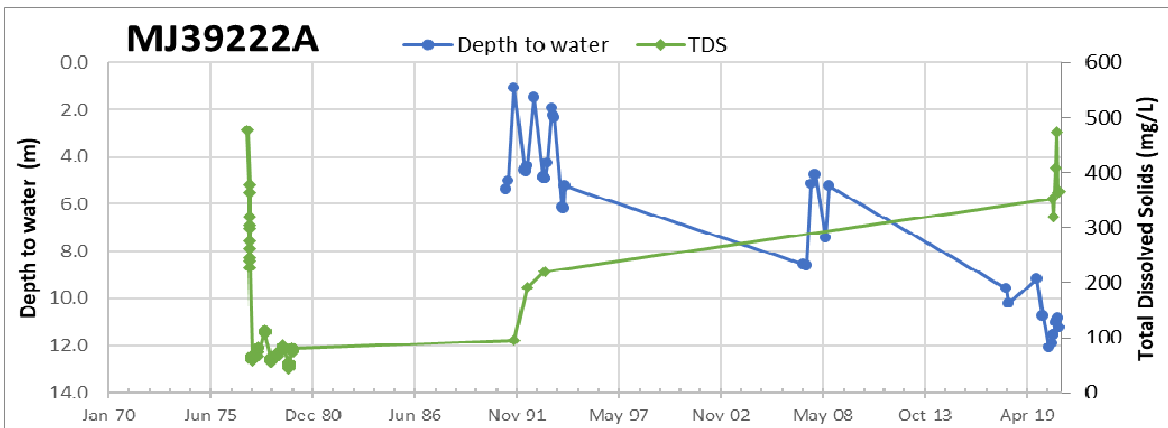
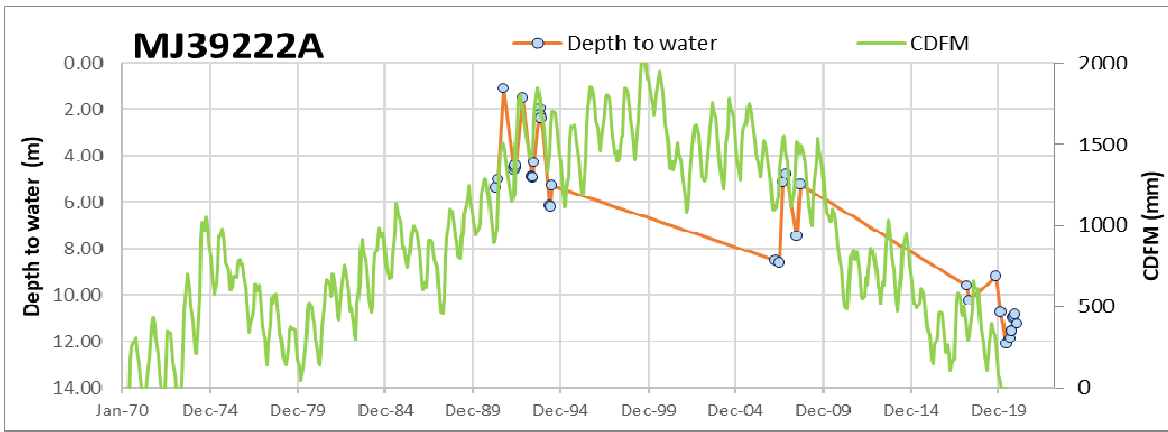


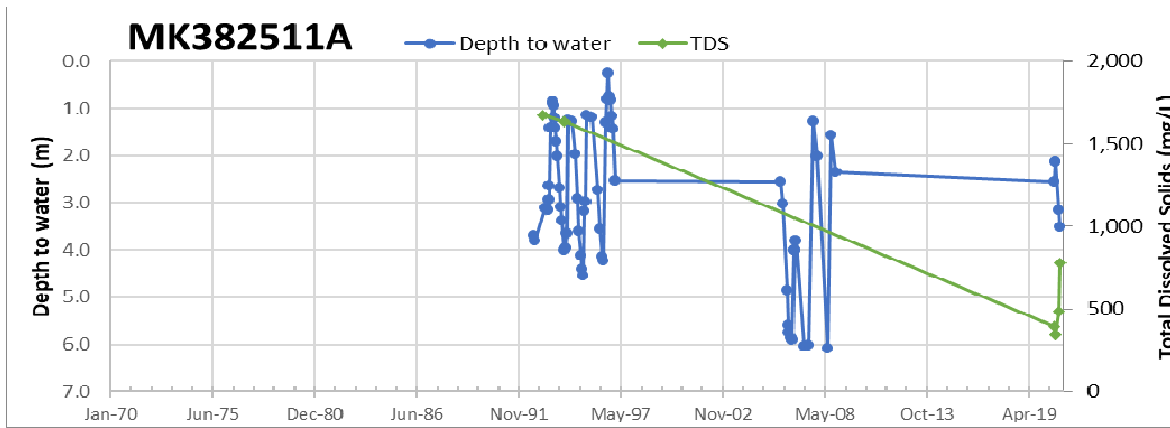
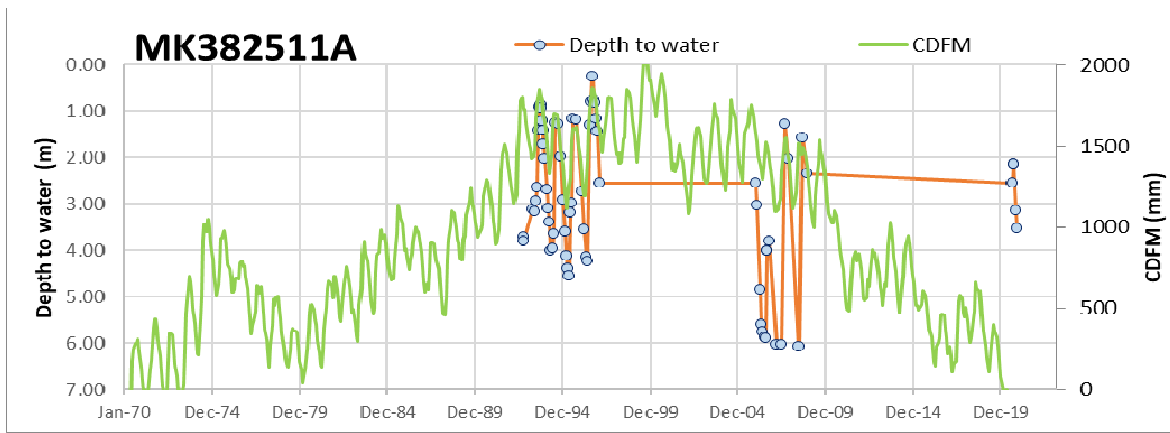
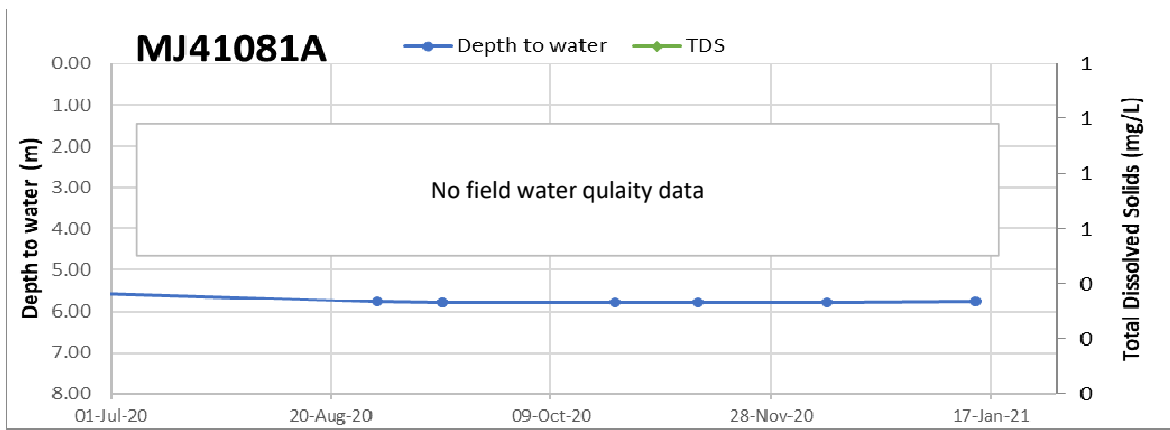
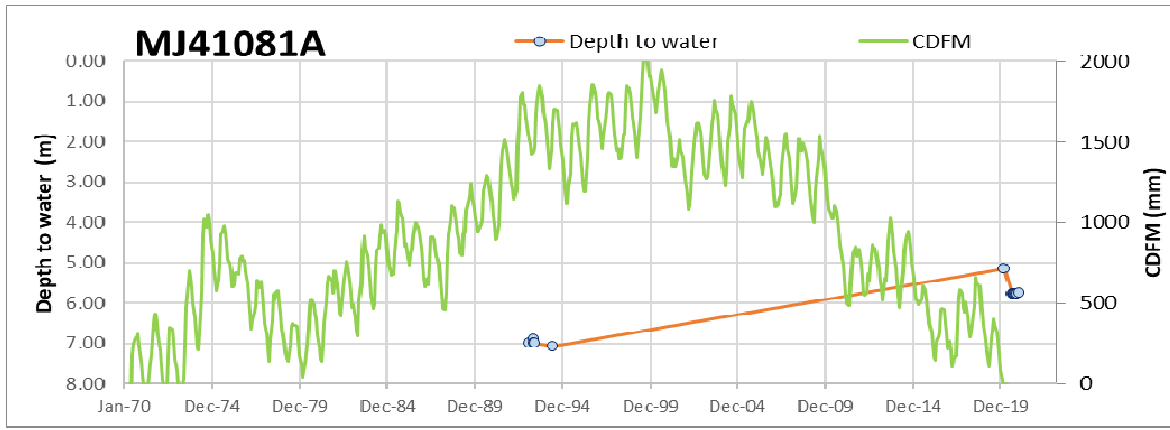


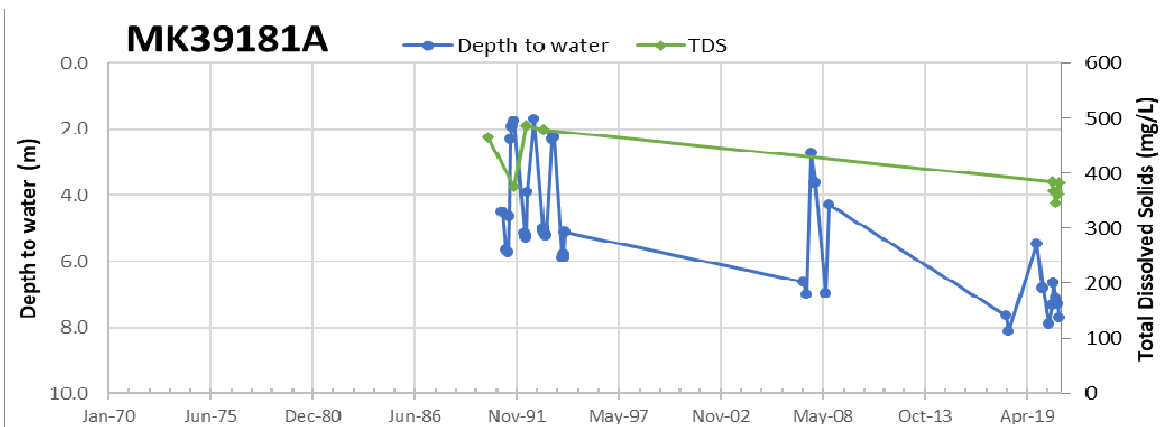
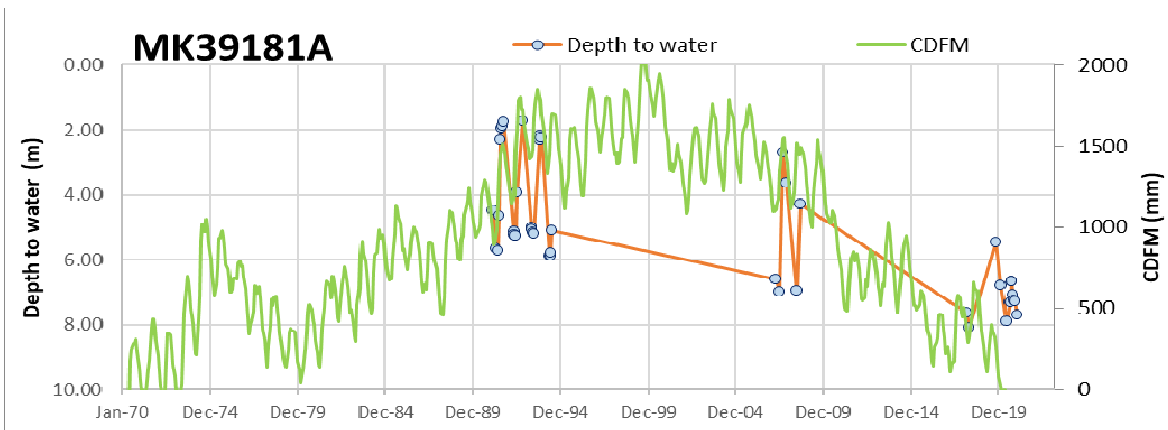
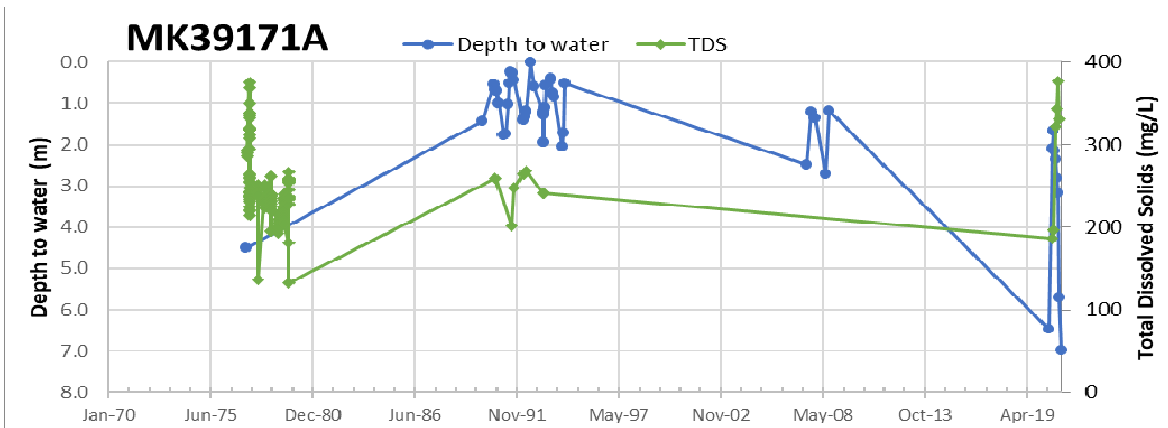
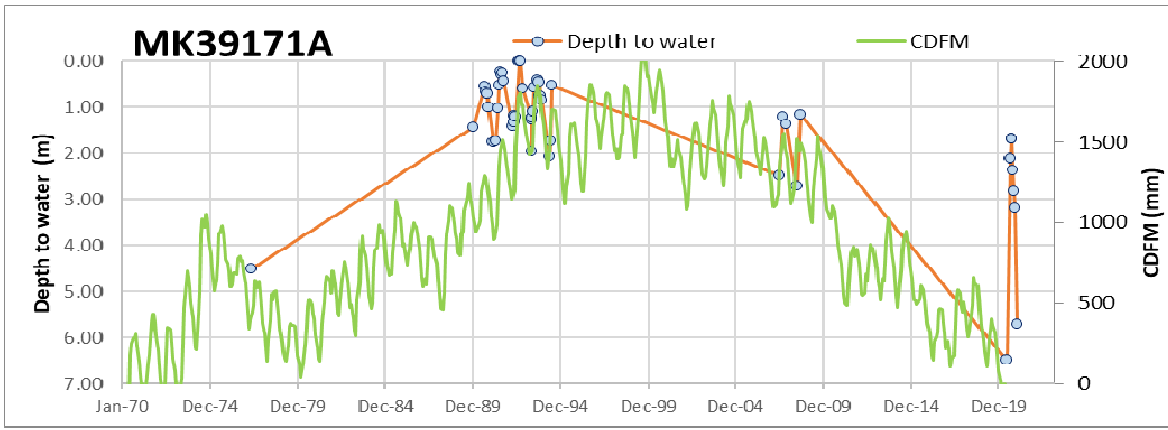
Appendix J

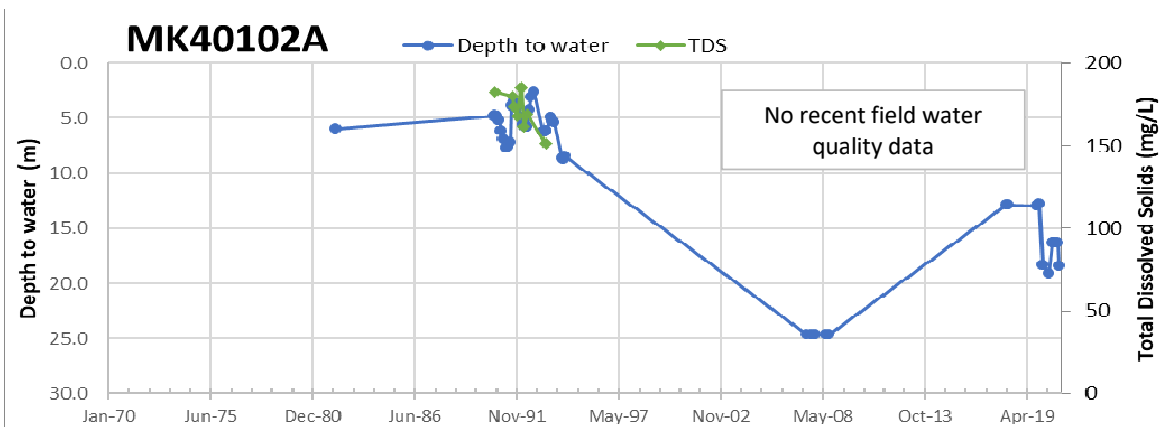
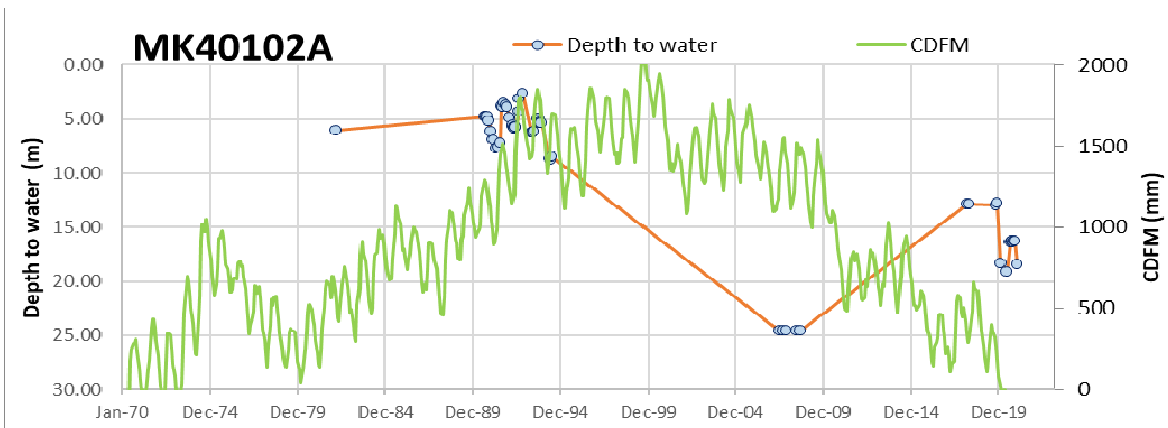
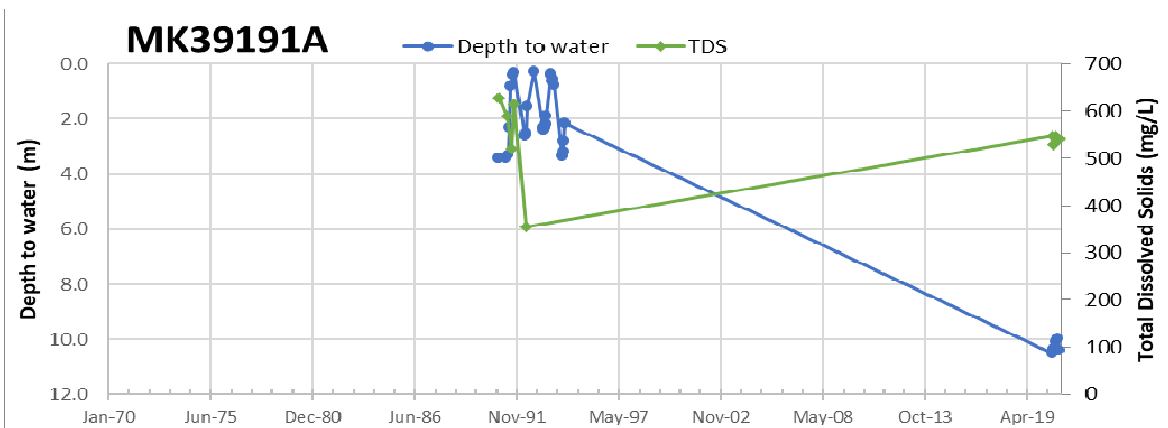
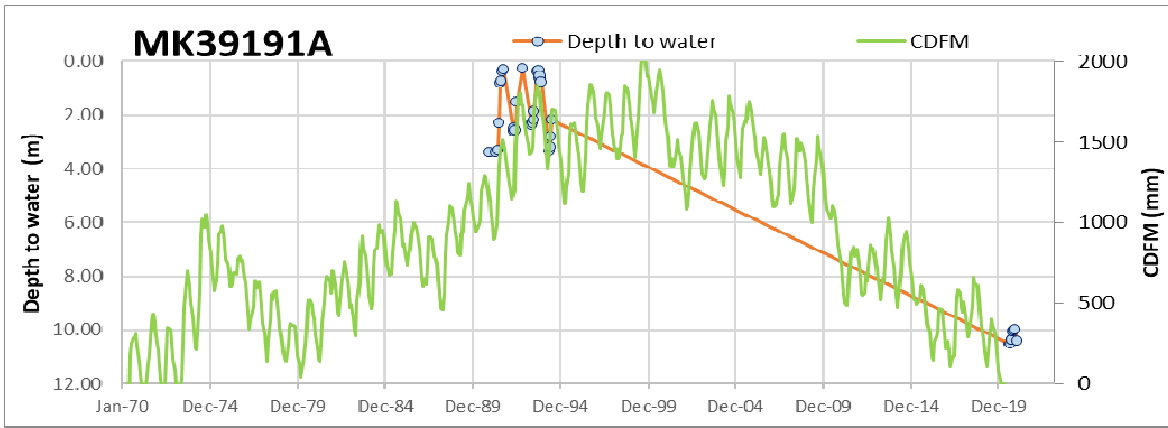
Groundwater data graphs - historical sites

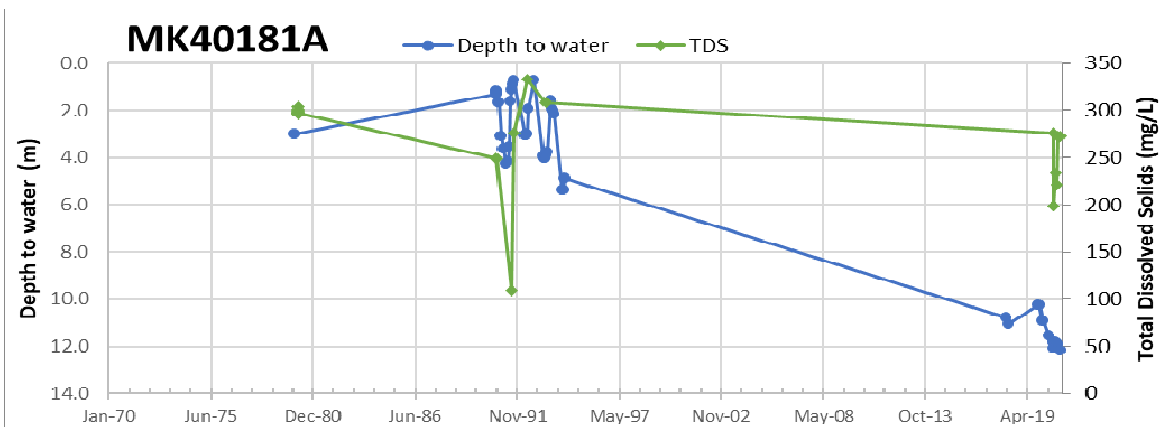
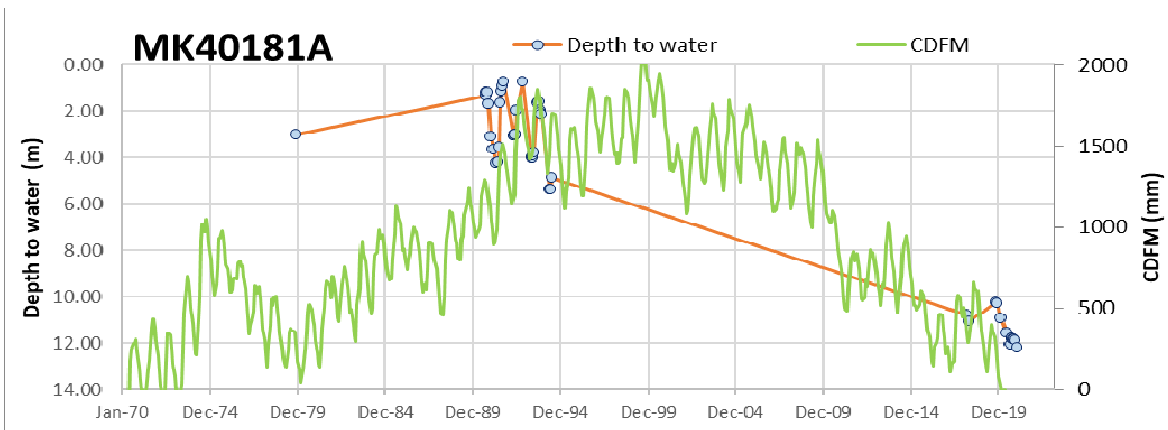
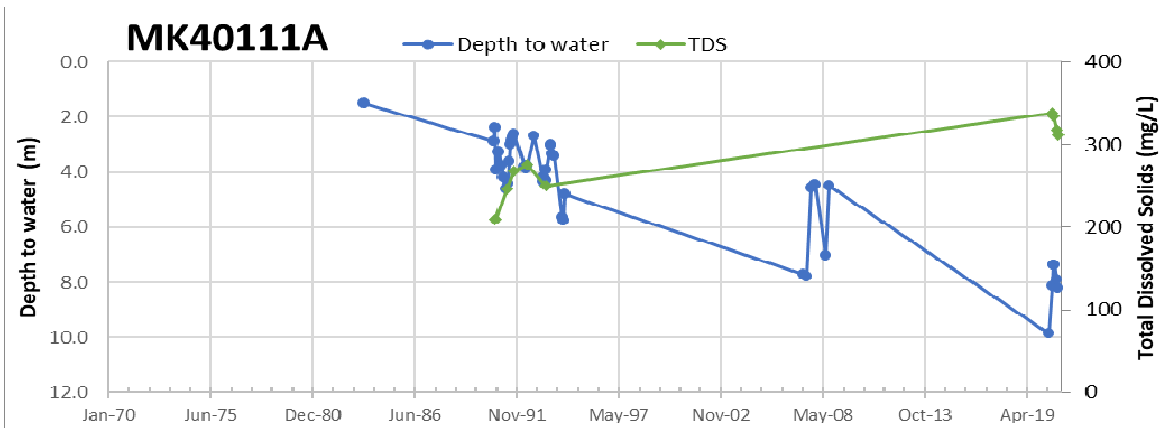
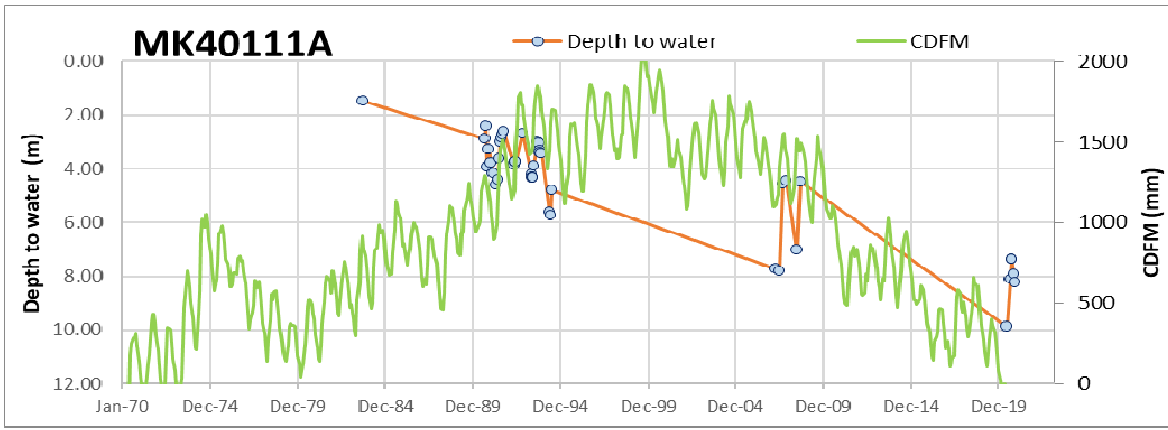


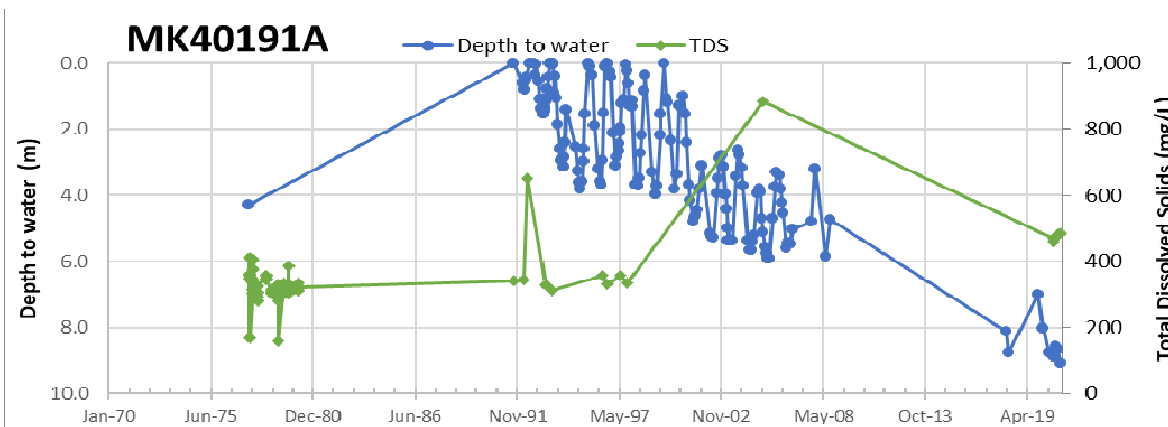
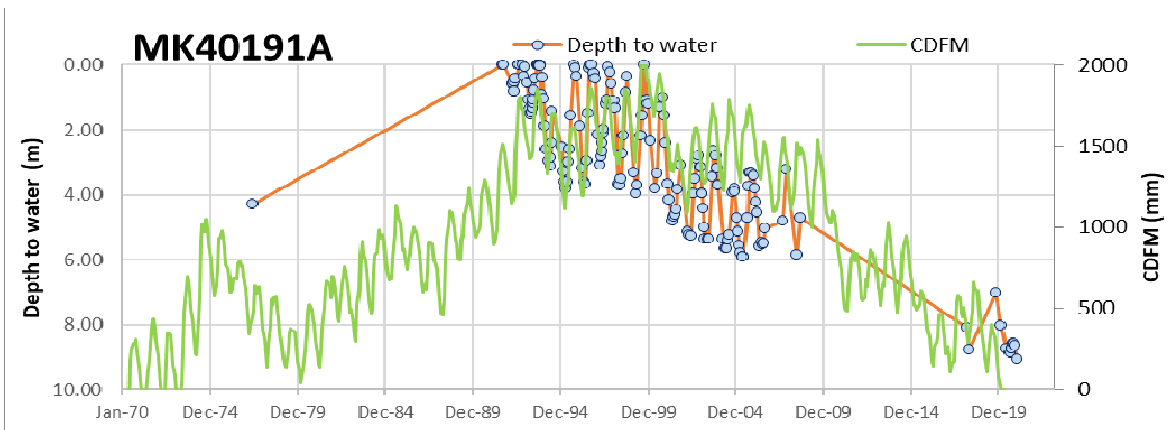
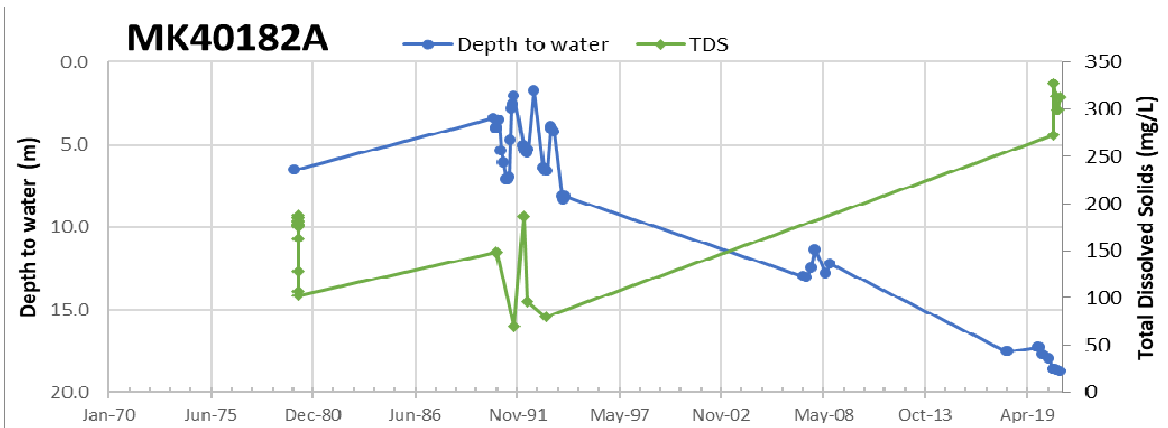
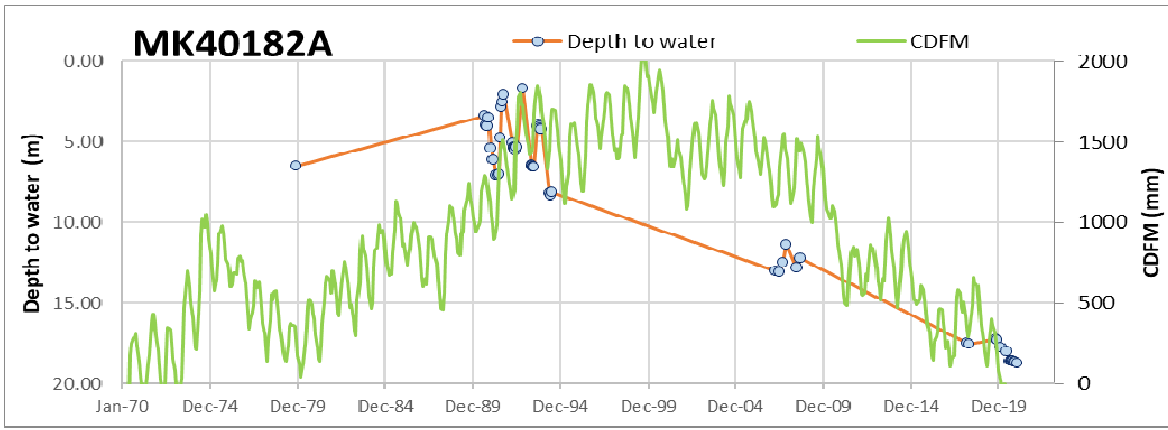


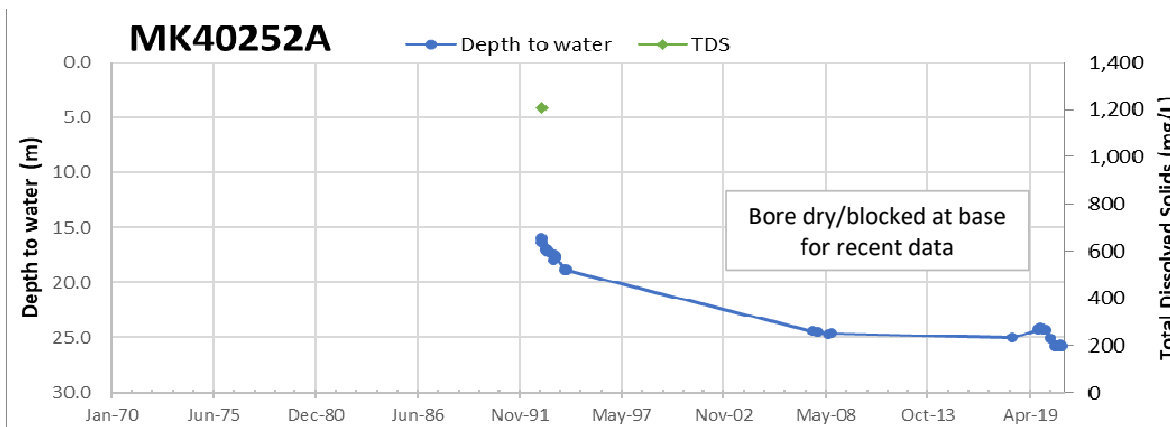
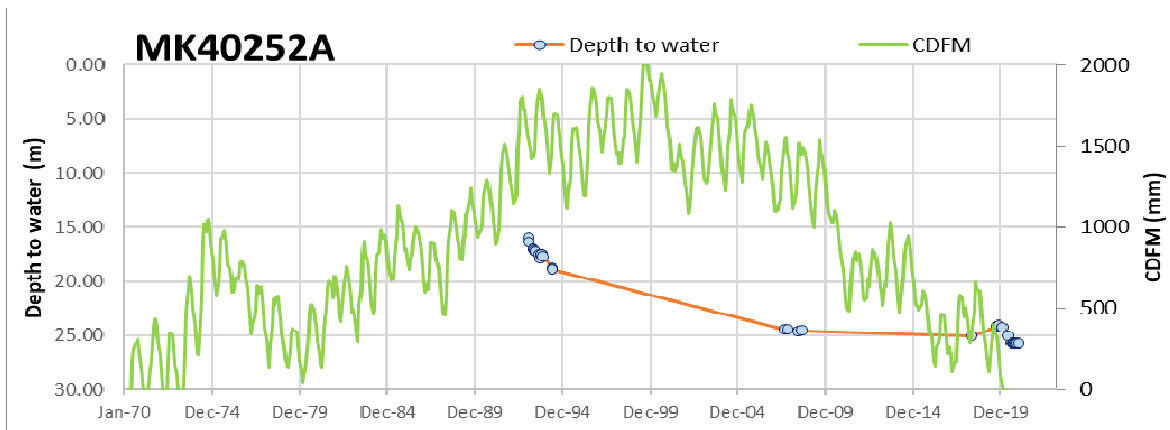
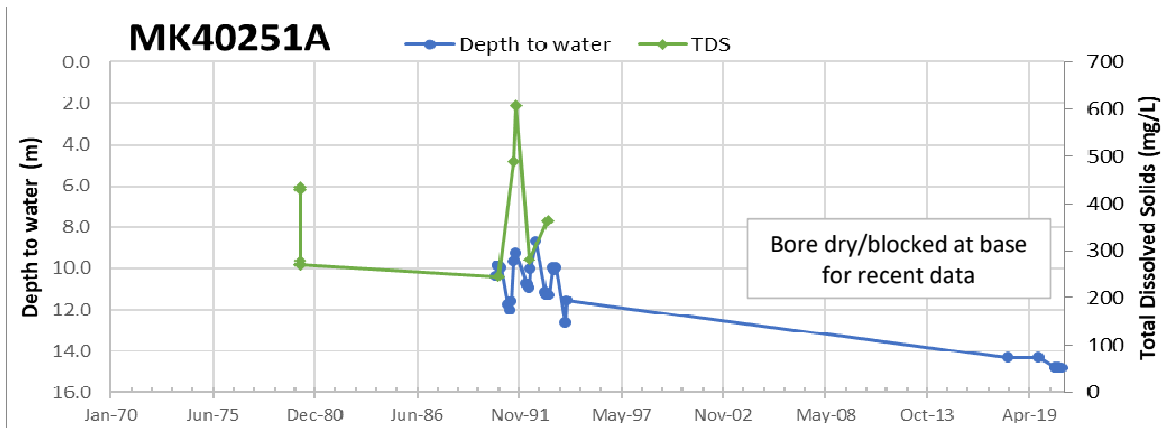
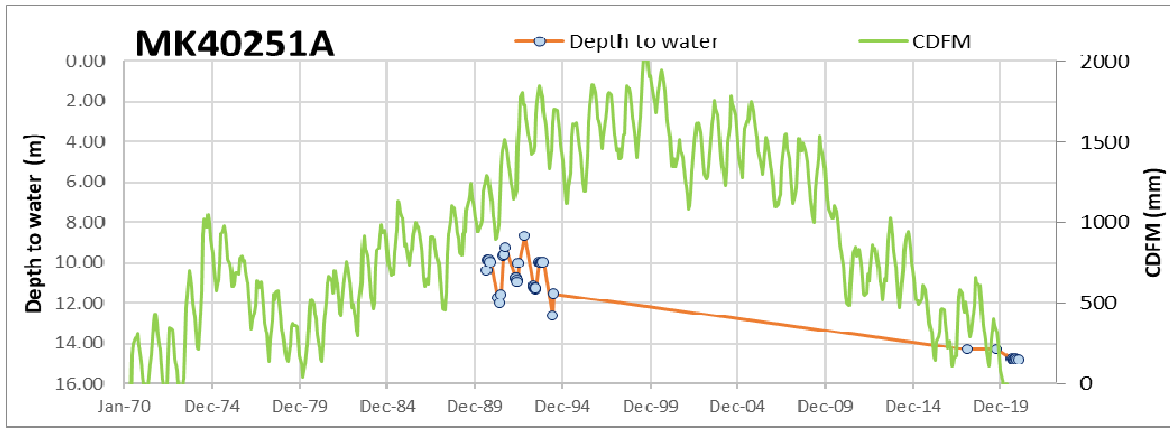


