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HYDRO ALUMINIUM SMELTER
CAPPED WASTE STOCKPILE, 2022 ANNUAL GROUNDWATER MONITORING REPORT

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HYDRO ALUMINIUM SMELTER
2022 ANNUAL GROUNDWATER MONITORING REPORT

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Prepared by	**Jake Bourke, Jordyn Kirsch**
Checked by	**Kirsty Greenfield (CEnvP Site Contamination Specialist No. SC40104)**
Approved by	**Fiona Robinson (CEnvP Site Contamination Specialist No. SC40100)**
Description	**2022 Annual Groundwater Monitoring Report for the leachate plume associated with the Capped Waste Stockpile at the former Hydro Aluminium Kurri Kurri Smelter, Loxford, NSW.**

Ramboll
Level 2, Suite 18 Eastpoint
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia

T +61 2 4962 5444
https://ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

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ABBREVIATIONS

Abbreviation	Description
AEC 1	Areas of Concern 1
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines (Water Quality)
CoC	Contaminant of Concern
Conc.	Concentration (in tables and graphs)
DQI	Data Quality Indicator
DQO	Data Quality Objective
CWS	Capped Waste Stockpile
EC	Electrical Conductivity
EPA	Environmental Protection Authority
GME	Groundwater Monitoring Event
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
ha	hectare
km	kilometre
L	litre
LOR	Limit of Reporting
m	metre
m bgs	Metres below ground surface
µg/L	micrograms per litre
mg/L	milligrams per litre
NATA	National Association of Testing Authorities
NSW	New South Wales
No.	Number of samples (in tables and graphs)
pH	Measure of acidity, hydrogen ion activity
Ramboll	Ramboll Australia Pty Ltd
RPD	Relative Percentage Difference
QA/QC	quality assurance/quality control

EXECUTIVE SUMMARY

Thirty-seven groundwater monitoring events have been completed between July 2013 and December 2022 to monitor a leachate impacted groundwater plume associated with the Capped Waste Stockpile (CWS) at the former Hydro Aluminium Kurri Kurri Smelter, located off Hart Road, Loxford, NSW. Monitoring of the groundwater down gradient of the CWS was initiated to assess the impacts to groundwater from leachate and to provide a temporal and spatial evaluation of the plume behaviour. Leachate from the CWS has high pH and elevated dissolved fluoride characteristics.

Each GME included the sampling and analysis of groundwater from a network of 24 shallow and deep wells located on five sections along the length of the leachate plume down-gradient of the CWS. In 2016, an additional two pairs of shallow and deep wells were added to the network. These wells are located adjacent to Swamp Creek, the nearest surface water receptor. Physico-chemical parameters were recorded, and groundwater samples analysed for soluble fluoride, total and free cyanide as well as total and dissolved aluminium.

Groundwater downgradient of the CWS is shallow and within a former sand filled river channel. Geological constraints limit the movement of groundwater and cause groundwater discharge to the surface following rainfall events. Groundwater wells target the upper phreatic surface, or shallow part of the aquifer, and a deeper part of the aquifer. The monitoring depth of the deeper well is variable and depending on geological stratum.

Evaluation of 2022 GME data has identified the following:

- The leachate plume in shallow groundwater is delineated to the north, with a decreasing trend in soluble fluoride concentrations in well N9 at the leading edge of the plume.
- An increasing trend in pH and soluble fluoride concentrations have been reported at well E4 on the eastern boundary of the leachate plume. Groundwater at this location is constrained from further eastern migration due to geological constraints (high plasticity clay with low permeability). In addition, soluble fluoride concentrations in leachate at this location on the eastern edge of the leachate plume are generally consistent with historical observations made in 2013.
- Consistent with previous monitoring, the leachate plume has impacted the deeper sand aquifer in a localised area close to the plume source, the CWS, as shown by elevated soluble fluoride concentrations and a high pH in well W2D. Fluoride concentrations at this well have been elevated over the monitoring period and while no increasing trend in fluoride concentration has been observed, there is an increasing trend in pH with the highest pH results identified in the three most recent monitoring events in June, September and December 2022.
- There may be some expansion of leachate impact in the deep aquifer to the east, from the source towards W1D, with an increasing trend identified for both pH and soluble fluoride concentrations for two consecutive years (2021 to 2022). pH values at W1D are approaching levels characteristic of leachate impact (pH >9). The increasing plume migration coincides with higher than average rainfall experienced in the area, which is the primary mechanism for movement of the plume from the CWS.
- Consistent with previous monitoring, the leachate plume is not reaching the nearest surface water receptor of Swamp Creek, as indicated by continued low pH and low soluble fluoride concentrations in sentinel wells.
- Leachate is currently only generated in limited quantities following heavy rainfall and removal of leachate from the northern interception trench is completed as required. The active leachate interception trench at the toe of the CWS has not been pumped since 2016 and it was replaced in late 2022 with two separate interception trenches. Water pumped from these interception trenches will be pumped to the TWTP for treatment prior to disposal through the water management system.

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was commissioned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to undertake quarterly Groundwater Monitoring Events (GMEs) on a portion of the Hydro Aluminium Kurri Kurri Smelter, located off Hart Road, Loxford, New South Wales (NSW), Australia.

The portion of the Smelter subject to the quarterly groundwater monitoring comprises the former smelter waste storage area known as the 'Capped Waste Stockpile' (CWS) and an associated area of leachate impacted groundwater (the leachate plume). The CWS and associated leachate impacted groundwater were identified as Area of Concern 1 (AEC 1) in the Phase 2 Environmental Site Assessment completed by Environ (now Ramboll) in 2012. The location of AEC 1 is shown in **Figure 1, Appendix 1**.

Results of previous GMEs completed between July 2013 and December 2021 have been reported in the following reports:

- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 12 Month Groundwater Monitoring Report', by Environ (now Ramboll), dated February 2015
- 'Hydro Aluminium Smelter, Capped Waste Stockpile, 2015 Annual Groundwater Monitoring Report' by Ramboll Environ (now Ramboll), dated April 2016
- 'Hydro Aluminium Smelter, Capped Waste Stockpile, 2016-2017 Annual Groundwater Monitoring Report', by Ramboll, dated February 2018
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2018 Annual Groundwater Monitoring Report', by Ramboll, dated February 2019
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2019 Annual Groundwater Monitoring Report', by Ramboll, dated February 2020
- 'Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 2020 Annual Groundwater Monitoring Report', by Ramboll, dated February 2021

This report presents the results of four quarterly GMEs, completed in March, June, September, and December of 2022, as well as a trend analysis of the results from the 37 monitoring events completed between 2013 and 2022.

1.1 Objective and Scope of Work

The objective of each quarterly GME was to:

- Assess the current status of leachate impacts to groundwater occurring from the CWS
- Compare the current status of leachate impacts to historical data to assess changes in groundwater quality.

The objective of this 2022 Groundwater Monitoring Report is to:

- Tabulate results for depth to groundwater, physico-chemical parameters and analytical data collected in 2022
- Complete trend analysis of monitored parameters in key wells incorporating data collected since July 2013
- Complete trend analysis with rainfall data
- Contour contaminant concentrations in the shallow and deep aquifers
- Assess the impact of the leachate interception trench on groundwater quality
- Assess plume migration
- Provide conclusions and recommendations

The scope of work for each quarterly GME included:

- Gauging, purging and sampling of 28 groundwater monitoring wells on five sections through the plume, including two shallow wells and two deep wells located adjacent to Swamp Creek
- Measurement of groundwater physico-chemical properties during purging, including pH, temperature, electrical conductivity (EC), redox, turbidity and dissolved oxygen
- Laboratory analysis of groundwater samples for soluble fluoride, total and dissolved aluminium and total and free cyanide

1.2 Update on ECC and Remediation Project

The ECC and Remediation Project includes the construction of an on-site Engineered Containment Cell (ECC) for the long-term secure storage of smelter wastes and contaminated soil, which is to be relocated from the CWS and other Areas of Environmental Concern at the Smelter Site and associated Buffer Zone.

Remedial works commenced in 2015 and progressed through the demolition of the Smelter between 2017 and 2020. Contaminated soil that was remediated during this period has been stockpiled in interim stockpiles on the Smelter Site. The ECC was constructed between 2021 and 2022. Smelter wastes from the CWS and contaminated soil in interim stockpiles will be relocated to the ECC in 2023.

Topsoil and clay capping was removed from the CWS and stockpiled for re-use on the Smelter Site in August 2022.

Two new leachate interception trenches were installed along the toe of the CWS in late 2022 to capture leachate from the CWS and direct it through a Temporary Water Treatment Plant (TWTP) that was constructed adjacent to the CWS in mid-2022. The TWTP will treat leachate from the CWS, and leachate generated during periods of rainfall during waste placement at the ECC. The TWTP is anticipated to operate for a period of two years.

1.3 Limitations

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 4 December 2020 and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous. Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

1.4 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without Ramboll's express written permission.

2. BACKGROUND

2.1 Site Background

The Hydro Aluminium Kurri Kurri Smelter is located approximately 30 kilometres (km) west of the city of Newcastle and 150 km north of Sydney, in NSW, Australia. The smelter includes a 60-hectare (ha) plant area and a 2,000-ha buffer zone.

The CWS is a repository of waste arising during the operations of the aluminium smelter and includes spent pot lining, anodes, scrubber bags, concrete, brick, bulky waste, fines and other smelter wastes. The CWS is located near the eastern boundary of the smelter footprint and adjacent to the surrounding Hydro owned buffer land.

The CWS was maintained as an uncapped bunded waste repository prior to being capped with clay under development consent in the mid-1990s. At this time, impacts to vegetation in the buffer zone downgradient of the CWS were observed. Leachate from the CWS, caused by rainwater and groundwater coming in to contact with the CWS contents, was also known to have impacted on groundwater and investigations commenced to explore the extent of groundwater impact. These investigations identified that leachate impacted groundwater likely originated from the northeast corner of the CWS and extended approximately 250 meters (m) northeast. The CWS and associated leachate impacted groundwater were identified as AEC 1 in the Phase 2 Environmental Site Assessment completed by Environ (now Ramboll) in 2012. The location of AEC 1 is shown in **Figure 1, Appendix 1**. Ramboll assessed AEC 1 as part of the following investigations:

- 'Phase 2 Environmental Site Assessment, Kurri Kurri Aluminium Smelter', dated 1 November 2012
- 'Environmental Site Assessment, Capped Waste Stockpile, Kurri Kurri Aluminium Smelter', dated 13 December 2012
- 'Plume Delineation Report, Capped Waste Stockpile', dated 6 November 2013.

Following these investigations, a Groundwater Monitoring Programme was developed that included monitoring 24 wells on five cross sections along the length of the plume. A summary of the Plume Delineation Report was included in Section 2.2 of the 12 Month Groundwater Monitoring Report (ENVIRON June 2016) and further information regarding the development of the Program is presented in Section 2.4 of that report.

Interim mitigation measures were taken in 2013, 2016, 2017 and late 2022 to intercept the shallow movement and daylighting of leachate impacted groundwater. Measures involved the installation of passive or active shallow trenches, extending approximately 2 m below the ground surface perpendicular to the plume migration and providing pipe conveyance of the leachate impacted groundwater to the surface.

Planning approval has been received for the remediation of the CWS (State Significant Development SSD 6666). Remediation will involve the consolidation of all contaminated materials within one centralised engineered containment cell located approximately 1 km west of the current CWS site and within residual clay soils. The engineered containment cell was constructed in 2021 and 2022. It is anticipated that the relocation of wastes into the cell will occur in 2023, following which the cell will be capped. Remediation of the CWS will result in the removal of the source of leachate to the groundwater system. Remediation involves some removal of leachate impacted groundwater with the remaining groundwater remediation occurring through natural processes following subsequent rainfall.

2.2 Characterisation of the Leachate Plume

A conceptual site model was developed following Stage 1 and Stage 2 of the investigations and was included in 12 Month Groundwater Summary Report, 2014 (Environ 2015).

The Hydro aluminium smelter and surrounding land generally comprises flat, low lying swampy ground that is at an elevation of between 12 m Australian Height Datum (AHD) and 15 m AHD.

The CWS is located within the smelter portion of the site and is approximately 170 m in length by 130 m in width and is up to 11 m high and has until recently been capped with clay and topsoil. The eastern portion of the site within the buffer zone retains natural bushland vegetation with minor surface filling using refractory bricks along the buffer zone fence line. Two areas of vegetation impact, known as the northern and southern vegetation impact areas are located in the north-eastern portion of the site.

The CWS comprises stockpiled spent pot lining wastes and other wastes including cryolite, alumina, floor sweepings, shot blast dust, cement and pot lining mix. The waste is not leachate generating of itself (i.e., not putrescible) however, the uncapped storage of waste and subsequent infiltration of rainwater through the waste stockpile led to the generation of leachate over a period of approximately 25 years. Prior to capping, the leachate was collected behind bund walls surrounding the spent pot lining stockpile. During capping, leachate was suspected to have been entrapped within the fill in the north-eastern corner of the CWS.

The CWS was capped in 1995 to prevent further infiltration. The suspected burial of leachate during capping and the ongoing contact between waste material and shallow groundwater beneath the CWS is considered to result in the ongoing leachate generation.

Major contaminants in the leachate are sodium (4,800 mg/L to 15,300 mg/L), fluoride (1,100 mg/L to 3,420 mg/L), sulphate (4,000 mg/L to 6,740 mg/L) and cyanide (70 mg/L to 200 mg/L) based on data obtained from leachate ponded within the bunded area of the CWS prior to capping (Reference: Dames & Moore (1992) 'Environmental Impact Statement, Upgrades to Waste Storage Facilities at the Alcan Australia Limited Kurri Kurri Smelter'). Leachate impacted groundwater is observed to be brown in colour.

The leachate plume originates from beneath the eastern side of the CWS where seepage into shallow groundwater within a semi-continuous sand aquifer has occurred. The shallow sand aquifer has been delineated as an elongate and sinuous sand lens approximately 50 m wide and 250 m in length extending to the northeast of the CWS. The shallow sand aquifer is surrounded vertically and horizontally by a discontinuous clay aquitard that has been less impacted by leachate in close proximity to the plume and not been impacted by leachate at a distance from the plume. The configuration of the aquifer is a result of the nature of the deposition of sediments within a former estuary during periods of sea level rise and fall. A schematic cross section of the site is included as **Attachment 1**, **Appendix 2**.

The location of the plume within the semi-continuous shallow sand aquifer constrained by the surrounding discontinuous clay aquitard suggests that the movement of the leachate groundwater plume is limited by the geology. The complex interbedded Quaternary sediments comprise estuarine muds (high plasticity clay), fluvial channel sands (fine grained and coarse-grained sands), sandy levee deposits (clayey sand/sandy clay) and high energy flood deposits (coarse grained quartz sand).

Delineation investigations show that the groundwater plume remains confined within one main sand filled channel which directs flow to the northeast. This finding is consistent with observations of a heavily vegetated area evident in the 1961 historical aerial photograph (**Attachment 2**, **Appendix 2**). The heavy vegetation is a reflection of surface and subsurface drainage lines and likely represents the shallow groundwater table present in the sand filled channel. The 1961 aerial photograph depicts the vegetation extending further to the northeast and connecting with Swamp Creek. Given the correlation between the plume extent and the vegetation, it is reasonable to conclude that the groundwater flow path will continue along the vegetation alignment toward Swamp Creek and that, should the plume migration reach the surface water receptor, the discharge point will occur approximately 750 m to 1,000 m north-east of the plume, as shown in **Attachment 2**, **Appendix 2**. Fate and transport modelling to predict the migration of the plume along this channel has been undertaken, as summarised in **Section 2.5**.

The shallow nature of the semi-continuous sand aquifer results in the exfiltration of leachate impacted groundwater within topographically low areas of the site and following high rainfall events. The impacts of exfiltration are observed on the eastern edge of the plume where dieback of vegetation has occurred (southern and northern vegetation impact areas). Brown coloured seepage is observed and evaporation of exfiltrated groundwater has left a white salt crust on surface soils in this area. The high electrical conductivity of the exfiltrated groundwater (up to 15,000 µs/cm) exceeds the limit (12,200 µs/cm) at which conditions are generally too saline for plant growth (ANZECC, 2000).

The semi-continuous shallow sand aquifer that is impacted with leachate is characterised by high pH (pH >9), electrical conductivity (>5,000 µS/cm), fluoride (>200 mg/L) and total cyanide (>6 mg/L) concentrations and is brown in colour. Historical data from 1992 to 2014 indicates fluoride concentrations within the leachate plume decreased after the CWS was capped in 1995. Fluoride concentrations near the CWS, the source of the plume, peaked in 1997. Mid-way along the plume, fluoride concentrations peaked around 2000 and at the leading edge, fluoride concentrations peaked between 2004 and 2006, as shown in **Figure 2-1**.

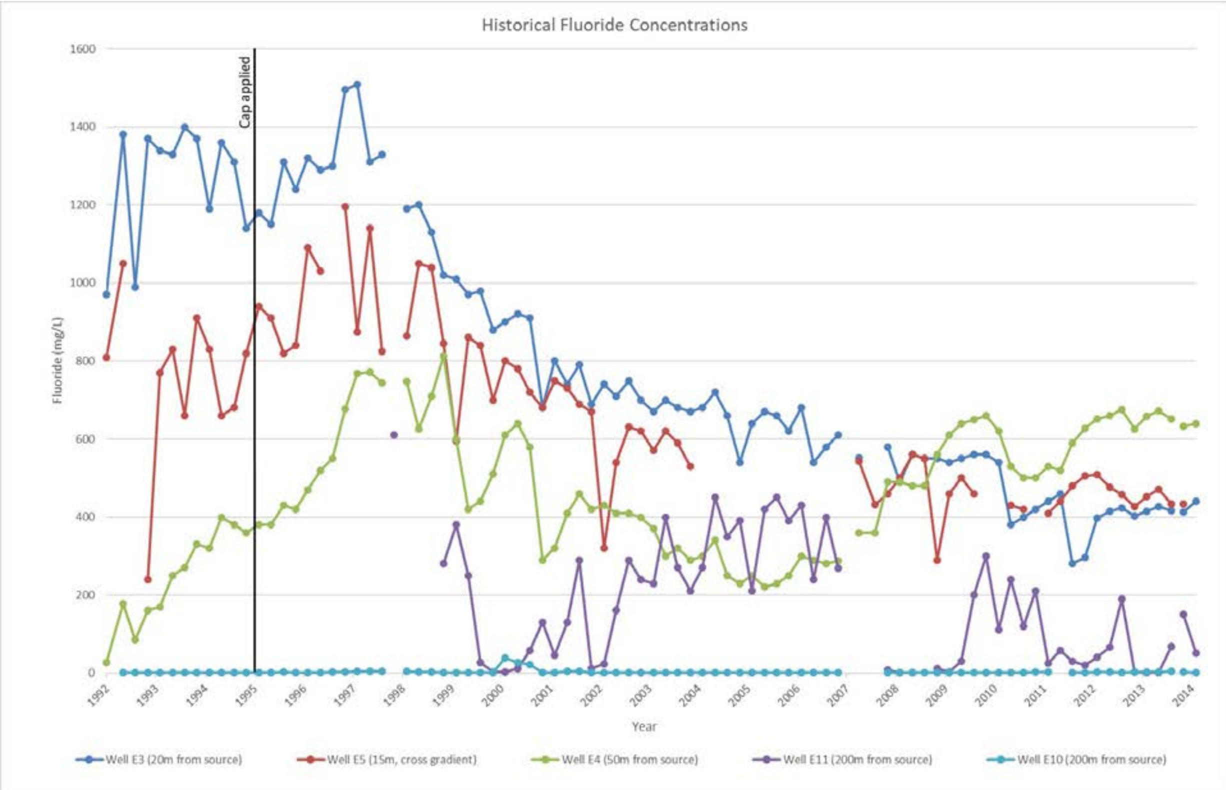


Figure 2-1: Historical Fluoride Concentrations Along the Plume 1992 - 2014

Ex-filtrated leachate impacted groundwater is observed to become overland flow discharging along a surface water flow path to a small dam. During periods of high rainfall, surface water within this dam is able to flow through a culvert structure to a larger dam which discharges to Swamp Creek. The overland flow path is shown in **Attachment 3**, **Appendix 2**.

Fluoride concentrations at the semi-permanent dam, located between the leachate impacted groundwater plume and Swamp Creek, typically vary between 15 mg/L and 25 mg/L. It is considered that the elevated fluoride concentrations in the semi-permanent dam are due to overland flow of exfiltrated groundwater from their source at the southern and northern vegetation impact areas. Sampling found the fluoride concentrations in Swamp Creek vary between 0.49 mg/L upstream of the smelter and 1.2 mg/L downstream. Adjacent to the semi-permanent dam discharge to Swamp Creek, fluoride concentrations were 1.6 mg/L. The Stage 2 Aquatic Assessment - Ecological Risk Assessment completed by ENVIRON in June 2013 indicated there is no discernible impact to the aquatic ecology within the semi-permanent dam as a result of elevated concentrations of fluoride in surface water and sediment.

2.3 Aquifer Characterisation

A sand aquifer within the buffer zone of the Hydro Aluminium Smelter has been impacted by leachate from the CWS. An underlying deep aquifer has also been impacted in close proximity to the contamination source. The characteristics of this sand aquifer and the underlying deep aquifer are critical to the understanding of the site CSM. Aquifer characteristics have been identified as outlined in **Table 2-1**.

Table 2-1: Aquifer Characteristics

Characteristic	Comment
Aquifer Type	Unconsolidated sediment (estuarine)
Aquifer Depth	Shallow: Approximately 0.3 metres below ground surface (m bgs) to 2.5 m bgs Deep: Approximately 3.5 m bgs to 7 m bgs
Confined/Unconfined	Shallow: Unconfined Deep: Confined by high plasticity clays in some areas
Groundwater Flow Direction	Shallow: North to northeast Deep: Northeast
Recharge Mechanism	Shallow: Infiltration Deep: Infiltration
Porosity	Shallow: Variable due to variable nature of the sediments. High porosity quartz gravels identified at northeast corner of the Capped Waste Stockpile. Mid to low porosity tightly packed sands identified along plume length. Deep: Mid to low porosity poorly sorted, tightly packed fine-grained sand.

The most important characteristic for the movement of leachate through the shallow aquifer is the nature of the materials, in particular the complex and variable nature of the unconsolidated sediments. The nature of the sediments impacts the soil permeability, with high porosity quartz gravels, mid to low porosity tightly packed sands and high plasticity clays with very low porosity, all identified within the unconsolidated estuarine sediments. The leachate from the CWS permeates through mid to high porosity sediments but is retarded by high plasticity clays. Where low porosity and low permeability conditions constrain sub-surface flow, groundwater may discharge at the ground surface coinciding with changes in topography.

2.4 Leachate Interception Trenches

The following leachate interception trenches were installed down gradient of the source of the leachate plume to capture leachate prior to daylighting to surface near the two vegetation impact areas:

- A passive interception trench was installed in early 2013 to the north of Section 2 to intercept leachate flowing into the southern vegetation impact area
- An active interception trench was installed at the toe of the CWS immediately upgradient of the wells on Section 1 in April 2014
- A second passive interception trench was installed north of Section 4 in October 2017 to capture leachate daylighting along the western edge of the northern vegetation impact area

The location of these interception trenches are shown in **Attachment 4**, **Appendix 2.** A conceptual cross section of the active interception trench on Section 1 is included in **Attachment 5**, **Appendix 2**.

These trenches were installed as an interim remedial measure to reduce daylighting and overland flow of leachate downgradient of the CWS. The active trench was in operation from May 2014 to March 2016 when the discharge rate dropped to 0 L/ minute. Operation of the active trench since March 2016 has not been required as leachate is no longer collecting in the trench. The passive trenches are occasionally pumped out following heavy rainfall. The trenches have been effective as an interim remedial measure, with water quality improvements and regeneration of vegetation observed in the two vegetation impact areas.

In late 2022, the active interception trench at the toe of the CWS was removed and two interception trenches were reinstated in this area. One horizontal trench extends approximately 40 m, with a slope to the south and a connection to a vertical pumping bore located near well W7S. A second pumping bore was installed adjacent to the deep well W2D, which is impacted with leachate. Both pumping bores will pump leachate to a holding tank, which will be pumped to the Leachate Dam prior to treatment through the Temporary Water Treatment Plant (TWTP) set up to treat leachate during the ECC and Remediation Project. The TWTP is likely to operate for a two year period from 2023 to 2025.

2.5 Fate and transport modelling

ENVIRON (February 2015) conducted a hydrogeological review and analytical groundwater contaminant transport modelling to assess the fate and transport of the leachate plume within the shallow aquifer. The assessment and modelling included a review of site investigation data and the construction of a conceptual hydrogeological model of AEC 1 and its surrounds.

A one-dimensional model (UK EA Remedial Targets Worksheet) was used to simulate the groundwater flow and contaminant transport conditions to predict contaminant (fluoride) concentrations from the source to the nearest down-gradient receptor (Swamp Creek).

The model was calibrated against observed fluoride concentrations from the existing groundwater monitoring well network to the east and north-east of the capped waste stockpile. The groundwater fluoride concentration at the receptor impact point was then evaluated under the simulated model and compared with the guideline criteria.

The following conclusions were drawn from the results of the modelling:

- Based on the existing hydrogeological conditions and the presence of an ongoing source from the CWS, the model estimated a fluoride concentration of 4.3 mg/L at the receptor distance (1,000 m), compared to the guideline criteria of 1.5 mg/L
- This value is considered a conservative estimate given the model assumes a continuous source, however, historical, more recent and proposed works are considered to have mitigated the source contribution. Future remedial works are proposed to ultimately remove the source (spent Pot Liner, anodes, scrubber bags, concrete, brick, bulky waste, fines and other smelter wastes stockpiled within the CWS)
- The model demonstrates sensitivity to a number of input parameters including the soil partition coefficient, (Kd). Future studies may include site specific determination of the soil partition coefficient in order to improve model calibration.

2.6 Conceptual Site Model

A Conceptual Site Model (CSM) is a site-specific qualitative description of the source(s) of contamination, the pathway(s) by which a contaminant may migrate through environmental media and the populations (human and/or ecological) that may potentially be exposed. This relationship is commonly known as a Source-Pathway-Receptor (SPR) linkage. Where one or more elements of the SPR linkage are missing, the exposure pathway is considered to be incomplete, and no further assessment is required.

A CSM was developed for the CWS leachate plume based on details provided in the sections above. The CSM has been updated based on field observations and data to 2022.

2.6.1 Contaminant Sources

The contaminant sources at the CWS leachate plume is the aluminium smelter wastes disposed in the CWS, primarily spent pot lining and cryolite.

2.6.2 Contaminants of Concern

Contaminants of Concern associated with spent pot lining and cryolite include fluoride, cyanide, aluminium, sodium, sulphate and high pH.

2.6.3 Potential Human and Ecological Receptors

Identified potential receptors of contaminants of concern, should a complete exposure pathway be present, include:

- Maintenance personnel (brush cutting is completed in this area)
- Hydro employees who access the buffer zone
- Vegetation growing in the area of the leachate plume
- Transitory fauna that traverse through the area of the leachate plume
- The ecology of the semi-permanent dam located adjacent to Swamp Creek, the nearest down gradient receptor
- The ecology of Swamp Creek

Limited human receptors were identified as the site is located in a portion of the buffer zone that is fenced and not accessible to the general public or Hydro employees aside from those who work in the buffer zone.

2.6.4 Potential Transport Mechanisms

Identified potential transport mechanisms by which contaminants of concern may migrate from the source include:

- Migration through groundwater
- Daylighting of groundwater and overland surface water flow

Infiltration as a transport mechanism was stopped by the capping of the CWS with low permeability clay in the mid-1990s.

2.6.5 Exposure Pathways

For a receptor to be exposed to a chemical contaminant derived from a site, there must be an exposure pathway linking the source of contamination and the exposed receptor. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed receptor and generally includes the following elements (US EPA 1989):

- A source and mechanism of chemical release
- A retention or transport medium (or media where chemicals are transferred between media)
- A point of potential human contact with the contaminated media
- An exposure route (e.g., ingestion, inhalation) at the point of exposure

An evaluation of exposure pathways at the site is outlined in **Table 2-2**.

Table 2-2: Source-Pathway-Receptor Linkages

	Source-Pathway-Receptor Link? (Yes/No/Potential (P), Not Relevant (NR))						
	Maintenance Personnel	**Hydro Employees**	**Vegetation**	**Transitory fauna**	**Ecology of dam down gradient**	**Ecology of Swamp Creek**	**Justification**
Soil							
Dermal contact with impacted soil	No	No	NR	No	NR	NR	The contents of the CWS and underlying 0.5 m of soil are impacted by elevated concentrations of fluoride, asbestos, PAHs and petroleum hydrocarbons (Ramboll 2016). Natural soils more than 0.5 m below the waste are not impacted. The contamination is no longer accessible following capping of the CSW with low plasticity clay in the mid-1990s.
Incidental ingestion of impacted soil	No	No	NR	No	NR	NR	
Outdoor dust inhalation	No	No	NR	No	NR	NR	
Surface Water							
Dermal contact with impacted surface water	No	No	NR	No	No	No	Groundwater within the leachate plume can daylight and flow across overland flow paths, providing a pathway between contaminated groundwater and human and ecological receptors. Following the installation of the interception trenches, the daylighting of groundwater has reduced in frequency and impacted surface water has been observed on few occasions during heavy rainfall since 2014.
Incidental ingestion of impacted surface water	No	No	NR	No	No	No	
Uptake of impacted surface water	NR	NR	No	NR	NR	NR	
Groundwater							
Dermal contact with impacted groundwater	No	No	No	No	No	No	Groundwater within the leachate plume is not accessible aside from uptake of impacted water by vegetation, as evidenced by the two vegetation impact areas in the down gradient portion of the plume. High plasticity clays located east of the leachate plume prevent groundwater migration east towards Swamp Creek.
Incidental Ingestion of impacted groundwater	No	No	No	No	No	No	
Uptake of impacted groundwater	NR	NR	**Yes**	NR	NR	NR	

3. SAMPLING AND ANALYSIS QUALITY PLAN

3.1 Objective

The objective of each quarterly GME is to collect water quality data from the groundwater monitoring network to inform the behaviour of the leachate plume over time and provide data for annual reporting.

The groundwater monitoring network comprises groundwater wells located on five sections along the length of the leachate plume, as follows:

- Section 1: Wells E5, E5D, W7S, W7M, PUMP, W2S, W2D
- Section 2: Wells E5, E5D, E4, W1S, W1D
- Section 3: Wells A7, W3S, ~~W3D~~[1], ~~W3SA~~[2], W4S, ~~W4D~~[3]
- Section 4: Wells E11, W5S, W5D, N2
- Section 5: Wells G2, N8, N9, W6S, W6D

Two pairs of shallow and deep wells adjacent to Swamp Creek (F5/G5 and F6/G6) were added to the groundwater monitoring network in 2016. These are sentinel wells that are unimpacted by leachate. The presence of leachate in these wells would indicate potential impact to Swamp Creek, the nearest surface water receptor. The groundwater monitoring network is shown in **Figure 2, Appendix 1**.

3.2 Scope of Works

The scope of works included the following:

- The collection of groundwater samples and measurement of water levels and physico-chemical parameters (including pH, temperature, EC, redox, turbidity and dissolved oxygen) from 28 groundwater wells in the groundwater monitoring network
- Laboratory analysis of groundwater samples for soluble fluoride, total and dissolved aluminium, and total and free cyanide. Dissolved aluminium was included as part of laboratory analysis from June 2018.

3.3 Fieldwork Methodology

The fieldwork methodology for the collection of groundwater samples is outlined in **Table 3-1**.

Table 3-1: Field Methodology for Quarterly Groundwater Monitoring

Activity	Details
Well Gauging	Monitoring wells were gauged using a water interface probe.
Well Purging	Monitoring wells were purged prior to sampling by pumping water from the wells until the physico-chemical parameters stabilised.
Decontamination	The majority of the sampling equipment used during low flow sampling was dedicated and disposable, such as the dedicated and disposable sampling tube. Non-disposable sampling equipment, including the interface probe, water quality meter and flexible pump tubing was decontaminated by washing in a Decon®90 solution and rinsing with potable water between sampling locations.
Sample Collection and Storage	Groundwater samples were collected into laboratory-supplied bottles with the appropriate preservative for the analysis undertaken. The bottles were stored in an ice-filled cooler in the field and in transit to the laboratory.
Chain of Custody	Groundwater samples were dispatched to the laboratory under chain of custody conditions.

[1] This well has not been sampled since December 2020 due to an obstruction in the well casing. The well is suspected to be damaged and has not been replaced.

[2] This well was damaged in the April 2015 storm. As this well was dry for the majority of the 2013 and 2014 sampling events, it has not been replaced.

[3] This well was damaged in the April 2015 storm. It was able to be sampled until October 2016 but is now damaged beyond repair and has not been replaced.

3.4 Groundwater Well Maintenance

During December 2022, a well cap was added to W5D as the well was exposed without a monument.

3.5 Data Quality Objectives

Data quality objectives (DQOs) are outlined in **Table 3-2**.

Table 3-2: Data Quality Objectives

DQO	Outcome
State the Purpose	To collect on-going monitoring data from a network of wells to understand the temporal and spatial behaviour of the aquifer in the area of leachate impacted groundwater.
Identify the Decision	• Is the data collected from the monitoring well network of sufficient quality to meet the project objectives? • Is the data collected from the monitoring well network of sufficient quality to be comparable between events?
Identify Inputs to the Decision	• Record physico-chemical parameters and collect samples from the groundwater monitoring well network (see **Figure 2, Appendix 1**) over four quarterly GMEs. • Complete analysis of collected groundwater samples for soluble fluoride, total and free cyanide, total and dissolved aluminium; and • Analyse the data and compare with historical results.
Define the Study Boundaries	AEC 1 identified in **Figure 1**, **Appendix 1** plus the surface water receptors identified down gradient of AEC 1, including a semi-permanent dam and Swamp Creek. The investigation relates to groundwater.
Develop a Decision Rule	The statistical parameters of interest are the concentrations of fluoride, cyanide, aluminium, pH and EC identified historically and in the current investigations. The Assessment Criteria outlined in **Section 5** and the historical groundwater concentrations where available for the monitoring wells. The Decision Rules for groundwater are: • Groundwater concentrations were assessed against the acceptance criteria outlined in **Section 5** in combination with a comparison against background criteria where applicable. An evaluation of significance was also undertaken; and • Recommendations were made for further evaluation for concentrations above criteria or background concentrations.
Specify Limits on Decision Errors	As this investigation involves a series of GMEs to monitor the state of a groundwater leachate plume, decision errors relate to the comparability of data between monitoring events. During the 2022 GMEs, 28 wells will be sampled unless found to be dry. This number takes into consideration three damaged wells (W3SA, W4D and W3D). Standard operating procedures, including consistent use of low flow techniques, should be implemented to ensure comparability of data between events. The same primary and secondary laboratories should be used for analysis and laboratory QA/QC should be assessed to ensure comparability between events.
Optimise the Design for Obtaining Data	Low flow sampling techniques will be used to collect groundwater samples to optimise the quality of the samples. Field samples for each round will be collected using the same sampling procedures to ensure comparability between GMEs.

3.6 Data Quality Indicators

Project data quality indicators (DQI) have been established to set acceptance limits on field and laboratory data collected as part of the quarterly groundwater monitoring program. The data quality indicators are outlined in **Table 3-3.**

Table 3-3: Data Quality Indicators

DQI	Field	Laboratory
Completeness – a measure of the amount of useable data from a data collection activity	All critical locations sampled. All samples collected, aside from dry wells. Experienced sampler. Documentation correct.	All critical samples analysed. All analysis completed according to standard operating procedures. Appropriate methods Appropriate Practical Quantitation Limits (PQLs).
Comparability – the confidence that data may be considered to be equivalent for each sampling and analytical event	Experienced sampler. Climatic conditions appropriate for the type of analyte. Climatic conditions noted during sampling. Same types of samples collected using same sampling methods.	Same analytical methods used. Same sample PQLs. Same NATA accredited laboratories used. Same units.
Representativeness – the confidence that data are representative of each medium present on site.	Appropriate media sampled. Groundwater sampled following stabilisation of physico-chemical parameters	All samples analysed according to standard operating procedures.
Precision – a quantitative measure of the variability of the data.	Collection of intra-laboratory duplicates at a rate of 1 in 10 primary samples. Collection of inter-laboratory duplicate samples at a rate of 1 in 20 primary samples.	Analysis of field duplicate samples, relative percent difference (RPDs) to be less than 30%. Laboratory duplicates analysed, RPDs to be less than 30%.
Accuracy – a quantitative measure of the closeness of the reported data to the “true” value.	Sampling methodologies appropriate and complied with. Collection of rinsate samples from non-disposable sampling equipment.	Analysis of: • Rinsate blanks • Method blanks • Matrix spikes • Surrogate spikes • Laboratory control samples • Reagent blanks. • Results for blank samples to be non-detect. • Results for spike samples to be between 70% and 130%.

4. QUALITY ASSURANCE / QUALITY CONTROL

Four quarterly GMEs were completed in March 2022, June 2022, September 2022, and December 2022. A quality assurance/quality control assessment is provided in **Table 4-1** and **Table 4-2**.

Table 4-1: QA/QC Sampling and Analysis Methodology Assessment

Sampling Methodology	Ramboll Assessment
Sampling Pattern and Locations	Prior to the commencement of the GMEs, the leachate plume originating from the CWS was delineated through staged fieldwork and reporting in ENVIRON (2013, revised 2016) 'Plume Delineation Report, Capped Waste Stockpile'. From the delineation work, 19 new groundwater wells were installed along the length of the plume to assist with groundwater monitoring. The five sections are approximately 60 m apart and extend from the toe of the CWS to the leading edge of the leachate plume. Groundwater wells target both the shallow and deep aquifer. Groundwater wells located on five sections were selected for the 2022 GMEs. Each section provides a cross section at different lengths along the known location of the leachate plume. One of the wells, W3SA, was destroyed in the April 2015 storm and has not been replaced. Another well, W4D, was also damaged in this storm but was able to be sampled until the October 2016 GME. This well can no longer be sampled and has not been replaced. A third well, W3D, has been unable to be sampled since December 2020 due to an obstruction within the well casing and is suspected to be damaged. This well has also not been replaced. In 2016, an additional two shallow and deep pairs of wells (F5/G5 and G6/F6) were added to the monitoring network. These wells are sentinel wells located adjacent to Swamp Creek, the nearest surface water receptor.
Sampling Density	Twenty-eight groundwater wells were selected for sampling for the 2022 quarterly GMEs on five sections along the length of the leachate plume and adjacent to the nearest surface water receptor. As the leachate plume is approximately 300 m in length, there is one section per 60 m. One primary groundwater sample was collected from each well (unless dry or damaged).
Sample Depths	Both shallow groundwater (the leachate plume) and the deep aquifer were sampled as part of the 2022 quarterly GMEs.
Sample Collection Method	For the 2022 quarterly GMEs, groundwater samples were collected using low flow methods (peristaltic pump and dedicated LDPE tubing). Groundwater samples were collected directly into laboratory-supplied bottles with field filtration for dissolved aluminium (0.45 µm). Disposable gloves were worn during sample collection.
Decontamination Procedures	Dedicated disposable tubing was used to collect the groundwater samples. A short piece of silicone tubing was retained in the peristaltic pump and used for all wells. This tubing along with all non-disposable sampling equipment (i.e., interface probe, water quality meter) was decontaminated between sampling locations by washing with a solution of Decon®90 and potable water.
Sample Handling and Containers	Samples were placed into laboratory supplied sampling containers, dosed with the correct preservative (where relevant), and immediately placed into a cooler chilled with ice and/or ice bricks while in the field and during transportation to the laboratory.
Detailed Description of Field Screening Protocols	A water quality meter was used to collect field data, including temperature, pH, electrical conductivity, reduction/oxidation potential, turbidity, dissolved oxygen, and total dissolved solids (TDS). These parameters were recorded during purging until they stabilised.

Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples.

Table 4-2: QA/Q Assessment

Data Quality Indicator	Ramboll Comments
Field Quality Control Samples	In general, intra-laboratory duplicate samples were analysed at a rate of approximately 10% and inter-laboratory duplicate samples were analysed at a rate of approximately 5% during the 2022 GMEs. At least one rinsate sample was collected per GME. A summary of the field quality control samples collected during the 2022 GMEs is outlined below: • March 2022: two intra-laboratory duplicates (D01_20220317, D02_20220318), one inter-laboratory duplicate (T01_20220317) and one rinsate (R01_20220318) • June 2022: two intra-laboratory duplicates (D01_20220615, D02_20220616), one inter-laboratory duplicate (T01_20220615) and one rinsate (R01_20220616) • September 2022: two intra-laboratory duplicates (D01_20220920, D01_20220921), two inter-laboratory duplicates (T01_20220920, T01_20220921) and one rinsate (R01_20220921) • December 2022: two intra-laboratory duplicates (D01_20221220, D02_20221221), one inter-laboratory duplicate (T01_20221220) and one rinsate (R01_20221221).
Field Quality Control Results	Intra-laboratory and inter-laboratory duplicate results for each GME are presented in **Table M**, **Appendix 3**. Relative percentage differences (RPDs) were calculated for intra-laboratory and inter-laboratory duplicate pairs of samples. RPDs for most analytes were below the criterion (30%) except for: • March 2022: inter-laboratory duplicate pair G2/T01_20220317 RPD for total aluminium 57% • June 2022: inter-laboratory duplicate pair PUMP/T01_20220615 RPD for dissolved aluminium 31% • December 2022: inter-laboratory duplicate pair W2D/T01_20221220 RPD for total and dissolved aluminium, 118% and 86% respectively, and free cyanide 197% There is no criterion for total aluminium. Therefore, these higher RPDs for this analyte are not considered to affect the outcomes of this report. The RPD exceedance reported for dissolved aluminium in inter-laboratory duplicate pair PUMP/T01_20220615 RPD was marginally above the acceptance criteria and unlikely to affect the outcomes of this report. W2D is highly contaminated and the RPD exceedances for free cyanide and dissolved aluminium may be the result of the heterogenous nature of leachate at this location. Rinsate sample results were all reported at less than the limit of reporting (<LOR) for the four 2022 GMEs.
Equipment Calibration	The water quality meter was calibrated prior to use. Standard practice is to rely on pre-calibration for short sampling periods. Calibration certificates are included in **Appendix 6**.
NATA registered laboratory and NATA endorsed methods	Envirolab was the primary analytical laboratory and ALS was used as the secondary laboratory. The laboratory certificates are NATA stamped.
Analytical methods	Summary analytical methods were included in the laboratory test certificates.
Holding times	Review of laboratory certificates indicated one holding times breach. Inter-laboratory duplicate sample T01_20221220 (collected as part of the December 2022 GME) did not reach the secondary laboratory within the appropriate holding time for total and free cyanide.
Limits of Reporting	LORs for all groundwater analytes were below the assessment criteria.
Laboratory quality control samples	Quality control frequencies were not within specification for total and dissolved metals at the secondary laboratory (ALS).
Laboratory quality control results	During June 2022, a matrix spike recovery for total cyanide could not be determined, as the background level was greater than/equal to 4-times the spike level The results for laboratory duplicates, laboratory control samples, and surrogates were acceptable, noting that reporting of percentage recovery was not possible in some samples over the four quarters due to high concentrations of elements in the samples however, an acceptable recovery was obtained for the Laboratory Control Sample (LCS).

Ramboll makes the following conclusions regarding the DQIs:

- Completeness: The data for the 2022 GMEs is complete as the selected 28 groundwater wells were located and dipped for depth to groundwater during each GME and groundwater samples were collected from wells containing sufficient water to sample.
- Comparability: The groundwater data collected during the four 2022 GMEs is comparable to previous results as the sampling protocols, analysis methods, quality control methods and monitoring well locations are generally consistent between sampling events and with prior events. The four 2022 GMEs were completed by a single sampler, Jake Bourke, a Ramboll environmental scientist.
- Representativeness: The selection of shallow and deep wells on sections along the length of the leachate plume is considered to provide data that is representative of the leachate plume in shallow groundwater and representative of the underlying deep aquifer. Groundwater was sampled following purging to ensure groundwater samples are representative of the aquifer sampled.
- Precision: In the field, Ramboll achieved precision by using standard operating procedures for the collection of groundwater samples and by collecting duplicate and triplicate samples for analysis. Relative Percent Difference (RPD) results for duplicate samples were generally acceptable. Laboratory quality control results indicate precision was achieved at the primary and secondary laboratories.
- Accuracy: In the field, Ramboll achieved accuracy by using Ramboll's standard operating procedures for the collection of groundwater samples. Laboratory quality control results indicate accuracy was achieved at the primary and secondary laboratories.

In general, the DQIs outlined above have been met and Ramboll considers that the data is of suitable quality to meet the project objectives.

5. ASSESSMENT CRITERIA

5.1 Groundwater Assessment Criteria

The assessment criteria adopted for the assessment of groundwater contamination were sourced from the following references:

- NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination
- ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality
- ANZG (2018) Guidelines for Fresh and Marine Water Quality
- NHMRC (2008) Guidelines for Managing Risks in Recreational Water
- ENVIRON (March 2013) Tier 2 Ecological Risk Assessment, Kurri Kurri Aluminium Smelter

5.2 Potential Beneficial Uses

NSW DEC (2007) indicates that for assessing groundwater quality, it is first necessary to assess the beneficial uses of groundwater and surface water down gradient of the site.

The closest surface water receptor to the site is a dam and then Swamp Creek located approximately 1.5 km to the north-east of the site within an area of the buffer zone used for farming. This drainage area discharges into Wentworth Swamp, which in turn discharges to the Hunter River approximately 15 km north-east of the site near Maitland.

Surface water acidity/alkalinity within the Swamp Creek is described as generally neutral with pH ranging between 7.0 and 7.8 and conductivity is generally fresh, ranging from 626 µS/cm to 1,520 µS/cm. This surface water body is considered to be a freshwater receptor.

Groundwater is expected to follow a subsurface drainage line through a sand filled channel and flow north east towards Swamp Creek. Water level gauging completed during previous investigations confirmed the groundwater flow direction to the north east.

According to the Office of Industry and Investment, NSW, there are 17 licensed groundwater abstractions (bores) located within the site, which are known to be associated with monitoring of groundwater impact. There are no other licensed groundwater bores within 2 km of the site.

Potential beneficial uses of groundwater down gradient of the site include:

- Discharge into Swamp Creek, which supports aquatic ecosystems, is used for recreational fishing and flows into Wentworth Swamp, which potentially flows into the Hunter River
- Extraction of water from Swamp Creek may also be used for stock watering and/or irrigation.

Drinking water has not been included as a potential beneficial use of water from Swamp Creek for the following reasons:

- Drinking water supply to the local communities is reticulated and originates from Chichester Dam on the Chichester River
- The Kurri Wastewater Treatment Works is located up gradient of the site. The works has a licensed discharge point into Swamp Creek.

5.3 Appropriate Criteria for Groundwater

Based on the review of potential beneficial uses of groundwater and surface water within the closest receptor, the criteria for protection of aquatic ecosystems, irrigation, stock watering and recreational use will be used.

The investigation levels presented in ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality are considered applicable for the protection of aquatic ecosystems of receiving waters. ANZG (2018) advocates a site-specific approach to developing guideline trigger values based on such factors as local biological affects data and the current levels of disturbance of the ecosystem. The guidelines present 'low risk trigger values' which are defined as concentrations of key performance parameters below which there is a low risk of adverse biological effects. If these trigger values are exceeded, then further action is required which may include further site-specific investigations to assess potential contamination or management and remedial actions.

Low risk trigger values are presented in ANZG (2018) for the protection of 80-99% of species in fresh and marine waters, with trigger values depending on the health of the receiving waters.

Groundwater results will be compared against trigger values for the protection of 95% of freshwater species. A 95% protection of freshwater species was selected due to the indication from the Hunter Catchment Management Trust that declining stream water quality and a reduction in diversity of native plants and animals has occurred in the last ten years.

A guideline for fluoride that is protective of the environment has not been developed in Australia.

A summary of the assessment criteria for groundwater is presented in **Table 5-1**.

Table 5-1: Groundwater Assessment Criteria

Contaminant	95% Protection for Aquatic Ecosystems	Irrigation	Stock Watering	Recreational
Aluminium (mg/L)	0.055	5	5	0.2[d]
Fluoride (mg/L)	No guideline	1	2	1.5[e]
Free Cyanide (mg/L)	0.007	No guideline	No guideline	0.8
pH (pH Units)	6.5 - 8[a]	No guideline	No guideline	6.5 - 8.5[d]
Electrical Conductivity (µS/cm)	No guideline	4,500 – 7,700[b] >12,200[c]	No guideline	No guideline

[a] *Values for lowland rivers from Table 3.3.2 in ANZECC (2000).*
[b] *Values for tolerant crops from Table 4.2.4 in ANZECC (2000).*
[c] *Value from Table 4.2.4 in ANZECC (2000) for where electrical conductivity is 'generally too saline' for plant growth.*
[d] *Aesthetic only, insufficient data to set a guideline value based on health considerations.*
[e] *Value from Ramboll (2023) Tier 1 Screening Human Health Guideline Values, Fluoride and Aluminium*

6. RESULTS AND TREND ANALYSIS

A summary of groundwater elevation, pH and laboratory results for the past 37 GMEs, including the four quarterly GMEs from 2022 are included in **Appendix 3**. Groundwater field parameter forms are included in **Appendix 4**, laboratory reports are included in **Appendix 5** and calibration certificates for the groundwater quality meter and interface probe are included in **Appendix 6**.

The identified contaminants of concern associated with the leachate are fluoride, cyanide and aluminium. Fluoride has been selected as the primary contaminant of concern as a result of its persistence observed in groundwater and its concentration range in comparison with the adopted guideline criteria. Aluminium was not selected due to its ubiquity in the environment generally.

The following parameters have been assessed in the following sections:

- Section 6.1: Shallow Aquifer
    - Section 6.1.1: Groundwater Elevation and Flow Direction
    - Section 6.1.2: Groundwater pH
    - Section 6.1.3: Soluble Fluoride
    - Section 6.1.4: Free Cyanide
- Section 6.2: Deep Aquifer
    - Section 6.2.1: Groundwater Elevation and Flow Direction
    - Section 6.2.2: Groundwater pH
    - Section 6.2.3: Soluble Fluoride
    - Section 6.2.4: Free Cyanide

6.1 Shallow Aquifer

6.1.1 Groundwater Elevation and Flow Direction

Figure 6-1 shows groundwater elevation within the shallow aquifer across the 37 GMEs completed between July 2013 and December 2022. Monthly rainfall is presented for the same period.

Historical groundwater elevation within the shallow aquifer generally shows an increase in response to heavy rainfall and a downward trend in groundwater elevation during extended periods of low rainfall.

Overall, groundwater elevation in the shallow aquifer shows minimal change between the start of monitoring in July 2013 and the most recent GME in December 2022. Decreasing groundwater elevations are consistent with a period of drought from 2017 to 2019, with groundwater elevations recovering following increased rainfall during 2020 and 2022.

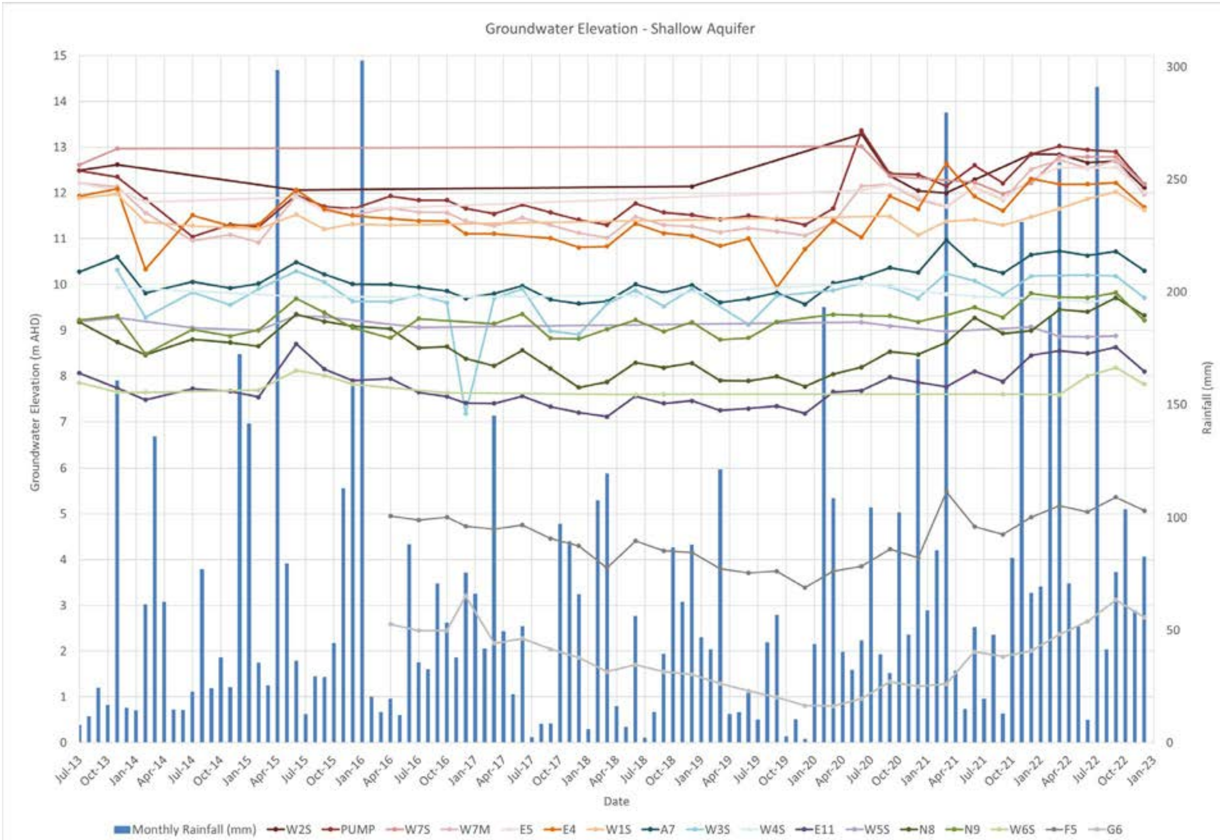


Figure 6-1: Groundwater Elevation – Shallow Aquifer, 2013 to 2022

Interpreted groundwater flow directions within the shallow aquifer for the four GMEs completed during 2022 is presented in **Figure 6-2**.

Between March 2022 and December 2022, groundwater flow within the shallow aquifer was generally to the north and northeast with a centralised low area at E11. These observations are largely consistent with historical observations. Historical elevations and flow directions are attached in **Appendix 7**.

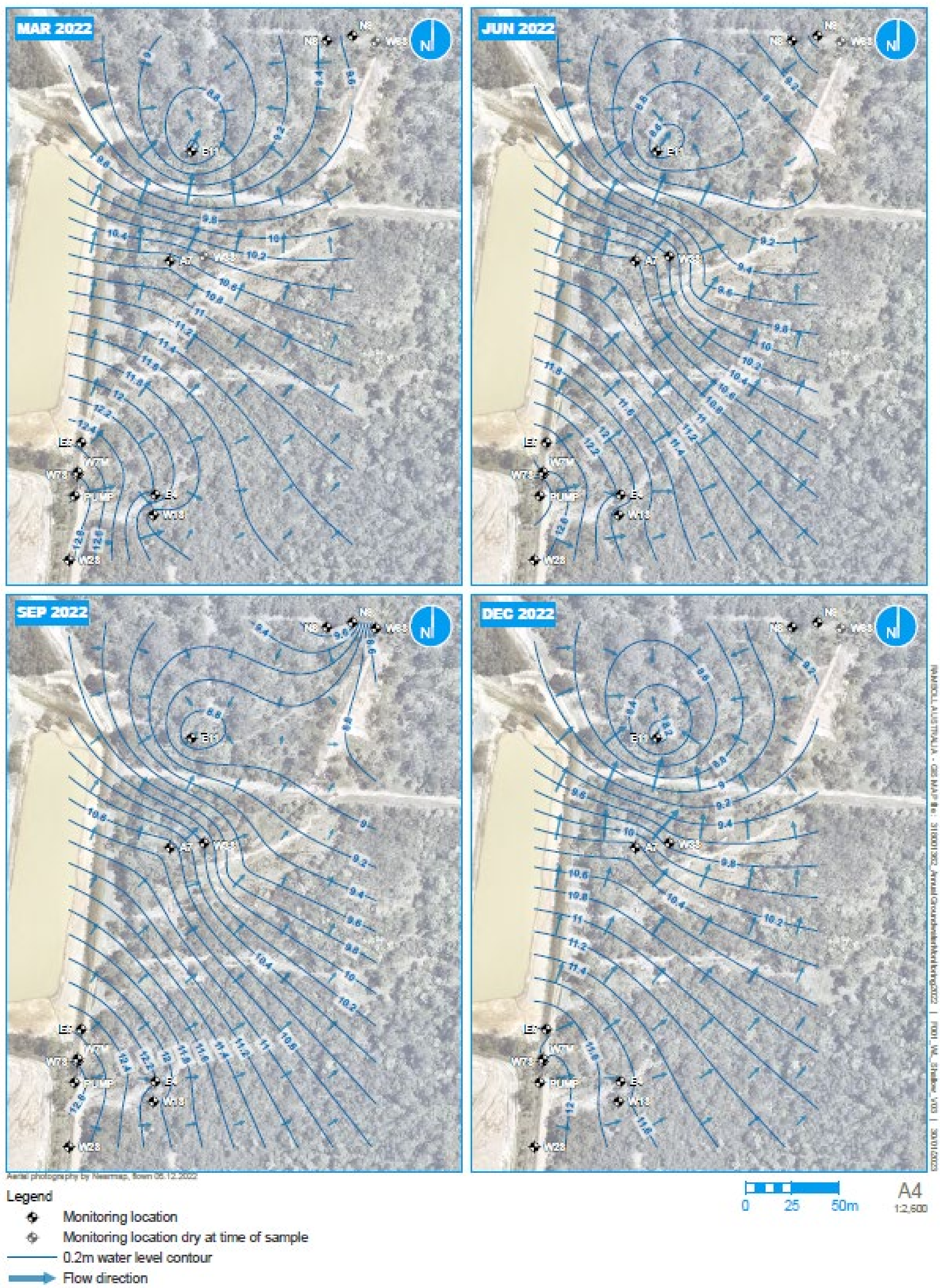


Figure 6-2: Interpolated Groundwater Elevation and Flow Direction – Shallow Aquifer 2022

6.1.2 Groundwater pH

Table 6-1 summarises field pH values reported within the shallow aquifer during 2022. Complete results are included in **Appendix 3.**

Table 6-1: Field pH Values - Shallow Aquifer

Contaminant of Concern (CoC)	Date	No. of Samples	Minimum Value (pH Units)	Maximum Value (pH Units)	No. Results Exceeding Criteria	
					95% Protection (<6.5 - >8 pH units)	Recreational (<6.5 - >8.5 pH units)
Field pH	March 2022	14	4.37	9.82	**6**	**4**
	June 2022	14	4.29	10.39	**8**	**8**
	September 2022	15	5.07	10.45	**9**	**7**
	December 2022	13	4.10	10.81	**7**	**6**

A pH greater than 8 exceeds the ANZECC (2000) 95% protection for aquatic species criteria and a pH greater than 8.5 exceed the recreational criteria. Wells with a pH greater than 9, which is characteristic of leachate impacted groundwater, include the following:

- Section 1: E5, W7M, PUMP
- Section 2: E4
- Section 3: A7
- Section 4: None
- Section 5: None

Shallow wells along the length of the leachate plume reported pH values ranging between 6.51 and 10.81 during 2022. The pH in shallow sentinel wells F5 and G6 near Swamp Creek were less than 5.45, which may be indicative of the natural pH of groundwater in this part of the Buffer Zone. Although this pH is below the range for ANZECC (2000) 95% protection criteria, it is not considered to require further analysis as it is not indicative of leachate impact.

The lateral extent of high pH impacted groundwater in the shallow aquifer throughout 2022 is presented in **Figure 6-3**.

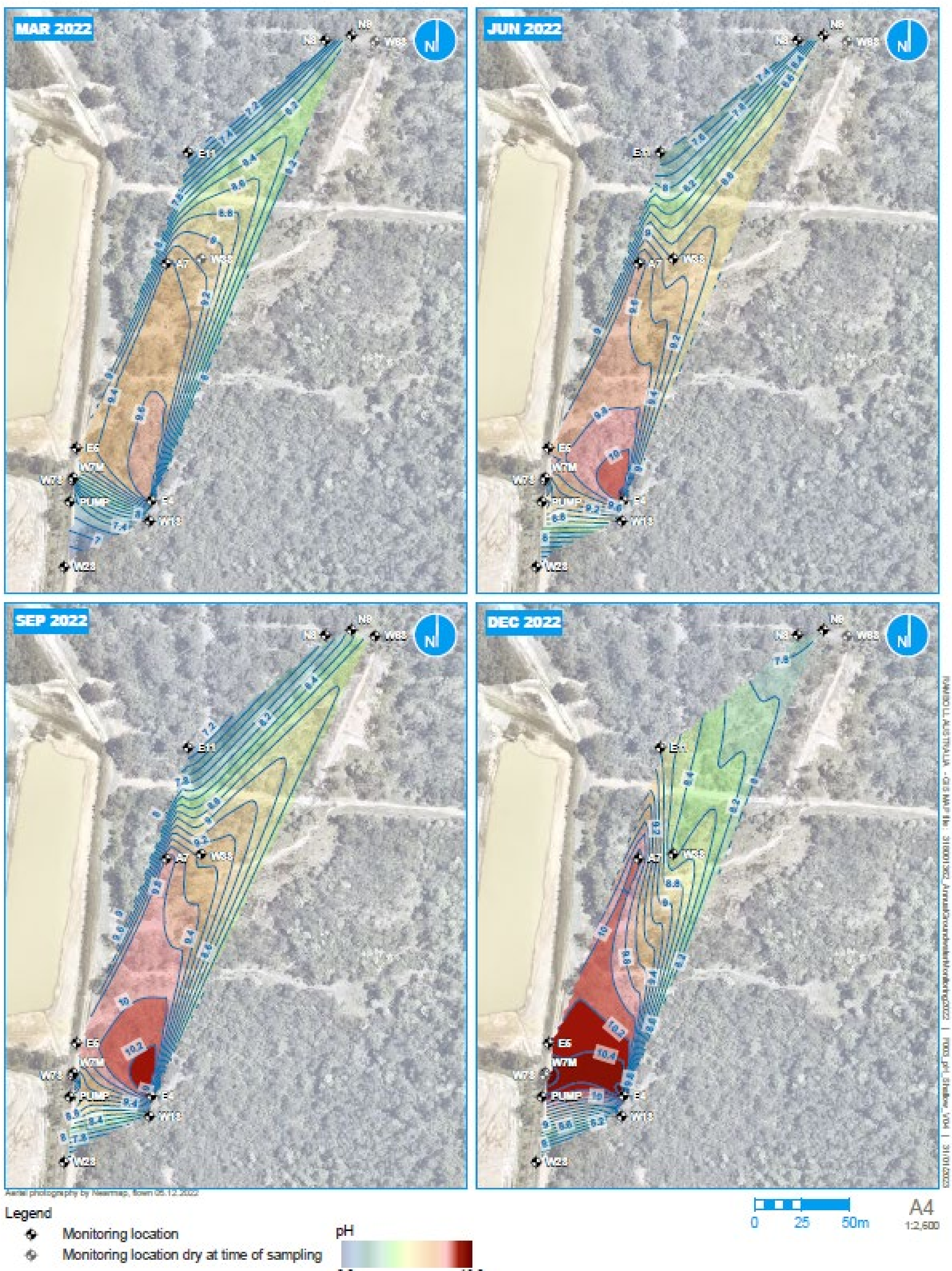


Figure 6-3: Interpolated Field pH – Shallow Aquifer 2022

6.1.2.1 Time Series Trends

Comparison of pH values for the 37 GMEs completed between July 2013 and December 2022 are shown in **Figure 6-4** to **Figure 6-6**. The blue dotted line shows pH 9, pH above this is characteristic of leachate impact. The time series trends show the following:

- The consistent presence of groundwater with elevated pH at shallow wells E4, E5, W7M, PUMP and A7 along the length of the plume
- Low pH of groundwater in sentinel wells F5 and G6.

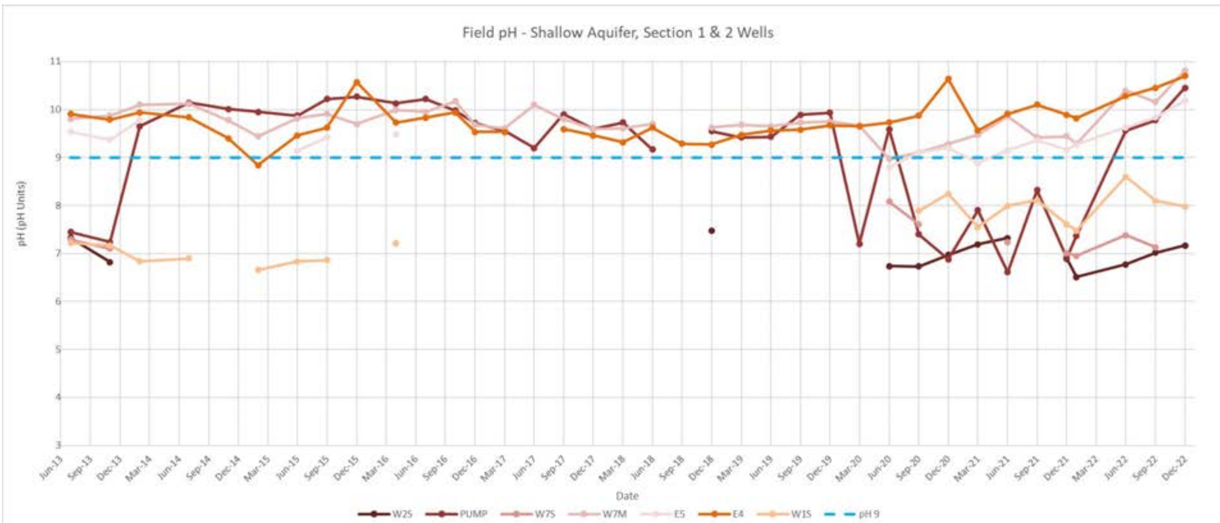


Figure 6-4: Field pH Values – Shallow Aquifer, Section 1 & 2 Wells

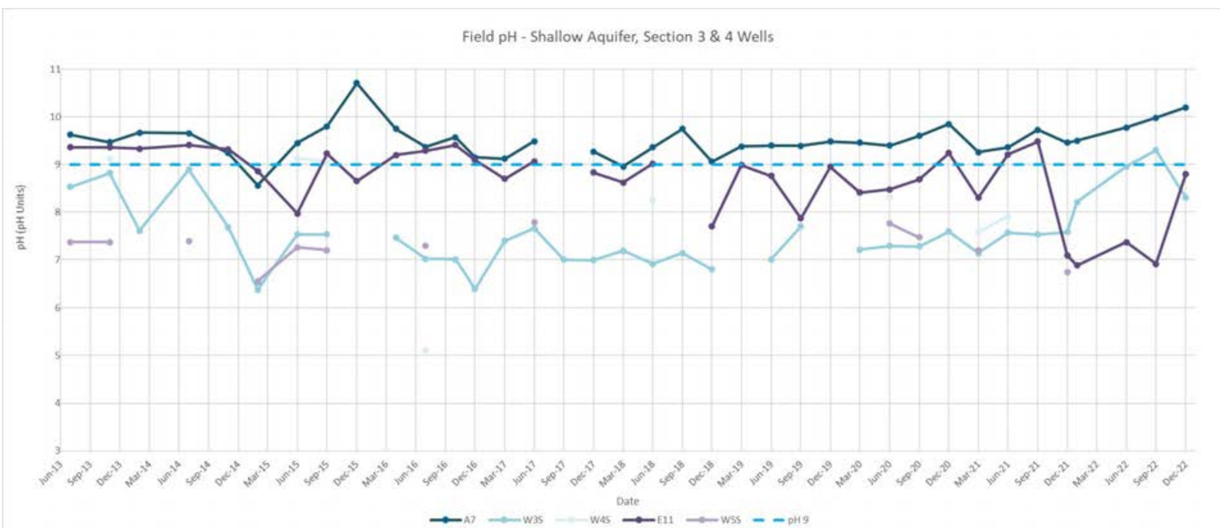


Figure 6-5: Field pH Values – Shallow Aquifer, Section 3 & 4 Wells

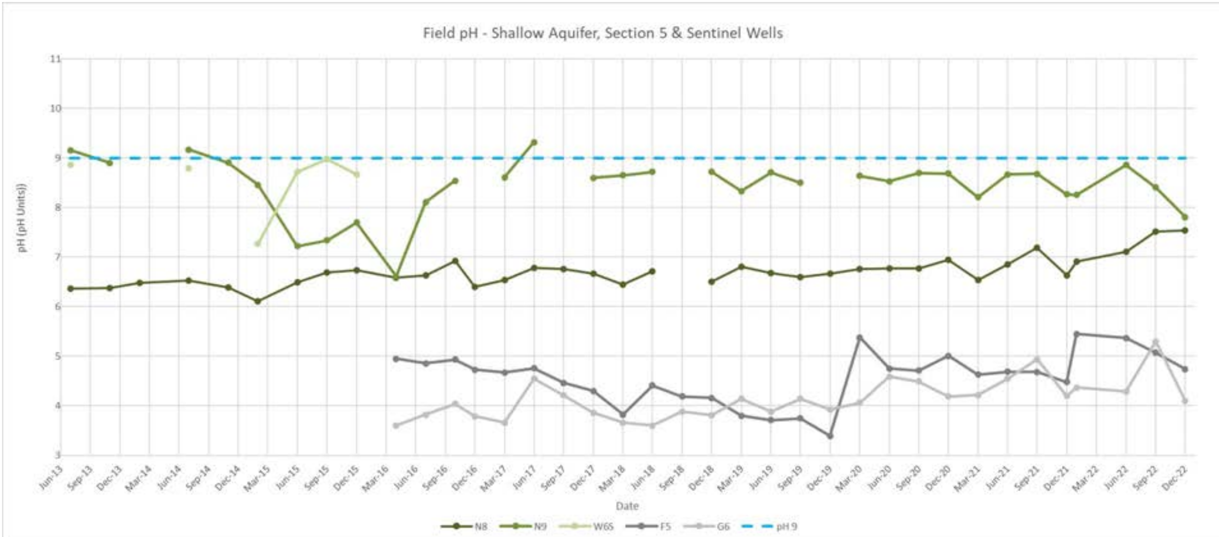


Figure 6-6: Field pH Values – Shallow Aquifer, Section 5 & Sentinel Wells

6.1.2.2 Mann-Kendall Trend Analysis

Mann-Kendall trend analysis was used to statistically assess each of the shallow monitoring locations to identify trends in pH. Trend analysis was carried out using the GSI Environmental Mann-Kendall Toolkit (GSI 2012). The outputs from the Mann-Kendall Toolkit are provided in **Appendix 8**. Data from July 2013 to December 2022 (37 GMEs) were included for the purpose of Mann-Kendall trend analysis of pH, a summary is provided in **Table 6-2**.

Mann-Kendall trend analysis of pH within the shallow aquifer between 2013 and 2022 indicates an increasing trend at eight of the fifteen locations. Of these eight locations, two locations (E4 and A7) have visual characteristics of leachate impact (i.e., yellow/ brown colouration) and a pH exceeding the assessment criteria. Other locations with visual characteristics of leachate impact (i.e., yellow/ brown colouration) and a pH exceeding the assessment criteria have a 'decreasing' trend (PUMP), 'probably decreasing' trend (W7M) and 'stable' trend (E11).

Increasing trends in pH along the length of the leachate plume occur at locations with no evidence of leachate impact (W2S, W7S, N8 and G6), aside from G9 which has a pH exceeding the assessment criteria but no visual characteristics of leachate impact.

Table 6-2: Mann-Kendall pH Trends - Shallow Aquifer

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
PUMP	**Decreasing**	**Decreasing**	**Yes**	**Yes**
W2S	Stable	**Increasing**	No	No
W7M	**Decreasing**	Prob. Decreasing	**Yes**	**Yes**
W7S	Stable	**Increasing**	No	No
E5	Prob. Decreasing	Prob. Increasing	**Yes**	**Yes**
Section 2				
E4	No Trend	**Increasing**	**Yes**	**Yes**

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	pH >Assessment Criteria[1]	Leachate Impacted[2]
W1S	Increasing	Increasing	Yes	No
Section 3				
W3S	Stable	No Trend	Yes[3]	No
W4S	Decreasing	-	-	No
A7	Stable	Increasing	Yes	Yes
Section 4				
E11	Decreasing	Stable	Yes	Yes
W5S	Stable	-	-	No
Section 5				
N8	Increasing	Increasing	No	No
N9	Stable	Increasing	Yes	No
W6S	-	No Trend	Yes	No
Sentinel				
F5	Stable	No Trend	No	No
G6	Increasing	Increasing	No	No

- Indicates no 2022 data available
[1]Field pH exceeded the assessment criteria for 95% Protection for Aquatic Ecosystems or Recreational criteria during any GME completed in 2022
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour
[3]pH exceeded assessment criteria during September 2022 only

6.1.3 Soluble Fluoride

Table 6-3 summarises the laboratory results for soluble fluoride within the shallow aquifer during 2022. Complete results are included in **Appendix 3**.

Table 6-3: Soluble Fluoride Concentrations - Shallow Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria		
					Irrigation (>1 mg/L)	Stock Watering (>2 mg/L)	Rec. (>15 mg/L)
Soluble Fluoride	March 2022	14	0.20	710	**11**	**11**	**9**
	June 2022	14	0.20	820	**11**	**11**	**9**
	September 2022	15	0.20	660	**12**	**12**	**9**
	December 2022	14	0.20	850	**10**	**10**	**8**

During the four GMEs completed in 2022, soluble fluoride concentrations in shallow groundwater exceeded the site assessment criteria for Irrigation, Stock Watering or Recreational use at up to 12 wells as follows:

- Section 1: Pump, W2S, W7M, W7S, E5
- Section 2: E4, W1S
- Section 3: W3S, A7

- Section 4: E11
- Section 5: N9, W6S

Section 3 well W4S and Section 4 well W5S, exceeded the site assessment criteria during 2021, but were dry during 2022 and could not be sampled.

With the exception of Section 5 well N8, all Section 1, Section 2, Section 3, and Section 4 shallow wells exceeded one or more site assessment criteria for soluble fluoride during 2022, with concentrations generally decreasing to the northeast away from the CWS. The highest concentrations were generally reported at Section 2 well E4 located hydraulically downgradient of Section 1. The sentinel wells F5 and G6, located adjacent to the nearest surface water receptor (Swamp Creek), have consistently reported fluoride concentrations below 1 mg/L, indicating no impact from the leachate plume. The lateral extent of soluble fluoride in the shallow aquifer throughout 2022 is presented in **Figure 6-7**.

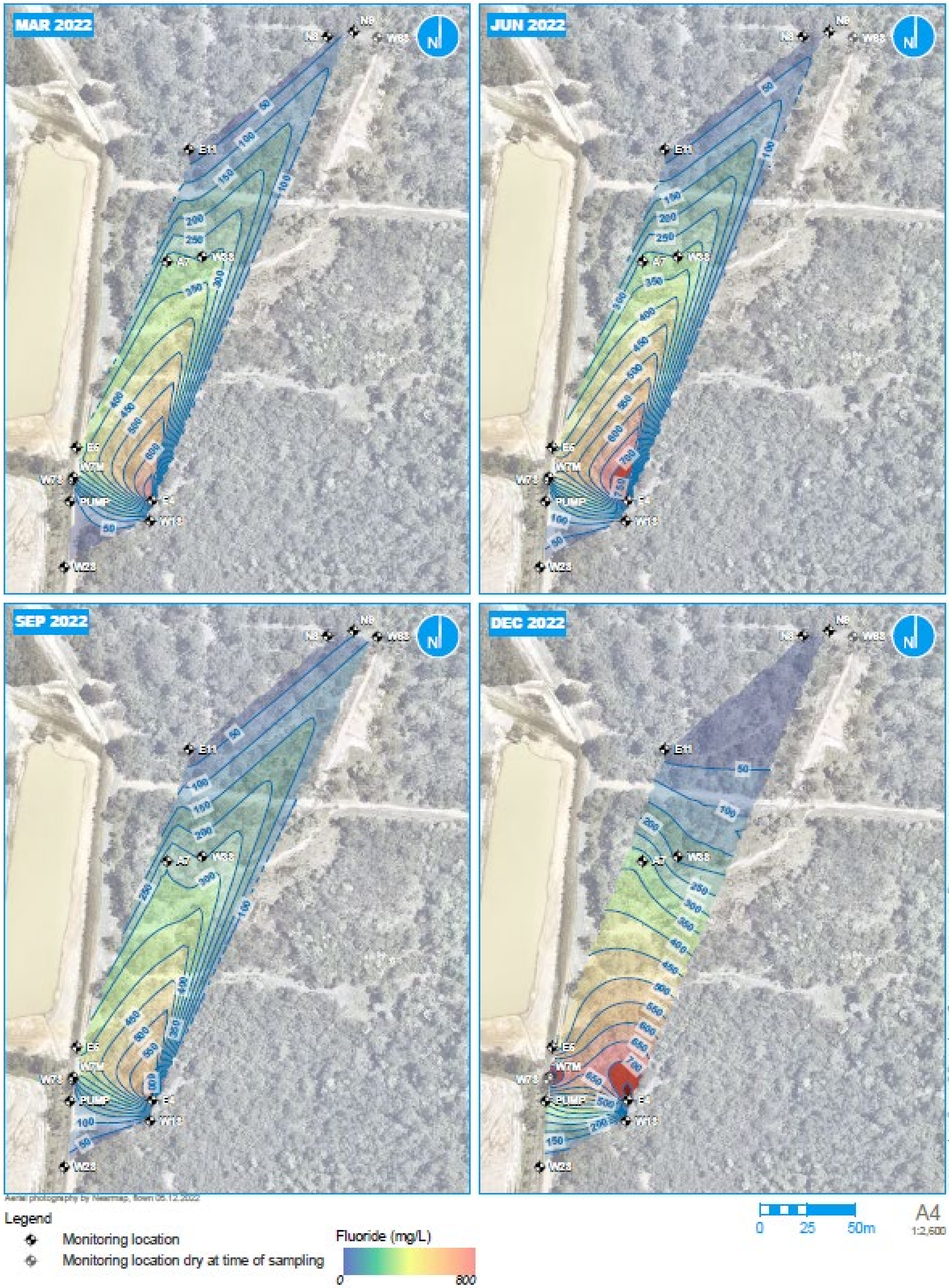


Figure 6-7: Interpolated Soluble Fluoride - Shallow Aquifer 2022

6.1.3.1 Time Series Trends

Comparison of soluble fluoride concentrations for the 37 GMEs completed between July 2013 and December 2022 are shown in **Figure 6-8** to **Figure 6-10**. Assessment criteria has not been plotted on the graphs due to the elevated groundwater concentrations. The time series trends show the following:

- Fluctuating soluble fluoride concentrations in wells on Section 1 and Section 2, closest to the source of the leachate
- Increasing soluble fluoride concentrations at E4 since September 2017
- Consistently elevated soluble fluoride concentrations indicating leachate impact at Section 3 and Section 4 wells
- Overall decreasing soluble fluoride concentrations at well N9 on Section 5, the leading edge of the plume
- Consistently low soluble fluoride concentrations at the sentinel wells F5 and G6.

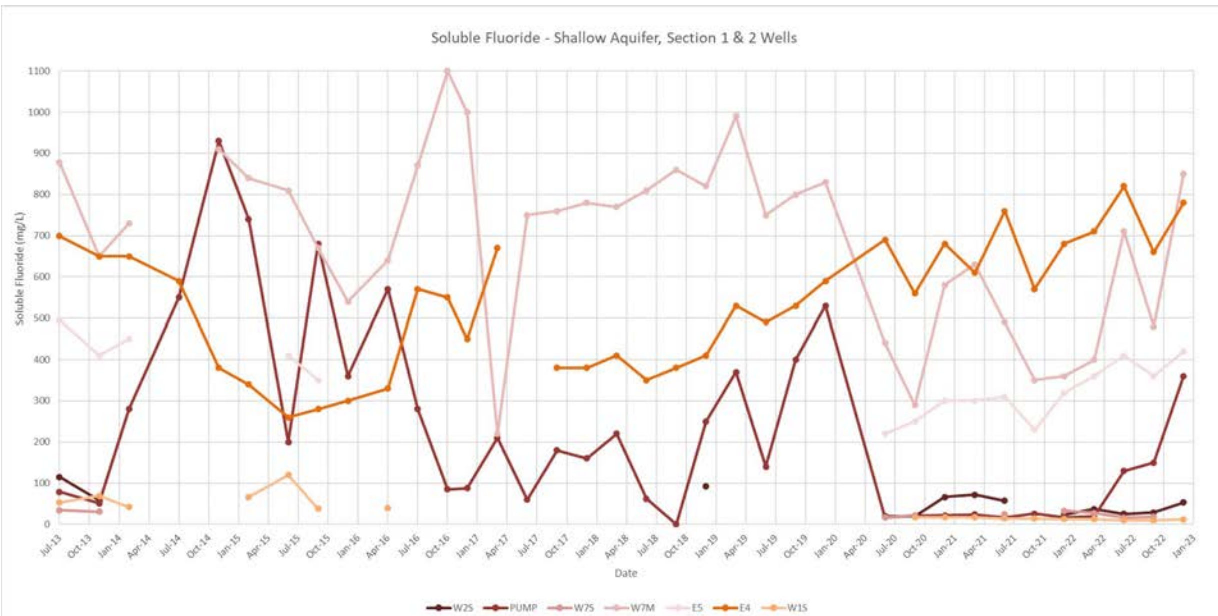


Figure 6-8: Soluble Fluoride Concentrations – Shallow Aquifer, Section 1 & 2 Wells

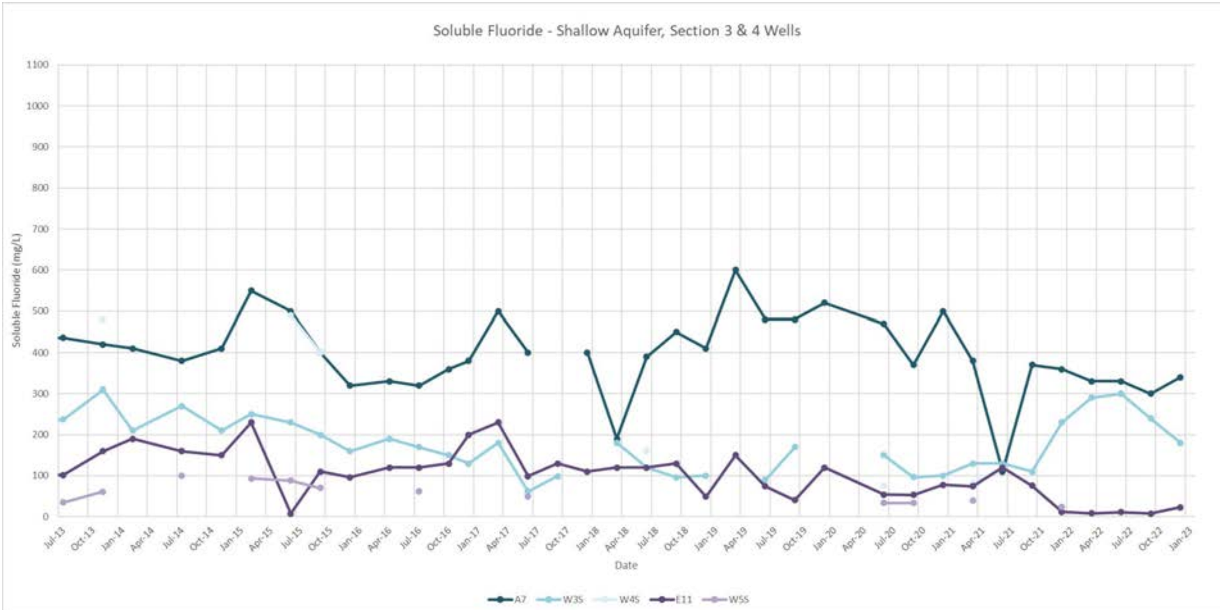


Figure 6-9: Soluble Fluoride Concentrations – Shallow Aquifer, Section 3 & 4 Wells

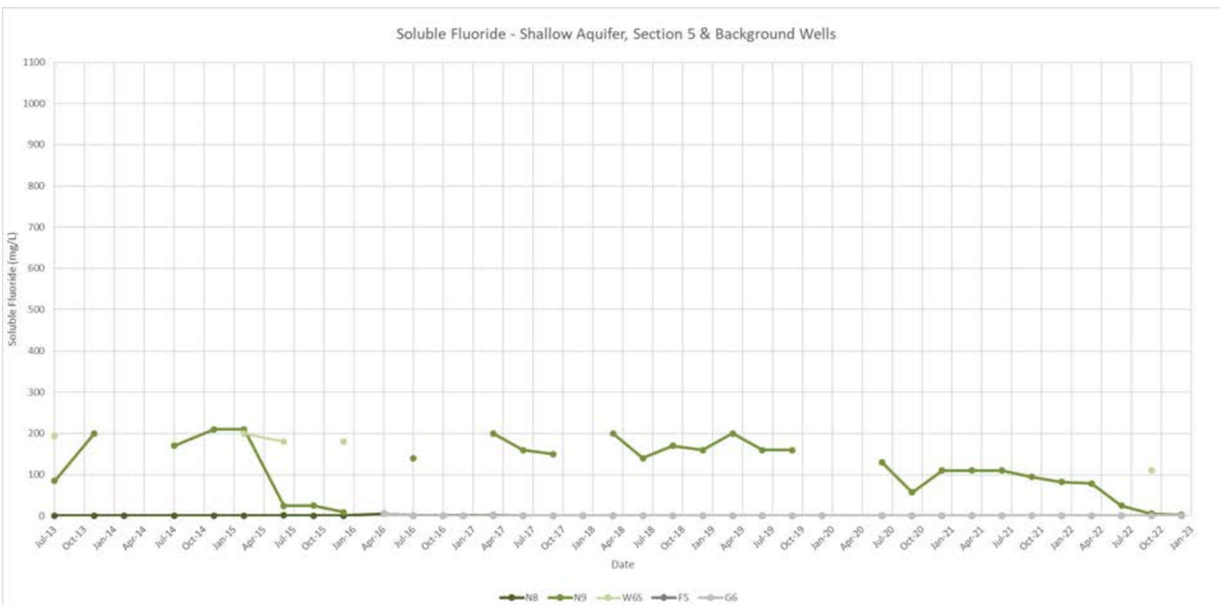


Figure 6-10: Soluble Fluoride Concentrations – Shallow Aquifer, Section 5 & Sentinel Wells

6.1.3.2 Mann-Kendall Trend Analysis

Data from July 2013 to December 2022 (37 sampling events) were included for the purpose of Mann-Kendall trend analysis of soluble fluoride, a summary is provided in **Table 6-4**.

Mann-Kendall trend analysis of soluble fluoride within the shallow aquifer indicates an increasing trend at three wells, E4 (located on Section 2), N8 (located on Section 4) and G6 (sentinel). Further review of soluble fluoride concentrations at E4 indicate the increase to be minor, from 699 mg/L in July 2013 to 780 mg/L in December 2022. Soluble fluoride concentrations at N8 and G6 are within natural fluctuations and pH is not characteristic of leachate impacted groundwater at these locations.

Mann-Kendall trend analysis of soluble fluoride at N9, the well at the leading edge of the plume, shows a decreasing trend indicating the plume is not expanding to the north.

Table 6-4: Mann-Kendall Trend Analysis of Soluble Fluoride – Shallow Aquifer

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	Soluble Fluoride >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
PUMP	Decreasing	Decreasing	Yes	Yes
W2S	Stable	Stable	Yes	No
W7M	Decreasing	Decreasing	Yes	Yes
W7S	Stable	Stable	Yes	No
E5	Decreasing	Stable	Yes	Yes
Section 2				
E4	Increasing	Increasing	Yes	Yes
W1S	Decreasing	Decreasing	Yes	No
Section 3				
W3S	Decreasing	Decreasing	Yes	No
W4S	Decreasing	-	-	No
A7	Stable	Decreasing	Yes	Yes
Section 4				
E11	Decreasing	Decreasing	Yes	Yes
W5S	Stable	-	-	No
Section 4				
N8	Increasing	Increasing	No	No
N9	Decreasing	Decreasing	Yes	No
W6S	Stable	Prob. Decreasing	Yes	No
Sentinel				
F5	Prob. Increasing	Prob. Increasing	No	No
G6	No Trend	Increasing	No	No

- Indicates no 2022 data available
[1]Soluble fluoride exceeded the assessment criteria of either Irrigation, Stock Watering or Recreational during any GME completed in 2022
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour

6.1.4 Free Cyanide

Both total and free cyanide were included for analysis in the 2022 GMEs. Free cyanide was introduced for analysis in 2015, as there are no Australian guidelines for total cyanide.

Laboratory results for free cyanide in shallow groundwater reported during 2022 are summarised in **Table 6-5**.

Table 6-5: Free Cyanide Concentrations - Shallow Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria	
					95% Protection (>0.007 mg/L)	Recreational (>0.8 mg/L)
Free Cyanide	March 2022	14	<0.004	140	**2**	0
	June 2022	14	<0.004	0.029	**4**	0
	September 2022	15	<0.004	0.2	**4**	0
	December 2022	13	<0.004	0.006	0	0

Free cyanide concentrations exceeded the ANZECC (2000) 95% protection for aquatic ecosystems criterion in the following wells:

- Section 1: PUMP, E5, W7M
- Section 2: E4
- Section 3: W3S, A7

Remaining locations generally reported free cyanide concentrations below the laboratory limit of reporting.

6.1.4.1 Time Series Trends

Comparison of free cyanide concentrations for the 32 GMEs completed between February 2015 and December 2022 are shown in **Figure 6-11** to **Figure 6-13**. Assessment criteria for 95% species protection (0.007 mg/L) has not been plotted on the graphs due to the historical elevated groundwater concentrations. Overall, concentrations of free cyanide in groundwater have decreased between 2015 and 2022 with no detections above the human health recreational guideline value of 0.8 mg/L since June 2015.

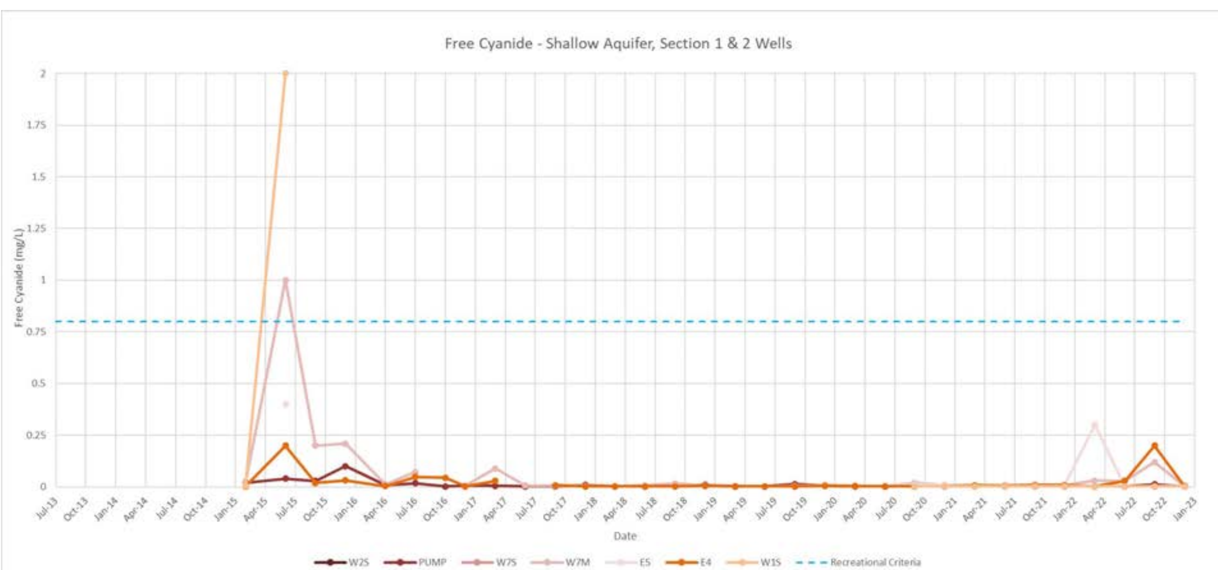


Figure 6-11: Free Cyanide Concentrations – Shallow Aquifer, Section 1 & 2 Wells

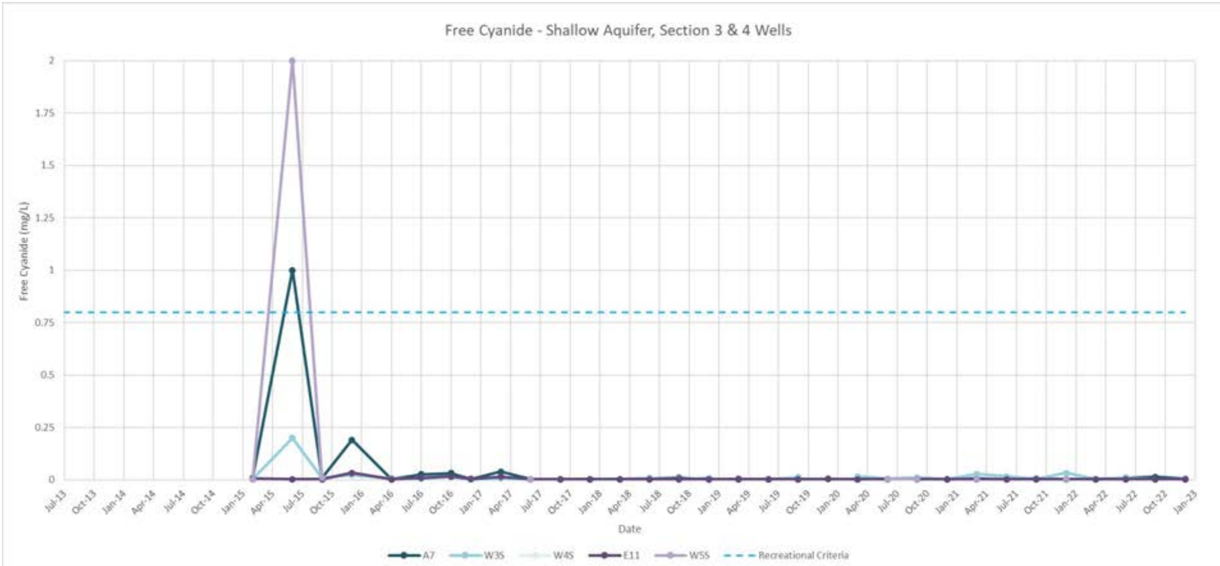


Figure 6-12: Free Cyanide Concentrations – Shallow Aquifer, Section 3 & 4 Shallow Wells

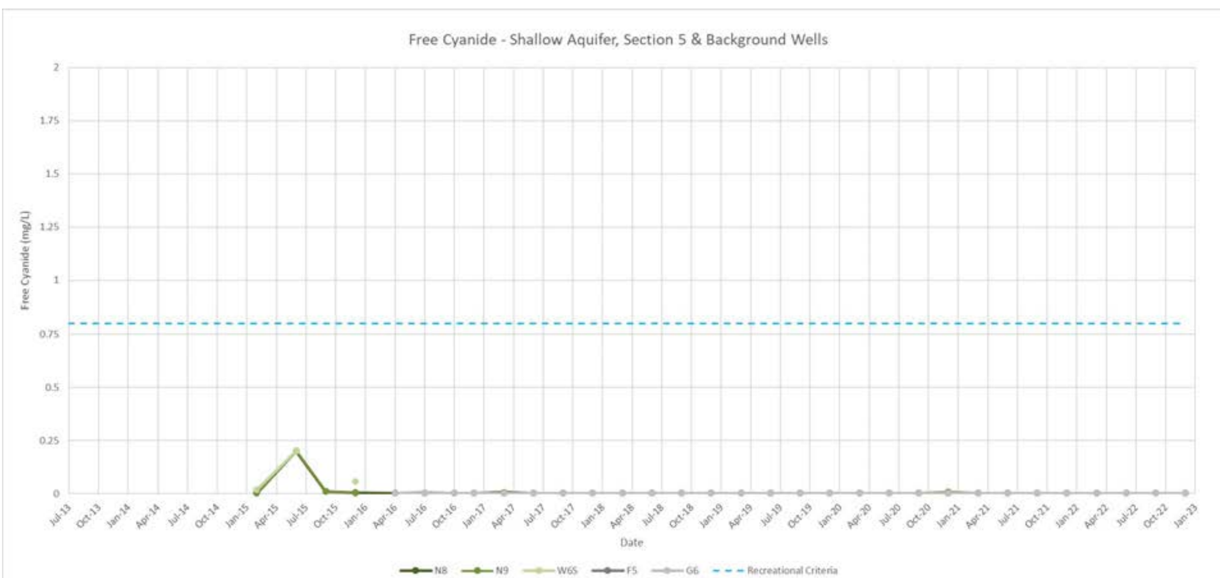


Figure 6-13: Free Cyanide Concentrations - Shallow Aquifer, Section 5 & Sentinel Shallow Wells

6.1.4.2 Mann-Kendall Trend Analysis

Data from February 2015 to December 2022 (32 sampling events) were included for the purpose of Mann-Kendall trend analysis of free cyanide in the shallow aquifer, a summary is provided in **Table 6-6**.

Mann-Kendall trend analysis of free cyanide in shallow groundwater indicates no increasing trends.

Table 6-6: Mann-Kendall Trend Analysis of Free Cyanide Trends - Shallow Aquifer

Well	Previous Trend 2015 to 2021	Current Trend 2015 to 2022	Free Cyanide >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
PUMP	**Decreasing**	**Decreasing**	**Yes**	**Yes**
W2S	Stable	Stable	No	No
W7M	Prob. Decreasing	No Trend	**Yes**	**Yes**
W7S	Stable	Stable	No	No
E5	No Trend	No Trend	**Yes**	**Yes**
Section 2				
E4	No Trend	No Trend	**Yes**	**Yes**
W1S	No Trend	No Trend	No	No
Section 3				
W3S	No Trend	No Trend	**Yes**	No
W4S	No Trend	-	-	No
A7	**Decreasing**	No Trend	**Yes**	**Yes**
Section 4				
E11	**Decreasing**	**Decreasing**	No	**Yes**
W5S	No Trend	-	-	No
Section 5				
N8	Stable	Stable	No	No
N9	No Trend	Stable	No	No
W6S	I.D	No Trend	No	No
Sentinel				
F5	Stable	Stable	No	No
G6	Stable	Stable	No	No

I.D Insufficient data to perform trend analysis

[1] Free cyanide exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2022

[2] Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour

6.2 Deep Aquifer

6.2.1 Groundwater Elevation and Flow Direction

Figure 6-14 shows groundwater elevation within the deep aquifer across the 37 GMEs completed between July 2013 and December 2022. Monthly rainfall is presented for the same period.

Groundwater levels within the deep aquifer decreased over the period of low rainfall between 2017 and 2019 and have since increased in response to increased rainfall in 2020, 2021 and 2022, with groundwater levels in the deep aquifer now similar to those observed during the first monitoring event in July 2013. The most notable groundwater recovery is at W1D.

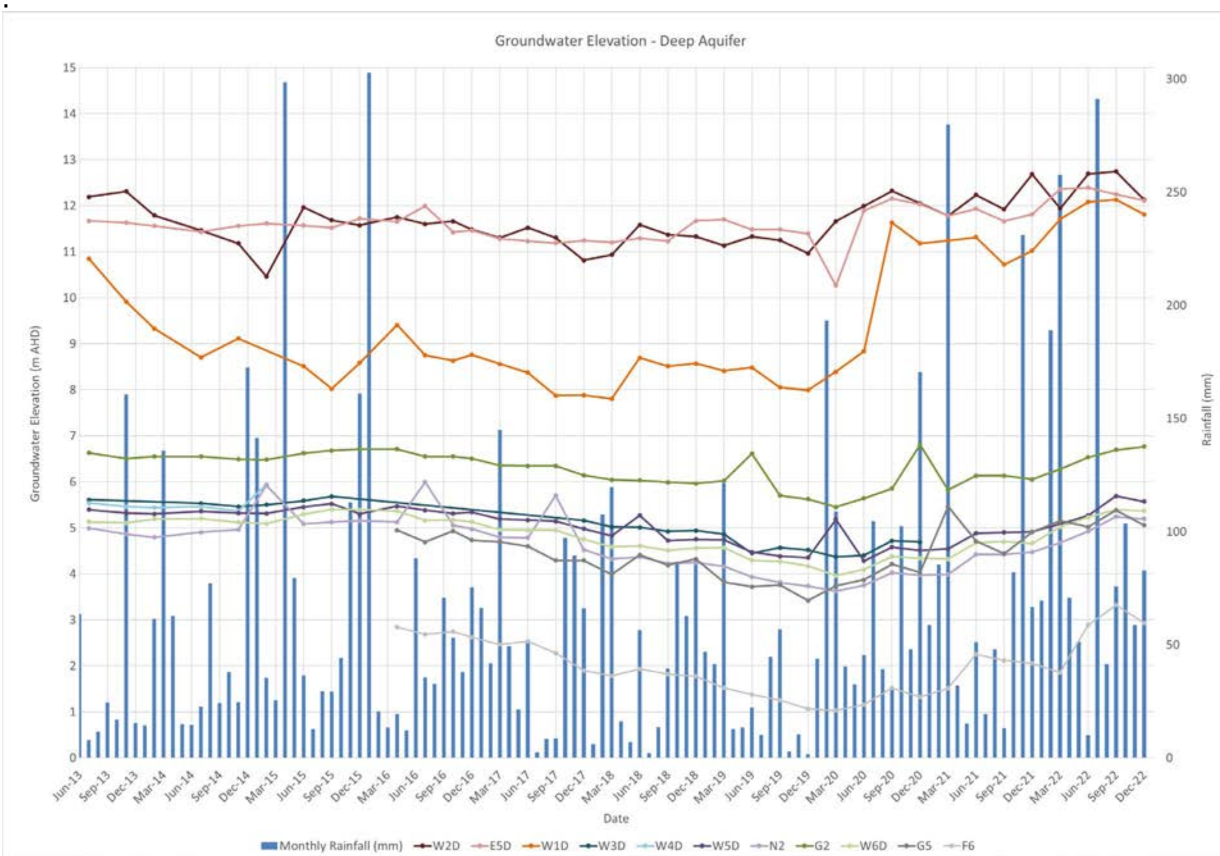


Figure 6-14: Groundwater Elevation – Deep Aquifer, 2013 to 2022

Interpreted groundwater flow directions within the deep aquifer for the four GMEs completed during 2022 is presented in **Figure 6-15**. Historical elevations and flow directions are attached in **Appendix 7**.

Groundwater flow direction in the deep aquifer is to the northeast. The deep aquifer shows little variation in flow direction between June 2013 and December 2022. There is a consistent gradient from approximately 11 m AHD near E5D to approximately 5 m AHD near W5D, then the gradient shallows through the northern vegetation impact area.

Figure 6-15: Interpolated Groundwater Elevation and Flow Direction – Deep Aquifer 2022

6.2.2 Groundwater pH

Table 6-7 summarises field pH values reported within the deep aquifer during 2022. Complete results are included in **Appendix 3.**

Table 6-7: Field pH Values – Deep Aquifer

CoC	Date	No. of Samples	Minimum Value (pH Units)	Maximum Value (pH Units)	No. Results Exceeding Criteria	
					95% Protection (<6.5 - >8 pH units)	Recreational (<6.5 - >8.5 pH units)
Field pH	March 2022	9	5.35	10.17	**1**	**1**
	June 2022	9	5.92	10.65	**2**	**2**
	September 2022	9	5.9	10.79	**2**	**2**
	December 2022	9	6.03	10.99	**3**	**2**

The deep aquifer has generally not been impacted by leachate with pH levels largely below pH 8, except for W1D and W2D located on Section 1. The pH at W2D has consistently been greater than 9 indicating leachate impacted groundwater at this well. The pH at W1D has gradually increased since 2019 and has reported variable pH values above and below the assessment criteria for 95% species protection since December 2020. During June, September, and December 2022 the groundwater pH at W1D consistently exceeded the assessment criteria for 95% species protection and recreational use.

The natural pH conditions in the deep aquifer are slightly acidic to neutral, with pH conditions generally within or below the trigger values for lowland rivers of 6.5 to 8 (ANZECC 2000).

The lateral extent of high pH impacted groundwater in the deep aquifer throughout 2022 is presented in **Figure 6-16**.