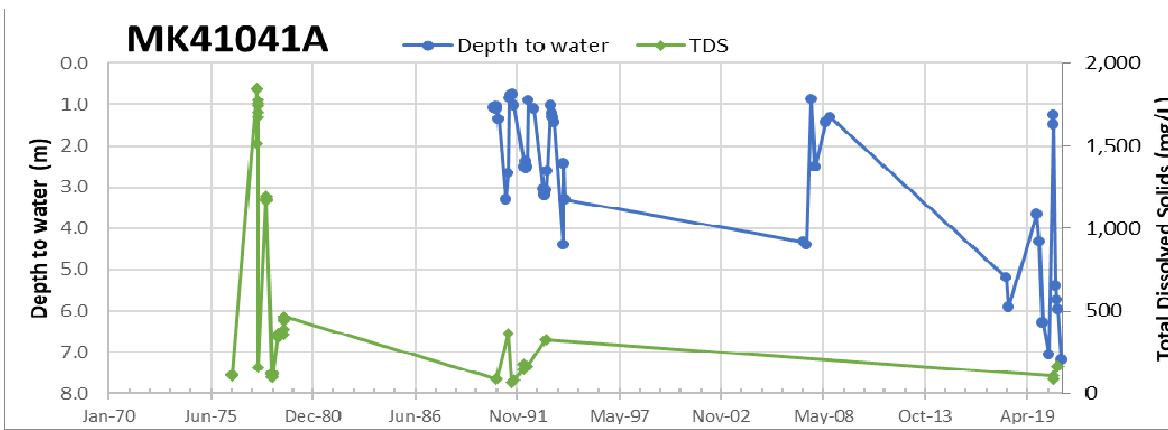
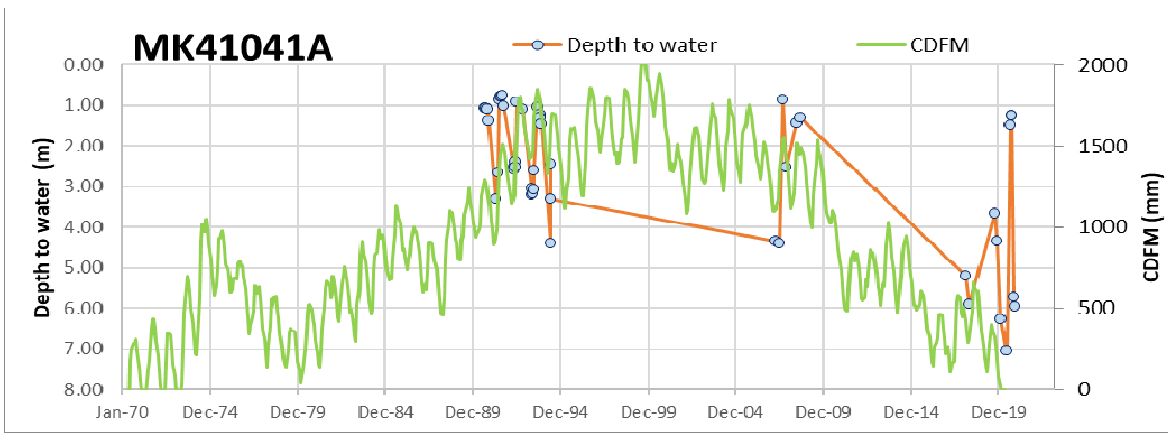
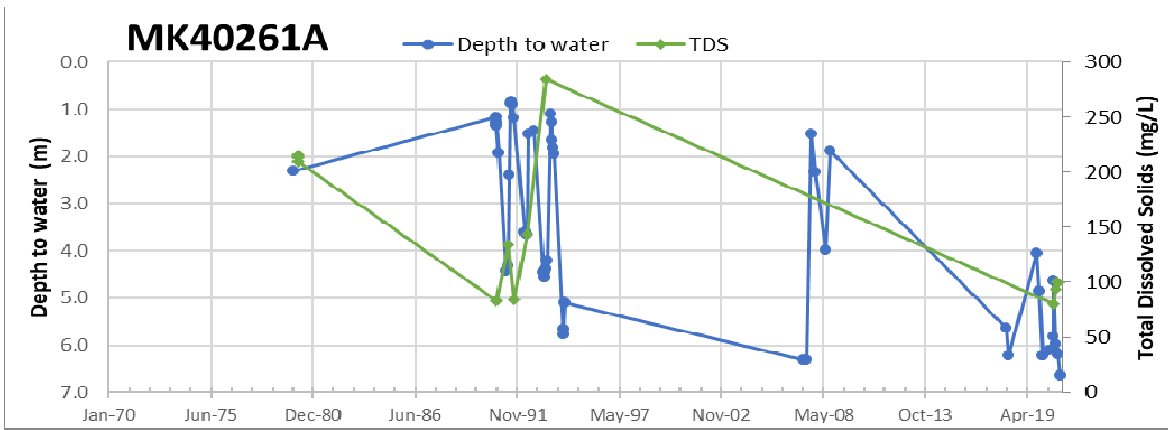
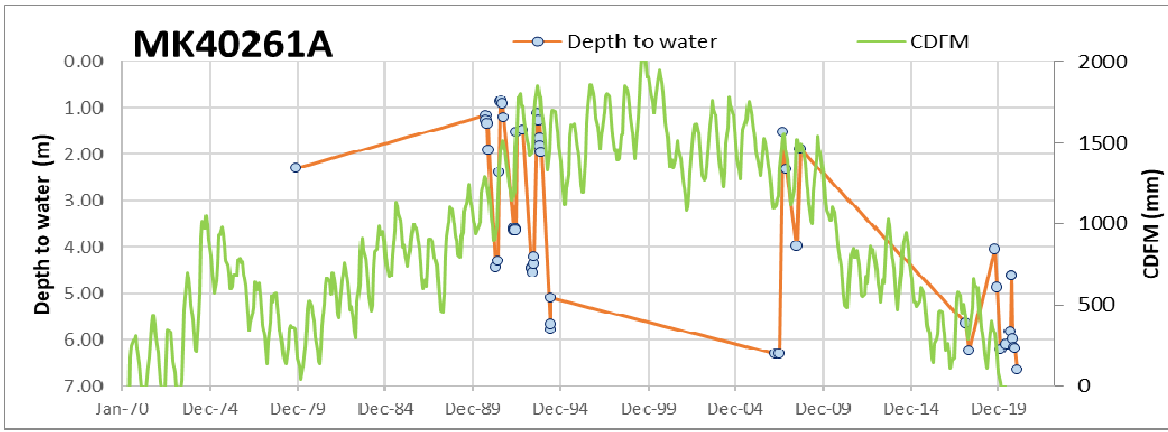


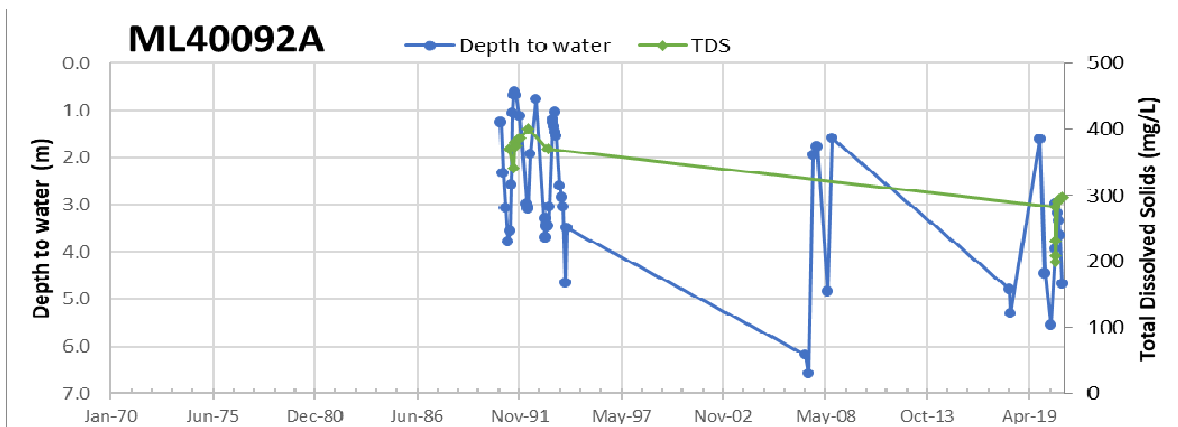
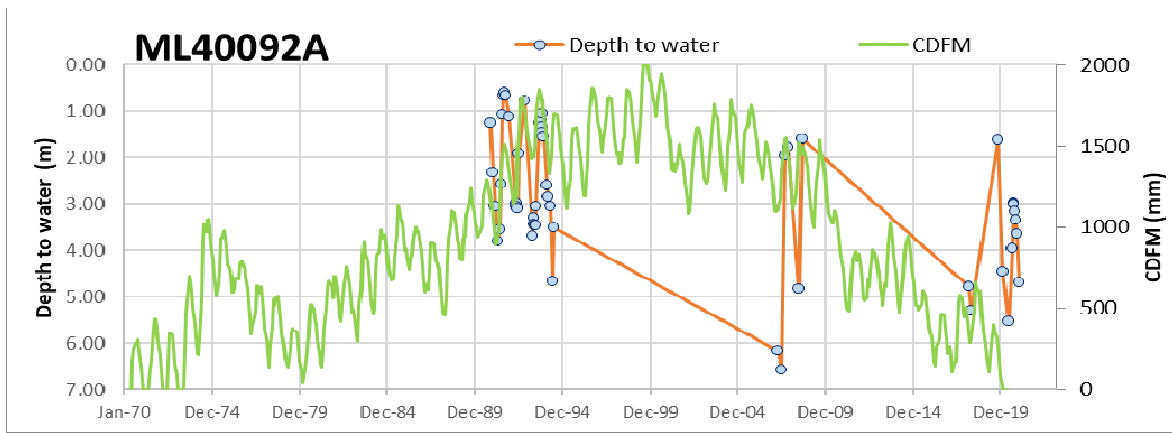
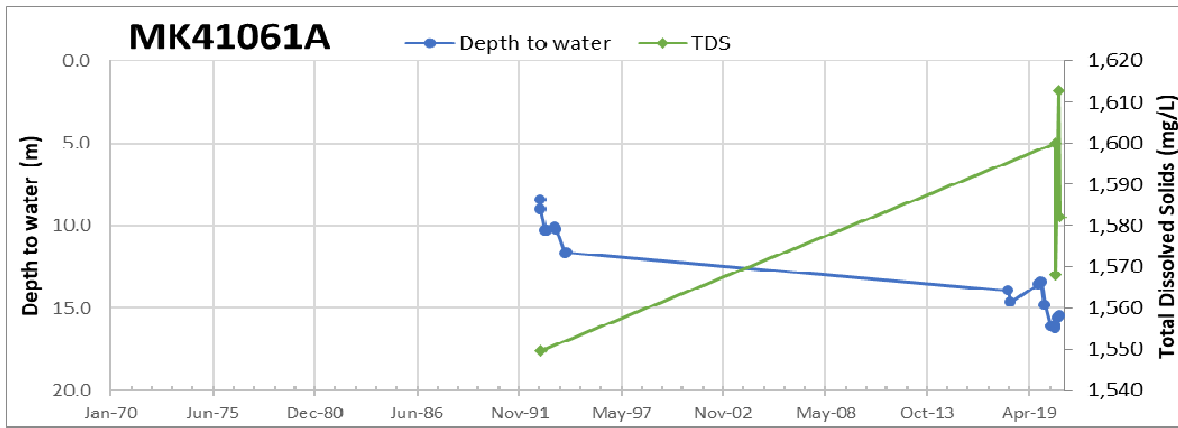
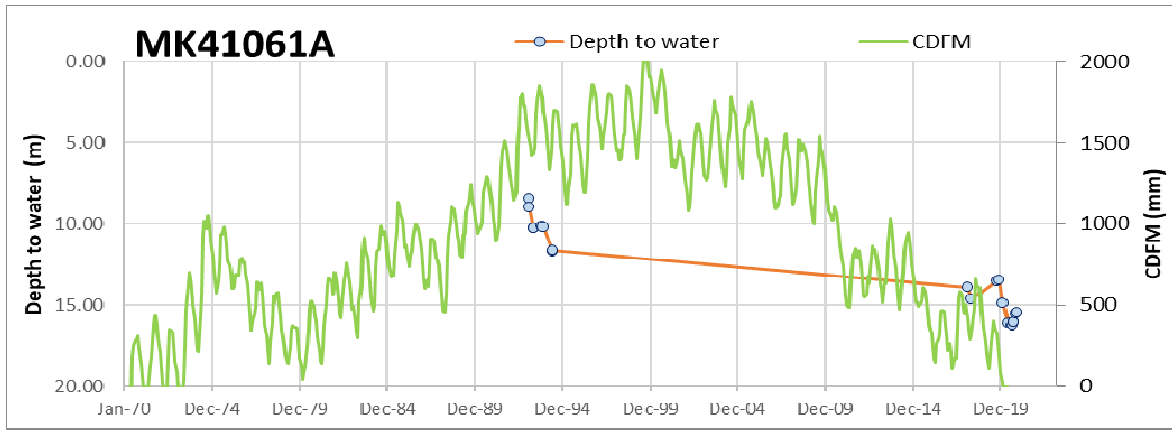


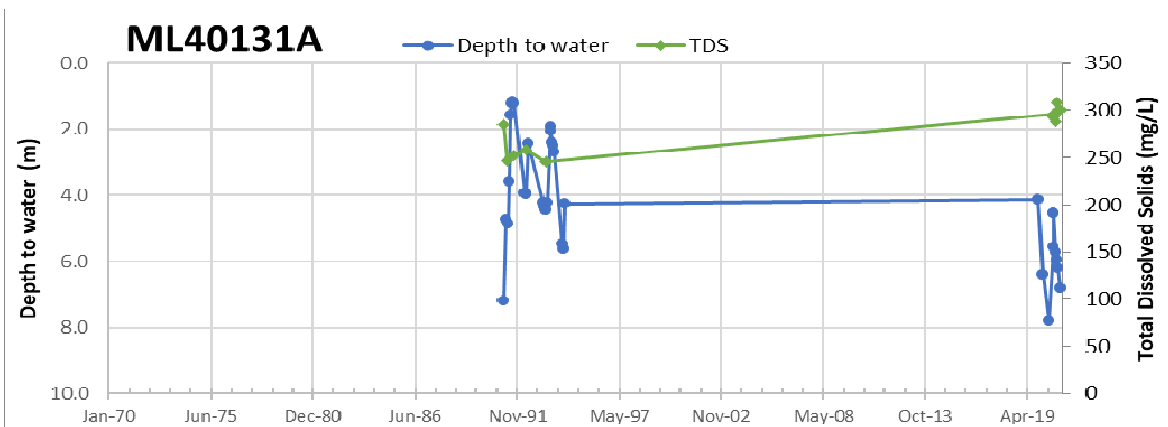
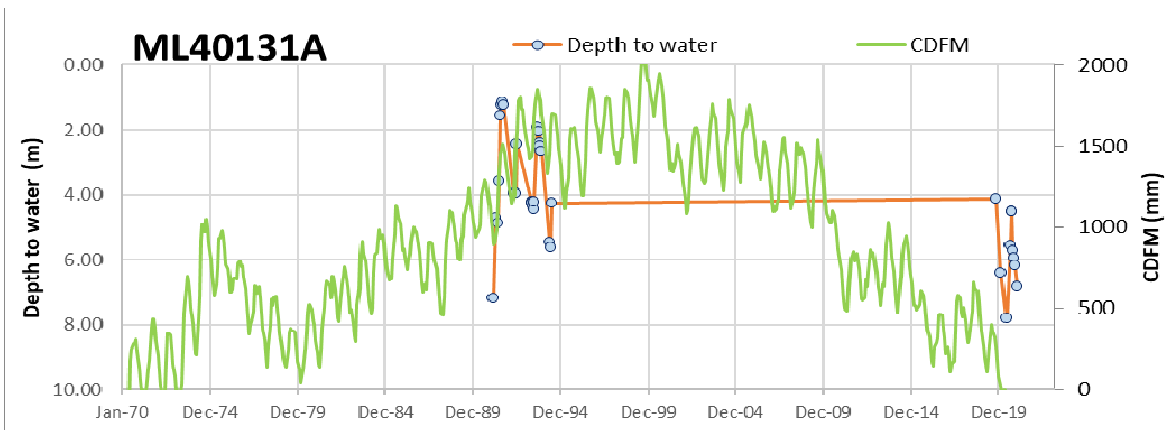
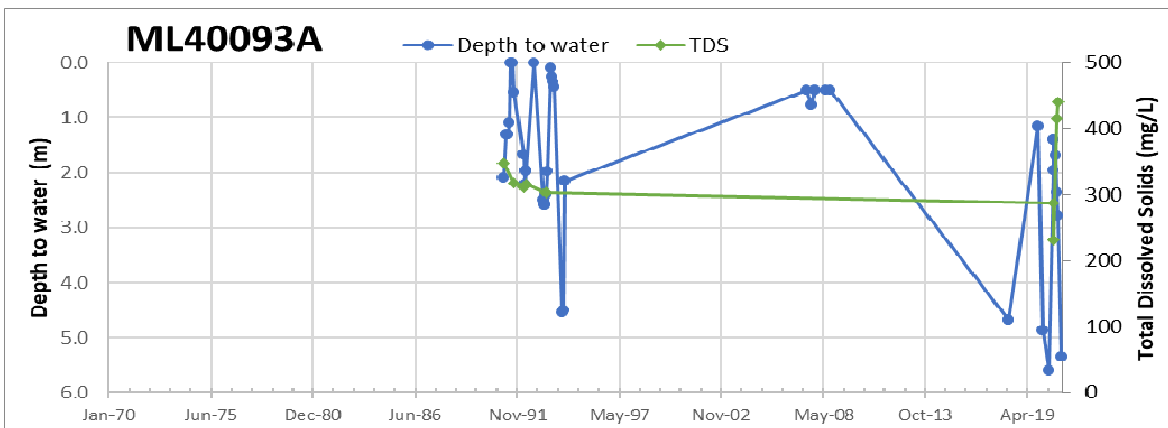
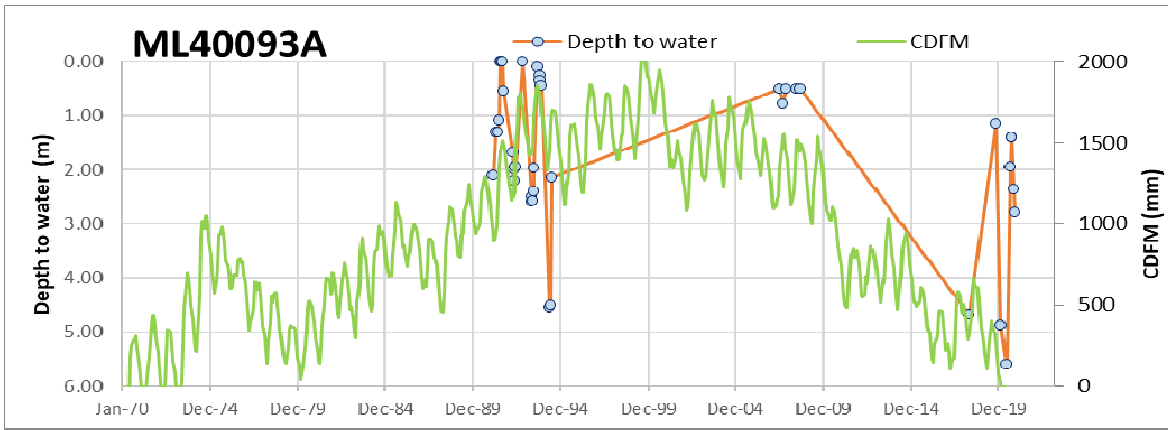


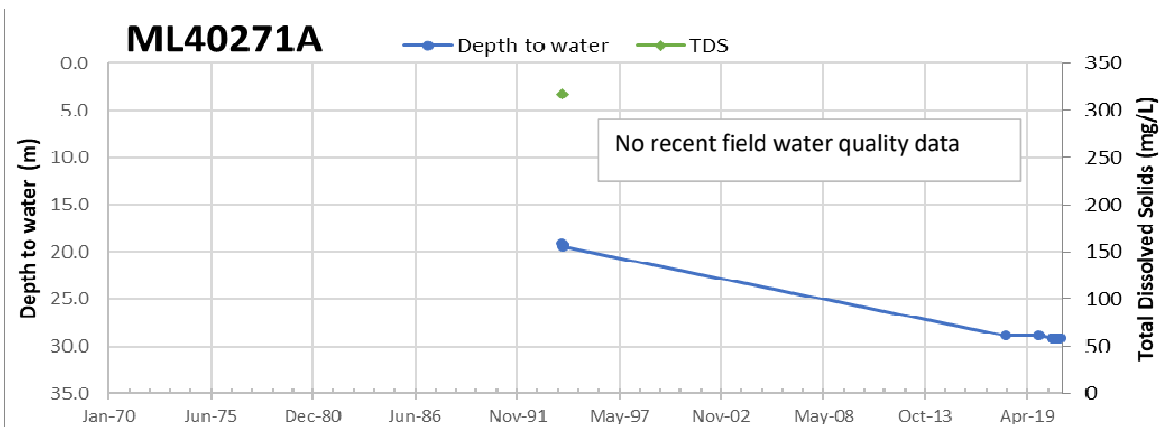
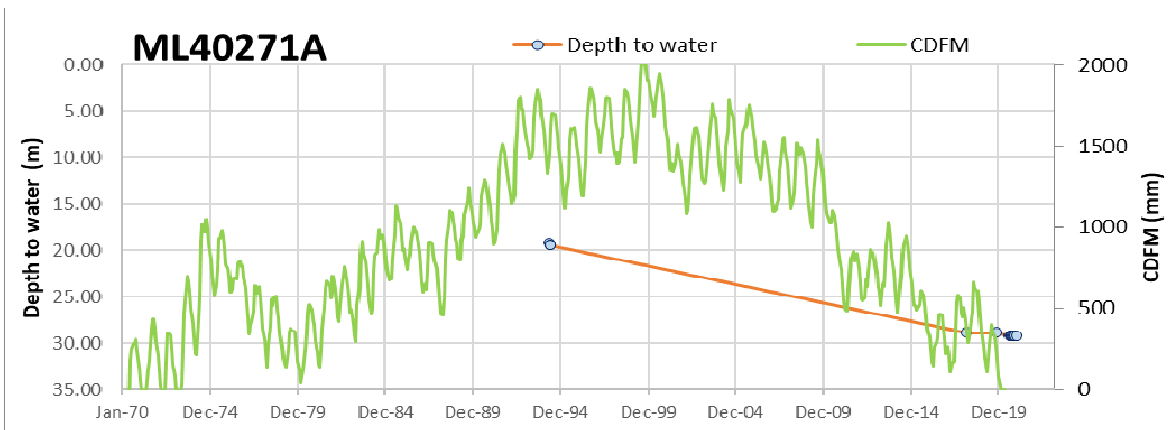
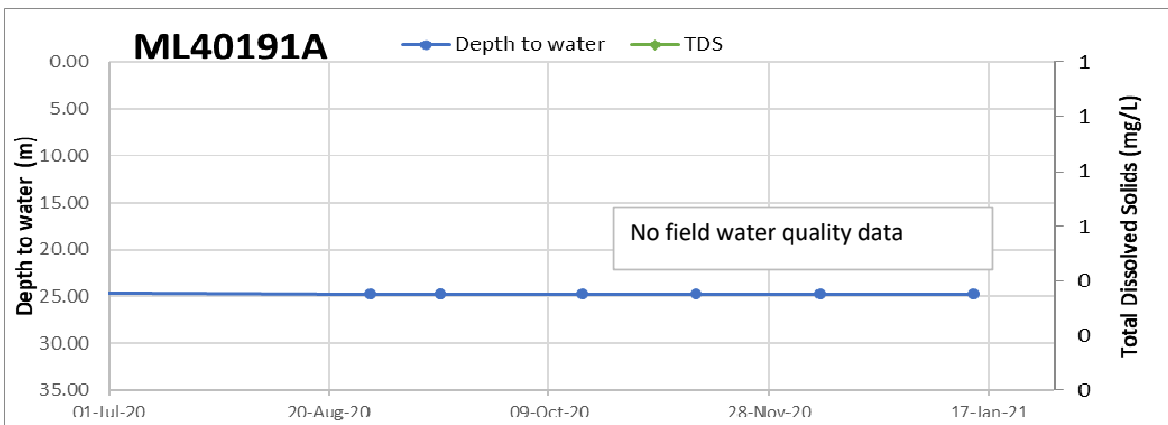
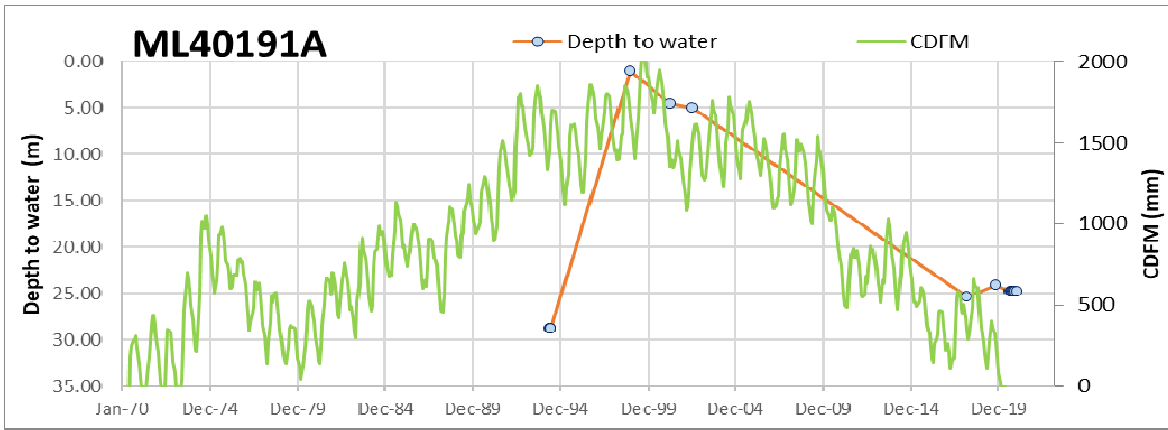


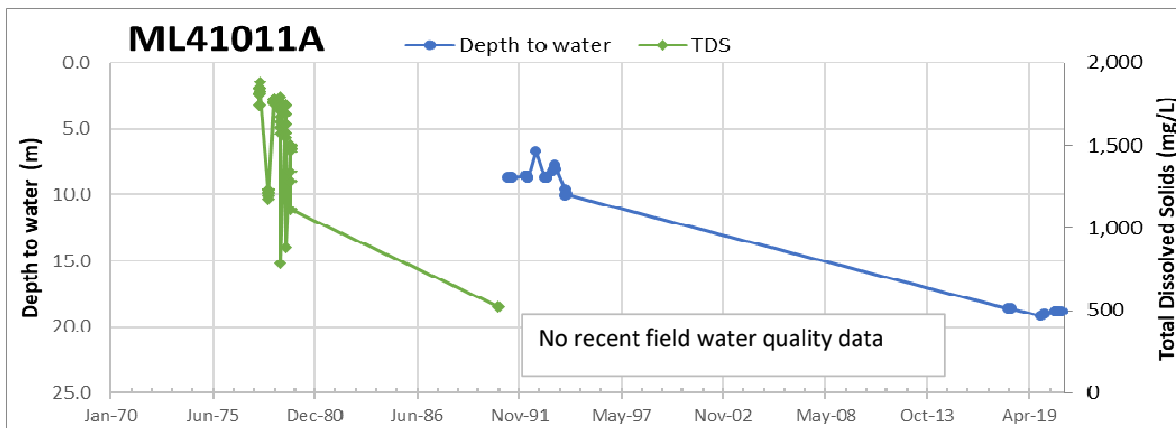
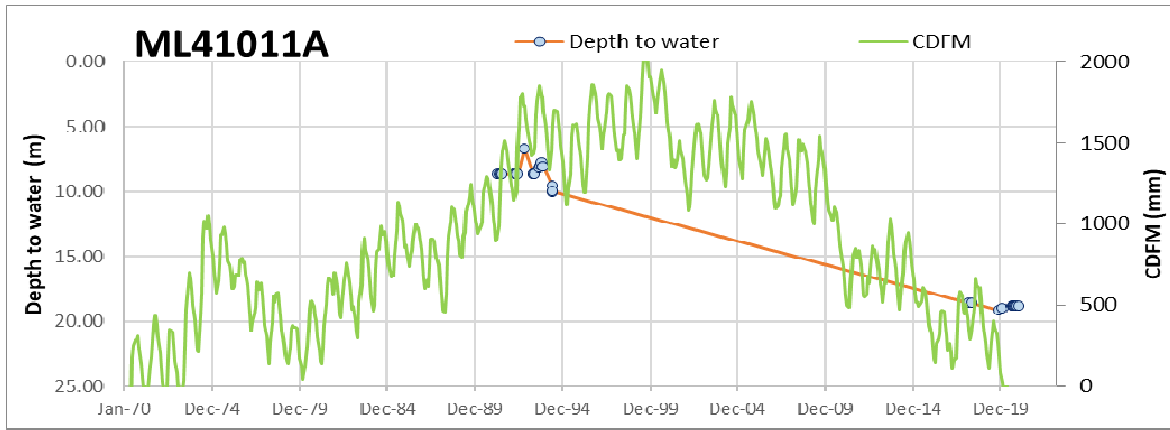


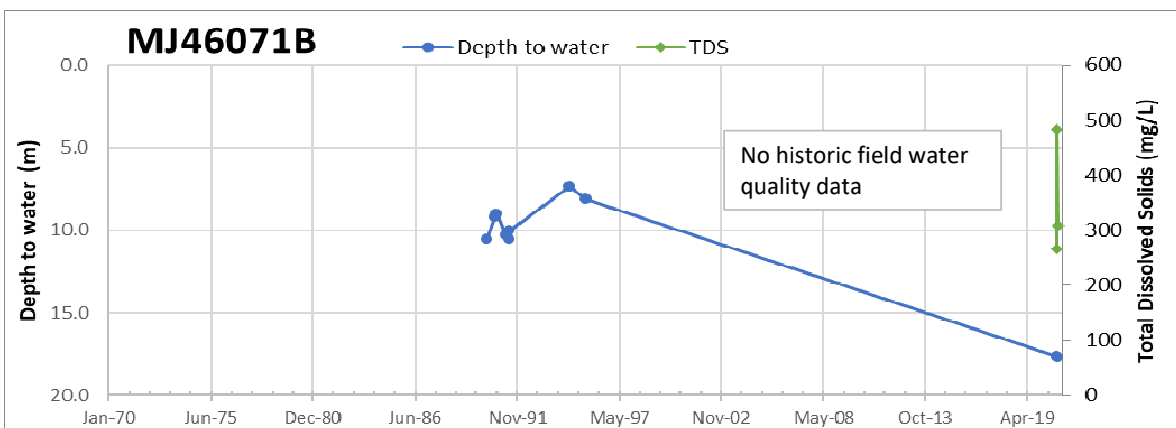
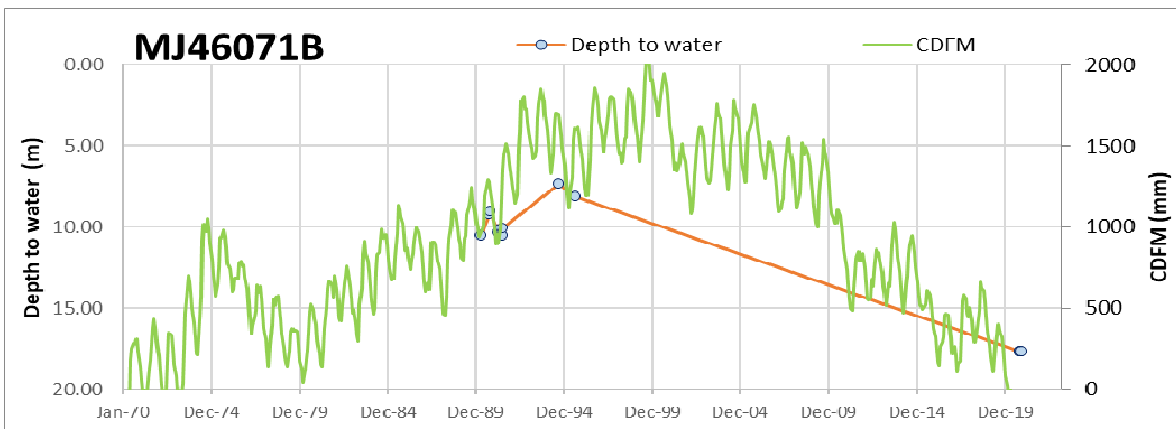
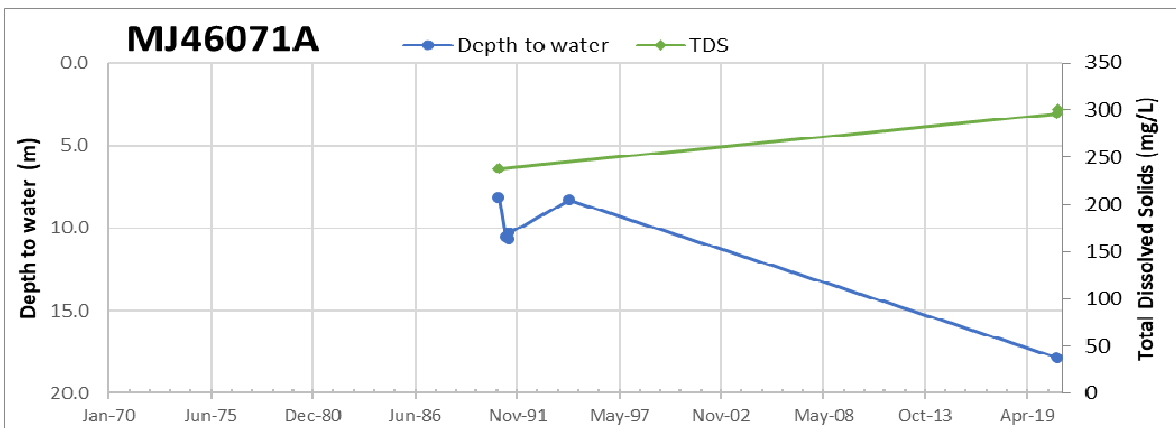
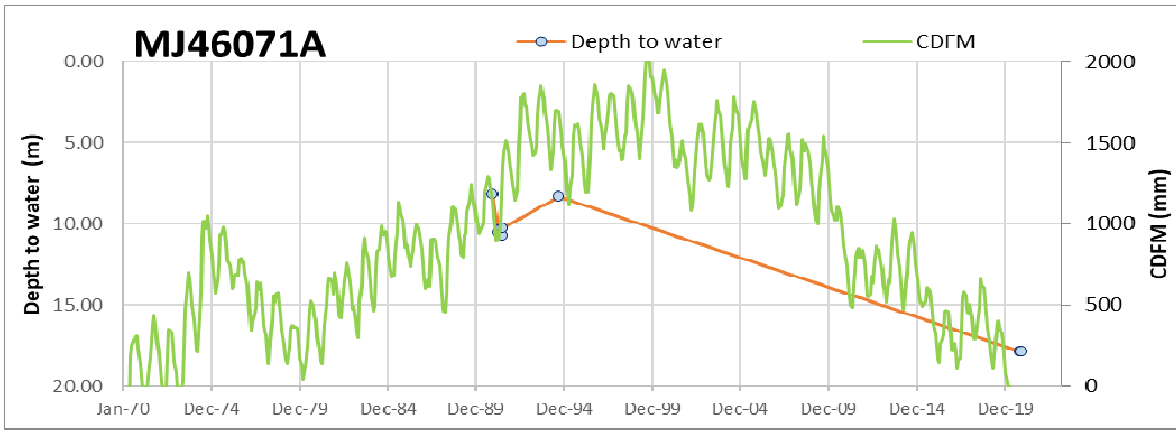


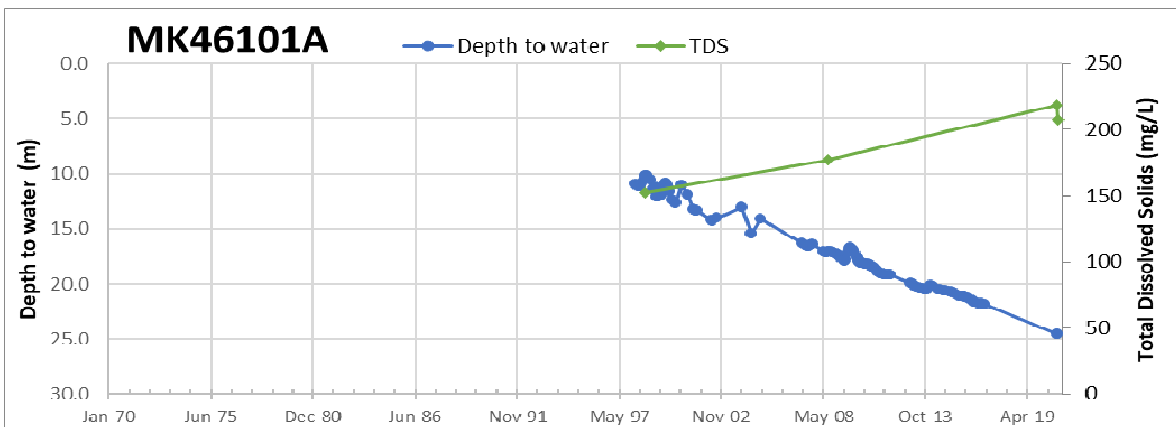
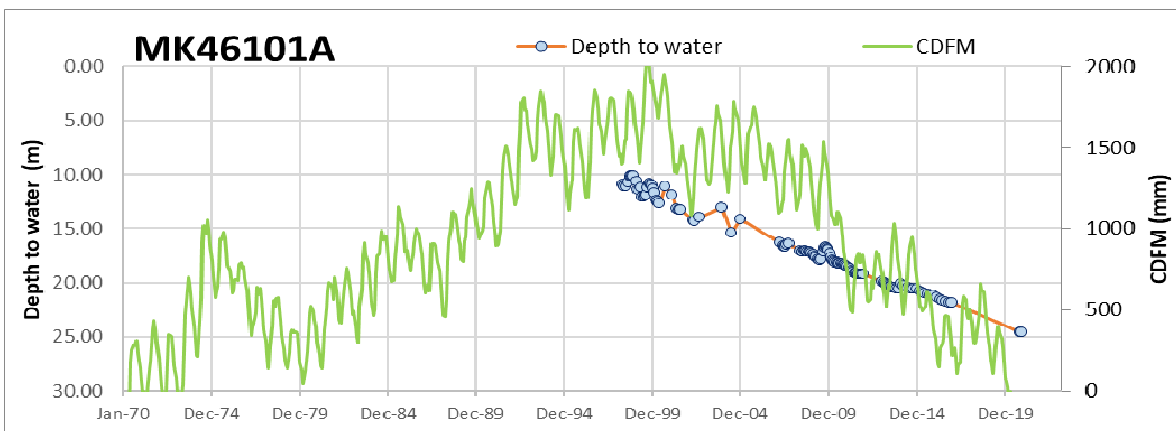
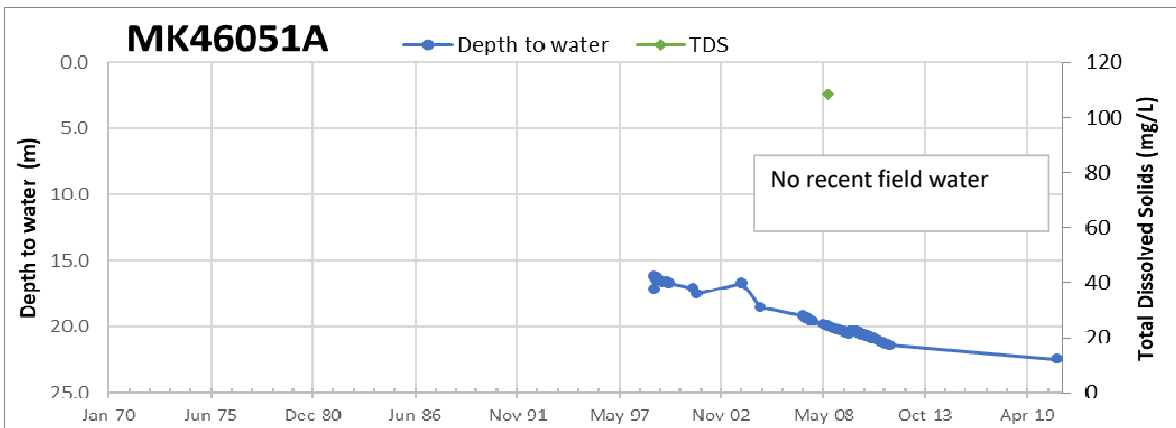
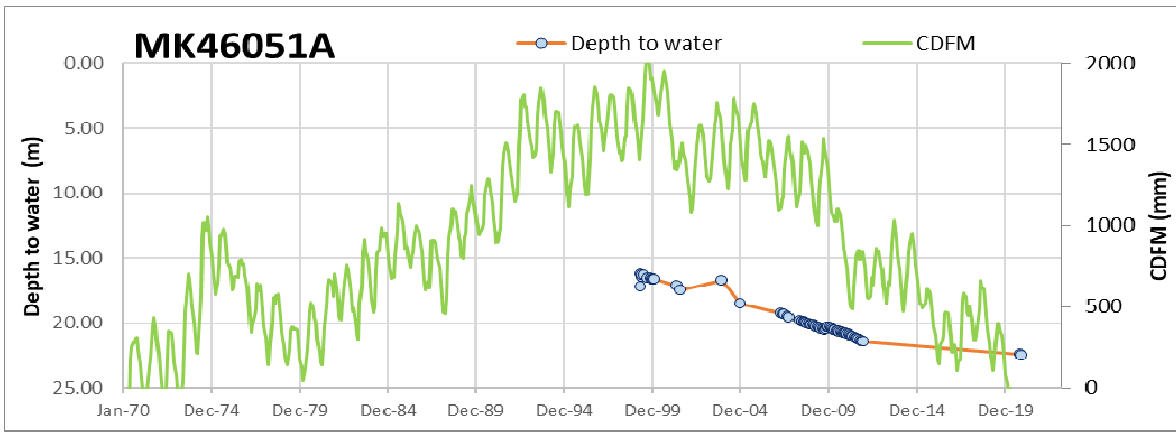