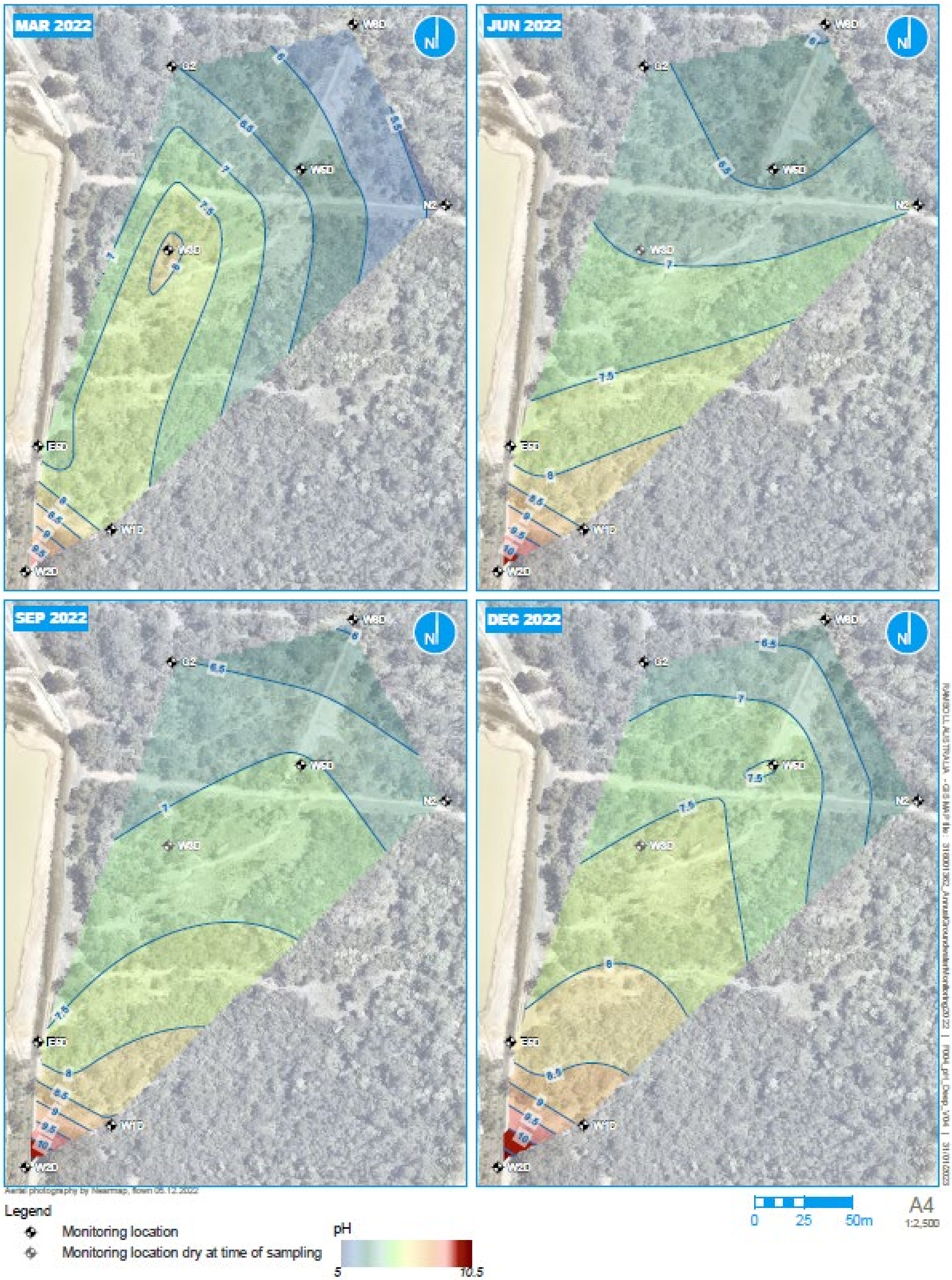


Figure 6-16: Interpolated Field pH – Deep Aquifer 2022

6.2.2.1 Time Series Trends

Comparison of pH values reported within the deep aquifer for the 37 GMEs completed between July 2013 and December 2022 are shown in **Figure 6-17** to **Figure 6-19**. The blue dotted line shows pH 9 which is indicative of leachate impact.

The time series trends show the following:

- Consistently elevated pH above 9 at well W2D on Section 1
- Increasing pH at W1D
- pH consistently below 8 in down gradient and sentinel wells.

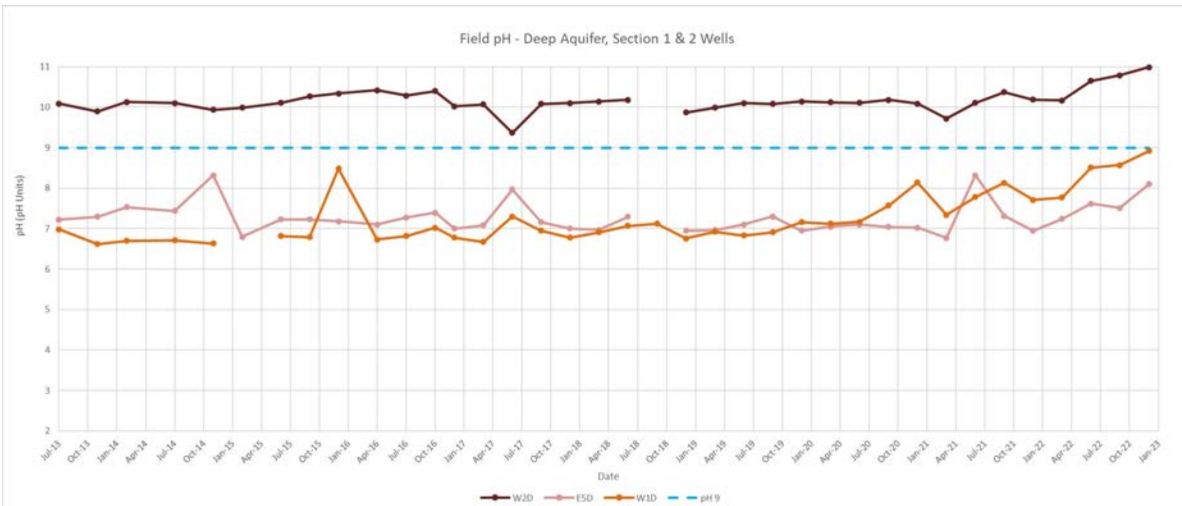


Figure 6-17: Field pH Values – Deep Aquifer, Section 1 & 2 Wells

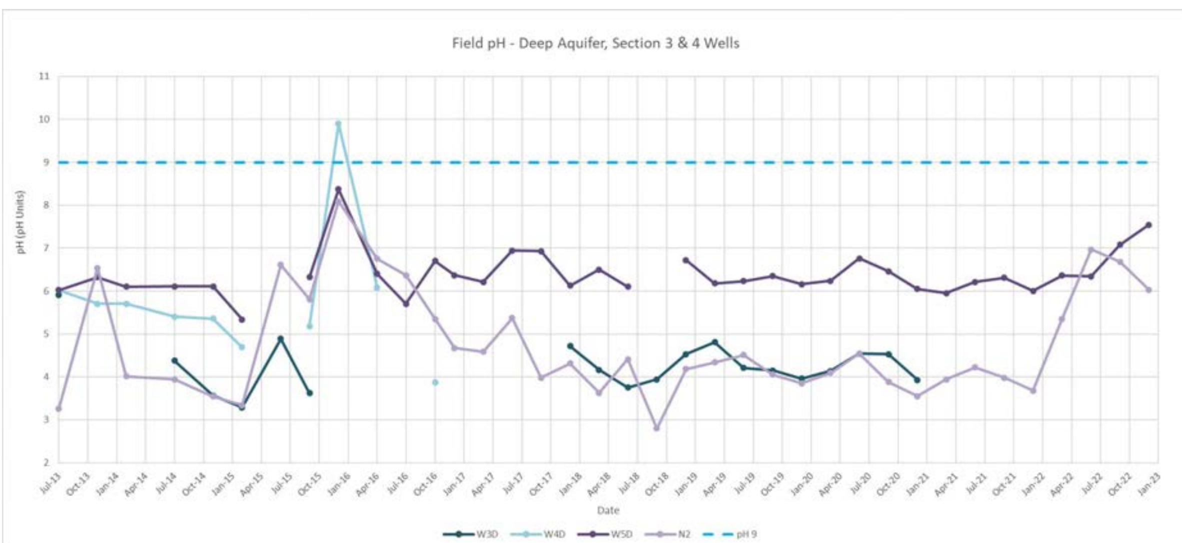


Figure 6-18: Field pH Values – Deep Aquifer, Section 3 & 4 Wells

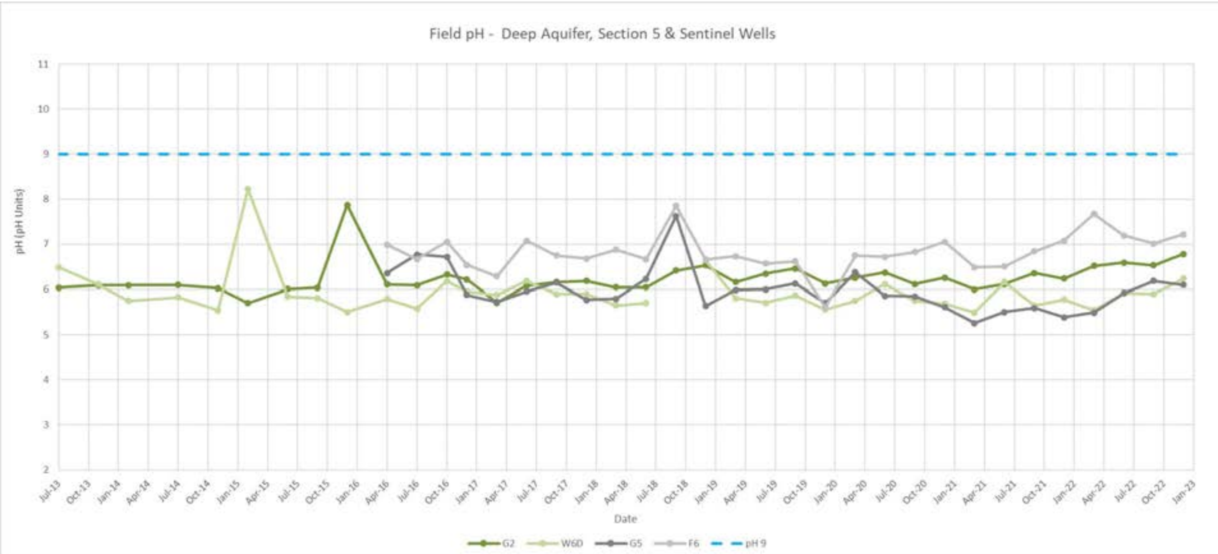


Figure 6-19: Field pH Values, Section 5 & Sentinel Deep Wells (pH Units)

6.2.2.2 Mann-Kendall Trend Analysis

Data from July 2013 to December 2022 (37 sampling events) were included for the purpose of Mann-Kendall trend analysis of pH, a summary is provided in **Table 6-8**.

Mann-Kendall trend analysis of pH within the deep aquifer indicates increasing trends at W2D (located on Section 1), W1D (located on Section 2), G2 (located on Section 5) and F6 (sentinel well).

During 2022, increasing pH trends coincided with pH values in excess of the assessment criteria at two locations only, W2D and W1D. Further review of W1D indicates an increase from pH 6.98 in July 2013 to pH 8.92 in December 2022. pH values at W1D are approaching levels characteristic of leachate impact (pH >9) and the groundwater has been described as yellow/brown. The increasing pH trend at W1D may be indicative of the leachate plume expanding to the east of well W2D, the most leachate-impacted well. pH values at W2D have consistently been elevated since the first GME was completed in July 2013 however, the time series graph (refer to **Figure 6-17**) indicates a rapid increase over the three most recent GMEs (June 2022 to December 2022).

Table 6-8: Mann-Kendall pH Trends - Deep Aquifer

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	No Trend	**Increasing**	**Yes**	**Yes**
E5D	**Decreasing**	Stable	**Yes**	No
Section 2				
W1D	**Increasing**	**Increasing**	**Yes**	No
Section 3				
~~W3D~~	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	No Trend	Prob. Increasing	No	No
N2	**Decreasing**	**Stable**	No	No

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	pH >Assessment Criteria[1]	Leachate Impacted[2]
Section 5				
G2	Increasing	**Increasing**	No	No
W6D	Prob. Decreasing	Stable	No	No
Sentinel				
G5	**Decreasing**	**Decreasing**	No	No
F6	No Trend	**Increasing**	No	No

[1] pH exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2022
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour

6.2.3 Soluble Fluoride

Laboratory results for soluble fluoride in the deep aquifer reported during 2022 are summarised in **Table 6-9**.

Table 6-9: Soluble Fluoride Concentrations – Deep Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria		
					Irrigation (>1 mg/L)	Stock Watering (>2 mg/L)	Rec. (>15 mg/L)
Soluble Fluoride	March 2022	9	0.1	970	**3**	**3**	**1**
	June 2022	9	<0.1	1100	**4**	**4**	**1**
	September 2022	9	<0.1	840	**4**	**4**	**1**
	December 2022	9	<0.1	1100	**4**	**4**	**1**

During the four GMEs completed in 2022, soluble fluoride concentrations in deep groundwater exceeded the site assessment criteria for Irrigation, Stock Watering or Recreational use at up to 4 wells as follows:

- Section 1: W2D and E5D
- Section 2: W1D
- Section 4: N2

The highest soluble fluoride concentrations were consistently reported at Section 1 deep well W2D. W2D is located directly adjacent to the CWS and reports the highest soluble fluoride concentrations of all the wells.

The lateral extent of soluble fluoride in the deep aquifer throughout 2022 is presented in **Figure 6-20**.

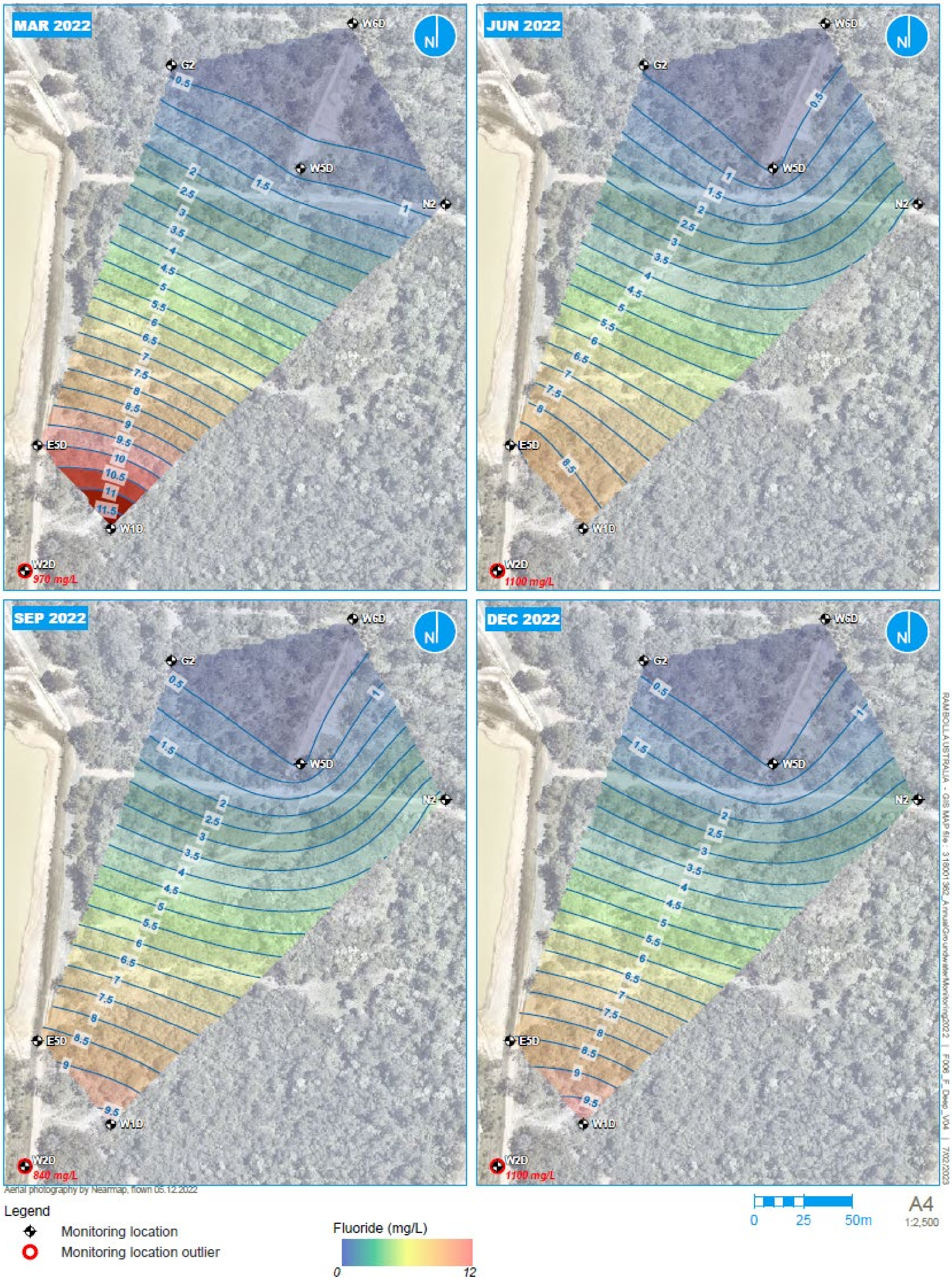


Figure 6-20: Interpolated Soluble Fluoride - Deep Aquifer 2022

6.2.3.1 Time Series Trends

Comparison of soluble fluoride concentrations within the deep aquifer for the 37 GMEs completed between July 2013 and December 2022 are shown in **Figure 6-21** to **Figure 6-24** with concentrations for W2D only, shown in **Figure 6-21**.

The time series trends show the following:

- Consistently elevated soluble fluoride concentrations at well W2D on Section 1
- Some initial fluctuations in concentrations on Section 1 to Section 5 followed by consistently lower soluble fluoride concentrations from 2017 to 2021, aside from an increase at W1D from 2020 to 2022
- Consistently low soluble fluoride concentrations in the sentinel wells.

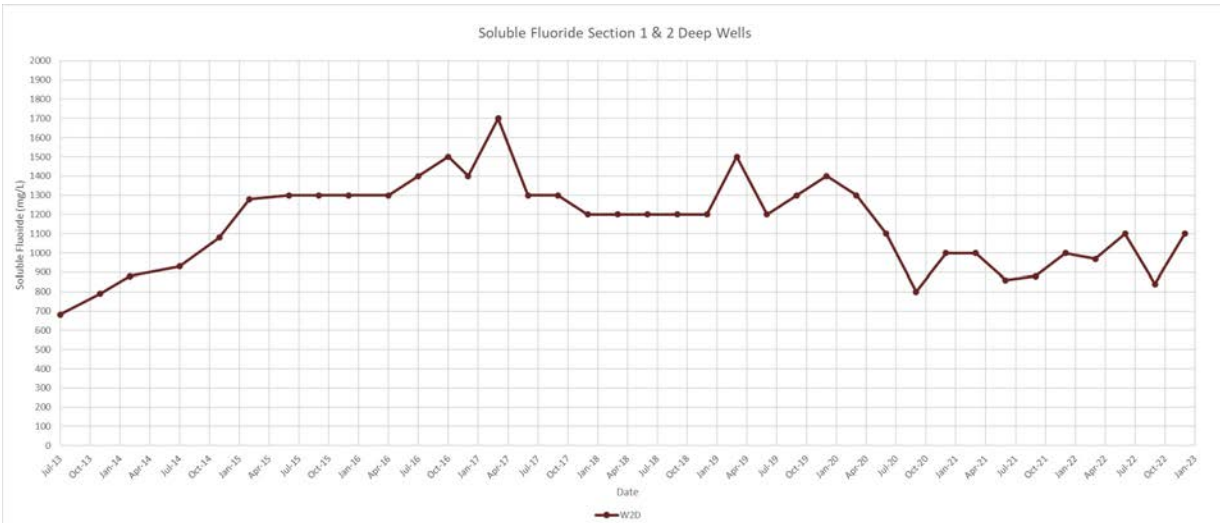


Figure 6-21: Soluble Fluoride Concentrations – Deep Aquifer, W2D

Figure 6-22: Soluble Fluoride Concentrations – Deep Aquifer, Section 1 & 2 Wells

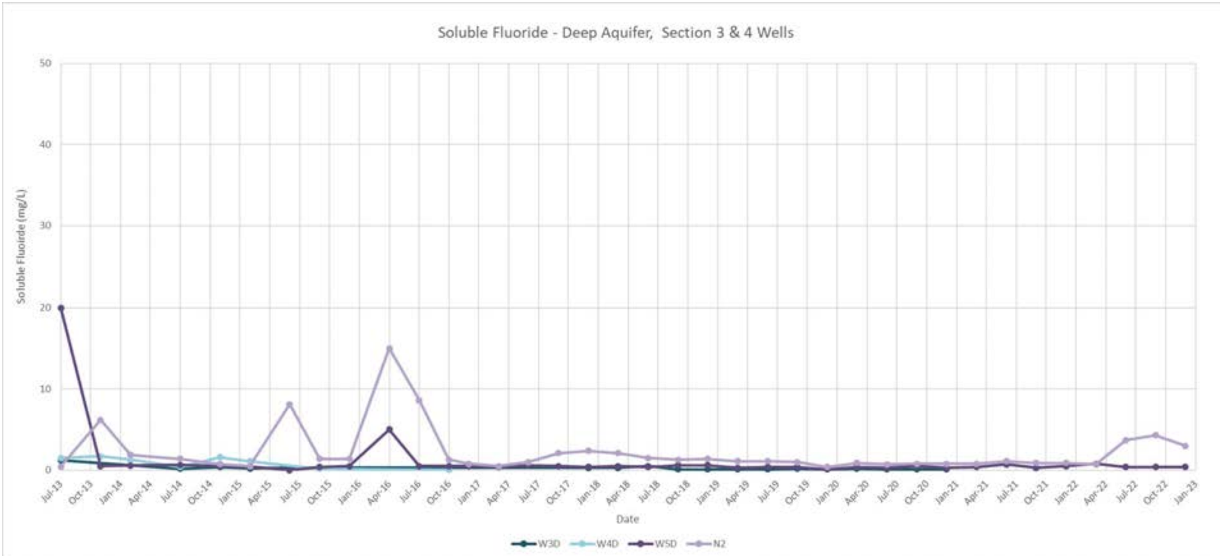


Figure 6-23: Soluble Fluoride Concentrations – Deep Aquifer, Section 3 & 4 Wells

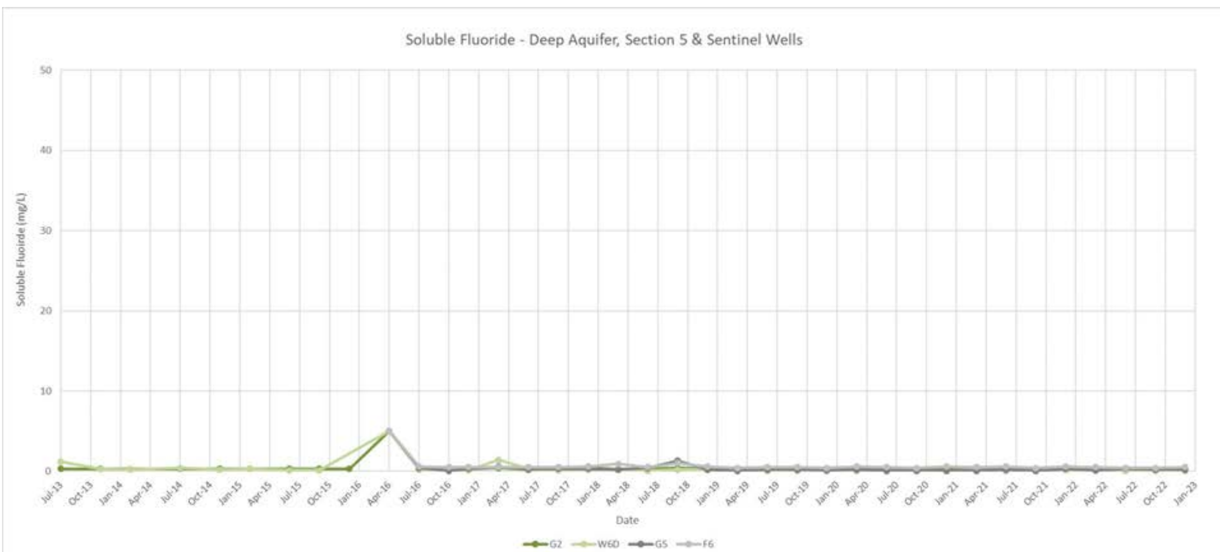


Figure 6-24: Soluble Fluoride Concentrations – Deep Aquifer, Section 5 & Sentinel Wells

6.2.3.2 Mann-Kendall Trend Analysis

Data from July 2013 to December 2022 (37 sampling events) were included for the purpose of Mann-Kendall trend analysis of soluble fluoride, a summary is provided in **Table 6-10**. Mann-Kendall trend analysis of soluble fluoride indicates an increasing trend in well W1D (located on Section 2) and G2 (located on Section 5). Further review indicates that for the period of September 2020 to December 2022, fluoride concentrations at W1D have been the highest reported for this well since November 2013. The pH values at W1D are approaching levels characteristic of leachate impact (pH >9) and the groundwater has been described as yellow/brown indicating the plume may be expanding to the east of highly impacted well W2D.

Table 6-10: Mann-Kendall Soluble Fluoride Trends - Deep Aquifer

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	Soluble Fluoride >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	Stable	**Prob. Decreasing**	**Yes**	**Yes**
E5D	**Decreasing**	**Decreasing**	**Yes**	No
Section 2				
W1D	**Increasing**	**Increasing**	**Yes**	No
Section 3				
W3D	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	**Decreasing**	**Decreasing**	No	No
N2	**Decreasing**	No Trend	**Yes**	No
Section 5				
G2	Prob. Increasing	**Increasing**	No	No
W6D	**Decreasing**	**Decreasing**	No	No
Sentinel				
G5	**Decreasing**	**Decreasing**	No	No
F6	No Trend	**Decreasing**	No	No

[1]Soluble Fluoride exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2022
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour

6.2.4 Free Cyanide

Laboratory results for free cyanide in deep groundwater reported during 2022 are summarised in **Table 6-11**. Free cyanide concentrations exceeded the site ecological assessment criteria for 95% protection for aquatic ecosystems at W2D during March 2022, June 2022 and September 2022. All other wells targeting the deep aquifer reported free cyanide concentrations below the laboratory limit of reporting.

Table 6-11: Free Cyanide Concentrations – Deep Aquifer

CoC	Date	No. of Samples	Minimum Conc. (mg/L)	Maximum Conc. (mg/L)	No. Results Exceeding Criteria	
					95% Protection (>0.007 mg/L)	Recreational (>0.8 mg/L)
Free Cyanide	March 2022	9	<0.004	0.066	1	0
	June 2022	9	<0.004	0.055	**1**	0
	September 2022	9	<0.004	0.22	**1**	0
	December 2022	9	<0.004	0.004	0	0

6.2.4.1 Time Series Trends

Comparison of free cyanide concentrations at W2D for 32 GMEs completed between February 2015 and December 2022 are shown in **Figure 6-25**. Only concentrations at W2D have been graphed because all other concentrations have historically fallen below the laboratory limit of reporting. Free cyanide concentrations at W2D increased from 0.009 mg/L in December 2021 to 0.022 mg/L in September 2022 then subsequently decreased to 0.004 mg/L in December 2022.

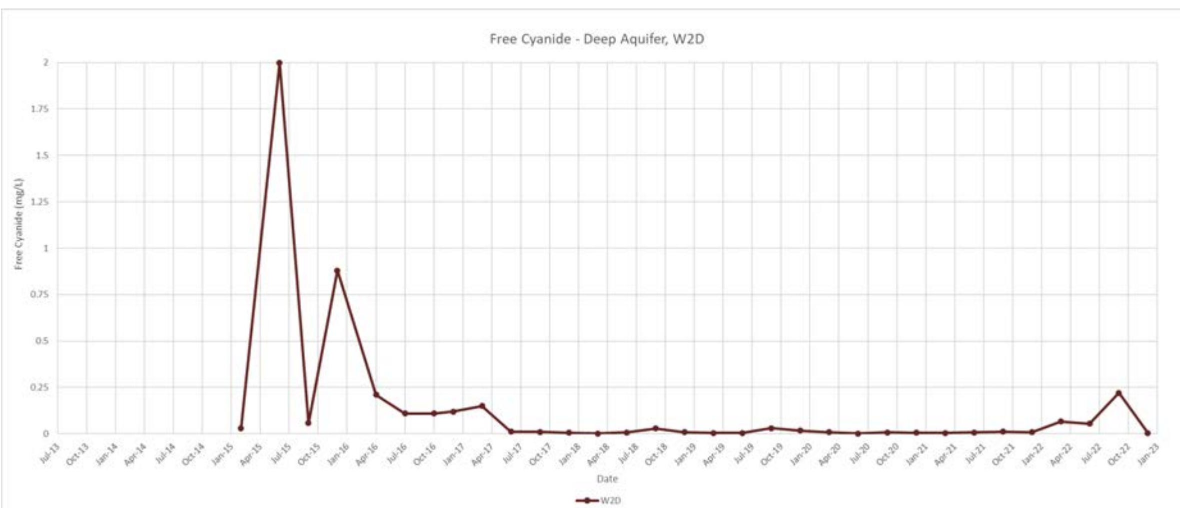


Figure 6-25: Free Cyanide Concentration – Deep Aquifer, W2D

6.2.4.2 Mann-Kendall Trend Analysis

Data from February 2015 to December 2022 (32 sampling events) were included for the purpose of Mann-Kendall trend analysis of free cyanide, a summary is provided in **Table 6-12**.

Mann-Kendall trend analysis of free cyanide in the deep aquifer shows a 'stable' trend at all wells aside from the leachate impacted well W2D, which shows a 'decreasing' trend.

Table 6-12: Mann-Kendall Trend Analysis of Free Cyanide – Deep Aquifer

Well	Previous Trend 2013 to 2021	Current Trend 2013 to 2022	Free Cyanide >Assessment Criteria[1]	Leachate Impacted[2]
Section 1				
W2D	**Decreasing**	**Decreasing**	**Yes**	**Yes**
E5D	Stable	Stable	No	No
Section 2				
W1D	Stable	Stable	No	No
Section 3				
W3D	*Damaged*	*Damaged*	*Damaged*	*Damaged*
~~W4D~~	*Destroyed*	*Destroyed*	*Destroyed*	*Destroyed*
Section 4				
W5D	Stable	Stable	No	No
N2	Stable	Stable	No	No
Section 5				
G2	Stable	Stable	No	No
W6D	Stable	Stable	No	No
Sentinel				
G5	Stable	Stable	No	No
F6	Stable	Stable	No	No

[1]Free cyanide exceeded the assessment criteria of either 95% Protection of Aquatic Ecosystems or Recreational during any GME completed in 2022
[2]Groundwater generally characteristic of leachate impact i.e., pH >9, brown in colour

7. HYDRO DATA

Hydro historically collected groundwater samples for analysis from the monitoring well network in between Ramboll quarterly GMEs. Hydro ceased sampling in June 2022, instead relying on samples collected by Ramboll. Thirty-four (34) sampling events were completed by Hydro between May 2014 and June 2022. Hydro personnel gauged depth to water and collected groundwater samples for pH, conductivity and fluoride. Fluoride concentrations reported for wells sampled by Hydro are included in **Table 7-1** with a graphic representation provided in **Figure 7-1**. The results from the Hydro sampling are similar to the results of the quarterly GMEs completed by Ramboll.

Table 7-1: Fluoride Concentrations in Wells Sampled by Hydro (mg/L)

Date	W1S	W1D	W2D	W7S	E5D	W3S	W4S	W5S	W6S	W6D
May 2014	70	8.9	840	39	39	410	610	180	-	-
June 2014	75	5.7	660	-	36	310	400	87	-	1.1
September 2014	79	3	1,200	-	15	270	460	110	-	0.7
December 2014	58	2	1,200	-	10	230	-	89	-	0.7
March 2014	-	2	1,200	-	10	230	-	-	-	<0.5
June 2014	-	3.4	1,300	-	14	240	500	95	150	0.7
September 2015	-	2	1,300	-	7	220	-	77	-	<0.5
December 2015	-	<5	1,100	-	9	180	-	8.3	-	<0.5
March 2016	-	8.3	1,200	-	14	230	-	-	-	0.9
June 2016	-	3.7	1,600	-	<0.5	160	-	-	-	<0.5
September 2016	-	4.1	1,100	-	12	130	-	-	-	<0.5
December 2016	-	7.5	1,400	-	15	-	-	-	-	<0.5
March 2017	-	5.3	1,200	-	14	220	-	-	-	<0.5
June 2017	-	4.5	1,300	-	18	140	-	-	-	<0.5
September 2017	-	4.2	1,200	-	20	90	-	-	-	<0.5
December 2017	-	6.7	1,600	-	200	1,100	-	-	-	1.7
March 2018	-	15.0	1,700	-	25	1,700	-	-	-	-
June 2018	-	6.4	2,200	-	30	120	-	-	-	-
September 2018	-	4.5	860	-	12	96	-	-	-	-
December 2018	-	4.3	1,100	-	10	87	-	-	-	-
March 2019	-	5.5	1,100	-	20	-	-	-	-	-
June 2019	-	5.2	1,500	-	10	120	-	-	-	-
September 2019	-	7.7	1,200	-	12	140	-	-	-	-
December 2019	-	4.8	1,200	-	7.3	-	-	-	-	-
March 2020	-	5.6	1,100	-	8.4	180	-	-	-	-
June 2020	-	6.8	650	-	8.0	130	-	-	-	-
September 2020	-	12	910	-	17	33	-	-	-	-
December 2020	-	9.6	770	-	11	<0.5	-	-	-	-
March 2021	-	11	780	-	15	28	-	-	-	-
June 2021	-	11	1100	-	11	270	-	-	-	-
September 2021	-	13	1100	-	15	150	-	-	-	-
December 2021	-	46	270*	-	8.5	220	-	-	-	-
March 2022	19	20	360	22	15	260	-	-	-	-
June 2022	9.8	10	67	7.7	13	17	-	-	-	-

- *Not sampled, i.e., dry*

* *Anomalous data, not included in graph*

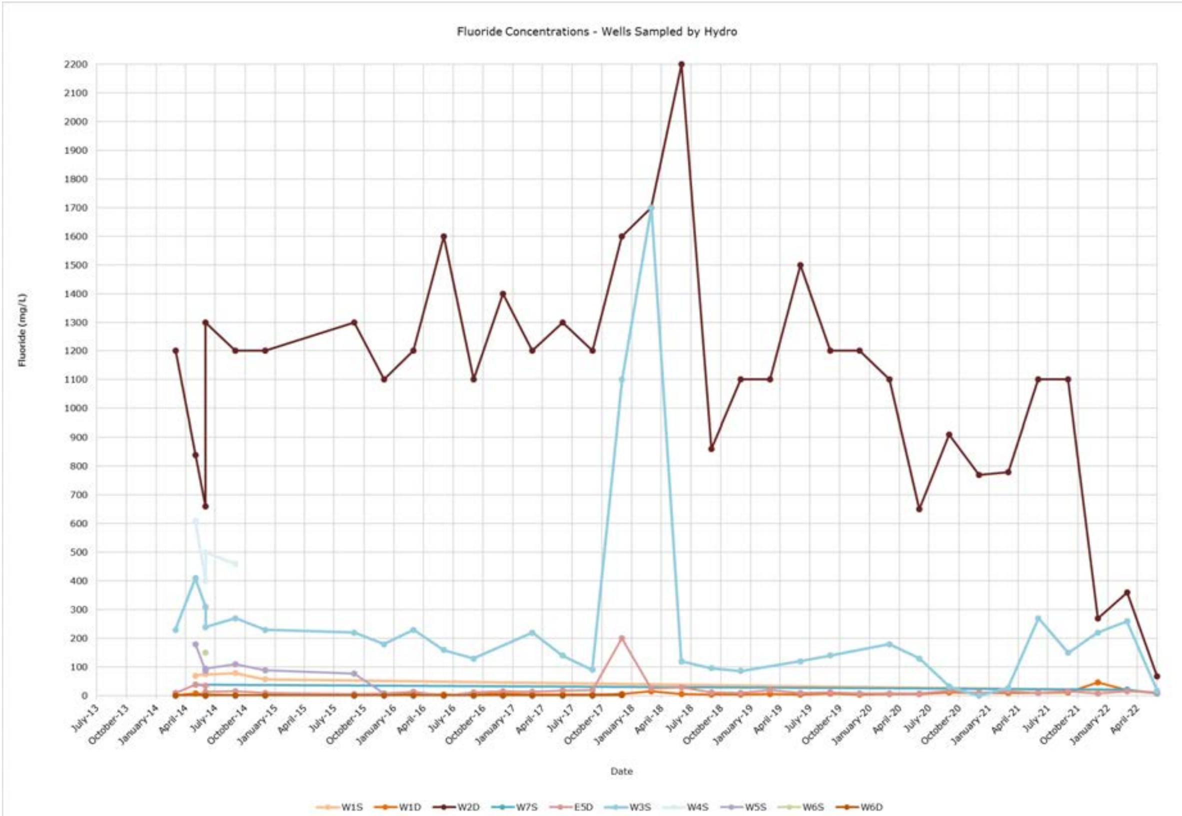


Figure 7-1: Fluoride Concentrations in Wells Sampled by Hydro

8. CONCLUSIONS AND RECOMMENDATIONS

Thirty-seven GMEs have been completed within a leachate impacted groundwater plume associated with the CWS (AEC 1) at the former Hydro Aluminium Kurri Kurri Smelter. The four most recent events were completed in March, June, September, and December 2022.

Each GME included the sampling and analysis of groundwater from a network of 24 shallow and deep wells located on five sections along the length of the leachate plume down-gradient of the CWS. An additional pair of two shallow and deep wells were added to the network in 2016. These wells are located adjacent to Swamp Creek, the nearest surface water receptor. Physico-chemical parameters were recorded, and groundwater samples were collected and analysed for soluble fluoride, total and free cyanide as well as total and dissolved aluminium.

Evaluation of 2022 GME data has identified the following:

- The leachate plume in shallow groundwater is delineated to the north, with a decreasing trend in soluble fluoride concentrations in well N9 at the leading edge of the plume.
- An increasing trend in pH and soluble fluoride concentrations have been reported at well E4 on the eastern boundary of the leachate plume. Groundwater at this location is constrained from further eastern migration due to geological constraints (high plasticity clay with low permeability). In addition, soluble fluoride concentrations in leachate at this location on the eastern edge of the leachate plume are generally consistent with historical observations made in 2013.
- Consistent with previous monitoring, the leachate plume has impacted the deeper sand aquifer in a localised area close to the plume source, the CWS, as shown by elevated soluble fluoride concentrations and a high pH in well W2D. Fluoride concentrations at this well have been elevated over the monitoring period and while no increasing trend in fluoride concentration has been observed, there is an increasing trend in pH with the highest pH results identified in the three most recent monitoring events in June, September and December 2022.
- There may be some expansion of leachate impact in the deep aquifer to the east, from the source towards W1D, with an increasing trend identified for both pH and soluble fluoride concentrations for two consecutive years (2021 to 2022). pH values at W1D are approaching levels characteristic of leachate impact (pH >9). The increasing plume migration coincides with higher than average rainfall experienced in the area, which is the primary mechanism for movement of the plume from the CWS.
- Consistent with previous monitoring, the leachate plume is not reaching the nearest surface water receptor of Swamp Creek, as indicated by continued low pH and low soluble fluoride concentrations in sentinel wells.
- Leachate is currently only generated in limited quantities following heavy rainfall and removal of leachate from the northern interception trench is completed as required. The active leachate interception trench at the toe of the CWS has not been pumped since 2016 and it was replaced in late 2022 with two separate interception trenches. Water pumped from these interception trenches will be pumped to the TWTP for treatment prior to disposal through the water management system.

9. REFERENCES

ANZG (2018) Guidelines for Fresh and Marine Water Quality

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality

ENVIRON (March 2013) Tier 2 Ecological Risk Assessment, Kurri Kurri Aluminium Smelter

ENVIRON (February 2015) Groundwater Fate and Transport Modelling, Leachate Plume – Capped Waste Stockpile, Hydro Aluminium Smelter Kurri Kurri, NSW

ENVIRON (June 2016) Hydro Aluminium Kurri Kurri Smelter, Capped Waste Stockpile, 12 Month Groundwater Monitoring Report

ENVIRON (September 2016) Plume Delineation Report, Capped Waste Stockpile

GSI (2012) Groundwater Services Inc., GSI Mann-Kendall Toolkit for Constituent Trend Analysis, Version 1.0, November 2012

NHMRC (2008) Guidelines for Managing Risks in Recreational Water

NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination

Ramboll (April 2016) Hydro Aluminium Smelter, Capped Waste Stockpile, 2015 Annual Groundwater Monitoring Report

APPENDIX 1
FIGURES

Aerial photography by Nearmap, flown 05.12.2022

Legend

- Leachate Plume
- Capped Waste Stockpile
- East Surge Pond
- Watercourse (NSWSS)
- Waterbody (NSWSS)

0 50 100m

A4
1:5,000

Figure 1 | AEC 1: Site Location Plan, 2022 Annual Groundwater Monitoring Report

Aerial photography by Nearmap, flown 05.12.2022

Legend

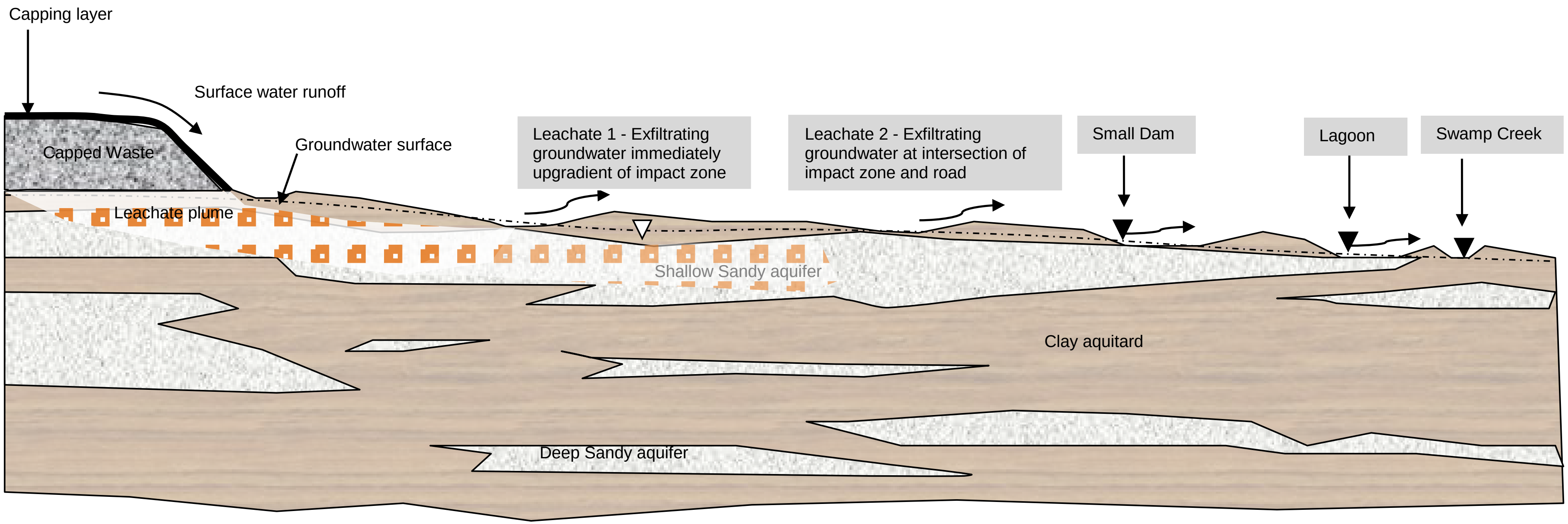
- Deep groundwater well
- Shallow groundwater well
- Groundwater sentinel well
- Cross section
- Leachate interception trench
- Leachate Plume
- Capped Waste Stockpile
- East Surge Pond
- Watercourse (NSWSS)
- Waterbody (NSWSS)

0 25 50m

A4
1:3,000

Figure 2 | Groundwater Monitoring Well Network, 2022 Annual Groundwater Monitoring Report

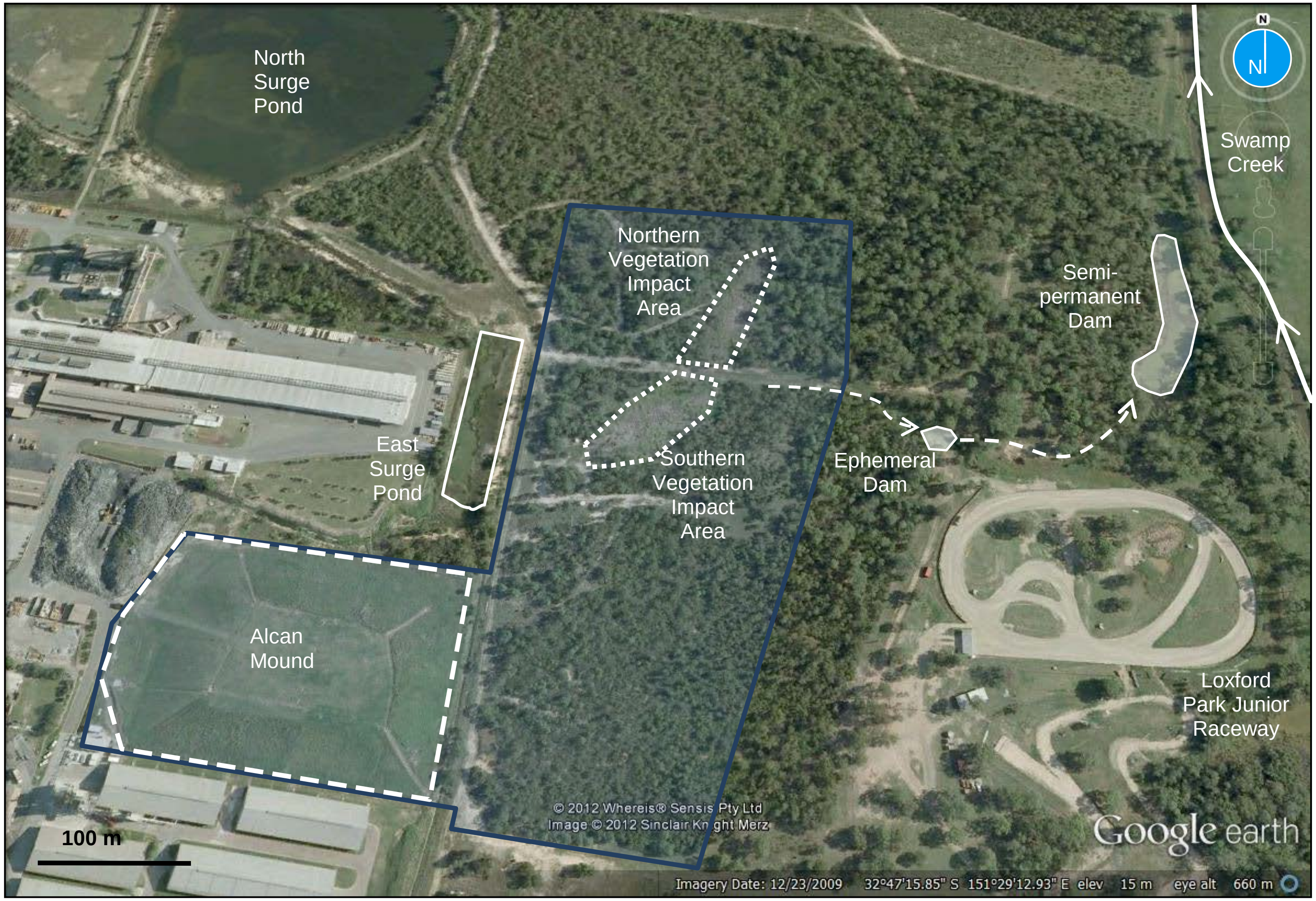
APPENDIX 2
ATTACHMENTS



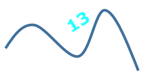
RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 1

RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 2

Attachment 2 | 1961 Aerial Photograph showing Plume Location, 2022 Annual Groundwater Monitoring Report

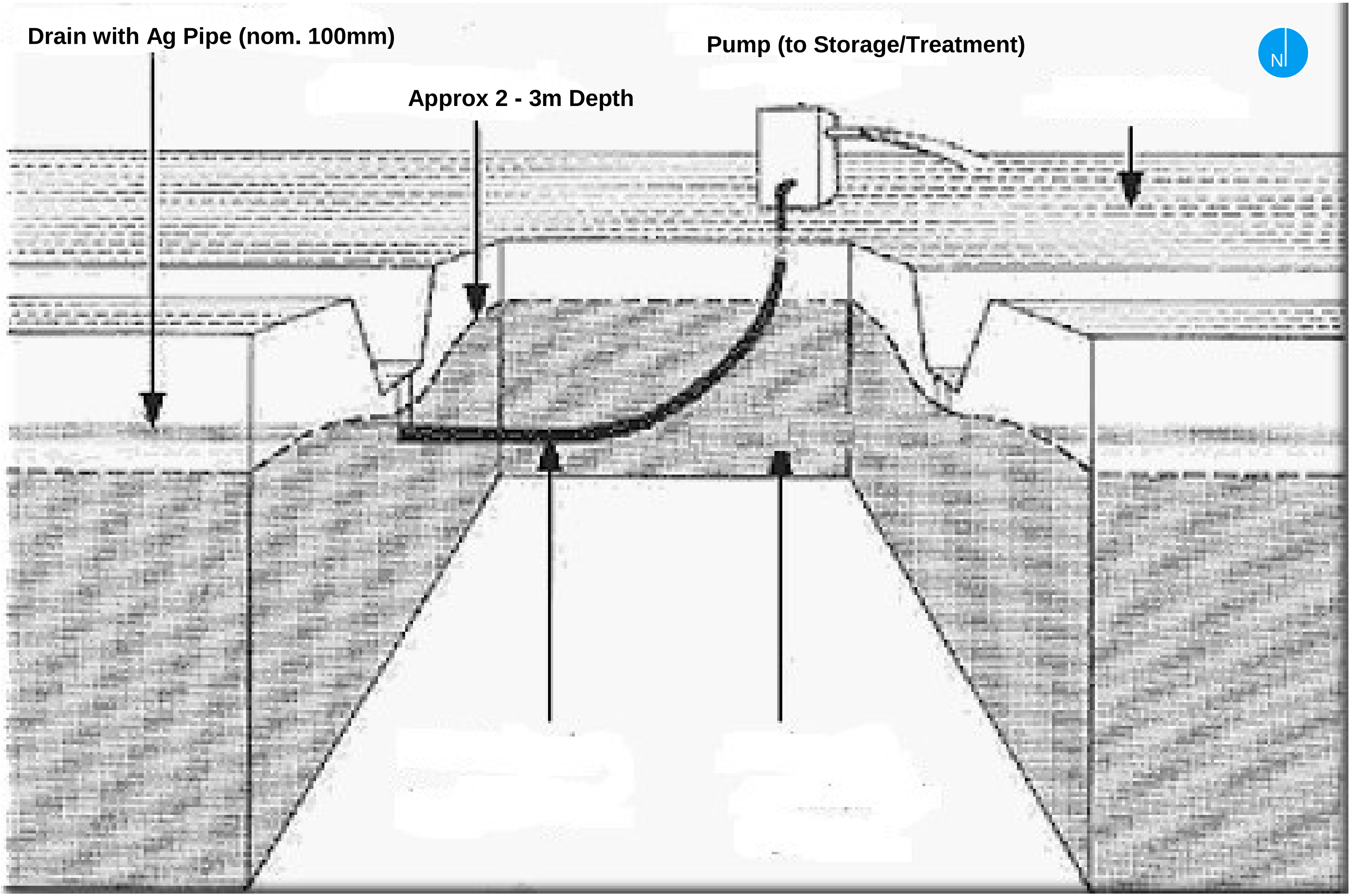


RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 3



Topographic Contours mAHD (based on 1m Lidar)

RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 4



RAMBOLL AUSTRALIA - GIS MAP file : 318000664 - 2019 Annual Groundwater Monitoring Report - Attachment 5

Attachment 5 | Conceptual Cross Section of Leachate Interception Trench, 2022 Annual Groundwater Monitoring Report

APPENDIX 3
2013-2022 GME HISTORICAL DATA

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	12.489	12.619	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Description:	Light brown	Clear	Dry	Dry	Dry	Dry	Turbid, brown, purged dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Analyte grouping/Analyte	**95% Protection of Aquatic Ecosystems**	**Irrigation**	**Stock Watering**	**Recreational**	**Units**	**LOR**	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
pH (field)	6.5-8º			6.5-8.5	pH units	-	7.33	6.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*115*	*58*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***91.5***	***33***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:							W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S	W2S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							-			12.139						13.289	12.379	12.049	11.999	12.289	-	12.849	12.8390
Sample Description:							Dry	Dry	Dry	Clear, no odour	Dry	Dry	Dry	Dry	Dry	Clear, turbid	Turbid, pale yellow, no odour	Turbid, light brown, no odour	Turbid, light brown, no odour	Slightly turbid, pale yellow/grey, no odour	Insufficient water to sample	Turbid, pale yellow brown, no odour	Very pale brown, slight sulphidic odour. Very turbid
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	-	7.47	-	-	-	-	-	6.74	6.73	6.97	7.19	7.32	-		6.51
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	*92*	-	-	-	-	-	*20*	*20*	*66*	*72*	*57*	-	*24*	*37*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	0.01	-	-	-	-	-	<0.004	<0.004	0.008	<0.004	0.005	-	<0.004	< 0.004
Total Cyanide					mg/L	0.004	-	-	-	3.9	-	-	-	-	-	0.17	0.48	1.8	1.5	0.44	-	0.061	0.27
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	***37***	-	-	-	-	-	***18***	***19***	***31***	***43***	**6.9**	-	***9.6***	***17***
Aluminium (dissolved)	0.055	5	5	0.2	mg/L	0.01	-	-	-	***11***	-	-	-	-	-	***9.6***	**7.2**	**5.2**	**5.20**	4.50	-	4.20	12