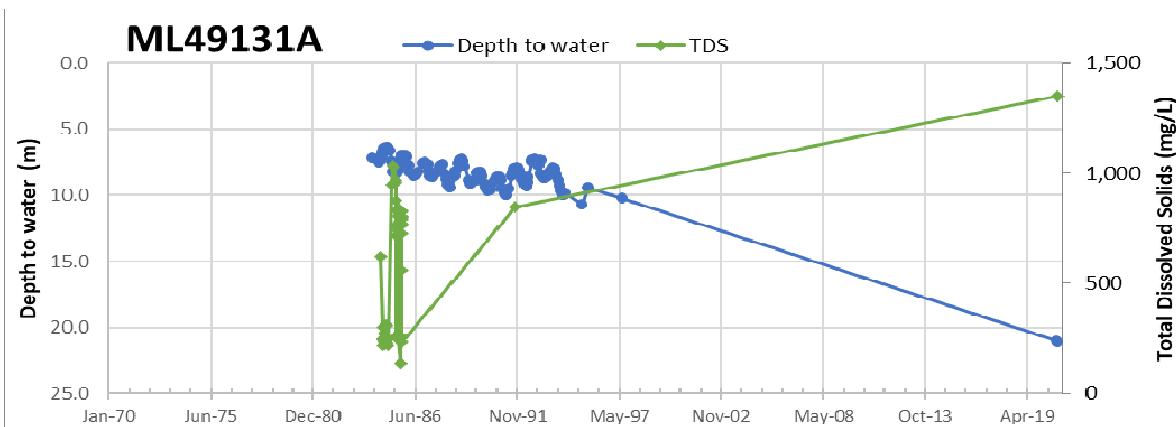
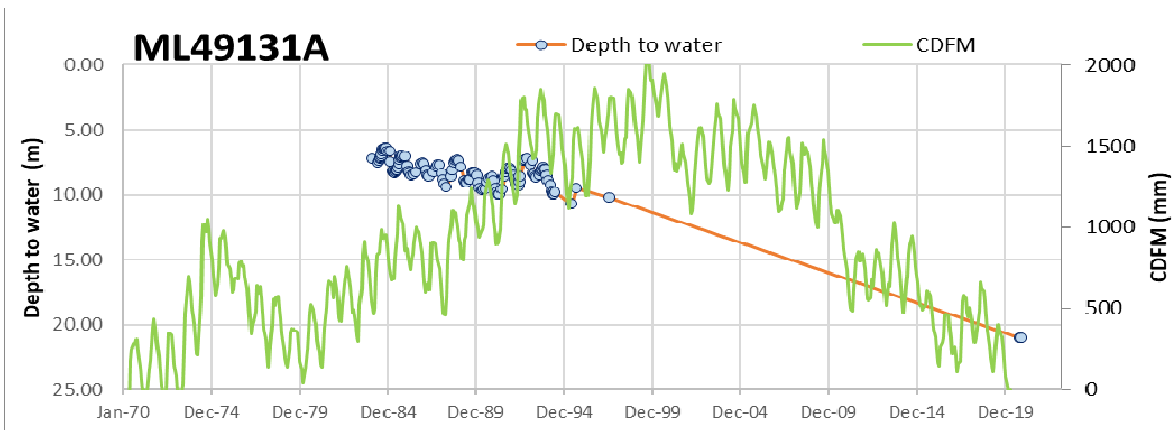
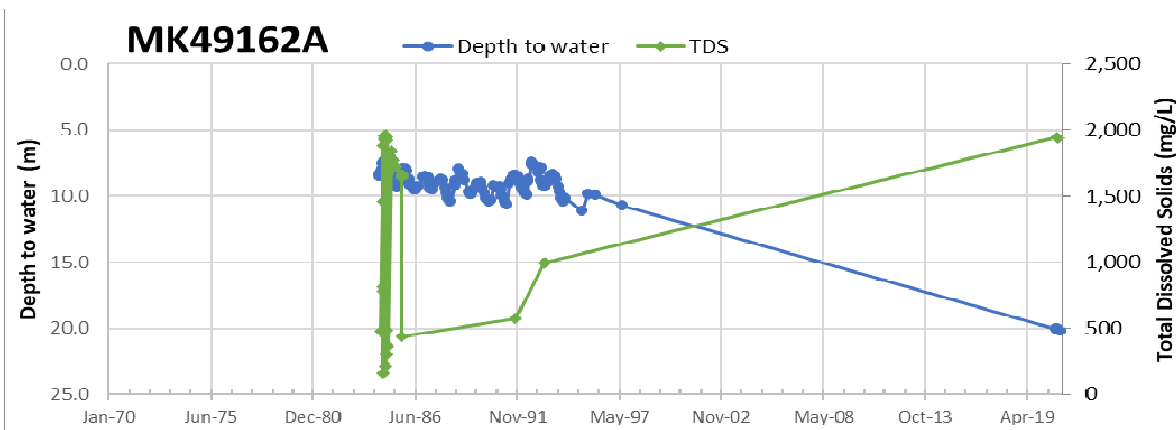
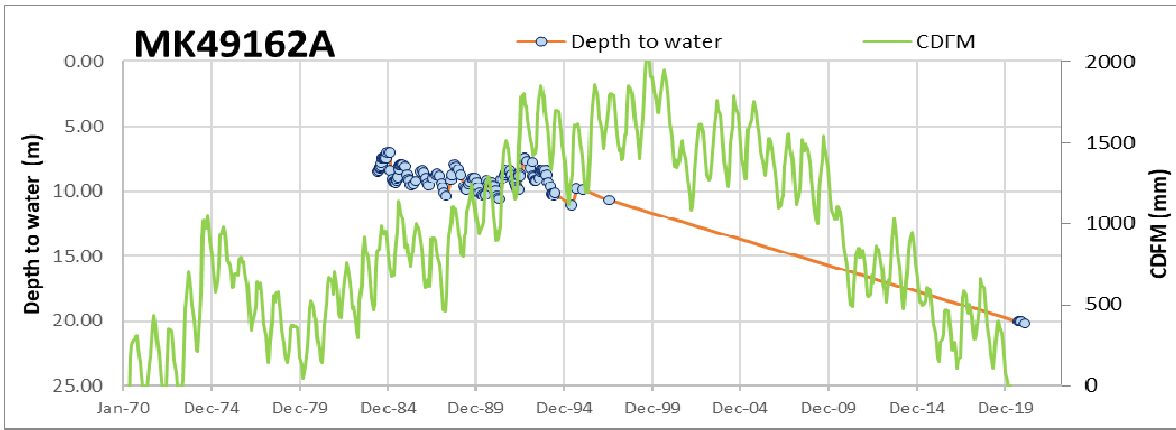












Appendix K

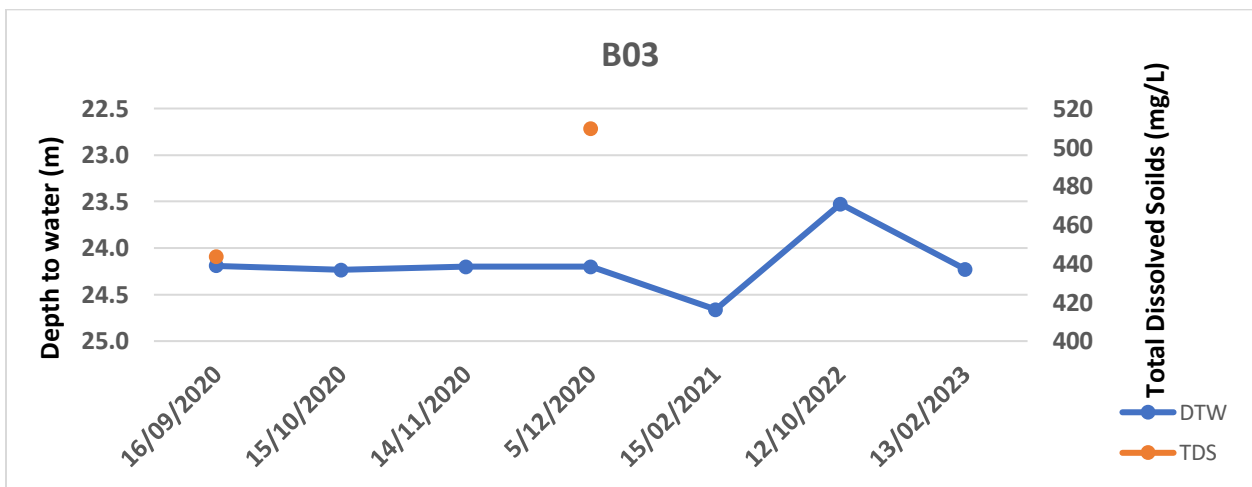
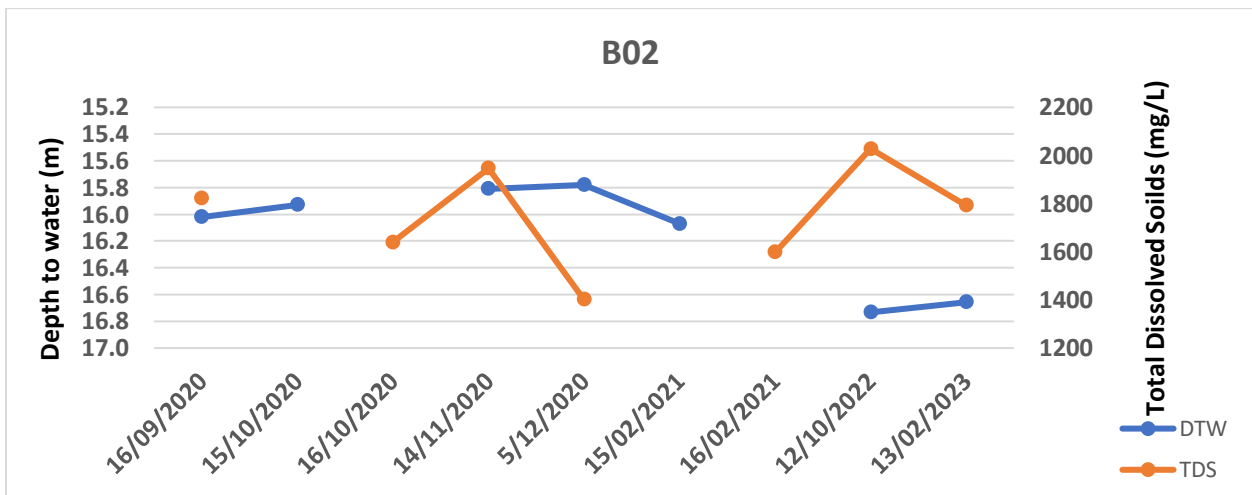
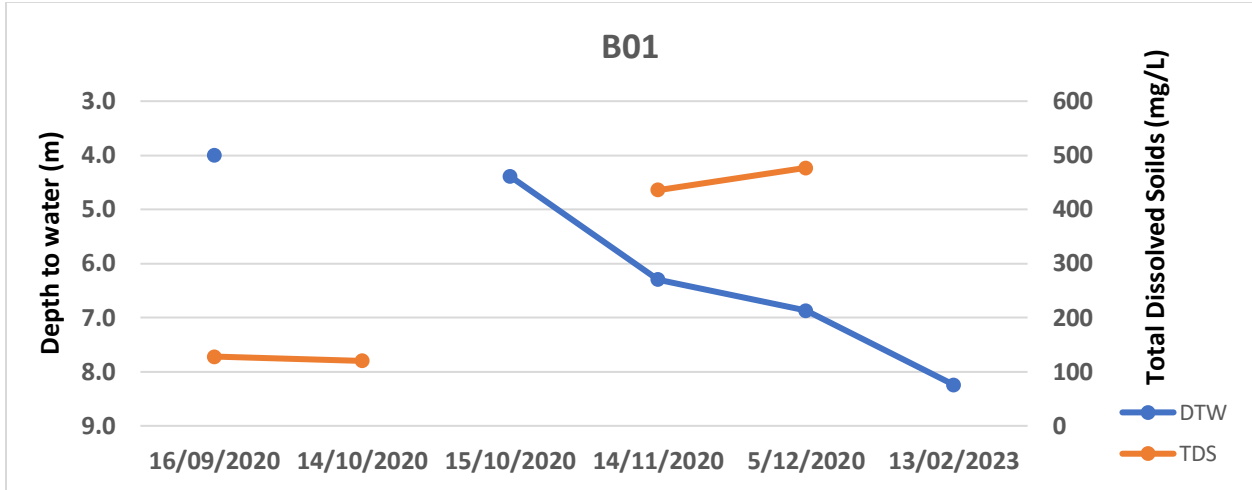
Groundwater data graphs – New sites

Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

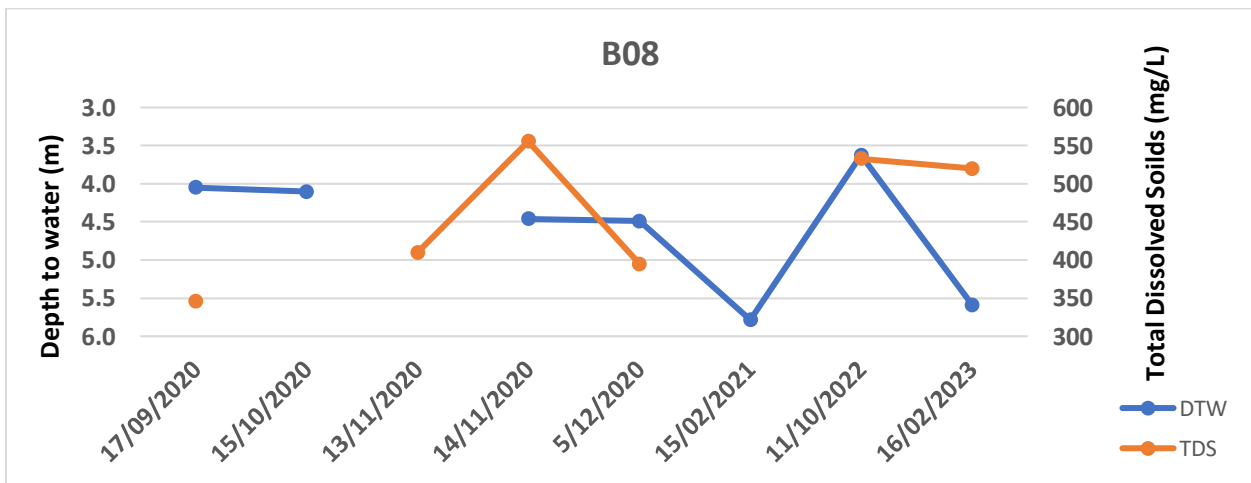
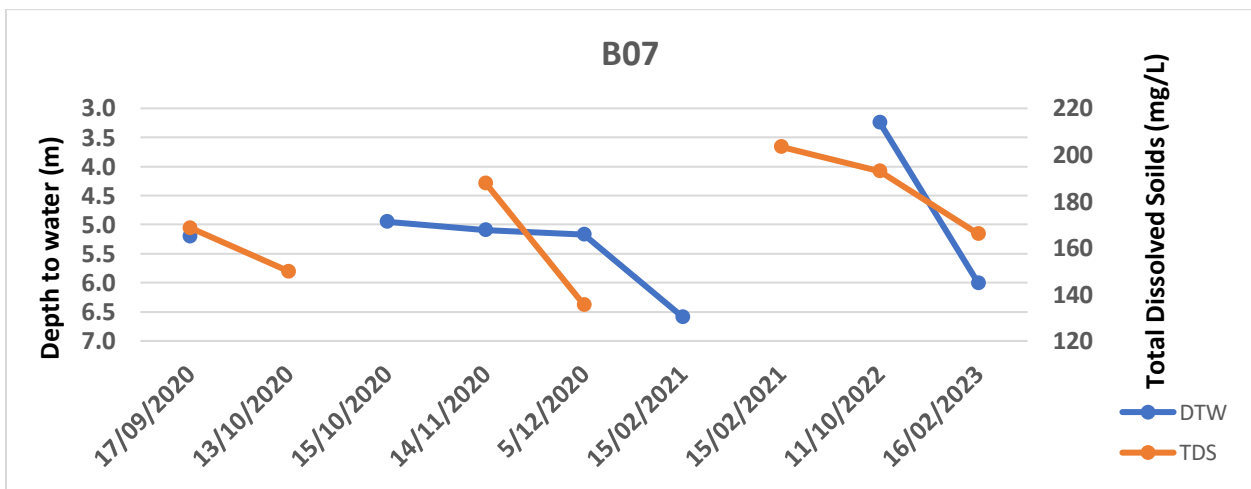
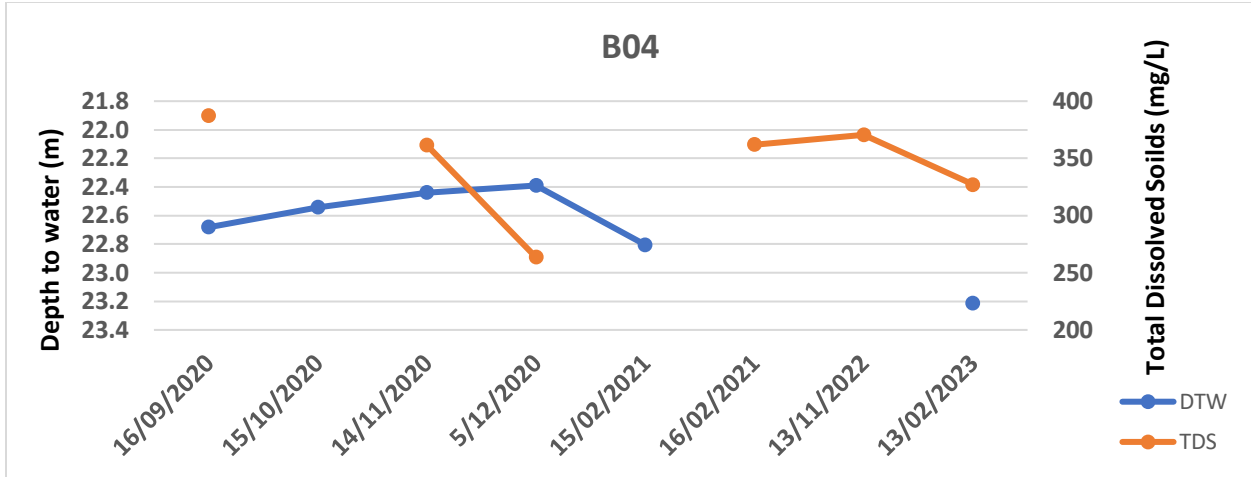
North Myara



Baseline Surface Water and Groundwater Quality Report (12520591)

North Myara

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Myara North and Holyoake - New Monitoring Bores

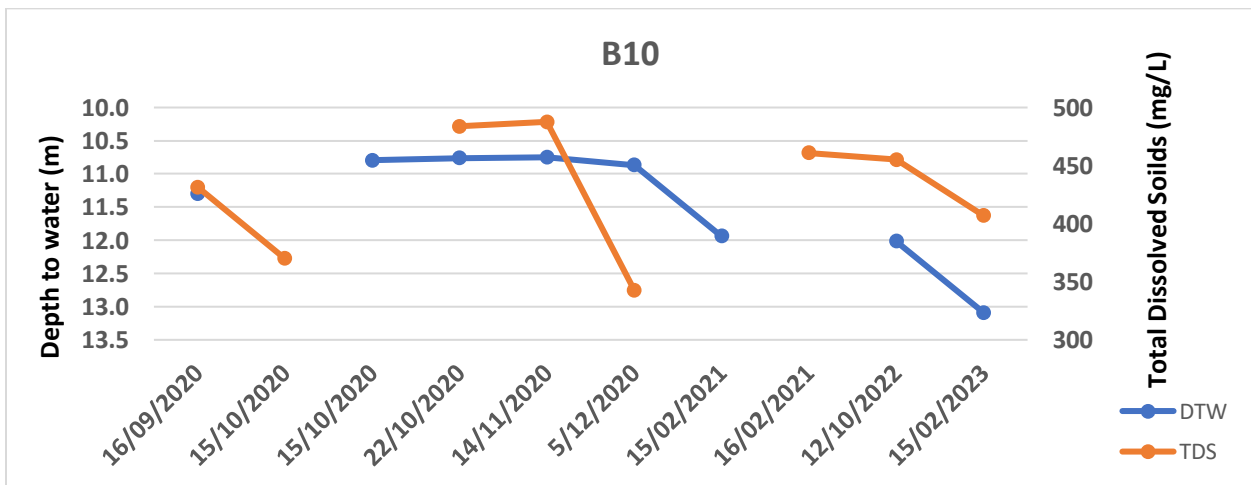
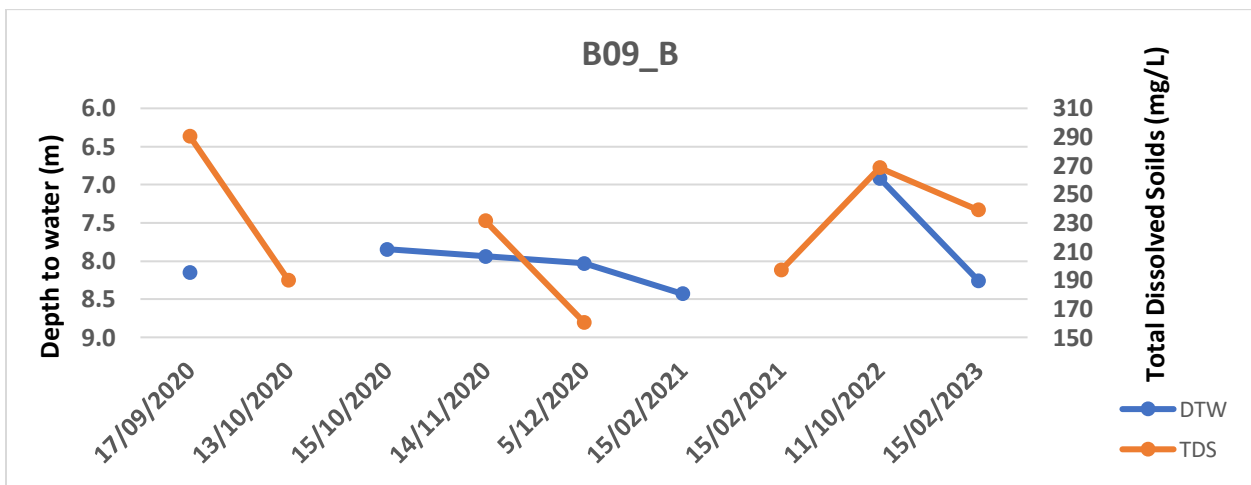
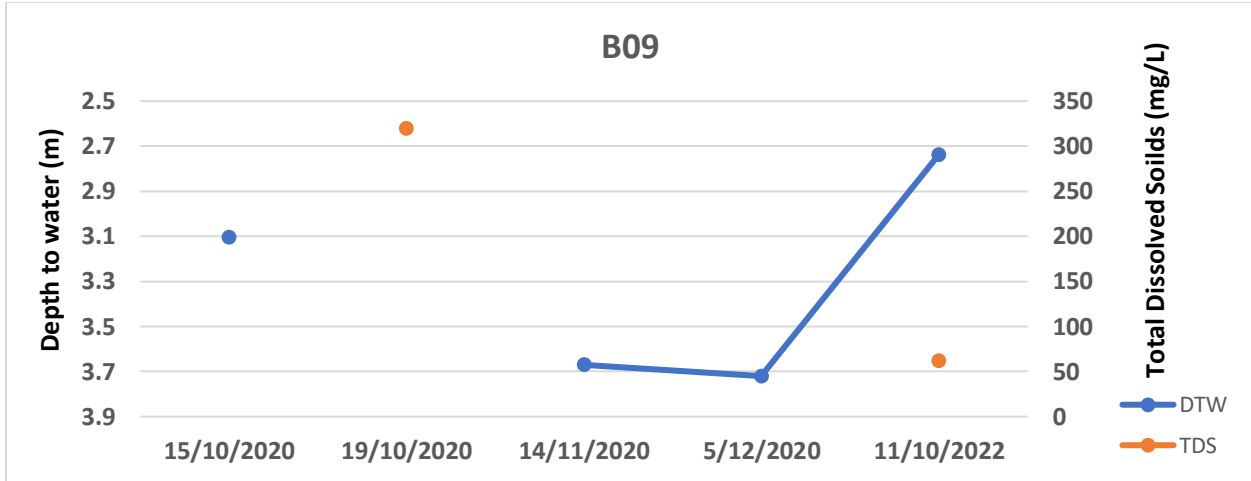


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

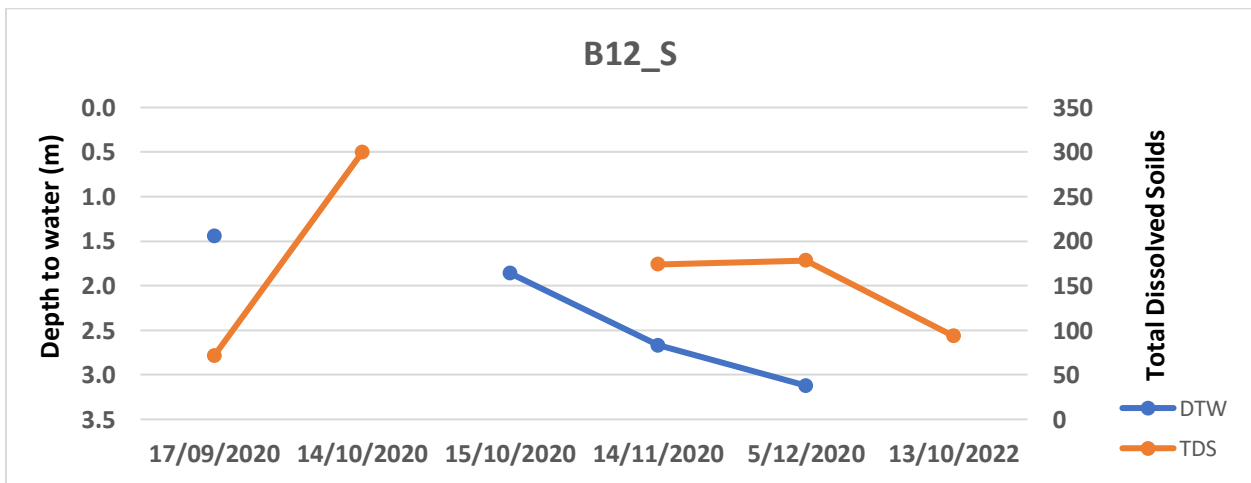
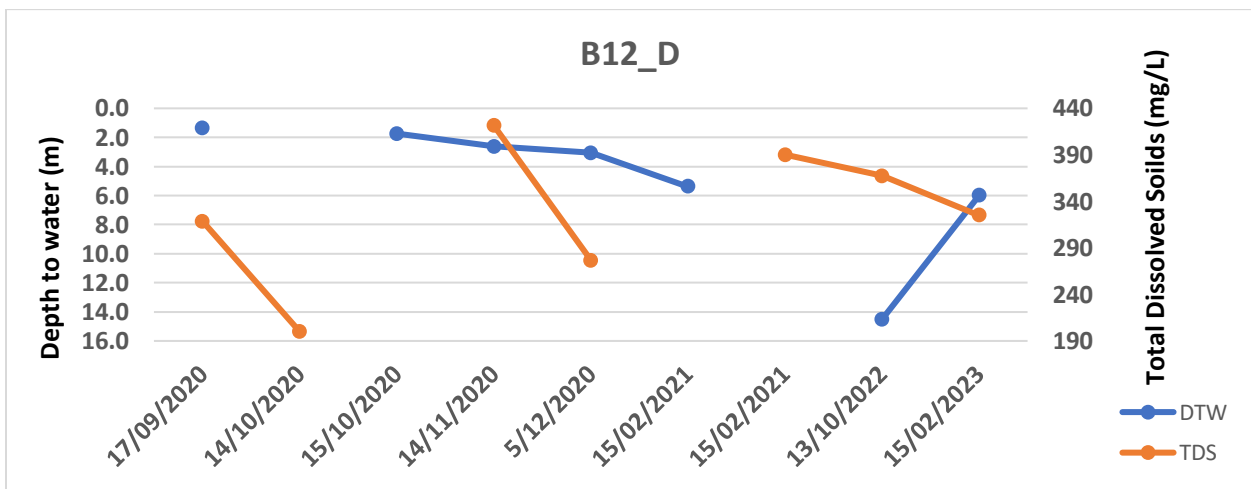
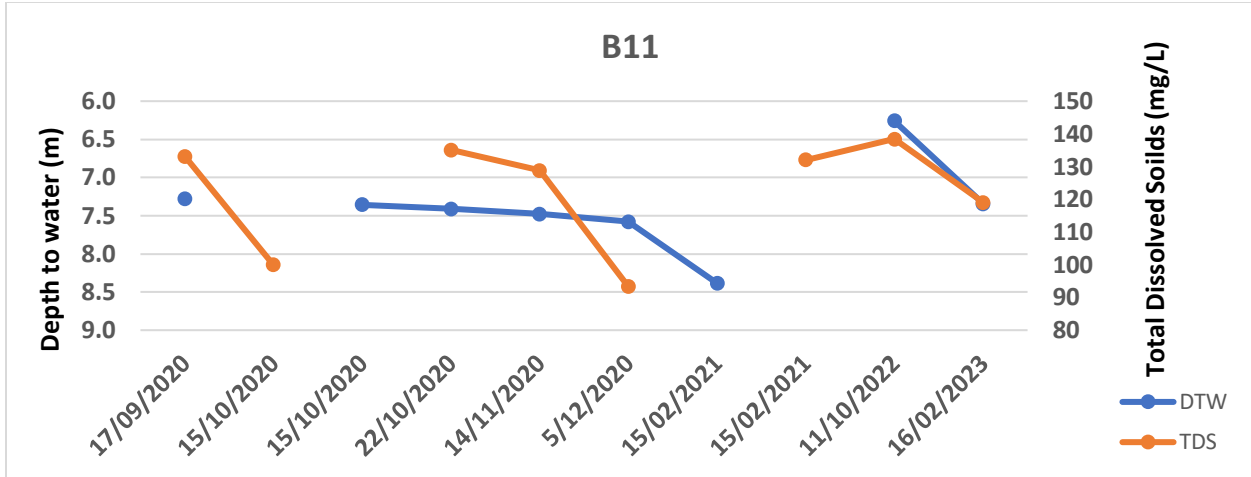
North Myara



Baseline Surface Water and Groundwater Quality Report (12520591)

North Myara

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Myara North and Holyoake - New Monitoring Bores

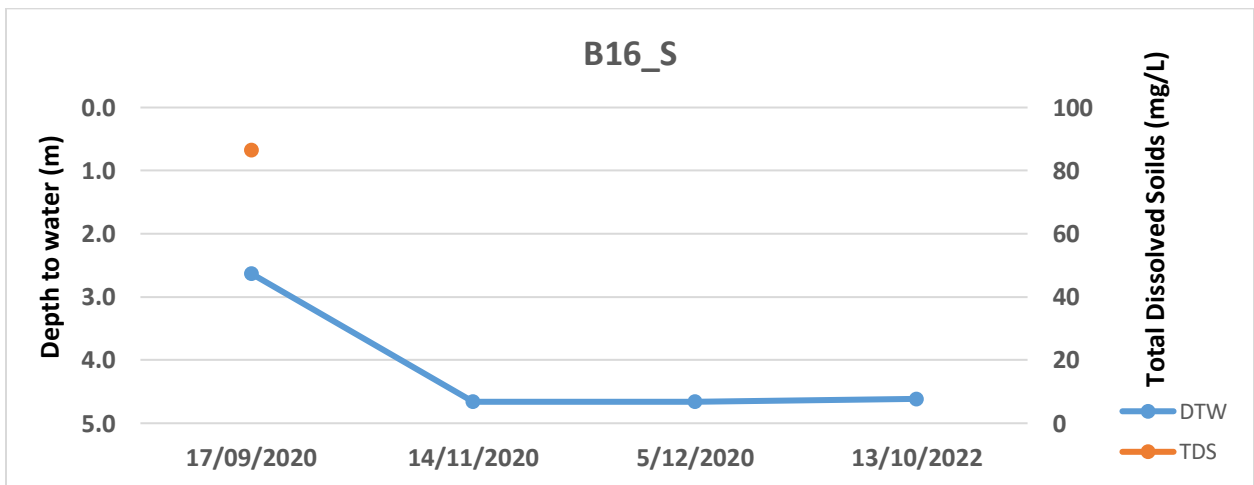
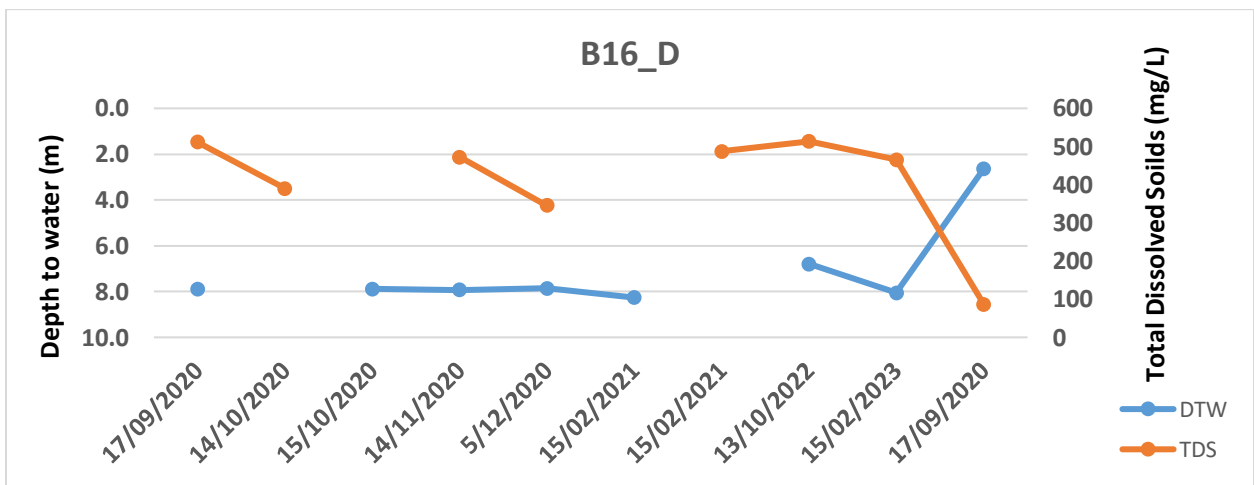
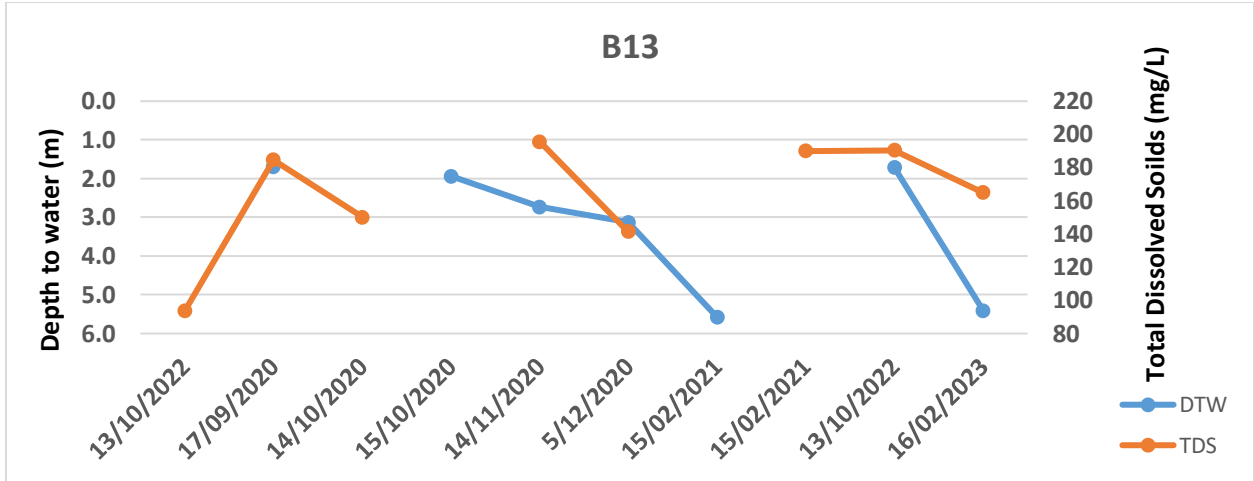


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

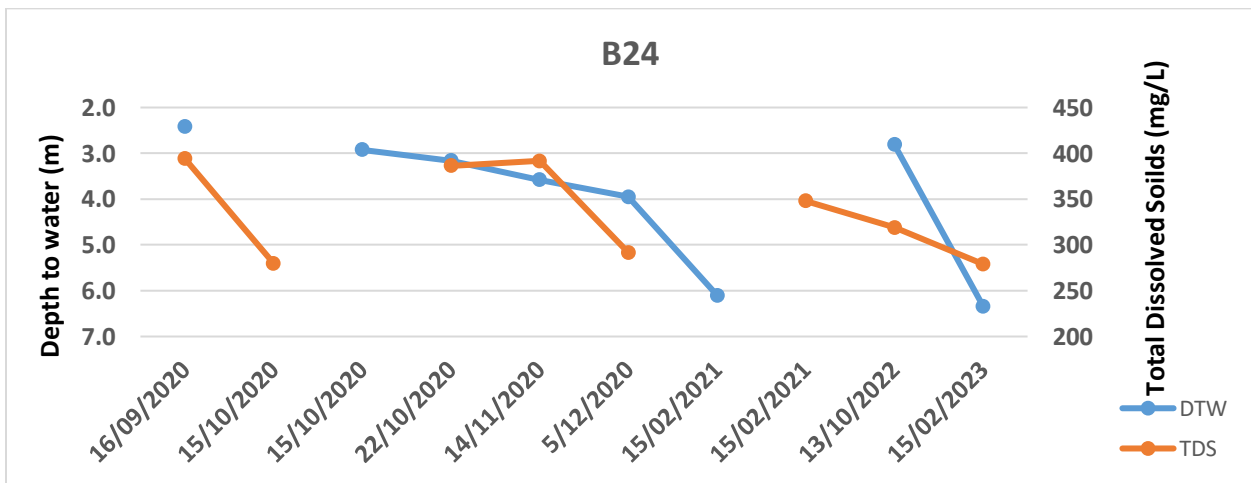
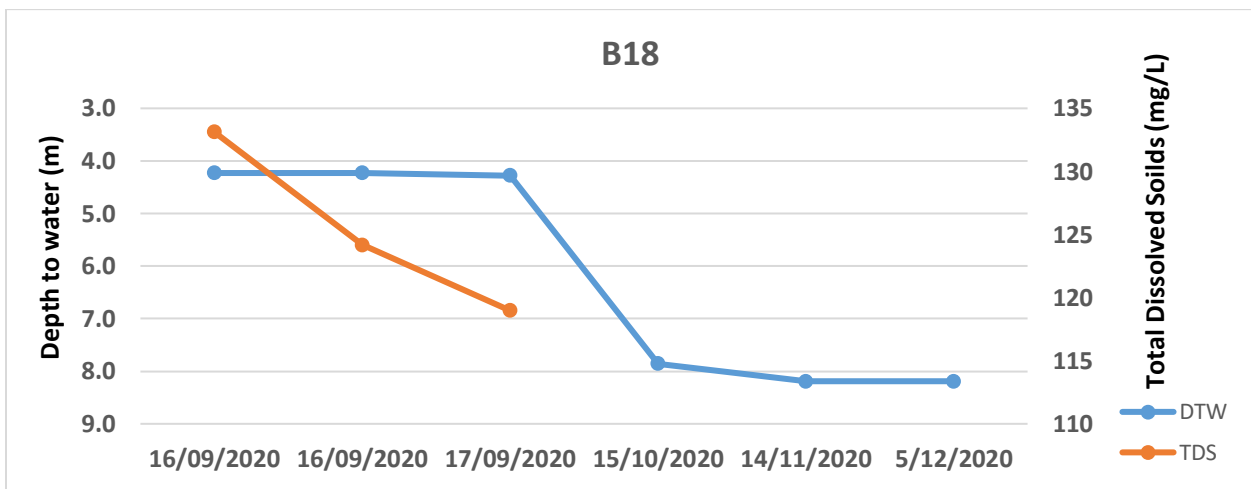
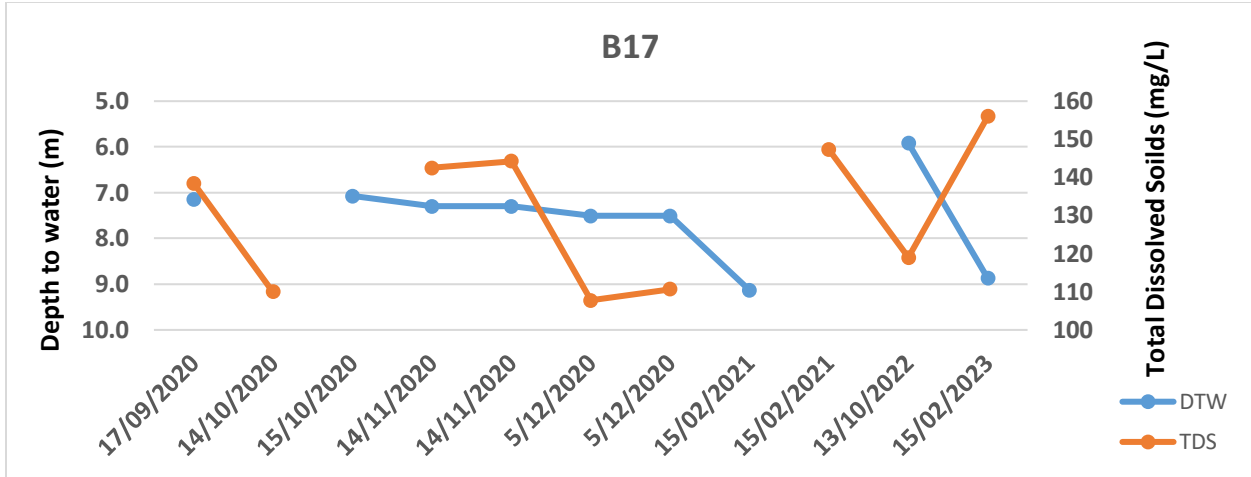
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Baseline Surface Water and Groundwater Quality Report (12520591)

North Myara

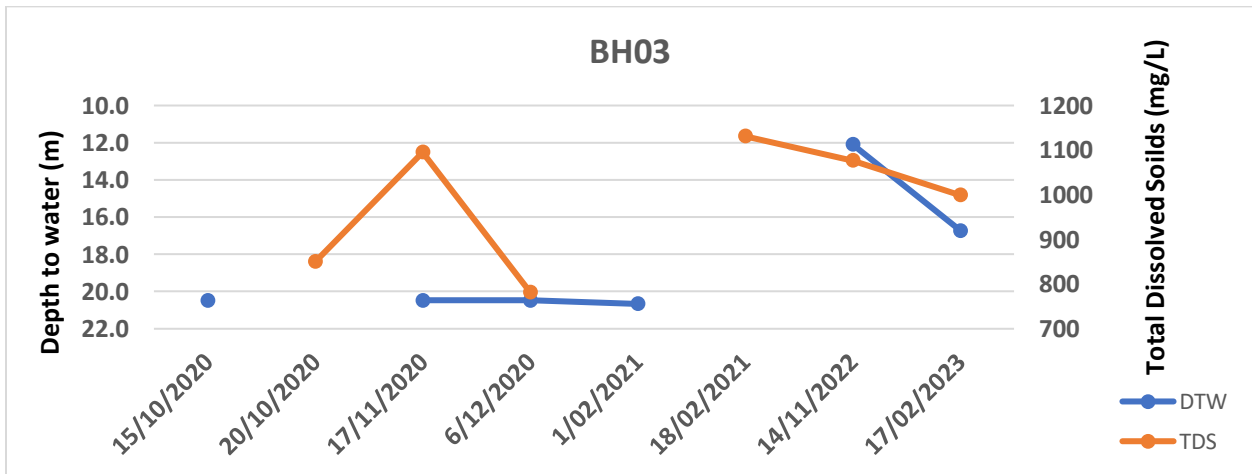
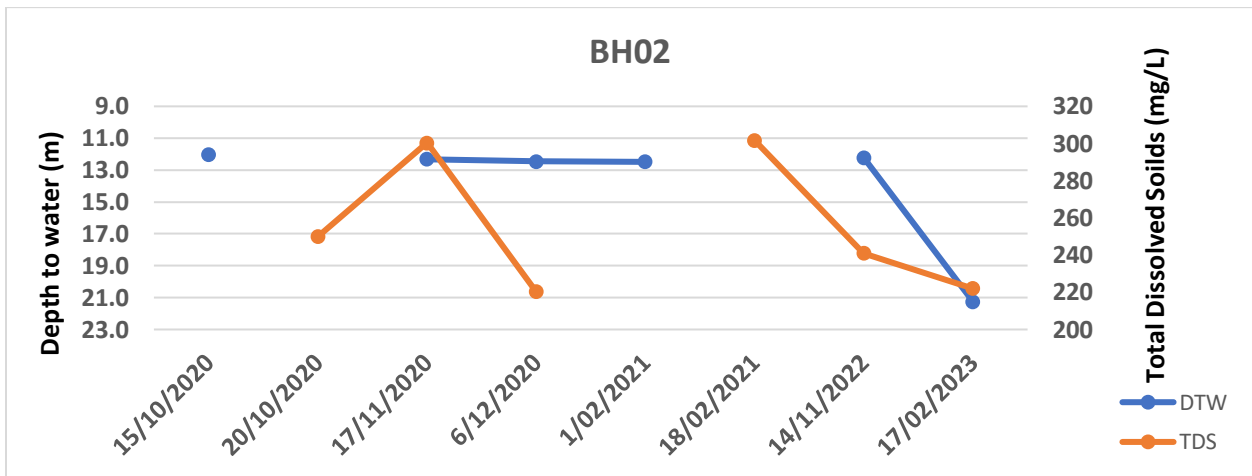
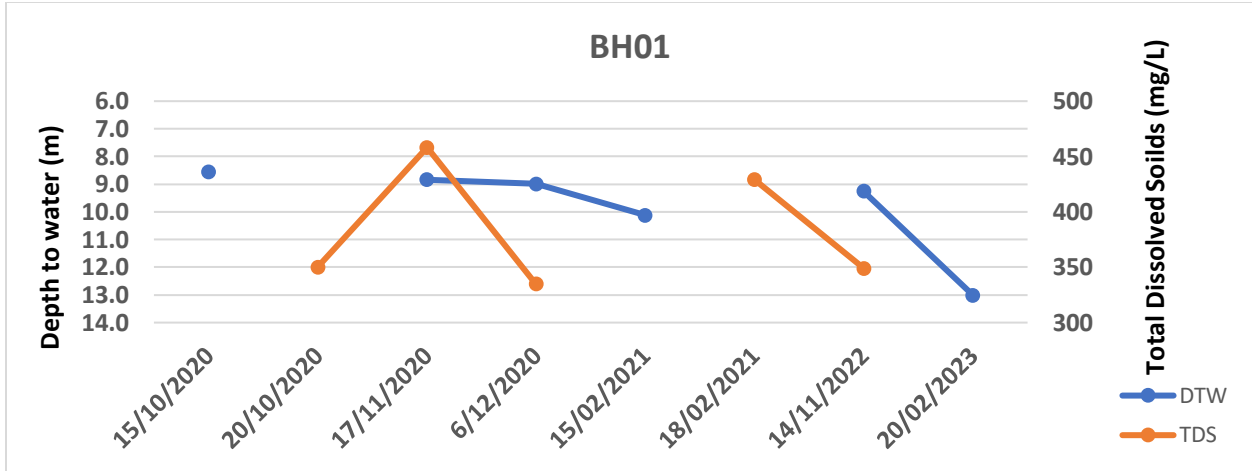
Groundwater Monitoring Data:
Myara North and Holyoake - New Monitoring Bores