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	14/April/2017
					Sample ID:		W2S	W2S	W2S	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		12.6590	12.6990	12.1090	12.214	12.054	11.804	-	-	-	11.904	11.614	-	11.724	-	-	-	-
					Sample Description:		Turbid, pale yellow grey, no odour	Clear, colourless, no odour	Very turbid, pale brown, no odour	Brown	Brown	Brown	Dry	Dry	Dry	Brown	Brown	Dry	Brown	Dry	Dry	Dry	Dry
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.77	7.02	7.17	*9.54*	*9.37*	*9.78*	-	-	-	*9.14*	*9.42*	-	*9.48*	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*25*	*29*	*53*	*495*	*410*	*450*	-	-	-	*410*	*350*	-	*330*	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	-	*<0.8*	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	0.14	0.23	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***28***	***7.6***	***63***	0.33	0.52	2.5	-	-	-	3	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	24	7	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

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Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
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Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
					Sample ID:		E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	-	-	-	-	-	12.054	12.184	11.914	11.714	12.134
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Slightly red/brown	Clear, yellow/brown, no odour	Clear to slightly turbid, brown, no odour	Slightly turbid, pale brown, no odour	Clear, dark brown, no odour
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	-	-	-	-	-	-	-	-	-	-	-	8.79	*9.11*	*9.2*	8.89	*9.15*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	*220*	*250*	*300*	*300*	*310*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	0.007	0.011	0.01	<0.004	0.011
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	62	57	79	54	50
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	0.9	1	3.6	**9**	0.49
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	0.08	0.07	0.12	0.13	0.08

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16
					Sample ID:		E5	E5	E5	E5	E5	E5	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		11.864	12.304	12.5640	12.5340	12.5640	12.0240	12.487	12.352	11.862	11.042	11.312	11.262	11.952	11.702	11.652	11.932	11.842
					Sample Description:		Clear, yellow brown, no odour	Clear, dark brown, no odour	Dark brown, no odour	Clear, dark yellow brown, no odour	Clear, dark yellow brown, no odour	Clear, dark yellow brown, sulphidic odour	Light brown	Light brown, cloudy	Brown, murky, light brown	Brown, no odour	Brown, turbid, some odour	Light brown, no odour	Light brown	Very turbid, brown	-	Brown, turbid	Very turbid, brown
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.36*	*9.16*	*9.27*	*9.63*	*9.84*	*10.19*	7.45	7.24	*9.65*	*10.14*	*10.01*	*9.95*	*9.87*	*10.22*	*10.27*	*10.13*	*10.22*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*230*	*320*	*360*	*410*	*360*	*420*	*79*	*51*	*280*	*550*	*930*	*740*	*200*	*680*	*360*	*570*	*280*
Free Cyanide	0.007			0.8	mg/L	0.004	0.011	0.013	0.3	< 0.004	< 0.004	0.006	-	-	-	-	-	0.021	<0.08	0.029	0.1	0.01	0.018
Total Cyanide					mg/L	0.004	18	19	56	68	82	86	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.75	1.6	0.31	0.52	0.15	0.3	***58.1***	***60***	***17***	-	***310***	***370***	***120***	***610***	***97***	***280***	***93***
Aluminium (dissolved)					mg/L	0.01	0.10	0.09	0.09	0.09	0.09	0.08	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20
					Sample ID:		PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		11.842	11.662	11.542	11.742	11.572	11.412	11.302	11.772	11.572	11.522	11.422	11.502	11.432	11.302	11.662	13.362	12.422
					Sample Description:		-	Milky	Brown	Brown	Milky brown	Brown	Turbid, brown	Light brown, no odour	Light brown/grey, hydrogen sulfide odour	Clear to slightly brown, no odour	Slightly brown, slight sulphidic odour	Slightly turbid, clear, no odour	Brown/grey, sulphidic odour	Turbid, slightly brown	Yellow/brown, turbid	Clear, no odour	Turbid, yellow, no odour
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.98*	*9.72*	*9.56*	*9.2*	*9.9*	*9.6*	*9.73*	*9.17*	*13.68*	*9.55*	*9.42*	*9.43*	*9.89*	*9.93*	7.2	*9.59*	7.4
Soluble Fluoride		1	2	1.5	mg/L	0.1	*85*	*88*	*210*	*60*	*180*	*160*	*220*	*62*		*250*	*370*	*140*	*400*	*530*	*30*	*17*	*21*
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.006	0.006	<0.004	<0.005	0.009	<0.004	<0.004	0.01	0.009	<0.004	<0.004	0.014	0.007	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	20	4.1	44	14	21	9.8	35	57	0.31	0.009	0.077
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***90***	***120***	***740***	***39***	***160***	***45***	***82***	***46***	***23***	**5.4**	***9.3***	***38***	***93***	***77***	***49***	3.2	**6.1**
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	0.09	0.46	1.9	1.3	4.3	0.86	2.9	***17***	0.44	0.76

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15
Sample ID:							PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							12.402	12.152	12.602	12.212	12.852	13.0220	12.9420	12.9020	12.1920	12.614	12.969	-	-	-	-	-	-
Sample Description:							Slightly turbid, light brown, no odour	Turbid, pale black/grey/brown, strong odour	Slightly turbid, some flocculants, pale grey, no odour	Slightly turbid, pale grey, no odour	Clear, colourless, no odour	Brown, no odour	Clear to slightly turbid, pale yellow, no odour	Slightly turbid, pale yellow brown, no odour	Turbid, yellow brown, sulphidic odour	Cloudy/turbid	Light brown, cloudy sediment	Dry	Dry	Dry	Dry	Dry	Dry
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.88	7.9	6.61	8.32	6.91	7.37	9.56	9.78	10.45	7.29	7.1	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*22*	*24*	*17*	*26*	*17*	*19*	*130*	*150*	*360*	*34*	*31*	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	0.012	< 0.004	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	0.23	0.23	0.056	0.068	0.012	0.035	4.8	8.4	27	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***12***	***23***	***12***	***18***	4.1	9	2.8	11	8.5	***415***	***42***	-	***210***	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	1.9	***15.00***	**6.40**	***11.00***	2.10	2.3	0.6	2.2	0.95	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																	
					Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19
					Sample ID:	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S
					Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Sample Description:	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Purge dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	**Units**	**LOR**	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
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For Limit of Reporting (LOR) refer to laboratory certificates of analysis
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Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational		LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14
					Sample ID:		W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7S	W7M	W7M	W7M	W7M	W7M
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	13.019	12.369	-	-	12.229	11.979	12.219	12.7990	12.7890	12.7890	-	12.218	12.138	11.568	10.958	11.088
					Sample Description:		Dry	Clear, no odour	Turbid, yellow/brown, no odour	Dry	Dry	Very turbid, pale brown, no odour	Dry	Very turbid, pale brown, no odour	Pale brown, no odour	Turbid, pale yellow grey, no odour	Turbid, pale yellow brown, no odour	Insufficiemt water to sample	Light brown	Brown	Brown, dark, sulphur smell	Brown, no odour	Brown, turbid, some odour
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	8.08	7.61	-	-	7.24	-	7.01	6.95	7.38	7.13	-	*9.81*	*9.87*	*10.1*	*10.12*	*9.78*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	*17*	*22*	-	-	*24*	-	*33*	*27*	*16*	*18*	-	*878*	*650*	*730*	-	*910*
Free Cyanide	0.007			0.8	mg/L	0.004	-	<0.004	<0.004	-	-	<0.004	-	<0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	
Total Cyanide					mg/L	0.004	-	0.08	1.1	-	-	1.2	-	1	0.51	0.21	0.2	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	**5.9**	***65***	-	-	***410***	-	***86***	***32***	***7.5***	***3.6***	**-**	***11.4***	2.3	***45***		***21***
Aluminium (dissolved)					mg/L	0.01	-	2.1	0.55	-	-	***20***	-	***9.1***	***23***	***2.9***	***1.9***	**-**	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19
Sample ID:							W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							10.918	11.938	11.608	11.518	11.668	11.578	11.568	11.388	11.278	11.458	11.298	11.128	11.018	11.478	11.298	11.268	11.138
Sample Description:							Brown/copper, strong odour	Brown	Brown	-	Brown	-	Brown	-	Brown	Brown	Brown	Tea brown	Tea brown	Turbid, light brown, no odour	Turbid, brown, no odour	Slightly brown, slight odour	Slightly brown
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.44*	*9.82*	*9.91*	*9.7*	*9.99*	*9.95*	*10.17*	*9.68*	*9.61*	*10.1*	*9.8*	*9.6*	*9.61*	*9.7*	*13.24*	*9.63*	*9.68*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*840*	*810*	*670*	*540*	*640*	*870*	*1100*	*1000*	*220*	*750*	*760*	*780*	*770*	*810*	*860*	*820*	*990*
Free Cyanide	0.007			0.8	mg/L	0.004	0.02	***<2***	***<0.4***	*0.21*	0.013	0.072	-	0.007	0.09	0.007	0.005	0.006	<0.004	0.008	0.017	0.007	0.006
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	140	190	160	130	150
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.99	***32***	**8.7**	**7.8**	4.4	0.08	**6.2**	***11***	3.4	1.3	1.2	3.6	***10***	0.76	**6.6**	0.31	**7.5**
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16	0.14	0.22	0.28

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table i: Results
Shallow Aquifer, Section 1

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M	W7M
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	11.228	11.158	11.068	11.348	12.148	12.188	11.858	11.698	12.128	11.848	12.518	12.728	12.538	12.708	11.968
Sample Description:	Brown, no odour	Brown/red, slightly sulphidic odour	Slightly brown	Slightly red/brown, no odour	Clear, no odour	Clear to slightly turbid, brown, no odour	Slightly turbid, brown, no odour	Slightly turbid, dark brown, strong odour	Slightly turbid, dark brown, no odour	Clear, dark yellow, no odour	Slightly turbid, pale yellow brown, no odour	Dark yellow brown, no odour	Clear, dark brown, no odour	Turbid, pale yellow brown, no odour	Turbid, dark yellow brown, no odour

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
pH (field)	6.5-8º			6.5-8.5	pH units	-	*9.65*	*9.73*	*9.75*	*9.67*	*8.97*	*9.1*	*9.28*	*9.47*	*9.86*	*9.42*	*9.44*	*9.29*	*10.39*	*10.16*	*10.81*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*750*	*800*	*830*	*810*	*440*	*290*	*580*	*630*	*490*	*350*	*360*	*400*	*710*	*480*	*850*
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.006	0.009	0.006	<0.004	0.019	0.009	0.005	0.006	0.013	0.008	0.03	0.029	0.12	< 0.004
Total Cyanide					mg/L	0.004	130	160	160	130	34	28	30	75	48	25	16	29	99	110	170
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.5	2	***10***	0.74	2.8	***11***	***11***	2.1	**8.1**	2.3	**6.8**	4.2	3.6	2.4	3.4
Aluminium (dissolved)					mg/L	0.01	0.30	0.30	0.27	0.39	0.83	2.60	0.76	0.35	0.51	0.36	0.37	0.75	0.37	0.3	0.25

Blank Cell indicates no criterion available
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For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table ii: Results
Shallow Aquifer, Section 2

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		11.887	11.977	11.367	11.277	-	11.217	11.527	11.207	11.317	11.297	-	-	-	-	-	-	-
					Sample Description:		Brown	Brown	Brown, cloudy, sulphur odour	Dark brown	Dry	Brown, no odour	Dark brown, turbid	Brown		Brown	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	7.22	7.17	6.84	6.9	-	6.66	6.83	6.86	-	7.21	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*53*	*69*	*42*	-	-	*66*	*120*	*38*	-	*39*	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	0.004	*<4*	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***121***	***130***	***27***	-	-	***120***	***1200***	-	-	***15***	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table ii: Results
Shallow Aquifer, Section 2

RAMBOLL

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
					Sample ID:		W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S	W1S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	-	-	10.857	11.487	11.077	11.377	11.417	11.297	11.477	11.657
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, yellow, no odour	Red/brown, sulphidic odour	Turbid, yellow brown, no odour	Turbid, dark yellow, no odour	Turbid, yellow brown, no odour	Turbid, yellow brown, no odour	Dark yellow brown, no odour
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	-	-	-	-	-	-	-	-	-	7.89	8.24	7.55	7.99	8.11	7.61	7.48
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	*17*	*17*	*17*	**14**	**14**	**13**	**13**
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	0.71	0.7	0.44	0.45	0.18	0.35	0.72
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	3.2	**7**	**7.6**	***56***	4.7	2.1	1.1
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	0.3	0.14	0.12	0.22	0.11	0.07	0.18

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Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
					Sample ID:		W1S	W1S	W1S	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		11.867	12.027	11.627	11.93	12.09	10.33	11.51	11.28	11.31	12.07	11.65	11.5	11.44	11.39	11.38	11.11	11.11
					Sample Description:		Clear, dark yellow, no odour	Slightly turbid, dark yellow, no odour	Slightly turbid, yellow, slight sulphidic odour	Brown	Brown, sulphur smell	Brown	Dark brown, no odour	Strong sulphur odour, dark brown	Brown/orange, no odour	Brown	Dark brown, turbid		Brown	Brown	Turbid, brown	Tea colour	Tea brown
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	8.6	8.1	7.98	*9.91*	*9.79*	*9.94*	*9.84*	*9.4*	8.84	*9.46*	*9.62*	*10.57*	*9.73*	*9.83*	*9.94*	*9.53*	*9.53*
Soluble Fluoride		1	2	1.5	mg/L	0.1	**9.8**	**10**	**12**	*699*	*650*	*650*	*590*	*380*	*340*	*260*	*280*	*300*	*330*	*570*	*550*	*450*	*670*
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	<0.004	<0.4	<0.04	0.032	0.004	0.049	0.045	<0.004	0.029
Total Cyanide					mg/L	0.004	1.4	1	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.5	2.3	0.28	0.379	0.89	0.4	3.2	***35***	***46***	***49***	***53***	***18***	***14***	***9.9***	2.6	***36***	***12***
Aluminium (dissolved)					mg/L	0.01	< 0.01	0.11	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Table ii: Results
Shallow Aquifer, Section 2

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
Sample ID:	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4	E4
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	-	11.01	10.81	10.83	11.33	11.12	11.06	10.84	11	9.94	10.77	11.4	11.03	11.93	11.65	12.64	11.92
Sample Description:	Dry	Milky brown	Dark brown	Brown	Brown/orange, strong hydrogen sulfide odour	Turbid, slightly brown/yellow	Slightly brown, no odour	Slightly brown, slight sulphidic odour	Slightly yellow, sulphidic odour	Brown, sulphidic odour	Clear to slightly grey	Yellow/brown	Red/brown, no odour	Clear to slightly turbid, orange/brown, slight unknown	Brown/red, easy to filter	Clear, brown, slight odour	Turbid, brown, no odour

Analyte grouping / Analyte	**95% Protection of Aquatic Ecosystems**	**Irrigation**	**Stock Watering**	**Recreational**	**Units**	**LOR**	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	*9.59*	*9.46*	*9.32*	*9.62*	*9.29*	*9.27*	*9.47*	*9.56*	*9.58*	*9.67*	*9.65*	*9.73*	*9.87*	*10.64*	*9.56*	*9.91*
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	*380*	*380*	*410*	*350*	*380*	*410*	*530*	*490*	*530*	*590*	*560*	*690*	*560*	*680*	*610*	*760*
Free Cyanide	0.007			0.8	mg/L	0.004	-	0.008	<0.004	<0.004	<0.004	<0.004	0.006	<0.004	<0.004	<0.004	0.006	0.004	<0.004	<0.004	<0.004	0.008	0.006
Total Cyanide					mg/L	0.004	-	-	-	61	69	41	48	57	74	130	130	110	160	190	1.8	89	120
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	***32***	***37***	***37***	***13***	***22***	1.7	**5.2**	1.3	0.98	1.8	***14***	0.5	0.55	0.44	0.65	***9.4***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	1	0.42	0.8	1.1	0.25	0.83	0.45	0.79	0.36	0.46	0.28	0.38	0.45

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table ii: Results
Shallow Aquifer, Section 2

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR						
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:							E4	E4	E4	E4	E4	E4
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							11.61	12.31	12.19	12.19	12.22	11.69
Sample Description:							Very turbid, dark brown, no odour	Slightly turbid, yellow brown, sulphidic odour	Dark yellow brown, sulphidic odour	Clear to slightly turbid, yellow brown, no odour	Clear, dark brown, slight sulphidic odour	Clear, dark yellow brown, slight sulphidic odour
Analyte grouping / Analyte												
pH (field)	6.5-8º			6.5-8.5	pH units	-	*10.1*	*9.89*	*9.82*	*10.28*	*10.45*	*10.7*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*570*	*680*	*710*	*820*	*660*	*780*
Free Cyanide	0.007			0.8	mg/L	0.004	0.008	0.008	< 0.004	0.029	0.2	0.004
Total Cyanide					mg/L	0.004	47	81	140	180	220	210
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***70***	0.49	0.41	0.82	0.38	***0.39***
Aluminium (dissolved)					mg/L	0.01	0.53	0.29	0.36	0.42	0.35	0.38

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		10.279	10.599	9.809	10.059	9.919	10.019	10.489	10.219	10.009	9.999	9.939	9.859	9.699	9.799	9.969	9.669	9.579
					Sample Description:		Brown	Brown	Brown	Brown, strong organic material odour	Brown/orange, slightly turbid, slight odour	Dark orange/brown, no odour	Brown	Brown	-	Brown	Brown	Turbid, brown	Brown	Tea brown	Tea brown	Tea brown, foul smell	Tea brown, smelly
pH (field)	6.5-8ᵅ			6.5-8.5	pH units	-	*9.63*	*9.47*	*9.67*	*9.66*	*9.24*	8.56	*9.45*	*9.8*	*10.71*	*9.75*	*9.37*	*9.57*	*9.15*	*9.12*	*9.49*	2.65	*9.27*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*436*	*420*	*410*	*380*	*410*	*550*	*500*	*400*	*320*	*330*	*320*	*360*	*380*	*500*	*400*	*390*	*400*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	*11*	*<2*	<0.020	*0.19*	<0.004	0.026	0.032	<0.004	0.039	<0.004	<0.005	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.208	4.7	0.7	0.26	0.71	1.7	2.7	0.61	0.72	***14***	2.9	2.1	3	***25***	3.7	**5.9**	4.1
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
ᵅ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																		
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:							A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7	A7
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							9.629	9.999	9.819	9.989	9.609	9.689	9.819	9.569	10.029	10.149	10.369	10.259	10.969	10.419	10.249	10.649	10.7290
Sample Description:							Tea brown	Dark brown/orange, very strong hydrogen sulfide odour	Slightly brown/yellow, 'rotten egg' odour	Brown, sulphidic odour	Slightly brown, sulphidic odour	Slightly brown, sulphidic odour	Brown sulphidic odour	Slightly red/brown, sulphidic odour	Slightly red/brown, sulphidic odour	Slightly brown, sulphidic odour	Clear, brow, strong 'rotten eggs' odour	Red/brown, strong odour	Clear, brown, strong odour	Clear to slightly turbid, dark yellow/brown, slight odour	Slightly turbid, dark brown, strong odour	Clear to slightly turbid, dark brown, sulphidic odour	Dark yellow brown, strong sulphidic odour
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8ᵅ			6.5-8.5	pH units	-	8.96	*9.36*	*9.75*	*9.06*	*9.38*	*9.4*	*9.39*	*9.48*	*9.46*	*9.4*	*9.6*	*9.85*	*9.26*	*9.36*	*9.73*	*9.46*	*9.5*
Soluble Fluoride		1	2	1.5	mg/L	0.1	*190*	*390*	*450*	*410*	*600*	*480*	*480*	*520*	*410*	*470*	*370*	*500*	*380*	*110*	*370*	*360*	*330*
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.007	0.009	<0.004	<0.004	<0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	0.005	<0.004	0.005	<0.004	< 0.004
Total Cyanide					mg/L	0.004	15	87	80	54	100	82	88	90	64	86	81	1.8	43	9.2	20	18	45
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**8.9**	***24***	4.4	1	0.44	0.5	0.4	0.33	0.46	0.37	0.4	0.87	0.31	0.16	1	0.28	0.2
Aluminium (dissolved)					mg/L	0.01	-	0.37	0.2	0.25	0.19	0.16	0.21	0.28	0.25	0.21	0.22	0.23	0.21	0.11	0.23	0.15	0.16

Blank Cell indicates no criterion available
ᵅ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
					Sample ID:		A7	A7	A7	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		10.6290	10.7190	10.2990	-	10.312	9.282	9.832	9.552	9.902	10.292	10.052	9.632	9.622	9.762	9.602	7.182	9.702
					Sample Description:		Clear, yellow brown, no odour	Clear, dark yellow brown, strong sulphidic odour	Clear, dark yellow brown. No odour	Light brown	Brown	Light brown	Clear to brown, no odour	Brown/orange, no odour	Brown/orange, no odour	Brown	Light brown, slightly turbid	-	Brown	Turbid, brown	Turbid, brown	Brown	-
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	*9.78*	*9.98*	*10.2*	8.53	8.82	7.61	8.89	7.68	6.38	7.53	7.53		7.46	7.02	7.01	6.4	7.4
Soluble Fluoride		1	2	1.5	mg/L	0.1	*330*	*300*	*340*	*237*	*310*	*210*	*270*	*210*	*250*	*230*	*200*	*160*	*190*	*170*	*150*	*110*	*180*
Free Cyanide	0.007			0.8	mg/L	0.004	0.009	0.014	0.005	-	-	-	-	-	<0.004	*<0.4*	<0.02	0.023	0.007	0.005	0.014	<0.004	0.007
Total Cyanide					mg/L	0.004	41	60	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.23	0.22	0.15	***11.7***	2.6	**7.1**	***9.2***	**5.3**	***34***	4.4	***24***	***92***	***15***	**6.9**	***21***	***90***	***48***
Aluminium (dissolved)					mg/L	0.01	0.18	0.17	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

RAMBOLL

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
					Sample ID:		W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S	W3S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		9.902	8.982	8.912	9.582	9.872	9.522	9.902	-	9.122	9.752	-	9.872	10.022	9.952	9.702	10.242	10.082
					Sample Description:		Tea brown	Brown	Purge dry	Milky brown	Turbid, brown	Turbid, brown, no odour	Slightly brown, no odour	Turbid, pale brown, silty	Clear to yellow, slightly turbid, cloudy	Slightly brown	Insufficient water for sampling	Slightly brown/red	Clear, slightly red/brown	Clear to slightly turbid, brown, no odour	Red/brown, no odour	Turbid, yellow/brown, no odour	Clear to slightly turbid, yellow brown, no odour
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	7.66	7	6.99	7.19	6.91	7.14	6.8	-	7.01	7.7	-	7.21	7.29	7.28	7.59	7.14	7.57
Soluble Fluoride		1	2	1.5	mg/L	0.1	*62*	*99*	-	*180*	*120*	*96*	*100*	-	*90*	*170*	-	*150*	*150*	*97*	*100*	*130*	*130*
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.005	-	<0.004	0.007	0.004	0.008	-	<0.004	0.013	-	0.016	0.005	0.011	<0.004	0.028	0.016
Total Cyanide					mg/L	0.004	-	-	-	20	24	14	15	-	15	20	-	26	18	9.3	14	13	17
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***15***	***110***	-	***80***	***16***	***23***	***21***	-	***33***	3.8	-	***26***	3.1	**8.2**	***29***	**8.7**	4
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	1.3	1.1	3.2	-	3.3	0.79	-	4.1	1.2	4.4	3.5	2.5	0.58

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16
					Sample ID:		W3S	W3S	W3S	W3S	W3S	W3S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		9.772	10.182	10.1320	10.2020	10.1820	9.71200	-	9.934	-	-	-	-	9.739	9.729	-	-	9.719
					Sample Description:		Slightly turbid, dark yellow brown, slight odour	Clear, dark yellow brown, no odour	Pale brown, no odour	Turbid, yellow brown, no odour	Clear, yellow, no odour	Clear, dark yellow, no odour	Dry	Brown	Dry	Dry	Dry	Dry	Brown	Dark brown	Dry	Dry	Slightly turbid, brown
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	7.53	7.58	8.21	8.96	9.3	8.3	-	*9.13*	-	-	-	-	*9.13*	*9.07*	-	-	5.11
Soluble Fluoride		1	2	1.5	mg/L	0.1	*110*	*230*	*290*	*300*	*240*	*180*	-	*480*	-	-	-	-	*490*	*400*	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.033	< 0.004	0.009	< 0.004	0.006	-	-	-	-	-	-	*<4*	*<40*	-	-	-
Total Cyanide					mg/L	0.004	12	14	26	27	25	28	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	3.1	0.73	4.7	3.3	2.1	3.7	-	3.6	-	-	-	-	2.3	***13***	-	-	-
Aluminium (dissolved)	0.055	5	5	0.2	mg/L	0.01	0.62	0.3	0.31	0.26	0.26	0.37	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
α Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20
					Sample ID:		W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	9.759	-	-	-	-	-	-	9.599	10.029	
					Sample Description:		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dark brown, orange odour	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Slightly red/brown	Purge dry
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	-	-	-	-	-	-	8.26	-	-	-	-	-	-	-	8.32	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	*160*	-	-	-	-	-	-	-	*76*	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	<0.004	-	-	-	-	-	-	-	<0.004	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	2.1	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	***71***	-	-	-	-	-	-	-	***19***	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	0.38	-	-	-	-	-	-	-	5.4	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iii: Results
Shallow Aquifer, Section 3

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	**Sample Type:**		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
					Sample ID:		W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S	W4S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		10.629	9.789	9.739	-	-	-	-	-	-
					Sample Description:		Dry, mud at base of well	Very turbid, brown, organic odour	Very turbid, grey/black/brown, organic odour	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample	Insufficient water to sample
Analyte grouping / Analyte					**Units**	**LOR**									
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	7.58	7.91	-	-	-	-	-	-
Soluble Fluoride		1	2	15.	mg/L	0.1	-	*81*	*120*	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	<0.004	<0.004	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	2.2	1.7	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	***63***	***170***	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	***24***	2.3	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iv: Results
Shallow Aquifer, Section 4

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																		
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		8.06	7.735	7.48	7.72	7.67	7.54	8.7	8.15	7.9	7.94	7.64	7.55	7.41	7.4	7.56	7.33	7.2
					Sample Description:		Clear/light brown	Cloudy, brown	Light brown	Brown, slightly turbid, sulphidic odour	Dark grey, turbid, no odour	Brown/orange, slight sulphidic odour	Brown	-	-	Clear to light brown, turbid	Turbid, brown	Turbid, brown	Grey	Brown	Brown	Milky	Brown
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*9.36*	*9.36*	*9.33*	*9.41*	*9.32*	8.86	7.97	*9.23*	8.65	*9.2*	*9.29*	*9.41*	*9.1*	8.7	*9.07*	3.51	8.83
Soluble Fluoride		1	2	1.5	mg/L	0.1	*102*	*160*	*190*	*160*	*150*	*230*	***7.4***	*110*	*96*	*120*	*120*	*130*	*200*	*230*	*99*	*130*	*110*
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	0.005	<0.004	<0.004	0.033	<0.004	0.009	0.016	0.004	0.015	<0.004	<0.005	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***23***	***23***	4	**7.8**	3.6	5	2.5	***11***	2.7	**7.6**	***23***	***22***	***15***	***89***	**5.6**	***120***	***49***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iv: Results
Shallow Aquifer, Section 4

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
					Sample ID:		E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11	E11
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		7.11	7.56	7.4	7.46	7.25	7.29	7.34	7.18	7.65	7.68	7.97	7.86	7.76	8.1	7.88	8.45	8.55000
					Sample Description:		Yellow	Light brown, hydrogen sulfide odour	Slightly brown	Clear, no odour	-	Clear, sulphidic odour	Clear, slightly turbid	Clear, sulphidic odour	-	Clear, slight sulphidic odour	Clear, yellow/brown, no odour	Clear to slightly turbid, light brown, no odour	Low turbid, pale yellow, strong odour	Very turbid	Turbid, pale yellow brown, slight odour	Turbid, pale brown, no odour	Pale yellow brown, no odour
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	8.62	*9.02*	*10.45*	7.7	8.99	8.76	7.87	8.95	8.41	8.48	8.69	*9.24*	8.3	*9.21*	*9.48*	7.09	6.88
Soluble Fluoride		1	2	1.5	mg/L	0.1	*120*	*120*	*130*	*49*	*150*	*74*	*41*	*120*	*41*	*54*	*53*	*78*	*74*	*120*	*76*	12	8.3
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	7.4	10	8	0.65	18	3.8	0.3	20	0.79	1.9	3.5	5.1	1.9	3.1	1.4	0.17	0.2
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	4.4	4.9	***9.3***	**6.4**	***11***	1.8	3.9	1.5	3.3	2.4	2.6	**5.3**	1.1	***50***	5	4.8	3.3
Aluminium (dissolved)					mg/L	0.01	-	0.03	0.02	0.1	0.06	0.04	0.03	0.03	0.07	0.06	0.12	0.08	0.05	0.23	0.09	2	2.1

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iv: Results
Shallow Aquifer, Section 4

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
					Sample ID:		E11	E11	E11	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		8.49000	8.63000	8.10000	9.188	9.273	-	9.053	-	8.993	9.323	9.293	-	-	9.063	-	-	-
					Sample Description:		Turbid, pale yellow grey, no odour	Clear to slightly turbid, colourless to pale brown, sulphidic	Turbid, brown yellow, slight sulphidic odour	Light brown	Light brown, cloudy	Dry	Brown, turbid, no odour	Dry	Brown/orange, no odour	Brown	Brown	Dry	Dry	-	Dry	Dry	Dry
pH (field)	6.5-8ᵅ			6.5-8.5	pH units	-	7.37	6.91	8.8	7.37	7.37	-	7.39	-	6.55	7.26	7.2	-	-	7.29	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	11	7.9	*23*	*35*	*61*	-	*100*	-	*93*	*88*	*70*	-	-	*62*	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	<0.004	*<4*	<0.02	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	0.93	0.21	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.8	1.8	1.1	***13***	***13***	-	***15***	-	***22***	**7**	***31***	-	-	***10***	-	-	-
Aluminium (dissolved)					mg/L	0.01	0.59	1	0.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

ᵅ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table iv: Results
Shallow Aquifer, Section 4

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																		
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
					Sample ID:		W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S	W5S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		-	-	-	-	-	-	-	-	-	-	-	8.843	9.173	9.093	-	8.973	-
					Sample Description:		Brown	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Clear, yellow, no odour	Slightly turbid, yellow/orange / brown, no odour	Dry	Very turbid, brown, no odour	Dry
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	7.79	-	-	-	-	-	-	-	-	-	-	-	7.76	7.47	-	7.2	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	*50*	-	-	-	-	-	-	-	-	-	-	-	*34*	*34*	-	*39*	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	-	-	-	-	-	-	-	-	-	-	-	<0.004	<0.004	-	<0.004	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	2.6	2.2	-	2.5	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**6.2**	-	-	-	-	-	-	-	-	-	-	-	**11**	**23**	-	***42***	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	**6.6**	2.6	-	5	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Table iv: Results
Shallow Aquifer, Section 4

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-21	Dec-21
					Sample ID:		W5S	W5S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4
					Aquifer:		Shallow	Shallow
					SWL (m AHD):		-	9.073
					Sample Description:		Dry	Very turbid, grey brown, no odour
Analyte grouping / Analyte					**Units**	**LOR**		
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	6.74
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	*24*
Free Cyanide	0.007			0.8	mg/L	0.004	-	<0.004
Total Cyanide					mg/L	0.004	-	0.34
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	***32***
Aluminium (dissolved)					mg/L	0.01	-	***14***

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																				
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		9.18	8.74	8.46	8.8	8.73	8.65	9.35	9.19	9.09	9.03	8.61	8.64	8.38	8.22	8.56	8.16	7.75
					Sample Description:		Yellow	Clear, slightly cloudy	Light brown, sulphur odour	Clear/dark yellow, no odour	Dark grey, turbid, no odour	Orange/yellow, no odour	Brown	Slightly turbid, light brown	-	Brown, turbid	-	Turbid, brown	-	Light brown	Brown	Faint yellow	Faint brown
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.36	6.38	6.48	6.53	6.39	6.11	6.49	6.69	6.74	6.59	6.63	6.92	6.4	6.54	6.78	6.76	6.67
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.27	0.17	0.26	0.27	0.29	0.35	0.9	0.3	0.4	**<10**	0.4	0.6	0.4	1	0.4	0.4	0.4
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	*<0.4*	<0.02	0.005	<0.004	0.004	<0.004	<0.004	0.006	<0.004	<0.005	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.102	***12***	0.11	0.3	***91***	1.8	***29***	**5.3**	3.4	***34***	0.47	1.6	1	***34***	3.9	***25***	4
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																		
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:							N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8	N8
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							7.87	8.29	8.18	8.28	7.9	7.89	7.99	7.77	8.04	8.19	8.53	8.47	8.73	9.27	8.93	8.99	9.45000
Sample Description:							Brown	Light brown, some odour	Brown/yellow	Slightly brown, very slight sulphidic odour	Slightly brown/yellow, no odour	Clear to yellow	Turbid, brown/yellow, no odour	Slightly yellow, sulphidic odour	Clear, bright yellow, sulphidic odour	Slightly yellow/red, no odour	Turbid, yellow, no odour	Slightly turbid, brown, slight odour	Turbid, yellow/orange /brown, slight odour	Slightly turbid, yellow/brown, no odour	Turbid, yellow/orange brown, slight odour	Turbid, pale yellow brown, no odour	Yellow brown, sulphidic odour
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.45	6.71	<u>*10.53*</u>	6.51	6.81	6.68	6.6	6.67	6.76	6.77	6.77	6.95	6.54	6.85	7.19	6.63	6.91
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.5	0.6	0.5	0.5	0.5
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	0.54	0.67	0.56	0.6	0.61	0.55	0.47	0.63	0.35	0.49	0.66	0.44	0.1	0.2	0.1	0.041	0.38
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**5.1**	4.3	0.22	0.35	0.9	0.76	1.1	1.7	0.3	0.63	4.5	1	0.7	**5.1**	**6.5**	0.2	0.61
Aluminium (dissolved)					mg/L	0.01	-	0.02	0.03	0.06	0.04	0.06	0.06	0.06	0.07	0.05	0.06	0.05	0.06	0.05	0.04	0.04	0.07

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in <u>*underline/italics*</u> exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
					Sample ID:		N8	N8	N8	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		9.40000	9.71000	9.32000	9.222	9.312	8.482	9.012	8.872	9.002	9.692	9.382	9.052	8.832	9.252	-	-	9.142
					Sample Description:		Slightly turbid, yellow, no odour	Turbid, dark yellow, no odour	Dark yellow	Light brown	Cloudy brown	Dry	Dark yellow, slightly turbid, no odour	Dark grey, becoming yellow, turbid, no odour	Brown/orange, sulphidic odour	Turbid, grey	Clear, strong sulphidic odour	-	Brown	Slightly brown	Brown	Dry	Brown
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	7.11	7.52	7.54	*9.16*	8.9	-	*9.17*	8.91	8.46	7.22	7.34	7.7	6.61	8.11	8.54	-	8.61
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.5	0.6	0.6	***85***	***200***	-	***170***	***210***	***210***	***24***	***25***	***9***	-	***140***	-	-	***200***
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	<0.004	*<0.4*	<0.02	<0.004	-	<0.004	-	-	<0.004
Total Cyanide					mg/L	0.004	0.62	0.52	0.61	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.29	0.39	0.34	***14.7***	***62***	-	***9***	***130***	**8**	***14***	***22***	0.89	-	**5.5**	-	-	
Aluminium (dissolved)					mg/L	0.01	0.05	0.03	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
Sample ID:	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9	N9
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	9.352	8.822	8.812	9.022	9.222	8.972	9.172	8.792	8.832	9.182	-	9.342	9.322	9.312	9.182	9.332	9.502
Sample Description:	Light brown, smelly	-	Tea brown	Tea brown	Light brown, some odour	Brown, sediment, strong hydrogen sulfide odour	Clear, slightly brown, sulphidic odour	Light brown, sediments, strong sulphidic odour	Clear, sediments	Clear to slightly brown, sulphidic odour	Insufficient water for sampling	Clear, sulphidic odour	Clear, sulphidic odour	Clear to slightly turbid, yellow, sulphidic odour	Turbid, light brown, slight odour	Low turbid, pale brown/yellow, strong odour	Turbid, pale yellow, strong odour

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	*9.32*	-	8.6	8.65	8.72	*12.9*	8.72	8.33	8.71	8.5	-	8.64	8.53	8.7	8.69	8.21	8.67
Soluble Fluoride		1	2	1.5	mg/L	0.1	***160***	***150***		***200***	***140***	***170***	***160***	***200***	***160***	***160***	-	***140***	***130***	***57***	***110***	***110***	***110***
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.005	<0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	<0.004	<0.004	<0.004	0.008	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	15	6.7	7.2	7.4	6.6	9.2	8	-	5.4	3.7	2.9	5.3	2.3	1.1
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.6	-	-	0.54	*17*	0.95	0.28	1.5	2	0.64	-	4.9	1.6	1.3	1.6	0.52	*15*
Aluminium (dissolved)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	0.1	0.1	0.08	0.27	0.46	0.08	-	1.1	0.7	0.6	0.28	0.06	0.84

Blank Cell indicates no criterion available

[α] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16
					Sample ID:		N9	N9	N9	N9	N9	N9	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		9.282	9.802	9.72200	9.71200	9.82200	9.21200	7.85	7.65	7.64	-	-	7.69	8.12	8.01	7.82	-	-
					Sample Description:		Turbid, pale yellow brown, no odour	Turbid, pale yellow brown, no odour	Pale yellow brown, sulphidic odour	Turbid, pale yellow grey, no odour	Turbid, pale yellow brown, no odour	Turbid, pale grey, no odour	Light brown	Dry	Dry	Brown/yellow, turbid	Dry	Orange, no odour	Light brown, turbid	Light brown, slightly turbid	-	Dry	Dry
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	8.68	8.27	8.26	8.86	8.41	7.81	8.87	-	-	8.79	-	7.27	8.72	8.98	8.67	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	***95***	***82***	***79***	***25***	***5.2***	***2.9***	***195***	-	-	-	-	***200***	***180***	-	***180***	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	0.019	*<0.4*	-	0.058	-	-
Total Cyanide					mg/L	0.004	0.83	0.18	0.65	0.17	0.061	0.076	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	3.7	0.71	1.6	22	9.7	2	***60.1***	-	-	-	-	3.5	***7.7***	-	***22***	-	-
Aluminium (dissolved)					mg/L	0.01	0.6	0.06	0.17	7.6	3.9	1.1	-	-	-	-	-	-	-	-		-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20
Sample ID:	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	7.63	-	-	-	-	-	-	7.59	7.6	-	-	-	-	-	7.59	-	-
Sample Description:	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

Analyte grouping/Analyte	**95% Protection of Aquatic Ecosystems**	**Irrigation**	**Stock Watering**	**Recreational**	**Units**	**LOR**	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20
pH (field)	6.5-8º			6.5-8.5	pH units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table v: Results
Shallow Aquifer, Section 5

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR									
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:							W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S	W6S
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):							Dry	-	-	7.6	-	-	-	8.18000	-
Sample Description:							Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, pale yellow brown, no odour	Dry
pH (field)	6.5-8°			6.5-8.5	pH units	-	-	-	-	-	-	-	-	8.56	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	-	-	-	-	*110*	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	< 0.004	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	1.8	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	-	-	-	-	4.1	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	0.28	-

Blank Cell indicates no criterion available
° Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table vi: Results
Shallow Aquifer, Background

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																		
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
					Sample ID:		F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	F5
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
					Aquifer:		Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):		4.95	4.86	4.93	4.73	4.67	4.76	4.46	4.3	3.82	4.41	4.19	4.16	3.8	3.71	3.75	3.39	3.75	3.85
					Sample Description:		Clear to light brown	Clear	Clear	Colourless	Colourless with particles	Faint yellow	Colourless	Colourless with particles	Colourless with particles	Clear, hydrogen sulfide odour	Clear	Clear, very slight sulphidic odour	Clear, no odour	Clear, slight sulphidic odour	Clear, no odour	Clear, sulphidic odour	Clear, organic odour	Clear, slight sulphidic odour
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	7.38	5.58	5.25	4.46	4.11	5.08	4.21	4.57	4.3	4.46	4.35	5.02	4.96	4.71	4.6	4.54	5.38	4.75
Soluble Fluoride		1	2	1.5	mg/L	0.1	**<10**	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	<0.1	<0.4	<0.4
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	0.013	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	2.2	2.1	0.89	2.3	2.3	4.6	2.9	3.2	3	2.2	2.1	2	1.4	1.7	2.3	1.9	1.7	2.5
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	1.5	1.9	1.7	1.1	0.92	1.5	1.2	1.3	2.3

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table vi: Results
Shallow Aquifer, Background

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational		Units	LOR																		
					Sample Type:			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:			Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:			Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:			F5	F5	F5	F5	F5	F5	F5	F5	F5	F5	G6	G6	G6	G6	G6	G6	G6	G6
					Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:			Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:			Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
					Aquifer:			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
					SWL (m AHD):			4.23	4.04	5.48	4.72	4.55	4.93	5.18000	5.04000	5.36000	5.07000	2.59	2.45	2.45	3.21	2.17	2.28	2.04	1.86
					Sample Description:			Clear, no odour	Clear, sulphidic odour	Clear to slightly turbid, colourless/grey, slight	Clear, colourless, slight sulphidic odour, slight	Clear with some flocculants, colourless, strong odour	Clear, colourless, black flocculants, sulphidic	Colourless, sulphidic odour	Clear, colourless, sulphidic odour	Clear and colourless with brown floccules, strong	Clear, colourless with grey floccules, no odour	-	Clear	Clear	Colourless with particles	Colourless with particles	Colourless	Colourless with particles	Colourless with particles
pH (field)	6.5-8[a]			6.5-8.5		pH units	-	4.71	5.01	4.63	4.69	4.68	4.48	5.45	5.37	5.07	4.74	3.6	3.82	4.04	3.79	3.66	4.55	4.21	3.86
Soluble Fluoride		1	2	1.5		mg/L	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	***<10***	<0.1	0.2	<0.1	<0.1	0.4	0.4	0.5
Free Cyanide	0.007			0.8		mg/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	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide						mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2		mg/L	0.01	3.2	2.2	2.6	2.7	2.7	2.4	1.3	3.1	2.8	2.5	***28***	0.78	0.13	***29***	***25***	***23***	***21***	***27***
Aluminium (dissolved)						mg/L	0.01	2.7	1.9	2.2	2	2.2	2	0.25	2.3	1.9	2.1	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentrations below the LOR noted as <value

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table vi: Results
Shallow Aquifer, Background

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
Sample ID:	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6	G6
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
SWL (m AHD):	1.55	1.7	1.55	1.49	1.29	1.13	0.99	0.81	0.8	0.96	1.33	1.23	1.28	1.99	1.88	2.01	2.37	2.65
Sample Description:	Colourless with particles	Clear, no odour	Clear, no odour	Clear, no odour	Clear, slight sulphidic odour	Clear, sulphidic odour	Slightly brown, strong sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour, slightly turbid	Clear, no odour	Clear, sulphidic odour	Slightly turbid, black/grey, strong odour	Clear, colourless, strong sulphidic odour, slight	Clear with flocculants, colourless, slight odour	Clear, colourless, strong sulphidic odour	Colourless, strong sulphidic odour	Clear, colourless, strong sulphidic odour

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
pH (field)	6.5-8º			6.5-8.5	pH units	-	3.66	3.6	3.88	3.81	4.14	3.88	4.14	3.93	4.06	4.59	4.49	4.19	4.22	4.55	4.94	4.2	4.37	4.29
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.4	0.4	0.7	0.6	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.6	0.4	0.6	0.4	0.5
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004
Total Cyanide					mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***27***	***25***	***23***	***25***	***16***	***17***	***9.8***	**9**	**6.9**	**7.3**	***9.3***	**6.9**	**8**	3.5	**6.6**	**7.4**	**10**	**8.7**
Aluminium (dissolved)					mg/L	0.01	-	***26***	***22***	***23***	***16***	***18***	***9.5***	**8.9**	**6.7**	**5.8**	**8.5**	**6.9**	**8**	2.8	**5.9**	**5.6**	**10**	**8.2**

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Table vi: Results
Shallow Aquifer, Background

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-22	Dec-22
					Sample ID:		G6	G6
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background
					Aquifer:		Shallow	Shallow
					SWL (m AHD):		3.12	2.74
					Sample Description:		Clear and colourless with light grey floccules.	Colourless with grey flocucules
Analyte grouping / Analyte					**Units**	**LOR**		
pH (field)	6.5-8º			6.5-8.5	pH units	-	5.3	4.1
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.6	0.7
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**12**	**17**
Aluminium (dissolved)	0.055	5	5	0.2	mg/L	0.01	**11**	**16**

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Table vii: Results
Deep Aquifer, Section 1

RAMBOLL

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR
pH (field)	6.5-8º			6.5-8.5	pH units	-
Soluble Fluoride		1	2	1.5	mg/L	0.1
Free Cyanide	0.007			0.8	mg/L	0.004
Total Cyanide					mg/L	0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01
Aluminium (dissolved)					mg/L	0.01

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15
Sample ID:	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	12.193	12.313	11.793	11.463	11.183	10.463	11.963	11.683	11.573
Sample Description:	Brown	Brown	Brown	Dark brown, slight sulphidic odour	Brown, turbid, strong odour	Copper/brown, strong sulphidic odour	Brown	Brown	-
pH (field)	*10.09*	*9.9*	*10.13*	*10.1*	9.94	*9.99*	*10.11*	*10.27*	*10.34*
Soluble Fluoride	***682***	***790***	***880***	***930***	***1080***	***1279***	***1300***	***1300***	***1300***
Free Cyanide	-	-	-	-	-	0.03	<4	*0.058*	*0.88*
Total Cyanide	-	-	-	-	-	-	-	-	-
Aluminium (total)	2.86	0.6	0.67	1.4	44	0.03	0.19	0.03	3.5
Aluminium (dissolved)	-	-	-	-	-	-	-	-	-

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18
Sample ID:	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	11.753	11.603	11.663	11.483	11.303	11.523	11.303	10.813	10.933
Sample Description:	Brown	Brown	Brown	Brown	Dark brown	Dark brown	Tea brown	Tea brown	Reddish/tea brown
pH (field)	*10.42*	*10.29*	*10.4*	*10.02*	*10.07*	*9.37*	*10.08*	*10.1*	*10.14*
Soluble Fluoride	***1300***	***1400***	***1500***	***1400***	***1700***	***1300***	***1300***	***1200***	***1200***
Free Cyanide	*0.21*	*0.11*	*0.11*	*0.12*	*0.15*	0.012	0.01	0.006	<0.004
Total Cyanide	-	-	-	-	-	-	-	-	300
Aluminium (total)	0.06	0.09	0.92	***31***	1	0.08	1.6	0.28	1.1
Aluminium (dissolved)	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Table vii: Results
Deep Aquifer, Section 1

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22
					Sample ID:		W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D	W2D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		11.583	11.373	11.333	11.133	11.333	11.253	10.963	11.663	8.842	12.323	12.053	11.783	12.233	11.923	12.683	11.9430	12.6930	12.7430
					Sample Description:		Dark brown, odour	Dark brown	Brown, slight 'burnt' odour	Dark brown	Brown, very slight sulphidic odour	Brown/red, no odour	Slightly brown/red	Red/brown, sulphidic odour	Red/brown, sulphidic odour	Turbid, orange/brown , no odour	Clear to turbid, brown, slight odour	Slightly turbid, brown, strong odour	Clear to slightly turbid, dark chocolate brown, no	Clear to slightly turbid, dark brown, no odour	Clear, dark brown, sulphidic odour	Dark brown, slight sulphidic odour	Clear, dark brown, no odour	Clear, dark brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																		
pH (field)	6.5-8º			6.5-8.5	pH units	-	*10.18*	*13.74*	*9.87*	*9.99*	*10.1*	*10.08*	*10.14*	*10.12*	*10.11*	*10.18*	*10.09*	*9.72*	*10.11*	*10.37*	*10.19*	*10.17*	*10.65*	*10.79*
Soluble Fluoride		1	2	1.5	mg/L	0.1	***1200***	***1200***	***1200***	***1500***	***1200***	***1300***	***1400***	***1300***	***1100***	***800***	***1000***	***1000***	***860***	***880***	***1000***	***970***	***1100***	***840***
Free Cyanide	0.007			0.8	mg/L	0.004	0.007	0.029	0.009	0.004	0.004	0.03	0.018	0.009	<0.004	0.008	0.006	0.005	0.008	0.011	0.009	0.066	0.055	0.22
Total Cyanide					mg/L	0.004	330	280	330	300	230	240	270	250	210	190	1.8	120	100	46	82	220	180	210
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.71	0.39	1	0.61	0.72	0.83	1.2	0.97	0.76	0.76	0.71	1.6	2	1.6	0.68	0.87	0.45	1.1
Aluminium (dissolved)					mg/L	0.01	0.77	0.52	0.69	0.51	0.7	0.73	0.7	0.76	0.78	0.69	0.58	0.73	0.6	0.6	0.56	0.73	0.73	0.6

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

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Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table vii: Results
Deep Aquifer, Section 1

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:	W2D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	12.1330	11.672	11.632	11.562	11.432	11.562	11.612	11.572	11.522	11.722	11.652	11.992	11.422	11.462	11.282	11.232	11.192	11.242
Sample Description:	Clear, dark brown, sulphidic odour	Cloudy, brown	-	Light brown/clear	Brown, no odour	Yellow/orange, no odour	Light brown/copper, no odour	-	Brown	-	Brown	Brown	Brown	Milky	Brown	Light brown	Milky brown	Light tea brown

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	*10.99*	7.22	7.29	7.53	7.44	8.32	6.8	7.23	7.23	7.18	7.1	7.27	7.39	7	7.08	7.97	7.16	7
Soluble Fluoride		1	2	1.5	mg/L	0.1	***1100***	1.21	***40***	***44***	***23***	***12***	***18***	***16***	***14***	***16***	***19***	***18***	***15***	***16***	***22***	***19***	***14***	***14***
Free Cyanide	0.007			0.8	mg/L	0.004	0.004	-	-	-	-	-	<0.004	<0.4	<0.02	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.45	1.697	1.5	***110***	2.2	3.3	3.4	2.1	2.1	4.3	3.6	2.7	1.9	4.2	***64***	2.8	5	2.2
Aluminium (dissolved)					mg/L	0.01	0.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table vii: Results
Deep Aquifer, Section 1

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																				
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22
					Sample ID:		E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D	E5D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1	Section 1
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		11.202	11.292	11.232	11.672	11.702	11.482	11.482	11.392	10.262	11.892	12.152	12.032	11.782	11.932	11.662	11.812	12.3620	12.3920
					Sample Description:		Light yellow	Light brown, some odour	Brown	Slightly brown, no odour	Clear to slightly yellow, no odour	Slightly brown, no odour	Clear to slightly brown, no odour	Clear, no odour	Bright yellow, sulphidic odour	Clear, no odour	Clear to slightly turbid, yelow, no odour	Slightly turbid, light brown, no odour	Medium turbid, yellow brown, strong odour	Clear, yellow, no odour	Clear to slightly turbid, dark yellow, slight odour	Clear, pale brown, sulphidic odour	Dark yellow brown, slight hydrocarbon odour	Clear to slightly turbid, yellow, no odour
Analyte grouping / Analyte					**Units**	**LOR**																		
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.97	7.29	*12.79*	6.95	6.96	7.1	7.3	6.95	7.05	7.1	7.04	7.02	6.77	8.32	7.31	6.95	7.24	7.62
Soluble Fluoride		1	2	1.5	mg/L	0.1	***16***	***14***	***12***	***11***	***8.1***	***9.6***	***8.3***	***9.4***	***9.8***	***7.7***	***7.3***	***7.8***	***9.1***	***8.3***	***7.6***	***7.9***	***10***	***9.1***
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.6	1.6	1.2	0.81	1.1	0.92	0.68	1.1	2.3	0.84	0.7	0.63	0.38	0.61	0.17	0.27	0.70	1.2
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	3.4	4.1	2.2	0.72	1.3	1.2	1.2	2.5	1.2	1.3	1.6	1.3	1.6	0.33	0.42	0.27	0.27	0.84
Aluminium (dissolved)					mg/L	0.01	-	<0.01	0.01	0.03	<0.01	0.01	<0.01	<0.01	0.01	<0.01	0.02	0.01	0.03	0.01	0.02	0.02	0.02	< 0.01

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Table vii: Results
Deep Aquifer, Section 1

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational				
					Sample Type:		Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab
					Sample date:		Sep-22	Dec-22
					Sample ID:		E5D	E5D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 1	Section 1
					Aquifer:		Deep	Deep
					SWL (m AHD):		12.2520	12.1120
					Sample Description:		Slightly turbid, pale yellow brown, no odour	Slightly turbid, dark yellow, sulphidic odour
Analyte grouping / Analyte					**Units**	**LOR**		
pH (field)	6.5-8º			6.5-8.5	pH units	-	7.51	8.1
Soluble Fluoride		1	2	1.5	mg/L	0.1	**8.8**	**8.6**
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	0.87	0.94
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.3	1.2
Aluminium (dissolved)					mg/L	0.01	0.02	< 0.01

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table viii: Results
Deep Aquifer, Section 2

RAMBØLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	10.852	9.912	9.332	8.702	9.112	-	8.512	8.022	8.582	9.412	8.752	8.632	8.762	8.562	8.372	7.872	7.882
Sample Description:	Brown	-	Light brown	Light brown, turbid	-	Dry	Light brown, turbid	Light brown, slightly turbid	-	Brown	Brown	Turbid, brown	Light brown	Tea brown	Tea brown	Tea brown	Tea brown

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	6.98	6.62	6.7	6.71	6.63	-	6.82	6.79	8.48	6.73	6.82	7.02	6.78	6.67	7.3	6.95	6.78
Soluble Fluoride		1	2	1.5	mg/L	0.1	***39***	**5.4**	**3.5**	**5.1**	**3.3**	-	**4.4**	**3.5**	**2.6**	**<10**	**3.1**	**3.3**	**3.4**	**3.9**	**4.4**	**4.8**	**4.2**
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	<0.2	<0.02	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.005	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***21.2***	0.9	2.4	2.4	0.26	0.26	4	0.95	0.4	1.5	0.66	0.87	18	89	120	4.1	1.4
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
α Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Table viii: Results
Deep Aquifer, Section 2

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:							W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D	W1D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2	Section 2
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							7.802	8.692	8.512	8.572	8.412	8.482	8.052	7.992	8.392	8.842	11.632	11.182	11.242	11.312	10.722	11.022	11.7120
Sample Description:							Brown	Yellow, hydrogen sulfide odour	Slight brown/yellow	Clear, slightly brown, slight sulphidic odour	Clear to slightly brown, slight sulphidic odour	Clear, slighly cloudy, sulphidic odour	Slightly brown/yellow, sulphidic odour	Slightly yellow, no odour	Bright yellow	Clear to slightly yellow	Clear, dark yellow no odour	Yellow, no odour	Clear, dark yellow, no odour	Clear, yellow/brown, no odour	Clear, dark yellow, no odour	Clear brown, no odour	Dark yellow brown, sulphidic odour
pH (field)	6.5-8ᵅ			6.5-8.5	pH units	-	6.91	7.07	7.12	6.76	6.92	6.83	6.91	7.16	7.12	7.17	7.57	8.14	7.34	7.78	8.13	7.71	7.77
Soluble Fluoride		1	2	1.5	mg/L	0.1	**4.7**	**5.1**	**4.5**	**4.8**	**3.9**	**4.7**	**4.4**	**4.8**	**4.1**	**3.8**	**8.5**	**9.2**	***11***	***11***	***9.7***	***10***	***12***
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	0.34	0.69	0.59	0.67	0.64	0.47	0.046	0.67	0.25	0.5	1	1.1	0.6	0.19	0.23	0.1	0.81
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.46	0.88	0.38	0.43	0.48	0.69	0.71	0.23	0.98	2.1	1.2	0.53	0.4	0.29	0.32	0.8	1
Aluminium (dissolved)					mg/L	0.01	-	0.14	0.14	0.25	0.15	0.21	0.19	0.1	0.15	0.22	0.13	0.09	0.14	0.05	0.05	0.08	0.24

Blank Cell indicates no criterion available

ᵅ Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in ***underline/italics*** exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table viii: Results
Deep Aquifer, Section 2

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational					
					Sample Type:		Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab
					Sample date:		Jun-22	Sep-22	Dec-22
					Sample ID:		W1D	W1D	W1D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 2	Section 2	Section 2
					Aquifer:		Deep	Deep	Deep
					SWL (m AHD):		12.0820	12.1320	11.8120
					Sample Description:		Slightly turbid, brown yellow, slight sulphidic odour	Clear, dark yellow, no odour	Turbid, pale yellow brown, slight sulphidic odour
Analyte grouping/Analyte					**Units**	**LOR**			
pH (field)	6.5-8º			6.5-8.5	pH units	-	8.51	8.57	8.92
Soluble Fluoride		1	2	1.5	mg/L	0.1	***<u>8.8</u>***	***<u>9.7</u>***	***<u>10</u>***
Free Cyanide	0.007			0.8	mg/L	0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	1.4	1	1.2
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.3	0.38	0.72
Aluminium (dissolved)					mg/L	0.01	0.05	0.05	0.09

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *<u>underline/italics</u>* exceed Recreational criteria value

Table ix: Results
Deep Aquifer, Section 3

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
Sample ID:							W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							5.61	-	-	5.53	5.46	5.5	5.59	5.68	-	-	-	-	-	-	-	-	5.16
Sample Description:							Clear	Dry	Dry	Clear, no odour	Grey, slightly turbid, no odour	Clear, no odour	Clear	Sclear, sulphidic odour	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Turbid, suspended particles
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	5.91	-	-	4.38	3.56	3.29	4.89	3.62	-	-	-	-	-	-	-	-	4.72
Soluble Fluoride		1	2	1.5	mg/L	0.1	1.23	-	-	0.19	0.41	0.22	0.3	0.3	-	-	-	-	-	-	-	-	0.3
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	<0.004	<0.004	-	-	-	-	-	-	-	-	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.7	-	-	0.58	0.72	0.76	0.81	0.04	-	-	-	-	-	-	-	-	1.4
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[α] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table ix: Results
Deep Aquifer, Section 3

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
					Sample ID:		W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D	W3D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		5.02	5.01	4.92	4.94	4.86	4.45	4.57	4.52	4.37	4.4	4.72	4.69	-	-	-	-	-
					Sample Description:		Slightly turbid, odourless	Clear, some odour	Light brown, some odour	Clear, no odour	Clear, no odour	Clear, slight sulphidic odour	-	Clear, no odour	Clear	Clear	Clear, no odour	Clear, no odour	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	4.16	3.75	3.94	4.53	4.81	4.21	4.15	3.96	4.14	4.54	4.53	3.93	-	-	-	-	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.3	0.5	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	-	-	-	-	-
Free Cyanide	0.007			0.8	mg/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	-	-	-	-	-
Total Cyanide					mg/L	0.004	<0.004	0.036	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.2	1.5	0.9	1	0.81	1	1	1.1	0.99	2.3	0.97	1.2	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	1.3	0.91	1	0.74	0.87	0.94	0.94	0.89	0.69	0.72	1.1	-	-	-	-	-

Blank Cell indicates no criterion available

[α] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in _**underline/italics**_ exceed Recreational criteria value

Table ix: Results
Deep Aquifer, Section 3

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR														
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16
Sample ID:							W3D	W3D	W3D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D	W4D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3	Section 3
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							-	-	-	5.539	5.459	5.439	5.459	5.369	5.939	-	-	-	-	-
Sample Description:							Well damaged and unable to be sampled	Well damaged and unable to be sampled	Well damaged and unable to be sampled	Clear	Clear	Clear	Clear to pale yellow, no odour	Clear, no odour	Clear, no odour	Clear	Clear	-	Clear	Destroyed
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	-	-	-	6.02	5.7	5.7	5.4	5.36	4.69	-	5.18	*9.9*	6.08	-
Soluble Fluoride		1	2	1.5	mg/L	0.1	-	-	-	1.48	*1.7*	1.3	0.41	*1.6*	1.1	-	0.2	-	-	-
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	-	-	-	-	-
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	-	-	-	0.794	0.48	0.19	0.27	0.5	0.35	-	-	-	-	-
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table x: Results
Deep Aquifer, Section 4

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15
					Sample ID:		W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		5.396	5.321	5.301	5.361	5.321	5.311	5.451	5.521	5.301
					Sample Description:		Clear	Clear	Clear	Clear, no odour	Light brown, slightly turbid, no odour	Clear, no odour	Dry	Clear	-
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.02	6.32	6.1	6.11	6.11	5.34	-	6.32	8.37
Soluble Fluoride		1	2	1.5	mg/L	0.1	***20***	0.51	0.59	0.65	0.53	0.44	-	0.4	0.5
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	-	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.323	0.04	0.02	0.02	0.05	0.16	-	0.99	0.54
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-

Analyte grouping/Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		5.471	5.381	5.311	5.341	5.191	5.171	5.141	4.981
					Sample Description:		Clear	Clear	Slightly turbid	Colourless	Colourless	Clear, colourless	Colourless	Faint yellow with particles
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.4	5.7	6.7	6.37	6.21	6.94	6.93	6.13
Soluble Fluoride		1	2	1.5	mg/L	0.1	***<10***	0.5	0.5	0.5	0.4	0.6	0.5	0.4
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.39	0.23	0.14	0.05	0.01	0.05	0.02	0.2
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in ***underline/italics*** exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table x: Results
Deep Aquifer, Section 4

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D	W5D
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	4.831	5.271	4.721	4.751	4.741	4.471	4.381	4.351	5.181	4.281	4.581	4.511	4.541	4.881	4.901	4.911	5.08100
Sample Description:	Clear with few particles	Clear some particles, no odour	Clear, slightly brown	Clear, no odour	-	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, sulphidic odour	Clear, no odour	Clear, no odour	Clear, colourless, slight odour	Slightly turbid, grey/brown, no odour	Clear to slightly turbid, colourless, no odour	Turbid, grey/brown, no odour	Colourless to very pale yellow brown, no odour

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.5	6.1	*10.2*	6.72	6.18	6.23	6.35	6.16	6.24	6.76	6.46	6.05	5.95	6.21	6.31	6	6.36
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.5	0.4	0.6	0.6	0.3	0.4	0.4	0.1	0.4	0.3	0.5	0.3	0.4	0.7	0.3	0.5	0.8
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	0.004	0.01	<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	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.03	0.16	0.09	0.04	0.44	0.04	0.24	0.28	0.04	0.52	0.24	0.09	0.33	0.33	0.27	0.38	0.28
Aluminium (dissolved)					mg/L	0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	0.01	<0.01	0.02	0.04

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table x: Results
Deep Aquifer, Section 4

RAMBOLL

Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:		Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
Sample ID:		W5D	W5D	W5D	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2
Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):		5.27100	5.69100	5.57100	4.993	4.863	4.793	4.903	4.963	5.923	5.083	5.123	5.153	5.123	5.993	5.053	4.973	4.793
Sample Description:		Clear to slightly turbid, colourless, no odour	Clear to slightly turbid, colourless, no odour	Clear, colourless, no odour	Clear	Clear	Clear	Pale yellow/brown, slightly turbid, no odour	Light grey, slightly turbid, no odour	Light brown, no odour	Brown/black	Clear, sulphidic odour	-	Turbid, black	Trubid, black	Turbid	Faint yellow	Brown

Analyte grouping / Analyte	**95% Protection of Aquatic Ecosystems**	**Irrigation**	**Stock Watering**	**Recreational**	**Units**	**LOR**	Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.34	7.08	7.54	3.26	6.54	4.01	3.94	3.54	3.34	6.61	5.81	8.09	6.75	6.37	5.35	4.67	4.59
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.4	0.4	0.43	**6.2**	1.9	1.4	0.74	0.49	**8.1**	1.4	1.4	**15**	**8.6**	1.3	0.8	0.5
Free Cyanide	0.007			0.8	mg/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
Total Cyanide					mg/L	0.004	< 0.004	0.007	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.42	0.04	0.05	**5.771**	3	4.6	4.5	**6.7**	**28**	3.4	2.4	***9.1***	***24***	3.2	3.7	**5.9**	***23***
Aluminium (dissolved)					mg/L	0.01	< 0.01	< 0.01	< 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Table x: Results
Deep Aquifer, Section 4

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
					Sample ID:		N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2	N2
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		4.783	5.703	4.523	4.323	4.363	4.223	4.243	4.163	3.933	3.813	3.733	3.623	3.753	4.023	3.973	3.983	4.423
					Sample Description:		Brown	Milky	Faint yellow	-	Light brown, no odour	Clear, slightly brown	-	Clear, no odour	Clear to grey, no odour	Clear, no odour. Purged dry	Clear, no odour	Clear to turbid, slightly brown	Clear, sulphidic odour	Clear to slightly turbid, no odour	Clear, no odour	Very turbid, yellow/brown/grey, no odour	Very turbid, pale brown, no odour
Analyte grouping/Analyte					**Units**	**LOR**																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	5.37	3.98	4.31	3.63	4.41	2.8	4.18	4.34	4.51	4.05	3.85	4.09	4.54	3.88	3.55	3.94	4.22
Soluble Fluoride		1	2	1.5	mg/L	0.1	1	**2.1**	**2.4**	**2.1**	1.5	1.3	1.4	1.1	1.1	1	0.4	0.9	0.7	0.8	0.8	0.8	1.1
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	0.054	0.013	0.01	0.005	<0.004	0.005	0.007	<0.004	0.051	0.009	<0.004	<0.004	0.005	<0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	***10***	***23***	5.7	5.2	**6.9**	4.7	5	4.2	**6.2**	**8.4**	**7.7**	**8.5**	**6.7**	4.5	3.1	***12***	***12***
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	3.1	3.8	3.9	4.2	3.2	3.2	3.5	2.6	2.6	3.1	2.8	2.4	2.1

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Table x: Results
Deep Aquifer, Section 4

RAMBOLL

Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:		Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:		N2	N2	N2	N2	N2	N2
Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:		Section 4	Section 4	Section 4	Section 4	Section 4	Section 4
Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):		4.423	4.473	4.67300	4.92300	5.24300	5.19300
Sample Description:		Turbid, pale yellow brown, no odour	Turbid, pale grey, no odour	Pale yellow brown, no odour	Clear to slightly turbid, yellow, no odour	Slightly turbid, pale yellow brown, no odour	Pale yellow

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
pH (field)	6.5-8º			6.5-8.5	pH units	-	3.98	3.68	5.35	6.97	6.68	6.03
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.9	0.9	0.7	3.7	4.3	3
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	< 0.004	0.15	0.14	0.027
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**6.5**	4.4	4.1	1.9	1.5	**2.6**
Aluminium (dissolved)					mg/L	0.01	3.4	3	3	1.1	1.1	1.9

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xi: Results
Deep Aquifer, Section 5

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																			
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17
					Sample ID:		G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		6.632	6.502	6.552	6.552	6.492	6.482	6.622	6.682	6.712	6.712	6.552	6.552	6.502	6.352	6.342	6.342	6.142
					Sample Description:		Clear	Clear	Clear	Pale brown, slightly turbid, no odour	Light brown/orange, slight odour, slightly turbid	Light brown, no odour	Clear, slightly cloudy	Turbid, brown	-	Light brown, turbid	Clear	Slightly turbid	Faint yellow	Faint yellow	Faint yellow	Faint yellow	Faint yellow
					Units	LOR																	
pH (field)	6.5-8º			6.5-8.5	pH units	-	6.04	6.09	6.09	6.1	6.03	5.7	6.01	6.04	7.87	6.11	6.09	6.33	6.22	5.71	6.08	6.16	6.19
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.28	0.28	0.25	0.28	0.28	0.28	0.3	0.3	0.3	***<10***	0.3	0.3	0.3	0.4	0.2	0.3	0.4
Free Cyanide	0.007			0.8	mg/L	0.004	-	-	-	-	-	<0.004	<0.004	<0.02	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.115	0.1	0.04	1.2	2.1	2.9	2	4.1	1.8	***9.6***	1.2	1.6	1.2	1.2	**6.6**	1.8	1.7
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xi: Results
Deep Aquifer, Section 5

RAMBOLL

Sample Type:	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
Sample ID:	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2	G2
Project Name:	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):	6.042	6.032	5.992	5.962	6.022	6.612	5.702	5.622	5.452	5.642	5.852	6.802	5.822	6.132	6.132	6.052	6.27200
Sample Description:	Faint yellow	Clear, no odour	Light brown, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Clear, no odour	Slightly turbid, pale yellow, no odour	Slightly turbid, light brown, no odour	Slightly turbid, pale grey	Clear to slightly turbid, colourless to pale grey, no	Slightly turbid, colourless, no odour	Turbid, grey, strong sulphidic odour	Dark grey, sulphidic odour

Analyte grouping / Analyte	**95% Protection of Aquatic Ecosystems**	**Irrigation**	**Stock Watering**	**Recreational**	**Units**	**LOR**	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.05	6.05	6.42	6.53	6.16	6.35	6.46	6.13	6.26	6.37	6.12	6.26	6	6.12	6.36	6.24	6.52
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.3	0.3	0.4	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.4	0.3	0.3	0.5	0.3
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	0.005	0.006	<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	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.5	2.4	0.57	1.5	1	0.68	1.1	1.3	0.41	1	1.9	1.7	0.62	0.73	0.62	0.1	0.31
Aluminium (dissolved)					mg/L	0.01	-	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	<0.01	<0.01	0.03	< 0.01

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in ***underline/italics*** exceed Recreational criteria value

Table xi: Results
Deep Aquifer, Section 5

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational																		
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jun-22	Sep-22	Dec-22	Jul-13	Nov-13	Feb-14	Jul-14	Nov-14	Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17
Sample ID:							G2	G2	G2	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							6.53200	6.69200	6.76200	5.129	5.109	5.189	5.199	5.119	5.089	5.299	5.399	5.389	5.369	5.159	5.169	5.129	4.959
Sample Description:							Clear and colourless with some black floccules, no	Clear, colourless, slight sulphidic odour	Clear, colourless, no odour	Clear	Clear	Clear	Pale brown, slightly turbid, no odour	Clear, no odour	Clear, no odour	Clear	Clear	-	Clear	Clear	Colourless, clear	Faint yellow	Clear
Analyte grouping / Analyte					**Units**	**LOR**																
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.59	6.53	6.78	6.49	6.11	5.75	5.83	5.54	8.22	5.84	5.81	5.5	5.79	5.58	6.18	5.96	5.88
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.4	0.3	0.3	1.19	0.25	0.21	0.4	0.19	0.3	0.1	0.1	-	*<10*	0.2	0.1	0.1	1.4
Free Cyanide	0.007			0.8	mg/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
Total Cyanide					mg/L	0.004	0.018	< 0.004	< 0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.31	0.12	0.16	1.087	0.06	0.04	1.2	0.5	0.12	0.19	0.74	-	0.08	0.08	0.17	-	1.1
Aluminium (dissolved)					mg/L	0.01	< 0.01	0.01	< 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xi: Results
Deep Aquifer, Section 5

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21
Sample ID:							W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D	W6D
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.949	4.949	4.749	4.589	4.609	4.509	4.559	4.569	4.289	4.269	4.169	3.959	4.089	4.379	4.339	4.319	4.679
Sample Description:							Clear, colourless	Light yellow	Clear, colourless	Colourless with particles	Turbid, light brown, no odour	Clear, slightly brown	Clear, no odour	Slightly yellow	Clear, slight odour	Turbid, slightly brown, no odour	Clear, slight sulphidic odour	Clear, no odour	Clear, no odour	-	Turbid, yellow/brown, no odour	Very turbid, pale brown/grey, no odour	Very turbid, pale brown, no odour
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.19	5.9	5.9	5.65	5.7	*10.47*	6.65	5.81	5.71	5.87	5.56	5.75	6.12	5.75	5.69	5.49	6.16
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.3	0.1	0.2	0.3	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	0.01	0.005	0.006	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.028
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.09	***25***	2.7	0.47	***19***	0.96	2.4	3.6	0.98	3.6	1.9	1.6	4.4	3.6	3.2	**7.1**	**8.4**
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	<0.01	<0.01	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.04	0.02	0.98	0.05

Blank Cell indicates no criterion available

[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

For Limit of Reporting (LOR) refer to laboratory certificates of analysis

Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value

Concentration in red font exceed Irrigation criteria value

Concentration in **bold** font exceed Stock Watering criteria value

Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xi: Results
Deep Aquifer, Section 5

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational							
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
					Sample ID:		W6D	W6D	W6D	W6D	W6D	W6D
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Section 5	Section 5	Section 5	Section 5	Section 5	Section 5
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		4.699	4.659	5.01900	5.22900	5.38900	5.36900
					Sample Description:		Turbid, pale yellow brown, slight odour	Turbid, pale brown, no odour	Pale yellow-grey brown, no odour	Very turbid, pale yellow grey, no odour	Very turbid, pale grey brown, no odour	Very turbid, pale yellow brown grey, no odour
Analyte grouping/Analyte					**Units**	**LOR**						
pH (field)	6.5-8º			6.5-8.5	pH units	-	5.65	5.78	5.55	5.92	5.9	6.24
Soluble Fluoride		1	2	1.5	mg/L	0.1	<0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	**5.4**	4.1	1.5	2.4	3.1	**1.4**
Aluminium (dissolved)					mg/L	0.01	0.05	0.04	< 0.01	0.05	0.02	0.03

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xii: Results
Deep Aquifer, Background

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17	Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20
Sample ID:							G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
Aquifer:							Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							4.95	4.69	4.93	4.73	4.69	4.6	4.29	4.29	3.99	4.41	4.19	4.32	3.82	3.72	3.76	3.42	3.74
Sample Description:							Clear	-	Colourless, clear	Colourless	Colourless with suspended solids	Turbid	Light brown with particles		Colourless with few particles	Clear, some particles, no odour	Clear	Clear, very slight sulphidic odour	Clear, slight sulphidic odour	Clear, sulphidic odour	Clear, black particulates, very slight sulphidic odour	Clear, no odour	Clear, very strong sulphidic odour
pH (field)	6.5-8[o]			6.5-8.5	pH units	-	6.36	6.77	6.72	5.88	5.73	5.96	6.15	5.77	5.8	6.23	7.63	5.64	5.99	6	6.13	5.7	6.38
Soluble Fluoride		1	2	1.5	mg/L	0.1	***<10***	0.4	<0.1	0.3	0.6	0.3	0.3	0.3	0.2	0.4	1.3	0.2	<0.1	0.2	0.2	0.1	0.2
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	0.006	<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	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	-	-	-	-	-	-	<0.004	<0.004	0.01	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	1.8	***24***	0.14	0.17	**6.2**	3.6	4.9	0.26	0.19	0.9	0.04	0.21	0.29	0.12	0.29	0.41	0.11
Aluminium (dissolved)					mg/L	0.01	-	-	-	-	-	-	-	-	-	<0.01	<0.01	0.03	0.03	<0.01	0.01	0.02	<0.01

Blank Cell indicates no criterion available
[o] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xii: Results
Deep Aquifer, Background

RAMBOLL

	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21	Dec-21	Mar-22	Jun-22	Sep-22	Dec-22	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17
					Sample ID:		G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	G5	F6	F6	F6	F6	F6	F6
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		3.87	4.21	4.03	5.46	4.71	4.44	4.91	5.15000	5.02000	5.38000	5.06000	2.84	2.68	2.75	2.62	2.46	2.53
					Sample Description:		Clear, sulphidic odour, black particulate	Clear, no odour	Clear, no odour	Clear, colourless, no odour	Clear, colourless, slight sulphidic odour, slight	Clear with flocculants, colourless, slight odour	Clear, colourless, sulphidic odour, black flocculants	Colourless with black floccules, sulphidic odour	Clear, colourless, no odour	Slightly turbid, colourless to very pale grey brown,	Colourless with grey floccules	-	Clear	-	Colourless	Colourless with particles	Colourless
Analyte grouping / Analyte					**Units**	**LOR**																	
pH (field)	6.5-8[α]			6.5-8.5	pH units	-	5.86	5.85	5.61	5.26	5.5	5.59	5.39	5.49	5.92	6.19	6.1	6.99	6.67	7.05	6.54	6.29	7.08
Soluble Fluoride		1	2	1.5	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.3	0.1	0.3	0.2	0.2	**<10**	0.6	0.5	0.5	0.5	0.5
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/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	-	-	-	-	-	-
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.08	0.07	0.06	0.09	0.15	0.18	0.06	0.26	0.25	0.82	0.45	0.57	0.7	0.15	0.12	0.33	0.08
Aluminium (dissolved)					mg/L	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.48	0.08	-	-	-	-	-	-

Blank Cell indicates no criterion available
[α] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
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Concentrations below the LOR noted as <value
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Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xii: Results
Deep Aquifer, Background

RAMBOLL

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR																	
					Sample Type:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
					Laboratory:		Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
					Sample date:		Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20	Sep-20	Dec-20	Mar-21	Jun-21	Sep-21
					Sample ID:		F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6	F6
					Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
					Site:		Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
					Section:		Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
					Aquifer:		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
					SWL (m AHD):		2.28	1.9	1.78	1.93	1.82	1.77	1.52	1.38	1.25	1.07	1.03	1.16	1.52	1.32	1.51	2.25	2.12
					Sample Description:		Colourless with particles	Light grey with particles	Clear, colourless	Clear, no odour	Clear, no odour	Clear	Clear, slight sulphidic odour	Clear, sulphidic odour	Clear, black particulate, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, sulphidic odour	Clear, no odour	Clear, no odour	Clear, colourless, strong odour	Clear to slightly turbid, colourless, slight odour,	Clear to slightly turbid, colourless, no odour
pH (field)	6.5-8[a]			6.5-8.5	pH units	-	6.75	6.68	6.88	6.67	7.85	6.66	6.73	6.57	6.62	5.61	6.75	6.72	6.83	7.05	6.49	6.51	6.84
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.5	0.6	0.9	0.5	1	0.6	0.4	0.5	0.5	0.4	0.6	0.5	0.4	0.6	0.5	0.6	0.4
Free Cyanide	0.007			0.8	mg/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	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide					mg/L	0.004	-	-	0.024	<0.004	0.032	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.008	<0.004	<0.004	<0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	0.11	**7.6**	0.16	0.06	0.03	0.05	0.06	0.05	0.12	0.07	0.03	0.04	0.27	0.03	0.05	0.08	0.03
Aluminium (dissolved)					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	<0.01	<0.01	<0.01

Blank Cell indicates no criterion available
[a] Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
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Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xii: Results
Deep Aquifer, Background

Analyte grouping / Analyte	95% Protection of Aquatic Ecosystems	Irrigation	Stock Watering	Recreational	Units	LOR					
Sample Type:							Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Laboratory:							Envirolab	Envirolab	Envirolab	Envirolab	Envirolab
Sample date:							Dec-21	Mar-22	Jun-22	Sep-22	Dec-22
Sample ID:							F6	F6	F6	F6	F6
Project Name:							Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Site:							Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri	Hydro Kurri Kurri
Section:							Background	Background	Background	Background	Background
Aquifer:							Deep	Deep	Deep	Deep	Deep
SWL (m AHD):							2.06	1.85000	2.89000	3.32000	2.93000
Sample Description:							Clear, colourless, sulphidic odour	Colourless, strong sulphidic odour	Clear, colourless, slight sulphidic odour	Clear and colourless with brown floccules, no odour	Clear, colourless, no odour
pH (field)	6.5-8º			6.5-8.5	pH units	-	7.08	7.67	7.19	7.01	7.22
Soluble Fluoride		1	2	1.5	mg/L	0.1	0.6	0.5	0.4	0.4	0.5
Free Cyanide	0.007			0.8	mg/L	0.004	<0.004	< 0.004	< 0.004	< 0.004	< 0.004
Total Cyanide					mg/L	0.004	<0.004	< 0.004	< 0.004	< 0.004	0.004
Aluminium (total)	0.055	5	5	0.2	mg/L	0.01	<0.01	0.48	0.03	0.01	0.07
Aluminium (dissolved)					mg/L	0.01	<0.01	< 0.01	< 0.01	< 0.01	< 0.01

Blank Cell indicates no criterion available
º Values for lowland rivers from Table 3.3.2 in ANZECC (2000)
LOR = Limit of Reporting
Concentrations below the LOR noted as <value
For Limit of Reporting (LOR) refer to laboratory certificates of analysis
Concentration in grey box exceed 95% Protection of Aquatic Ecosystems criteria value
Concentration in red font exceed Irrigation criteria value
Concentration in **bold** font exceed Stock Watering criteria value
Concentration in *underline/italics* exceed Recreational criteria value

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

Duplicate Type:			Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplcate	RPD%	Primary	Intra-laboratory	RPD%	Primary	Intra-laboratory	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
Sample date:			Feb-15	Feb-15		Feb-15	Feb-15		Feb-15	Feb-15		Jun-15	Jun-15		Jun-15	Jun-15		Jun-15	Jun-15		Sep-15	Sep-15		Sep-15
Sample ID:			G2	QA1		G2	QA2		E11	QA3		PUMP	QA1 (QA100)		W7M	QA2 (QA101)		W7M	QA3 (QC200)		PUMP	QA100		W7M
Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping / Analy	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.28	0.28	*0.0*	0.28	0.4	*35.3*	230	240	*4.3*	200	210	*4.9*	810	850	*4.8*	810	895	*10.0*	680	670	*1.5*	660
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.005	0.005	*0.0*	<0.08	<0.08	*NC*	<2	<4	*NC*	<2	<0.040	*NC*	0.029	0.027	*7.1*	<0.04
Total Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	7.7	13	*51.2*	8.7	9.3	*6.7*	170	180	*5.7*	170	107	*45.5*	110	100	*9.5*	100
Aluminium (total)	mg/L	0.01	2.9	2.8	*3.5*	2.9	1.62	*56.6*	5	5.2	*3.9*	120	120	*0.0*	32	3.4	*161.6*	32	3.42	*161.4*	610	6,200	*164.2*	8700
Aluminium (dissolved)	mg/L	0.01	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR)
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the LOR.

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
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Table xiii: Results
QA / QC

Duplicate Type:			Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-lboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
Sample Type:			Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
Sample date:			Sep-15		Sep-15	Sep-15		Dec-15	Dec-15		Dec-15	Dec-15		Apr-16	Apr-16		Apr-16	Apr-16		Apr-16	Apr-16		Jul-16	Jul-16
Sample ID:			QA101		W7M	QA200		W2D	QA101		W2D	QA201		G2	QA101		G2	QA201		E11	QA102		G2	QC101
Project Name:			Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Sampling Method:			Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	13	*192.3*	660	648	*1.8*	1300	1200	*8.0*	1300	1300	*0.0*	0.2	0.2	*0.0*	0.2	0.3	*40.0*	120	120	*0.0*	0.3	0.3
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.04	<0.04	*NC*	0.88	0.67	*27.1*	0.88	0.7	*22.8*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	1.9	*192.5*	100	56.9	*54.9*	290	300	*3.4*	290	290	*0.0*	0.046	0.038	*19.0*	0.046	<0.004	*NC*	15	15	*0.0*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	2100	*122.2*	8700	2270	*117.2*	3.5	3	*15.4*	3.5	2.8	*22.2*	9.6	8.9	*7.6*	9.6	10	*4.1*	7.6	9.4	*21.2*	1.2	1.2
Aluminium (dissolved)	mg/L	0.01	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-

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Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
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Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
Sample Type:				Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
Sample date:				Jul-16	Jul-16		Jul-16	Jul-16		Oct-16	Oct-16		Oct-16	Oct-16		Oct-16	Oct-16		Dec-16	Dec-16		Dec-16	Dec-16	
Sample ID:				G2	QC102		W7M	QC100		W5D	QA100		W5D	QA200		A7	QA101		N2	2DUP		F5	5DUP	
Project Name:				Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
Sampling Method:				Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	*0.0*	0.3	0.2	*40.0*	870	900	*3.4*	0.5	0.4	*22.2*	0.5	0.5	*0.0*	390	390	*0.0*	0.8	0.7	13.3	<0.1	<0.1	*NC*
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	0.072	0.084	*15.4*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.03	0.03	*0.0*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	250	260	*3.9*	0.005	0.005	*0.0*	0.005	<0.003	*NC*	76	94	*21.2*	0.12	0.098	20.2	<0.004	<0.004	*NC*
Aluminium (total)	mg/L	0.01	*0.0*	1.2	0.79	*41.2*	0.08	0.08	*0.0*	0.14	0.1	*7.4*	0.14	0.14	*0.0*	2.1	2.2	*4.7*	5.9	5.6	5.2	2.3	2.2	4.4
Aluminium (dissolved)	mg/L	0.01	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*

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Project No: 318001362
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Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
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Table xiii: Results
QA / QC

RAMBOLL

	Duplicate Type:		Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
	Sample Type:		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
	Sample date:		Mar-17	Mar-17		Mar-17	Mar-17		Mar-17	Mar-17		Jun-17	Jun-17		Jun-17	Jun-17		Jun-17	Jun-17		Sep-17	Sep-17		Sep-17
	Sample ID:		E5D	DUP1		E5D	TRIP1		W6D	DUP2		N8	DUP1		G2	TRIP1		G2	DUP2		G2	DUP1		G2
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	22	19	14.6	22	21.9	0.5	1.4	0.5	94.7	0.4	0.4	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	0.3	0.0	0.3
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Total Cyanide	mg/L	0.004	5.5	2.3	82.1	5.5	3.04	57.6	0.043	0.043	0.0	<0.004	0.2	*NC*	<0.004	<0.004	*NC*	<0.004	0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Aluminium (total)	mg/L	0.01	64	26	84.4	64	13.1	132.0	1.1	0.8	31.6	3.9	4.9	22.7	6.6	1.04	145.5	6.6	9.4	35.0	1.8	4.9	92.5	1.8
Aluminium (dissolved)	mg/L	0.01	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-

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Project No: 318001362
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Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
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Table xiii: Results
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RAMBOLL

Duplicate Type:			Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
Sample Type:			Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
Sample date:			Sep-17		Sep-17	Sep-17		Dec-17	Dec-17		Dec-17	Dec-17		Dec-17	Dec-17		Mar-18	Mar-18		Mar-18	Mar-18		Mar-18	Mar-18
Sample ID:			TRIP1		N8	DUP2		W2D	DUP1		W2D	TRIP1		G2	DUP2		F6	DUP1		G5	TRIP1		G5	DUP2
Project Name:			Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Sampling Method:			Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.4	28.6	0.4	0.4	0.0	1200	1200	0.0	1200	1430	17.5	0.4	0.4	0.0	0.9	1	10.5	0.2	0.2	0.0	0.2	0.2
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.006	0.012	66.7	0.006	<1	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	*NC*	0.41	0.027	175.3	200	230	14.0	200	268	29.1	<0.004	<0.004	*NC*	0.024	0.023	4.3	<0.004	<0.004	*NC*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	0.82	74.8	25	26.0	3.9	0.28	0.25	11.3	0.28	<100	*NC*	1.7	1.4	19.4	0.16	0.13	20.7	0.19	0.17	11.1	0.19	0.15
Aluminium (dissolved)	mg/L	0.01	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-	*NC*	-	-

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<value = Less than the laboratory Limit of Reporting (LOR)

Shaded cells exceed RPD >30%

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Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
Sample Type:				Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
Sample date:				Jun-18	Jun-18		Jun-18	Jun-18		Jun-18	Jun-18		Sep-18	Sep-18		Sep-18	Sep-18		Sep-18	Sep-18		Dec-18	Dec-18	
Sample ID:				E5D	QA101		W1D	QA102		W1D	QA103		W3D	QA101		G2	QA102		G2	QA103		E5D	QA101	
Project Name:				Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
Sampling Method:				Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping / Analy	**Units**	**LOR**																					
Soluble Fluoride	mg/L	0.1	0.0	14	14	0.0	5.1	5.9	14.5	5.1	5.1	0.0	0.1	0.1	0.0	0.4	0.4	0.0	0.4	0.4	0.0	11	11	0.0
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.005	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	1.6	1.7	6.1	0.69	0.532	25.9	0.7	0.7	4.3	<0.004	<0.004	*NC*	0.006	0.006	0.0	0.006	0.01	50.0	0.81	0.82	1.2
Aluminium (total)	mg/L	0.01	23.5	4.1	3.8	7.6	0.88	0.58	41.1	0.88	0.93	5.5	0.9	1.0	5.4	0.57	0.49	15.1	0.57	0.37	42.6	0.72	0.6	18.2
Aluminium (dissolved)	mg/L	0.01	*NC*	<0.01	<0.01	*NC*	0.14	0.1	33.3	0.1	0.1	0.0	0.9	1.0	9.4	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.03	0.02	40.0

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Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
Sample date:			Dec-18	Dec-18		Dec-18	Dec-18		Mar-19	Mar-19		Mar-19	Mar-19		Mar-19	Mar-19		Jun-19	Jun-19		Jun-19	Jun-19		Jun-19
Sample ID:			W1D	QA103		W1D	QA102		W5D	QA101		G5	QA103		W5D	QA102		G2	QA101		F6	QA102		F6
Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	4.8	5.7	17.1	4.8	4.8	0.0	0.3	0.3	0.0	<0.1	0.1	*NC*	0.3	0.5	50.0	0.3	0.3	0.0	0.5	0.5	0.0	0.5
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Total Cyanide	mg/L	0.004	0.67	0.171	118.7	0.67	0.45	39.3	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004
Aluminium (total)	mg/L	0.01	0.43	0.76	55.5	0.43	0.51	17.0	0.44	0.38	14.6	0.3	0.3	12.9	0.44	0.36	20.0	0.7	0.7	0.0	0.05	0.04	22.2	0.05
Aluminium (dissolved)	mg/L	0.01	0.25	<0.01	*NC*	0.25	0.21	17.4	<0.01	<0.01	*NC*	30.0	30.0	0.0	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01

LOR = Limit of Reporting
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Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

	Duplicate Type:		Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
	Sample Type:		Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:		Jun-19		Sep-19	Sep-19		Sep-19	Sep-19		Sep-19	Sep-19		Dec-19	Dec-19		Dec-19	Dec-19		Dec-19	Dec-19		Mar-20	Mar-20
	Sample ID:		QA103		F6	QA101		G5	QA102		G5	QA103		G2	QA101		G5	QA102		G5	QA103		F6	D01
	Project Name:		Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Groundwater M	Groundwater M		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:		Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyte	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.5	0.0	0.5	0.5	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	<0.1	*NC*	0.1	<0.1	*NC*	0.1	0.1	0.0	0.6	0.6
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	0.08	46.2	0.12	0.18	40.0	0.29	0.32	9.8	0.29	0.48	49.4	1.3	1.2	8.0	0.41	0.37	10.3	0.41	0.29	34.3	0.03	0.02
Aluminium (dissolved)	mg/L	0.01	<0.01	*NC*	<0.01	<0.01	*NC*	*0.01*	<0.01	*NC*	0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.02	0.02	0.0	0.02	0.02	0	<0.01	<0.01

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Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
Sample Type:				Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
Sample date:				Mar-20	Mar-20		Mar-20	Mar-20		Jun-20	Jun-20		Jun-20	Jun-20		Jun-20	Jun-20		Sep-20	Sep-20		Sep-20	Sep-20	
Sample ID:				G5	D02		G5	T01		G2	D01_170620		F6	D02_180620		F6	T01_180620		G2	DUP1		G5	DUP2	
Project Name:				Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
Sampling Method:				Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping / Analyt	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.0	0.2	0.3	40.0	0.2	0.3	40.0	0.3	0.3	0.0	0.5	0.5	0.0	0.5	0.6	18.2	0.2	0.3	40.0	<0.1	0.1	*NC*
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.04	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	*NC*	<0.004	<0.04	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.008	*NC*
Aluminium (total)	mg/L	0.01	40.0	0.11	0.08	31.6	0.11	0.12	8.7	1	1	0.0	0.04	0.05	22.2	0.04	0.06	40.0	1.9	1.7	11.1	0.07	0.08	13.3
Aluminium (dissolved)	mg/L	0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	<0.01	<0.01	*NC*	0.03	0.03	0.0

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Project No: 318001362
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Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%
Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater	
Sample date:			Sep-20	Sep-20		Dec-20	Dec-20		Dec-20	Dec-20		Dec-20	Dec-20	
Sample ID:			G5	TRIP1		W6D	D01_202012 08		W6D	T01_20201208		F6	D02_091220	
Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	
Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow	
Analyte grouping / Analyt	**Units**	**LOR**												
Soluble Fluoride	mg/L	0.1	<0.1	<0.1	*NC*	<0.1	<0.1	*NC*	<0.1	0.1	*NC*	0.6	0.7	*15.4*
Free Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*
Total Cyanide	mg/L	0.004	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.008	0.007	*13.3*
Aluminium (total)	mg/L	0.01	0.07	0.07	0.0	3.2	2.6	20.7	3.2	1.46	74.7	0.03	0.03	0.0
Aluminium (dissolved)	mg/L	0.01	0.03	0.02	40.0	0.02	0.02	0.0	0.02	0.01	66.7	<0.01	<0.01	*NC*

Duplicate Type:			Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary
Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater
Sample date:			Mar-21	Mar-21		Mar-21	Mar-21		Mar-21	Mar-21		Jun-21
Sample ID:			W2D	D01_20210317		F5	D02_202103 25		W2D	T01_20210317		G2
Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring
Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow
Analyte grouping / Analyt	**Units**	**LOR**										
Soluble Fluoride	mg/L	0.1	1000	920	8.3	0.2	0.2	0.0	1000	930	7.3	0.3
Free Cyanide	mg/L	0.004	0.005	0.005	0.0	<0.004	<0.004	*NC*	0.005	0.006	18.2	<0.004
Total Cyanide	mg/L	0.004	120	120	0.0	<0.004	<0.004	*NC*	120	100	18.2	<0.004
Aluminium (total)	mg/L	0.01	1.6	1.4	13.3	2.6	2.6	0.0	1.6	1.1	**37.0**	0.73
Aluminium (dissolved)	mg/L	0.01	0.73	0.69	5.6	2.2	2.2	0.0	0.73	0.72	1.4	<0.01

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Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate
Sample Type:			Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
Sample date:			Jun-21		Jun-21	Jun-21		Jun-21	Jun-21		Sep-21	Sep-21		Sep-21	Sep-21		Sep-21	Sep-21		Dec-21	Dec-21		Dec-21	Dec-21
Sample ID:			D01_20210615		F6	D02_20210616		G2	T01_20210615		E5D	D01_20210920		W5D	D02_20210921		E5D	T01_20210920		W5D	D01_20211202		G5	D02_20211202
Project Name:			Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Sampling Method:			Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyte	**Units**	**LOR**																						
Soluble Fluoride	mg/L	0.1	0.3	0.0	0.3	0.6	**66.7**	0.3	0.3	0.0	7.6	7.7	1.3	0.3	0.3	0.0	7.6	<0.0001	*NC*	0.5	0.5	0.0	0.3	0.3
Free Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.00004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	*NC*	<0.004	<0.004	*NC*	<0.004	<0.004	*NC*	0.17	0.2	16.2	<0.004	<0.004	*NC*	0.17	0.00126	**197.1**	<0.004	<0.004	*NC*	<0.004	<0.004
Aluminium (total)	mg/L	0.01	1.9	**89.0**	2.7	0.008	**198.8**	0.73	1.3	**56.2**	0.42	0.37	12.7	0.27	0.4	**38.8**	0.42	0.26	**47.1**	0.38	0.28	**30.3**	0.06	0.04
Aluminium (dissolved)	mg/L	0.01	<0.01	*NC*	2	<0.01	*NC*	<0.01	<0.01	*NC*	0.02	0.01	**66.7**	<0.01	0.01	*NC*	0.02	0.01	**66.7**	0.02	0.02	0.0	0.03	0.03

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Table xiii: Results
QA / QC

RAMBOLL

Duplicate Type:			RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Intra-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate
Sample Type:				Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
Sample date:				Dec-21	Dec-21		Mar-22	Mar-22		Mar-22	Mar-22		Mar-22	Mar-22		Jun-22	Jun-22		Jun-22	Jun-22		Jun-22	Jun-22
Sample ID:				W5D	T01_20211201		G2	D01_20220317		G5	D02_20220318		G2	T01_20220317		G5	D02_20220616		PUMP	D01_20220615		PUMP	T01_20220615
Project Name:				Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Sampling Method:				Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyt	**Units**	**LOR**																					
Soluble Fluoride	mg/L	0.1	0.0	0.5	0.3	**50.0**	0.3	0.3	0.0	0.1	0.1	0.0	0.3	0.3	0.0	0.3	0.4	28.6	130	140	7.4	130	126
Free Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.002	*NC*	4.8	4.7	2.1	4.8	4.04
Total Cyanide	mg/L	0.004	*NC*	<0.004	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.200
Aluminium (total)	mg/L	0.01	**40.0**	0.38	0.1	**116.7**	310	260	17.5	260	280	7.4	310	560	**57.5**	40	40	0.0	600	620	3.3	600	440
Aluminium (dissolved)	mg/L	0.01	0.0	0.02	<0.01	*NC*	<5	<5	*NC*	30	30	0.0	<5	<10	*NC*	250	310	21.4	2800	3000	6.9	2800	2630

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2/02/2023

Table xiii: Results
QA / QC

	Duplicate Type:		RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate	RPD%	Primary	Inter-laboratory Duplicate
	Sample Type:			Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater		Groundwater	Groundwater
	Sample date:			Sep-22	Sep-22		Sep-22	Sep-22		Sep-22	Sep-22		Sep-22	Sep-22		Dec-22	Dec-22		Dec-22	Dec-22		Dec-22	Dec-22
	Sample ID:			W2S	D01_20220920		G5	D01_20220921		W2S	T01_20220920		G5	T01_20220921		E4	D02_20221221		W2D	D01_20221220		W2D	T01_20221220
	Project Name:			Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
	Sampling Method:			Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow		Low-flow	Low-flow
Analyte grouping / Analyte	**Units**	**LOR**																				
Soluble Fluoride	mg/L	0.1	3.1	29	31	6.7	0.2	0.2	0.0	29	33.6	14.7	0.2	0.6	**100.0**	780	810	3.8	1100	1200	8.7	1100	1050
Free Cyanide	mg/L	0.004	17.2	0.23	0.18	24.4	<0.002	<0.002	*NC*	0.23	0.173	28.3	<0.002	<0.004	*NC*	210	210	0.0	230	220	4.4	230	214
Total Cyanide	mg/L	0.004	*NC*	<0.002	<0.002	*NC*	<0.002	<0.002	*NC*	<0.002	<0.004	*NC*	<0.002	<0.004	*NC*	0.004	0.005	22.2	0.004	0.005	22.2	0.004	0.621
Aluminium (total)	mg/L	0.01	**30.8**	7000	7200	2.8	480	590	20.6	7000	6620	5.6	480	290	**49.4**	380	370	2.7	550	510	7.5	550	220
Aluminium (dissolved)	mg/L	0.01	6.3	7600	8300	8.8	820	840	2.4	7600	7350	3.3	820	670	20.1	390	370	5.3	450	450	0.0	450	1740

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<value = Less than the laboratory Limit of Reporting (LOR)
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the LC

Table xiii: Results
QA / QC

	Duplicate Type:			RPD%
	Sample Type:			
	Sample date:			
	Sample ID:			
	Project Name:			
	Sampling Method:			
Analyte grouping / Analyt	**Units**	**LOR**		
Soluble Fluoride	mg/L	0.1		4.7
Free Cyanide	mg/L	0.004		7.2
Total Cyanide	mg/L	0.004		**197.4**
Aluminium (total)	mg/L	0.01		**85.7**
Aluminium (dissolved)	mg/L	0.01		**117.8**

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR)
Shaded cells exceed RPD >30%
NC = not calculated as one or more results are below the LC

Project No: 318001362
Client Name: Hydro Aluminium Kurri Kurri Pty Ltd
Project Name: 2022 Annual Groundwater Monitoring Report
Project Site: Kurri Kurri Smelter
2/02/2023

Table xiv: Results
Rinsate

RAMBOLL

	Sample Type:		Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank
	Sample date:		Feb-15	Jun-15	Sep-15	Dec-15	Apr-16	Jul-16	Oct-16	Dec-16	Mar-17	Jun-17
	Sample ID:		QB1	QA4 (QA300)	QA300	QA301	QA301	QA300	QA300	BLANK	BLANK	BLANK
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Analyte grouping / Analy	**Units**	**LOR**										
Soluble Fluoride	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Free Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Aluminium (total)	mg/L	0.01	*0.05*	<0.01	<0.01	*0.02*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-

	Sample Type:		Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank	Rinsate Blank
	Sample date:		Sep-17	Dec-17	Mar-18	Jun-18	Sep-18	Dec-18	Mar-19	Jun-19	Sep-19	Dec-19	Mar-20	Jun-20
	Sample ID:		BLANK	BLANK	BLANK	QC101	QC101	QC101	QC101	R01	QC101	QC101	R01	R01_180320
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Analyte grouping / Analy	**Units**	**LOR**												
Soluble Fluoride	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Free Cyanide	mg/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
Total Cyanide	mg/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
Aluminium (total)	mg/L	0.01	<0.01	0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminium (dissolved)	mg/L	0.01	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

LOR = Limit of Reporting

<value = Less than the laboratory Limit of Reporting (LOR)

Shaded cells indicate when above the acceptance criteria for Trip Spikes/Blanks and Rinsates

Table xiv: Results
Rinsate

RAMBOLL

	Sample Type:		Rinsate Blank	Rinsate Blank
	Sample date:		Sep-20	Dec-20
	Sample ID:		R01_20200923	R01_091220
	Project Name:		Quarterly Groundwater Monitoring	Quarterly Groundwater Monitoring
Analyte grouping / Analy	**Units**	**LOR**		
Soluble Fluoride	mg/L	0.1	<0.1	<0.1
Free Cyanide	mg/L	0.004	<0.004	<0.004
Total Cyanide	mg/L	0.004	<0.004	<0.004
Aluminium (total)	mg/L	0.01	<0.01	<0.01
Aluminium (dissolved)	mg/L	0.01	<0.01	<0.01

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR)
Shaded cells indicate when above the acceptance criteria for Trip Spikes/Blanks and Rinsates

APPENDIX 4
FIELD PARAMETER FORMS

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

A7

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	1.59
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.32
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	2.74
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:23	Dark yellow brown	Strong sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
11:26		24.59	9.51	16900	-337	0.0	17.5	1.64	TDS - 10.4 g/L
11:29		24.69	9.49	16800	-355	0.0	17.1	1.71	TDS - 10.5 g/L
11:32		24.76	9.50	16400	-372	0.0	16.3	1.77	TDS - 10.1 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:36	Dark yellow brown	Strong sulphidic odour	NO	Final depth to water 1.84 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	11:34	Analysis:	
Sample ID:	A7	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

E11

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	2.29
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.80
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	2.51
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:51	Pale yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
14:54		26.7	7.07	1240	-43	0.06	116	2.27	TDS - 0.841 g/L
14:57		26.46	7.05	1140	-37	0.0	106	2.28	TDS - 0.713 g/L
15:01		26.45	6.82	835	-27	0.0	77.6	2.28	TDS - 0.522 g/L
15:03		26.45	6.80	793	-25	0.0	73.5	2.28	TDS - 0.505 g/L
15:05		26.43	6.76	759	-23	0.0	68.4	2.28	TDS - 0.472 g/L
15:59		26.42	6.88	1060	-36	0.0	94.2	2.28	TDS - 0.653 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:08	Pale yellow brown	No odour	NO	Final depth to water 2.29 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	15:06	Analysis:	
Sample ID:	E11	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

E4

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	1.62
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.44
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.82
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:13	Dark yellow brown	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
12:17		28.22	9.83	29100	-268	0.28	20.3	3.64	TDS - 18.0 g/L
12:20		28.12	9.82	28800	-297	0.0	18.5	3.70	TDS - 17.8 g/L
12:23		27.98	9.82	28500	-317	0.0	18.0	3.75	TDS - 17.6 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:35	Dark yellow brown	Sulphidic odour	NO	Final depth to water 3.92 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	12:33	Analysis:	
Sample ID:	E4	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

E5

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.54
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.58
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.04
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:22	Dark brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
11:26		25.80	9.28	21300	147	0.17	7.4	1.62	TDS - 13.2 g/L
11:29		25.86	9.27	21300	157	0.10	6.7	1.67	TDS - 13.2 g/L
11:32		25.93	9.27	21200	172	0.0	6.6	1.75	TDS - 13.2 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:37	Dark brown	No odour	NO	Final depth to water 1.81 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	11:37	Analysis:	
Sample ID:	E5	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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E5

E5D

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.82
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.43
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	3.61
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:48	Brown	Slight hydrocarbon odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
11:51		26.63	7.39	15800	-37	0.68	26.3	1.99	TDS - 9.70 g/L
11:54		26.68	7.35	15500	-53	0.01	24.2	2.05	TDS - 9.60 g/L
11:57		26.68	7.26	15500	-55	0.0	24.4	2.06	TDS - 9.58 g/L
12:00		26.68	7.20	15400	-55	0.0	24.1	2.08	TDS - 9.55 g/L
12:03		26.67	7.24	15300	-54	0.0	24.0	2.08	TDS - 9.52 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:06	Dark yellow brown	Slight hydrocarbon odour	NO	Final depth to water 2.12 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	12:03	Analysis:	
Sample ID:	E5D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

F5

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	2.45
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	7.39
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	4.94
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:32	Colourless	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
09:36		20.87	5.52	12600	26	1.09	35.5	2.68	TDS - 7.76 g/L
09:39		20.97	5.47	12400	21	1.21	98.7	2.77	TDS - 7.72 g/L
09:42		20.75	5.45	12500	17	1.33	78.5	2.82	TDS - 7.82 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:45	Colourless	Sulphidic odour	NO	Final depth to water 2.90 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	09:46	Analysis:	
Sample ID:	F5	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

F6

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	4.83
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	15.50
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	10.67
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:02	Colourless	Strong sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
10:05		22.14	8.14	9820	9	0.73	139	4.86	TDS - 6.21 g/L
10:08		22.14	7.89	9710	29	0.40	130	5.02	TDS - 6.12 g/L
10:11		22.11	7.76	9560	33	0.16	123	5.13	TDS - 5.98 g/L
10:14		22.06	7.66	9470	30	0.10	123	5.20	TDS - 5.98 g/L
10:17		22.03	7.67	9450	28	0.07	115	5.39	TDS - 5.95 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:20	Colourless	Strong sulphidic odour	NO	Final depth to water 5.87 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	10:19	Analysis:	
Sample ID:	F6	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