Baseline Surface Water and Groundwater Quality Report (12520591)

Holyoak

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Myara North and Holyoake - New Monitoring Bores

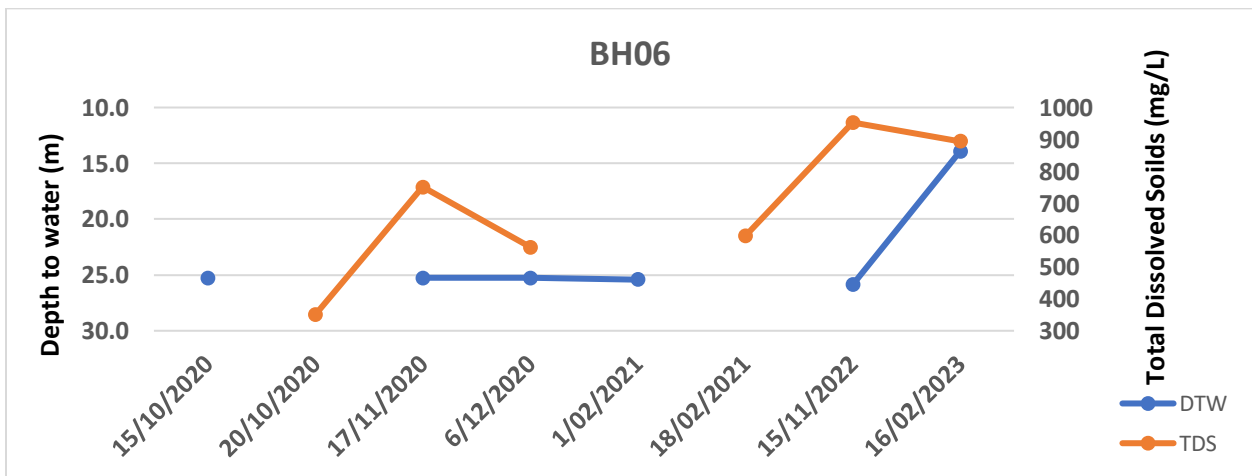
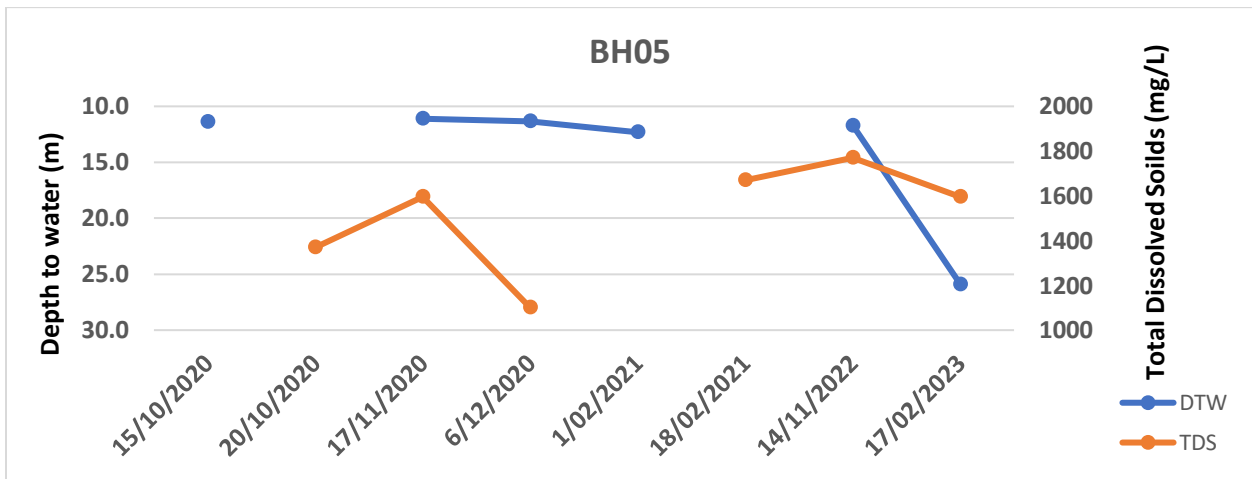
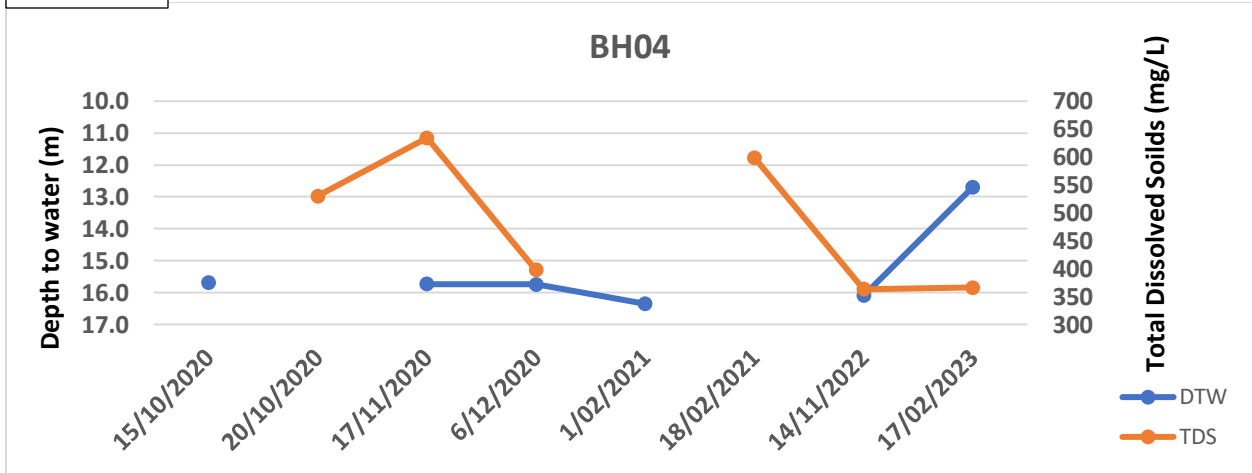


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

Holyoak

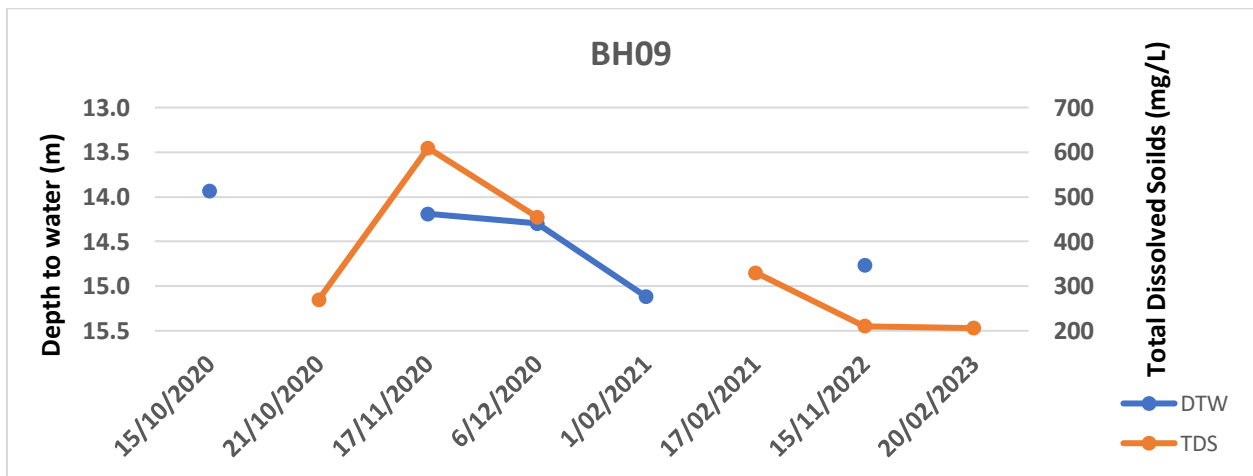
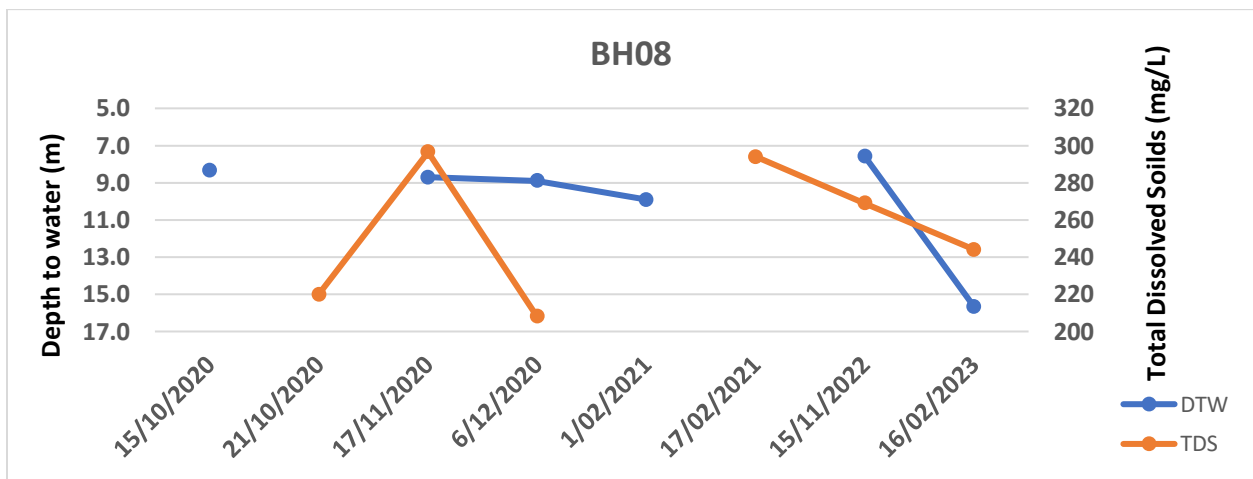
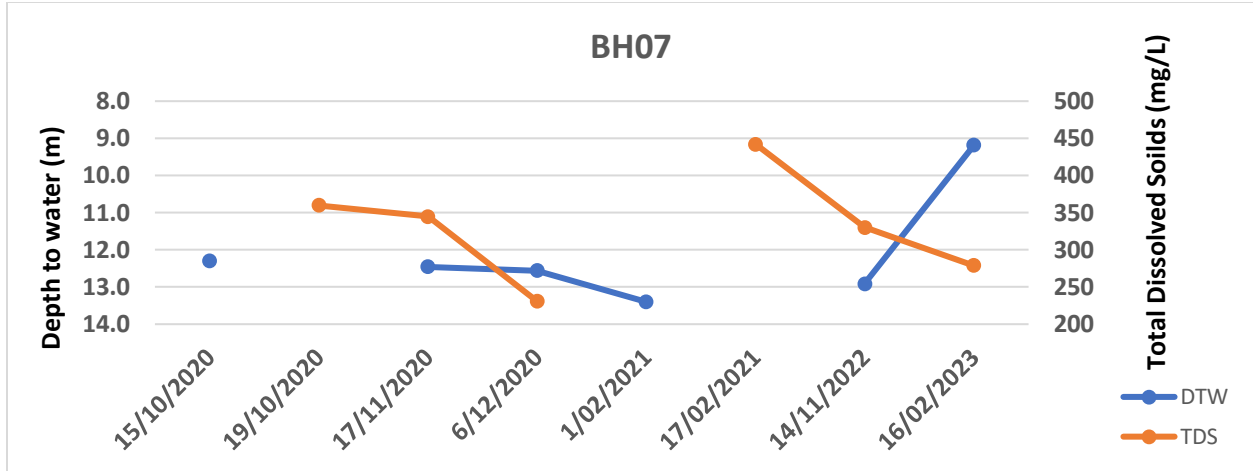


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

Holyoak

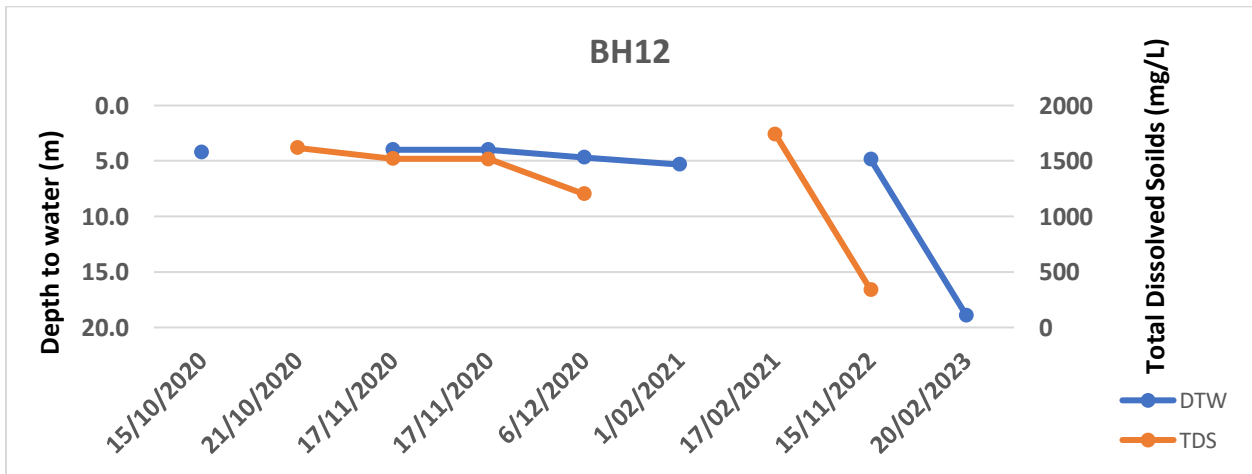
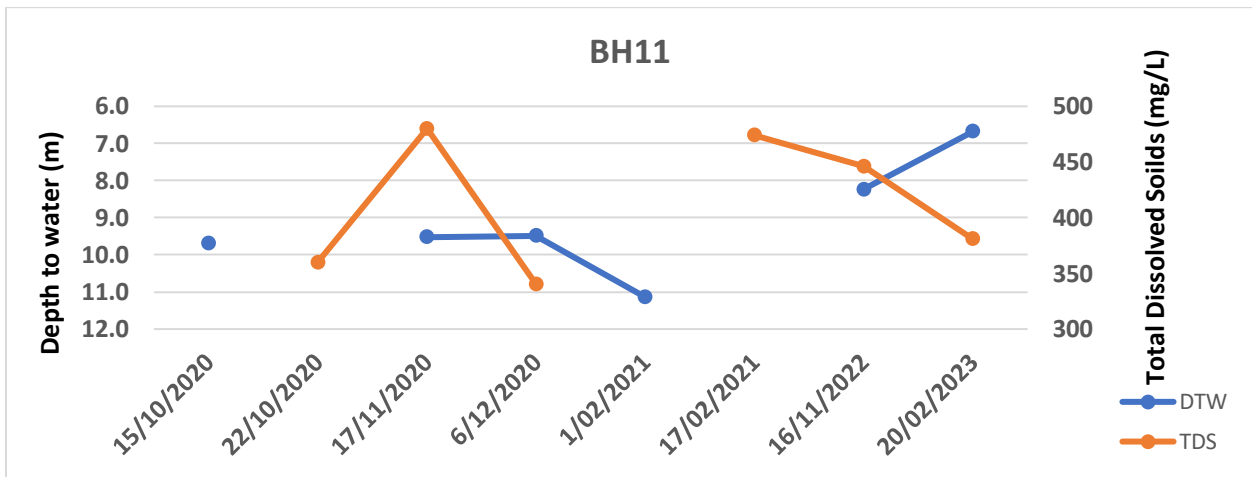
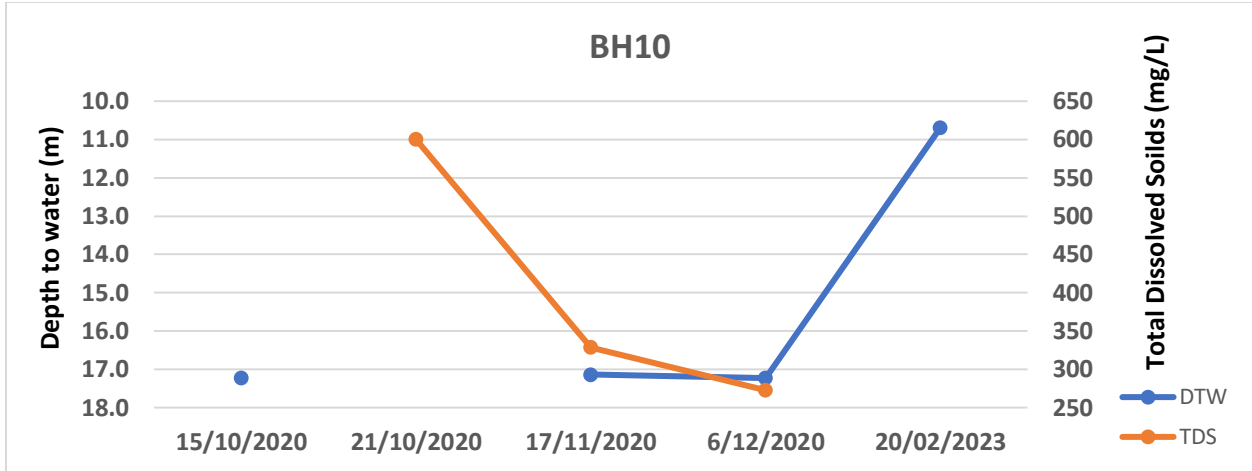


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

Holyoak

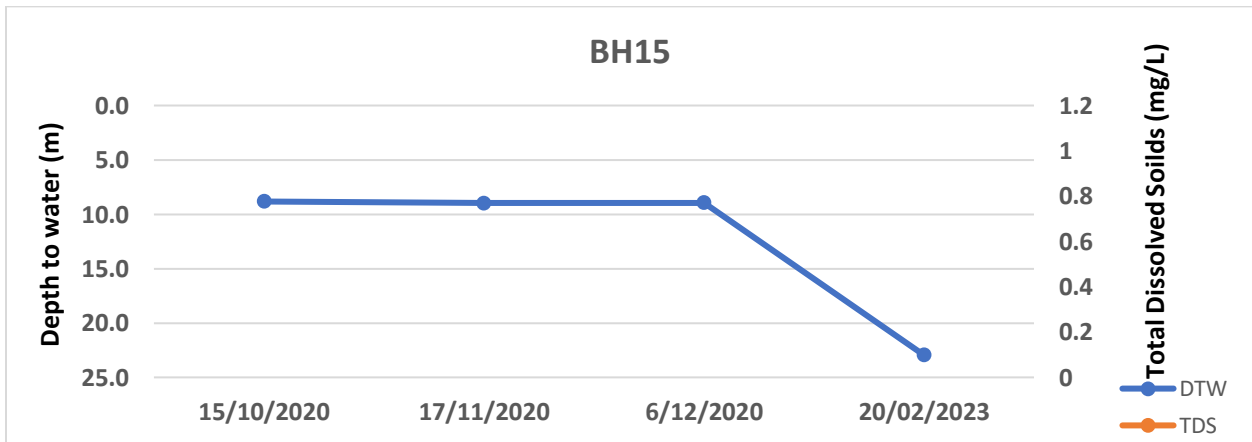
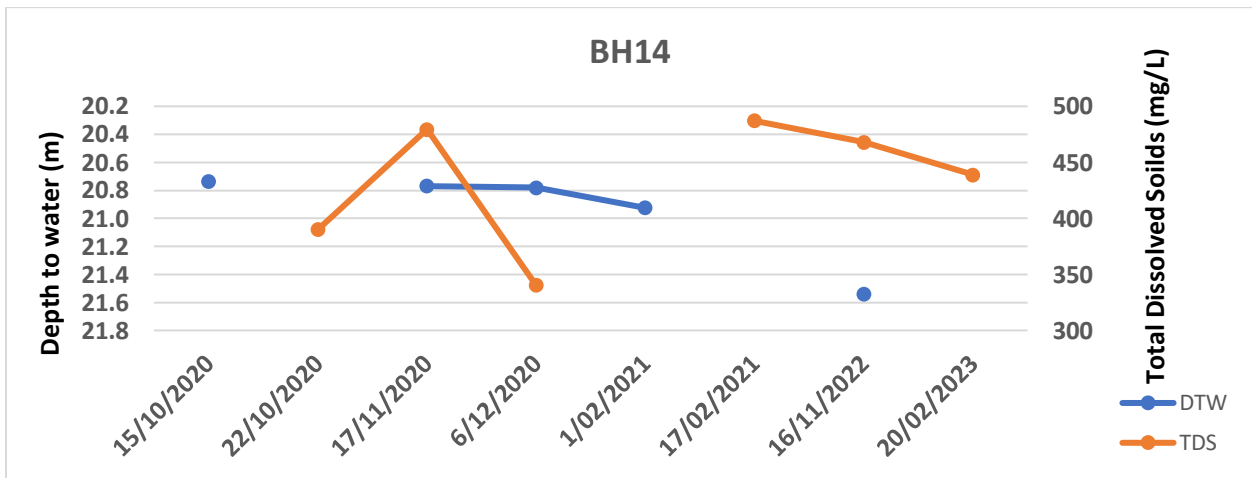
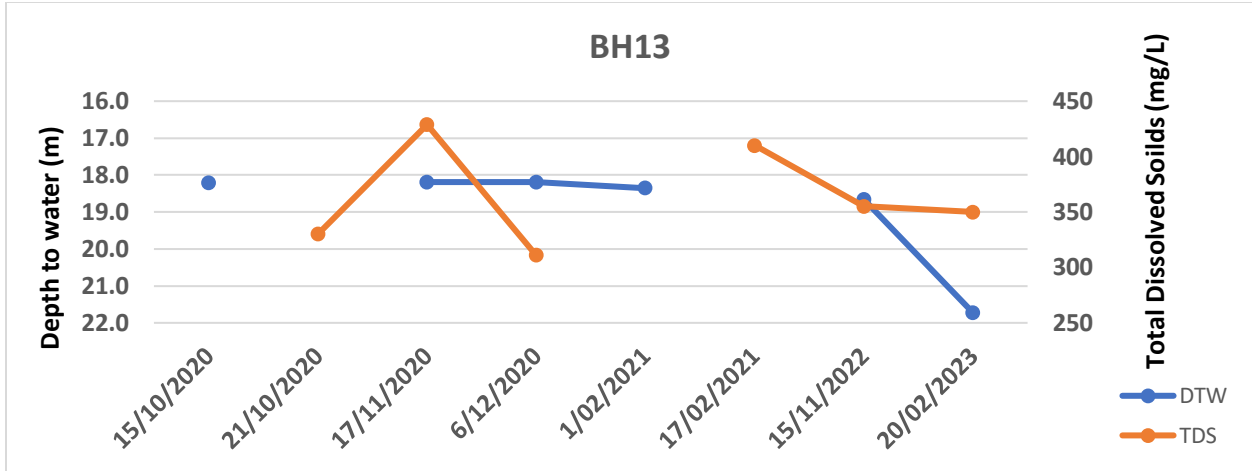


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

Holyoak

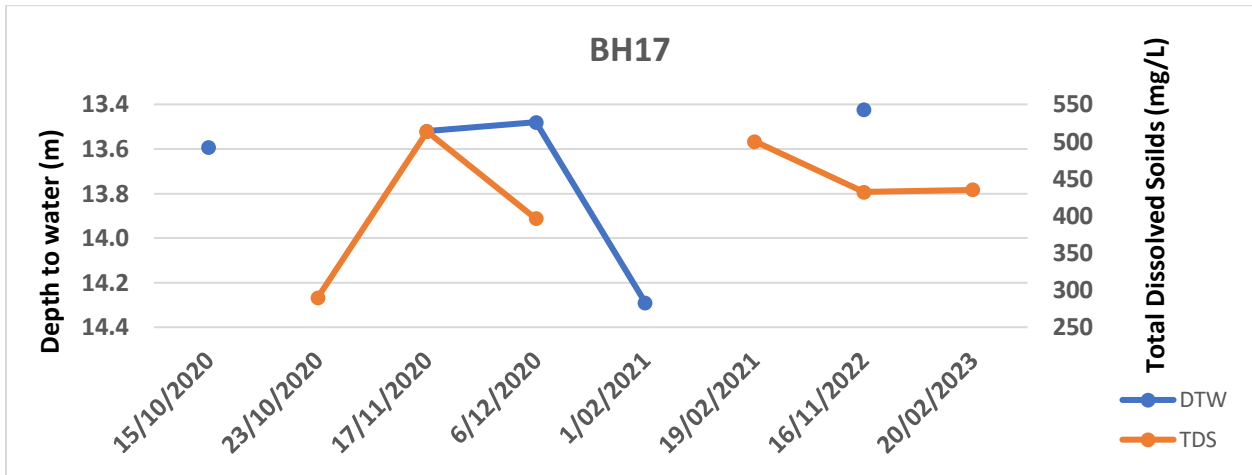
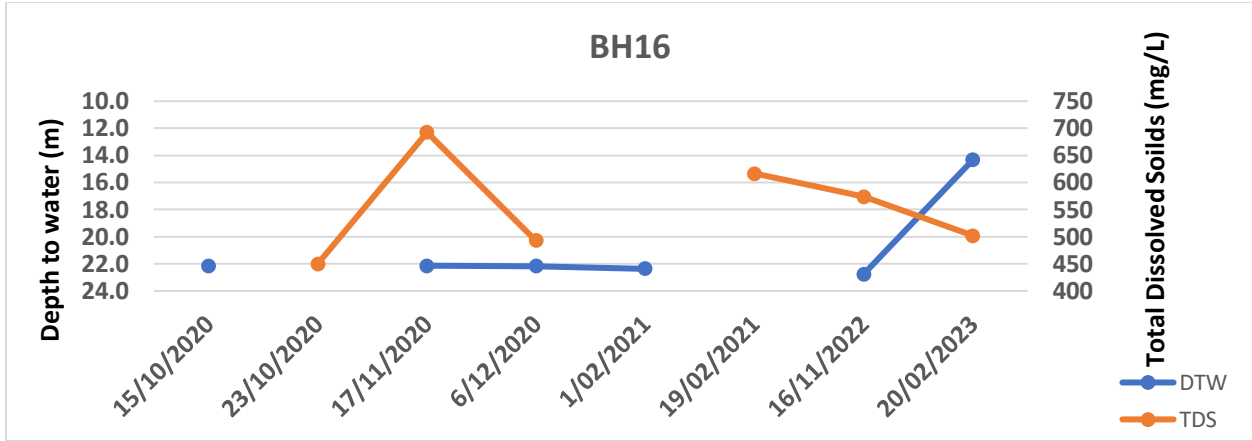


Baseline Surface Water and Groundwater Quality Report (12520591)

Groundwater Monitoring Data:

Myara North and Holyoake - New Monitoring Bores

Holyoak



Appendix L

**Laboratory Results Summary –
Groundwater and Surface Water**



Appendix L
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID 6141121				Location ID 6141125								
								Sample Date	22 Sep 2020	03 Sep 2021	22 Sep 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	18 Aug 2022	21 Sep 2020	
								Lab Report	EP2010190	EP2110337	EP2111333	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210522	EP2010111	
Inorganics																				
pH (Lab)	pH units	0.01		6.5-8						6.69	6.76	6.77	6.82	6.96	6.97	6.68	6.93	7.05	6.98	6.74*
Electrical conductivity (lab)	µS/cm	1								164	140	165	109	203	222	292	171	198	123	240
Turbidity	NTU	0.1								0.3	0.7	1.1	1.4	0.4	0.6	1.2	1.4	1.4	1.6	0.3
Total Suspended Solids	mg/L	1								<5	<1	<1	<5	<5	<5	<5	<1	<1	<5	<5
Salinity	mg/L	0.00001								0.00009	0.00008	0.00009	0.00005	0.00011	0.00012	0.00016	0.00009	0.00011	0.00006	0.00013
Biological																				
E.coli	orgs/100mL	1								7	200	14	9	8	55	26	65	16	23	34
Enterococci	orgs/100mL	1								6	9	2	1	7	24	7	51	20	1	28*
Acidity & Alkalinity																				
Alkalinity (Carbonate as CaCO3)	mg/L	1								<1	<1	<1	-	<1	<1	<1	<1	<1	-	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1								9	8	10	-	8	8	10	8	9	-	9
Alkalinity (Hydroxide as CaCO3)	mg/L	1								<1	<1	<1	-	<1	<1	<1	<1	<1	-	<1
Alkalinity (total as CaCO3)	mg/L	1								9	8	10	-	8	8	10	8	9	-	9
Hardness as CaCO3 (filtered)	mg/L	1								21	17	21	-	21	28	32	21	21	-	37*
Major Ions																				
Calcium (filtered)	mg/L	1								2	2	2	-	2	3	3	2	2	-	4
Magnesium (filtered)	mg/L	1								4	3	4	-	4	5	6	4	4	-	6*
Potassium (filtered)	mg/L	1								2	2	2	-	1	1	2	1	1	-	2
Sodium (filtered)	mg/L	1								24	21	23	-	31	36	42	27	29	-	34
Chloride	mg/L	1								35	32	41	-	51	54	87	40	49	-	57
Sulfate (filtered)	mg/L	1	500 ^{#1}							12	7	8	-	11	10	11	8	9	-	15
Cations Total	meq/L	0.01								1.52	1.31	1.48	-	1.80	2.15	2.52	1.63	1.72	-	2.27*
Anions Total	meq/L	0.01								1.42	1.21	1.52	-	1.83	1.89	2.88	1.45	1.75	-	2.10
Ionic Balance	%	0.01								3.64	4.09	1.41	-	0.67	-	6.69	5.65	0.96	-	5.14*
Nutrients																				
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}				0.02	<0.01	0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}				0.04	0.03	0.03	0.01	0.02	0.01	0.02	0.01	0.02	0.05	0.73*
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}						0.04	0.03	0.03	0.01	0.02	0.01	0.02	0.01	0.02	0.05	0.73*
Nitrogen (Total)	mg/L	0.1		0.45						<0.1	0.2	<0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.9*
Kjeldahl Nitrogen Total	mg/L	0.1								<0.1	0.2	<0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2*
Reactive Phosphorus as P	mg/L	0.01								<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Phosphorus (Total)	mg/L	0.01		0.02						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Metals																				
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}				<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001
Barium (filtered)	mg/L	0.001	2							0.009	0.047	0.0085	0.005	0.007	0.010	0.012	0.037	0.0072	0.004	0.013
Beryllium (filtered)	mg/L	0.001	0.06							<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34				<0.05	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006				<0.0001	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}				<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001
Cobalt (filtered)	mg/L	0.001								<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	0.0004	<0.001	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001				<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001				<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2				0.002	0.003	0.0041	<0.001	0.003	0.007	0.014	0.010	0.0177	0.004	0.002
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006				<0.0001	<0.0001	<0.00004	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	-	<0.0001
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008				<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005				<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01
Vanadium (filtered)	mg/L	0.01								<0.01	<0.01	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	0.0002	<0.01	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024				<0.005	0.029	0.001	<0.005	<0.005	<0.005	<0.005	0.015	<0.001	<0.005	<0.005
BTEXN																				
Benzene	µg/L	1	1		950	600				<1	<1	-	-	<1	<1	<1	<1	-	-	<1
Toluene	µg/L	2	800		180	110				<2	<2	-	-	<2	<2	<2	<2	-	-	<2
Ethylbenzene	µg/L	2	300		80	50				<2	<2	-	-	<2	<2	<2	<2	-	-	<2
Xylene (o)	µg/L	2			350	200				<2	<2	-	-	<2	<2	<2	<2	-	-	<2
Xylene (m & p)	µg/L	2								<2	<2	-	-	<2	<2	<2	<2	-	-	<2
Xylene Total	µg/L	2	600							<2	<2	-	-	<2	<2	<2	<2	-	-	<2
BTEX (Sum of Total) - Lab Calc	µg/L	1								<1	<1	-	-	<1	<1	<1	<1	-	-	<1
Naphthalene	µg/L	0.004			16	2.5				<0.004	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004
TRH - NEPM 2013																				
F1 (C6-C10 minus BTEX)	µg/L	20								<20	<20	-	-	<20	<20	<20	<20	-	-	<20
C6-C10 Fraction	µg/L	20								<20	<20	-	-	<20	<20	<20	<20	-	-	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100								<100	<100	-	-	<100	<100	<100	<100	-	-	<100
>C10-C16 Fraction	µg/L	100								<100	<100	-	-	<100	<100	<100	<100	-	-	<100
F3 (>C16-C34 Fraction)	µg/L	100								<100	<100	-	-	<100	<100	<100	<100	-	-	<100
F4 (>C34-C40 Fraction)	µg/L	100								<100	<100	-	-	<100	<100	<100	<100	-	-	<100



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	6141121				6141125						
								Sample Date	22 Sep 2020	03 Sep 2021	22 Sep 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	18 Aug 2022	21 Sep 2020
								Lab Report	EP2010190	EP2110337	EP2111333	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210522	EP2010111
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	-	-	<100	<100	<100	<100	-	-	<100
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	-	-	<20	<20	<20	<20	-	-	<20
C10-C14 Fraction	µg/L	50							<50	<50	-	-	<50	<50	<50	<50	-	-	<50
C15-C28 Fraction	µg/L	100							<100	<100	-	-	<100	<100	<100	<100	-	-	<100
C29-C36 Fraction	µg/L	50							<50	<50	-	-	<50	<50	<50	<50	-	-	<50
C10-C36 (Sum of Total)	µg/L	50							<50	<50	-	-	<50	<50	<50	<50	-	-	<50
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Acenaphthylene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Anthracene	µg/L	0.001			0.4	0.01			<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(b+j)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Chrysene	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Fluoranthene	µg/L	0.001			1.4	1			<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Fluorene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Phenanthrene	µg/L	0.002			2	0.6			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Pyrene	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Sum of standard 16 PAHs	µg/L	0.001	0.01						<0.001	-	-	-	-	<0.001	-	-	-	-	<0.001
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01						-	<0.001	-	-	-	<0.001	-	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Perylene	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Benzo(b+j+k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
a-BHC	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Aldrin	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
b-BHC	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
d-BHC	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
4,4 DDD	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Dieldrin	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endrin	µg/L	0.002			0.02	0.01			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Endrin ketone	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Oxychlordane	µg/L	0.002							<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID				6141125							
								Sample Date	22 Sep 2020	03 Sep 2021	22 Sep 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	18 Aug 2022	21 Sep 2020
								Lab Report	EP2010190	EP2110337	EP2111333	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210522	EP2010111
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
1,3-Dinitrobenzene	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
2,4,6-Trinitrotoluene	µg/L	1			140	100		<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
2,4-Dinitrotoluene	µg/L	1			65	16		<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
2,6-dinitrotoluene	µg/L	1						<1.0	<2.0	-	-	<1.0	<1.0	<1.0	<2.0	-	-	<1.0	
2-Amino-4,6-DNT	µg/L	1						<1.0	<2.0	-	-	<1.0	<1.0	<1.0	<2.0	-	-	<1.0	
2-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
4-Amino,2,6-DNT	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
4-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
HMX	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
m-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
Nitrobenzene	µg/L	1			550	230		<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
Nitroglycerine	µg/L	5						<5	<5	-	-	<5	<5	<5	<5	-	-	<5	
PETN	µg/L	5						<5	<5	-	-	<5	<5	<5	<5	-	-	<5	
RDX	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
Tetryl	µg/L	1						<1.0	<1.0	-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	<10	-	-	-	-	<10	<10	-	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	<5	-	-	-	-	<5	<5	-	-	-	
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						<100	<100	<100	-	-	<100	<100	<100	100	-	<100	
SVOCs																			
Coronene	µg/L	0.002						<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	<0.0003	<0.0003	<0.0003	-	0.0024	0.0053	<0.0003	<0.0003	<0.0003	-	<0.0003	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	<0.0003	<0.0003	<0.0003	-	0.0024	0.0053	<0.0003	<0.0003	<0.0003	-	<0.0003	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	<0.0003	<0.0003	-	0.0024	0.0053	<0.0003	<0.0003	<0.0003	-	<0.0003	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	GG03						SN01				
								Sample Date	12 Oct 2020	03 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	18 Aug 2022	04 Aug 2020	22 Sep 2020	12 Oct 2020	02 Sep 2021	21 Sep 2021
								Lab Report	EP2011108	EP2110337	EP2111185	EP2112494	EP2113959	EP2210522	EP2008144	EP2010190	EP2011108	EP2110241	EP2111222
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.66*	5.84	6.78	7.08	6.79	6.85	6.81	7.05	6.92	6.93	7.02
Electrical conductivity (lab)	µS/cm	1							259	211	221	240	238	186	171	176	217	137	169
Turbidity	NTU	0.1							0.3	1.2	1.3	0.4	0.5	1.9	1.4	1.7	4.6	2.4	4.0
Total Suspended Solids	mg/L	1							<5	<1	<1	<1	<1	<5	<5	<5	<5	<1	6
Salinity	mg/L	0.00001							0.00014	0.00011	0.00012	0.00013	0.00012	0.00009	0.00009	0.00009	0.00014	0.00007	0.00009
Biological																			
E.coli	orgs/100mL	1							22	26	16	2	24	180	10	32	16	370	29
Enterococci	orgs/100mL	1							43	31	27	4	8	17	4	16	4	320	15
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							11	2	8	9	12	-	10	10	25	8	9
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							11	2	8	9	12	-	10	10	25	8	9
Hardness as CaCO3 (filtered)	mg/L	1							37	30	24	24	30	-	21	21	26	17	15
Major Ions																			
Calcium (filtered)	mg/L	1							5	4	3	3	4	-	2	2	4	2	1
Magnesium (filtered)	mg/L	1							6	5	4	4	5	-	4	4	4	3	3
Potassium (filtered)	mg/L	1							2	2	2	2	2	-	1	1	1	1	1
Sodium (filtered)	mg/L	1							35	31	32	32	34	-	26	28	31	22	25
Chloride	mg/L	1							70	46	52	52	68	-	44	40	52	36	41
Sulfate (filtered)	mg/L	1	500 ^{#1}						15	15	11	12	12	-	9	9	7	6	8
Cations Total	meq/L	0.01							2.32	2.01	1.92	1.92	2.14	-	1.58	1.67	1.90	1.33	1.41
Anions Total	meq/L	0.01							2.51	1.65	1.86	1.90	2.41	-	1.63	1.52	2.11	1.30	1.50
Ionic Balance	%	0.01							3.94	9.86	1.75	0.67	5.86	-	1.33	4.92	5.21	1.10	3.20
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.04	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			0.24*	0.53	0.45	0.30	0.06	0.69	0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					0.24*	0.53	0.45	0.30	0.06	0.69	0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					0.3	0.7	0.6	0.4	<0.1	0.9	0.2	<0.1	0.3	0.3	0.1
Kjeldahl Nitrogen Total	mg/L	0.1							0.1	0.2	0.2	0.1	<0.1	0.2	0.2	<0.1	0.3	0.3	0.1
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01
Phosphorus (Total)	mg/L	0.01		0.02					0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002
Barium (filtered)	mg/L	0.001	2						0.014*	0.046	0.0119	0.0125	0.0150	0.010	0.004	0.004	0.011	0.034	0.0048
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	<0.005	0.006	0.025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	<0.0001	0.0002	0.0004	<0.001	<0.001	<0.001	0.004	<0.001	0.0003
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.011*	0.001	0.0031	0.0092	0.0390	0.001	0.008	0.005	0.282	0.006	0.0126
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	<0.00004	<0.00004	<0.00004	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	<0.0002	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	0.0002	0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	0.017	0.003	<0.001	0.004	<0.005	<0.005	<0.005	<0.005	0.011	0.001
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	-	-	-	-	<1	<1	<1	<1	-
Toluene	µg/L	2	800		180	110			<2	<2	-	-	-	-	<2	<2	<2	<2	-
Ethylbenzene	µg/L	2	300		80	50			<2	<2	-	-	-	-	<2	<2	<2	<2	-
Xylene (o)	µg/L	2			350	200			<2	<2	-	-	-	-	<2	<2	<2	<2	-
Xylene (m & p)	µg/L	2							<2	<2	-	-	-	-	<2	<2	<2	<2	-
Xylene Total	µg/L	2	600						<2	<2	-	-	-	-	<2	<2	<2	<2	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	-	-	-	-	<1	<1	<1	<1	-
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	-	-	-	-	<20	<20	<20	<20	-
C6-C10 Fraction	µg/L	20							<20	<20	-	-	-	-	<20	<20	<20	<20	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-
>C10-C16 Fraction	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	GG03						SN01				
								Sample Date	12 Oct 2020	03 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	18 Aug 2022	04 Aug 2020	22 Sep 2020	12 Oct 2020	02 Sep 2021	21 Sep 2021
								Lab Report	EP2011108	EP2110337	EP2111185	EP2112494	EP2113959	EP2210522	EP2008144	EP2010190	EP2011108	EP2110241	EP2111222
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	-	-	-	-	<20	<20	<20	<20	-
C10-C14 Fraction	µg/L	50							<50	<50	-	-	-	-	<50	<50	<50	<50	-
C15-C28 Fraction	µg/L	100							<100	<100	-	-	-	-	<100	<100	<100	<100	-
C29-C36 Fraction	µg/L	50							<50	<50	-	-	-	-	<50	<50	<50	<50	-
C10-C36 (Sum of Total)	µg/L	50							<50	<50	-	-	-	-	<50	<50	<50	<50	-
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Acenaphthylene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Anthracene	µg/L	0.001			0.4	0.01			<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Chrysene	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Fluoranthene	µg/L	0.001			1.4	1			<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Fluorene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Phenanthrene	µg/L	0.002			2	0.6			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Pyrene	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Sum of standard 16 PAHs	µg/L	0.001	0.01						-	-	-	-	-	-	-	<0.001	-	-	-
PAHs (Sum of total) - Lab Calc	µg/L	0.001	0.01						<0.001	<0.001	-	-	-	-	<0.001	-	<0.001	<0.001	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Perylene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Benzo(b)+k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	-	<0.004	<0.004	<0.004	<0.004	-
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
a-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Aldrin	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
b-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	-	-	-	-	<0.001	<0.001	<0.001	<0.001	-
d-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
4,4 DDD	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Dieldrin	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endrin	µg/L	0.002			0.02	0.01			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Endrin ketone	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Oxychlordane	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
Explosives																			
2,4- & 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	GG03						SN01				
								Sample Date	12 Oct 2020	03 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	18 Aug 2022	04 Aug 2020	22 Sep 2020	12 Oct 2020	02 Sep 2021	21 Sep 2021
								Lab Report	EP2011108	EP2110337	EP2111185	EP2112494	EP2113959	EP2210522	EP2008144	EP2010190	EP2011108	EP2110241	EP2111222
4-& 2-AM-DNT (Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
1,3,5-Trinitrobenzene	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
1,3-Dinitrobenzene	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
2,4,6-Trinitrotoluene	µg/L	1			140	100			<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
2,4-Dinitrotoluene	µg/L	1			65	16			<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
2,6-dinitrotoluene	µg/L	1							<1.0	<2.0	-	-	-	-	<1.0	<1.0	<1.0	<2.0	-
2-Amino-4,6-DNT	µg/L	1							<1.0	<2.0	-	-	-	-	<1.0	<1.0	<1.0	<2.0	-
2-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
4-Amino,2,6-DNT	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
4-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
HMX	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
m-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
Nitrobenzene	µg/L	1			550	230			<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
Nitroglycerine	µg/L	5							<5	<5	-	-	-	-	<5	<5	<5	<5	-
PETN	µg/L	5							<5	<5	-	-	-	-	<5	<5	<5	<5	-
RDX	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
Tetryl	µg/L	1							<1.0	<1.0	-	-	-	-	<1.0	<1.0	<1.0	<1.0	-
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180			<10	<10	-	-	-	-	<10	<10	<10	<10	-
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037			<5	<5	-	-	-	-	<5	<5	<5	<5	-
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100							<100	100	<100	<100	-	-	<100	<100	<100	<100	<100
SVOCs																			
Coronene	µg/L	0.002							<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	-
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002							<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003							<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SN02										
								Sample Date	18 Oct 2021	15 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	04 Nov 2020	01 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	07 Nov 2022
								Lab Report	EP2112494	EP2210305	EP2008205	EP2010190	EP2011108	EP2012241	EP2110238	EP2111222	EP2112494	EP2210305	EP2214921
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					7.51	6.88	6.82	6.79	6.20	6.81	6.76	6.97	7.06	6.49	6.94*
Electrical conductivity (lab)	µS/cm	1							228	143	280	254	641	2,800	146	208	655	152	1,630*
Turbidity	NTU	0.1							4.1	0.7	1.5	1.2	4.0	5.5	2.4	2.8	3.5	0.9	16.0
Total Suspended Solids	mg/L	1							1	<5	<5	<5	<5	<5	2	1	1	<5	6
Salinity	mg/L	0.00001							0.00012	0.00007	0.00015	0.00014	0.00035	0.00158	0.00008	0.00011	0.00036	0.00007	0.00082*
Biological																			
E.coli	orgs/100mL	1							7	26	22	97	10	-	1,500	1,000	10	28	75
Enterococci	orgs/100mL	1							10	20	6	33	1	-	3,100	59	<1	21	1
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	-	<1	<1	<1	<1	<1	<1	<1	-	-
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							38	-	9	9	5	8	6	9	14	-	-
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	-	<1	<1	<1	<1	<1	<1	<1	-	-
Alkalinity (total as CaCO3)	mg/L	1							38	-	9	9	5	8	6	9	14	-	-
Hardness as CaCO3 (filtered)	mg/L	1							34	-	28	28	76	363	17	21	78	-	-
Major Ions																			
Calcium (filtered)	mg/L	1							7	-	3	3	9	40	2	2	8	-	-
Magnesium (filtered)	mg/L	1							4	-	5	5	13	64	3	4	14	-	-
Potassium (filtered)	mg/L	1							1	-	<1	1	1	6	1	1	2	-	-
Sodium (filtered)	mg/L	1							30	-	44	40	90	390	24	30	91	-	-
Chloride	mg/L	1							42	-	74	63	205	789	39	51	195	-	-
Sulfate (filtered)	mg/L	1	500 ^{#1}						5	-	13	11	30	58	9	10	21	-	-
Cations Total	meq/L	0.01							2.01	-	2.48	2.33	5.46	24.4	1.42	1.76	5.56	-	-
Anions Total	meq/L	0.01							2.05	-	2.54	2.18	6.51	23.6	1.41	1.83	6.22	-	-
Ionic Balance	%	0.01							0.96	-	1.25	3.12	8.76	1.58	0.31	1.87	5.58	-	-
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			0.01	<0.01	0.02	0.02	0.03	-	<0.01	<0.01	<0.01	<0.01	0.07*
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			<0.01	<0.01	0.04	0.03	0.03	-	<0.01	0.02	<0.01	0.07	0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					<0.01	<0.01	0.04	0.03	0.03	-	<0.01	0.02	<0.01	0.07	0.01
Nitrogen (Total)	mg/L	0.1		0.45					0.2	0.2	0.2	0.2	0.2	-	0.3	0.1	0.2	0.3	0.7*
Kjeldahl Nitrogen Total	mg/L	0.1							0.2	0.2	0.2	0.2	0.2	-	0.3	0.1	0.2	0.2	0.7*
Reactive Phosphorus as P	mg/L	0.01							<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-
Phosphorus (Total)	mg/L	0.01		0.02					<0.01	<0.01	<0.01	<0.01	0.02	-	<0.01	<0.01	0.01	0.01	0.04
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.0002	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.0002	<0.0002	<0.001	<0.001
Barium (filtered)	mg/L	0.001	2						0.0104	0.003	0.006	0.006	0.017	-	0.044	0.0061	0.0196	0.004	0.050
Beryllium (filtered)	mg/L	0.001	0.06						<0.0001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.0001	<0.0001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.005	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.005	<0.005	<0.05	0.06
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.0002	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.0002	<0.0002	<0.001	<0.001
Cobalt (filtered)	mg/L	0.001							0.0040	<0.001	<0.001	<0.001	0.004	-	<0.001	0.0004	0.0075	<0.001	0.005
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.0005	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.0005	<0.0005	<0.001	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.0001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.0001	<0.0001	<0.001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.312	0.002	0.020	0.011	0.145	-	0.011	0.0159	0.364	0.002	0.356*
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.00004	-	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.00004	<0.00004	-	-
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			0.0006	<0.001	<0.001	<0.001	0.002	-	<0.001	<0.0005	0.0024	<0.001	0.002*
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.0002	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.0002	<0.0002	<0.01	<0.01
Vanadium (filtered)	mg/L	0.01							0.0005	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.0002	<0.0002	<0.01	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024			0.001	<0.005	<0.005	<0.005	<0.005	-	0.019	<0.001	0.001	<0.005	<0.005
BTEXN																			
Benzene	µg/L	1	1		950	600			-	-	<1	<1	<1	-	<1	-	-	-	-
Toluene	µg/L	2	800		180	110			-	-	<2	<2	<2	-	<2	-	-	-	-
Ethylbenzene	µg/L	2	300		80	50			-	-	<2	<2	<2	-	<2	-	-	-	-
Xylene (o)	µg/L	2			350	200			-	-	<2	<2	<2	-	<2	-	-	-	-
Xylene (m & p)	µg/L	2							-	-	<2	<2	<2	-	<2	-	-	-	-
Xylene Total	µg/L	2	600						-	-	<2	<2	<2	-	<2	-	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							-	-	<1	<1	<1	-	<1	-	-	-	-
Naphthalene	µg/L	0.004			16	2.5			-	-	<0.004	<0.004	<0.004	-	<0.004	-	-	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							-	-	<20	<20	<20	-	<20	-	-	-	-
C6-C10 Fraction	µg/L	20							-	-	<20	<20	<20	-	<20	-	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							-	-	<100	<100	<100	-	<100	-	-	-	-
>C10-C16 Fraction	µg/L	100							-	-	<100	<100	<100	-	<100	-	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100							-	-	<100	<100	<100	-	<100	-	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100							-	-	<100	<100	<100	-	<100	-	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	SN02											
								Location ID	18 Oct 2021	15 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	04 Nov 2020	01 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	07 Nov 2022
								Sample Date	EP2112494	EP2210305	EP2008205	EP2010190	EP2011108	EP2012241	EP2110238	EP2111222	EP2112494	EP2210305	EP2214921
>C10-C40 (Sum of Total)	µg/L	100						-	-	<100	<100	<100	-	<100	-	-	-		
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						-	-	<20	<20	<20	-	<20	-	-	-		
C10-C14 Fraction	µg/L	50						-	-	<50	<50	<50	-	<50	-	-	-		
C15-C28 Fraction	µg/L	100						-	-	<100	<100	<100	-	<100	-	-	-		
C29-C36 Fraction	µg/L	50						-	-	<50	<50	<50	-	<50	-	-	-		
C10-C36 (Sum of Total)	µg/L	50						-	-	<50	<50	<50	-	<50	-	-	-		
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Acenaphthylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Anthracene	µg/L	0.001			0.4	0.01		-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Benzo(a)anthracene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1		-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Benzo(b)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	-	<0.004	-	-	-		
Benzo(k)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	-	<0.004	-	-	-		
Benzo(g,h,i)perylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Chrysene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Dibenz(a,h)anthracene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Fluoranthene	µg/L	0.001			1.4	1		-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Fluorene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Phenanthrene	µg/L	0.002			2	0.6		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Pyrene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Sum of standard 16 PAHs	µg/L	0.001	0.01					-	-	-	<0.001	-	-	-	-	-	-		
PAHs (Sum of total) - Lab Calc	µg/L	0.001	0.01					-	-	<0.001	-	<0.001	-	<0.001	-	-	-		
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
3-methylcholanthrene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	-	<0.004	-	-	-		
7,12-dimethylbenz(a)anthracene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Benzo(e)pyrene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Perylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Benzo(b)+k)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	-	<0.004	-	-	-		
OC Pesticides																			
4,4'-DDE	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
a-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Aldrin	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
b-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Chlordane	µg/L	0.001	2		0.08	0.03		-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Chlordane (cis)	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
Chlordane (trans)	µg/L	0.001						-	-	<0.001	<0.001	<0.001	-	<0.001	-	-	-		
d-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
4,4 DDD	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
4,4 DDT	µg/L	0.002	9		0.01	0.006		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Dieldrin	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endosulfan	µg/L	0.002	20		0.2	0.03		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endosulfan I (alpha)	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endosulfan II (beta)	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endosulfan Sulfate	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endrin	µg/L	0.002			0.02	0.01		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endrin aldehyde	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Endrin ketone	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Heptachlor	µg/L	0.002	0.3		0.09	0.01		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Heptachlor epoxide	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Hexachlorobenzene	µg/L	0.002			0.1	0.05		-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Methoxychlor	µg/L	0.002	300					-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Oxychlordane	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID											
								Sample Date	18 Oct 2021	15 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	04 Nov 2020	01 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	07 Nov 2022
								Lab Report	EP2112494	EP2210305	EP2008205	EP2010190	EP2011108	EP2012241	EP2110238	EP2111222	EP2112494	EP2210305	EP2214921
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
1,3,5-Trinitrobenzene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
1,3-Dinitrobenzene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
2,4,6-Trinitrotoluene	µg/L	1			140	100		-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
2,4-Dinitrotoluene	µg/L	1			65	16		-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
2,6-dinitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<2.0	-	-	-		
2-Amino-4,6-DNT	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<2.0	-	-	-		
2-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
4-Amino,2,6-DNT	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
4-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
HMX	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
m-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
Nitrobenzene	µg/L	1			550	230		-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
Nitroglycerine	µg/L	5						-	-	<5	<5	<5	-	<5	-	-	-		
PETN	µg/L	5						-	-	<5	<5	<5	-	<5	-	-	-		
RDX	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
Tetryl	µg/L	1						-	-	<1.0	<1.0	<1.0	-	<1.0	-	-	-		
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	-	<10	<10	<10	-	<10	-	-	-		
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	-	<5	<5	<5	-	<5	-	-	-		
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						200	-	<100	<100	<100	-	100	<100	<100	-		
SVOCs																			
Coronene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	-	<0.002	-	-	-		
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						0.0010	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005						0.0047	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003						0.0198	-	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-		
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	-	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	-		
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						0.0009	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56					0.56	-	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-		
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-		
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						0.039	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-		
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-		
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07					0.0245	-	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-		
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						0.0654	-	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-		

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SN04					SW01					
								Sample Date	21 Sep 2020	12 Oct 2020	04 Nov 2020	02 Sep 2021	18 Aug 2022	03 Aug 2020	21 Sep 2020	06 Sep 2021	22 Sep 2021	18 Oct 2021	16 Nov 2021
								Lab Report	EP2010111	EP2011108	EP2012241	EP2110241	EP2210522	EP2008094	EP2010111	EP2110430	EP2111333	EP2112494	EP2113959
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.39	6.29	7.09	6.80	6.90	6.82	6.77	6.95	6.95	7.06	7.13
Electrical conductivity (lab)	µS/cm	1							162	197	203	136	109	187	193	240	250	334	331
Turbidity	NTU	0.1							2.3	2.0	1.9	2.3	2.8	2.9	0.8	4.2	2.7	2.0	1.8
Total Suspended Solids	mg/L	1							<5	<5	<5	<1	<5	<5	<5	13	6	7	2
Salinity	mg/L	0.00001							0.00009	0.00011	0.00009	0.00007	0.00005	0.00010	0.00010	0.00013	0.00013	0.00018	0.00016
Biological																			
E.coli	orgs/100mL	1							13	<1	-	21	3	11	27	53	2	8	16
Enterococci	orgs/100mL	1							6	2	-	18	4	3	24	14	4	35	52
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							8	8	9	10	-	7	8	9	9	10	26
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							8	8	9	10	-	7	8	9	9	10	26
Hardness as CaCO3 (filtered)	mg/L	1							17	17	17	17	-	17	21	24	21	32	39
Major Ions																			
Calcium (filtered)	mg/L	1							2	2	2	2	-	2	2	3	2	3	4
Magnesium (filtered)	mg/L	1							3	3	3	3	-	3	4	4	4	6	7
Potassium (filtered)	mg/L	1							2	1	1	2	-	2	1	2	2	2	2
Sodium (filtered)	mg/L	1							25	29	32	21	-	29	31	37	36	54	56
Chloride	mg/L	1							38	54	59	34	-	46	45	69	65	79	102
Sulfate (filtered)	mg/L	1	500 ^{#1}						8	7	4	6	-	12	12	9	8	7	6
Cations Total	meq/L	0.01							1.48	1.63	1.76	1.31	-	1.66	1.80	2.14	2.05	3.04	3.26
Anions Total	meq/L	0.01							1.40	1.83	1.93	1.28	-	1.69	1.68	2.31	2.18	2.57	3.52
Ionic Balance	%	0.01							3.02	5.64	4.42	1.06	-	0.84	3.56	3.91	3.17	8.36	3.82
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			<0.01	0.02	-	<0.01	<0.01	0.03	<0.01	<0.01	0.03	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			<0.01	<0.01	-	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					<0.01	<0.01	-	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					0.1	0.1	-	0.2	0.3	<0.1	0.1	0.3	0.2	0.1	0.4
Kjeldahl Nitrogen Total	mg/L	0.1							0.1	0.1	-	0.2	0.3	<0.1	0.1	0.3	0.2	0.1	0.4
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	-	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phosphorus (Total)	mg/L	0.01		0.02					0.01	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium (filtered)	mg/L	0.001	2						0.005	0.006	-	0.039	0.003	0.002	0.002	0.036	0.0065	0.0086	0.0132
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.037
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (filtered)	mg/L	0.001			0.001	0.002			0.001	0.002	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.0002	0.0003	0.0013
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	0.0001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.030	0.068	-	0.004	0.002	0.001	0.004	0.007	0.0070	0.0219	0.128
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	-	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.0002
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	0.0003	0.0002	0.0004
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	<0.005	-	0.016	<0.005	<0.005	<0.005	0.017	0.006	<0.001	0.002
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	-	<1	-	<1	<1	<1	-	-	-
Toluene	µg/L	2	800		180	110			<2	<2	-	<2	-	<2	<2	<2	-	-	-
Ethylbenzene	µg/L	2	300		80	50			<2	<2	-	<2	-	<2	<2	<2	-	-	-
Xylene (o)	µg/L	2			350	200			<2	<2	-	<2	-	<2	<2	<2	-	-	-
Xylene (m & p)	µg/L	2							<2	<2	-	<2	-	<2	<2	<2	-	-	-
Xylene Total	µg/L	2	600						<2	<2	-	<2	-	<2	<2	<2	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	-	<1	-	<1	<1	<1	-	-	-
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	-	<0.004	-	<0.004	<0.004	<0.004	-	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	-	<20	-	<20	<20	<20	-	-	-
C6-C10 Fraction	µg/L	20							<20	<20	-	<20	-	<20	<20	<20	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-
>C10-C16 Fraction	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SN04					SW01					
								Sample Date	21 Sep 2020	12 Oct 2020	04 Nov 2020	02 Sep 2021	18 Aug 2022	03 Aug 2020	21 Sep 2020	06 Sep 2021	22 Sep 2021	18 Oct 2021	16 Nov 2021
								Lab Report	EP2010111	EP2011108	EP2012241	EP2110241	EP2210522	EP2008094	EP2010111	EP2110430	EP2111333	EP2112494	EP2113959
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	-	<20	-	<20	<20	<20	-	-	-
C10-C14 Fraction	µg/L	50							<50	<50	-	<50	-	<50	<50	<50	-	-	-
C15-C28 Fraction	µg/L	100							<100	<100	-	<100	-	<100	<100	<100	-	-	-
C29-C36 Fraction	µg/L	50							<50	<50	-	<50	-	<50	<50	<50	-	-	-
C10-C36 (Sum of Total)	µg/L	50							<50	<50	-	<50	-	<50	<50	<50	-	-	-
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Acenaphthylene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Anthracene	µg/L	0.001			0.4	0.01			<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Benzo(b+j)fluoranthene	µg/L	0.004							<0.004	<0.004	-	<0.004	-	<0.004	<0.004	<0.004	-	-	-
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	<0.004	-	<0.004	<0.004	<0.004	-	-	-
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Chrysene	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Fluoranthene	µg/L	0.001			1.4	1			<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Fluorene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Phenanthrene	µg/L	0.002			2	0.6			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Pyrene	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Sum of standard 16 PAHs	µg/L	0.001	0.01						<0.001	-	-	-	-	<0.001	-	-	-	-	-
PAHs (Sum of total) - Lab Calc	µg/L	0.001	0.01						-	<0.001	-	-	-	<0.001	-	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	-	<0.004	-	<0.004	<0.004	<0.004	-	-	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Perylene	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Benzo(b+j+k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	<0.004	-	<0.004	<0.004	<0.004	-	-	-
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
a-BHC	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Aldrin	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	-	<0.002	-	0.033	<0.002	<0.002	<0.002	-	-
b-BHC	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	-	-	-
d-BHC	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
4,4 DDD	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Dieldrin	µg/L	0.002							<0.002	<0.002	-	<0.002	-	0.033	<0.002	<0.002	<0.002	-	-
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endrin	µg/L	0.002			0.02	0.01			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Endrin ketone	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Oxychlorane	µg/L	0.002							<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	SN04					SW01						
								Location ID	21 Sep 2020	12 Oct 2020	04 Nov 2020	02 Sep 2021	18 Aug 2022	03 Aug 2020	21 Sep 2020	06 Sep 2021	22 Sep 2021	18 Oct 2021	16 Nov 2021
								Sample Date	EP2010111	EP2011108	EP2012241	EP2110241	EP2210522	EP2008094	EP2010111	EP2110430	EP2111333	EP2112494	EP2113959
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
1,3-Dinitrobenzene	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
2,4-Dinitrotoluene	µg/L	1			65	16		<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
2,6-dinitrotoluene	µg/L	1						<1.0	<1.0	-	<2.0	-	<1.0	<1.0	<2.0	-	-	-	
2-Amino-4,6-DNT	µg/L	1						<1.0	<1.0	-	<2.0	-	<1.0	<1.0	<2.0	-	-	-	
2-Nitrotoluene	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
4-Amino,2,6-DNT	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
4-Nitrotoluene	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
HMX	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
m-Nitrotoluene	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
Nitrobenzene	µg/L	1			550	230		<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
Nitroglycerine	µg/L	5						<5	<5	-	<5	-	<5	<5	<5	-	-	-	
PETN	µg/L	5						<5	<5	-	<5	-	<5	<5	<5	-	-	-	
RDX	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
Tetryl	µg/L	1						<1.0	<1.0	-	<1.0	-	<1.0	<1.0	<1.0	-	-	-	
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	<10	-	<10	-	-	-	<10	-	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	<5	-	<5	-	-	-	<5	-	-	-	
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						<100	<100	-	200	-	-	<100	200	<100	<100	-	
SVOCs																			
Coronene	µg/L	0.002						<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	-	-	-	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	<0.0003	<0.0003	-	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	<0.002	-	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	<0.0005	<0.0005	-	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	<0.001	-	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	<0.0003	<0.0003	-	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	<0.0003	-	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW02										
								Sample Date	16 Dec 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	15 Aug 2022	22 Sep 2020	13 Oct 2020	04 Nov 2020
								Lab Report	EP2115650	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210305	EP2010190	EP2011137	EP2012241
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.90	6.98	7.01	6.96	7.01	6.93	7.02	6.82	6.80	6.89	7.08
Electrical conductivity (lab)	µS/cm	1							352	139	193	192	225	159	183	146	220	252	266
Turbidity	NTU	0.1							5.0	4.2	0.2	0.3	0.5	1.2	0.7	0.4	0.4	1.6	0.8
Total Suspended Solids	mg/L	1							2	<5	<5	<5	<5	4	<1	<5	<5	<5	<5
Salinity	mg/L	0.00001							0.00017	0.00006	0.00010	0.00010	0.00012	0.00009	0.00010	0.00007	0.00012	0.00013	0.00013
Biological																			
E.coli	orgs/100mL	1							7	49	<1	12	<1	53	27	9	7	<1	-
Enterococci	orgs/100mL	1							30	32	2	15	<1	57	26	2	17	6	-
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	-	<1	<1	<1	<1	<1	-	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							28	-	9	10	12	8	9	-	7	12	15
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	-	<1	<1	<1	<1	<1	-	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							28	-	9	10	12	8	9	-	7	12	15
Hardness as CaCO3 (filtered)	mg/L	1							43	-	24	24	24	17	17	-	26	32	32
Major Ions																			
Calcium (filtered)	mg/L	1							4	-	3	3	3	2	2	-	2	3	3
Magnesium (filtered)	mg/L	1							8	-	4	4	4	3	3	-	5	6	6
Potassium (filtered)	mg/L	1							3	-	1	1	1	1	1	-	1	2	2
Sodium (filtered)	mg/L	1							57	-	28	31	32	25	27	-	34	38	40
Chloride	mg/L	1							106	-	48	44	64	37	46	-	53	70	71
Sulfate (filtered)	mg/L	1	500 ^{#1}						<1	-	10	8	8	6	8	-	11	13	8
Cations Total	meq/L	0.01							3.41	-	1.72	1.85	1.90	1.46	1.55	-	2.02	2.35	2.43
Anions Total	meq/L	0.01							3.55	-	1.74	1.61	2.21	1.33	1.64	-	1.86	2.48	2.47
Ionic Balance	%	0.01							1.94	-	0.57	-	7.67	4.71	3.05	-	3.91	2.84	0.70
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	0.01	<0.01	-
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			<0.01	0.06	0.02	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	-
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					<0.01	0.06	0.02	<0.01	0.02	<0.01	<0.01	0.02	<0.01	<0.01	-
Nitrogen (Total)	mg/L	0.1		0.45					0.7	0.4	0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.2	-
Kjeldahl Nitrogen Total	mg/L	0.1							0.7	0.3	0.1	<0.1	<0.1	0.1	0.1	0.1	<0.1	0.2	-
Reactive Phosphorus as P	mg/L	0.01							<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.02	-
Phosphorus (Total)	mg/L	0.01		0.02					0.02	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	-
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	-
Barium (filtered)	mg/L	0.001	2						0.0156	0.005	0.008	0.009	0.010	0.039	0.0071	0.005	0.008	0.013	-
Beryllium (filtered)	mg/L	0.001	0.06						<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	-
Boron (filtered)	mg/L	0.05	4		0.94	0.34			0.023	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.05	<0.05	<0.05	-
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	-
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	-
Cobalt (filtered)	mg/L	0.001							0.0024	<0.001	<0.001	<0.001	<0.001	<0.001	0.0003	<0.001	<0.001	<0.001	-
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	-
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	-
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.199	0.004	0.011	0.018	0.039	0.010	0.0153	0.007	0.002	0.013	-
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.00004	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	-	<0.0001	<0.0001	-
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	-
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	-
Vanadium (filtered)	mg/L	0.01							0.0013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	-
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.001	<0.005	<0.005	<0.005	<0.005	0.015	<0.001	<0.005	<0.005	<0.005	-
BTEXN																			
Benzene	µg/L	1	1		950	600			-	-	<1	<1	<1	<1	-	-	<1	<1	-
Toluene	µg/L	2	800		180	110			-	-	<2	<2	<2	<2	-	-	<2	<2	-
Ethylbenzene	µg/L	2	300		80	50			-	-	<2	<2	<2	<2	-	-	<2	<2	-
Xylene (o)	µg/L	2			350	200			-	-	<2	<2	<2	<2	-	-	<2	<2	-
Xylene (m & p)	µg/L	2							-	-	<2	<2	<2	<2	-	-	<2	<2	-
Xylene Total	µg/L	2	600						-	-	<2	<2	<2	<2	-	-	<2	<2	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							-	-	<1	<1	<1	<1	-	-	<1	<1	-
Naphthalene	µg/L	0.004			16	2.5			-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004	<0.004	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							-	-	<20	<20	<20	<20	-	-	<20	<20	-
C6-C10 Fraction	µg/L	20							-	-	<20	<20	<20	<20	-	-	<20	<20	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							-	-	<100	<100	<100	<100	-	-	<100	<100	-
>C10-C16 Fraction	µg/L	100							-	-	<100	<100	<100	<100	-	-	<100	<100	-
F3 (>C16-C34 Fraction)	µg/L	100							-	-	<100	<100	<100	<100	-	-	<100	<100	-
F4 (>C34-C40 Fraction)	µg/L	100							-	-	<100	<100	<100	<100	-	-	<100	<100	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW02										
								Sample Date	16 Dec 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	15 Aug 2022	22 Sep 2020	13 Oct 2020	04 Nov 2020
								Lab Report	EP2115650	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210305	EP2010190	EP2011137	EP2012241
>C10-C40 (Sum of Total)	µg/L	100						-	-	<100	<100	<100	<100	-	-	<100	<100	-	
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						-	-	<20	<20	<20	<20	-	-	<20	<20	-	
C10-C14 Fraction	µg/L	50						-	-	<50	<50	<50	<50	-	-	<50	<50	-	
C15-C28 Fraction	µg/L	100						-	-	<100	<100	<100	<100	-	-	<100	<100	-	
C29-C36 Fraction	µg/L	50						-	-	<50	<50	<50	<50	-	-	<50	<50	-	
C10-C36 (Sum of Total)	µg/L	50						-	-	<50	<50	<50	<50	-	-	<50	<50	-	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Acenaphthylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Anthracene	µg/L	0.001			0.4	0.01		-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Benzo(a)anthracene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1		-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Benzo(b)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004	<0.004	-	
Benzo(k)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004	<0.004	-	
Benzo(g,h,i)perylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Chrysene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Dibenz(a,h)anthracene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Fluoranthene	µg/L	0.001			1.4	1		-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Fluorene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Phenanthrene	µg/L	0.002			2	0.6		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Pyrene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Sum of standard 16 PAHs	µg/L	0.001	0.01					-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
3-methylcholanthrene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004	<0.004	-	
7,12-dimethylbenz(a)anthracene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Benzo(e)pyrene	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Perylene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Benzo(b)fluoranthene	µg/L	0.004						-	-	<0.004	<0.004	<0.004	<0.004	-	-	<0.004	<0.004	-	
OC Pesticides																			
4,4'-DDE	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
a-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Aldrin	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
b-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Chlordane	µg/L	0.001	2		0.08	0.03		-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Chlordane (cis)	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
Chlordane (trans)	µg/L	0.001						-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	-	
d-BHC	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
4,4 DDD	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
4,4 DDT	µg/L	0.002	9		0.01	0.006		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Dieldrin	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endosulfan	µg/L	0.002	20		0.2	0.03		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endosulfan I (alpha)	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endosulfan II (beta)	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endosulfan Sulfate	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endrin	µg/L	0.002			0.02	0.01		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endrin aldehyde	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Endrin ketone	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Heptachlor	µg/L	0.002	0.3		0.09	0.01		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Heptachlor epoxide	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Hexachlorobenzene	µg/L	0.002			0.1	0.05		-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Methoxychlor	µg/L	0.002	300					-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Oxychlorane	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW02										
								Sample Date	16 Dec 2021	18 Aug 2022	05 Aug 2020	22 Sep 2020	12 Oct 2020	03 Sep 2021	21 Sep 2021	15 Aug 2022	22 Sep 2020	13 Oct 2020	04 Nov 2020
								Lab Report	EP2115650	EP2210522	EP2008205	EP2010190	EP2011108	EP2110337	EP2111222	EP2210305	EP2010190	EP2011137	EP2012241
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
1,3,5-Trinitrobenzene	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
1,3-Dinitrobenzene	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
2,4-Dinitrotoluene	µg/L	1			65	16		-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
2,6-dinitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	<2.0	-	-	<1.0	<1.0	-	
2-Amino-4,6-DNT	µg/L	1						-	-	<1.0	<1.0	<1.0	<2.0	-	-	<1.0	<1.0	-	
2-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
4-Amino,2,6-DNT	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
4-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
HMX	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
m-Nitrotoluene	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
Nitrobenzene	µg/L	1			550	230		-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
Nitroglycerine	µg/L	5						-	-	<5	<5	<5	<5	-	-	<5	<5	-	
PETN	µg/L	5						-	-	<5	<5	<5	<5	-	-	<5	<5	-	
RDX	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
Tetryl	µg/L	1						-	-	<1.0	<1.0	<1.0	<1.0	-	-	<1.0	<1.0	-	
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	-	-	-	<10	<10	-	-	-	<10	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	-	-	-	<5	<5	-	-	-	<5	-	
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						-	-	-	<100	<100	<100	<100	-	-	<100	<100	
SVOCs																			
Coronene	µg/L	0.002						-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	-	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	-	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	-	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	-	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	-	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	-	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	-	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID					Sample Date					
								SW03					SW04					
								03 Sep 2021	20 Sep 2021	28 Oct 2021	18 Aug 2022	09 Nov 2022	22 Sep 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	15 Aug 2022	04 Aug 2020
								EP2110337	EP2111185	EP2113087	EP2210522	EP2215092	EP2010190	EP2110430	EP2111185	EP2112494	EP2210305	EP2008144
Inorganics																		
pH (Lab)	pH units	0.01		6.5-8				6.85	6.95	7.10	6.93	6.86	6.46	6.81	6.49	6.87	6.41	6.45
Electrical conductivity (lab)	µS/cm	1						176	199	206	130	276	163	157	154	199	138	302*
Turbidity	NTU	0.1						0.7	1.2	0.6	1.4	0.8	1.5	1.1	2.3	2.8	0.9	0.4
Total Suspended Solids	mg/L	1						<1	<1	<1	<5	<5	<5	<1	2	10	<5	<5
Salinity	mg/L	0.00001						0.00009	0.00011	0.00011	0.00006	0.00013	0.00009	0.00008	0.00008	0.00011	0.00006	0.00016
Biological																		
E.coli	orgs/100mL	1						19	1	53	8	<1	31	3	100	6	7	<1
Enterococci	orgs/100mL	1						21	25	36	7	7*	15	1	18	2	7	1*
Acidity & Alkalinity																		
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1	<1	<1	-	-	<1	<1	<1	<1	-	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1						7	7	8	-	-	5	6	5	9	-	6
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1	<1	<1	-	-	<1	<1	<1	<1	-	<1
Alkalinity (total as CaCO3)	mg/L	1						7	7	8	-	-	5	6	5	9	-	6
Hardness as CaCO3 (filtered)	mg/L	1						21	21	21	-	-	21	21	15	21	-	30*
Major Ions																		
Calcium (filtered)	mg/L	1						2	2	2	-	-	2	2	1	2	-	2
Magnesium (filtered)	mg/L	1						4	4	4	-	-	4	4	3	4	-	6*
Potassium (filtered)	mg/L	1						1	1	1	-	-	2	2	2	3	-	1
Sodium (filtered)	mg/L	1						28	30	32	-	-	24	23	22	28	-	50*
Chloride	mg/L	1						41	47	50	-	-	38	37	38	46	-	95
Sulfate (filtered)	mg/L	1	500 ^{#1}					9	9	8	-	-	8	9	7	7	-	7
Cations Total	meq/L	0.01						1.67	1.76	1.85	-	-	1.52	1.48	1.30	1.72	-	2.79*
Anions Total	meq/L	0.01						1.48	1.65	1.74	-	-	1.34	1.35	1.32	1.62	-	2.94
Ionic Balance	%	0.01						5.98	3.12	3.06	-	-	-	4.58	0.48	3.00	-	4.94
Nutrients																		
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}		<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}		<0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	0.02
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}				<0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	0.02
Nitrogen (Total)	mg/L	0.1		0.45				0.1	0.4	0.3	0.2	0.2	0.1	0.3	1.9	0.3	0.3	0.1
Kjeldahl Nitrogen Total	mg/L	0.1						0.1	0.4	0.3	0.2	0.2	0.1	0.3	1.9	0.3	0.3	0.1
Reactive Phosphorus as P	mg/L	0.01						<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	-	<0.01
Phosphorus (Total)	mg/L	0.01		0.02				<0.01	0.06	0.01	0.02	0.03	<0.01	0.02	0.10	0.01	<0.01	<0.01
Metals																		
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}		<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001
Barium (filtered)	mg/L	0.001	2					0.043	0.0477	0.0082	0.006	0.014	0.011	0.040	0.0108	0.0139	0.008	0.025*
Beryllium (filtered)	mg/L	0.001	0.06					<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34		<0.05	<0.005	0.009	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.05	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006		<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}		<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	0.0003	0.0002	<0.001	<0.001
Cobalt (filtered)	mg/L	0.001						<0.001	0.0001	0.0001	<0.001	<0.001	<0.001	<0.001	0.0003	0.0009	<0.001	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001		<0.001	0.0006	<0.0005	<0.001	<0.001	0.001	<0.001	0.0017	0.0009	<0.001	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001		<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.0001	<0.0001	<0.001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2		0.001	0.0018	0.0020	0.001	0.029	0.004	0.004	0.0048	0.0300	0.001	0.006*
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006		<0.0001	<0.00004	<0.00004	-	-	<0.0001	<0.0001	<0.00004	<0.00004	-	<0.0001
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008		<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	0.0005	0.0006	<0.001	<0.001
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005		<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01
Vanadium (filtered)	mg/L	0.01						<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	0.0007	0.0004	<0.01	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024		0.016	0.02	<0.001	<0.005	<0.005	<0.005	0.018	0.002	0.004	<0.005	<0.005
BTEXN																		
Benzene	µg/L	1	1		950	600		<1	-	-	-	-	<1	<1	-	-	-	<1
Toluene	µg/L	2	800		180	110		<2	-	-	-	-	<2	<2	-	-	-	<2
Ethylbenzene	µg/L	2	300		80	50		<2	-	-	-	-	<2	<2	-	-	-	<2
Xylene (o)	µg/L	2			350	200		<2	-	-	-	-	<2	<2	-	-	-	<2
Xylene (m & p)	µg/L	2						<2	-	-	-	-	<2	<2	-	-	-	<2
Xylene Total	µg/L	2	600					<2	-	-	-	-	<2	<2	-	-	-	<2
BTEX (Sum of Total) - Lab Calc	µg/L	1						<1	-	-	-	-	<1	<1	-	-	-	<1
Naphthalene	µg/L	0.004			16	2.5		<0.004	-	-	-	-	<5	<0.004	-	-	-	<0.004
TRH - NEPM 2013																		
F1 (C6-C10 minus BTEX)	µg/L	20						<20	-	-	-	-	<20	<20	-	-	-	<20
C6-C10 Fraction	µg/L	20						<20	-	-	-	-	<20	<20	-	-	-	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100						<100	-	-	-	-	<100	<100	-	-	-	<100
>C10-C16 Fraction	µg/L	100						<100	-	-	-	-	<100	<100	-	-	-	<100
F3 (>C16-C34 Fraction)	µg/L	100						<100	-	-	-	-	<100	<100	-	-	-	<100
F4 (>C34-C40 Fraction)	µg/L	100						<100	-	-	-	-	<100	<100	-	-	-	<100



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW03					SW04								
								Sample Date	03 Sep 2021	20 Sep 2021	28 Oct 2021	18 Aug 2022	09 Nov 2022	22 Sep 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	15 Aug 2022	04 Aug 2020			
								Lab Report	EP2110337	EP2111185	EP2113087	EP2210522	EP2215092	EP2010190	EP2110430	EP2111185	EP2112494	EP2210305	EP2008144			
>C10-C40 (Sum of Total)	µg/L	100							<100	-	-	-	-	-	<100	<100	-	-	-	-	-	<100
TRH - NEPM 1999																						
C6-C9 Fraction	µg/L	20							<20	-	-	-	-	-	<20	<20	-	-	-	-	-	<20
C10-C14 Fraction	µg/L	50							<50	-	-	-	-	-	<50	<50	-	-	-	-	-	<50
C15-C28 Fraction	µg/L	100							<100	-	-	-	-	-	<100	<100	-	-	-	-	-	<100
C29-C36 Fraction	µg/L	50							<50	-	-	-	-	-	<50	<50	-	-	-	-	-	<50
C10-C36 (Sum of Total)	µg/L	50							<50	-	-	-	-	-	<50	<50	-	-	-	-	-	<50
PAHs - standard 16																						
Acenaphthene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Acenaphthylene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Anthracene	µg/L	0.001			0.4	0.01			<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Benzo(a)anthracene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Benzo(b+j)fluoranthene	µg/L	0.004							<0.004	-	-	-	-	-	<0.004	-	-	-	-	-	-	<0.004
Benzo(k)fluoranthene	µg/L	0.004							<0.004	-	-	-	-	-	<0.004	-	-	-	-	-	-	<0.004
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Chrysene	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Fluoranthene	µg/L	0.001			1.4	1			<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Fluorene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Phenanthrene	µg/L	0.002			2	0.6			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Pyrene	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Sum of standard 16 PAHs	µg/L	0.001	0.01						-	-	-	-	-	-	-	-	-	-	-	-	-	-
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01						<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
PAHs - extended																						
2-methylnaphthalene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
3-methylcholanthrene	µg/L	0.004							<0.004	-	-	-	-	-	<0.004	-	-	-	-	-	-	<0.004
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Benzo(e)pyrene	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Perylene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Benzo(b+j+k)fluoranthene	µg/L	0.004							<0.004	-	-	-	-	-	<0.004	-	-	-	-	-	-	<0.004
OC Pesticides																						
4,4'-DDE	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
a-BHC	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Aldrin	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
b-BHC	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Chlordane (cis)	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
Chlordane (trans)	µg/L	0.001							<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	-	<0.001
d-BHC	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
4,4 DDD	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Dieldrin	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endosulfan I (alpha)	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endosulfan II (beta)	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endosulfan Sulfate	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endrin	µg/L	0.002			0.02	0.01			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endrin aldehyde	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Endrin ketone	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Heptachlor epoxide	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Methoxychlor	µg/L	0.002	300						<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Oxychlorane	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	-	<0.002
Explosives																						
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	-	<1.0