RAMBOLL

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

G2

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	8.07
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	13.42
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	5.35
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:47	Dark grey	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
12:52		27.86	6.75	6090	-10	2.60	473	8.13	TDS - 3.85 g/L
12:56		27.85	6.53	5940	-14	2.13	424	8.12	TDS - 3.75 g/L
13:00		27.78	6.51	5850	-15	2.45	390	8.10	TDS - 3.70 g/L
13:00		27.27	6.52	5800	-10	2.43	359	8.10	TDS - 3.66 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
	Dark grey	Sulphidic odour	NO	Final depth to water

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	13:03	Analysis:	
Sample ID:	G2	Bottles:	
QC Sample ID:	D01_20220317 and T01_20220317	QC Sample Time:	13:03
Remarks:	Final depth to water 8.14 mbTOC		

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

G5

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	2.44
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	11.35
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	8.91
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:04	Colourless with black flocculants	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
09:04		20.05	5.71	7640	67	0.14	78.1	2.54	TDS - 4.83 g/L
09:06		20.20	5.57	7680	82	0.0	72.7	2.65	TDS - 4.84 g/L
09:10		20.26	5.52	7720	89	0.0	71.2	2.79	TDS - 4.86 g/L
09:13		20.10	5.49	7760	90	0.0	66.7	2.93	TDS - 4.89 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:19	Colourless with black flocculants	Sulphidic odour	NO	Final depth to water 3.29 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	09:18	Analysis:	
Sample ID:	G5	Bottles:	
QC Sample ID:	D02_20220318	QC Sample Time:	09:18
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

G6

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	4.18
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.69
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	2.52
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:26	Colourless	Strong sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
10:29		22.25	4.75	8620	70	0.0	39.1	8.26	TDS - 5.43 g/L
10:32		22.24	4.70	8610	80	0.0	35.3	8.29	TDS - 5.43 g/L
10:35		22.23	4.47	8590	96	0.0	30.2	8.29	TDS - 5.41 g/L
10:37		22.15	4.40	8580	96	0.0	25.7	8.29	TDS - 5.41 g/L
10:40		22.11	4.37	8590	91	0.0	37.7	8.29	TDS - 5.42 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:44	Colourless	Strong sulphidic odour	NO	Final depth to water 8.29 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	10:42	Analysis:	
Sample ID:	G6	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N2

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	4.18
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.68
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.50
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:26	Pale yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
08:29		20.17	4.27	7550	243	6.20	141	5.46	TDS - 4.73 g/L
08:32		20.01	4.39	7110	262	5.46	142	4.58	TDS - 4.43 g/L
08:35		19.99	4.81	6320	242	5.44	155	4.71	TDS - 4.04 g/L
08:38		19.96	5.27	5380	213	5.82	182	4.93	TDS - 3.36 g/L
08:41		20.45	5.33	4910	192	6.21	210	5.02	TDS - 2.63 g/L
08:42		20.46	5.35	4888	190	6.03	205	5.03	TDS - 3.13 g/L
08:47		20.47	5.35	4850	190	5.73	200	5.04	TDS - 3.11 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:49	Pale yellow brown	No odour	NO	Final depth to water 5.12 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	08:47	Analysis:	
Sample ID:	N2	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N8

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	2.70
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.77
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	3.07
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:25	Yellow brown	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
14:27		27.36	6.91	11000	-88	1.88	430	2.77	TDS - 6.73 g/L
14:30		27.11	6.92	11000	-92	1.38	447	2.93	TDS - 6.78 g/L
14:33		26.86	6.91	10800	-90	1.41	456	3.06	TDS - 6.71 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:40	Yellow brown	Sulphidic odour	NO	Final depth to water 3.20 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	14:36	Analysis:	
Sample ID:	N8	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N9

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.81
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.86
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.05
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:27	Pale yellow brown	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
13:30		23.31	8.23	9400	-141	0.0	156	2.12	TDS - 5.9 g/L
13:32		23.36	8.24	9360	-156	0.0	125	2.17	TDS - 5.92 g/L
13:36		22.80	8.26	9460	-185	0.0	83.7	2.17	TDS - 5.96 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:38	Pale yellow brown	Sulphidic odour	NO	Final depth to water 2.15 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	13:39	Analysis:	
Sample ID:	N9	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

PUMP

Date:	03/17/2022	Weather Conditions:	Clear|Partly Cloudy|Sunny	Depth to Water	1.28
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.47
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	2.20
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:59	Brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
10:03		22.44	7.64	378	58	1.41	98.8	1.32	TDS - 0.245 g/L
10:06		22.51	7.55	367	71	1.30	104	1.35	TDS - 0.239 g/L
10:06		22.60	7.39	354	81	1.25	97.4	1.38	TDS -0.230 g/L
10:09		23.68	7.38	351	86	1.14	96.5	1.39	TDS - 0.229 g/L
10:12		22.70	7.37	352	87	1.19	94.3	1.39	TDS - 0.228 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:18	Brown	No odour	NO	Turbid. Final depth to water 1.42 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	10:17	Analysis:	
Sample ID:	PUMP	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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PUMP

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W1D

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	1.40
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.42
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	9.02
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:05	Dark yellow brown	Sulphidic odour		

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
13:08		28.22	7.76	15100	-74	2.36	717	1.53	TDS - 9.32 g/L
13:11		28.19	7.76	14800	-71	1.87	762	1.64	TDS - 9.32 g/L
13:14		28.18	7.77	14700	-53	2.18	748	1.78	TDS - 9.37 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:20	Dark yellow brown	Sulphidic odour	NO	Final depth to water 2.23 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	13:18	Analysis:	
Sample ID:	W1D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W1S

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	1.52
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.43
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.92
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:45	Dark yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
12:48		26.78	7.50	15900	-66	0.15	630	1.75	TDS - 9.83 g/L
12:51		27.20	7.49	15700	-58	0.0	575	1.96	TDS - 9.69 g/L
12:54		27.75	7.48	15600	-49	0.0	574	2.06	TDS - 9.65 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:00	Dark yellow brown	No odour	NO	Final depth to water 2.24 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	12:58	Analysis:	
Sample ID:	W1S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W2D

Date:	03/17/2022	Weather Conditions:	Clear|Sunny|Partly Cloudy	Depth to Water	2.09
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.39
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	4.30
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:33	Dark brown	Slight sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
09:36		21.97	10.19	36000	-138	0.0	10.9	2.30	TDS 21.8 g/L
09:39		21.98	10.19	35800	-171	0.0	10.3	1.39	TDS 21.8 g/L
09:42		22.03	10.18	35700	-210	0.0	5.1	1.54	TDS 21.8 g/L
09:45		22.05	10.17	35800	-240	0.0	5.3	1.67	TDS - 21.9 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:50	Dark brown	Slight sulphidic odour	NO	Final depth to water 2.91 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	09:50	Analysis:	
Sample ID:	W2D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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W2D
Date:
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W2S

Date:	03/17/2022	Weather Conditions:	Clear|Partly Cloudy	Depth to Water	1.39
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.39
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.01
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:57	Very pale brown	Slight sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
09:00		21.50	6.58	561	-4	1.53	1000	1.42	TDS 0.361 g/L
09:03		21.54	6.58	568	-9	1.16	1000	1.46	TDS 0.363 g/L
09:06		21.68	6.55	555	-14	0.78	1000	1.46	TDS 0.354 g/L
09:09		21.72	6.53	544	-15	0.68	1000	1.46	TDS 0.346 g/L
09:12		21.71	6.51	522	-17	0.63	1000	1.46	TDS 0.332 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:19	Very pale brown	Slight sulphidic odour	NO	Very turbid - 1000 NTU is max reading for turbidity on WQM. Final depth to water 1.46 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	09:18	Analysis:	
Sample ID:	W2S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W3D

Date:	03/18/2022	Weather Conditions:	Clear|Sunny	Depth to Water	1.22
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.55
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	1.33
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:56	Pale brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
10:59		23.12	8.21	12000	-48	1.48	466	1.36	TDS - 7.44 g/L
11:02		23.21	8.22	12000	1	1.21	445	1.49	TDS - 7.44 g/L
11:05		23.37	8.21	12000	34	1.07	424	1.56	TDS - 7.45 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:10	Pale brown	No odour	NO	Final depth to water 1.61 mbTOC

Sampling Summary

Sample Date:	03/18/2022	COC:	
Sample Time:	11:08	Analysis:	
Sample ID:	W3S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

W4D

Date:	03/18/2022	Weather Conditions:		Depth to Water	
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	Insufficient water to sample - very turbid

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
10:54									Insufficient water to sample - very turbid

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample - very turbid

Sampling Summary

W4S

Date:	03/18/2022	Weather Conditions:	Sunny|Clear	Depth to Water	0.96
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.12
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.17
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample - very turbid				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample - very turbid

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
11:51									Insufficient water to sample - very turbid

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample - very turbid

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample - very turbid		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W5D

Date:	03/17/2022	Weather Conditions:		Depth to Water	5.49
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	10.63
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	5.15
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:27	Colourless to very pale yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
15:30		25.11	6.35	6510	4	3.75	115	5.67	TDS - 4.1 g/L
15:33		25.61	6.35	6400	3	3.57	114	5.98	TDS - 4.02 g/L
15:36			6.36	6360	2	3.37	113	6.14	TDS - 4.02 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:43	Colourless to very pale yellow brown	No odour	NO	Final depth to water 6.31 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	15:40	Analysis:	
Sample ID:	W5D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W5S

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.63
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.7
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.08
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Dry - insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	Dry - insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
15:15									Dry - insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NA	Dry - insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Dry - insufficient water to sample		

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W6D

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	5.27
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	8.77
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	3.50
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:56	Pale yellow-grey brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
13:59		28.06	6.07	1170	63	0.84	434	5.55	TDS - 0.745 g/L
14:02		27.77	5.71	1120	94	0.41	418	5.81	TDS - 0.713 g/L
14:05		27.32	5.65	1050	101	0.0	406	5.88	TDS - 0.672 g/L
14:08		27.03	5.60	1020	104	0.0	401	5.97	TDS - 0.650 g/L
14:11		26.83	5.55	999	105	0.0	403		TDS - 0.638 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:16	Pale yellow-grey brown	No odour	NO	Final depth to water 5.95 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	14:15	Analysis:	
Sample ID:	W6D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W6S

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	3.10
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	3.13
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.03
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Dry - insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
13:48									Dry - insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NO	Dry - insufficient water to sample

Sampling Summary

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

W7M

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.59
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.72
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	2.13
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:59	Pale brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
11:02		24.80	9.29	8280	-32	0.27	66.8	1.90	TDS - 5.22 g/L
11:05		24.88	9.29	8300	-15	0.24	66.3	1.96	TDS - 5.22 g/L
11:08		24.99	9.29	8240	6	0.22	65.1	1.98	TDS - 5.19 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:14	Dark yellow brown	No odour	NO	Final depth to water 2.03 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	11:12	Analysis:	
Sample ID:	W7M	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W7S

Date:	03/17/2022	Weather Conditions:	Sunny	Depth to Water	1.50
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.30
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.80
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:27	Pale brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	uS/cm	mV	mg/L	NTU	m bmp	
10:30		23.21	7.14	1210	-10	1.13	1000	1.53	TDS - 0.762 g/L
10:33		23.299	7.07	1130	-21	1.28	1000	1.56	TDS - 0.723 g/L
10:36		23.43	6.97	1070	-19	1.60	1000	1.67	TDS - 0.679 g/L
10:39		23.50	6.93	995	-15	1.83	1000	1.71	
10:42		23.59	6.95	974	-12	1.89	1000		TDS - 0.624 g/L

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:50	Pale brown	No odour	NO	Final depth to water 1.73 mbTOC

Sampling Summary

Sample Date:	03/17/2022	COC:	
Sample Time:	10:48	Analysis:	
Sample ID:	W7S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

Gauging Data

Sampler: Jake Bourke

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
A7	03/18/2022 11:19		12.319	4.32	1.59	10.729					
E11	03/17/2022 14:48		10.84	4.80	2.27	8.57					
E4	03/18/2022 12:05		13.81	3.44	1.62	12.19					
E5	03/17/2022 11:20		14.104	2.58	1.54	12.564					
E5D	03/17/2022 11:39		14.182	5.44	1.82	12.362					
F5	03/18/2022 09:27		7.63	7.39	2.45	5.18					
F6	03/18/2022 09:57		6.68	15.50	4.83	1.85					
G2	03/17/2022 12:42		14.342	13.42	8.07	6.272					
G5	03/18/2022 08:59		7.59	11.35	2.44	5.15					
G6	03/18/2022 10:24		6.55	6.69	4.18	2.37					
N2	03/18/2022 08:09		8.853	5.63	4.18	4.673					
N8	03/17/2022 14:21		12.15	5.78	2.70	9.45					
N9	03/17/2022 13:23		11.532	2.86	1.81	9.722					
PUMP	03/17/2022 09:54		14.302	3.47	1.28	13.022					
W1D	03/18/2022 13:01		13.112	10.42	1.40	11.712					
W1S	03/18/2022 12:40		13.177	2.43	1.52	11.657					
W2D	03/17/2022 09:26		14.033	6.39	2.09	11.943					
W2S	03/17/2022 08:52		14.229	2.39	1.39	12.839					
W3D	03/18/2022 10:54		11.29	2.54	1.22	10.07					
W3S	03/18/2022 10:54		11.352			11.352					
W3SA	03/18/2022 10:54		10.786			10.786					
W4D	03/18/2022 10:54		10.839			10.839					
W4S	03/18/2022 11:50		10.629	1.12	0.96	9.669					
W5D	03/17/2022 15:15		10.571	10.63	5.49	5.081					

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Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
W5S	03/17/2022 15:14		10.493	1.7	1.63	8.863					Dry - insufficient water to sample
W6D	03/17/2022 13:51		10.289	8.77	5.27	5.019					
W6S	03/17/2022 13:46		10.69	3.13	3.10	7.59					
W7M	03/17/2022 10:55		14.318	3.72	1.59	12.728					
W7S	03/17/2022 10:24		14.299	2.30	1.50	12.799					

RAMBOLL

Groundwater Monitoring Field Data Form

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A7

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.69
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.32
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.63
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:41	Clear, yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
11:44	0.16	17.09	9.78	12.8	-191	1.94	26.3	1.76	Clear, yellow brown, no odour
11:47	0.16	17.17	9.81	12.5	-195	0.59	26.0	1.79	Clear, yellow brown, no odour
11:50	0.16	17.25	9.80	12.6	-189	0.51	25.5	1.84	Clear, yellow brown, no odour
11:53	0.16	17.32	9.80	12.5	-186	0.16	24.7	1.88	Clear, yellow brown, no odour
11:56	0.16	17.47	9.78	12.5	-184	0.00	23.7	1.94	Clear, yellow brown, no odour
11:59	0.16	17.62	9.78	12.4	-183	0.0	22.9	2.05	Clear, yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:03	Clear, yellow brown	No odour	NO	Final depth to water 2.10 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	12:02	Analysis:	
Sample ID:	A7	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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16/06/22
A7
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Cyanides

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Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

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E11

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	2.35
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.82
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.47
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:47	Turbid, pale yellow grey	Sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
14:50	0.16	17.26	8.37	1.46	-117	0.74	409	2.37	Turbid, pale yellow grey, no odour
14:53	0.16	17.35	7.58	1.34	-91	0.15	401	2.37	Turbid, pale yellow grey, no odour
14:56	0.16	17.40	7.46	1.28	-91	0.05	344	2.37	Turbid, pale yellow grey, no odour
14:59	0.16	17.41	7.40	1.21	-91	0.0	270	2.37	Turbid, pale yellow grey, no odour
15:02	0.16	17.40	7.37	1.17	-91	0.0	213	2.37	Turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:06	Turbid, pale yellow grey	No odour	NO	Final depth to water 2.36 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	15:02	Analysis:	
Sample ID:	E11	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

E4

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.62
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.40
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.77
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:52	Clear to slightly turbid, yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
12:55	0.16	18.34	10.30	28.8	-275	0.0	107	1.71	Clear to slightly turbid, yellow brown, no odour
12:58	0.16	18.00	10.29	29.0	-298	0.0	100	1.73	Clear to slightly turbid, yellow brown, no odour
13:01	0.16	17.92	10.28	28.8	-311	0.0	95.1	1.82	Clear to slightly turbid, yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:05	Clear to slightly turbid, yellow brown	No odour	NO	Final depth to water 1.89 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	13:04	Analysis:	
Sample ID:	E4	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
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E5

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.57
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.57
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.99
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:07	Clear, dark yellow brown	No odour	NO	

Field Parameters

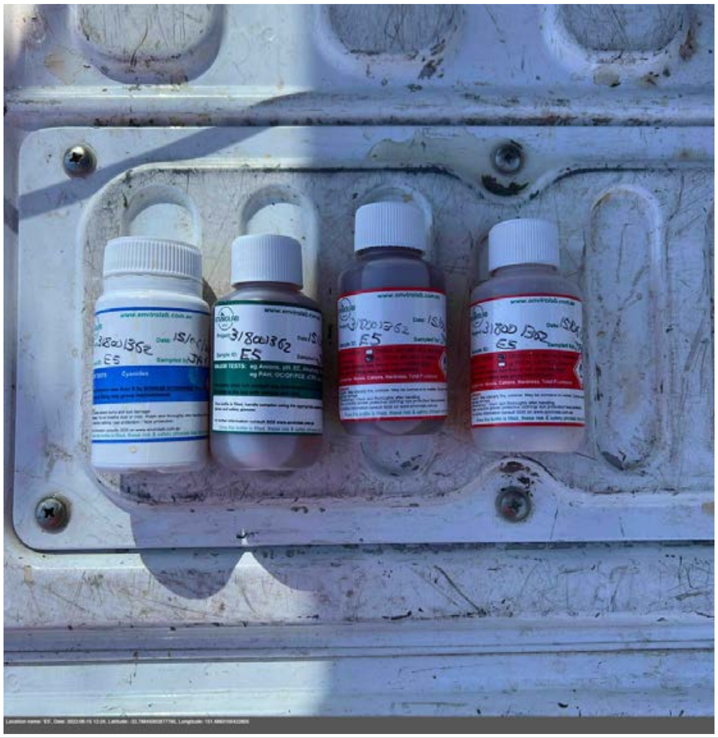
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
12:10	0.16	15.36	9.67	20.0	199	0.22	15.7	1.63	Clear, dark yellow brown, no odour
12:13	0.16	15.65	9.65	20.1	204	0.04	15.8	1.74	Clear, dark yellow brown, no odour
12:16	0.16	15.83	9.64	20.2	204	0.02	14.6	1.83	Clear, dark yellow brown, no odour
12:19	0.16	15.97	9.63	20.1	205	0.01	14.9	1.87	Clear, dark yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:23	Clear, dark yellow brown	No odour	NO	Final depth to water 1.96 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	12:20	Analysis:	
Sample ID:	E5	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



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Site: Hydro Quarterly Groundwater Monitoring 2022
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E5D

Date:	06/15/2022	Weather Conditions:	Sunny|High Winds	Depth to Water	1.79
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.44
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.65
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:34	Clear to slightly turbid, yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
12:37	0.16	16.13	7.69	14.8	191	3.89	49.7	1.96	Clear to slightly turbid, yellow, no odour
12:40	0.16	16.26	7.63	15.0	188	1.69	46.1	2.05	Clear to slightly turbid, yellow, no odour
12:43	0.16	16.37	7.62	15.0	182	1.40	42.3	2.11	Clear to slightly turbid, yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:48	Clear to slightly turbid, yellow	No odour	NO	Final depth to water 2.09 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	12:46	Analysis:	
Sample ID:	E5D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
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F5

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	2.59
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	7.37
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	4.78
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:16	Clear, colourless	Sulphidic odour	NO	

Field Parameters

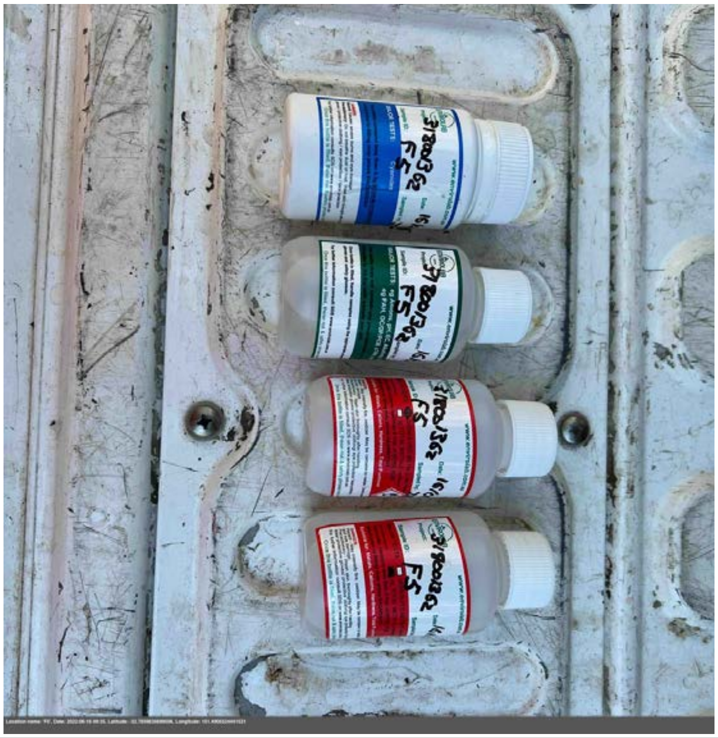
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
09:19	0.16	12.53	5.69	10.8	108	1.39	24.5	2.79	Clear, colourless, sulphidic odour
09:22	0.16	12.61	5.54	10.9	136	0.37	19.5	2.92	Clear, colourless, sulphidic odour
09:25	0.16	12.72	5.48	10.9	139	0.25	17.8	2.96	Clear, colourless, sulphidic odour
09:28	0.16	12.88	5.37	10.9	142	0.12	15.3	2.99	Clear, colourless, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:34	Clear, colourless	No odour	NO	Final depth to water 2.93 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	09:32	Analysis:	
Sample ID:	F5	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



F6

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	3.79
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	15.48
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:53	Clear, colourless	Slight sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
09:56	0.16	13.13	6.92	9.51	5	1.74	6.6	4.04	Clear, colourless, slight sulphidic odour
09:59	0.16	13.35	7.14	9.49	7	0.76	4.9	4.22	Clear, colourless, slight sulphidic odour
10:02	0.16	13.44	7.15	9.57	8	0.47	5.3	4.33	Clear, colourless, slight sulphidic odour
10:05	0.16	13.70	7.19	9.48	7	0.30	4.5	4.54	Clear, colourless, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:11	Clear, colourless	Slight sulphidic odour	NO	Final depth to water 4.79 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	10:10	Analysis:	
Sample ID:	F6	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

G2

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	7.81
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	13.42
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.61
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:59	Clear, colourless	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:02	0.16	16.16	7.31	5.40	-74	0.90	40.5	7.86	Clear, colourless, no odour
13:05	0.16	16.23	7.10	5.62	-65	4.74	42.2	7.91	Clear, colourless, no odour
13:08	0.16	16.36	6.60	5.75	-61	4.71	45.3	7.93	Clear, colourless, no odour
13:11	0.16	16.56	6.59	5.72	-60	4.58	109	7.91	Clear with some black floccules, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:18	Clear with black floccules	No odour	NO	Final depth to water 7.88 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	13:16	Analysis:	
Sample ID:	G2	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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G5

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	2.57
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	11.31
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	8.74
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:42	Clear, colourless	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
08:45	0.16	11.62	7.06	6.44	-43	1.26	38.7	2.80	Clear, colourless, no odour
08:48	0.16	11.90	6.07	6.50	35	0.56	38.7	2.98	Clear, colourless, no odour
08:51	0.16	12.13	6.01	6.51	38	0.39	30.4	3.09	Clear, colourless, no odour
08:54	0.16	12.37	5.97	6.54	39	0.24	33.6	3.20	Clear, colourless, no odour
08:57	0.16	12.57	5.92	6.60	40	0.16	31.1		Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:09	Clear, colourless	No odour	NO	Final depth to water 3.39 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	09:07	Analysis:	
Sample ID:	G5	Bottles:	
QC Sample ID:	D02_20220616 and T02_20220616	QC Sample Time:	09:07
Remarks:			


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G6

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	3.90
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.68
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.78
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:18	Clear, colourless	Strong sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:21	0.16	14.37	5.37	7.89	108	1.29	26.8	3.97	Clear, colourless, strong sulphidic odour
10:24	0.16	14.48	4.74	7.92	113	0.59	18.6	3.99	Clear, colourless, strong sulphidic odour
10:27	0.16	14.71	4.51	7.90	118	0.30	11.8	3.99	Clear, colourless, strong sulphidic odour
10:30	0.16	14.97	4.33	7.89	123	0.22	11.8	3.99	Clear, colourless, strong sulphidic odour
10:33	0.16	15.15	4.29	7.83	122	0.18	11.3	3.99	Clear, colourless, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:37	Clear, colourless	Strong sulphidic odour	NO	Final depth to water 3.94 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	10:34	Analysis:	
Sample ID:	G6	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

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N2

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	3.93
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.64
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.7
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
07:00	Clear, yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
08:00	0.16	12.45	7.02	1.93	-134	5.52	77.3	4.22	Clear, yellow, no odour
08:03	0.16	12.74	6.91	1.87	-90	4.46	68.9	4.33	Clear, yellow, no odour
08:06	0.16	12.96	6.89	1.76	-71	3.95	59.9	3.47	Clear, yellow, no odour
08:09	0.16	13.07	6.89	1.64	-63	3.85	70.0	3.64	Clear, yellow, no odour
08:12	0.16	13.24	6.91	1.53	-52	3.97	75.7	3.67	Clear to slightly turbid, yellow, no odour
08:15	0.16	13.11	6.97	1.54	-42	4.04	91.4	3.67	Clear to slightly turbid, yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:22	Clear to slightly turbid, yellow	No odour	NO	Final depth to water 3.80 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	08:20	Analysis:	
Sample ID:	N2	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
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N8

Date:	06/15/2022	Weather Conditions:	Sunny|High Winds	Depth to Water	2.75
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.28
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.53
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:22	Slightly turbid, yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
14:25	0.16	17.00	7.04	10.1	-106	0.32	167	2.97	Slightly turbid, yellow, no odour
14:28	0.16	17.01	7.06	10.1	-110	0.02	176	3.05	Slightly turbid, yellow, no odour
14:31	0.16	17.10	7.09	9.97	-116	0.0	139	3.22	
14:34	0.16	17.14	7.11	9.89	-119	0.0	155	3.31	Slightly turbid, yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
	Slightly turbid, yellow	No odour	NO	Final depth to water 3.48 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	14:38	Analysis:	
Sample ID:	N8	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N9

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.82
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.83
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.01
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:29	Turbid, pale yellow grey	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:32	0.16	16.30	8.64	1.62	2	6.62	204	2.02	Turbid, pale yellow grey, no odour
13:35	0.16	16.16	8.84	1.59	13	6.65	205	2.13	Turbid, pale yellow grey, no odour
13:38	0.16	16.10	8.86	1.55	19	6.48	210	2.18	Turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:44	Turbid, pale yellow grey	No odour	NO	Final depth to water 2.08 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	13:41	Analysis:	
Sample ID:	N9	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

PUMP

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.36
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.44
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.08
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:17	Clear to slightly turbid, pale yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:20	0.16	12.90	9.64	4.30	-151	2.14	27.0	1.40	Clear to slightly turbid, pale yellow, no odour
10:23	0.16	12.97	9.61	4.27	-179	0.7	21.4	1.42	Clear to slightly turbid, pale yellow, no odour
10:26	0.16	13.06	9.58	4.23	-182	0.39	20.7	1.44	Clear to slightly turbid, pale yellow, no odour
10:29	0.16	13.14	9.57	4.21	-180	0.26	19.7	1.45	Clear to slightly turbid, pale yellow, no odour
10:32	0.16	13.20	9.56	4.17	-177	0.19	21.7	1.48	Clear to slightly turbid, pale yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:44	Clear to slightly turbid, pale yellow	No odour	NO	Finals depth to water 1.55 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	10:42	Analysis:	
Sample ID:	PUMP	Bottles:	
QC Sample ID:	D01_20220615 and T01_20220615	QC Sample Time:	10:42
Remarks:			

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W1D

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.03
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.40
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	9.37
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:16	Slightly turbid, brown yellow	Slight sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
13:19	0.16	19.65	8.48	14.4	-80	0.23	43.6	1.31	Slightly turbid, brown yellow, slight sulphidic odour
13:22	0.16	19.69	8.49	14.4	-103	0.03	44.7	1.44	Slightly turbid, brown yellow, slight sulphidic odour
13:25	0.16	19.92	8.50	14.3	-135	0.0	41.6	1.69	Slightly turbid, brown yellow, slight sulphidic odour
13:28	0.16	20.08	8.51	14.3	-164	0.0	40.5	1.94	Slightly turbid, brown yellow, slight sulphidic odour
13:31	0.16	20.24	8.51	13.8	-157	0.0	36.9	2.14	Slightly turbid, brown yellow, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:37	Slightly turbid, brown yellow	Slight sulphidic odour	NO	Final depth to water 2.46 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	13:36	Analysis:	
Sample ID:	W1D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W1S

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.31
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.41
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.1
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:58	Clear, dark yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
14:02	0.125	21.35	8.23	12.7	49	1.94	47.2	1.56	Clear, dark yellow, no odour
14:06	0.125	21.04	8.28	12.8	67	1.61	45.4	1.73	Clear, dark yellow, no odour
14:10	0.125	20.87	8.37	11.9	50	7.28	40.4	1.82	Clear, dark yellow, no odour
14:14	0.125	20.73	8.44	10.9	43	3.99	41.3	1.87	Clear, dark yellow, no odour
14:18	0.125	20.64	8.54	10.5	52	2.82	42.5	2.91	Clear, dark yellow, no odour
14:23	0.125	20.55	8.60	10.1	56	1.76	43.6		Clear, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:31	Clear, dark yellow	No odour	NO	Final depth to water 2.24 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	14:30	Analysis:	
Sample ID:	W1S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W2D

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.34
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.39
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.05
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:37	Clear, dark brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:40	0.16	10.60	10.69	36.2	-292	0.48	19.6	1.62	Clear, dark brown, no odour
09:43	0.16	10.90	10.66	36.7	-323	0.0	16.8	1.91	Clear, dark brown, no odour
09:46	0.16	11.18	10.65	36.6	-333	0.0	15.1	2.04	Clear, dark brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:52	Clear, dark brown	No odour	NO	Finals depth to water 2.37 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	09:48	Analysis:	
Sample ID:	W2D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

W2S

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.57
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.37
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.8
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:05	Turbid, pale yellow grey	No odour	NO	

Field Parameters

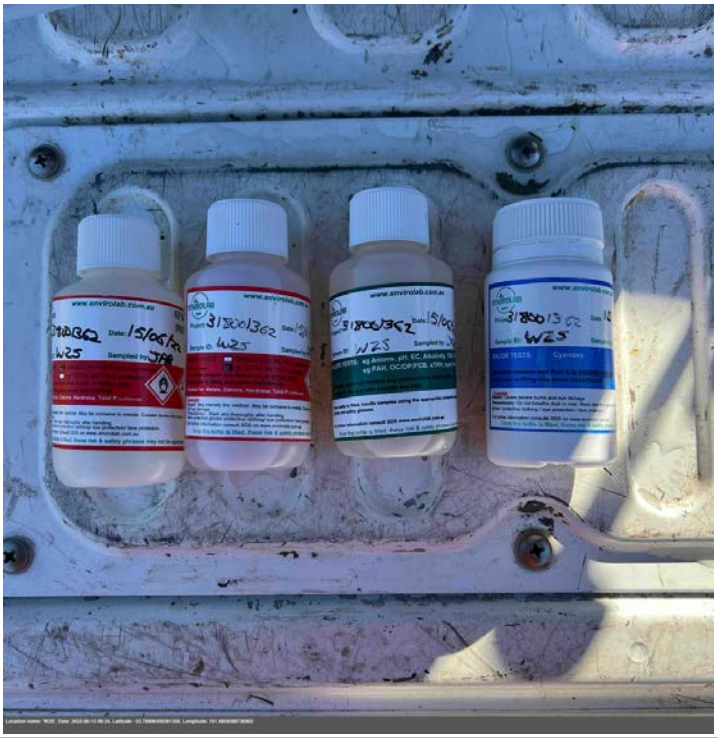
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:08	0.16	9.66	7.87	1.07	157	4.83	546	1.63	Turbid, pale yellow grey, no odour
09:11	0.16	10.00	7.40	1.03	45	3.72	361	1.61	Turbid, pale yellow grey, no odour
09:14	0.16	10.08	7.09	0.875	-72	2.28	305	1.61	Turbid, pale yellow grey, no odour
09:17	0.16	10.16	6.93	0.736	-79	2.06	237	1.62	Turbid, pale yellow grey, no odour
09:20	0.16	10.27	6.84	0.653	-80	1.56	160	1.62	Turbid, pale yellow grey, no odour
09:23	0.16	10.35	6.80	0.615	-78	1.23	116	1.62	Turbid, pale yellow brown, no odour
09:26	0.16	10.44	6.77	0.592	-78	0.93	88.7	1.62	Turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:34	Slightly turbid, pale yellow grey	No odour	NO	Final depth to water 1.58 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	09:31	Analysis:	
Sample ID:	W2S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W3D

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - damaged

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:21									Well not sampled - damaged

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - damaged

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not sampled - damaged		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

W3S

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.15
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.54
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.39
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:56	Turbid, yellow brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:59	0.16	15.81	8.81	10.1	53	2.64	233	1.40	Turbid, yellow brown, no odour
11:02	0.16	15.84	8.78	10.0	153	0.55	231	1.48	Turbid, yellow brown, no odour
11:05	0.16	15.88	8.85	9.87	185	0.44	225	1.60	Turbid, yellow brown, no odour
11:08	0.16	15.92	8.96	9.56	191	0.70	176	1.70	Turbid, yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:13	Turbid, yellow brown	No odour	NO	Final depth to water 1.71 mbTOC

Sampling Summary

Sample Date:	06/16/2022	COC:	
Sample Time:	11:12	Analysis:	
Sample ID:	W3S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W3SA

Date:	06/15/2022	Weather Conditions:		Depth to Water	
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well not sampled - destroyed				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - destroyed

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:23									Well not sampled - destroyed

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - destroyed

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not sampled - destroyed		

W4D

Date:	06/15/2022	Weather Conditions:		Depth to Water	
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well not sampled - destroyed				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - destroyed

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
13:24									Well not sampled - destroyed

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - destroyed

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not sampled - destroyed		

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W4S

Date:	06/16/2022	Weather Conditions:	Sunny	Depth to Water	1.01
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.12
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.11
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well not samples - insufficient water				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	Well not samples - insufficient water

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
11:26									Well not samples - insufficient water

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well not samples - insufficient water

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not samples - insufficient water		

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

W5D

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	5.30
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.63
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.33
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:30	Clear to slightly turbid, colourless	No odour	NO	

Field Parameters

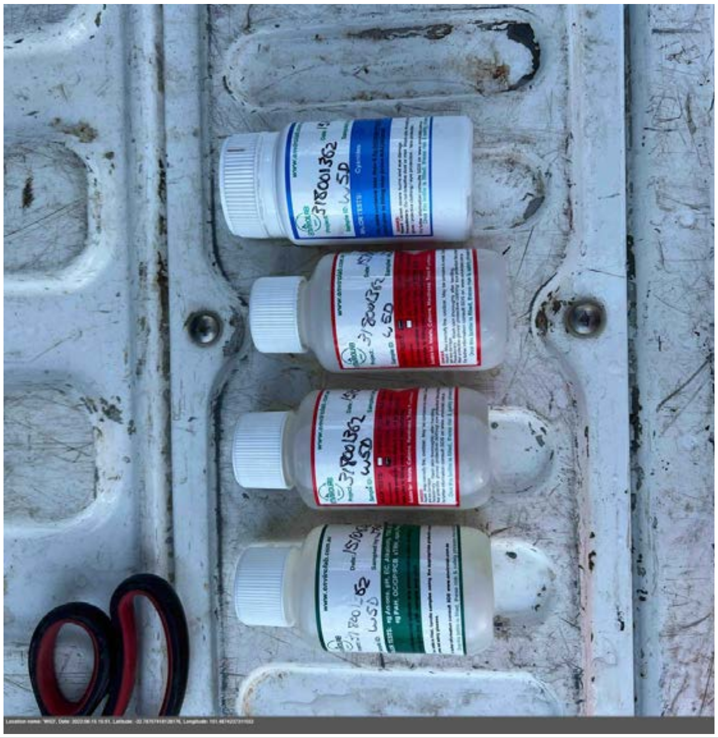
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
15:33	0.16	17.65	6.43	5.86	-7	0.79	69.4		Clear to slightly turbid, colourless, no odour
15:36	0.16	17.76	6.30	5.78	9	0.31	63.6		Clear to slightly turbid, colourless, no odour
15:39	0.16	17.78	6.31	5.38	15	0.19	61.2		Clear to slightly turbid, colourless, no odour
15:42	0.16	17.78	6.32	5.15	17	0.18	69.5		Clear to slightly turbid, colourless, no odour
15:45	0.16	17.77	6.33	4.81	20	0.16	65.5		Clear to slightly turbid, colourless, no odour
15:48	0.16	17.77	6.34	4.68	22	0.13	56.6		Clear to slightly turbid, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:51	Clear to slightly turbid, colourless	No odour	NO	Final depth to water 6.95 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	15:50	Analysis:	
Sample ID:	W5D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



W5S

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.64
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	1.70
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.06
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well not sampled - insufficient water				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	Well not sampled - insufficient water

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
15:13									Well not sampled - insufficient water

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NO	Well not sampled - insufficient water

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not sampled - insufficient water		

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W6D

Date:	06/15/2022	Weather Conditions:	Sunny|High Winds	Depth to Water	5.06
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	8.79
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.72
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:57	Turbid, pale yellow grey	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU	mS/cm		mg/L	NTU	m bmp	
14:00	0.16	16.74	6.52	0.966	44	1.18	719	5.33	Very turbid, pale yellow grey, no odour
14:03	0.16	16.81	6.10	0.969	55	0.70	720	5.41	Very turbid, pale yellow grey, no odour
14:06	0.16	17.01	5.86	0.972	50	0.51	717	5.46	Very turbid, pale yellow grey, no odour
14:09	0.16	17.04	5.92	0.972	51	0.36	700	5.52	Very turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:17	Turbid, pale yellow grey	No odour	NO	Final depth to water 5.38 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	14:14	Analysis:	
Sample ID:	W6D	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

W6S

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	2.69
Purge Method:		Water Quality Meter:	Horiba	Well Depth:	3.1
Purge Volume Units:	ml	Casing Material:	PVC	Water Column in Well:	0.41
Sampling Type:	Low Flow	Casing Diameter:		Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well not sampled - insufficient water				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NO	Well not sampled - insufficient water

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:51									Well not sampled - insufficient water

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well not sampled - insufficient water

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well not sampled - insufficient water		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W7M

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.78
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.72
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.94
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:18	Clear, dark brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
11:21	0.16	14.65	9.82	8.92	196	0.53	38.0	2.28	Clear, dark brown, no odour
11:24	0.16	14.89	9.87	8.29	197	0.49	25.3	2.37	Clear, dark brown, no odour
11:27	0.16	15.10	9.99	9.50	113	0.23	23.6	2.48	Clear,dark brown, no odour
11:30	0.16	15.24	10.24	11.2	-180	0.0	16.4	2.54	Clear, dark brown, no odour
11:33	0.16	15.40	10.34	15.2	-255	0.0	16.8	2.57	Clear, dark brown, no odour
11:36	0.16	15.56	10.36	17.7	-284	0.0	16.2	2.59	Clear, dark brown, no odour
11:39	0.16	15.69	10.40	19.9	-300	0.0	15.6	2.61	Clear, dark brown, no odour
11:42	0.16	15.85	10.40	21.5	-311	0.0	14.6	2.62	Clear, dark brown, no odour
11:45	0.16	16.00	10.39	22.3	-314	0.0	13.8	2.63	Clear, dark brown, no odour
11:48	0.16	16.18	10.39	23.3	-322	0.0	13.8	2.64	Clear, dark brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:55	Clear, dark brown	No odour	NO	Final depth to water 2.41 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	11:51	Analysis:	
Sample ID:	W7M	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			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Cyanides

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W7S

Date:	06/15/2022	Weather Conditions:	Sunny	Depth to Water	1.51
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.30
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.78
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:55	Turbid, pale yellow grey	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:58	0.16	13.71	7.62	0.643	68	6.53	140	1.59	Turbid, pale yellow grey, no odour
11:01	0.16	13.82	7.45	0.640	70	6.80	143	1.60	Turbid, pale yellow grey, no odour
11:04	0.16	13.96	7.40	0.636	72	6.82	146	1.60	Turbid, pale yellow grey, no odour
11:07	0.16	14.12	7.38	0.625	70	6.96	157	1.60	Turbid, pale yellow grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:14	Turbid, pale yellow grey	No odour	NO	Final depth to water 1.64 mbTOC

Sampling Summary

Sample Date:	06/15/2022	COC:	
Sample Time:	11:11	Analysis:	
Sample ID:	W7S	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Gauging Data

Sampler: Jake Bourke

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
A7	06/16/2022 11:40		12.319	4.32	1.69	10.629					
E11	06/15/2022 14:46		10.84	4.82	2.35	8.49					
E4	06/16/2022 12:51		13.81	3.40	1.62	12.19					
E5	06/15/2022 12:03		14.104	2.57	1.57	12.534					
E5D	06/15/2022 12:26		14.182	5.44	1.79	12.392					
F5	06/16/2022 09:13		7.63	7.37	2.59	5.04					
F6	06/16/2022 09:50		6.68	15.48	3.79	2.89					
G2	06/15/2022 12:56		14.342	13.42	7.81	6.532					
G5	06/16/2022 08:34		7.59	11.31	2.57	5.02					
G6	06/16/2022 10:16		6.55	6.68	3.90	2.65					
N2	06/16/2022 07:52		8.853	5.64	3.93	4.923					
N8	06/15/2022 14:22		12.15	5.28	2.75	9.4					
N9	06/15/2022 13:26		11.532	2.83	1.82	9.712					
PUMP	06/15/2022 10:15		14.302	3.44	1.36	12.942					
W1D	06/16/2022 13:15		13.112	10.40	1.03	12.082					
W1S	06/16/2022 13:39		13.177	2.41	1.31	11.867					
W2D	06/15/2022 09:37		14.033	6.39	1.34	12.693					
W2S	06/15/2022 09:03		14.229	2.37	1.57	12.659					
W3D	06/15/2022 13:21		11.29			11.29					
W3S	06/16/2022 10:48		11.352	2.54	1.15	10.202					
W3SA	06/15/2022 13:22		10.786			10.786					Well not sampled - destroyed
W4D	06/15/2022 13:24		10.839			10.839					Well not sampled - destroyed
W4S	06/16/2022 11:25		10.629	1.12	1.01	9.619					Well not samples - insufficient water

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
W5D	06/15/2022 15:15		10.571	10.63	5.30	5.271					
W5S	06/15/2022 15:12		10.493	1.70	1.64	8.853					Well not sampled - insufficient water
W6D	06/15/2022 13:53		10.289	8.79	5.06	5.229					
W6S	06/15/2022 13:50		10.69	3.1	2.69	8					Well not sampled - insufficient water
W7M	06/15/2022 11:17		14.318	3.72	1.78	12.538					
W7S	06/15/2022 10:51		14.299	2.30	1.51	12.789					

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

A7

Date:	09/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.60
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.31
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.7
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	275.24
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:39	Clear, dark yellow brown, no odour	Strong sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:42	0.17	19.63	9.99	13600	-156	0.0	11.1	1.65	Clear, dark yellow brown, strong sulphidic odour
10:45	0.17	19.59	9.99	13600	-186	0.0	10.9	1.70	Clear, dark yellow brown, strong sulphidic odour
10:48	0.17	19.57	9.98	13600	-197	0.0	11.0	1.74	Clear, dark yellow brown, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:52	Clear, dark yellow brown	Strong sulphidic odour	NO	Final depth to water 1.77 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	10:51	Analysis:	
Sample ID:	A7_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

E11

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	2.21
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.78
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.57
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	261.98
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:54	Pale brown	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
13:57	0.17	20.43	8.36	2070	-45	0.60	61.8	2.21	Turbid, pale brown, sulphidic odour
14:00	0.17	20.33	8.25	2080	-73	0.22	62.3	2.22	Turbid, pale brown, sulphidic odour
14:03	0.17	20.21	8.00	1720	-92	0.03	43.7	2.22	Turbid, pale brown, sulphidic odour
14:06	0.17	19.02	7.53	1230	-73	0.0	26.6	2.23	Slightly turbid, pale brown, sulphidic odour
14:09	0.17	18.84	7.30	814	-57	0.0	20.8	2.23	Slightly turbid, pale brown, sulphidic odour
14:12	0.17	17.87	7.36	666	-47	0.00	18.8	2.23	Clear to slightly turbid, pale brown, sulphidic odour
14:15	0.17	18.47	7.06	604	-39	0.0	15.6	2.23	Clear to slightly turbid, colourless to pale brown, sulphidic odour
14:18	0.17	19.08	6.96	562	-32	0.0	14.1	2.23	Clear to slightly turbid, colourless to pale brown, sulphidic odour
14:21	0.17	19.18	6.93	536	-31	0.0	12.1	2.23	Clear to slightly turbid, colourless to pale brown, sulphidic odour
14:24	0.17	18.83	6.91	532	-28	0.0	11.7	2.22	Clear to slightly turbid, colourless to pale brown, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:28	Colourless to pale brown	Sulphidic odour	NO	Final depth to water 2.22 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	14:26	Analysis:	
Sample ID:	E11_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

E4

Date:	09/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.59
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.4
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.8
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	183.49
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:06	Clear dark brown	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
11:09	0.17	19.81	10.46	26400	-199	0.26	12.7	1.66	Clear, dark brown, slight sulphidic odour
11:12	0.17	19.78	10.45	26600	-230	0.0	12.8	1.69	Clear, dark brown, slight sulphidic odour
11:15	0.17	19.85	10.45	26600	-248	0.0	11.8	1.74	Clear, dark brown, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:19	Clear, dark brown	Slight sulphidic odour	NO	Final depth to water 1.79 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	11:18	Analysis:	
Sample ID:	E4_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

E5

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.54
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.57
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.02
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	103.97
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:32	Dark yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
10:35	0.17	19.00	9.85	19000	178	0.95	3.5	1.65	Clear, dark yellow brown, no odour
10:38	0.17	18.40	9.85	19300	191	0.56	3.6	1.63	Clear, dark yellow brown, no odour
10:41	0.17	17.95	9.84	19500	201	0.06	3.6	1.75	Clear, dark yellow brown, no odour
10:44	0.17	17.63	9.84	19600	206	0.0	4.0	1.87	Clear, dark yellow brown, no odour
10:47	0.17	17.49	9.84	19700	209	0.0	4.0	1.96	Clear, dark yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:56	Dark yellow brown	No odour	NO	Final depth to water 2.09 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	10:54	Analysis:	
Sample ID:	E5_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

E5D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.93
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.43
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.5
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	356.79
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:00	Pale yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
11:03	0.17	19.35	7.67	13500	176	1.29	46.6	2.13	Slightly turbid, pale yellow brown, no odour
11:06	0.17	18.28	7.56	14100	110	0.15	44.4	2.21	Slightly turbid, pale yellow brown, no odour
11:09	0.17	17.81	7.55	14100	-1	0.0	38.8	2.27	Slightly turbid, pale yellow brown, no odour
11:12	0.17	17.76	7.54	14100	-27	0.0	37.4	2.31	Slightly turbid, pale yellow brown, no odour
11:15	0.17	17.80	7.51	14000	-48	0.0	46.2	2.39	Slightly turbid, pale yellow brown, no odour
11:18		17.77	7.51	14000	-49	0.0	47.1	2.44	Slightly turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:24	Pale yellow brown	No odour	NO	Final depth to water 2.41 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	11:23	Analysis:	
Sample ID:	E5D_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

F5

Date:	09/21/2022	Weather Conditions:	Cloudy	Depth to Water	2.27
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	7.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.1
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	519.89
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:04	Clear and colourless with brown floccules	Strong sulphidic odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
09:07	0.17	17.77	5.12	9720	115	0.77	17.0	2.46	Clear and colourless with brown floccules, strong sulphidic odour
09:10	0.17	17.83	5.08	10000	110	0.29	17.3	2.55	Clear and colourless with brown floccules, strong sulphidic odour
09:13	0.17	17.87	5.08	10100	108	0.11	18.2	2.62	Clear and colourless with brown floccules, strong sulphidic odour
09:16	0.17	17.92	5.07	10100	107	0.03	14.5	2.66	Clear and colourless with brown floccules, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:21	Clear and colourless with brown floccules	Strong sulphidic odour	NO	Final depth to water 2.60 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	09:19	Analysis:	
Sample ID:	F5_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

F6

Date:	09/21/2022	Weather Conditions:	Cloudy	Depth to Water	3.36
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	15.49
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	12.13
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	1236.54
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:34	Clear and colourless with some brown floccules	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:37	0.17	18.30	6.97	8940	-21	1.33	8.9	3.65	Clear and colourless with some brown floccules, no odour
09:40	0.17	18.36	6.98	8940	-23	0.97	7.6	3.72	Clear and colourless with some brown floccules, no odour
09:43	0.17	18.40	6.99	8950	-26	0.68	8.0	4.03	Clear and colourless with some brown floccules, no odour
09:46	0.17	18.40	7.01	8960	-27	0.75	7.5	4.17	Clear and colourless with some brown floccules, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:51	Clear and colourless with some brown floccules	No odour	NO	Final depth to water 4.44 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	09:49	Analysis:	
Sample ID:	F6_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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Project: 318001362
Sample ID: F6
MAJOR TESTS: Cyanide

G2

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	7.65
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	13.34
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.68
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	579.02
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:41	Colourless	Slightly sulphidic odour	NA	

Field Parameters

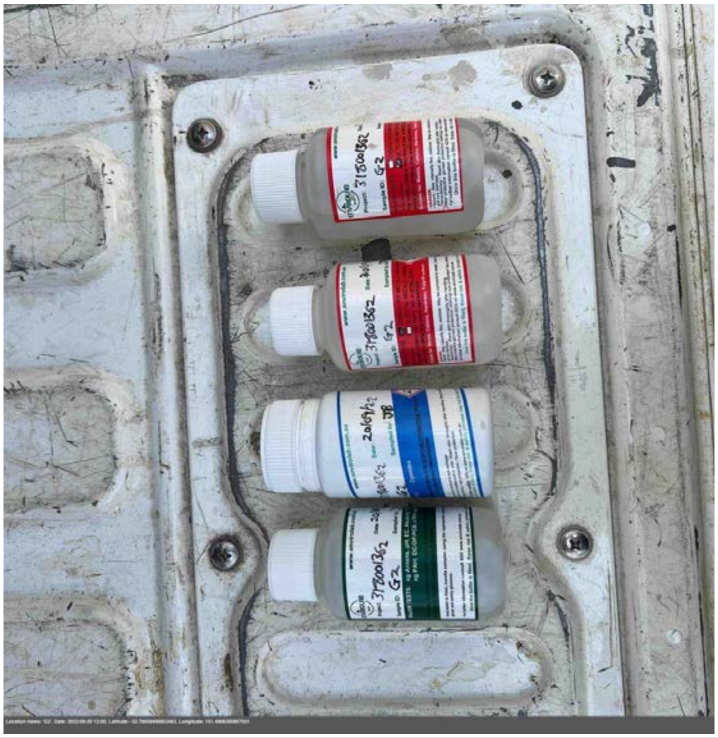
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
11:44	0.17	20.04	7.22	5280	-28	0.67	22.3	7.73	Clear, colourless, slight sulphidic odour
11:47	0.17	20.39	6.84	5290	-14	0.48	21.1	7.76	Clear, colourless, slight sulphidic odour
11:50	0.17	20.02	6.59	5330	-2	0.17	18.8	7.76	Clear, colourless, slight sulphidic odour
11:53	0.17	19.97	6.54	5330	0	0.03	19.3	7.76	Clear, colourless, slight sulphidic odour
11:56	0.17	20.08	6.53	5310	1	0.0	18.1	7.76	Clear, colourless, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:00	Clear, colourless	Slight sulphidic odour	NO	Final depth to water 7.74 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	12:58	Analysis:	
Sample ID:	G2_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



G5

Date:	09/21/2022	Weather Conditions:	Cloudy	Depth to Water	2.21
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	11.31
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	9.1
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	927.66
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:17	Colourless to very pale grey brown	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
08:20	0.17	15.93	7.92	2040	-22	0.93	40.0	2.48	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:23	0.17	16.17	6.36	1340	47	0.53	26.6	2.69	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:26	0.17	16.29	6.29	808	55	0.45	23.8	2.80	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:29	0.17	16.43	6.28	595	64	0.33	24.3	2.96	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:32	0.17	16.54	6.26	498	73	0.25	26.1	3.09	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:35	0.17	16.64	6.23	436	82	0.20	22.9	3.22	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:38	0.17	16.81	6.21	430	89	0.15	20.2	3.41	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour
08:41	0.17	16.93	6.19	457	90	0.11	18.6	3.56	Slightly turbid, colourless to very pale grey brown, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:00	Colourless to very pale brown	Slight sulphidic odour	NO	Final depth to water 3.82 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	08:56	Analysis:	
Sample ID:	G5_20220921	Bottles:	
QC Sample ID:	D01_20220921 and T01_20220921	QC Sample Time:	08:56
Remarks:			