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW03					SW04								
								Sample Date	03 Sep 2021	20 Sep 2021	28 Oct 2021	18 Aug 2022	09 Nov 2022	22 Sep 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	15 Aug 2022	04 Aug 2020			
								Lab Report	EP2110337	EP2111185	EP2113087	EP2210522	EP2215092	EP2010190	EP2110430	EP2111185	EP2112494	EP2210305	EP2008144			
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
1,3,5-Trinitrobenzene	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
1,3-Dinitrobenzene	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
2,4,6-Trinitrotoluene	µg/L	1			140	100			<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
2,4-Dinitrotoluene	µg/L	1			65	16			<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
2,6-dinitrotoluene	µg/L	1							<2.0	-	-	-	-	-	<1.0	<2.0	-	-	-	-	<1.0	
2-Amino-4,6-DNT	µg/L	1							<2.0	-	-	-	-	-	<1.0	<2.0	-	-	-	-	<1.0	
2-Nitrotoluene	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
4-Amino,2,6-DNT	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
4-Nitrotoluene	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
HMX	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
m-Nitrotoluene	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
Nitrobenzene	µg/L	1			550	230			<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
Nitroglycerine	µg/L	5							<5	-	-	-	-	-	<5	<5	-	-	-	-	<5	
PETN	µg/L	5							<5	-	-	-	-	-	<5	<5	-	-	-	-	<5	
RDX	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
Tetryl	µg/L	1							<1.0	-	-	-	-	-	<1.0	<1.0	-	-	-	-	<1.0	
Herbicides																						
Glyphosate	µg/L	10	1,000		320	180			<10	-	-	-	-	-	<10	<10	-	-	-	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037			<5	-	-	-	-	-	<5	<5	-	-	-	-	-	
Surfactants																						
Anionic Surfactants as MBAS	µg/L	100							<100	<100	<100	-	-	-	<100	200	<100	100	-	-	-	
SVOCs																						
Coronene	µg/L	0.002							<0.002	-	-	-	-	-	<0.002	-	-	-	-	-	<0.002	
PFAS - Perfluoroalkyl Sulfonic Acids																						
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	0.0015	-	-	<0.0005	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	0.0076	-	-	<0.0005	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003							<0.0003	<0.0003	<0.0003	-	-	-	<0.0003	<0.0003	<0.0003	0.0371	-	-	<0.0003	
PFAS - Perfluoroalkyl Carboxylic Acids																						
Perfluorobutanoic acid (PFBA)	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	<0.0005	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56						<0.0005	<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	-	-	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																						
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001							<0.001	0.002	<0.001	-	-	-	<0.001	<0.001	0.003	0.084	-	-	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	0.001	-	-	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	<0.001	
PFAS - Sums																						
Sum of PFHxS and PFOS	µg/L	0.0003	0.07						<0.0003	<0.0003	<0.0003	-	-	-	<0.0003	<0.0003	<0.0003	0.0447	-	-	<0.0003	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003							<0.0003	0.0020	<0.0003	-	-	-	<0.0003	<0.0003	0.0030	0.131	-	-	<0.0003	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW05										
								Sample Date	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Jan 2021	01 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	16 Dec 2021	18 Aug 2022
								Lab Report	EP2010190	EP2011137	EP2012241	EP2013869	EP2100123	EP2110238	EP2111185	EP2112494	EP2113959	EP2115650	EP2210522
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.68	6.61	6.77*	6.96*	6.67	6.19	6.38	6.70	6.41	6.51	6.57
Electrical conductivity (lab)	µS/cm	1							305	292	290*	272	268	270	284	272	254	255	218
Turbidity	NTU	0.1							0.3	2.3	0.3*	1.0	<0.1	1.6	1.0	0.3	0.6	20.0	1.3
Total Suspended Solids	mg/L	1							<5	8	<5	<5	<5	19	2	<1	8	76	<5
Salinity	mg/L	0.00001							0.00016	0.00016	0.00014	0.00013	0.00014	0.00014	0.00015	0.00015	0.00012	0.00012	0.00010
Biological																			
E.coli	orgs/100mL	1							7	32	-	-	-	5	4	13	29	23	5
Enterococci	orgs/100mL	1							<1	1	-	-	-	1	1	1	1	8	<1
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							7	7	7	8*	8*	5	5	6	6	7	-
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Alkalinity (total as CaCO3)	mg/L	1							7	7	7	8*	8*	5	5	6	6	7	-
Hardness as CaCO3 (filtered)	mg/L	1							32	28	26	21	21	19	26	21	21	21	-
Major Ions																			
Calcium (filtered)	mg/L	1							3	3	2	2	2	1	2	2	2	2	-
Magnesium (filtered)	mg/L	1							6	5	5	4	4	4	5	4	4	4	-
Potassium (filtered)	mg/L	1							1	1	2	1	2	1	2	1	1	1	-
Sodium (filtered)	mg/L	1							50	45	52	42	42	40	44	42	40	39	-
Chloride	mg/L	1							84	90	87	75*	72*	79	78	65	82	79	-
Sulfate (filtered)	mg/L	1	500 ^{#1}						8	7	6	6	6	7	6	6	7	7	-
Cations Total	meq/L	0.01							2.84	2.54	2.82	2.28	2.31	2.14	2.48	2.28	2.19	2.15	-
Anions Total	meq/L	0.01							2.68	2.82	2.72	2.40*	2.32*	2.47	2.42	2.08	2.58	2.51	-
Ionic Balance	%	0.01							3.04	5.22	2.42*	2.54*	1.49	7.14	1.04	4.66	8.05	7.78	-
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			0.02	0.01	-	-	-	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			0.02	0.01	-	-	-	0.02	0.02	0.02	0.02	0.03	0.02
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					0.02	0.01	-	-	-	0.02	0.02	0.02	0.02	0.03	0.02
Nitrogen (Total)	mg/L	0.1		0.45					<0.1	0.2	-	-	-	1.0	0.1	<0.1	0.3	0.1	0.2
Kjeldahl Nitrogen Total	mg/L	0.1							<0.1	0.2	-	-	-	1.0	0.1	<0.1	0.3	0.1	0.2
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	-
Phosphorus (Total)	mg/L	0.01		0.02					<0.01	0.01	-	-	-	0.04	<0.01	<0.01	0.02	<0.01	<0.01
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	-	-	-	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.001
Barium (filtered)	mg/L	0.001	2						0.023	0.024	-	-	-	0.057	0.0202	0.0197	0.0224	0.0196	0.013
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	-	-	-	<0.05	<0.005	0.008	0.027	0.019	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	-	-	-	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	-	-	-	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.001
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	-	-	-	<0.001	0.0003	0.0003	0.0003	0.0002	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	-	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.003
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	-	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.006	0.004	-	-	-	0.006	0.0052	0.0056	0.0064	0.0066	0.004
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	-	-	-	<0.0001	<0.00004	<0.00004	<0.00004	<0.00004	-
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	-	-	-	<0.001	0.0005	0.0006	0.0006	<0.0005	0.002
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	-	-	-	<0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.01
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	-	-	-	<0.01	0.0002	<0.0002	<0.0002	<0.0002	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	<0.005	-	-	-	0.021	0.001	0.001	0.006	0.002	<0.005
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	-	-	-	<1	-	-	-	-	-
Toluene	µg/L	2	800		180	110			<2	<2	-	-	-	<2	-	-	-	-	-
Ethylbenzene	µg/L	2	300		80	50			<2	<2	-	-	-	<2	-	-	-	-	-
Xylene (o)	µg/L	2			350	200			<2	<2	-	-	-	<2	-	-	-	-	-
Xylene (m & p)	µg/L	2							<2	<2	-	-	-	<2	-	-	-	-	-
Xylene Total	µg/L	2	600						<2	<2	-	-	-	<2	-	-	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	-	-	-	<1	-	-	-	-	-
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	-	-	-	<0.004	-	-	-	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	-	-	-	<20	-	-	-	-	-
C6-C10 Fraction	µg/L	20							<20	<20	-	-	-	<20	-	-	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	-	-	-	<100	-	-	-	-	-
>C10-C16 Fraction	µg/L	100							<100	<100	-	-	-	<100	-	-	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	-	-	-	<100	-	-	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	-	-	-	<100	-	-	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	SW05											
								Location ID	Sample Date										
								Lab Report	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Jan 2021	01 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	16 Dec 2021	18 Aug 2022
								EP2010190	EP2011137	EP2012241	EP2013869	EP2100123	EP2110238	EP2111185	EP2112494	EP2113959	EP2115650	EP2210522	
>C10-C40 (Sum of Total)	µg/L	100						<100	<100	-	-	-	<100	-	-	-	-	-	-
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						<20	<20	-	-	-	<20	-	-	-	-	-	-
C10-C14 Fraction	µg/L	50						<50	<50	-	-	-	<50	-	-	-	-	-	-
C15-C28 Fraction	µg/L	100						<100	<100	-	-	-	<100	-	-	-	-	-	-
C29-C36 Fraction	µg/L	50						<50	<50	-	-	-	<50	-	-	-	-	-	-
C10-C36 (Sum of Total)	µg/L	50						<50	<50	-	-	-	<50	-	-	-	-	-	-
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Acenaphthylene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Anthracene	µg/L	0.001			0.4	<i>0.01</i>		<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Benz(a)anthracene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	<i>0.1</i>		<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Benzo(b+j)fluoranthene	µg/L	0.004						<0.004	<0.004	-	-	-	<0.004	-	-	-	-	-	-
Benzo(k)fluoranthene	µg/L	0.004						<0.004	<0.004	-	-	-	<0.004	-	-	-	-	-	-
Benzo(g,h,i)perylene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Chrysene	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Dibenz(a,h)anthracene	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Fluoranthene	µg/L	0.001			1.4	<i>1</i>		<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Fluorene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Phenanthrene	µg/L	0.002			2	<i>0.6</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Pyrene	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Sum of standard 16 PAHs	µg/L	0.001	0.01					<0.001	-	-	-	-	-	-	-	-	-	-	-
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					-	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
3-methylcholanthrene	µg/L	0.004						<0.004	<0.004	-	-	-	<0.004	-	-	-	-	-	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Benzo(e)pyrene	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Perylene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Benzo(b+j+k)fluoranthene	µg/L	0.004						<0.004	<0.004	-	-	-	<0.004	-	-	-	-	-	-
OC Pesticides																			
4,4'-DDE	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
a-BHC	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Aldrin	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Aldrin + Dieldrin	µg/L	0.002	0.3					<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
b-BHC	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Chlordane	µg/L	0.001	2		0.08	<i>0.03</i>		<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Chlordane (cis)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
Chlordane (trans)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	-	-	-	-	-	-
d-BHC	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
4,4 DDD	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
4,4 DDT	µg/L	0.002	9		0.01	<i>0.006</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Dieldrin	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endosulfan	µg/L	0.002	20		0.2	<i>0.03</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endosulfan I (alpha)	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endosulfan II (beta)	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endosulfan Sulfate	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endrin	µg/L	0.002			0.02	<i>0.01</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endrin aldehyde	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Endrin ketone	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
g-BHC (Lindane)	µg/L	0.002	10		0.2	<i>0.07</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Heptachlor	µg/L	0.002	0.3		0.09	<i>0.01</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Heptachlor epoxide	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Hexachlorobenzene	µg/L	0.002			0.1	<i>0.05</i>		<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Methoxychlor	µg/L	0.002	300					<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Oxychlorane	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-
Explosives																			
2,4- & 2,6-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID															
								Sample Date	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Jan 2021	01 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	16 Dec 2021	18 Aug 2022				
								Lab Report	EP2010190	EP2011137	EP2012241	EP2013869	EP2100123	EP2110238	EP2111185	EP2112494	EP2113959	EP2115650	EP2210522				
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
1,3-Dinitrobenzene	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
2,4-Dinitrotoluene	µg/L	1			65	16		<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
2,6-dinitrotoluene	µg/L	1						<1.0	<1.0	-	-	-	<2.0	-	-	-	-	-	-	-	-	-	
2-Amino-4,6-DNT	µg/L	1						<1.0	<1.0	-	-	-	<2.0	-	-	-	-	-	-	-	-	-	
2-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
4-Amino,2,6-DNT	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
4-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
HMX	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
m-Nitrotoluene	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
Nitrobenzene	µg/L	1			550	230		<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
Nitroglycerine	µg/L	5						<5	<5	-	-	-	<5	-	-	-	-	-	-	-	-	-	
PETN	µg/L	5						<5	<5	-	-	-	<5	-	-	-	-	-	-	-	-	-	
RDX	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
Tetryl	µg/L	1						<1.0	<1.0	-	-	-	<1.0	-	-	-	-	-	-	-	-	-	
Herbicides																							
Glyphosate	µg/L	10	1,000		320	180		-	<10	-	-	-	<10	-	-	-	-	-	-	-	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	<5	-	-	-	<5	-	-	-	-	-	-	-	-	-	
Surfactants																							
Anionic Surfactants as MBAS	µg/L	100						<100	<100	-	-	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
SVOCs																							
Coronene	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	
PFAS - Perfluoroalkyl Sulfonic Acids																							
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005						0.07	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003						0.07	<0.0003	<0.0003	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS - Perfluoroalkyl Carboxylic Acids																							
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	<0.0005	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56					0.56	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PFAS - Sums																							
Sum of PFHxS and PFOS	µg/L	0.0003	0.07					0.07	<0.0003	<0.0003	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	<0.0003	-	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW06										
								Sample Date	09 Nov 2022	04 Aug 2020	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	15 Aug 2022
								Lab Report	EP2215092	EP2008144	EP2010190	EP2011137	EP2012241	EP2013869	EP2110430	EP2111185	EP2112494	EP2113959	EP2210305
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.64	6.28	6.44	6.54	6.68	6.79	6.56	6.43	6.73	6.47*	6.31
Electrical conductivity (lab)	µS/cm	1							269	236	228	290	329	330	189	191	222	247*	176
Turbidity	NTU	0.1							0.2	0.3	0.2	0.4	0.2	1.0	0.2	0.4	0.2	1.0	0.2
Total Suspended Solids	mg/L	1							<5	<5	<5	<5	<5	<5	<1	<1	<1	18*	<5
Salinity	mg/L	0.00001							0.00013	0.00013	0.00012	0.00015	0.00016	0.00016	0.00010	0.00010	0.00012	0.00012	0.00008
Biological																			
E.coli	orgs/100mL	1							6	3	2	<1	-	-	2	1	<1	18	6
Enterococci	orgs/100mL	1							<1	5	1	20	-	-	<1	3	4	47	1
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							-	4	4	7	7	6	4	4	4	6	-
Alkalinity (Hydroxide as CaCO3)	mg/L	1							-	<1	<1	<1	<1	<1	<1	<1	<1	<1	-
Alkalinity (total as CaCO3)	mg/L	1							-	4	4	7	7	6	4	4	4	6	-
Hardness as CaCO3 (filtered)	mg/L	1							-	23	23	30	34	30	21	19	19	26	-
Major Ions																			
Calcium (filtered)	mg/L	1							-	1	1	2	2	2	2	1	1	2	-
Magnesium (filtered)	mg/L	1							-	5	5	6	7	6	4	4	4	5	-
Potassium (filtered)	mg/L	1							-	1	1	2	2	2	2	2	2	2	-
Sodium (filtered)	mg/L	1							-	38	36	44	56	54	28	28	33	38*	-
Chloride	mg/L	1							-	71	58	88	105	94	52	46	54	80	-
Sulfate (filtered)	mg/L	1	500 ^{#1}						-	7	7	7	7	7	8	7	7	8	-
Cations Total	meq/L	0.01							-	2.14	2.05	2.56	3.16	2.99	1.70	1.65	1.86	2.22*	-
Anions Total	meq/L	0.01							-	2.23	1.86	2.77	3.25	2.92	1.71	1.52	1.75	2.54	-
Ionic Balance	%	0.01							-	2.03	4.88	3.93	1.32	1.29	0.45	3.94	3.23	7.87	-
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			<0.01	<0.01	0.02	0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			0.03	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					0.03	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					<0.1	0.1	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Kjeldahl Nitrogen Total	mg/L	0.1							<0.1	0.1	<0.1	<0.1	-	-	<0.1	<0.1	<0.1	<0.1	<0.1
Reactive Phosphorus as P	mg/L	0.01							-	<0.01	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	<0.01	-
Phosphorus (Total)	mg/L	0.01		0.02					0.04	0.02	<0.01	<0.01	-	-	0.01	<0.01	<0.01	<0.01	<0.01
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0002	<0.0002	<0.0002	<0.001
Barium (filtered)	mg/L	0.001	2						0.020	0.013	0.012	0.023	-	-	0.038	0.0483	0.0143	0.0216*	0.011
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	<0.05	<0.05	-	-	<0.05	<0.005	0.016	0.032	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.0001	<0.00005	<0.00005	<0.00005	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0002	<0.0002	<0.0002	<0.001
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	<0.001	<0.001	-	-	<0.001	0.0001	0.0002	0.0009	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0001	<0.0001	<0.0001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.004	0.003	0.002	0.011	-	-	0.004	0.0040	0.0095	0.0430*	0.002
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			-	<0.0001	<0.0001	<0.0001	-	-	<0.0001	<0.00004	<0.00004	<0.00004	-
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	<0.001	<0.001	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.001
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	<0.01	<0.01	-	-	<0.01	<0.0002	<0.0002	<0.0002	<0.01
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	-	-	<0.01	<0.0002	<0.0002	<0.0002	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	<0.005	<0.005	<0.005	-	-	0.016	0.014	<0.001	0.002*	<0.005
BTEXN																			
Benzene	µg/L	1	1		950	600			-	<1	<1	<1	-	-	<1	-	-	-	-
Toluene	µg/L	2	800		180	110			-	<2	<2	<2	-	-	<2	-	-	-	-
Ethylbenzene	µg/L	2	300		80	50			-	<2	<2	<2	-	-	<2	-	-	-	-
Xylene (o)	µg/L	2			350	200			-	<2	<2	<2	-	-	<2	-	-	-	-
Xylene (m & p)	µg/L	2							-	<2	<2	<2	-	-	<2	-	-	-	-
Xylene Total	µg/L	2	600						-	<2	<2	<2	-	-	<2	-	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							-	<1	<1	<1	-	-	<1	-	-	-	-
Naphthalene	µg/L	0.004			16	2.5			-	<0.004	<0.004	0.020	-	-	<0.004	-	-	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							-	<20	<20	<20	-	-	<20	-	-	-	-
C6-C10 Fraction	µg/L	20							-	<20	<20	<20	-	-	<20	-	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							-	<100	<100	<100	-	-	<100	-	-	-	-
>C10-C16 Fraction	µg/L	100							-	<100	<100	<100	-	-	<100	-	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100							-	<100	<100	<100	-	-	<100	-	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100							-	<100	<100	<100	-	-	<100	-	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW06										
								Sample Date	09 Nov 2022	04 Aug 2020	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	15 Aug 2022
								Lab Report	EP2215092	EP2008144	EP2010190	EP2011137	EP2012241	EP2013869	EP2110430	EP2111185	EP2112494	EP2113959	EP2210305
>C10-C40 (Sum of Total)	µg/L	100						-	<100	<100	<100	-	-	<100	-	-	-	-	
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						-	<20	<20	<20	-	-	<20	-	-	-	-	
C10-C14 Fraction	µg/L	50						-	<50	<50	<50	-	-	<50	-	-	-	-	
C15-C28 Fraction	µg/L	100						-	<100	<100	<100	-	-	<100	-	-	-	-	
C29-C36 Fraction	µg/L	50						-	<50	<50	<50	-	-	<50	-	-	-	-	
C10-C36 (Sum of Total)	µg/L	50						-	<50	<50	<50	-	-	<50	-	-	-	-	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Acenaphthylene	µg/L	0.002						-	<0.002	<0.002	0.007	-	-	<0.002	-	-	-	-	
Anthracene	µg/L	0.001			0.4	0.01		-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Benzo(a)anthracene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1		-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Benzo(b+j)fluoranthene	µg/L	0.004						-	<0.004	<0.004	<0.004	-	-	<0.004	-	-	-	-	
Benzo(k)fluoranthene	µg/L	0.004						-	<0.004	<0.004	<0.004	-	-	<0.004	-	-	-	-	
Benzo(g,h,i)perylene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Chrysene	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Dibenz(a,h)anthracene	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Fluoranthene	µg/L	0.001			1.4	1		-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Fluorene	µg/L	0.002						-	<0.002	<0.002	0.003	-	-	<0.002	-	-	-	-	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Phenanthrene	µg/L	0.002			2	0.6		-	<0.002	<0.002	0.009	-	-	<0.002	-	-	-	-	
Pyrene	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Sum of standard 16 PAHs	µg/L	0.001	0.01					-	-	<0.001	-	-	-	-	-	-	-	-	
PAHs (Sum of total) - Lab Calc	µg/L	0.001	0.01					-	<0.001	-	0.039	-	-	<0.001	-	-	-	-	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
3-methylcholanthrene	µg/L	0.004						-	<0.004	<0.004	<0.004	-	-	<0.004	-	-	-	-	
7,12-dimethylbenz(a)anthracene	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Benzo(e)pyrene	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Perylene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Benzo(b+j+k)fluoranthene	µg/L	0.004						-	<0.004	<0.004	<0.004	-	-	<0.004	-	-	-	-	
OC Pesticides																			
4,4'-DDE	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
a-BHC	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Aldrin	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3					-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
b-BHC	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Chlordane	µg/L	0.001	2		0.08	0.03		-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Chlordane (cis)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
Chlordane (trans)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	-	-	-	-	
d-BHC	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
4,4 DDD	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
4,4 DDT	µg/L	0.002	9		0.01	0.006		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Dieldrin	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endosulfan	µg/L	0.002	20		0.2	0.03		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endosulfan I (alpha)	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endosulfan II (beta)	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endosulfan Sulfate	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endrin	µg/L	0.002			0.02	0.01		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endrin aldehyde	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Endrin ketone	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Heptachlor	µg/L	0.002	0.3		0.09	0.01		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Heptachlor epoxide	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Hexachlorobenzene	µg/L	0.002			0.1	0.05		-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Methoxychlor	µg/L	0.002	300					-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Oxychlorane	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW06												
								Sample Date	09 Nov 2022	04 Aug 2020	22 Sep 2020	13 Oct 2020	04 Nov 2020	09 Dec 2020	06 Sep 2021	20 Sep 2021	18 Oct 2021	16 Nov 2021	15 Aug 2022		
								Lab Report	EP2215092	EP2008144	EP2010190	EP2011137	EP2012241	EP2013869	EP2110430	EP2111185	EP2112494	EP2113959	EP2210305		
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
1,3-Dinitrobenzene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
2,4,6-Trinitrotoluene	µg/L	1			140	100		-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
2,4-Dinitrotoluene	µg/L	1			65	16		-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
2,6-dinitrotoluene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<2.0	-	-	-	-	-	-	-
2-Amino-4,6-DNT	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<2.0	-	-	-	-	-	-	-
2-Nitrotoluene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
4-Amino,2,6-DNT	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
4-Nitrotoluene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
HMX	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
m-Nitrotoluene	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
Nitrobenzene	µg/L	1			550	230		-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
Nitroglycerine	µg/L	5						-	<5	<5	<5	-	-	<5	-	-	-	-	-	-	-
PETN	µg/L	5						-	<5	<5	<5	-	-	<5	-	-	-	-	-	-	-
RDX	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
Tetryl	µg/L	1						-	<1.0	<1.0	<1.0	-	-	<1.0	-	-	-	-	-	-	-
Herbicides																					
Glyphosate	µg/L	10	1,000		320	180		-	-	-	<10	-	-	<10	-	-	-	-	-	-	-
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	-	-	<5	-	-	<5	-	-	-	-	-	-	-
Surfactants																					
Anionic Surfactants as MBAS	µg/L	100						-	-	<100	<100	-	-	300	<100	<100	-	-	-	-	-
SVOCs																					
Coronene	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	-	-	-	-	-	-	-
PFAS - Perfluoroalkyl Sulfonic Acids																					
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	-	<0.0003	<0.0003	<0.0003	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-
PFAS - Perfluoroalkyl Carboxylic Acids																					
Perfluorobutanoic acid (PFBA)	µg/L	0.002						-	<0.002	<0.002	<0.002	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
PFAS - Fluorotelomer Sulfonic Acids																					
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						-	<0.001	<0.001	<0.001	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
PFAS - Sums																					
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	-	<0.0003	<0.0003	<0.0003	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						-	<0.0003	<0.0003	<0.0003	-	-	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	SW07						SW08				
								Sample Date	03 Aug 2020	21 Sep 2020	01 Sep 2021	22 Sep 2021	18 Oct 2021	18 Aug 2022	22 Sep 2020	14 Oct 2020	03 Sep 2021	21 Sep 2021	16 Dec 2021
								Lab Report	EP2008094	EP2010111	EP2110238	EP2111333	EP2112494	EP2210522	EP2010190	EP2011229	EP2110337	EP2111222	EP2115650
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.75	6.67	6.69*	6.81	6.93	7.03	6.82	6.91*	6.79	6.94	7.07
Electrical conductivity (lab)	µS/cm	1							209	197	190	207	237	147	266	315*	224	237	348
Turbidity	NTU	0.1							3.0	0.8	3.2	1.5	1.1	1.7	0.7	1.9*	1.5	1.7	9.5
Total Suspended Solids	mg/L	1							<5	<5	4	<1	<1	<5	<5	<5	<1	<1	<2
Salinity	mg/L	0.00001							0.00011	0.00011	0.00010	0.00011	0.00013	0.00007	0.00014	0.00017*	0.00012	0.00013	0.00017
Biological																			
E.coli	orgs/100mL	1							<1	4	2*	45	58	11	35	82*	30	9	21
Enterococci	orgs/100mL	1							<1	22	7	12	73	12	10	24*	33	10	38
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							7	7	7*	6	8	-	7	10*	6	8	29
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							7	7	7*	6	8	-	7	10*	6	8	29
Hardness as CaCO3 (filtered)	mg/L	1							21	21	21	15	21	-	32	35*	21	21	43
Major Ions																			
Calcium (filtered)	mg/L	1							2	2	2	1	2	-	3	4*	2	2	4
Magnesium (filtered)	mg/L	1							4	4	4	3	4	-	6	6*	4	4	8
Potassium (filtered)	mg/L	1							2	1	2	1	2	-	2	2*	1	2	3
Sodium (filtered)	mg/L	1							32	32	31	30	37	-	42	46*	36	34	56
Chloride	mg/L	1							50	45	51	52	52	-	70	87*	55	62	105
Sulfate (filtered)	mg/L	1	500 ^{#1}						11	13	13*	12	13	-	9	9*	8	8	2
Cations Total	meq/L	0.01							1.87	1.85	1.83	1.63	2.09	-	2.52	2.74*	2.02	1.96	3.37
Anions Total	meq/L	0.01							1.78	1.68	1.81	1.84	1.90	-	2.30	2.84*	1.84	2.08	3.58
Ionic Balance	%	0.01							2.54	4.72	1.78*	6.04	4.82	-	4.55	1.72*	4.73	2.88	3.05
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			0.02	<0.01	<0.01	0.04	0.02	0.01	0.03	<0.01	0.02	<0.01	0.16
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			<0.01	0.02	<0.01	0.01	<0.01	0.32	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					<0.01	0.02	<0.01	0.01	<0.01	0.32	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					<0.1	<0.1	0.5	<0.1	0.1	0.4	<0.1	0.2*	0.1	0.2	0.9
Kjeldahl Nitrogen Total	mg/L	0.1							<0.1	<0.1	0.5	<0.1	0.1	0.1	<0.1	0.2*	0.1	0.2	0.9
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01
Phosphorus (Total)	mg/L	0.01		0.02					<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002
Barium (filtered)	mg/L	0.001	2						0.005	0.005	0.006	0.0052	0.0062	0.006	0.010	0.014*	0.044	0.0079	0.0201
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	<0.05	<0.005	<0.005	<0.05	<0.05	<0.05	<0.05	<0.005	0.023
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.0002	0.0046
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.0003
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.003	0.002	0.020	0.0025	0.0128	0.005	0.017	0.074*	0.009	0.0134	1.07
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	-	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	0.0002	0.0007
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	<0.005	<0.005	<0.001	<0.001	<0.005	<0.005	<0.005	0.017	0.001	0.001
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	<1	-	-	-	<1	<1	<1	-	-
Toluene	µg/L	2	800		180	110			<2	<2	<2	-	-	-	<2	<2	<2	-	-
Ethylbenzene	µg/L	2	300		80	50			<2	<2	<2	-	-	-	<2	<2	<2	-	-
Xylene (o)	µg/L	2			350	200			<2	<2	<2	-	-	-	<2	<2	<2	-	-
Xylene (m & p)	µg/L	2							<2	<2	<2	-	-	-	<2	<2	<2	-	-
Xylene Total	µg/L	2	600						<2	<2	<2	-	-	-	<2	<2	<2	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	<1	-	-	-	<1	<1	<1	-	-
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	<0.004	-	-	-	<0.004	<5	<0.004	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	<20	-	-	-	<20	<20	<20	-	-
C6-C10 Fraction	µg/L	20							<20	<20	<20	-	-	-	<20	<20	<20	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-
>C10-C16 Fraction	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-



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								Sample Date	03 Aug 2020	21 Sep 2020	01 Sep 2021	22 Sep 2021	18 Oct 2021	18 Aug 2022	22 Sep 2020	14 Oct 2020	03 Sep 2021	21 Sep 2021	16 Dec 2021
								Lab Report	EP2008094	EP2010111	EP2110238	EP2111333	EP2112494	EP2210522	EP2010190	EP2011229	EP2110337	EP2111222	EP2115650
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	<20	-	-	-	<20	<20	<20	-	-
C10-C14 Fraction	µg/L	50							<50	<50	<50	-	-	-	<50	<50	<50	-	-
C15-C28 Fraction	µg/L	100							<100	<100	<100	-	-	-	<100	<100	<100	-	-
C29-C36 Fraction	µg/L	50							<50	<50	<50	-	-	-	<50	<50	<50	-	-
C10-C36 (Sum of Total)	µg/L	50							<50	<50	<50	-	-	-	<50	<50	<50	-	-
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Acenaphthylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Anthracene	µg/L	0.001			0.4	0.01			<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	-	<0.004	-	-
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	-	<0.004	-	-
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Chrysene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Fluoranthene	µg/L	0.001			1.4	1			<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Fluorene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Phenanthrene	µg/L	0.002			2	0.6			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Pyrene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Sum of standard 16 PAHs	µg/L	0.001	0.01						-	<0.001	-	-	-	-	<0.001	-	-	-	-
PAHs (Sum of total) - Lab Calc	µg/L	0.001	0.01						<0.001	-	<0.001	-	-	-	<0.001	-	<0.001	-	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	-	<0.004	-	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Perylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	-	<0.004	-	-
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
a-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Aldrin	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
b-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	-	<0.001	-	-
d-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
4,4 DDD	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Dieldrin	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endrin	µg/L	0.002			0.02	0.01			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Endrin ketone	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Oxychlordane	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-
Explosives																			
2,4- & 2,6-DNT (Isomeric Mixture)	µg/L	1							<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-



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								Lab Report	EP2008094	EP2010111	EP2110238	EP2111333	EP2112494	EP2210522	EP2010190	EP2011229	EP2110337	EP2111222	EP2115650
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
1,3-Dinitrobenzene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
2,4-Dinitrotoluene	µg/L	1			65	16		<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
2,6-dinitrotoluene	µg/L	1						<1.0	<1.0	<2.0	-	-	-	<1.0	-	<2.0	-	-	
2-Amino-4,6-DNT	µg/L	1						<1.0	<1.0	<2.0	-	-	-	<1.0	-	<2.0	-	-	
2-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
4-Amino,2,6-DNT	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
4-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
HMX	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
m-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
Nitrobenzene	µg/L	1			550	230		<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
Nitroglycerine	µg/L	5						<5	<5	<5	-	-	-	<5	-	<5	-	-	
PETN	µg/L	5						<5	<5	<5	-	-	-	<5	-	<5	-	-	
RDX	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
Tetryl	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	-	<1.0	-	-	
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	-	<10	-	-	-	-	-	<10	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	-	<5	-	-	-	-	-	<5	-	-	
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						-	<100	100*	<100	<100	-	<100	-	<100	<100	-	
SVOCs																			
Coronene	µg/L	0.002						<0.002	<0.002	<0.002	-	-	-	<0.002	-	<0.002	-	-	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	0.0051	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	0.0046	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	0.007	<0.001	<0.001	<0.001	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	0.0097	<0.0003	<0.0003	<0.0003	<0.0003	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-	0.0178	<0.0003	<0.0003	<0.0003	<0.0003	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	TN01					TN14					
								Sample Date	21 Sep 2020	03 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	05 Aug 2020	21 Sep 2020	12 Oct 2020	04 Nov 2020	09 Dec 2020	01 Sep 2021
								Lab Report	EP2010111	EP2110337	EP2111222	EP2112494	EP2210305	EP2008205	EP2010111	EP2011108	EP2012241	EP2013869	EP2110238
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.98	6.97	7.02	6.88	6.75	5.99	6.65	6.31	6.65	6.47	6.50
Electrical conductivity (lab)	µS/cm	1							218	187	235	267	169	230	218	348	400	473	179
Turbidity	NTU	0.1							0.6	1.2	1.1	0.5	0.4	0.6	0.5	1.4	1.7	1.5	1.4*
Total Suspended Solids	mg/L	1							<5	<1	2	<1	<5	<5	<5	<5	<5	<5	<1
Salinity	mg/L	0.00001							0.00012	0.00010	0.00013	0.00014	0.00008	0.00012	0.00012	0.00019	0.00020	0.00024	0.00010
Biological																			
E.coli	orgs/100mL	1							49	26	14	10	26	1	15	<1	-	-	14
Enterococci	orgs/100mL	1							51	37	<1	<1	8	1	12	<1	-	-	41
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							9	8	9	11	-	3	7	6	7	3	5
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							9	8	9	11	-	3	7	6	7	3	5
Hardness as CaCO3 (filtered)	mg/L	1							26	21	21	26	-	28	26	43	43	51	21
Major Ions																			
Calcium (filtered)	mg/L	1							2	2	2	2	-	3	2	4	4	4	2
Magnesium (filtered)	mg/L	1							5	4	4	5	-	5	5	8	8	10	4
Potassium (filtered)	mg/L	1							1	1	1	2	-	<1	1	1	2	2	1
Sodium (filtered)	mg/L	1							34	29	34	40	-	34	35	49	64	68	29
Chloride	mg/L	1							54	43	58	60	-	59	55	102	115	136	46
Sulfate (filtered)	mg/L	1	500 ^{#1}						10	9	10	8	-	15	10	21	19	27	12
Cations Total	meq/L	0.01							2.02	1.72	1.93	2.30	-	2.04	2.06	3.01	3.69	4.03	1.72
Anions Total	meq/L	0.01							1.91	1.56	2.02	2.08	-	2.04	1.90	3.43	3.78	4.46	1.65
Ionic Balance	%	0.01							2.66	4.76	2.29	5.10	-	0.09	4.04	6.50	1.16	5.03	2.04
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			<0.01	<0.01	<0.01	0.01	<0.01	0.02	<0.01	0.01	-	-	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01	-	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	-	-	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					0.1	0.2	0.1	0.1	0.1	0.1	<0.1	<0.1	-	-	0.2
Kjeldahl Nitrogen Total	mg/L	0.1							0.1	0.2	0.1	0.1	0.1	0.1	<0.1	<0.1	-	-	0.2
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	-	<0.01
Phosphorus (Total)	mg/L	0.01		0.02					0.01	<0.01	<0.01	0.01	0.01	0.02	<0.01	0.01	-	-	0.01
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Barium (filtered)	mg/L	0.001	2						0.007	0.043	0.0090	0.0121	0.006	0.014	0.008	0.024	-	-	0.041
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	-	-	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	0.0001	0.0010	<0.001	0.004	<0.001	0.006	-	-	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	-	-	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.002	0.009	0.0072	0.0438	0.002	0.035	0.004	0.063	-	-	0.004
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	<0.00004	<0.00004	-	<0.0001	<0.0001	<0.0001	-	-	<0.0001
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	<0.0005	<0.0005	<0.001	0.002	<0.001	0.002	-	-	<0.001
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	-	-	<0.01
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	-	-	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	0.014	<0.001	0.001	<0.005	0.005	<0.005	0.006	-	-	0.013
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	-	-	-	<1	<1	<1	-	-	<1
Toluene	µg/L	2	800		180	110			<2	<2	-	-	-	<2	<2	<2	-	-	<2
Ethylbenzene	µg/L	2	300		80	50			<2	<2	-	-	-	<2	<2	<2	-	-	<2
Xylene (o)	µg/L	2			350	200			<2	<2	-	-	-	<2	<2	<2	-	-	<2
Xylene (m & p)	µg/L	2							<2	<2	-	-	-	<2	<2	<2	-	-	<2
Xylene Total	µg/L	2	600						<2	<2	-	-	-	<2	<2	<2	-	-	<2
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	-	-	-	<1	<1	<1	-	-	<1
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	<0.004
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	-	-	-	<20	<20	<20	-	-	<20
C6-C10 Fraction	µg/L	20							<20	<20	-	-	-	<20	<20	<20	-	-	<20
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100
>C10-C16 Fraction	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	TN01					TN14					
								Sample Date	21 Sep 2020	03 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	05 Aug 2020	21 Sep 2020	12 Oct 2020	04 Nov 2020	09 Dec 2020	01 Sep 2021
								Lab Report	EP2010111	EP2110337	EP2111222	EP2112494	EP2210305	EP2008205	EP2010111	EP2011108	EP2012241	EP2013869	EP2110238
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	-	-	-	<20	<20	<20	-	-	<20
C10-C14 Fraction	µg/L	50							<50	<50	-	-	-	<50	<50	<50	-	-	<50
C15-C28 Fraction	µg/L	100							<100	<100	-	-	-	<100	<100	<100	-	-	<100
C29-C36 Fraction	µg/L	50							<50	<50	-	-	-	<50	<50	<50	-	-	<50
C10-C36 (Sum of Total)	µg/L	50							<50	<50	-	-	-	<50	<50	<50	-	-	<50
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Acenaphthylene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Anthracene	µg/L	0.001			0.4	<i>0.01</i>			<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	<i>0.1</i>			<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	<0.004
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	<0.004
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Chrysene	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Fluoranthene	µg/L	0.001			1.4	<i>1</i>			<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Fluorene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Phenanthrene	µg/L	0.002			2	<i>0.6</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Pyrene	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Sum of standard 16 PAHs	µg/L	0.001	0.01						<0.001	-	-	-	-	<0.001	<0.001	-	-	-	-
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01						-	<0.001	-	-	-	<0.001	-	<0.001	-	-	<0.001
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	<0.004
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Perylene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	-	-	-	<0.004	<0.004	<0.004	-	-	<0.004
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
a-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Aldrin	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
b-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Chlordane	µg/L	0.001	2		0.08	<i>0.03</i>			<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	-	-	-	<0.001	<0.001	<0.001	-	-	<0.001
d-BHC	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
4,4 DDD	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
4,4 DDT	µg/L	0.002	9		0.01	<i>0.006</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Dieldrin	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan	µg/L	0.002	20		0.2	<i>0.03</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endrin	µg/L	0.002			0.02	<i>0.01</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Endrin ketone	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
g-BHC (Lindane)	µg/L	0.002	10		0.2	<i>0.07</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Heptachlor	µg/L	0.002	0.3		0.09	<i>0.01</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Hexachlorobenzene	µg/L	0.002			0.1	<i>0.05</i>			<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Oxychlorane	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	TN01					TN14					
								Sample Date	21 Sep 2020	03 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022	05 Aug 2020	21 Sep 2020	12 Oct 2020	04 Nov 2020	09 Dec 2020	01 Sep 2021
								Lab Report	EP2010111	EP2110337	EP2111222	EP2112494	EP2210305	EP2008205	EP2010111	EP2011108	EP2012241	EP2013869	EP2110238
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
1,3,5-Trinitrobenzene	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
1,3-Dinitrobenzene	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
2,4,6-Trinitrotoluene	µg/L	1			140	100			<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
2,4-Dinitrotoluene	µg/L	1			65	16			<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
2,6-dinitrotoluene	µg/L	1							<1.0	<2.0	-	-	-	<1.0	<1.0	<1.0	-	-	<2.0
2-Amino-4,6-DNT	µg/L	1							<1.0	<2.0	-	-	-	<1.0	<1.0	<1.0	-	-	<2.0
2-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
4-Amino,2,6-DNT	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
4-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
HMX	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
m-Nitrotoluene	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
Nitrobenzene	µg/L	1			550	230			<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
Nitroglycerine	µg/L	5							<5	<5	-	-	-	<5	<5	<5	-	-	<5
PETN	µg/L	5							<5	<5	-	-	-	<5	<5	<5	-	-	<5
RDX	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
Tetryl	µg/L	1							<1.0	<1.0	-	-	-	<1.0	<1.0	<1.0	-	-	<1.0
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180			-	<10	-	-	-	-	-	<10	-	-	<10
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037			-	<5	-	-	-	-	-	<5	-	-	<5
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100							<100	<100	<100	200	-	-	<100	<100	-	-	<100
SVOCs																			
Coronene	µg/L	0.002							<0.002	<0.002	-	-	-	<0.002	<0.002	<0.002	-	-	<0.002
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07		<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07		<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-	-	<0.0003
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002							<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	-	<0.002
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005							<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56		<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	-	-	<0.0005
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	-	<0.001
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	-	<0.001
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	-	<0.001
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001							<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	-	-	<0.001
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07		<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-	-	<0.0003
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003							<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	-	-	<0.0003

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID										
								Sample Date	21 Sep 2021	28 Oct 2021	16 Dec 2021	18 Aug 2022	TN34					
								Lab Report	EP2111222	EP2113087	EP2115650	EP2210522	05 Aug 2020	21 Sep 2020	12 Oct 2020	06 Sep 2021	21 Sep 2021	18 Oct 2021
Inorganics																		
pH (Lab)	pH units	0.01		6.5-8				6.99	7.15	6.60	6.99	6.92	6.96	7.01	7.12	7.04	6.95	6.86
Electrical conductivity (lab)	µS/cm	1						206	208	499*	137	263	239	284	216	229	264	194
Turbidity	NTU	0.1						0.9	0.6	1.3	1.1	0.2	0.9	0.4	0.4	1.2	0.4	0.4
Total Suspended Solids	mg/L	1						<1	<1	<1	<5	<5	<5	<5	3	<1	<1	<5
Salinity	mg/L	0.00001						0.00011	0.00011	0.00024*	0.00006	0.00014	0.00013	0.00015	0.00012	0.00012	0.00014	0.00009
Biological																		
E.coli	orgs/100mL	1						9	36	8	13	14	12	2	7	2	14	7
Enterococci	orgs/100mL	1						4	41	1	16	<1	17	3	1	<1	5	7
Acidity & Alkalinity																		
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1	<1	<1	-	<1	<1	<1	<1	<1	<1	-
Alkalinity (Bicarbonate as CaCO3)	mg/L	1						7	8	5	-	7	8	8	7	7	6	-
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1	<1	<1	-	<1	<1	<1	<1	<1	<1	-
Alkalinity (total as CaCO3)	mg/L	1						7	8	5	-	7	8	8	7	7	6	-
Hardness as CaCO3 (filtered)	mg/L	1						21	21	58	-	26	26	30	21	21	26	-
Major Ions																		
Calcium (filtered)	mg/L	1						2	2	5	-	2	2	2	2	2	2	-
Magnesium (filtered)	mg/L	1						4	4	11	-	5	5	6	4	4	5	-
Potassium (filtered)	mg/L	1						1	1	2	-	1	2	2	2	2	2	-
Sodium (filtered)	mg/L	1						30	33	74	-	39	38	42	33	34	39	-
Chloride	mg/L	1						50	50	156*	-	72	60	83	59	58	61	-
Sulfate (filtered)	mg/L	1	500 ^{#1}					10	8	22	-	11	10	13	10	10	11	-
Cations Total	meq/L	0.01						1.76	1.89	4.42	-	2.23	2.22	2.47	1.92	1.96	2.26	-
Anions Total	meq/L	0.01						1.76	1.74	4.94*	-	2.40	2.06	2.77	2.01	1.98	2.07	-
Ionic Balance	%	0.01						0.03	4.22	6.55*	-	3.60	3.62	5.72	2.46	0.64	4.37	-
Nutrients																		
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}		<0.01	0.09	<0.01	<0.01	0.02	0.03	0.02	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}		<0.01	<0.01	<0.01	0.02	0.02	0.03	0.01	0.04	0.03	<0.01	0.06
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}				<0.01	<0.01	<0.01	0.02	0.02	0.03	0.01	0.04	0.03	<0.01	0.06
Nitrogen (Total)	mg/L	0.1		0.45				0.1	0.3	0.7	0.2	0.1	<0.1	<0.1	0.1	0.1	0.1	0.2
Kjeldahl Nitrogen Total	mg/L	0.1						0.1	0.3	0.7	0.2	0.1	<0.1	<0.1	0.1	0.1	0.1	0.1
Reactive Phosphorus as P	mg/L	0.01						<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Phosphorus (Total)	mg/L	0.01		0.02				<0.01	<0.01	0.02	<0.01	0.03	<0.01	0.01	0.01	<0.01	<0.01	<0.01
Metals																		
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}		<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002
Barium (filtered)	mg/L	0.001	2					0.0080	0.0078	0.0318	0.004	0.012	0.011	0.014	0.046	0.0115	0.0118	0.009
Beryllium (filtered)	mg/L	0.001	0.06					<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001
Boron (filtered)	mg/L	0.05	4		0.94	0.34		<0.005	0.006	0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.005	<0.05
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006		<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}		<0.0002	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001
Cobalt (filtered)	mg/L	0.001						0.0003	0.0002	0.0017	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0001	<0.001
Copper (filtered)	mg/L	0.001	2		0.0014	0.001		<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001		<0.0001	0.0002	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2		0.0044	0.0040	0.0491	0.002	0.002	0.003	0.009	0.004	0.0040	0.0055	0.001
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006		<0.00004	<0.00004	<0.00004	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	-
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008		<0.0005	<0.0005	0.0010	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005		<0.0002	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01
Vanadium (filtered)	mg/L	0.01						0.0002	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01
Zinc (filtered)	mg/L	0.005			0.008	0.0024		<0.001	0.001	0.002	<0.005	<0.005	<0.005	<0.005	0.016	<0.001	<0.001	<0.005
BTEXN																		
Benzene	µg/L	1	1		950	600		-	-	-	-	<1	<1	<1	<1	-	-	-
Toluene	µg/L	2	800		180	110		-	-	-	-	<2	<2	<2	<2	-	-	-
Ethylbenzene	µg/L	2	300		80	50		-	-	-	-	<2	<2	<2	<2	-	-	-
Xylene (o)	µg/L	2			350	200		-	-	-	-	<2	<2	<2	<2	-	-	-
Xylene (m & p)	µg/L	2						-	-	-	-	<2	<2	<2	<2	-	-	-
Xylene Total	µg/L	2	600					-	-	-	-	<2	<2	<2	<2	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1						-	-	-	-	<1	<1	<1	<1	-	-	-
Naphthalene	µg/L	0.004			16	2.5		-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-
TRH - NEPM 2013																		
F1 (C6-C10 minus BTEX)	µg/L	20						-	-	-	-	<20	<20	<20	<20	-	-	-
C6-C10 Fraction	µg/L	20						-	-	-	-	<20	<20	<20	<20	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-
>C10-C16 Fraction	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID											
								Sample Date	21 Sep 2021	28 Oct 2021	16 Dec 2021	18 Aug 2022	TN34						
								Lab Report	EP2111222	EP2113087	EP2115650	EP2210522	05 Aug 2020	21 Sep 2020	12 Oct 2020	06 Sep 2021	21 Sep 2021	18 Oct 2021	15 Aug 2022
													EP2008205	EP2010111	EP2011108	EP2110430	EP2111222	EP2112494	EP2210305
>C10-C40 (Sum of Total)	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-	
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						-	-	-	-	<20	<20	<20	<20	-	-	-	
C10-C14 Fraction	µg/L	50						-	-	-	-	<50	<50	<50	<50	-	-	-	
C15-C28 Fraction	µg/L	100						-	-	-	-	<100	<100	<100	<100	-	-	-	
C29-C36 Fraction	µg/L	50						-	-	-	-	<50	<50	<50	<50	-	-	-	
C10-C36 (Sum of Total)	µg/L	50						-	-	-	-	<50	<50	<50	<50	-	-	-	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Acenaphthylene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Anthracene	µg/L	0.001			0.4	<i>0.01</i>		-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Benzo(a)anthracene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	<i>0.1</i>		-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Benzo(b+j)fluoranthene	µg/L	0.004						-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-	
Benzo(k)fluoranthene	µg/L	0.004						-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-	
Benzo(g,h,i)perylene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Chrysene	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Dibenz(a,h)anthracene	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Fluoranthene	µg/L	0.001			1.4	<i>1</i>		-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Fluorene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Phenanthrene	µg/L	0.002			2	<i>0.6</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Pyrene	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Sum of standard 16 PAHs	µg/L	0.001	0.01					-	-	-	-	-	<0.001	<0.001	-	-	-	-	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					-	-	-	-	<0.001	-	<0.001	<0.001	-	-	-	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
3-methylcholanthrene	µg/L	0.004						-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-	
7,12-dimethylbenz(a)anthracene	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Benzo(e)pyrene	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Perylene	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Benzo(b+j+k)fluoranthene	µg/L	0.004						-	-	-	-	<0.004	<0.004	<0.004	<0.004	-	-	-	
OC Pesticides																			
4,4'-DDE	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
a-BHC	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Aldrin	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
b-BHC	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Chlordane	µg/L	0.001	2		0.08	<i>0.03</i>		-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Chlordane (cis)	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
Chlordane (trans)	µg/L	0.001						-	-	-	-	<0.001	<0.001	<0.001	<0.001	-	-	-	
d-BHC	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
4,4 DDD	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
4,4 DDT	µg/L	0.002	9		0.01	<i>0.006</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Dieldrin	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endosulfan	µg/L	0.002	20		0.2	<i>0.03</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endosulfan I (alpha)	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endosulfan II (beta)	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endosulfan Sulfate	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endrin	µg/L	0.002			0.02	<i>0.01</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endrin aldehyde	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Endrin ketone	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
g-BHC (Lindane)	µg/L	0.002	10		0.2	<i>0.07</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Heptachlor	µg/L	0.002	0.3		0.09	<i>0.01</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Heptachlor epoxide	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Hexachlorobenzene	µg/L	0.002			0.1	<i>0.05</i>		-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Methoxychlor	µg/L	0.002	300					-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Oxychlordane	µg/L	0.002						-	-	-	-	<0.002	<0.002	<0.002	<0.002	-	-	-	
Explosives																			
2,4- & 2,6-DNT(Isomeric Mixture)	µg/L	1						-	-	-	-	<1.0	<1.0	<1.0	<1.0	-	-	-	



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID								
								Sample Date	21 Sep 2021	28 Oct 2021	16 Dec 2021	18 Aug 2022	TN34			
								Lab Report	EP2111222	EP2113087	EP2115650	EP2210522	05 Aug 2020	21 Sep 2020	12 Oct 2020	06 Sep 2021
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
1,3,5-Trinitrobenzene	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
1,3-Dinitrobenzene	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
2,4,6-Trinitrotoluene	µg/L	1			140	100				<1.0	<1.0	<1.0	<1.0	-	-	-
2,4-Dinitrotoluene	µg/L	1			65	16				<1.0	<1.0	<1.0	<1.0	-	-	-
2,6-dinitrotoluene	µg/L	1								<1.0	<1.0	<1.0	<2.0	-	-	-
2-Amino-4,6-DNT	µg/L	1								<1.0	<1.0	<1.0	<2.0	-	-	-
2-Nitrotoluene	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
4-Amino,2,6-DNT	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
4-Nitrotoluene	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
HMX	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
m-Nitrotoluene	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
Nitrobenzene	µg/L	1			550	230				<1.0	<1.0	<1.0	<1.0	-	-	-
Nitroglycerine	µg/L	5								<5	<5	<5	<5	-	-	-
PETN	µg/L	5								<5	<5	<5	<5	-	-	-
RDX	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
Tetryl	µg/L	1								<1.0	<1.0	<1.0	<1.0	-	-	-
Herbicides																
Glyphosate	µg/L	10	1,000		320	180				-	-	<10	<10	-	-	-
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037				-	-	<5	<5	-	-	-
Surfactants																
Anionic Surfactants as MBAS	µg/L	100								<100	<100	-	100	<100	<100	-
SVOCs																
Coronene	µg/L	0.002								<0.002	<0.002	<0.002	<0.002	-	-	-
PFAS - Perfluoroalkyl Sulfonic Acids																
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005								<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07			<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-
PFAS - Perfluoroalkyl Carboxylic Acids																
Perfluorobutanoic acid (PFBA)	µg/L	0.002								<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005								<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005								<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005								<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56			<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
PFAS - Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001								<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001								<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001								<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001								<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
PFAS - Sums																
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07			<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003								<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	WG42					WG54					
								Sample Date	21 Sep 2020	12 Oct 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	15 Aug 2022	21 Sep 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	16 Nov 2021
								Lab Report	EP2010111	EP2011108	EP2110238	EP2111185	EP2112683	EP2210305	EP2010111	EP2110238	EP2111185	EP2112683	EP2113959
Inorganics																			
pH (Lab)	pH units	0.01		6.5-8					6.53	6.65	6.34	6.38*	6.73*	6.30	6.59	6.61	6.69	6.90	6.60
Electrical conductivity (lab)	µS/cm	1							219	233	197	206	207*	272	263	165	176	250	311
Turbidity	NTU	0.1							0.2	0.2	1.0	0.4	0.4*	0.1	0.2	1.3	0.7	0.6	0.4
Total Suspended Solids	mg/L	1							<5	<5	<1	<1	<1	<5	6	4	<1	<1	<1
Salinity	mg/L	0.00001							0.00012	0.00012	0.00011	0.00011	0.00010	0.00013	0.00014	0.00009	0.00009	0.00012	0.00015
Biological																			
E.coli	orgs/100mL	1							7	8	<1	1*	22*	3	1	45	2	38	18
Enterococci	orgs/100mL	1							2	9	4	2	7	3	12	14	7	23	11
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1							5	6	5	4	6*	-	9	5	5	7	11
Alkalinity (Hydroxide as CaCO3)	mg/L	1							<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1
Alkalinity (total as CaCO3)	mg/L	1							5	6	5	4	6*	-	9	5	5	7	11
Hardness as CaCO3 (filtered)	mg/L	1							21	21	21	15	15	-	30	8	15	21	30
Major Ions																			
Calcium (filtered)	mg/L	1							2	2	2	1	1	-	2	<1	1	2	2
Magnesium (filtered)	mg/L	1							4	4	4	3	3	-	6	2	3	4	6
Potassium (filtered)	mg/L	1							1	1	<1	1	1	-	2	<1	<1	2	2
Sodium (filtered)	mg/L	1							35	35	33	31	32*	-	42	26	28	39	55
Chloride	mg/L	1							60	71	56	54	60	-	70	39	41	72	94
Sulfate (filtered)	mg/L	1	500 ^{#1}						6	6	7	5	6	-	10	11	8	9	12
Cations Total	meq/L	0.01							1.98	1.98	1.86	1.71*	1.71*	-	2.47	1.30	1.51	2.18	3.04
Anions Total	meq/L	0.01							1.92	2.25	1.82	1.71	1.92	-	2.36	1.43	1.42	2.36	3.12
Ionic Balance	%	0.01							1.53	6.40	1.06	1.08	6.87	-	2.26	4.90	3.12	4.01	1.36
Nutrients																			
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}			<0.01	0.04	<0.01	<0.01	0.01*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}			0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.04	<0.01
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}					0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.04	<0.01
Nitrogen (Total)	mg/L	0.1		0.45					<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.2	<0.1	<0.1	0.1
Kjeldahl Nitrogen Total	mg/L	0.1							<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.2	<0.1	<0.1	0.1
Reactive Phosphorus as P	mg/L	0.01							<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01
Phosphorus (Total)	mg/L	0.01		0.02					<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.02
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}			<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002
Barium (filtered)	mg/L	0.001	2						0.010	0.012	0.047	0.0455	0.0107	0.013	0.012	0.036	0.0074	0.0101	0.0157
Beryllium (filtered)	mg/L	0.001	0.06						<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001
Boron (filtered)	mg/L	0.05	4		0.94	0.34			<0.05	<0.05	<0.05	<0.005	0.005	<0.05	<0.05	<0.05	<0.005	0.009	0.039
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006			<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}			<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0002
Cobalt (filtered)	mg/L	0.001							<0.001	<0.001	<0.001	0.0001	0.0001	<0.001	<0.001	<0.001	<0.0001	0.0001	0.0005
Copper (filtered)	mg/L	0.001	2		0.0014	0.001			<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001			<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2			0.002	0.004	0.002	0.0023	0.0030	0.002	0.008	0.002	0.0012	0.0025	0.0267
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006			<0.0001	<0.0001	<0.0001	<0.00004	<0.00004	-	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008			<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005			<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.0002
Vanadium (filtered)	mg/L	0.01							<0.01	<0.01	<0.01	<0.0002	<0.0002	<0.01	<0.01	<0.01	<0.0002	<0.0002	0.0003
Zinc (filtered)	mg/L	0.005			0.008	0.0024			<0.005	<0.005	0.022	0.015	<0.001	<0.005	<0.005	0.017	0.002	<0.001	<0.001
BTEXN																			
Benzene	µg/L	1	1		950	600			<1	<1	<1	-	-	-	<1	<1	-	-	-
Toluene	µg/L	2	800		180	110			<2	<2	<2	-	-	-	<2	<2	-	-	-
Ethylbenzene	µg/L	2	300		80	50			<2	<2	<2	-	-	-	<2	<2	-	-	-
Xylene (o)	µg/L	2			350	200			<2	<2	<2	-	-	-	<2	<2	-	-	-
Xylene (m & p)	µg/L	2							<2	<2	<2	-	-	-	<2	<2	-	-	-
Xylene Total	µg/L	2	600						<2	<2	<2	-	-	-	<2	<2	-	-	-
BTEX (Sum of Total) - Lab Calc	µg/L	1							<1	<1	<1	-	-	-	<1	<1	-	-	-
Naphthalene	µg/L	0.004			16	2.5			<0.004	<0.004	<0.004	-	-	-	<0.004	<0.004	-	-	-
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20							<20	<20	<20	-	-	-	<20	<20	-	-	-
C6-C10 Fraction	µg/L	20							<20	<20	<20	-	-	-	<20	<20	-	-	-
F2 (>C10-C16 minus Naphthalene)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-
>C10-C16 Fraction	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-
F3 (>C16-C34 Fraction)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-
F4 (>C34-C40 Fraction)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	WG42						WG54				
								Sample Date	21 Sep 2020	12 Oct 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	15 Aug 2022	21 Sep 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	16 Nov 2021
								Lab Report	EP2010111	EP2011108	EP2110238	EP2111185	EP2112683	EP2210305	EP2010111	EP2110238	EP2111185	EP2112683	EP2113959
>C10-C40 (Sum of Total)	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20							<20	<20	<20	-	-	-	<20	<20	-	-	-
C10-C14 Fraction	µg/L	50							<50	<50	<50	-	-	-	<50	<50	-	-	-
C15-C28 Fraction	µg/L	100							<100	<100	<100	-	-	-	<100	<100	-	-	-
C29-C36 Fraction	µg/L	50							<50	<50	<50	-	-	-	<50	<50	-	-	-
C10-C36 (Sum of Total)	µg/L	50							<50	<50	<50	-	-	-	<50	<50	-	-	-
PAHs - standard 16																			
Acenaphthene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Acenaphthylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Anthracene	µg/L	0.001			0.4	0.01			<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Benzo(a)anthracene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1			<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Benzo(b)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	<0.004	-	-	-
Benzo(k)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	<0.004	-	-	-
Benzo(g,h,i)perylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Chrysene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Dibenz(a,h)anthracene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Fluoranthene	µg/L	0.001			1.4	1			<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Fluorene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Phenanthrene	µg/L	0.002			2	0.6			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Pyrene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Sum of standard 16 PAHs	µg/L	0.001	0.01						<0.001	-	-	-	-	-	<0.001	-	-	-	-
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01						-	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
3-methylcholanthrene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	<0.004	-	-	-
7,12-dimethylbenz(a)anthracene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Benzo(e)pyrene	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Perylene	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Benzo(b)+k)fluoranthene	µg/L	0.004							<0.004	<0.004	<0.004	-	-	-	<0.004	<0.004	-	-	-
OC Pesticides																			
4,4'-DDE	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
a-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Aldrin	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Aldrin + Dieldrin	µg/L	0.002	0.3						<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
b-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Chlordane	µg/L	0.001	2		0.08	0.03			<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Chlordane (cis)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
Chlordane (trans)	µg/L	0.001							<0.001	<0.001	<0.001	-	-	-	<0.001	<0.001	-	-	-
d-BHC	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
4,4 DDD	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
4,4 DDT	µg/L	0.002	9		0.01	0.006			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Dieldrin	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endosulfan	µg/L	0.002	20		0.2	0.03			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endosulfan I (alpha)	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endosulfan II (beta)	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endosulfan Sulfate	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endrin	µg/L	0.002			0.02	0.01			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endrin aldehyde	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Endrin ketone	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Heptachlor	µg/L	0.002	0.3		0.09	0.01			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Heptachlor epoxide	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Hexachlorobenzene	µg/L	0.002			0.1	0.05			<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Methoxychlor	µg/L	0.002	300						<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Oxychlordane	µg/L	0.002							<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-
Explosives																			
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1							<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	WG42					WG54						
								Location ID	21 Sep 2020	12 Oct 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	15 Aug 2022	21 Sep 2020	01 Sep 2021	20 Sep 2021	21 Oct 2021	16 Nov 2021
								Sample Date	EP2010111	EP2011108	EP2110238	EP2111185	EP2112683	EP2210305	EP2010111	EP2110238	EP2111185	EP2112683	EP2113959
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
1,3-Dinitrobenzene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
2,4-Dinitrotoluene	µg/L	1			65	16		<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
2,6-dinitrotoluene	µg/L	1						<1.0	<1.0	<2.0	-	-	-	<1.0	<2.0	-	-	-	
2-Amino-4,6-DNT	µg/L	1						<1.0	<1.0	<2.0	-	-	-	<1.0	<2.0	-	-	-	
2-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
4-Amino,2,6-DNT	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
4-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
HMX	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
m-Nitrotoluene	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
Nitrobenzene	µg/L	1			550	230		<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
Nitroglycerine	µg/L	5						<5	<5	<5	-	-	-	<5	<5	-	-	-	
PETN	µg/L	5						<5	<5	<5	-	-	-	<5	<5	-	-	-	
RDX	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
Tetryl	µg/L	1						<1.0	<1.0	<1.0	-	-	-	<1.0	<1.0	-	-	-	
Herbicides																			
Glyphosate	µg/L	10	1,000		320	180		-	<10	<10	-	-	-	<10	<10	-	-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	<5	<5	-	-	-	<5	<5	-	-	-	
Surfactants																			
Anionic Surfactants as MBAS	µg/L	100						<100	<100	200	<100	<100	-	<100	<100	<100	<100	-	
SVOCs																			
Coronene	µg/L	0.002						<0.002	<0.002	<0.002	-	-	-	<0.002	<0.002	-	-	-	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0013	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	0.0032	0.0081	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	0.0004	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	0.0038	0.0040	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	0.0004	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	0.0070	0.0121	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						0.0004	<0.0003	<0.0003	<0.0003	<0.0003	-	<0.0003	<0.0003	<0.0003	0.0070	0.0146	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
 Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
 HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID		
								Sample Date	15 Aug 2022	09 Nov 2022
								Lab Report	EP2210305	EP2215092
Inorganics										
pH (Lab)	pH units	0.01		6.5-8				6.55	6.81	
Electrical conductivity (lab)	µS/cm	1						179	266	
Turbidity	NTU	0.1						0.3	2.6	
Total Suspended Solids	mg/L	1						<5	<5	
Salinity	mg/L	0.00001						0.00008	0.00012	
Biological										
E.coli	orgs/100mL	1						3	<1	
Enterococci	orgs/100mL	1						7	20	
Acidity & Alkalinity										
Alkalinity (Carbonate as CaCO3)	mg/L	1						-	-	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1						-	-	
Alkalinity (Hydroxide as CaCO3)	mg/L	1						-	-	
Alkalinity (total as CaCO3)	mg/L	1						-	-	
Hardness as CaCO3 (filtered)	mg/L	1						-	-	
Major Ions										
Calcium (filtered)	mg/L	1						-	-	
Magnesium (filtered)	mg/L	1						-	-	
Potassium (filtered)	mg/L	1						-	-	
Sodium (filtered)	mg/L	1						-	-	
Chloride	mg/L	1						-	-	
Sulfate (filtered)	mg/L	1	500 ^{#1}					-	-	
Cations Total	meq/L	0.01						-	-	
Anions Total	meq/L	0.01						-	-	
Ionic Balance	%	0.01						-	-	
Nutrients										
Ammonia as N	mg/L	0.01		0.06	0.9 ^{#5}	0.32 ^{#5}		<0.01	<0.01	
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}		2.4 ^{#6}	1 ^{#6}		0.01	<0.01	
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}					<0.01	<0.01	
Nitrogen (Total Oxidised) (as N)	mg/L	0.01		0.2 ^{#4}				0.01	<0.01	
Nitrogen (Total)	mg/L	0.1		0.45				<0.1	0.7	
Kjeldahl Nitrogen Total	mg/L	0.1						<0.1	0.7	
Reactive Phosphorus as P	mg/L	0.01						-	-	
Phosphorus (Total)	mg/L	0.01		0.02				<0.01	0.06	
Metals										
Arsenic (filtered)	mg/L	0.001	0.01		0.013 ^{#7}	0.0008 ^{#7}		<0.001	<0.001	
Barium (filtered)	mg/L	0.001	2					0.008	0.015	
Beryllium (filtered)	mg/L	0.001	0.06					<0.001	<0.001	
Boron (filtered)	mg/L	0.05	4		0.94	0.34		<0.05	0.10	
Cadmium (filtered)	mg/L	0.0001	0.002		0.0002	0.00006		<0.0001	0.0002	
Chromium (III+VI) (filtered)	mg/L	0.001			0.001 ^{#8}	0.00001 ^{#8}		<0.001	<0.001	
Cobalt (filtered)	mg/L	0.001						<0.001	0.003	
Copper (filtered)	mg/L	0.001	2		0.0014	0.001		<0.001	0.004	
Lead (filtered)	mg/L	0.001	0.01		0.0034	0.001		<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	0.5		1.9	1.2		<0.001	0.056	
Mercury (filtered)	mg/L	0.0001	0.001		0.0006	0.00006		-	-	
Nickel (filtered)	mg/L	0.001	0.02		0.011	0.008		<0.001	0.001	
Selenium (filtered)	mg/L	0.01	0.01		0.011	0.005		<0.01	<0.01	
Vanadium (filtered)	mg/L	0.01						<0.01	<0.01	
Zinc (filtered)	mg/L	0.005			0.008	0.0024		<0.005	<0.005	
BTEXN										
Benzene	µg/L	1	1		950	600		-	-	
Toluene	µg/L	2	800		180	110		-	-	
Ethylbenzene	µg/L	2	300		80	50		-	-	
Xylene (o)	µg/L	2			350	200		-	-	
Xylene (m & p)	µg/L	2						-	-	
Xylene Total	µg/L	2	600					-	-	
BTEX (Sum of Total) - Lab Calc	µg/L	1						-	-	
Naphthalene	µg/L	0.004			16	2.5		-	-	
TRH - NEPM 2013										
F1 (C6-C10 minus BTEX)	µg/L	20						-	-	
C6-C10 Fraction	µg/L	20						-	-	
F2 (>C10-C16 minus Naphthalene)	µg/L	100						-	-	
>C10-C16 Fraction	µg/L	100						-	-	
F3 (>C16-C34 Fraction)	µg/L	100						-	-	
F4 (>C34-C40 Fraction)	µg/L	100						-	-	



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID		
								Sample Date	15 Aug 2022	09 Nov 2022
								Lab Report	EP2210305	EP2215092
>C10-C40 (Sum of Total)	µg/L	100						-	-	
TRH - NEPM 1999										
C6-C9 Fraction	µg/L	20						-	-	
C10-C14 Fraction	µg/L	50						-	-	
C15-C28 Fraction	µg/L	100						-	-	
C29-C36 Fraction	µg/L	50						-	-	
C10-C36 (Sum of Total)	µg/L	50						-	-	
PAHs - standard 16										
Acenaphthene	µg/L	0.002						-	-	
Acenaphthylene	µg/L	0.002						-	-	
Anthracene	µg/L	0.001			0.4	0.01		-	-	
Benzo(a)anthracene	µg/L	0.002						-	-	
Benzo(a)pyrene	µg/L	0.001	0.01		0.2	0.1		-	-	
Benzo(b)fluoranthene	µg/L	0.004						-	-	
Benzo(k)fluoranthene	µg/L	0.004						-	-	
Benzo(g,h,i)perylene	µg/L	0.002						-	-	
Chrysene	µg/L	0.001						-	-	
Dibenz(a,h)anthracene	µg/L	0.001						-	-	
Fluoranthene	µg/L	0.001			1.4	1		-	-	
Fluorene	µg/L	0.002						-	-	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						-	-	
Phenanthrene	µg/L	0.002			2	0.6		-	-	
Pyrene	µg/L	0.001						-	-	
Sum of standard 16 PAHs	µg/L	0.001	0.01					-	-	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					-	-	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						-	-	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						-	-	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						-	-	
PAHs - extended										
2-methylnaphthalene	µg/L	0.002						-	-	
3-methylcholanthrene	µg/L	0.004						-	-	
7,12-dimethylbenz(a)anthracene	µg/L	0.001						-	-	
Benzo(e)pyrene	µg/L	0.001						-	-	
Perylene	µg/L	0.002						-	-	
Benzo(b++k)fluoranthene	µg/L	0.004						-	-	
OC Pesticides										
4,4'-DDE	µg/L	0.002						-	-	
a-BHC	µg/L	0.002						-	-	
Aldrin	µg/L	0.001						-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	
b-BHC	µg/L	0.002						-	-	
Chlordane	µg/L	0.001	2		0.08	0.03		-	-	
Chlordane (cis)	µg/L	0.001						-	-	
Chlordane (trans)	µg/L	0.001						-	-	
d-BHC	µg/L	0.002						-	-	
4,4 DDD	µg/L	0.002						-	-	
4,4 DDT	µg/L	0.002	9		0.01	0.006		-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	
Dieldrin	µg/L	0.002						-	-	
Endosulfan	µg/L	0.002	20		0.2	0.03		-	-	
Endosulfan I (alpha)	µg/L	0.002						-	-	
Endosulfan II (beta)	µg/L	0.002						-	-	
Endosulfan Sulfate	µg/L	0.002						-	-	
Endrin	µg/L	0.002			0.02	0.01		-	-	
Endrin aldehyde	µg/L	0.002						-	-	
Endrin ketone	µg/L	0.002						-	-	
g-BHC (Lindane)	µg/L	0.002	10		0.2	0.07		-	-	
Heptachlor	µg/L	0.002	0.3		0.09	0.01		-	-	
Heptachlor epoxide	µg/L	0.002						-	-	
Hexachlorobenzene	µg/L	0.002			0.1	0.05		-	-	
Methoxychlor	µg/L	0.002	300					-	-	
Oxychlordane	µg/L	0.002						-	-	
Explosives										
2,4-& 2,6-DNT(Isomeric Mixture)	µg/L	1						-	-	



Appendix H
Myara North Surface Water Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZECC 2000 SW Aust. Upland River	ANZG (2018) - FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID		
								Sample Date	15 Aug 2022	09 Nov 2022
								Lab Report	EP2210305	EP2215092
4-& 2-AM-DNT(Isomeric Mixture)	µg/L	1						-	-	
1,3,5-Trinitrobenzene	µg/L	1						-	-	
1,3-Dinitrobenzene	µg/L	1						-	-	
2,4,6-Trinitrotoluene	µg/L	1			140	100		-	-	
2,4-Dinitrotoluene	µg/L	1			65	16		-	-	
2,6-dinitrotoluene	µg/L	1						-	-	
2-Amino-4,6-DNT	µg/L	1						-	-	
2-Nitrotoluene	µg/L	1						-	-	
4-Amino,2,6-DNT	µg/L	1						-	-	
4-Nitrotoluene	µg/L	1						-	-	
HMX	µg/L	1						-	-	
m-Nitrotoluene	µg/L	1						-	-	
Nitrobenzene	µg/L	1			550	230		-	-	
Nitroglycerine	µg/L	5						-	-	
PETN	µg/L	5						-	-	
RDX	µg/L	1						-	-	
Tetryl	µg/L	1						-	-	
Herbicides										
Glyphosate	µg/L	10	1,000		320	180		-	-	
Metsulfuron Methyl	µg/L	5	40		0.018	0.0037		-	-	
Surfactants										
Anionic Surfactants as MBAS	µg/L	100						-	-	
SVOCs										
Coronene	µg/L	0.002						-	-	
PFAS - Perfluoroalkyl Sulfonic Acids										
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						-	-	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005					0.07	-	-	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003					0.07	-	-	
PFAS - Perfluoroalkyl Carboxylic Acids										
Perfluorobutanoic acid (PFBA)	µg/L	0.002						-	-	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						-	-	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						-	-	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005						-	-	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56				0.56	-	-	
PFAS - Fluorotelomer Sulfonic Acids										
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						-	-	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						-	-	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						-	-	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						-	-	
PFAS - Sums										
Sum of PFHxS and PFOS	µg/L	0.0003	0.07				0.07	-	-	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						-	-	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- * Denotes that the duplicate results have been adopted for the purposes of the risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix L
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID		B01						B02			B03		
							Sample Date	16 Oct 2020	29 Sep 2021	16 Oct 2020	16 Feb 2021	29 Sep 2021	15 Feb 2022	12 Oct 2022	13 Feb 2023	12 Oct 2022	16 Oct 2020	16 Feb 2021	29 Sep 2021	
							Lab Report	EP2011315	EP2111637	EP2011315	EP2101562	EP2111637	EP2201800	EP2213426	EP2302008	EP2213426	EP2011315	EP2101562	EP2111637	
Inorganics																				
pH (Lab)	pH units	0.01						6.14	5.93	7.21	6.97	6.65	6.66	6.71	6.50	6.63	6.13	5.81	5.67	
Electrical conductivity (lab)	µS/cm	1						236	195	2,720	2,920	2,940	3,020	2,790	2,970	617	568	548	544	
Turbidity	NTU	0.1						519	-	144	-	-	-	-	-	-	12.2	-	-	
Total Suspended Solids	mg/L	5						597	-	287	-	-	-	-	-	-	28	-	-	
Salinity	mg/L	0.00001						0.00013	0.00010	0.00153	0.00170	0.00153	0.00157	0.00144	0.00154	0.00030	0.00031	0.00030	0.00026	
Acidity & Alkalinity																				
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1						24	22	184	135	145	141	128	129	198	42	20	16	
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (total as CaCO3)	mg/L	1						24	22	184	135	145	141	128	129	198	42	20	16	
Hardness as CaCO3 (filtered)	mg/L	1						24	21	519	494	488	473	512	502	148	81	59	58	
Major Ions																				
Calcium (filtered)	mg/L	1						3	2	127	104	98	97	101	99	28	11	7	5	
Magnesium (filtered)	mg/L	1						4	4	49	57	59	56	63	62	19	13	10	11	
Potassium (filtered)	mg/L	1						<1	<1	9	8	10	8	8	8	14	4	4	4	
Sodium (filtered)	mg/L	1						35	30	388	395	377	416	437	430	84	74	76	75	
Chloride	mg/L	1						49	42	780	806	837	884	838	854	108	148	154	161	
Sulfate (filtered)	mg/L	1	500#1					12	9	89	96	64	89	89	81	17	16	14	14	
Cations Total	meq/L	0.01						2.00	1.73	27.5	27.3	26.4	27.7	29.4	29.0	6.97	4.94	4.58	4.52	
Anions Total	meq/L	0.01						2.11	1.81	27.5	27.4	27.8	29.6	28.0	28.4	7.36	5.35	5.04	5.15	
Ionic Balance	%	0.01						2.68	2.19	0.10	0.30	2.65	3.24	2.42	1.04	2.68	3.96	4.73	6.55	
Nutrients																				
Ammonia as N	mg/L	0.01		0.9#5	0.32#5			0.03	<0.01	0.06	<0.01	0.02	0.02	0.01	0.01	0.05	0.04	<0.01	<0.01	
Nitrate (as N)	mg/L	0.01	11.29#2	2.4#6	1#6			0.02	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.17	<0.01	<0.01	
Nitrite (as N)	mg/L	0.01	0.91#3					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrogen (Total Oxidised) (as N)	mg/L	0.01						0.02	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.17	<0.01	<0.01	
Nitrogen (Total)	mg/L	0.1						0.6	0.4	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.9	0.2	<0.1	<0.1	
Kjeldahl Nitrogen Total	mg/L	0.1						0.6	0.4	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.9	<0.1	<0.1	<0.1	
Reactive Phosphorus as P	mg/L	0.01						<0.01	<0.01	0.01	<0.01	<0.01	-	-	-	-	<0.01	<0.01	<0.01	
Phosphorus (Total)	mg/L	0.01						0.23	0.24	0.02	0.03	0.02	0.14	0.04	0.16	0.79	0.02	0.01	0.01	
Metals																				
Arsenic (filtered)	mg/L	0.001	0.01	0.013#7	0.0008#7			<0.001	<0.0002	<0.001	<0.001	0.0003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	
Barium (filtered)	mg/L	0.001	2					0.006	0.0008	0.083	0.070	0.0715	0.068	0.069	0.074	0.177	0.091	0.082	0.0827	
Beryllium (filtered)	mg/L	0.001	0.06					<0.001	<0.0001	<0.001	<0.001	0.0003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	
Boron (filtered)	mg/L	0.05	4	0.94	0.34			<0.05	<0.005	0.09	0.06	0.025	0.06	<0.05	<0.05	0.07	0.06	<0.05	<0.005	
Cadmium (filtered)	mg/L	0.0001	0.002	0.0002	0.00006			<0.0001	<0.00005	<0.0001	<0.0001	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00013	
Chromium (III+VI) (filtered)	mg/L	0.001		0.001#8	0.00001#8			0.001	<0.0002	0.004	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	
Chromium (hexavalent) (filtered)	mg/L	0.01	0.05	0.001	0.00001			-	-	-	-	-	<0.001	<0.01	<0.01	<0.01	-	-	-	
Chromium (Trivalent)	mg/L	0.01						-	-	-	-	-	<0.001	-	-	-	-	-	-	
Chromium (Trivalent) (filtered)	mg/L	0.01						-	-	-	-	-	-	<0.01	<0.01	<0.01	-	-	-	
Cobalt (filtered)	mg/L	0.001						<0.001	0.0002	0.005	0.007	0.0064	0.008	0.009	0.010	0.007	0.001	0.001	0.0010	
Copper (filtered)	mg/L	0.001	2	0.0014	0.001			<0.001	0.0013	<0.001	<0.001	0.0005	<0.001	<0.001	0.010	<0.001	<0.001	<0.001	<0.0005	
Lead (filtered)	mg/L	0.001	0.01	0.0034	0.001			<0.001	<0.0001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0002	
Manganese (filtered)	mg/L	0.001	0.5	1.9	1.2			0.041	0.0054	0.968	1.31	1.63	1.46	1.56	1.52	0.684	0.228	0.223	0.21	
Mercury (filtered)	mg/L	0.0001	0.001	0.0006	0.00006			<0.0001	<0.00004	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	
Nickel (filtered)	mg/L	0.001	0.02	0.011	0.008			0.001	<0.0005	0.002	0.004	0.0038	0.004	0.004	0.004	0.008	0.004	0.003	0.0023	
Selenium (filtered)	mg/L	0.01	0.01	0.011	0.005			<0.01	<0.0002	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	
Vanadium (filtered)	mg/L	0.01						<0.01	0.0004	<0.01	<0.01	0.0017	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	
Zinc (filtered)	mg/L	0.005		0.008	0.0024			0.012	0.004	0.007	0.007	0.009	0.006	0.006	0.006	0.038	0.008	0.007	0.004	
BTEXN																				
Benzene	µg/L	1	1	950	600			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Toluene	µg/L	2	800	180	110			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Ethylbenzene	µg/L	2	300	80	50			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (o)	µg/L	2		350	200			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (m & p)	µg/L	2						<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene Total	µg/L	2	600					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Naphthalene	µg/L	0.004		16	2.5			<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.008	<0.004	0.012	<0.004	<0.004	<0.004	
TRH - NEPM 2013																				
F1 (C6-C10 minus BTEX)	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
C6-C10 Fraction	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
F2 (>C10-C16 minus Naphthalene)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C16 Fraction	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
F3 (>C16-C34 Fraction)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	430	<100	<100	<100	
F4 (>C34-C40 Fraction)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C40 (Sum of Total)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	430	<100	<100	<100	



Appendix H
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B01			B02			B03					
							Sample Date	16 Oct 2020	29 Sep 2021	16 Oct 2020	16 Feb 2021	29 Sep 2021	15 Feb 2022	12 Oct 2022	13 Feb 2023	12 Oct 2022	16 Oct 2020	16 Feb 2021	29 Sep 2021
							Lab Report	EP2011315	EP2111637	EP2011315	EP2101562	EP2111637	EP2201800	EP2213426	EP2302008	EP2213426	EP2011315	EP2101562	EP2111637
Inorganics																			
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
C10-C14 Fraction	µg/L	50						<50	<50	<50	<50	<50	<50	<50	<70	<50	<50	<50	
C15-C28 Fraction	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
C29-C36 Fraction	µg/L	50						<50	<50	<50	<50	<50	<50	<50	160	<50	<50	<50	
C10-C36 (Sum of Total)	µg/L	50						<50	<50	<50	<50	<50	<50	<50	470	<50	<50	<50	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Acenaphthylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Anthracene	µg/L	0.001		0.4	0.01			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benz(a)anthracene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(a)pyrene	µg/L	0.001	0.01	0.2	0.1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(b+j)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(k)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(g,h,i)perylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Chrysene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Dibenz(a,h)anthracene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Fluoranthene	µg/L	0.001		1.4	1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Fluorene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Phenanthrene	µg/L	0.002		2	0.6			<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.003	<0.002	<0.002	<0.002	
Pyrene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					<0.001	<0.001	<0.001	<0.001	<0.001	0.016	<0.001	0.015	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.004	<0.002	<0.002	<0.002	
3-methylcholanthrene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
7,12-dimethylbenz(a)anthracene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(e)pyrene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Perylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(b+j+k)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
OC Pesticides																			
4,4'-DDE	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
a-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Aldrin	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	-	-	-	-	-	-	-	-	-	
b-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Chlordane	µg/L	0.001	2	0.08	0.03			-	-	-	-	-	-	-	-	-	-	-	
Chlordane (cis)	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-	
Chlordane (trans)	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-	
d-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
4,4 DDD	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
4,4 DDT	µg/L	0.002	9	0.01	0.006			-	-	-	-	-	-	-	-	-	-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Dieldrin	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Endosulfan	µg/L	0.002	20	0.2	0.03			-	-	-	-	-	-	-	-	-	-	-	
Endosulfan I (alpha)	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Endosulfan II (beta)	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Endosulfan Sulfate	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Endrin	µg/L	0.002		0.02	0.01			-	-	-	-	-	-	-	-	-	-	-	
Endrin aldehyde	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Endrin ketone	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
g-BHC (Lindane)	µg/L	0.002	10	0.2	0.07			-	-	-	-	-	-	-	-	-	-	-	
Heptachlor	µg/L	0.002	0.3	0.09	0.01			-	-	-	-	-	-	-	-	-	-	-	
Heptachlor epoxide	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Hexachlorobenzene	µg/L	0.002		0.1	0.05			-	-	-	-	-	-	-	-	-	-	-	
Methoxychlor	µg/L	0.002	300					-	-	-	-	-	-	-	-	-	-	-	
Oxychlorane	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-	
Explosives																			
2,4- & 2,6-DNT (Isomeric Mixture)	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
4- & 2-AM-DNT (Isomeric Mixture)	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
1,3,5-Trinitrobenzene	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
1,3-Dinitrobenzene	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B01			B02				B03				
							Sample Date	16 Oct 2020	29 Sep 2021	16 Oct 2020	16 Feb 2021	29 Sep 2021	15 Feb 2022	12 Oct 2022	13 Feb 2023	12 Oct 2022	16 Oct 2020	16 Feb 2021	29 Sep 2021
							Lab Report	EP2011315	EP2111637	EP2011315	EP2101562	EP2111637	EP2201800	EP2213426	EP2302008	EP2213426	EP2011315	EP2101562	EP2111637
Inorganics																			
2,4,6-Trinitrotoluene	µg/L	1		140	100			<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
2,4-Dinitrotoluene	µg/L	1		65	16			<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
2,6-dinitrotoluene	µg/L	1						<1.0	-	<1.0	<2.0	-	-	-	-	<1.0	<2.0	-	
2-Amino-4,6-DNT	µg/L	1						<1.0	-	<1.0	<2.0	-	-	-	-	<1.0	<2.0	-	
2-Nitrotoluene	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
4-Amino,2,6-DNT	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
4-Nitrotoluene	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
HMX	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
m-Nitrotoluene	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
Nitrobenzene	µg/L	1		550	230			<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
Nitroglycerine	µg/L	5						<5	-	<5	<5	-	-	-	-	<5	<5	-	
PETN	µg/L	5						<5	-	<5	<5	-	-	-	-	<5	<5	-	
RDX	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
Tetryl	µg/L	1						<1.0	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-	
SVOCs																			
Coronene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005				0.07		<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003				0.07		<0.0003	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-	
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002						<0.002	-	<0.002	<0.002	-	-	-	-	<0.002	<0.002	-	
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
Perfluorheptanoic acid (PFHpA)	µg/L	0.0005						<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56			0.56		<0.0005	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-	
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-	
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001						<0.001	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-	
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07			0.07		<0.0003	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-	
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003						<0.0003	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-	

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- *Denotes that the duplicate results have been adopted for the purposes of risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID B04				Location ID B07								
							Sample Date	15 Feb 2022	12 Oct 2022	13 Oct 2022	13 Feb 2023	13 Oct 2020	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	13 Oct 2020
							Lab Report	EP2201800	EP2213426	EP2213525	EP2302008	EP2011137	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011137
Inorganics																			
pH (Lab)	pH units	0.01					5.75	6.13	5.58	5.63	5.77	-	5.51	5.45	6.06*	5.59	5.82	6.21	
Electrical conductivity (lab)	µS/cm	1					550*	497	474	531	296	-	285	274	777*	275	277	760	
Turbidity	NTU	0.1					-	-	-	-	124*	-	-	-	-	-	-	8.3	
Total Suspended Solids	mg/L	5					-	-	-	-	113*	-	-	-	-	-	-	14	
Salinity	mg/L	0.00001					0.00026	0.00024	0.00023	0.00026	0.00016	-	0.00015	0.00013	0.00038*	0.00013	0.00013	0.00042	
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1					<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1					15	28	15	15	12	-	6	6	40*	6	7	48	
Alkalinity (Hydroxide as CaCO3)	mg/L	1					<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	
Alkalinity (total as CaCO3)	mg/L	1					15	28	15	15	12	-	6	6	40*	6	7	48	
Hardness as CaCO3 (filtered)	mg/L	1					60	69	60	58	28	-	26	26	106*	26	26	108	
Major Ions																			
Calcium (filtered)	mg/L	1					6	8	6	5	3	-	2	2	16*	2	2	17	
Magnesium (filtered)	mg/L	1					11	12	11	11	5	-	5	5	16*	5	5	16	
Potassium (filtered)	mg/L	1					3	4	3	4	2	-	2	2	4*	1	1	4	
Sodium (filtered)	mg/L	1					81*	84	80	85	50	-	45	44	112*	46	42	108	
Chloride	mg/L	1					164	158	151	160	86	-	74	82	221*	75	73	217	
Sulfate (filtered)	mg/L	1	500 ^{#1}				14	15	13	13	24	-	7	7	32*	5	6	30	
Cations Total	meq/L	0.01					4.80*	5.14	4.76	4.95	2.79	-	2.52	2.48	7.09*	2.54	2.36	6.96	
Anions Total	meq/L	0.01					5.22	5.33	4.83	5.08	3.16	-	2.35	2.58	7.70*	2.34	2.32	7.70	
Ionic Balance	%	0.01					4.57	1.77	0.72	1.29	6.35	-	3.42	2.02	4.13*	4.06	0.85	5.04	
Nutrients																			
Ammonia as N	mg/L	0.01		0.9 ^{#5}	0.32 ^{#5}		0.01	0.02	<0.01	0.01	0.01	-	<0.01	<0.01	0.01*	<0.01	<0.01	0.02	
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}	2.4 ^{#6}	1 ^{#6}		<0.01	0.09	<0.01	0.01	0.13	-	0.09	0.04	0.05	0.03	0.05	<0.01	
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}				<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrogen (Total Oxidised) (as N)	mg/L	0.01					<0.01	0.09	<0.01	0.01	0.13	-	0.09	0.04	0.05	0.03	0.05	<0.01	
Nitrogen (Total)	mg/L	0.1					<0.1	0.3	<0.1	<0.1	0.2	-	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	
Kjeldahl Nitrogen Total	mg/L	0.1					<0.1	0.2	<0.1	<0.1	0.1	-	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	
Reactive Phosphorus as P	mg/L	0.01					-	-	-	-	<0.01	-	<0.01	<0.01	-	-	-	<0.01	
Phosphorus (Total)	mg/L	0.01					0.04*	0.07	0.11	0.03	0.04	-	0.45	<0.01	0.01	0.02	0.02	0.02	
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01	0.013 ^{#7}	0.0008 ^{#7}		<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	
Barium (filtered)	mg/L	0.001	2				0.068	0.051	0.073	0.048	-	0.035	0.029	0.0208	0.155*	0.019	0.019	0.159	
Beryllium (filtered)	mg/L	0.001	0.06				<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	
Boron (filtered)	mg/L	0.05	4	0.94	0.34		<0.05	<0.05	<0.05	<0.05	-	<0.05	0.06	<0.005	<0.05	<0.05	<0.05	<0.05	
Cadmium (filtered)	mg/L	0.0001	0.002	0.0002	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	0.001		0.001 ^{#8}	0.00001 ^{#8}		<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	
Chromium (hexavalent) (filtered)	mg/L	0.01	0.05	0.001	0.00001		<0.001	<0.01	<0.01	<0.01	-	-	-	<0.001	<0.01	<0.01	-		
Chromium (Trivalent)	mg/L	0.01					<0.001	-	-	-	-	-	-	<0.001	-	-	-	-	
Chromium (Trivalent) (filtered)	mg/L	0.01					-	<0.01	<0.01	<0.01	-	-	-	-	<0.01	<0.01	-		
Cobalt (filtered)	mg/L	0.001					<0.001	<0.001	<0.001	<0.001	-	0.002	0.002	0.0011	0.009*	0.002	<0.001	0.005	
Copper (filtered)	mg/L	0.001	2	0.0014	0.001		<0.001	0.002	<0.001	<0.001	-	<0.001	0.002	0.0013	0.005*	<0.001	<0.001	0.002	
Lead (filtered)	mg/L	0.001	0.01	0.0034	0.001		<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	0.5	1.9	1.2		0.151	0.120	0.141	0.105	-	0.052	0.026	0.0107	0.208*	0.023	0.010	0.282	
Mercury (filtered)	mg/L	0.0001	0.001	0.0006	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	0.001	0.02	0.011	0.008		0.001	0.002	0.001	<0.001	-	0.002	0.010	0.0008	0.002*	<0.001	<0.001	0.002	
Selenium (filtered)	mg/L	0.01	0.01	0.011	0.005		<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	
Vanadium (filtered)	mg/L	0.01					<0.01	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	
Zinc (filtered)	mg/L	0.005		0.008	0.0024		<0.005	0.070	<0.005	<0.005	-	0.006	0.007	0.002	0.032	<0.005	<0.005	0.016	
BTEXN																			
Benzene	µg/L	1	1	950	600		<1	<1	<1	<1	<1	-	<1	<1	<1	<1	<1	<1	
Toluene	µg/L	2	800	180	110		<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	
Ethylbenzene	µg/L	2	300	80	50		<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	
Xylene (o)	µg/L	2		350	200		<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	
Xylene (m & p)	µg/L	2					<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	
Xylene Total	µg/L	2	600				<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	
Naphthalene	µg/L	0.004		16	2.5		<0.004	0.007	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<5	
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20					<20	<20	<20	<20	<20	-	<20	<20	<20	<20	<20	<20	
C6-C10 Fraction	µg/L	20					<20	<20	<20	<20	<20	-	<20	<20	<20	<20	<20	<20	
F2 (>C10-C16 minus Naphthalene)	µg/L	100					<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	
>C10-C16 Fraction	µg/L	100					<100	<100	<100	<100	<100	-	<100	<100	<100	<100	<100	<100	
F3 (>C16-C34 Fraction)	µg/L	100					<100	340	<100	<100	800	-	1,380	<100	<100	<100	<100	<100	
F4 (>C34-C40 Fraction)	µg/L	100					<100	<100	<100	<100	<100	-	160	<100	<100	<100	<100	<100	
>C10-C40 (Sum of Total)	µg/L	100					<100	340	<100	<100	800	-	1,540	<100	<100	<100	<100	<100	