G6

Date:	09/21/2022	Weather Conditions:	Cloudy	Depth to Water	3.43
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.66
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.23
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	329.26
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:58	Clear and colourless with light grey floccules	Strong sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
10:01	0.17	18.74	6.10	7450	108	0.67	8.2	3.50	Clear and colourless with light grey floccules, strong sulphidic odour
10:04	0.17	18.80	5.71	7480	142	0.31	7.4	3.51	Clear and colourless with light grey floccules, strong sulphidic odour
10:07	0.17	18.83	5.56	7470	147	0.24	8.6	3.51	Clear and colourless with light grey floccules, strong sulphidic odour
10:10	0.17	18.89	5.47	7420	150	0.16	6.5	3.51	Clear and colourless with light grey floccules, strong sulphidic odour
10:13	0.17	18.92	5.35	7410	149	0.11	5.5	3.52	Clear and colourless with light grey floccules, strong sulphidic odour
10:16	0.17	18.99	5.36	7410	147	0.09	6.1	3.52	Clear and colourless with light grey floccules, strong sulphidic odour
10:19	0.17	19.02	5.30	7390	146	0.08	5.3		Clear and colourless with light grey floccules, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:25	Clear and colourless with light grey floccules	Strong sulphidic odour	NO	Final depth to water 3.49 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	10:24	Analysis:	
Sample ID:	G6_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

N2

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	3.61
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.62
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.01
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	204.9
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:01	Pale yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
15:04	0.17	20.07	6.76	2360	94	5.39	10.4	3.87	Slightly turbid, pale yellow brown, no odour
15:07	0.17	19.97	6.70	2360	108	5.05	9.4	3.98	Slightly turbid, pale yellow brown, no odour
15:10	0.17	19.56	6.68	2380	121	4.88	11.2	4.14	Slightly turbid, pale yellow brown, no odour
15:13	0.17	19.76	6.68	2370	131	4.80	11.3	4.35	Slightly turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:20	Pale yellow brown	No odour	NO	Final depth to water 4.54 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	15:18	Analysis:	
Sample ID:	N2_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

N8

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	2.44
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.27
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.82
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	287.47
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:31	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
13:34	0.17	20.71	7.46	9450	-22	0.11	93.9	2.78	Turbid, dark yellow, no odour
13:37	0.17	20.70	7.46	9540	-20	0.02	88.1	2.90	Turbid, dark yellow, no odour
13:40	0.17	20.54	7.52	9610	-40	0.00	79.9	2.98	Turbid, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:45	Dark yellow	No odour		Final depth to water 3.17 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	13:43	Analysis:	
Sample ID:	N8_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			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Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

N9

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.71
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.84
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.13
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	115.19
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:09	Pale yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
12:12	0.17	16.77	8.22	266	-31	6.74	382	1.98	Turbid, pale yellow brown, no odour
12:15	0.17	17.84	8.25	261	-24	5.69	1000	2.06	Turbid, pale yellow brown, no odour
12:18	0.17	16.94	8.37	244	-15	5.01	1000	2.12	Turbid, pale yellow brown, no odour
12:21	0.17	16.54	8.39	240	-15	4.08	1000	2.12	Turbid, pale yellow brown, no odour
12:24	0.17	16.12	8.41	237	-12	3.30	1000	2.15	Turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:31	Pale yellow brown	No odour	NO	Finals depth to water 1.97 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	12:29	Analysis:	
Sample ID:	N9_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	1000 NTU is the max reading for turbidity on WQM		


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Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

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PUMP

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.40
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.45
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.05
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	208.97
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:01	Pale yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:04	0.17	15.68	9.77	7030	-20	1.43	27.2	1.45	Slightly turbid, pale yellow brown, no odour
09:07	0.17	15.55	9.77	7120	-39	0.56	28.7	1.47	Slightly turbid, pale yellow brown, no odour
09:10	0.17	15.55	9.78	7150	-50	0.38	30.9	1.49	Slightly turbid, pale yellow brown, no odour
09:13		15.59	9.78	7110	-55	0.3	31.4	1.51	Slightly turbid, pale yellow brown, no odour
09:16	0.17	15.64	9.78	7110	-58	0.22	31.9	1.53	Slightly turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:20	Pale brown	No odour	NO	Final depth with to water 1.57 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	09:18	Analysis:	
Sample ID:	PUMP_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

W1D

Date:	09/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	0.98
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.39
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	9.41
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	959.26
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:33	Dark yellow	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
11:36	0.17	21.08	8.76	14000	17	2.03	15.2	1.22	Clear, dark yellow, no odour
11:39	0.17	21.33	8.60	13900	11	0.86	13.4	1.39	Clear, dark yellow, no odour
11:42	0.17	21.60	8.54	13700	12	0.0	13.5	1.55	Clear, dark yellow, no odour
11:45	0.17	21.74	8.57	13600	14	0.0	12.2	1.75	Clear, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:56	Dark yellow	No odour	NO	Final depth to water 2.04 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	11:54	Analysis:	
Sample ID:	W1D_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W1S

Date:	09/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.15
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.34
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.19
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	121.3
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:04	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
12:07	0.17	22.34	8.46	11700	-6	0.67	54.5	1.53	Slightly turbid, dark yellow, no odour
12:10	0.17	21.51	8.22	11800	-27	0.59	53.2	1.62	Slightly turbid, dark yellow, no odour
12:13	0.17	22.71	8.13	11800	-36	0.01	44	1.70	Slightly turbid, dark yellow, no odour
12:16	0.17	22.81	8.12	11800	0	0.03	40	1.79	Slightly turbid, dark yellow, no odour
12:19	0.17	22.83	8.10	11800	12	0.0	33.5	1.83	Slightly turbid, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:24	Dark yellow	No odour	NO	Final depth to water 1.99 mbTOC

Sampling Summary

Sample Date:	09/21/2022	COC:	
Sample Time:	12:22	Analysis:	
Sample ID:	W1S_20220921	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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W2D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.29
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.09
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	518.87
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:36	Dark brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
08:38	0.17	15.23	10.81	31200	-234	1.71	8.8	1.47	Clear, dark brown, no odour
08:41	0.17	15.31	10.82	31900	-209	0.14	8.2	1.73	Clear, dark brown, no odour
08:44	0.17	15.39	10.81	32000	-188	0.0	5.6	1.91	Clear, dark brown, no odour
08:47	0.17	15.75	10.80	31800	-177	0.0	9.0	2.04	Clear, dark brown, no odour
08:50	0.17	15.96	10.79	31700	-167	0.0	7.5	2.17	Clear, dark brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:54	Clear dark brown	No odour	NO	Final depth to water 2.41 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	08:52	Analysis:	
Sample ID:	W2D_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

W2S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.53
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.84
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	85.63
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
07:56	Pale yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
07:59	0.17	14.71	7.48	1130	-27	1.37	204	1.61	Very turbid, pale yellow brown, no odour
08:02	0.17	14.76	7.38	1120	-31	1.29	134	1.62	Turbid, pale brown, no odour
08:05	0.17	14.77	7.32	1100	-31	1.16	213	1.63	Turbid, pale brown, no odour ,
08:08	0.17	14.80	7.24	1040	-34	0.87	60.2	1.64	Clear, colourless, no odour
08:11	0.17	14.83	7.15	925	-37	0.37	24.5	1.65	Clear, colourless, no odour
08:14	0.17	14.87	7.08	841	-37	0.20	19.9	1.64	Clear, colourless, no odour
08:17	0.17	14.90	7.06	808	-38	0.13	19.2	1.64	Clear, colourless, no odour
08:20	0.17	14.94	7.02	767	-46	0.03	15.6	1.64	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:30	Clear and colourless	No odour	NO	Final depth to water 1.60 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	08:30	Analysis:	
Sample ID:	W2S_20220920	Bottles:	
QC Sample ID:	D01_20220920 and T01_20220920	QC Sample Time:	08:30
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

W3D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU	mS/cm	mV	mg/L	NTU	m bmp	
15:14									Damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Damaged - unable to be sampled		

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W3S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.17
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.53
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.35
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	137.62
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:30	Yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
15:33	0.17	21.41	9.07	3500	50	3.74	10.2	1.40	Clear, yellow, no odour
15:36	0.17	21.32	9.11	3420	52	3.34	10.3	1.52	Clear, yellow, no odour
15:39	0.17	21.15	9.11	3350	56	3.06	10.8	1.61	Clear, yellow, no odour
15:42	0.17	20.45	9.30	3770	61	3.34	10.0	1.65	Clear, yellow, no odour
15:45	0.17	20.64	9.30	4500	54	2.86	9.8	1.71	Clear, yellow, no odour
15:48	0.17	20.57	9.29	4810	52	0.66	9.5	1.75	Clear, yellow, no odour
15:51	0.17	20.49	9.30	4930	67	0.44	9.3	1.80	Clear, yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:56	Yellow	No odour	NO	Final depth to water 1.80 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	15:54	Analysis:	
Sample ID:	W3S_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W3SA

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Destroyed - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Destroyed - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
15:11									Destroyed - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Destroyed - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Destroyed - unable to be sampled		

W4D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Destroyed - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Destroyed - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
15:12									Destroyed - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Destroyed - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Destroyed - unable to be sampled		

W4S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	0.96
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.09
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.13
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	13.25
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
15:59									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

W5D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	4.88
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.63
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.75
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	586.16
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:42	Clear and colourless with brown floccules	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
14:45	0.17	19.21	6.98	928	33	5.41	25.2	5.56	Clear and colourless with brown floccules, sulphidic odour
14:48	0.17	19.40	7.05	934	34	4.81	20.8	5.65	Clear and colourless with brown floccules, sulphidic odour
14:51	0.17	19.32	7.08	943	37	4.88	20.1	5.74	Clear and colourless with brown floccules, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:55	Clear and colourless with brown floccules	Sulphidic odour	NO	Final depth to water 6.93 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	14:54	Analysis:	
Sample ID:	W5D_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

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W5D
Cyanides

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W5S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.62
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.71
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.08
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	8.15
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
14:33									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W6D

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	4.90
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	8.79
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.88
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	395.53
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:55	Pale grey brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
12:58	0.17	19.90	6.35	742	127	3.36	1000	5.15	Very turbid, pale grey brown, no odour
13:01	0.17	19.76	6.06	737	132	3.16	1000	5.26	Very turbid, pale grey brown, no odour
13:04	0.17	20.10	6.00	726	140	3.25	585	5.28	Very turbid, pale grey brown, no odour
13:07	0.17	19.12	6.07	730	127	3.31	442	5.34	Very turbid, pale grey brown, no odour
13:10	0.17	19.71	5.95	721	163	3.01	721	5.38	Very turbid, pale grey brown, no odour
13:13	0.17	19.64	5.95	722	166	2.99	555	5.41	Very turbid, pale grey brown, no odour
13:16	0.17	19.67	5.90	719	168	3.14	799	5.43	Very turbid, pale grey brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:22	Pale grey brown	No odour	NO	Final depth to water 5.37 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	13:20	Analysis:	
Sample ID:	W6D_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	1000 NTU is the max reading for turbidity on WQM		


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W6D

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W6S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	2.51
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.1
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.59
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	60.14
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:36	Pale yellow brown	No odour	NA	

Field Parameters

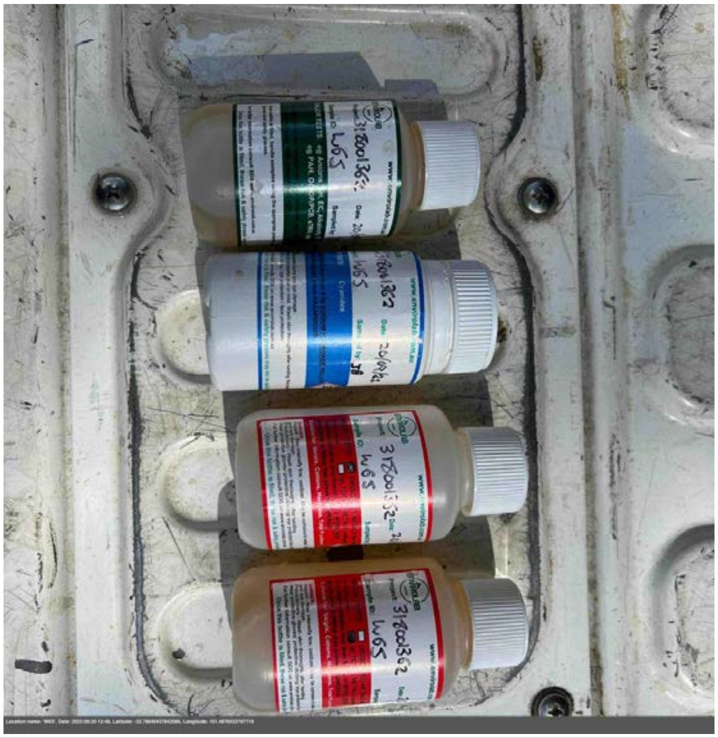
Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
12:39	0.17	19.48	8.46	8200	3	2.41	138	2.71	Turbid pale yellow brown, no odour
12:42	0.17	19.50	8.55	8260	19	1.92	125	2.76	Turbid, pale yellow brown, no odour
12:45	0.17	19.49	8.56	8250	43	1.58	109	2.84	Turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:50	Yellow brown	No odour	NO	Final depth to water 2.91 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	12:48	Analysis:	
Sample ID:	W6S_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			



W7M

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.61
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.73
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.11
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	215.09
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:02	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:05	0.17	17.71	10.07	9800	-169	0.27	9.6	1.93	Slightly turbid, dark yellow, no odour
10:08	0.17	17.81	10.09	9820	9.83	0.49	9.0	2.28	Turbid, pale yellow brown, no odour
10:11	0.17	17.96	10.11	10300	94	0.15	7.6	2.36	Turbid, pale yellow brown, no odour
10:14	0.17	18.05	10.16	10800	-165	0.0	6.6	2.42	Turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:21	Pale yellow brown	No odour	NO	Finals depth to water 2.55 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	10:19	Analysis:	
Sample ID:	Yw7M_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

W7S

Date:	09/20/2022	Weather Conditions:	Sunny	Depth to Water	1.51
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.33
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.82
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	83.59
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:29	Colourless with orange brown floccules	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
09:32	0.17	16.37	7.43	647	-40	1.04	291	1.63	Turbid, pale yellow brown, no odour
09:35	0.17	16.51	7.67	600	-63	1.23	138	1.63	Turbid, pale yellow brown, no odour
09:38	0.17	16.60	7.78	597	-67	1.18	117	1.63	Turbid, pale yellow brown, no odour
09:41	0.17	16.76	7.83	569	-71	1.14	79.1	1.65	Turbid, pale yellow brown, no odour
09:44	0.17	16.90	7.29	641	-62	0.49	132	1.67	Turbid, pale yellow brown, no odour
09:47	0.17	17.03	7.18	573	-63	0.34	75.2	1.72	Turbid, pale yellow brown, no odour
09:50	0.17	17.19	7.14	542	-63	0.31	61.2	1.77	Turbid, pale yellow brown, no odour
09:53	0.17	17.32	7.13	538	-64	0.22	53.0	1.83	Turbid, pale yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:58	Pale yellow brown	Slight sulphidic odour	NO	Final depth to water 1.93 mbTOC

Sampling Summary

Sample Date:	09/20/2022	COC:	
Sample Time:	09:56	Analysis:	
Sample ID:	W7S_20220920	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

Gauging Data

Sampler: Jake Bourke

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
A7	09/21/2022 10:37		12.319	4.31	1.60	10.719					
E11	09/20/2022 13:51		10.84	4.78	2.21	8.63					
E4	09/21/2022 11:04		13.81	3.4	1.59	12.22					
E5	09/20/2022 10:30		14.104	2.57	1.54	12.564					
E5D	09/20/2022 10:59		14.182	5.43	1.93	12.252					
F5	09/21/2022 09:02		7.63	7.38	2.27	5.36					
F6	09/21/2022 09:31		6.68	15.49	3.36	3.32					
G2	09/20/2022 11:36		14.342	13.34	7.65	6.692					
G5	09/21/2022 08:12		7.59	11.31	2.22	5.37					
G6	09/21/2022 09:53		6.55	6.66	3.43	3.12					
N2	09/20/2022 14:59		8.853	5.62	3.61	5.243					
N8	09/20/2022 13:25		12.15	5.27	2.44	9.71					
N9	09/20/2022 12:07		11.532	2.84	1.71	9.822					
PUMP	09/20/2022 08:56		10.629	3.45	1.40	9.229					
W1D	09/21/2022 11:30		13.112	10.39	0.98	12.132					
W1S	09/21/2022 11:59		13.177	2.34	1.15	12.027					
W2D	09/20/2022 08:33		14.033	6.38	1.29	12.743					
W2S	09/20/2022 07:54		14.229	2.39	1.53	12.699					
W3D	09/20/2022 15:13		11.29			11.29					Damaged - unable to be sampled
W3S	09/20/2022 15:30		11.352	2.53	1.17	10.182					
W3SA	09/20/2022 15:11		10.786			10.786					Destroyed - unable to be sampled
W4D	09/20/2022 15:12		10.839			10.839					Destroyed - unable to be sampled
W4S	09/20/2022 15:58		10.629	1.09	0.96	9.669					Insufficient water to sample

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
W5D	09/20/2022 14:35		10.571	10.63	4.88	5.691					
W5S	09/20/2022 14:32		10.493	1.71	1.62	8.873					Insufficient water to sample
W6D	09/20/2022 12:51		10.289	8.79	4.90	5.389					
W6S	09/20/2022 12:33		10.69	3.1	2.51	8.18					
W7M	09/20/2022 09:59		14.318	3.73	1.62	12.698					
W7S	09/20/2022 09:25		14.299	2.33	1.51	12.789					

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

A7

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.02
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.32
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.3
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	234.46
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:24	Dark yellow brown	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
11:27	0.17	21.08	10.21	13.6	-236	0.57	12.9	2.12	Clear, dark yellow brown, no odour
11:30	0.17	21.66	10.20	13.5	-240	0.28	9.4	2.19	Clear, dark yellow brown, no odour
11:33	0.17	21.78	10.20	13.4	-232	0.16	8.3		Clear, dark yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:38	Dark yellow brown	No odour	NA	Final depth to water 2.27 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	11:37	Analysis:	
Sample ID:	A7_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'A7', Date: 12/21/22 11:38, Azimuth: 218.3203125,Latitude: -32.78762172910644, Longitude: 151.48629183895093

E11

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.74
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	4.77
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.02
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	205.92
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
13:10	Brown yellow	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
13:13	0.17	23.96	9.84	7.39	-170	0.36	340	2.76	Turbid, brown yellow, slight sulphidic odour
13:16	0.17	23.83	9.80	6.35	-175	0.20	236	2.76	Turbid, brown yellow, slight sulphidic odour
13:19	0.17	23.59	9.67	4.85	-185	0.14	129	2.78	Turbid, brown yellow, slight sulphidic odour
13:22	0.17	23.31	9.37	3.71	-216	0.41	81.1	2.78	Turbid, brown yellow, slight sulphidic odour
13:25	0.17	23.32	8.91	3.20	-208	0.85	53.8	2.78	Turbid, brown yellow, slight sulphidic odour
13:28	0.17	23.33	8.84	2.92	-192	0.92	38.9	2.78	Turbid, brown yellow, slight sulphidic odour
13:31	0.17	23.34	8.80	2.79	-182	0.95	36.8	2.78	Turbid, brown yellow, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:33	Brown yellow	Slight sulphidic odour	NA	Final depth to water 2.76 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	13:31	Analysis:	
Sample ID:	E11_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

E4

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.12
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.42
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.29
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	131.5
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
07:59	Dark yellow brown	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
08:02	0.17	18.05	10.69	27.8	-204	0.64	5.5	2.19	Clear, dark yellow brown, slight sulphidic odour
08:05	0.17	18.20	10.69	27.8	-209	0.38	5.4	2.23	Clear, dark yellow brown, slight sulphidic odour
08:08	0.17	18.30	10.70	27.9	-215	0.25	5.4	2.29	Clear, dark yellow brown, slight sulphidic odour
08:11	0.17	18.31	10.70	28.0	-221	0.22	5.2	2.34	Clear, dark yellow brown, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:19	Dark yellow brown	Slight sulphidic odour	NA	Final depth to water 2.48 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	08:17	Analysis:	
Sample ID:	E4_20221221	Bottles:	
QC Sample ID:	D02_20221221	QC Sample Time:	08:17
Remarks:			


Location name: 'E4', Date: 12/21/22 08:20, Azimuth: -1.0,Latitude: -32.78866267766139, Longitude: 151.48627616479203


Location name: 'E4', Date: 12/21/22 08:20, Azimuth: -1.0,Latitude: -32.78865831907174, Longitude: 151.48627071655494

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

E5

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.08
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.58
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.5
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	50.97
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:08	Dark yellow brown	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:11	0.17	18.81	10.22	19.2	-31	1.16	5.3	2.19	Clear, dark yellow brown, sulphidic odour
10:14	0.17	18.92	10.21	19.6	-48	0.64	5.2	2.23	Clear, dark yellow brown, sulphidic odour
10:17	0.17	19.34	10.19	19.7	-60	0.29	5.1	2.29	Clear, dark yellow brown, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:20	Dark yellow brown	Sulphidic odour	NO	Final depth to water 2.39 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	10:20	Analysis:	
Sample ID:	E5_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


318001362
E5
Location name: 'E5', Date: 12/20/22 10:19, Azimuth: -1.0,Latitude: -32.79832007584755, Longitude: 151.4858752385918

RAMBOLL

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

E5D

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.07
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.45
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.38
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	344.56
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:25	Dark yellow	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:28	0.17	18.52	8.41	13.4	-64	1.7	75.1	2.24	Slightly turbid, dark yellow, sulphidic odour
10:31	0.17	18.72	8.33	13.3	-92	0.83	71.2	2.27	Slightly turbid, dark yellow, sulphidic odour
10:34	0.17	19.18	8.30	13.2	-102	0.21	71.5	2.31	Slightly turbid, dark yellow, sulphidic odour
10:37	0.17	19.72	8.17	13.2	-102	0.06	66.6	2.36	Slightly turbid, dark yellow, sulphidic odour
10:40	0.17	20.07	8.1	13.1	-102	0.0	58.1	2.40	Slightly turbid, dark yellow, sulphidic odour
10:43	0.17	20.27	8.1	13.1	-100	0.0	55.5		Slightly turbid, dark yellow, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:50	Dark yellow	Sulphidic odour	NO	Final depth to water 2.36 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	10:50	Analysis:	
Sample ID:	E5D_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Location name: 'ESD', Date: 12/20/22 10:49, Azimuth: -1.0,Latitude: -32.788321982564575, Longitude: 151.4858805891482

F5

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.56
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	7.39
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	4.83
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	492.37
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:59	Pale grey	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:02	0.17	20.45	5.13	8.63	113	1.02	64.2	2.91	Clear, colourless with grey floccules, no odour
10:05	0.17	20.35	4.83	9.66	117	0.20	40.1	3.04	Clear, colourless with grey floccules, no odour
10:08	0.17	20.33	4.77	9.78	116	0.06	27.3	3.13	Clear, colourless with grey floccules, no odour
10:11	0.17	19.52	4.74	10.1	116	0.02	15.6	3.19	Clear, colourless with grey floccules, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:15	Colourless with grey floccules	No odour	NA	Final depth to water 3.21 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	10:14	Analysis:	
Sample ID:	F5_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Location name: 'F5', Date: 12/21/22 10:14, Azimuth: 210.9375,Latitude: -32.78604475784375, Longitude: 151.4906360955457

RAMBOLL

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

F6

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	3.75
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	15.47
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	11.72
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	1194.74
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:24	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:27	0.17	19.29	7.03	9.07	-43	1.46	27.8	3.28	Clear, colourless, no odour
10:30	0.17	19.24	7.13	9.02	-52	1.00	7.3	4.15	
10:33	0.17	19.20	7.18	8.99	-54	0.75	9.1	4.26	Clear, colourless, no odour
10:36	0.17	19.05	7.22	9.02	-53	0.57	8.7	4.39	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
10:38	Colourless	No odour	NA	Finals depth to water 4.67 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	10:37	Analysis:	
Sample ID:	F6_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'F6', Date: 12/21/22 10:38, Azimuth: -1.0,Latitude: -32.787645156525805, Longitude: 151.48973068236512

G2

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	7.58
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	13.35
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.77
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	588.19
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:19	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
11:22	0.17	22.08	7.75	5.06	-80	0.5	41.5	7.69	Clear, colourless, no odour
11:25	0.17	22.08	6.91	4.97	-28	0.22	38.9	7.70	Clear, colourless, no odour
11:28	0.17	22.07	6.85	4.96	-18	0.21	36.5	7.70	Clear, colourless, no odour
11:31	0.17	22.05	6.78	4.93	-13	0.19	37.3	7.70	Clear, colourless, no odour
11:34	0.17	21.99	6.74	4.95	-12	0.1	36.2	7.0	Clear, colourless, no odour
11:37	0.17	21.94	6.78	4.89	-13	0.09	33.1	7.70	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
11:40	Colourless	No odour	NA	Final depth to water 7.69 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	11:38	Analysis:	
Sample ID:	G2_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

G5

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.53
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	11.34
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	8.81
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	898.09
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:36	Pale grey	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:39	0.17	20.74	7.19	5.16	-38	0.25	290	2.94	Turbid, pale grey, no odour
09:42	0.17	19.60	6.32	5.34	47	0.10	131	3.26	Turbid, pale grey, no odour
09:45	0.17	20.33	6.16	4.72	62	0.07	114	3.32	Slightly turbid, pale grey, no odour
09:48	0.17	20.87	6.14	4.17	64	0.05	79.5	3.57	Slightly turbid, pale grey, no odour
09:51	0.17	21.07	6.12	3.71	65	0.05	56.2	3.72	Clear, colourless with grey floccules, no odour
09:54	0.17	21.14	6.10	3.50	66	0.05	43.2	3.77	Clear, colourless with grey floccules, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:56	Colourless with grey floccules	No odour	NA	Final depth to water 3.92 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	09:55	Analysis:	
Sample ID:	G5_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'G5', Date: 12/21/22 09:56, Azimuth: -1.0,Latitude: -32.79456013143231, Longitude: 151.51229391454865

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

G6

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	3.81
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.68
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.86
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	291.55
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
10:43	Colourless with grey floccules	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
10:46	0.17	19.11	5.76	8.49	-42	0.98	37.7	3.89	Clear, colourless with grey floccules, strong sulphidic odour
10:49	0.17	18.80	5.02	8.53	31	0.87	6.8	3.94	Clear, colourless with grey floccules, strong sulphidic odour
10:52	0.17	18.72	4.89	8.56	38	0.76	6.3	3.91	Clear, colourless with grey floccules, strong sulphidic odour
10:55	0.17	18.69	4.45	8.60	65	0.40	3.8	3.91	Clear, colourless with grey floccules, strong sulphidic odour
10:58	0.17	18.62	4.33	8.65	68	0.29	2.7	4.92	Clear, colourless with grey floccules, strong sulphidic odour
11:01	0.17	18.66	4.17	8.69	78	0.0	2.4	3.92	Clear, colourless with grey floccules, strong sulphidic odour
11:04	0.17	18.64	4.15	8.74	84	0.00	3.0	3.92	Clear, colourless with grey floccules, strong sulphidic odour
11:07	0.17	18.75	4.10	8.75	86	0.0	2.7	3.92	Clear, colourless with grey floccules, strong sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
	Colourless with grey floccules	Strong sulphidic odour	NA	Final depth to water 3.91 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	11:09	Analysis:	
Sample ID:	G6_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'G6', Date: 12/21/22 11:10, Azimuth: -1.0,Latitude: -32.78758032250485, Longitude: 151.48972221664292

N2

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	3.66
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.62
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.96
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	199.8
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:29	Pale yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
15:32	0.17	22.45	8.01	2.02	47	0.97	5.8	3.94	Clear, pale yellow, no odour
15:35	0.17	22.46	7.75	2.09	59	0.96	6.1	4.06	Clear, pale yellow, no odour
15:38	0.17	21.91	7.43	3.58	35	2.58	19.3	4.13	Clear, pale yellow, no odour
15:41	0.17	22.25	6.16	3.58	115	0.72	16.1	4.19	Clear, pale yellow, no odour
15:44	0.17	21.85	6.11	3.74	122	0.65	23.5	4.42	Clear, pale yellow, no odour
15:47	0.17	21.17	6.03	3.91	124	0.64	22.2	4.54	Clear, pale yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:50	Pale yellow	No odour	NA	Finals depth to water 4.85 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	15:49	Analysis:	
Sample ID:	N2_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N8

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.83
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	5.23
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	2.4
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	244.65
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:48	Dark yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
12:51	0.17	23.85	7.45	9.11	-117	1.14	139	3.17	Turbid, dark yellow, no odour
12:54	0.17	24.48	7.49	8.97	-119	0.67	122	3.21	Turbid, dark yellow, no odour
12:57	0.17	24.63	7.51	8.91	-120	0.67	106	3.41	Turbid, dark yellow, no odour
13:00	0.17	24.67	7.54	8.92	-122	0.66	129	3.59	Turbid, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
13:03	Dark yellow	No odour	NA	Final depth to water 3.77 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	13:02	Analysis:	
Sample ID:	N8_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

N9

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.32
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.82
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.5
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	50.97
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
11:48	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
11:51	0.17	18.92	8.24	0.389	-123	1.78	323	2.58	Turbid, colourless, no odour
11:54	0.17	19.24	7.97	0.406	-110	1.19	252	2.61	Turbid, colourless, no odour
11:57	0.17	19.54	7.84	0.419	-100	2.13	536	2.64	Turbid, pale grey, no odour
12:00	0.17	19.98	7.81	0.447	-91	2.94	594	2.66	Turbid, pale grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:06	Pale grey	No odour	NO	Final depth to water 2.74 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	12:06	Analysis:	
Sample ID:	N9_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'N9', Date: 12/20/22 12:06, Azimuth: -1.0,Latitude: -32.78639189436367, Longitude: 151.48747603423104

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

PUMP

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.11
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.43
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.32
Sampling Type:	Low Flow	Casing Diameter:	100	Water Volume in Well	134.56
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:10	Pale brown	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
09:13	0.17	19.22	10.54	9.79	-258	1.39	236	2.17	Turbid, yellow brown, sulphidic odour
09:16	0.17	19.31	10.52	9.49	-253	0.25	229	2.23	Turbid, yellow brown, sulphidic odour
09:19	0.17	19.44	10.48	9.00	-245	0.02	215	2.30	Turbid, yellow brown, sulphidic odour
09:22	0.17	19.50	10.45	8.69	-238	0.0	208	2.34	Turbid, yellow brown, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:25	Yellow brown	Sulphidic odour	NA	Final depth to water 2.39 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	09:24	Analysis:	
Sample ID:	PUMP_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W1D

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.30
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.4
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	9.1
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	927.66
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:38	Pale yellow brown	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
08:41	0.17	20.27	9.53	12.6	-188	1.54	299	1.66	Turbid, pale yellow brown, slight sulphidic odour
08:44	0.17	20.32	9.51	12.5	-194	1.76	290	1.87	Turbid, pale yellow brown, slight sulphidic odour
08:47	0.17	20.42	9.23	12.4	-197	1.94	290	2.11	Turbid, pale yellow brown, slight sulphidic odour
08:50	0.17	20.50	8.97	12.4	-197	2.01	286	2.22	Turbid, pale yellow brown, slight sulphidic odour
08:53	0.17	20.67	8.84	12.6	-197	2.09	267	2.56	Turbid, pale yellow brown, slight sulphidic odour
08:56	0.17	20.80	8.84	12.7	-192	2.12	261	2.71	Turbid, pale yellow brown, slight sulphidic odour
08:59	0.17	20.92	8.92	12.6	-190	2.12	257	2.92	Turbid, pale yellow brown, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:02	Pale yellow brown	Slight sulphidic odour	NA	Final depth to water 3.12 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	08:59	Analysis:	
Sample ID:	W1D_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			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W1D
Location name: 'W1D', Date: 12/21/22 09:02, Azimuth: 64.3359375,Latitude: -32.78871724385097, Longitude: 151.48611950702173

W1S

Date:	12/21/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.55
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.43
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.88
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	89.7
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:10	Yellow	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:13	0.17	21.67	7.96	12.3	-140	0.77	70.5	1.86	Slightly turbid, yellow, slight sulphidic odour
09:16	0.17	21.72	7.96	12.2	-144	0.71	54.8	1.92	Slightly turbid, yellow, slight sulphidic odour
09:19	0.17	21.76	7.98	11.9	-147	0.70	23.1	2.03	Slightly turbid, yellow, slight sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:22	Yellow	Slight sulphidic odour	NA	Final depth to water 2.23 mbTOC

Sampling Summary

Sample Date:	12/21/2022	COC:	
Sample Time:	09:20	Analysis:	
Sample ID:	W1S_20221221	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

318001362
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W1S
Location name: 'W1S', Date: 12/21/22 09:21, Azimuth: 172.265625,Latitude: -32.78869364879354, Longitude: 151.48637230522138

Project No.: 318001362

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W2D

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.9
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	6.38
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	4.48
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	456.69
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:34	Dark brown	Sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
08:37	0.16	18.56	11.0	31.7	-301	0.37	3.7	2.26	Clear, dark brown, sulphidic odour
08:40	0.17	18.63	11.0	31.7	-311	0.0	2.5	2.38	Clear, dark brown, sulphidic odour
08:43	0.17	18.62	10.99	31.7	-312	0.0	2.1	2.51	Clear, dark brown, no odour
08:46	0.17	18.66	10.99	31.7	-314	0.0	2.0	2.76	Clear, dark brown, sulphidic odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:04	Dark brown	Sulphidic odour	NO	Final depth to water 3.47 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	09:05	Analysis:	
Sample ID:	W2D_20221220	Bottles:	
QC Sample ID:	D01_20221220 and T01_20221220	QC Sample Time:	09:05
Remarks:			


Location name: 'W2D', Date: 12/20/22 09:04, Azimuth: -1.0,Latitude: -32.788894437083485, Longitude: 151.4857910204703


Location name: 'W2D', Date: 12/20/22 09:04, Azimuth: -1.0,Latitude: -32.788893049216206, Longitude: 151.4857943772569


Location name: 'W2D', Date: 12/20/22 09:04, Azimuth: -1.0,Latitude: -32.788893457229186, Longitude: 151.48579361251967

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

W2S

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.12
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.39
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.27
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	27.52
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
08:15	Pale brown	No odour	NO	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
08:23		18.96	7.17	4.78	-55	1.72	1000	2.39	Very turbid, pale brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
08:23	Pale brown	No odour	NO	Very turbid. 1000 NTU is max reading for turbidity on WQM

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	08:24	Analysis:	
Sample ID:	W2S_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well purged dry - sample taken from flow cell		


Location name: 'W2S', Date: 12/20/22 08:29, Azimuth: 5.625,Latitude: -32.78890864460989, Longitude: 151.48579051732224

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W3D

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:35									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

W3S

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	1.64
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.54
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.9
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	91.74
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
15:04	Dale yellow	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
15:07	0.17	22.05	9.34	8.31	25	1.45	4.1	1.70	Clear, dark yellow, no odour
15:10	0.17	22.61	9.32	8.20	17	1.48	4.0	1.88	Clear, dark yellow, no odour
15:13	0.17	22.98	8.34	8.18	-7	0.07	3.9	1.97	Clear, dark yellow, no odour
15:16	0.17	22.99	8.35	8.19	-6	0.04	3.7	2.12	Clear, dark yellow, no odour
15:19	0.17	22.99	8.30	8.18	7	0.17	3.7	2.16	Clear, dark yellow, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
15:22	Dark yellow	No odour	NA	Final depth to water 2.35 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	15:21	Analysis:	
Sample ID:	W3S_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


Location name: 'W3S', Date: 12/20/22 15:23, Azimuth: 346.640625,Latitude: -32.78742856814785, Longitude: 151.4866147098611

W3SA

Date:	12/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
10:36									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W4D

Date:	12/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well damaged - unable to be sampled				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well damaged - unable to be sampled

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
10:39									Well damaged - unable to be sampled

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Well damaged - unable to be sampled

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well damaged - unable to be sampled		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W4S

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.11
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well dry				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well dry

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
13:40									Well dry

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NA	Well dry

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well dry		

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W5D

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	5.0
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	10.53
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	5.52
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	562.71
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
14:29	Colourless	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU			mg/L	NTU	m bmp	
14:32	0.17	22.44	8.45	1.59	11	1.32	8.7	5.62	Clear, colourless, no odour
14:35	0.17	22.53	8.36	1.46	20	0.91	10.4	5.78	Clear, colourless, no odour
14:38	0.17	22.57	8.26	1.69	32	3.68	7.0	5.82	Clear, colourless, no odour
14:41	0.17	22.54	7.79	2.08	4	4.16	5.4	5.85	Clear, colourless, no odour
14:44	0.17	22.60	7.57	2.16	15	3.17	5.0	5.88	Clear, colourless, no odour
14:47	0.17	22.70	7.45	0.843	20	4.13	4.5	5.88	Clear, colourless, no odour
14:50	0.17	22.84	7.51	0.824	11	4.60	4.4	5.88	Clear, colourless, no odour
14:53	0.17	22.89	7.54	0.812	8	5.13	4.5	5.88	Clear, colourless, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
14:55	Colourless	No odour	NA	Final depth to water 5.88 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	14:54	Analysis:	
Sample ID:	W5D_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022

Hart Rd, Loxford

Project No.: 318001362

W5S

Date:	12/20/2022	Weather Conditions:	Sunny	Depth to Water	
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	1.26
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Well dry				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Well dry

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
14:16									Well dry

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
			NA	Well dry

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Well dry		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W6D

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	4.92
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	8.79
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	3.86
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	393.49
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
12:16	Pale yellow brown grey	No odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
12:19	0.17	20.67	6.79	0.840	85	0.95	720	5.14	Very turbid, pale yellow brown grey, no odour
12:22	0.17	20.76	6.40	0.842	141	0.78	709	5.28	Very turbid, pale yellow brown grey, no odour
12:25	0.17	20.84	6.31	0.844	162	0.61	403	5.35	Very turbid, pale yellow brown grey, no odour
12:28	0.17	20.95	6.28	0.851	175	0.54	394	5.42	Very turbid, pale yellow brown grey, no odour
12:31	0.17	21.24	6.24	0.841	167	0.36	413	5.38	Very turbid, pale yellow brown grey, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
12:42	Pale yellow brown grey	No odour	NO	Final depth to water 5.21 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	12:39	Analysis:	
Sample ID:	W6D_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


318001362
W6D
Location name: 'W6D', Date: 12/20/22 12:41, Azimuth: 88.9453125,Latitude: -32.7864624699883, Longitude: 151.48774014799994

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

W6S

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.87
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.11
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.23
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	23.44
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
12:11									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Groundwater Monitoring Field Data Form

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

W7M

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.35
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	3.73
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	1.38
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	140.67
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:					

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
09:35	Yellow brown	Slight sulphidic odour	NA	

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min	C	SU	mS/cm	mV	mg/L	NTU	m bmp	
09:38	0.17	19.48	10.39	12.6	-188	0.35	5.9	2.77	Clear, yellow brown, slight sulphidic odour
09:41	0.17	19.51	10.36	12.8	-33	0.32	7.8	2.87	Clear, yellow brown, slight sulphidic odour
09:44	0.17	19.34	10.43	14.5	-124	0.32	10.2	3.02	Clear, yellow brown, slight sulphidic odour
09:47	0.17	19.38	10.78	23	-270	0.0	88.8	3.17	Turbid, dark yellow brown, no odour
09:50		19.35	10.78	23.2	-270	0.0	83.5	3.21	Turbid, dark yellow brown, no odour
09:53	0.17	19.43	10.81	23.3	-255	0.0	177		Turbid, dark yellow brown, no odour

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
09:58	Dark yellow brown	Slight sulphidic odour	NA	Final depth to water 3.11 mbTOC

Sampling Summary

Sample Date:	12/20/2022	COC:	
Sample Time:	09:54	Analysis:	
Sample ID:	W7M_20221220	Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:			


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318001362
W7M
Cyanides
Location name: 'W7M', Date: 12/20/22 09:58, Azimuth: 91.2008426725152,Latitude: -32.788460939956295, Longitude: 151.48584837182324

W7S

Date:	12/20/2022	Weather Conditions:	Sunny|Cloudy	Depth to Water	2.11
Purge Method:	Low Flow - Peristaltic Pump	Water Quality Meter:	Horiba	Well Depth:	2.32
Purge Volume Units:	L	Casing Material:	PVC	Water Column in Well:	0.2
Sampling Type:	Low Flow	Casing Diameter:	50	Water Volume in Well	20.38
Pump Intake Depth:		Casing Volume to Remove:		Total Volume to Remove:	
Comments:	Insufficient water to sample				

Initial Observations

Purge Start Time	Color	Odor	Sheen/Product	Remarks
			NA	Insufficient water to sample

Field Parameters

Time	Flow Rate	Temp	pH	Cond.	ORP	DO	Turbidity	DTW	Remarks
	L/min		SU				NTU	m bmp	
09:31									Insufficient water to sample

Final Observations

End purge time	Color	Odor	Sheen/Product	Remarks
				Insufficient water to sample

Sampling Summary

Sample Date:		COC:	
Sample Time:		Analysis:	
Sample ID:		Bottles:	
QC Sample ID:		QC Sample Time:	
Remarks:	Insufficient water to sample		

Groundwater Monitoring Field Data Form
Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Project No.: 318001362

Gauging Data

Sampler: Jake Bourke

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
A7	12/21/2022 11:23		12.319	4.32	2.02	10.299					
E11	12/20/2022 13:08		10.84	4.77	2.74	8.1					
E4	12/21/2022 07:54		13.81	3.42	2.12	11.69					
E5	12/20/2022 10:05		14.104	2.58	2.08	12.024					
E5D	12/20/2022 10:20		14.182	5.45	2.07	12.112					
F5	12/21/2022 09:58		7.63	7.39	2.56	5.07					
F6	12/21/2022 10:20		6.68	15.47	3.75	2.93					
G2	12/20/2022 11:11		14.342	13.35	7.58	6.762					
G5	12/21/2022 09:34		7.59	11.34	2.53	5.06					
G6	12/21/2022 10:41		6.55	6.68	3.81	2.74					
N2	12/20/2022 15:26		8.853	5.62	3.66	5.193					
N8	12/20/2022 12:46		12.15	5.23	2.83	9.32					
N9	12/20/2022 11:45		11.532	2.82	2.32	9.212					
PUMP	12/20/2022 09:10		14.302	3.43	2.11	12.192					
W1D	12/21/2022 08:33		13.112	10.4	1.30	11.812					
W1S	12/21/2022 09:07		13.177	2.43	1.55	11.627					
W2D	12/20/2022 08:32		14.033	6.38	1.90	12.133					
W2S	12/20/2022 07:54		14.229	2.39	2.12	12.109					
W3D	12/20/2022 10:34		11.29			11.29					Well damaged - unable to be sampled
W3S	12/20/2022 15:01		11.352	2.54	1.64	9.712					
W3SA	12/20/2022 10:36		10.786			10.786					Well damaged - unable to be sampled
W4D	12/20/2022 10:39		10.839			10.839					Well damaged - unable to be sampled

Groundwater Monitoring Field Data Form

Project No.: 318001362

Site: Hydro Quarterly Groundwater Monitoring 2022
Hart Rd, Loxford

Well	Date/Time	Depth Installed	Reference Elevation (ft)	Well Depth (ft)	Depth To Water (ft)	GW Elevation (ft)	NAPL Start Depth	NAPL End Depth	Calculate NAPL Thickness	PID (ppmv)	Remarks
W4S	12/20/2022 13:39		10.629	3.11		10.629					Wells dry
W5D	12/20/2022 14:21		10.571	10.53	5.0	5.571					
W5S	12/20/2022 14:15		10.493	1.26		10.493					Well dry
W6D	12/20/2022 12:12		10.289	8.79	4.92	5.369					
W6S	12/20/2022 12:10		10.69	3.11	2.87	7.82					Insufficient water to sample
W7M	12/20/2022 09:34		14.318	3.73	2.35	11.968					
W7S	12/20/2022 09:30		14.299	2.32	2.11	12.189					Insufficient water to sample

APPENDIX 5
LABORATORY REPORTS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 291631

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001362**
Number of Samples	26 Water
Date samples received	22/03/2022
Date completed instructions received	22/03/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	30/03/2022
Date of Issue	30/03/2022

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Results Approved By
Diego Bigolin, Inorganics Supervisor
Hannah Nguyen, Metals Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		291631-1	291631-2	291631-3	291631-4	291631-5
Your Reference	UNITS	W2S	W2D	PUMP	W7M	W7S
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Date analysed	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Fluoride, F	mg/L	37	970	19	400	27
Total Cyanide	mg/L	0.27	220	0.035	29	0.51
Free Cyanide in Water	mg/L	<0.004	0.066	<0.004	0.030	<0.004

Miscellaneous Inorganics						
Our Reference		291631-6	291631-7	291631-8	291631-9	291631-10
Your Reference	UNITS	E5	E5D	G2	N8	N9
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Date analysed	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Fluoride, F	mg/L	360	10	0.3	0.5	79
Total Cyanide	mg/L	56	0.70	<0.004	0.38	0.65
Free Cyanide in Water	mg/L	0.30	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		291631-11	291631-12	291631-13	291631-14	291631-15
Your Reference	UNITS	W6D	E11	W5D	N2	F5
Date Sampled		17/03/2022	17/03/2022	17/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Date analysed	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Fluoride, F	mg/L	<0.1	8.3	0.8	0.7	0.2
Total Cyanide	mg/L	<0.004	0.20	<0.004	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		291631-16	291631-17	291631-18	291631-19	291631-20
Your Reference	UNITS	G5	F6	G6	W3S	A7
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Date analysed	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Fluoride, F	mg/L	0.1	0.5	0.4	290	330
Total Cyanide	mg/L	<0.004	<0.004	<0.004	26	45
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		291631-21	291631-22	291631-23	291631-24	291631-25
Your Reference	UNITS	E4	W1S	W1D	D01_20220317	D02_20220318
Date Sampled		18/03/2022	18/03/2022	18/03/2022	17/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Date analysed	-	24/03/2022	24/03/2022	24/03/2022	24/03/2022	24/03/2022
Fluoride, F	mg/L	710	13	12	0.3	0.1
Total Cyanide	mg/L	140	0.72	0.81	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics		
Our Reference		291631-26
Your Reference	UNITS	R01_20220318
Date Sampled		18/03/2022
Type of sample		Water
Date prepared	-	24/03/2022
Date analysed	-	24/03/2022
Fluoride, F	mg/L	<0.1
Total Cyanide	mg/L	<0.004
Free Cyanide in Water	mg/L	<0.004

HM in water - dissolved						
Our Reference		291631-1	291631-2	291631-3	291631-4	291631-5
Your Reference	UNITS	W2S	W2D	PUMP	W7M	W7S
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	12,000	730	2,300	750	23,000

HM in water - dissolved						
Our Reference		291631-6	291631-7	291631-8	291631-9	291631-10
Your Reference	UNITS	E5	E5D	G2	N8	N9
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	90	20	<10	70	170

HM in water - dissolved						
Our Reference		291631-11	291631-12	291631-13	291631-14	291631-15
Your Reference	UNITS	W6D	E11	W5D	N2	F5
Date Sampled		17/03/2022	17/03/2022	17/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	<10	2,100	40	3,000	250

HM in water - dissolved						
Our Reference		291631-16	291631-17	291631-18	291631-19	291631-20
Your Reference	UNITS	G5	F6	G6	W3S	A7
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	30	<10	10,000	310	160

HM in water - dissolved						
Our Reference		291631-21	291631-22	291631-23	291631-24	291631-25
Your Reference	UNITS	E4	W1S	W1D	D01_20220317	D02_20220318
Date Sampled		18/03/2022	18/03/2022	18/03/2022	17/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	360	180	240	<10	30

HM in water - dissolved		
Our Reference		291631-26
Your Reference	UNITS	R01_20220318
Date Sampled		18/03/2022
Type of sample		Water
Date prepared	-	25/03/2022
Date analysed	-	25/03/2022
Aluminium-Dissolved	μg/L	<10

HM in water - total						
Our Reference		291631-1	291631-2	291631-3	291631-4	291631-5
Your Reference	UNITS	W2S	W2D	PUMP	W7M	W7S
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Total	µg/L	17,000	870	9,000	4,200	32,000

HM in water - total						
Our Reference		291631-6	291631-7	291631-8	291631-9	291631-10
Your Reference	UNITS	E5	E5D	G2	N8	N9
Date Sampled		17/03/2022	17/03/2022	17/03/2022	17/03/2022	17/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Total	µg/L	310	270	310	610	1,600

HM in water - total						
Our Reference		291631-11	291631-12	291631-13	291631-14	291631-15
Your Reference	UNITS	W6D	E11	W5D	N2	F5
Date Sampled		17/03/2022	17/03/2022	17/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Total	µg/L	1,500	3,300	280	4,100	1,300

HM in water - total						
Our Reference		291631-16	291631-17	291631-18	291631-19	291631-20
Your Reference	UNITS	G5	F6	G6	W3S	A7
Date Sampled		18/03/2022	18/03/2022	18/03/2022	18/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Total	µg/L	260	480	10,000	4,700	200

HM in water - total						
Our Reference		291631-21	291631-22	291631-23	291631-24	291631-25
Your Reference	UNITS	E4	W1S	W1D	D01_20220317	D02_20220318
Date Sampled		18/03/2022	18/03/2022	18/03/2022	17/03/2022	18/03/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Date analysed	-	25/03/2022	25/03/2022	25/03/2022	25/03/2022	25/03/2022
Aluminium-Total	µg/L	410	1,100	1,000	260	280

HM in water - total		
Our Reference		291631-26
Your Reference	UNITS	R01_20220318
Date Sampled		18/03/2022
Type of sample		Water
Date prepared	-	25/03/2022
Date analysed	-	25/03/2022
Aluminium-Total	μg/L	<10

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	291631-2
Date prepared	-			24/03/2022	1	24/03/2022	24/03/2022		24/03/2022	28/03/2022
Date analysed	-			24/03/2022	1	24/03/2022	24/03/2022		24/03/2022	28/03/2022
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	37	38	3	83	108
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	0.27	0.26	4	84	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	96	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	291631-3
Date prepared	-			[NT]	11	24/03/2022	24/03/2022		24/03/2022	24/03/2022
Date analysed	-			[NT]	11	24/03/2022	24/03/2022		24/03/2022	24/03/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	<0.1	<0.1	0	116	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	96	108
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	96	114

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	291631-22
Date prepared	-			[NT]	21	24/03/2022	24/03/2022		[NT]	28/03/2022
Date analysed	-			[NT]	21	24/03/2022	24/03/2022		[NT]	28/03/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	21	710	690	3	[NT]	95
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	21	140	[NT]		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	21	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	291631-26
Date prepared	-			[NT]	25	24/03/2022	24/03/2022		[NT]	24/03/2022
Date analysed	-			[NT]	25	24/03/2022	24/03/2022		[NT]	24/03/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	25	0.1	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	25	<0.004	<0.004	0	[NT]	99
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	25	<0.004	<0.004	0	[NT]	98

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	291631-2
Date prepared	-			25/03/2022	1	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Date analysed	-			25/03/2022	1	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	12000	12000	0	116	#

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	291631-22
Date prepared	-			[NT]	11	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Date analysed	-			[NT]	11	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	<10	<10	0	114	#

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	25/03/2022	25/03/2022		[NT]	[NT]
Date analysed	-			[NT]	21	25/03/2022	25/03/2022		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	21	360	370	3	[NT]	[NT]

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	291631-2
Date prepared	-			25/03/2022	1	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Date analysed	-			25/03/2022	1	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Aluminium-Total	µg/L	10	Metals-022	<10	1	17000	17000	0	108	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	291631-22
Date prepared	-			[NT]	11	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Date analysed	-			[NT]	11	25/03/2022	25/03/2022		25/03/2022	25/03/2022
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	1500	1400	7	106	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	25/03/2022	25/03/2022		[NT]	[NT]
Date analysed	-			[NT]	21	25/03/2022	25/03/2022		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	21	410	410	0	[NT]	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF CUSTODY - Client