Appendix H
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID B04				Location ID B07								
							Sample Date	15 Feb 2022	12 Oct 2022	13 Oct 2022	13 Feb 2023	13 Oct 2020	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	13 Oct 2020
							Lab Report	EP2201800	EP2213426	EP2213525	EP2302008	EP2011137	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011137
Inorganics																			
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20					<20	<20	<20	<20	<20	-	<20	<20	<20	<20	<20	<20	
C10-C14 Fraction	µg/L	50					<50	<50	<50	<50	<50	-	<50	<50	<50	<50	<50	<50	
C15-C28 Fraction	µg/L	100					<100	340	<100	<100	680	-	1,130	<100	<100	<100	<100	<100	
C29-C36 Fraction	µg/L	50					<50	110	<50	<50	210	-	450	<50	<50	<50	<50	<50	
C10-C36 (Sum of Total)	µg/L	50					<50	450	<50	<50	890	-	1,580	<50	<50	<50	<50	<50	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Acenaphthylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Anthracene	µg/L	0.001		0.4	0.01		<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benz(a)anthracene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(a)pyrene	µg/L	0.001	0.01	0.2	0.1		<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(b+j)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(k)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(g,h,i)perylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Chrysene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Dibenz(a,h)anthracene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Fluoranthene	µg/L	0.001		1.4	1		<0.001	0.004	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Fluorene	µg/L	0.002					<0.002	0.006	0.003	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Phenanthrene	µg/L	0.002		2	0.6		<0.002	0.014	0.005	<0.002	0.004	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Pyrene	µg/L	0.001					<0.001	0.008	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01				<0.001	0.039	0.008	<0.001	0.004	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002					<0.002	0.002	0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
3-methylcholanthrene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
7,12-dimethylbenz(a)anthracene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(e)pyrene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Perylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(b+j+k)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
OC Pesticides																			
4,4'-DDE	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
a-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Aldrin	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3				-	-	-	-	-	-	-	-	-	-	-	-	
b-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane	µg/L	0.001	2	0.08	0.03		-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane (cis)	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane (trans)	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
d-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
4,4 DDD	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
4,4 DDT	µg/L	0.002	9	0.01	0.006		-	-	-	-	-	-	-	-	-	-	-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Dieldrin	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan	µg/L	0.002	20	0.2	0.03		-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan I (alpha)	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan II (beta)	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan Sulfate	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endrin	µg/L	0.002		0.02	0.01		-	-	-	-	-	-	-	-	-	-	-	-	
Endrin aldehyde	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endrin ketone	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
g-BHC (Lindane)	µg/L	0.002	10	0.2	0.07		-	-	-	-	-	-	-	-	-	-	-	-	
Heptachlor	µg/L	0.002	0.3	0.09	0.01		-	-	-	-	-	-	-	-	-	-	-	-	
Heptachlor epoxide	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Hexachlorobenzene	µg/L	0.002		0.1	0.05		-	-	-	-	-	-	-	-	-	-	-	-	
Methoxychlor	µg/L	0.002	300				-	-	-	-	-	-	-	-	-	-	-	-	
Oxychlordane	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Explosives																			
2,4-& 2,6-DNT (Isomeric Mixture)	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-	-	
4-& 2-AM-DNT (Isomeric Mixture)	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-	-	
1,3,5-Trinitrobenzene	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-	-	
1,3-Dinitrobenzene	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-	-	



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID B04				Location ID B07								
							Sample Date	15 Feb 2022	12 Oct 2022	13 Oct 2022	13 Feb 2023	13 Oct 2020	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	13 Oct 2020
							Lab Report	EP2201800	EP2213426	EP2213525	EP2302008	EP2011137	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011137
Inorganics																			
2,4,6-Trinitrotoluene	µg/L	1		140	100		-	-	-	-	<1.0	-	<1.0	-	-	-	-		
2,4-Dinitrotoluene	µg/L	1		65	16		-	-	-	-	<1.0	-	<1.0	-	-	-	-		
2,6-dinitrotoluene	µg/L	1					-	-	-	-	<1.0	-	<2.0	-	-	-	-		
2-Amino-4,6-DNT	µg/L	1					-	-	-	-	<1.0	-	<2.0	-	-	-	-		
2-Nitrotoluene	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
4-Amino,2,6-DNT	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
4-Nitrotoluene	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
HMX	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
m-Nitrotoluene	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
Nitrobenzene	µg/L	1		550	230		-	-	-	-	<1.0	-	<1.0	-	-	-	-		
Nitroglycerine	µg/L	5					-	-	-	-	<5	-	<5	-	-	-	-		
PETN	µg/L	5					-	-	-	-	9	-	<5	-	-	-	-		
RDX	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
Tetryl	µg/L	1					-	-	-	-	<1.0	-	<1.0	-	-	-	-		
SVOCs																			
Coronene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002	<0.002	<0.002	<0.002		
PFAS - Perfluoroalkyl Sulfonic Acids																			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005					-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005				0.07	-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003				0.07	-	-	-	-	<0.0003	-	<0.0003	-	-	-	<0.0003		
PFAS - Perfluoroalkyl Carboxylic Acids																			
Perfluorobutanoic acid (PFBA)	µg/L	0.002					-	-	-	-	<0.002	-	<0.002	-	-	-	<0.002		
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005					-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005					-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
Perfluorheptanoic acid (PFHpA)	µg/L	0.0005					-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56			0.56	-	-	-	-	<0.0005	-	<0.0005	-	-	-	<0.0005		
PFAS - Fluorotelomer Sulfonic Acids																			
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001					-	-	-	-	<0.001	-	<0.001	-	-	-	<0.001		
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001					-	-	-	-	<0.001	-	<0.001	-	-	-	<0.001		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001					-	-	-	-	<0.001	-	<0.001	-	-	-	<0.001		
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001					-	-	-	-	<0.001	-	<0.001	-	-	-	<0.001		
PFAS - Sums																			
Sum of PFHxS and PFOS	µg/L	0.0003	0.07			0.07	-	-	-	-	<0.0003	-	<0.0003	-	-	-	<0.0003		
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003					-	-	-	-	<0.0003	-	<0.0003	-	-	-	<0.0003		

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
 - #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
 - #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
 - #4 Guideline value for NOx
 - #5 Measured as NH3-N at pH 8
 - #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
 - #7 In absence of total As guideline, As (V) guideline has been adopted.
 - #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- *Denotes that the duplicate results have been adopted for the purposes of risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 20)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 20)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	B08						B09			B01					
							Location ID						B08			B09			B01		
							Sample Date	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	19 Oct 2020	28 Sep 2021	11 Oct 2022	13 Oct 2020	15 Feb 2021	29 Sep 2021		
Lab Report	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011418	EP2111637	EP2213366	EP2011137	EP2101483	EP2111637									
Inorganics																					
pH (Lab)	pH units	0.01					-	6.05	6.09	6.09	6.25	6.50	5.49	4.85	5.58	5.79	5.67	5.44			
Electrical conductivity (lab)	µS/cm	1					-	876	743	773	767	864	95	189	179	371	326	338			
Turbidity	NTU	0.1					-	-	-	-	-	-	1.930	-	-	831	-	-			
Total Suspended Solids	mg/L	5					-	-	-	-	-	-	-	-	-	1,110	-	-			
Salinity	mg/L	0.00001					-	0.00048	0.00036	0.00038	0.00037	0.00042	0.00052	0.00009	0.00008	0.00020	0.00017	0.00016			
Acidity & Alkalinity																					
Alkalinity (Carbonate as CaCO3)	mg/L	1					-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Alkalinity (Bicarbonate as CaCO3)	mg/L	1					-	40	38	40	38	44	4	<1	3	23	12	13			
Alkalinity (Hydroxide as CaCO3)	mg/L	1					-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Alkalinity (total as CaCO3)	mg/L	1					-	40	38	40	38	44	4	<1	3	23	12	13			
Hardness as CaCO3 (filtered)	mg/L	1					-	127	98	107	105	116	17	15	15	33	21	21			
Major Ions																					
Calcium (filtered)	mg/L	1					-	18	13	15	14	17	2	1	1	5	2	2			
Magnesium (filtered)	mg/L	1					-	20	16	17	17	18	3	3	3	5	4	4			
Potassium (filtered)	mg/L	1					-	4	4	4	3	4	<1	<1	<1	2	1	2			
Sodium (filtered)	mg/L	1					-	129	104	111	116	123	36	28	32	62	58	60			
Chloride	mg/L	1					-	239	219	220	219	232	26	53	44	97	76	86			
Sulfate (filtered)	mg/L	1	500 ^{#1}				-	54	30	31	26	41	<1	6	1	21	22	22			
Cations Total	meq/L	0.01					-	8.26	6.59	7.08	7.22	7.78	1.91	1.51	1.69	3.41	2.98	3.09			
Anions Total	meq/L	0.01					-	8.66	7.56	7.65	7.48	8.28	0.81	1.62	1.32	3.63	2.84	3.14			
Ionic Balance	%	0.01					-	2.41	6.85	3.89	1.76	3.08	-	3.36	-	3.18	2.33	0.86			
Nutrients																					
Ammonia as N	mg/L	0.01		0.9 ^{#5}	0.32 ^{#5}		-	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01			
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}	2.4 ^{#6}	1 ^{#6}		-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01			
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}				-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
Nitrogen (Total Oxidised) (as N)	mg/L	0.01					-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01			
Nitrogen (Total)	mg/L	0.1					-	<0.1	<0.1	<0.1	<0.1	<0.1	5.1	0.6	0.6	<0.2	0.7	0.2			
Kjeldahl Nitrogen Total	mg/L	0.1					-	<0.1	<0.1	<0.1	<0.1	<0.1	5.1	0.6	0.6	<0.2	0.7	0.2			
Reactive Phosphorus as P	mg/L	0.01					-	<0.01	<0.01	-	-	-	<0.01	<0.01	-	<0.01	<0.01	<0.01			
Phosphorus (Total)	mg/L	0.01					-	0.01	<0.01	0.01	0.04	0.03	1.08	0.11	0.12	0.63	1.85	0.51			
Metals																					
Arsenic (filtered)	mg/L	0.001	0.01	0.013 ^{#7}	0.0008 ^{#7}		<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	0.0002	<0.001	<0.001	<0.001	<0.0002			
Barium (filtered)	mg/L	0.001	2				0.151	0.213	0.158	0.163	0.152	0.158	0.035	0.0326	0.013	0.063	0.050	0.0459			
Beryllium (filtered)	mg/L	0.001	0.06				<0.001	<0.001	0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001			
Boron (filtered)	mg/L	0.05	4	0.94	0.34		<0.05	0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.005	<0.05	<0.05	<0.05	<0.005			
Cadmium (filtered)	mg/L	0.0001	0.002	0.0002	0.00006		<0.0001	0.0001	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	<0.0001	<0.0001	<0.0001	<0.00005			
Chromium (III+VI) (filtered)	mg/L	0.001		0.001 ^{#8}	0.00001 ^{#8}		<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.0002			
Chromium (hexavalent) (filtered)	mg/L	0.01	0.05	0.001	0.00001		-	-	-	<0.001	<0.01	<0.01	-	-	<0.01	-	-	-			
Chromium (Trivalent)	mg/L	0.01					-	-	-	<0.001	-	-	-	-	-	-	-	-			
Chromium (Trivalent) (filtered)	mg/L	0.01					-	-	-	<0.01	<0.01	<0.01	-	-	<0.01	-	-	-			
Cobalt (filtered)	mg/L	0.001					0.006	0.011	0.0070	0.009	0.008	0.010	0.001	0.0042	0.002	0.002	0.002	0.0020			
Copper (filtered)	mg/L	0.001	2	0.0014	0.001		0.001	0.023	0.0066	0.005	0.004	0.007	0.031	0.0209	0.004	<0.001	<0.001	<0.0005			
Lead (filtered)	mg/L	0.001	0.01	0.0034	0.001		<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.0004	0.001	<0.001	<0.001	<0.0001			
Manganese (filtered)	mg/L	0.001	0.5	1.9	1.2		0.328	0.221	0.186	0.208	0.192	0.190	0.063	0.616	0.184	0.181	0.084	0.109			
Mercury (filtered)	mg/L	0.0001	0.001	0.0006	0.00006		<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.00004			
Nickel (filtered)	mg/L	0.001	0.02	0.011	0.008		0.003	0.002	0.0021	0.002	0.002	0.002	0.009	0.0032	0.001	0.003	0.004	0.0012			
Selenium (filtered)	mg/L	0.01	0.01	0.011	0.005		<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.0002			
Vanadium (filtered)	mg/L	0.01					<0.01	<0.01	0.0002	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.0002			
Zinc (filtered)	mg/L	0.005		0.008	0.0024		0.025	0.024	0.01	0.012	0.008	0.014	0.050	0.029	0.005	0.009	0.008	0.003			
BTEXN																					
Benzene	µg/L	1	1	950	600		-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Toluene	µg/L	2	800	180	110		-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Ethylbenzene	µg/L	2	300	80	50		-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Xylene (o)	µg/L	2		350	200		-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Xylene (m & p)	µg/L	2					-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Xylene Total	µg/L	2	600				-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2			
Naphthalene	µg/L	0.004		16	2.5		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007	<0.004	<0.004	<0.004			
TRH - NEMP 2013																					
F1 (C6-C10 minus BTEX)	µg/L	20					-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			
C6-C10 Fraction	µg/L	20					-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20			
F2 (>C10-C16 minus Naphthalene)	µg/L	100					-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
>C10-C16 Fraction	µg/L	100					-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
F3 (>C16-C34 Fraction)	µg/L	100					-	<100	<100	<100	<100	<100	<100	180	<100	120	700	590			
F4 (>C34-C40 Fraction)	µg/L	100					-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100			
>C10-C40 (Sum of Total)	µg/L	100					-	<100	<100	<100	<100	<100	<100	180	<100	120	700	590			



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B08						B09			B01		
							Sample Date	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	19 Oct 2020	28 Sep 2021	11 Oct 2022	13 Oct 2020	15 Feb 2021	29 Sep 2021
							Lab Report	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011418	EP2111637	EP2213366	EP2011137	EP2101483	EP2111637
Inorganics																			
TRH - NEPM 1999																			
C6-C9 Fraction	µg/L	20					-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
C10-C14 Fraction	µg/L	50					-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
C15-C28 Fraction	µg/L	100					-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
C29-C36 Fraction	µg/L	50					-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
C10-C36 (Sum of Total)	µg/L	50					-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
PAHs - standard 16																			
Acenaphthene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Acenaphthylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Anthracene	µg/L	0.001		0.4	0.01		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benz(a)anthracene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(a)pyrene	µg/L	0.001	0.01	0.2	0.1		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(b+j)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(k)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Benzo(g,h,i)perylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Chrysene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Dibenz(a,h)anthracene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Fluoranthene	µg/L	0.001		1.4	1		<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	
Fluorene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	0.002	0.002	0.002	<0.002	
Indeno(1,2,3-c,d)pyrene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Phenanthrene	µg/L	0.002		2	0.6		<0.002	0.002	<0.002	<0.002	<0.002	0.006	<0.002	0.008	0.008	0.008	0.006	<0.002	
Pyrene	µg/L	0.001					<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01				<0.001	0.002	<0.001	0.001	<0.001	<0.001	0.008	<0.001	0.020	0.010	0.008	<0.001	
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
PAHs - extended																			
2-methylnaphthalene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
3-methylcholanthrene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
7,12-dimethylbenz(a)anthracene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Benzo(e)pyrene	µg/L	0.001					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Perylene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Benzo(b+j+k)fluoranthene	µg/L	0.004					<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
OC Pesticides																			
4,4'-DDE	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
a-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Aldrin	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
Aldrin + Dieldrin	µg/L	0.002	0.3				-	-	-	-	-	-	-	-	-	-	-	-	
b-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane	µg/L	0.001	2	0.08	0.03		-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane (cis)	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
Chlordane (trans)	µg/L	0.001					-	-	-	-	-	-	-	-	-	-	-	-	
d-BHC	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
4,4 DDD	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
4,4 DDT	µg/L	0.002	9	0.01	0.006		-	-	-	-	-	-	-	-	-	-	-	-	
DDT+DDE+DDD - Lab Calc	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Dieldrin	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan	µg/L	0.002	20	0.2	0.03		-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan I (alpha)	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan II (beta)	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endosulfan Sulfate	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endrin	µg/L	0.002		0.02	0.01		-	-	-	-	-	-	-	-	-	-	-	-	
Endrin aldehyde	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Endrin ketone	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
g-BHC (Lindane)	µg/L	0.002	10	0.2	0.07		-	-	-	-	-	-	-	-	-	-	-	-	
Heptachlor	µg/L	0.002	0.3	0.09	0.01		-	-	-	-	-	-	-	-	-	-	-	-	
Heptachlor epoxide	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Hexachlorobenzene	µg/L	0.002		0.1	0.05		-	-	-	-	-	-	-	-	-	-	-	-	
Methoxychlor	µg/L	0.002	300				-	-	-	-	-	-	-	-	-	-	-	-	
Oxychlorane	µg/L	0.002					-	-	-	-	-	-	-	-	-	-	-	-	
Explosives																			
2,4-& 2,6-DNT (Isomeric Mixture)	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-	
4-& 2-AM-DNT (Isomeric Mixture)	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-	
1,3,5-Trinitrobenzene	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-	
1,3-Dinitrobenzene	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-	



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	B08						B09			B01				
							Location ID	Sample Date	15 Oct 2020	15 Feb 2021	29 Sep 2021	18 Feb 2022	11 Oct 2022	16 Feb 2023	19 Oct 2020	28 Sep 2021	11 Oct 2022	13 Oct 2020	15 Feb 2021	29 Sep 2021
							Lab Report	EP2011280	EP2101483	EP2111637	EP2201993	EP2213366	EP2302105	EP2011418	EP2111637	EP2213366	EP2011137	EP2101483	EP2111637	
Inorganics																				
2,4,6-Trinitrotoluene	µg/L	1		140	100		-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
2,4-Dinitrotoluene	µg/L	1		65	16		-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
2,6-dinitrotoluene	µg/L	1					-	<2.0	-	-	-	-	<1.0	-	-	<1.0	<2.0	-		
2-Amino-4,6-DNT	µg/L	1					-	<2.0	-	-	-	-	<1.0	-	-	<1.0	<2.0	-		
2-Nitrotoluene	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
4-Amino,2,6-DNT	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
4-Nitrotoluene	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
HMX	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
m-Nitrotoluene	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
Nitrobenzene	µg/L	1		550	230		-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
Nitroglycerine	µg/L	5					-	<5	-	-	-	-	<5	-	-	<5	<5	-		
PETN	µg/L	5					-	<5	-	-	-	-	<5	-	-	<5	<5	-		
RDX	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
Tetryl	µg/L	1					-	<1.0	-	-	-	-	<1.0	-	-	<1.0	<1.0	-		
SVOCs																				
Coronene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		
PFAS - Perfluoroalkyl Sulfonic Acids																				
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005					-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005				0.07	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003				0.07	-	<0.0003	-	-	-	-	<0.0003	-	-	<0.0003	<0.0003	-		
PFAS - Perfluoroalkyl Carboxylic Acids																				
Perfluorobutanoic acid (PFBA)	µg/L	0.002					-	<0.002	-	-	-	-	<0.002	-	-	<0.002	<0.002	-		
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005					-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005					-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
Perfluoroheptanoic acid (PFHpA)	µg/L	0.0005					-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56			0.56	-	<0.0005	-	-	-	-	<0.0005	-	-	<0.0005	<0.0005	-		
PFAS - Fluorotelomer Sulfonic Acids																				
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001					-	<0.001	-	-	-	-	<0.001	-	-	<0.001	<0.001	-		
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001					-	<0.001	-	-	-	-	<0.001	-	-	<0.001	<0.001	-		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001					-	<0.001	-	-	-	-	<0.001	-	-	<0.001	<0.001	-		
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001					-	<0.001	-	-	-	-	<0.001	-	-	<0.001	<0.001	-		
PFAS - Sums																				
Sum of PFHxS and PFOS	µg/L	0.0003	0.07			0.07	-	<0.0003	-	-	-	-	<0.0003	-	-	<0.0003	<0.0003	-		
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003					-	<0.0003	-	-	-	-	<0.0003	-	-	<0.0003	<0.0003	-		

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
 - #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
 - #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
 - #4 Guideline value for NOx
 - #5 Measured as NH3-N at pH 8
 - #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
 - #7 In absence of total As guideline, As (V) guideline has been adopted.
 - #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- *Denotes that the duplicate results have been adopted for the purposes of risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID B			B10									
							Sample Date	18 Feb 2022	11 Oct 2022	15 Feb 2023	15 Oct 2020	16 Feb 2021	29 Sep 2021	18 Feb 2022	12 Oct 2022	15 Feb 2023	15 Oct 2020	15 Feb 2021	28 Sep 2021
							Lab Report	EP2201993	EP2213366	EP2302008	EP2011280	EP2101562	EP2111637	EP2201993	EP2213426	EP2302008	EP2011280	EP2101562	EP2111637
Inorganics																			
pH (Lab)	pH units	0.01					5.48	5.75	5.56	-	6.35	5.78	5.79	5.85	6.12*	5.40*	5.48	5.32	
Electrical conductivity (lab)	µS/cm	1					342	379	375	-	704	689	672	587*	681*	197	197	200	
Turbidity	NTU	0.1					-	-	-	-	-	-	-	-	-	-	-	-	
Total Suspended Solids	mg/L	5					-	-	-	-	-	-	-	-	-	-	-	-	
Salinity	mg/L	0.00001					0.00016	0.00018	0.00018	-	0.00038	0.00034	0.00032	0.00028	0.00033*	0.00009	0.00011	0.00010	
Acidity & Alkalinity																			
Alkalinity (Carbonate as CaCO3)	mg/L	1					<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1					11	12	13	-	27	24	29	22	31	8	8	6	
Alkalinity (Hydroxide as CaCO3)	mg/L	1					<1	<1	<1	-	<1	<1	<1	<1	<1	<1	<1	<1	
Alkalinity (total as CaCO3)	mg/L	1					11	12	13	-	27	24	29	22	31	8	8	6	
Hardness as CaCO3 (filtered)	mg/L	1					21	26	30	-	78	74	84	81	82*	17	17	21	
Major Ions																			
Calcium (filtered)	mg/L	1					2	2	2	-	13	10	14	11	13*	2	2	2	
Magnesium (filtered)	mg/L	1					4	5	6	-	11	12	12	13	12	3	3	4	
Potassium (filtered)	mg/L	1					1	2	2	-	2	2	2	2	2	1	1	1	
Sodium (filtered)	mg/L	1					58	66	66	-	101	99	100	110*	105	32	27	31	
Chloride	mg/L	1					88	98	102	-	190	198	195	183	188*	54	45	54	
Sulfate (filtered)	mg/L	1	500 ^{#1}				22	18	22	-	25	31	29	29	28	7	7	6	
Cations Total	meq/L	0.01					2.98	3.43	3.52	-	6.00	5.84	6.09	6.41	6.20	1.76	1.55	1.80	
Anions Total	meq/L	0.01					3.16	3.38	3.60	-	6.42	6.71	6.68	6.20	6.53*	1.83	1.57	1.77	
Ionic Balance	%	0.01					2.98	0.80	1.12	-	3.39	6.90	4.67	1.82*	3.20*	1.80	0.90	0.98	
Nutrients																			
Ammonia as N	mg/L	0.01		0.9 ^{#5}	0.32 ^{#5}		<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}	2.4 ^{#6}	1 ^{#6}		<0.01	<0.01	<0.01	0.04	0.02	0.03	0.02	0.03	0.02	0.05	0.04	0.05	
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrogen (Total Oxidised) (as N)	mg/L	0.01					<0.01	<0.01	<0.01	0.04	0.02	0.03	0.02	0.03	0.02	0.05	0.04	0.05	
Nitrogen (Total)	mg/L	0.1					0.3	0.2	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Kjeldahl Nitrogen Total	mg/L	0.1					0.3	0.2	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Reactive Phosphorus as P	mg/L	0.01					-	-	-	<0.01	<0.01	<0.01	-	-	-	<0.01	<0.01	<0.01	
Phosphorus (Total)	mg/L	0.01					0.36	0.42	1.26	0.01	<0.01	<0.01	0.02	0.01	0.01	0.01	0.01	<0.01	
Metals																			
Arsenic (filtered)	mg/L	0.001	0.01	0.013 ^{#7}	0.0008 ^{#7}		<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	
Barium (filtered)	mg/L	0.001	2				0.048	0.059	0.303	0.052	0.044	0.0484	0.046	0.047*	0.041*	0.022	0.015	0.0151	
Beryllium (filtered)	mg/L	0.001	0.06				<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	
Boron (filtered)	mg/L	0.05	4	0.94	0.34		<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.05	<0.005	
Cadmium (filtered)	mg/L	0.0001	0.002	0.0002	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	
Chromium (III+VI) (filtered)	mg/L	0.001		0.001 ^{#8}	0.0001 ^{#8}		<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	
Chromium (hexavalent) (filtered)	mg/L	0.01	0.05	0.001	0.00001		<0.001	<0.01	<0.01	-	-	-	<0.001	<0.01	<0.01	-	-		
Chromium (Trivalent)	mg/L	0.01					<0.001	-	-	-	-	-	<0.001	-	-	-	-	-	
Chromium (Trivalent) (filtered)	mg/L	0.01					-	<0.01	<0.01	-	-	-	-	<0.01	<0.01	-	-	-	
Cobalt (filtered)	mg/L	0.001					0.002	0.003	0.003	0.002	0.001	0.0011	0.001	0.001	<0.001	<0.001	<0.001	0.0002	
Copper (filtered)	mg/L	0.001	2	0.0014	0.001		<0.001	<0.001	0.006	<0.001	0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	
Lead (filtered)	mg/L	0.001	0.01	0.0034	0.001		<0.001	<0.001	0.013	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0003	
Manganese (filtered)	mg/L	0.001	0.5	1.9	1.2		0.033	0.070	0.040	0.119	0.100	0.0776	0.078	0.068	0.056*	0.028	0.009	0.0084	
Mercury (filtered)	mg/L	0.0001	0.001	0.0006	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	
Nickel (filtered)	mg/L	0.001	0.02	0.011	0.008		0.001	<0.001	<0.001	0.002	0.002	0.0024	0.002	0.002	0.002	<0.001	<0.001	<0.0005	
Selenium (filtered)	mg/L	0.01	0.01	0.011	0.005		<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	
Vanadium (filtered)	mg/L	0.01					<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	
Zinc (filtered)	mg/L	0.005		0.008	0.0024		0.006	<0.005	0.018	<0.005	<0.005	0.002	0.015	<0.005	<0.005	<0.005	<0.005	0.002	
BTEXN																			
Benzene	µg/L	1	1	950	600		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Toluene	µg/L	2	800	180	110		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Ethylbenzene	µg/L	2	300	80	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (o)	µg/L	2		350	200		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene (m & p)	µg/L	2					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Xylene Total	µg/L	2	600				<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Naphthalene	µg/L	0.004		16	2.5		<0.004	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
TRH - NEPM 2013																			
F1 (C6-C10 minus BTEX)	µg/L	20					<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
C6-C10 Fraction	µg/L	20					<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	
F2 (>C10-C16 minus Naphthalene)	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C16 Fraction	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
F3 (>C16-C34 Fraction)	µg/L	100					150	150	950	<100	<100	<100	<100	<100	<100	<100	<100	<100	
F4 (>C34-C40 Fraction)	µg/L	100					<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
>C10-C40 (Sum of Total)	µg/L	100					150	150	950	<100	<100	<100	<100	<100	<100	<100	<100	<100	



Appendix H
Myara North Groundwater Analytical Results

Alcoa of Australia Limited
Myara North
Alcoa Huntly Expansion Monitoring 2022 /2023

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B10										
							B											
							Sample Date	18 Feb 2022	11 Oct 2022	15 Feb 2023	15 Oct 2020	16 Feb 2021	29 Sep 2021	18 Feb 2022	12 Oct 2022	15 Feb 2023	15 Oct 2020	15 Feb 2021
Lab Report	EP2201993	EP2213366	EP2302008	EP2011280	EP2101562	EP2111637	EP2201993	EP2213426	EP2302008	EP2011280	EP2101562	EP2111637						
Inorganics																		
TRH - NEPM 1999																		
C6-C9 Fraction	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10-C14 Fraction	µg/L	50						<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15-C28 Fraction	µg/L	100						130	140	770	<100	<100	<100	<100	<100	<100	<100	<100
C29-C36 Fraction	µg/L	50						<50	<50	190	<50	<50	<50	<50	<50	<50	<50	<50
C10-C36 (Sum of Total)	µg/L	50						130	140	960	<50	<50	<50	<50	<50	<50	<50	<50
PAHs - standard 16																		
Acenaphthene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Acenaphthylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Anthracene	µg/L	0.001		0.4	0.01			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benz(a)anthracene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene	µg/L	0.001	0.01	0.2	0.1			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(b+j)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(k)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(g,h,i)perylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chrysene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibenz(a,h)anthracene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluoranthene	µg/L	0.001		1.4	1			0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene	µg/L	0.002						<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002
Indeno(1,2,3-c,d)pyrene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Phenanthrene	µg/L	0.002		2	0.6			0.003	0.004	<0.002	<0.002	<0.002	<0.002	0.005	<0.002	<0.002	<0.002	<0.002
Pyrene	µg/L	0.001						0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PAHs (Sum of total) - Lab calc	µg/L	0.001	0.01					0.007	0.011	<0.001	<0.001	<0.001	<0.001	0.008	<0.001	<0.001	<0.001	<0.001
Total 8 PAHs (as BaP TEQ)(zero LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total 8 PAHs (as BaP TEQ) (half LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total 8 PAHs (as BaP TEQ)(full LOR) - Lab Calc	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PAHs - extended																		
2-methylnaphthalene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
3-methylcholanthrene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
7,12-dimethylbenz(a)anthracene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzo(e)pyrene	µg/L	0.001						<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perylene	µg/L	0.002						<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Benzo(b+j+k)fluoranthene	µg/L	0.004						<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
OC Pesticides																		
4,4'-DDE	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
a-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Aldrin	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-
Aldrin + Dieldrin	µg/L	0.002	0.3					-	-	-	-	-	-	-	-	-	-	-
b-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Chlordane	µg/L	0.001	2	0.08	0.03			-	-	-	-	-	-	-	-	-	-	-
Chlordane (cis)	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-
Chlordane (trans)	µg/L	0.001						-	-	-	-	-	-	-	-	-	-	-
d-BHC	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
4,4 DDD	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
4,4 DDT	µg/L	0.002	9	0.01	0.006			-	-	-	-	-	-	-	-	-	-	-
DDT+DDE+DDD - Lab Calc	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Dieldrin	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Endosulfan	µg/L	0.002	20	0.2	0.03			-	-	-	-	-	-	-	-	-	-	-
Endosulfan I (alpha)	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Endosulfan II (beta)	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Endosulfan Sulfate	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Endrin	µg/L	0.002		0.02	0.01			-	-	-	-	-	-	-	-	-	-	-
Endrin aldehyde	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Endrin ketone	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
g-BHC (Lindane)	µg/L	0.002	10	0.2	0.07			-	-	-	-	-	-	-	-	-	-	-
Heptachlor	µg/L	0.002	0.3	0.09	0.01			-	-	-	-	-	-	-	-	-	-	-
Heptachlor epoxide	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	µg/L	0.002		0.1	0.05			-	-	-	-	-	-	-	-	-	-	-
Methoxychlor	µg/L	0.002	300					-	-	-	-	-	-	-	-	-	-	-
Oxychlordane	µg/L	0.002						-	-	-	-	-	-	-	-	-	-	-
Explosives																		
2,4-& 2,6-DNT (Isomeric Mixture)	µg/L	1						-	-	-	<1.0	<1.0	-	-	-	<1.0	<1.0	-
4-& 2-AM-DNT (Isomeric Mixture)	µg/L	1						-	-	-	<1.0	<1.0	-	-	-	<1.0	<1.0	-
1,3,5-Trinitrobenzene	µg/L	1						-	-	-	<1.0	<1.0	-	-	-	<1.0	<1.0	-
1,3-Dinitrobenzene	µg/L	1						-	-	-	<1.0	<1.0	-	-	-	<1.0	<1.0	-



Appendix H
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B10										
							B											
							Sample Date	18 Feb 2022	11 Oct 2022	15 Feb 2023	15 Oct 2020	16 Feb 2021	29 Sep 2021	18 Feb 2022	12 Oct 2022	15 Feb 2023	15 Oct 2020	15 Feb 2021
Lab Report	EP2201993	EP2213366	EP2302008	EP2011280	EP2101562	EP2111637	EP2201993	EP2213426	EP2302008	EP2011280	EP2101562	EP2111637						
Inorganics																		
2,4,6-Trinitrotoluene	µg/L	1		140	100		-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
2,4-Dinitrotoluene	µg/L	1		65	16		-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
2,6-dinitrotoluene	µg/L	1					-	-	-	<1.0	<2.0	-	-	-	-	<1.0	<2.0	-
2-Amino-4,6-DNT	µg/L	1					-	-	-	<1.0	<2.0	-	-	-	-	<1.0	<2.0	-
2-Nitrotoluene	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
4-Amino,2,6-DNT	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
4-Nitrotoluene	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
HMX	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
m-Nitrotoluene	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Nitrobenzene	µg/L	1		550	230		-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Nitroglycerine	µg/L	5					-	-	-	<5	<5	-	-	-	-	<5	<5	-
PETN	µg/L	5					-	-	-	<5	<5	-	-	-	-	<5	<5	-
RDX	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
Tetryl	µg/L	1					-	-	-	<1.0	<1.0	-	-	-	-	<1.0	<1.0	-
SVOCs																		
Coronene	µg/L	0.002					<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PFAS - Perfluoroalkyl Sulfonic Acids																		
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.0005					-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.0005				0.07	-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.0003				0.07	-	-	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-
PFAS - Perfluoroalkyl Carboxylic Acids																		
Perfluorobutanoic acid (PFBA)	µg/L	0.002					-	-	-	<0.002	<0.002	-	-	-	-	<0.002	<0.002	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.0005					-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
Perfluorohexanoic acid (PFHxA)	µg/L	0.0005					-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
Perfluorheptanoic acid (PFHpA)	µg/L	0.0005					-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
Perfluorooctanoic acid (PFOA)	µg/L	0.0005	0.56			0.56	-	-	-	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.0005	-
PFAS - Fluorotelomer Sulfonic Acids																		
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.001					-	-	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.001					-	-	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.001					-	-	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.001					-	-	-	<0.001	<0.001	-	-	-	-	<0.001	<0.001	-
PFAS - Sums																		
Sum of PFHxS and PFOS	µg/L	0.0003	0.07			0.07	-	-	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-
PFAS (Sum of Total)(WA DER List)	µg/L	0.0003					-	-	-	<0.0003	<0.0003	-	-	-	-	<0.0003	<0.0003	-

Comments

- #1 Not specifically guideline value: >500mg/L can have purgative effects
- #2 Guideline value calculated by dividing Nitrate (as Nitrate) value (50 mg/L) by 4.427
- #3 Guideline value calculated by dividing Nitrite (as Nitrite) value (0.3 mg/L) by molecular weight (3.2967033).
- #4 Guideline value for NOx
- #5 Measured as NH3-N at pH 8
- #6 Values taken from "Updating nitrate toxicity effects on freshwater aquatic species, 2013"
- #7 In absence of total As guideline, As (V) guideline has been adopted.
- #8 In absence of total Cr guideline, Cr (VI) guideline has been adopted.
- *Denotes that the duplicate results have been adopted for the purposes of risk assessment

Environmental Standards

National Health and Medical Research Council, January 2022, ADWG 2011 Health (v3.7 updated 2022)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 95% (updated 26 July 2021)
Department of Agriculture and Water Resources, 2018 updated July 2021, ANZG (2018) - FW - 99% (updated 26 July 2021)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water

Statistics

* A Non Detect Multiplier of 0.5 has been applied.



Appendix H
Myara North Groundwater Analytical Results

Analyte	Unit	LOR	ADWG 2011 Health (v3.7 updated 2022)	ANZG (2018) FW - 95% (updated 26 July 2021)	ANZG (2018) - FW - 99% (updated 26 July 2021)	PFAS NEMP 2.0 2020 Health Drinking Water	Location ID	B11						B12_D						B12_S	
							Sample Date	29 Sep 2021	15 Feb 2022	11 Oct 2022	16 Feb 2023	14 Oct 2020	15 Feb 2021	24 Sep 2021	18 Feb 2022	13 Oct 2022	15 Feb 2023	14 Oct 2020	24 Sep 2021		
							Lab Report	EP2111637	EP2201800	EP2213366	EP2302105	EP2011229	EP2101483	EP2111429	EP2201993	EP2213525	EP2302008	EP2011229	EP2111429		
Inorganics																					
pH (Lab)	pH units	0.01						5.29	5.18	5.22	4.71	6.73	6.63	6.72	6.79	6.54	6.86	6.32	5.71		
Electrical conductivity (lab)	µS/cm	1						200	204	192	210	563	587*	554	568	473	549*	232	130		
Turbidity	NTU	0.1						-	-	-	-	0.1	-	-	-	-	-	268	-		
Total Suspended Solids	mg/L	5						-	-	-	-	<5	-	-	-	-	-	942	-		
Salinity	mg/L	0.00001						0.00010	0.00010	0.00009	0.00010	0.00030	0.00031	0.00030	0.00027	0.00023	0.00026	0.00012	0.00007		
Acidity & Alkalinity																					
Alkalinity (Carbonate as CaCO3)	mg/L	1						<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Alkalinity (Bicarbonate as CaCO3)	mg/L	1						6	5	6	<1	37	48	41	46	44	54	24	6		
Alkalinity (Hydroxide as CaCO3)	mg/L	1						<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Alkalinity (total as CaCO3)	mg/L	1						6	5	6	<1	37	48	41	46	44	54	24	6		
Hardness as CaCO3 (filtered)	mg/L	1						21	21	21	21	79	99	77	86	87	91	20	8		
Major Ions																					
Calcium (filtered)	mg/L	1						2	2	2	2	12	15	11	13	15	15	3	<1		
Magnesium (filtered)	mg/L	1						4	4	4	4	12	15	12	13	12	13	3	2		
Potassium (filtered)	mg/L	1						1	1	1	1	2	2	2	2	2	2	1	2		
Sodium (filtered)	mg/L	1						31	31	31	29	76	81	75	78	74	77	40	21		
Chloride	mg/L	1						51	52	46	48	155	151	163	153	135	142	40	32		
Sulfate (filtered)	mg/L	1	500 ^{#1}					6	6	5	14	15	17*	14	15	13	14	20	10		
Cations Total	meq/L	0.01						1.80	1.80	1.80	1.72	4.94	5.56	4.85	5.16	5.01	5.22	2.16	1.13		
Anions Total	meq/L	0.01						1.68	1.69	1.52	1.64	5.42	5.55	5.71	5.55	4.96	5.38	2.02	1.23		
Ionic Balance	%	0.01						3.43	3.18	-	2.10	4.64	0.13*	8.13	3.59	0.48	1.48	3.29	4.30		
Nutrients																					
Ammonia as N	mg/L	0.01		0.9 ^{#5}	0.32 ^{#5}			0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01		
Nitrate (as N)	mg/L	0.01	11.29 ^{#2}	2.4 ^{#6}	1 ^{#6}			0.04	0.04	0.05	0.05	0.04	0.42	0.05	0.03	0.04	0.04	0.03	0.01		
Nitrite (as N)	mg/L	0.01	0.91 ^{#3}					<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Nitrogen (Total Oxidised) (as N)	mg/L	0.01						0.04	0.04	0.05	0.05	0.04	0.42	0.05	0.03	0.04	0.04	0.03	0.01		
Nitrogen (Total)	mg/L	0.1						<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	1.3	0.8		
Kjeldahl Nitrogen Total	mg/L	0.1						<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	0.8		
Reactive Phosphorus as P	mg/L	0.01						<0.01	-	-	-	<0.01	<0.01	<0.01	-	-	-	<0.01	<0.01		
Phosphorus (Total)	mg/L	0.01						<0.01	0.01	0.02	0.05	0.01	0.01	0.02	0.01	0.11	<0.01	0.36	0.12		
Metals																					
Arsenic (filtered)	mg/L	0.001	0.01	0.013 ^{#7}	0.0008 ^{#7}			<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0002		
Barium (filtered)	mg/L	0.001	2					0.0153	0.014	0.014	0.014	0.043	0.054*	0.0441	0.050	0.042	0.048	0.020	0.0093		
Beryllium (filtered)	mg/L	0.001	0.06					<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001		
Boron (filtered)	mg/L	0.05	4	0.94	0.34			<0.005	<0.05	<0.05	<0.05	<0.05	0.05	<0.005	<0.05	<0.05	<0.05	<0.05	<0.005		
Cadmium (filtered)	mg/L	0.0001	0.002	0.0002	0.00006			<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005		
Chromium (III+VI) (filtered)	mg/L	0.001		0.001 ^{#8}	0.00001 ^{#8}			<0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	0.0003		
Chromium (hexavalent) (filtered)	mg/L	0.01	0.05	0.001	0.00001			-	<0.001	<0.01	<0.01	-	-	-	<0.001	<0.01	<0.01	-	-		
Chromium (Trivalent)	mg/L	0.01						-	<0.001	-	-	-	-	-	<0.001	-	-	-	-		
Chromium (Trivalent) (filtered)	mg/L	0.01						-	<0.001	<0.01	<0.01	-	-	-	<0.001	<0.01	<0.01	-	-		
Cobalt (filtered)	mg/L	0.001						0.0002	<0.001	<0.001	<0.001	<0.001	<0.001	0.0003	<0.001	<0.001	<0.001	<0.001	0.0004		
Copper (filtered)	mg/L	0.001	2	0.0014	0.001			<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	0.002	<0.001	0.0008		
Lead (filtered)	mg/L	0.001	0.01	0.0034	0.001			<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	0.0001		
Manganese (filtered)	mg/L	0.001	0.5	1.9	1.2			0.0083	0.008	0.008	0.007	0.074	0.112	0.0705	0.089	0.061	0.084	0.222	0.0517		
Mercury (filtered)	mg/L	0.0001	0.001	0.0006	0.00006			<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004		
Nickel (filtered)	mg/L	0.001	0.02	0.011	0.008			<0.0005	<0.001	<0.001	<0.001	0.001	0.001	0.0010	<0.001	<0.001	<0.001	<0.001	<0.0005		
Selenium (filtered)	mg/L	0.01	0.01	0.011	0.005			<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.0002	<0.01	<0.01	<0.01	<0.01	0.0002		
Vanadium (filtered)	mg/L	0.01						<0.0002	<0.01	<0.01	<0.01	<0.01	<0.01	0.0003	<0.01	<0.01	<0.01	<0.01	0.0008		
Zinc (filtered)	mg/L	0.005		0.008	0.0024			0.002	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	<0.005	<0.005	<0.005	<0.005	0.014		
BTEXN																					
Benzene	µg/L	1	1	950	600			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Toluene	µg/L	2	800	180	110			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Ethylbenzene	µg/L	2	300	80	50			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Xylene (o)	µg/L	2		350	200			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Xylene (m & p)	µg/L	2						<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Xylene Total	µg/L	2	600					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2		
Naphthalene	µg/L	0.004		16	2.5			<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007		
TRH - NEPM 2013																					
F1 (C6-C10 minus BTEX)	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		
C6-C10 Fraction	µg/L	20						<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		
F2 (>C10-C16 minus Naphthalene)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		
>C10-C16 Fraction	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		
F3 (>C16-C34 Fraction)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		
F4 (>C34-C40 Fraction)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		
>C10-C40 (Sum of Total)	µg/L	100						<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100		