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Client: Ramboll		Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067
Contact person: Jake Bourke		PO No.:	Phone: 02 9910 6200 Fax :02 9910 6201
Project Mgr: Jordyn Kirsch		Envirolab Quote No. :	E-mail: ahie@envirolabservices.com.au
Sampler: Jake Bourke		Date results required:	Contact: Aileen Hie
Address: Level 2 Suite 18, 50 Glebe Road, The Junction		Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154
Phone: (02) 49625444	Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	Phone: 08 9317 2505 Fax :08 9317 4163
Fax:		Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com			Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
1	W2S		17/03/2022	WATER	X	X	X	X	X	
2	W2D		17/03/2022	WATER	X	X	X	X	X	
3	PUMP		17/03/2022	WATER	X	X	X	X	X	
4	W7M		17/03/2022	WATER	X	X	X	X	X	
5	W7S		17/03/2022	WATER	X	X	X	X	X	
6	E5		17/03/2022	WATER	X	X	X	X	X	
7	E5D		17/03/2022	WATER	X	X	X	X	X	
8	G2		17/03/2022	WATER	X	X	X	X	X	
9	N8		17/03/2022	WATER	X	X	X	X	X	
10	N9		17/03/2022	WATER	X	X	X	X	X	
11	W6D		17/03/2022	WATER	X	X	X	X	X	
12	E11		17/03/2022	WATER	X	X	X	X	X	
13	W5D		17/03/2022	WATER	X	X	X	X	X	
14	N2		18/03/2022	WATER	X	X	X	X	X	

Relinquished by (company):	Ramboll	Received by (company):	ELS	*Lab use only:*	291631
Print Name:	Jake Bourke	Print Name:	GEOFF	Samples Received: Cool or Ambient (circle one)	
Date & Time:	18/03/2022	Date & Time:	22-3-22 & 23-3-22	Temperature Received at: 6 (if applicable)	
Signature:		Signature:		Transported by: Hand delivered / courier	

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	Envirolab Services
Contact person: Jake Bourke		12 Ashley St, Chatswood, NSW 2067
Project Mgr: Jordyn Kirsch	PO No.:	Phone: 02 9910 6200 Fax :02 9910 6201
Sampler: Jake Bourke	Envirolab Quote No. :	E-mail: ahie@envirolabservices.com.au
Address: Level 2 Suite 18, 50 Glebe Road,	Date results required:	Contact: Aileen Hie
The Junction		Envirolab Services WA t/a MPL
	Or choose: standard / same day / 1 day / 2 day / 3 day	16-18 Hayden Crt, Myaree WA 6154
Phone: (02) 49625444 Mob: 0467580473	Note: Inform lab in advance if urgent turnaround is required - surcharge applies	Phone: 08 9317 2505 Fax :08 9317 4163
Fax:	Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com		Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
15	F5		18/03/2022	WATER	X	X	X	X	X	
16	G5		18/03/2022	WATER	X	X	X	X	X	
17	F6		18/03/2022	WATER	X	X	X	X	X	
18	G6		18/03/2022	WATER	X	X	X	X	X	
19	W3S		18/03/2022	WATER	X	X	X	X	X	
20	A7		18/03/2022	WATER	X	X	X	X	X	
21	E4		18/03/2022	WATER	X	X	X	X	X	
22	W1S		18/03/2022	WATER	X	X	X	X	X	
23	W1D		18/03/2022	WATER	X	X	X	X	X	
24	D01_20220317		17/03/2022	WATER	X	X	X	X	X	
–	T01_20220317		17/03/2022	WATER	X	X	X	X	X	Please forward to ALS
25	D02_20220318		18/03/2022	WATER	X	X	X	X	X	
26	R01_20220318		18/03/2022	WATER	X	X	X	X	X	

Relinquished by (company): Ramboll	Received by (company): ELS	*Lab use only:* 291631
Print Name: Jake Bourke	Print Name: GW	Samples Received: Cool or Ambient (circle one)
Date & Time: 18/03/2022	Date & Time: 22/3/22 23/3/22	Temperature Received at: 10 (if applicable)
Signature:	Signature:	Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch

Sample Login Details	
Your reference	Hydro Groundwater Plume Monitoring - 318001362
Envirolab Reference	291631
Date Sample Received	22/03/2022
Date Instructions Received	22/03/2022
Date Results Expected to be Reported	30/03/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	26 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	6
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

One esky received 22/3 , one received 23/03

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total
W2S	✓	✓	✓	✓	✓
W2D	✓	✓	✓	✓	✓
PUMP	✓	✓	✓	✓	✓
W7M	✓	✓	✓	✓	✓
W7S	✓	✓	✓	✓	✓
E5	✓	✓	✓	✓	✓
E5D	✓	✓	✓	✓	✓
G2	✓	✓	✓	✓	✓
N8	✓	✓	✓	✓	✓
N9	✓	✓	✓	✓	✓
W6D	✓	✓	✓	✓	✓
E11	✓	✓	✓	✓	✓
W5D	✓	✓	✓	✓	✓
N2	✓	✓	✓	✓	✓
F5	✓	✓	✓	✓	✓
G5	✓	✓	✓	✓	✓
F6	✓	✓	✓	✓	✓
G6	✓	✓	✓	✓	✓
W3S	✓	✓	✓	✓	✓
A7	✓	✓	✓	✓	✓
E4	✓	✓	✓	✓	✓
W1S	✓	✓	✓	✓	✓
W1D	✓	✓	✓	✓	✓
D01_20220317	✓	✓	✓	✓	✓
D02_20220318	✓	✓	✓	✓	✓
R01_20220318	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2210212**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 23-Mar-2022 17:30
Order number	: ----	Date Analysis Commenced	: 26-Mar-2022
C-O-C number	: ----	Issue Date	: 31-Mar-2022 13:36
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**T01_20220317**	----	----	----	----
			Sampling date / time	17-Mar-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2210212-001**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	<10	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	**560**	----	----	----	----
EK025SF: Free CN by Segmented Flow Analyser								
Free Cyanide	----	0.004	mg/L	<0.004	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.3**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES2210212**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 23-Mar-2022
Order number	: ----	Date Analysis Commenced	: 26-Mar-2022
C-O-C number	: ----	Issue Date	: 31-Mar-2022
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4254036)									
ES2207094-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2210452-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4253081)									
ES2210246-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2210514-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.70	0.70	0.0	0% - 20%
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 4256933)									
ES2210212-001	T01_20220317	EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4256934)									
ES2210212-001	T01_20220317	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4251097)									
ES2210132-002	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
ES2210386-004	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4254036)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	90.5	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 4253081)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	97.1	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4256933)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	106	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4256934)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	98.0	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4251097)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	102	82.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4256933)							
ES2210212-001	T01_20220317	EK025SF: Free Cyanide	----	0.2 mg/L	91.8	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4256934)							
ES2210212-001	T01_20220317	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	96.7	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4251097)							
ES2210064-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	102	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2210212**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 23-Mar-2022
Site	: ----	Issue Date	: 31-Mar-2022
Sampler	: JAKE BOURKE	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	9	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation* Date extracted	Due for extraction	Evaluation	*Analysis* Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
T01_20220317	**17-Mar-2022**	**----**	----	----	**29-Mar-2022**	13-Sep-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
T01_20220317	**17-Mar-2022**	**28-Mar-2022**	13-Sep-2022	✓	**28-Mar-2022**	13-Sep-2022	✓
EK025SF: Free CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK025SF)							
T01_20220317	**17-Mar-2022**	**----**	----	----	**30-Mar-2022**	31-Mar-2022	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF)							
T01_20220317	**17-Mar-2022**	**----**	----	----	**30-Mar-2022**	31-Mar-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
T01_20220317	**17-Mar-2022**	**----**	----	----	**26-Mar-2022**	14-Apr-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	8	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	6	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Fluoride by PC Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	9	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by PC Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2210212**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: PO BOX 560 NORTH SYDNEY NSW, AUSTRALIA 2060	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: olivia.barbato@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 23-Mar-2022 17:30	Issue Date	: 24-Mar-2022
Client Requested Due Date	: 31-Mar-2022	Scheduled Reporting Date	: **31-Mar-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: ----	Temperature	: 12.3'c - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (PCT)
ES2210212-001	17-Mar-2022 00:00	T01_20220317	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com
JAKE BOURKE		
- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com
JORDYN KIRSCH		
- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

CHAIN OF COUSTODY - Client

HT

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services**
Contact person: Jake Bourke	PO No.:	12 Ashley St, Chatswood, NSW 2067
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	Phone: 02 9910 6200 Fax :02 9910 6201
Sampler: Jake Bourke	Date results required:	E-mail: ahie@envirolabservices.com.au
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	Contact: Aileen Hie
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163
Fax:	Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com		Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
1	W2S		17/03/2022	WATER	X	X	X	X	X	
2	W2D		17/03/2022	WATER	X	X	X	X	X	
3	PUMP		17/03/2022	WATER	X	X	X	X	X	
4	W7M		17/03/2022	WATER	X	X	X	X	X	
5	W7S		17/03/2022	WATER	X	X	X	X	X	
6	E5		17/03/2022	WATER	X	X	X	X	X	
7	E5D		17/03/2022	WATER	X	X	X	X	X	
8	G2		17/03/2022	WATER	X	X	X	X	X	
9	N8		17/03/2022	WATER	X	X	X	X	X	
10	N9		17/03/2022	WATER	X	X	X	X	X	
11	W6D		17/03/2022	WATER	X	X	X	X	X	
12	E11		17/03/2022	WATER	X	X	X	X	X	
13	W5D		17/03/2022	WATER	X	X	X	X	X	
14	N2		18/03/2022	WATER	X	X	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES2210212
Telephone : + 61-2-8784 8555

Relinquished by (company):	Ramboll	ELS MD	Received by (company): ELS	*Lab use only:* 291631
Print Name:	Jake Bourke	A.BM	Print Name: GEOFF	Samples Received: Cool or Ambient (circle one)
Date & Time:	18/03/2022	23/3/22 1310	Date & Time: 22-3-22 & 23-3-22	Temperature Received at: 6 (if applicable)
Signature:			Signature:	Transported by: Hand delivered / courier

Rec. sotto ACS
23/3/22 1730 12.3c

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.:	
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	
Sampler: Jake Bourke	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
15	F5		18/03/2022	WATER	X	X	X	X	X	
16	G5		18/03/2022	WATER	X	X	X	X	X	
17	F6		18/03/2022	WATER	X	X	X	X	X	
18	G6		18/03/2022	WATER	X	X	X	X	X	
19	W3S		18/03/2022	WATER	X	X	X	X	X	
20	A7		18/03/2022	WATER	X	X	X	X	X	
21	E4		18/03/2022	WATER	X	X	X	X	X	
22	W1S		18/03/2022	WATER	X	X	X	X	X	
23	W1D		18/03/2022	WATER	X	X	X	X	X	
24	D01_20220317		17/03/2022	WATER	X	X	X	X	X	
—	T01_20220317		17/03/2022	WATER	X	X	X	X	X	Please forward to ALS
25	D02_20220318		18/03/2022	WATER	X	X	X	X	X	
26	R01_20220318		18/03/2022	WATER	X	X	X	X	X	

Relinquished by (company):	Ramboll	ELS MD	Received by (company): ELS	*Lab use only:* 291631
Print Name:	Jake Bourke	A Bm	Print Name: GW	Samples Received: Cool or Ambient (circle one)
Date & Time:	18/03/2022	23/3/22 1310	Date & Time: 22/3/22 23/3/22	Temperature Received at: 10 (if applicable)
Signature:			Signature:	Transported by: Hand delivered / courier

Rec - Soft
Ag.
23/3/22 17:30 12-3c

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 298454

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001362**
Number of Samples	27 Water
Date samples received	21/06/2022
Date completed instructions received	21/06/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	28/06/2022
Date of Issue	28/06/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Greta Petzold, Assistant Operation Manager
Loren Bardwell, Development Chemist
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		298454-1	298454-2	298454-3	298454-4	298454-5
Your Reference	UNITS	W6D	G5	G2	F5	G6
Date Sampled		15/06/2022	16/06/2022	15/06/2022	16/06/2022	16/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Fluoride, F	mg/L	<0.1	0.3	0.4	0.2	0.5
Total Cyanide	mg/L	<0.004	<0.004	0.018	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		298454-6	298454-7	298454-8	298454-9	298454-10
Your Reference	UNITS	F6	N2	W5D	N8	E11
Date Sampled		16/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Fluoride, F	mg/L	0.4	3.7	0.4	0.5	11
Total Cyanide	mg/L	<0.004	0.15	<0.004	0.62	0.93
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		298454-11	298454-12	298454-13	298454-14	298454-15
Your Reference	UNITS	E5D	W1D	W1S	PUMP	W7S
Date Sampled		15/06/2022	16/06/2022	16/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Fluoride, F	mg/L	9.1	8.8	9.8	130	16
Total Cyanide	mg/L	1.2	1.4	1.4	4.8	0.21
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		298454-16	298454-17	298454-18	298454-19	298454-20
Your Reference	UNITS	W2S	N9	W3S	A7	E5
Date Sampled		15/06/2022	15/06/2022	16/06/2022	16/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Fluoride, F	mg/L	25	25	300	330	410
Total Cyanide	mg/L	0.14	0.17	27	41	68
Free Cyanide in Water	mg/L	<0.004	<0.004	0.009	0.009	<0.004

Miscellaneous Inorganics						
Our Reference		298454-21	298454-22	298454-23	298454-24	298454-25
Your Reference	UNITS	W7M	E4	W2D	D01_20220615	D02_20220616
Date Sampled		15/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Fluoride, F	mg/L	710	820	1,100	140	0.4
Total Cyanide	mg/L	99	180	180	4.7	<0.004
Free Cyanide in Water	mg/L	0.029	0.029	0.055	<0.004	<0.004

Miscellaneous Inorganics		
Our Reference		298454-27
Your Reference	UNITS	R01_20220616
Date Sampled		16/06/2022
Type of sample		Water
Date prepared	-	23/06/2022
Date analysed	-	23/06/2022
Fluoride, F	mg/L	<0.1
Total Cyanide	mg/L	<0.004
Free Cyanide in Water	mg/L	<0.004

HM in water - dissolved						
Our Reference		298454-1	298454-2	298454-3	298454-4	298454-5
Your Reference	UNITS	W6D	G5	G2	F5	G6
Date Sampled		15/06/2022	16/06/2022	15/06/2022	16/06/2022	16/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	50	40	<10	2,300	8,200

HM in water - dissolved						
Our Reference		298454-6	298454-7	298454-8	298454-9	298454-10
Your Reference	UNITS	F6	N2	W5D	N8	E11
Date Sampled		16/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	<10	1,100	<10	50	590

HM in water - dissolved						
Our Reference		298454-11	298454-12	298454-13	298454-14	298454-15
Your Reference	UNITS	E5D	W1D	W1S	PUMP	W7S
Date Sampled		15/06/2022	16/06/2022	16/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	<10	50	<10	600	2,900

HM in water - dissolved						
Our Reference		298454-16	298454-17	298454-18	298454-19	298454-20
Your Reference	UNITS	W2S	N9	W3S	A7	E5
Date Sampled		15/06/2022	15/06/2022	16/06/2022	16/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	24,000	7,600	260	180	90

HM in water - dissolved						
Our Reference		298454-21	298454-22	298454-23	298454-24	298454-25
Your Reference	UNITS	W7M	E4	W2D	D01_20220615	D02_20220616
Date Sampled		15/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Date analysed	-	23/06/2022	23/06/2022	23/06/2022	23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	370	420	730	620	40

HM in water - dissolved		
Our Reference		298454-27
Your Reference	UNITS	R01_20220616
Date Sampled		16/06/2022
Type of sample		Water
Date prepared	-	23/06/2022
Date analysed	-	23/06/2022
Aluminium-Dissolved	µg/L	<10

HM in water - total						
Our Reference		298454-1	298454-2	298454-3	298454-4	298454-5
Your Reference	UNITS	W6D	G5	G2	F5	G6
Date Sampled		15/06/2022	16/06/2022	15/06/2022	16/06/2022	16/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Date analysed	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Aluminium-Total	µg/L	2,400	250	310	3,100	8,700

HM in water - total						
Our Reference		298454-6	298454-7	298454-8	298454-9	298454-10
Your Reference	UNITS	F6	N2	W5D	N8	E11
Date Sampled		16/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Date analysed	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Aluminium-Total	µg/L	30	1,900	420	290	1,800

HM in water - total						
Our Reference		298454-11	298454-12	298454-13	298454-14	298454-15
Your Reference	UNITS	E5D	W1D	W1S	PUMP	W7S
Date Sampled		15/06/2022	16/06/2022	16/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Date analysed	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Aluminium-Total	µg/L	840	300	1,500	2,800	7,500

HM in water - total						
Our Reference		298454-16	298454-17	298454-18	298454-19	298454-20
Your Reference	UNITS	W2S	N9	W3S	A7	E5
Date Sampled		15/06/2022	15/06/2022	16/06/2022	16/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Date analysed	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Aluminium-Total	µg/L	28,000	22,000	3,300	230	520

HM in water - total						
Our Reference		298454-21	298454-22	298454-23	298454-24	298454-25
Your Reference	UNITS	W7M	E4	W2D	D01_20220615	D02_20220616
Date Sampled		15/06/2022	16/06/2022	15/06/2022	15/06/2022	15/06/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Date analysed	-	24/06/2022	24/06/2022	24/06/2022	24/06/2022	24/06/2022
Aluminium-Total	µg/L	3,600	820	450	3,000	310

HM in water - total		
Our Reference		298454-27
Your Reference	UNITS	R01_20220616
Date Sampled		16/06/2022
Type of sample		Water
Date prepared	-	24/06/2022
Date analysed	-	24/06/2022
Aluminium-Total	μg/L	<10

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	298454-2
Date prepared	-			23/06/2022	1	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Date analysed	-			23/06/2022	1	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	<0.1	<0.1	0	103	85
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	107	98
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	95	90

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	298454-27
Date prepared	-			[NT]	11	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Date analysed	-			[NT]	11	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	9.1	9.3	2	110	111
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	1.2	1.2	0	103	93
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	106	94

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	23/06/2022	23/06/2022		[NT]	[NT]
Date analysed	-			[NT]	21	23/06/2022	23/06/2022		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	21	710	700	1	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	21	99	[NT]		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	21	0.029	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	25	23/06/2022	23/06/2022		[NT]	[NT]
Date analysed	-			[NT]	25	23/06/2022	23/06/2022		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	25	0.4	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	25	<0.004	<0.004	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	25	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	298454-2
Date prepared	-			23/06/2022	1	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Date analysed	-			23/06/2022	1	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	50	50	0	115	107

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	298454-22
Date prepared	-			[NT]	11	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Date analysed	-			[NT]	11	23/06/2022	23/06/2022		23/06/2022	23/06/2022
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	<10	<10	0	104	#

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	23/06/2022	23/06/2022		[NT]	[NT]
Date analysed	-			[NT]	21	23/06/2022	23/06/2022		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	21	370	360	3	[NT]	[NT]

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	298454-2
Date prepared	-			24/06/2022	1	24/06/2022	24/06/2022		24/06/2022	24/06/2022
Date analysed	-			24/06/2022	1	24/06/2022	24/06/2022		24/06/2022	24/06/2022
Aluminium-Total	µg/L	10	Metals-022	<10	1	2400	2300	4	111	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	298454-22
Date prepared	-			[NT]	11	24/06/2022	24/06/2022		24/06/2022	24/06/2022
Date analysed	-			[NT]	11	24/06/2022	24/06/2022		24/06/2022	24/06/2022
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	840	830	1	112	#

QUALITY CONTROL: HM in water - total						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	24/06/2022	24/06/2022		[NT]	[NT]
Date analysed	-			[NT]	21	24/06/2022	24/06/2022		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	21	3600	3400	6	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

TRACE METALS: In theory the total metal content should be higher than the dissolved metal content. However, in some samples this is not the case. Sample #23 has been re-analysed for both Total and Dissolved metals and results have been confirmed.

298454
KW 21/6

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067
Contact person: Jake Bourke		Phone: 02 9910 6200 Fax :02 9910 6201
Project Mgr: Jordyn Kirsch	PO No.:	E-mail: ahie@envirolabservices.com.au
Sampler: Jake Bourke	Envirolab Quote No. :	Contact: Aileen Hie
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Date results required:	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154
	Or choose: standard / same day / 1 day / 2 day / 3 day	
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	Phone: 08 9317 2505 Fax :08 9317 4163
Fax:	Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com		Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
15	W7S		15/06/2022	WATER	X	X	X	X	X	
16	W2S		15/06/2022	WATER	X	X	X	X	X	
17	N9		15/06/2022	WATER	X	X	X	X	X	
18	W3S		16/06/2022	WATER	X	X	X	X	X	
19	A7		16/06/2022	WATER	X	X	X	X	X	
20	E5		15/06/2022	WATER	X	X	X	X	X	
21	W7M		15/06/2022	WATER	X	X	X	X	X	
22	E4		16/06/2022	WATER	X	X	X	X	X	
23	W2D		15/06/2022	WATER	X	X	X	X	X	
24	D01_20220615		15/06/2022	WATER	X	X	X	X	X	Please forward to ALS
~~[illegible]~~	T01_20220615		15/06/2022	WATER	X	X	X	X	X	
25	D02_20220616		16/06/2022	WATER	X	X	X	X	X	HOLD
26	T02_20220616		16/06/2022	WATER	X	X	X	X	X	
27	R01_20220616		16/06/2022	WATER	X	X	X	X	X	

Relinquished by (company): Ramboll	Received by (company): ELS SYD	*Lab use only:*
Print Name: Jake Bourke	Print Name: Katy Wayne	Samples Received: Cool or Ambient (circle one)
Date & Time: 20/06/2022	Date & Time: 21/6/22 1015	Temperature Received at: 15°C (if applicable)
Signature:	Signature:	Transported by: Hand delivered / courier

298454 KW 21/6

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.:	
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	
Sampler: Jake Bourke	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
1	W6D		15/06/2022	WATER	X	X	X	X	X	
2	G5		16/06/2022	WATER	X	X	X	X	X	
3	G2		15/06/2022	WATER	X	X	X	X	X	
4	F5		16/06/2022	WATER	X	X	X	X	X	
5	G6		16/06/2022	WATER	X	X	X	X	X	
6	F6		16/06/2022	WATER	X	X	X	X	X	
7	N2		16/06/2022	WATER	X	X	X	X	X	
8	W5D		15/06/2022	WATER	X	X	X	X	X	
9	N8		15/06/2022	WATER	X	X	X	X	X	
10	E11		15/06/2022	WATER	X	X	X	X	X	
11	E5D		15/06/2022	WATER	X	X	X	X	X	
12	W1D		16/06/2022	WATER	X	X	X	X	X	
13	W1S		16/06/2022	WATER	X	X	X	X	X	
14	PUMP		15/06/2022	WATER	X	X	X	X	X	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 298454
Date Received: 21/6/22
Time Received: 1015
Received By: KW
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company): Ramboll	Received by (company): ELS SYD	*Lab use only:*
Print Name: Jake Bourke	Print Name: Katy Wayne	Samples Received: Cool or Ambient (circle one)
Date & Time: 20/06/2022	Date & Time: 21/6/22 1015	Temperature Received at: 15°C (if applicable)
Signature:	Signature:	Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Ramboll Australia Pty Ltd
Attention	J Kirsch

Sample Login Details	
Your reference	Hydro Groundwater Plume Monitoring - 318001362
Envirolab Reference	298454
Date Sample Received	21/06/2022
Date Instructions Received	21/06/2022
Date Results Expected to be Reported	28/06/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	27 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	15
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total	On Hold
W6D	✓	✓	✓	✓	✓	
G5	✓	✓	✓	✓	✓	
G2	✓	✓	✓	✓	✓	
F5	✓	✓	✓	✓	✓	
G6	✓	✓	✓	✓	✓	
F6	✓	✓	✓	✓	✓	
N2	✓	✓	✓	✓	✓	
W5D	✓	✓	✓	✓	✓	
N8	✓	✓	✓	✓	✓	
E11	✓	✓	✓	✓	✓	
E5D	✓	✓	✓	✓	✓	
W1D	✓	✓	✓	✓	✓	
W1S	✓	✓	✓	✓	✓	
PUMP	✓	✓	✓	✓	✓	
W7S	✓	✓	✓	✓	✓	
W2S	✓	✓	✓	✓	✓	
N9	✓	✓	✓	✓	✓	
W3S	✓	✓	✓	✓	✓	
A7	✓	✓	✓	✓	✓	
E5	✓	✓	✓	✓	✓	
W7M	✓	✓	✓	✓	✓	
E4	✓	✓	✓	✓	✓	
W2D	✓	✓	✓	✓	✓	
D01_20220615	✓	✓	✓	✓	✓	
D02_20220616	✓	✓	✓	✓	✓	
T02_20220616						✓
R01_20220616	✓	✓	✓	✓	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2221927**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: olivia.barbato@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 22-Jun-2022 16:30	Issue Date	: 25-Jun-2022
Client Requested Due Date	: 30-Jun-2022	Scheduled Reporting Date	: **30-Jun-2022**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 12.6'C
Receipt Detail	: FOAM	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2221927-001	15-Jun-2022 00:00	T01_20220615	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE		
- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com
JAKE BOURKE		
- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com
JORDYN KIRSCH		
- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

298454
KW 21/6

ENVIROLAB GROUP

Client: Ramboll
Contact person: Jake Bourke
Project Mgr: Jordyn Kirsch
Sampler: Jake Bourke
Address: Level 2 Suite 18, 50 Glebe Road,
The Junction
Phone: (02) 49625444 Mob: 0467580473
Fax:
Email: jkirsch@ramboll.com; jbourke@ramboll.com

Client Project Name / Number / Site etc (ie report title):
Hydro Groundwater Plume Monitoring - 318001362
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharge applies
Lab comments: Highly contaminated

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments (Provide as much information about the sample as you can)
15	W7S		15/06/2022	WATER	X	X	X	X	X	
16	W2S		15/06/2022	WATER	X	X	X	X	X	
17	N9		15/06/2022	WATER	X	X	X	X	X	
18	W3S		16/06/2022	WATER	X	X	X	X	X	
19	A7		16/06/2022	WATER	X	X	X	X	X	
20	E5		15/06/2022	WATER	X	X	X	X	X	
21	W7M		15/06/2022	WATER	X	X	X	X	X	
22	E4		16/06/2022	WATER	X	X	X	X	X	
23	W2D		15/06/2022	WATER	X	X	X	X	X	
24	D01_20220615		15/06/2022	WATER	X	X	X	X	X	Please forward to ALS
[illegible]	T01_20220615		15/06/2022	WATER	X	X	X	X	X	
25	D02_20220616		16/06/2022	WATER	X	X	X	X	X	HOLD
26	T02_20220616		16/06/2022	WATER	X	X	X	X	X	
27	R01_20220616		16/06/2022	WATER	X	X	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES2221927
Telephone : +61-2-8784 8555

Relinquished by (company): Ramboll / ELS SYD
Print Name: Jake Bourke / Christine.
Date & Time: 20/06/2022 / 22/06/22 1245
Signature:

Received by (company): ELS SYD
Print Name: Katy Wayne
Date & Time: 21/6/22 1015
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 15°C (if applicable)
Transported by: Hand delivered / courier

Rec - Sogh AS. 22/6/22 1630
12.6

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2221927**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 22-Jun-2022 16:30
Order number	: ----	Date Analysis Commenced	: 27-Jun-2022
C-O-C number	: ----	Issue Date	: 30-Jun-2022 11:37
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK025: LOR raised for Frre CN sample 1 due to sample matrix.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	T01_20220615	----	----	----	----
			Sampling date / time	15-Jun-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2221927-001	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	**440**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	**2630**	----	----	----	----
EK025SF: Free CN by Segmented Flow Analyser								
Free Cyanide	----	0.004	mg/L	<0.200	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	**4.04**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**126**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES2221927**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 22-Jun-2022
Order number	: ----	Date Analysis Commenced	: 27-Jun-2022
C-O-C number	: ----	Issue Date	: 30-Jun-2022
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4424928)									
ES2222086-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2222168-012	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4424942)									
ES2221931-006	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	0.50	0.53	6.3	0% - 20%
ES2221703-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 4421963)									
ES2221927-001	T01_20220615	EK025SF: Free Cyanide	----	0.004	mg/L	<0.200	<0.200	0.0	No Limit
ES2222399-001	Anonymous	EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4421962)									
ES2222144-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2221927-001	T01_20220615	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	4.04	3.87	4.2	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 4427036)									
ES2221927-001	T01_20220615	EK040P: Fluoride	16984-48-8	0.1	mg/L	126	126	0.8	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4424928)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	99.2	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 4424942)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	86.8	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4421963)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	112	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4421962)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	114	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4427036)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	109	82.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4421963)							
ES2221927-001	T01_20220615	EK025SF: Free Cyanide	----	20 mg/L	107	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4421962)							
ES2221927-001	T01_20220615	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	# Not Determined	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4427036)							
ES2222144-001	Anonymous	EK040P: Fluoride	16984-48-8	250 mg/L	96.8	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2221927**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 22-Jun-2022
Site	: ----	Issue Date	: 30-Jun-2022
Sampler	: JAKE BOURKE	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK026SF: Total CN by Segmented Flow Analyser	ES2221927--001	T01_20220615	**Total Cyanide**	57-12-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	3	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	4	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) T01_20220615	**15-Jun-2022**	**----**	----	----	**28-Jun-2022**	12-Dec-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T) T01_20220615	**15-Jun-2022**	**28-Jun-2022**	12-Dec-2022	✓	**28-Jun-2022**	12-Dec-2022	✓
EK025SF: Free CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK025SF) T01_20220615	**15-Jun-2022**	**----**	----	----	**27-Jun-2022**	29-Jun-2022	✓
EK026SF: Total CN by Segmented Flow Analyser							
Opaque plastic bottle - NaOH (EK026SF) T01_20220615	**15-Jun-2022**	**----**	----	----	**27-Jun-2022**	29-Jun-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P) T01_20220615	**15-Jun-2022**	**----**	----	----	**28-Jun-2022**	13-Jul-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	3	**66.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	3	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	4	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45μm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES2221927**		
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Olivia Barbato
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: olivia.barbato@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 22-Jun-2022 16:30	Issue Date	: 25-Jun-2022
Client Requested Due Date	: 30-Jun-2022	Scheduled Reporting Date	: **30-Jun-2022**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 12.6'C
Receipt Detail	: FOAM	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2221927-001	15-Jun-2022 00:00	T01_20220615	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com

JAKE BOURKE

- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com

JORDYN KIRSCH

- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

298454
KW 21/6

ENVIROLAB GROUP

Client: Ramboll
Contact person: Jake Bourke
Project Mgr: Jordyn Kirsch
Sampler: Jake Bourke
Address: Level 2 Suite 18, 50 Glebe Road,
The Junction
Phone: (02) 49625444 Mob: 0467580473
Fax:
Email: jkirsch@ramboll.com; jbourke@ramboll.com

Client Project Name / Number / Site etc (ie report title):
Hydro Groundwater Plume Monitoring - 318001362
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharge applies
Lab comments: Highly contaminated

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments (Provide as much information about the sample as you can)
15	W7S		15/06/2022	WATER	X	X	X	X	X	
16	W2S		15/06/2022	WATER	X	X	X	X	X	
17	N9		15/06/2022	WATER	X	X	X	X	X	
18	W3S		16/06/2022	WATER	X	X	X	X	X	
19	A7		16/06/2022	WATER	X	X	X	X	X	
20	E5		15/06/2022	WATER	X	X	X	X	X	
21	W7M		15/06/2022	WATER	X	X	X	X	X	
22	E4		16/06/2022	WATER	X	X	X	X	X	
23	W2D		15/06/2022	WATER	X	X	X	X	X	
24	D01_20220615		15/06/2022	WATER	X	X	X	X	X	Please forward to ALS
~~24~~	T01_20220615		15/06/2022	WATER	X	X	X	X	X	
25	D02_20220616		16/06/2022	WATER	X	X	X	X	X	HOLD
26	T02_20220616		16/06/2022	WATER	X	X	X	X	X	
27	R01_20220616		16/06/2022	WATER	X	X	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES2221927
Telephone : +61-2-8784 8555

Relinquished by (company): Ramboll | ELS SYD
Print Name: Jake Bourke | Christine.
Date & Time: 20/06/2022 | 22/06/22 1245
Signature:

Received by (company): ELS SYD
Print Name: Katy Wayne
Date & Time: 21/6/22 1015
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 15°C (if applicable)
Transported by: Hand delivered / courier

Rec - Sofh ALS. 22/6/22 1630
12.6

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 306675

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001362**
Number of Samples	27 Water
Date samples received	27/09/2022
Date completed instructions received	27/09/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	05/10/2022
Date of Issue	05/10/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Giovanni Agosti, Group Technical Manager
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		306675-1	306675-2	306675-3	306675-4	306675-5
Your Reference	UNITS	W2S_20220920	W2D_20220920	PUMP_20220920	W7M_20220920	W7S_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Fluoride, F	mg/L	29	840	150	480	18
Total Cyanide	mg/L	0.23	210	8.4	110	0.20
Free Cyanide in Water	mg/L	<0.004	0.22	0.012	0.12	<0.004

Miscellaneous Inorganics						
Our Reference		306675-6	306675-7	306675-8	306675-9	306675-10
Your Reference	UNITS	E5_20220920	E5D_20220920	G2_20220920	N8_20220920	N9_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Fluoride, F	mg/L	360	8.8	0.3	0.6	5.2
Total Cyanide	mg/L	82	0.87	<0.004	0.52	0.061
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		306675-11	306675-12	306675-13	306675-14	306675-15
Your Reference	UNITS	W6D_20220920	W6S_20220920	E11_20220920	W3S_20220920	W5D_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Fluoride, F	mg/L	<0.1	110	7.9	240	0.4
Total Cyanide	mg/L	<0.004	1.8	0.21	25	0.007
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		306675-16	306675-17	306675-18	306675-19	306675-20
Your Reference	UNITS	N2_20220920	F5_20220921	G5_20220921	F6_20220921	G6_20220921
Date Sampled		20/09/2022	21/09/2022	21/09/2022	21/09/2022	21/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Fluoride, F	mg/L	4.3	0.2	0.2	0.4	0.6
Total Cyanide	mg/L	0.14	<0.004	<0.004	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		306675-21	306675-22	306675-23	306675-24	306675-25
Your Reference	UNITS	A7_20220921	E4_20220921	W1S_20220921	W1D_20220921	D01_20220920
Date Sampled		21/09/2022	21/09/2022	21/09/2022	21/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Fluoride, F	mg/L	300	660	10	9.7	31
Total Cyanide	mg/L	60	220	1.0	1.0	0.18
Free Cyanide in Water	mg/L	0.014	0.20	<0.004	<0.004	<0.004

Miscellaneous Inorganics			
Our Reference		306675-26	306675-27
Your Reference	UNITS	D01_20220921	R01_20220921
Date Sampled		20/09/2022	21/09/2022
Type of sample		Water	Water
Date prepared	-	04/10/2022	04/10/2022
Date analysed	-	04/10/2022	04/10/2022
Fluoride, F	mg/L	0.2	<0.1
Total Cyanide	mg/L	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004

HM in water - dissolved						
Our Reference		306675-1	306675-2	306675-3	306675-4	306675-5
Your Reference	UNITS	W2S_20220920	W2D_20220920	PUMP_20220920	W7M_20220920	W7S_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	7,000	600	2,200	300	1,900

HM in water - dissolved						
Our Reference		306675-6	306675-7	306675-8	306675-9	306675-10
Your Reference	UNITS	E5_20220920	E5D_20220920	G2_20220920	N8_20220920	N9_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	90	20	10	30	3,900

HM in water - dissolved						
Our Reference		306675-11	306675-12	306675-13	306675-14	306675-15
Your Reference	UNITS	W6D_20220920	W6S_20220920	E11_20220920	W3S_20220920	W5D_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	20	280	1,000	260	<10

HM in water - dissolved						
Our Reference		306675-16	306675-17	306675-18	306675-19	306675-20
Your Reference	UNITS	N2_20220920	F5_20220921	G5_20220921	F6_20220921	G6_20220921
Date Sampled		20/09/2022	21/09/2022	21/09/2022	21/09/2022	21/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	1,100	1,900	480	<10	11,000

HM in water - dissolved						
Our Reference		306675-21	306675-22	306675-23	306675-24	306675-25
Your Reference	UNITS	A7_20220921	E4_20220921	W1S_20220921	W1D_20220921	D01_20220920
Date Sampled		21/09/2022	21/09/2022	21/09/2022	21/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022	28/09/2022	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	170	350	110	50	7,200

HM in water - dissolved			
Our Reference		306675-26	306675-27
Your Reference	UNITS	D01_20220921	R01_20220921
Date Sampled		20/09/2022	21/09/2022
Type of sample		Water	Water
Date prepared	-	28/09/2022	28/09/2022
Date analysed	-	28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	590	<10

HM in water - total						
Our Reference		306675-1	306675-2	306675-3	306675-4	306675-5
Your Reference	UNITS	W2S_20220920	W2D_20220920	PUMP_20220920	W7M_20220920	W7S_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Aluminium-Total	µg/L	7,600	1,100	11,000	2,400	3,600

HM in water - total						
Our Reference		306675-6	306675-7	306675-8	306675-9	306675-10
Your Reference	UNITS	E5_20220920	E5D_20220920	G2_20220920	N8_20220920	N9_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Aluminium-Total	µg/L	150	1,300	120	390	9,700

HM in water - total						
Our Reference		306675-11	306675-12	306675-13	306675-14	306675-15
Your Reference	UNITS	W6D_20220920	W6S_20220920	E11_20220920	W3S_20220920	W5D_20220920
Date Sampled		20/09/2022	20/09/2022	20/09/2022	20/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Aluminium-Total	µg/L	3,100	4,100	1,800	2,100	40

HM in water - total						
Our Reference		306675-16	306675-17	306675-18	306675-19	306675-20
Your Reference	UNITS	N2_20220920	F5_20220921	G5_20220921	F6_20220921	G6_20220921
Date Sampled		20/09/2022	21/09/2022	21/09/2022	21/09/2022	21/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Aluminium-Total	µg/L	1,500	2,800	820	10	12,000

HM in water - total						
Our Reference		306675-21	306675-22	306675-23	306675-24	306675-25
Your Reference	UNITS	A7_20220921	E4_20220921	W1S_20220921	W1D_20220921	D01_20220920
Date Sampled		21/09/2022	21/09/2022	21/09/2022	21/09/2022	20/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Aluminium-Total	µg/L	220	380	2,300	380	8,300

HM in water - total			
Our Reference		306675-26	306675-27
Your Reference	UNITS	D01_20220921	R01_20220921
Date Sampled		20/09/2022	21/09/2022
Type of sample		Water	Water
Date prepared	-	29/09/2022	29/09/2022
Date analysed	-	29/09/2022	29/09/2022
Aluminium-Total	µg/L	840	<10

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	306675-2
Date prepared	-			04/10/2022	1	04/10/2022	04/10/2022		04/10/2022	04/10/2022
Date analysed	-			04/10/2022	1	04/10/2022	04/10/2022		04/10/2022	04/10/2022
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	29	29	0	111	#
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	0.23	0.23	0	96	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	<0.004	0	94	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	306675-8
Date prepared	-			[NT]	11	04/10/2022	04/10/2022		04/10/2022	04/10/2022
Date analysed	-			[NT]	11	04/10/2022	04/10/2022		04/10/2022	04/10/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	<0.1	[NT]		108	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	94	82
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	97	93

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	306675-22
Date prepared	-			[NT]	26	04/10/2022	04/10/2022		[NT]	04/10/2022
Date analysed	-			[NT]	26	04/10/2022	04/10/2022		[NT]	04/10/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	26	0.2	[NT]		[NT]	#
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	26	<0.004	<0.004	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	26	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	306675-27
Date prepared	-			[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	04/10/2022
Date analysed	-			[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	04/10/2022
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	88
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]	96

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	306675-2
Date prepared	-			28/09/2022	1	28/09/2022	28/09/2022		28/09/2022	28/09/2022
Date analysed	-			28/09/2022	1	28/09/2022	28/09/2022		28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	7000	7000	0	111	#

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	306675-11
Date prepared	-			[NT]	10	28/09/2022	28/09/2022		28/09/2022	28/09/2022
Date analysed	-			[NT]	10	28/09/2022	28/09/2022		28/09/2022	28/09/2022
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	10	3900	3800	3	99	85

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	20	28/09/2022	28/09/2022		[NT]	[NT]
Date analysed	-			[NT]	20	28/09/2022	28/09/2022		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	20	11000	11000	0	[NT]	[NT]

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	306675-2
Date prepared	-			29/09/2022	1	29/09/2022	29/09/2022		29/09/2022	29/09/2022
Date analysed	-			29/09/2022	1	29/09/2022	29/09/2022		29/09/2022	29/09/2022
Aluminium-Total	µg/L	10	Metals-022	<10	1	7600	7800	3	105	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W5	306675-22
Date prepared	-			[NT]	11	29/09/2022	29/09/2022		29/09/2022	29/09/2022
Date analysed	-			[NT]	11	29/09/2022	29/09/2022		29/09/2022	29/09/2022
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	3100	3000	3	115	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	29/09/2022	29/09/2022		[NT]	[NT]
Date analysed	-			[NT]	21	29/09/2022	29/09/2022		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	21	220	210	5	[NT]	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Fluoride
Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

COC 26/9 9:22.

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362
Contact person: Jake Bourke	PO No.:
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :
Sampler: Jake Bourke	Date results required:
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*
Fax:	Lab comments: Highly contaminated
Email: jkirsch@ramboll.com; jbourke@ramboll.com	

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Sample information					Tests Required					Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Provide as much information about the sample as you can
1	W2S_20220920		20/09/2022	WATER	X	X	X	X	X	
2	W2D_20220920		20/09/2022	WATER	X	X	X	X	X	
3	PUMP_20220920		20/09/2022	WATER	X	X	X	X	X	
4	W7M_20220920		20/09/2022	WATER	X	X	X	X	X	
5	W7S_20220920		20/09/2022	WATER	X	X	X	X	X	
6	E5_20220920		20/09/2022	WATER	X	X	X	X	X	
7	E5D_20220920		20/09/2022	WATER	X	X	X	X	X	
8	G2_20220920		20/09/2022	WATER	X	X	X	X	X	
9	N8_20220920		20/09/2022	WATER	X	X	X	X	X	
10	N9_20220920		20/09/2022	WATER	X	X	X	X	X	
11	W6D_20220920		20/09/2022	WATER	X	X	X	X	X	
12	W6S_20220920		20/09/2022	WATER	X	X	X	X	X	
13	E11_20220920		20/09/2022	WATER	X	X	X	X	X	
14	W3S_20220920		20/09/2022	WATER	X	X	X	X	X	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 306675
Date Received: 27.9.22
Time Received: 1160
Received By: AP
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company):	Ramboll	Received by (company):	ELS SYD	*Lab use only:*	
Print Name:	Jake Bourke	Print Name:	AP	Samples Received: Cool or Ambient (circle one)	
Date & Time:	26/09/2022	Date & Time:	27-9-22 1160	Temperature Received at:	(if applicable)
Signature:		Signature:		Transported by: Hand delivered / courier	

AP 27/9
306675.

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll
Contact person: Jake Bourke
Project Mgr: Jordyn Kirsch
Sampler: Jake Bourke
Address: Level 2 Suite 18, 50 Glebe Road,
The Junction

Phone: (02) 49625444 Mob: 0467580473
Fax:
Email: jkirsch@ramboll.com; jbourke@ramboll.com

Client Project Name / Number / Site etc (ie report title):
Hydro Groundwater Plume Monitoring - 318001362
PO No.:
Envirolab Quote No. :
Date results required:

Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharge applies
Lab comments: Highly contaminated

Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Phone: 02 9910 6200 Fax :02 9910 6201
E-mail: ahie@envirolabservices.com.au
Contact: Aileen Hie

Envirolab Services WA t/a MPL
16-18 Hayden Crt, Myaree WA 6154
Phone: 08 9317 2505 Fax :08 9317 4163
E-mail: lab@mpl.com.au
Contact: Joshua Lim

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD										Comments: Provide as much information about the sample as you can
15	W5D_20220920		20/09/2022	WATER	X	X	X	X	X											
16	N2_20220920		20/09/2022	WATER	X	X	X	X	X											
17	F5_20220921		21/09/2022	WATER	X	X	X	X	X											
18	G5_20220921		21/09/2022	WATER	X	X	X	X	X											
19	F6_20220921		21/09/2022	WATER	X	X	X	X	X											
20	G6_20220921		21/09/2022	WATER	X	X	X	X	X											
21	A7_20220921		21/09/2022	WATER	X	X	X	X	X											
22	E4_20220921		21/09/2022	WATER	X	X	X	X	X											
23	W1S_20220921		21/09/2022	WATER	X	X	X	X	X											
24	W1D_20220921		21/09/2022	WATER	X	X	X	X	X											
25	D01_20220920		20/09/2022	WATER	X	X	X	X	X											
—	T01_20220920		20/09/2022	WATER	X	X	X	X	X											Please forward to ALS
26	D01_20220921		21/09/2022	WATER	X	X	X	X	X											
—	T01_20220921		21/09/2022	WATER						X										Please forward to ALS
27	R01_20220921		21/09/2022	WATER	X	X	X	X	X											

Relinquished by (company): Ramboll
Print Name: Jake Bourke
Date & Time: 26/09/2022
Signature:

Received by (company):
Print Name:
Date & Time: 1100
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: 6° (if applicable)
Transported by: Hand delivered / courier

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Ramboll Australia Pty Ltd
Attention	J Bourke

Sample Login Details	
Your reference	Hydro Groundwater Plume Monitoring - 318001362
Envirolab Reference	306675
Date Sample Received	27/09/2022
Date Instructions Received	27/09/2022
Date Results Expected to be Reported	05/10/2022

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	27 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	11
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total
W2S_20220920	✓	✓	✓	✓	✓
W2D_20220920	✓	✓	✓	✓	✓
PUMP_20220920	✓	✓	✓	✓	✓
W7M_20220920	✓	✓	✓	✓	✓
W7S_20220920	✓	✓	✓	✓	✓
E5_20220920	✓	✓	✓	✓	✓
E5D_20220920	✓	✓	✓	✓	✓
G2_20220920	✓	✓	✓	✓	✓
N8_20220920	✓	✓	✓	✓	✓
N9_20220920	✓	✓	✓	✓	✓
W6D_20220920	✓	✓	✓	✓	✓
W6S_20220920	✓	✓	✓	✓	✓
E11_20220920	✓	✓	✓	✓	✓
W3S_20220920	✓	✓	✓	✓	✓
W5D_20220920	✓	✓	✓	✓	✓
N2_20220920	✓	✓	✓	✓	✓
F5_20220921	✓	✓	✓	✓	✓
G5_20220921	✓	✓	✓	✓	✓
F6_20220921	✓	✓	✓	✓	✓
G6_20220921	✓	✓	✓	✓	✓
A7_20220921	✓	✓	✓	✓	✓
E4_20220921	✓	✓	✓	✓	✓
W1S_20220921	✓	✓	✓	✓	✓
W1D_20220921	✓	✓	✓	✓	✓
D01_20220920	✓	✓	✓	✓	✓
D01_20220921	✓	✓	✓	✓	✓
R01_20220921	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2234720**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 28-Sep-2022 15:50
Order number	: ----	Date Analysis Commenced	: 01-Oct-2022
C-O-C number	: ----	Issue Date	: 06-Oct-2022 15:13
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	T01_20220920	T01_20221921	----	----	----
			Sampling date / time	21-Sep-2022 00:00	21-Sep-2022 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2234720-001	ES2234720-002	--------	--------	--------
				Result	Result	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	**6620**	**290**	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	10	µg/L	**7350**	**670**	----	----	----
EK025SF: Free CN by Segmented Flow Analyser								
Free Cyanide	----	0.004	mg/L	<0.004	<0.004	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	**0.173**	<0.004	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**33.6**	**0.6**	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2234720**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 28-Sep-2022
Order number	: ----	Date Analysis Commenced	: 01-Oct-2022
C-O-C number	: ----	Issue Date	: 06-Oct-2022
Sampler	: ----		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 2		
No. of samples analysed	: 2		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4615924)									
WN2212140-002	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2234679-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4616294)									
ES2234591-004	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<10 µg/L	<0.01	0.0	No Limit
ES2234418-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 4617332)									
ES2234543-006	Anonymous	EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	<0.004	0.0	No Limit
ES2235380-002	Anonymous	EK025SF: Free Cyanide	----	0.004	mg/L	0.034	0.037	6.6	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4617334)									
ES2235380-002	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	0.540	0.601	10.7	No Limit
ES2234577-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4613031)									
ES2234730-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	0.3	94.7	No Limit
ES2234730-003	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4615924)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	90.5	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 4616294)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	95.6	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4617332)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	103	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4617334)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	104	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4613031)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	105	82.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4617332)							
ES2234543-006	Anonymous	EK025SF: Free Cyanide	----	0.2 mg/L	103	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4617334)							
ES2234577-001	Anonymous	EK026SF: Total Cyanide	57-12-5	0.2 mg/L	104	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4613031)							
ES2234730-002	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	87.0	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2234720**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 28-Sep-2022
Site	: ----	Issue Date	: 06-Oct-2022
Sampler	: ----	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	10	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)								
T01_20220920,	T01_20220921	**21-Sep-2022**	**----**	----	----	**04-Oct-2022**	20-Mar-2023	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)								
T01_20220920,	T01_20220921	**21-Sep-2022**	**04-Oct-2022**	20-Mar-2023	✓	**04-Oct-2022**	20-Mar-2023	✓
EK025SF: Free CN by Segmented Flow Analyser								
Opaque plastic bottle - NaOH (EK025SF)								
T01_20220920,	T01_20220921	**21-Sep-2022**	**----**	----	----	**05-Oct-2022**	05-Oct-2022	✓
EK026SF: Total CN by Segmented Flow Analyser								
Opaque plastic bottle - NaOH (EK026SF)								
T01_20220920,	T01_20220921	**21-Sep-2022**	**----**	----	----	**05-Oct-2022**	05-Oct-2022	✓
EK040P: Fluoride by PC Titrator								
Clear Plastic Bottle - Natural (EK040P)								
T01_20220920,	T01_20220921	**21-Sep-2022**	**----**	----	----	**01-Oct-2022**	19-Oct-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	12	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	10	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **ES2234720**

Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: cez.bautista@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Page	: 1 of 2
Order number	: ----	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 28-Sep-2022 15:50	Issue Date	: 30-Sep-2022
Client Requested Due Date	: 06-Oct-2022	Scheduled Reporting Date	: **06-Oct-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.3°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2234720-001	21-Sep-2022 00:00	T01_20220920	✓	✓	✓	✓	✓
ES2234720-002	21-Sep-2022 00:00	T01_20220921	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com

JAKE BOURKE

- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com

JORDYN KIRSCH

- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

MP 471

306675.

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.:	
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	
Sampler: Jake Bourke	Date results required:	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	HOLD	Comments: Provide as much information about the sample as you can
15	W5D_20220920		20/09/2022	WATER	X	X	X	X	X		
15	N2_20220920		20/09/2022	WATER	X	X	X	X	X		
17	F5_20220921		21/09/2022	WATER	X	X	X	X	X		
18	G5_20220921		21/09/2022	WATER	X	X	X	X	X		
19	F6_20220921		21/09/2022	WATER	X	X	X	X	X		
20	G6_20220921		21/09/2022	WATER	X	X	X	X	X		
21	A7_20220921		21/09/2022	WATER	X	X	X	X	X		
22	E4_20220921		21/09/2022	WATER	X	X	X	X	X		
23	W1S_20220921		21/09/2022	WATER	X	X	X	X	X		
24	W1D_20220921		21/09/2022	WATER	X	X	X	X	X		
25	D01_20220920		20/09/2022	WATER	X	X	X	X	X		
—	T01_20220920		20/09/2022	WATER	X	X	X	X	X		Please forward to ALS
26	D01_20220921		21/09/2022	WATER	X	X	X	X	X		
—	T01_20220921		21/09/2022	WATER						X	Please forward to ALS
27	R01_20220921		21/09/2022	WATER	X	X	X	X	X		

Environmental Division
Sydney
Work Order Reference
ES2234720
Telephone : + 61-2-8784 8555

Relinquished by (company):	Ramboll	ELS SYD	Received by (company):	*Lab use only:*
Print Name:	Jake Bourke	CMUENN	Print Name:	Samples Received: Cool or Ambient (circle one)
Date & Time:	26/09/2022	28/9/22 1130 am	Date & Time: 1100	Temperature Received at: 6 (if applicable)
Signature:			Signature:	Transported by: Hand delivered / courier

Rec: JG 28/09/22 1550

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 313871

Client Details

Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**Hydro Groundwater Plume Monitoring - 318001362**
Number of Samples	26 Water
Date samples received	23/12/2022
Date completed instructions received	23/12/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	09/01/2023
Date of Issue	09/01/2023

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Miscellaneous Inorganics						
Our Reference		313871-1	313871-2	313871-3	313871-4	313871-5
Your Reference	UNITS	W2S_20221220	W2D_20221220	PUMP_20221220	W7M_20221220	W3S_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Date analysed	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Fluoride, F	mg/L	53	1,100	360	850	180
Total Cyanide	mg/L	1.4	230	27	170	28
Free Cyanide in Water	mg/L	<0.004	0.004	<0.004	<0.004	0.006

Miscellaneous Inorganics						
Our Reference		313871-6	313871-7	313871-8	313871-9	313871-10
Your Reference	UNITS	E5_20221220	E5D_20221220	G2_20221220	N8_20221220	N9_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Date analysed	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Fluoride, F	mg/L	420	8.6	0.3	0.6	2.9
Total Cyanide	mg/L	86	0.94	<0.004	0.61	0.076
Free Cyanide in Water	mg/L	0.006	<0.004	<0.004	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		313871-11	313871-12	313871-13	313871-14	313871-16
Your Reference	UNITS	W6D_20221220	E11_20221220	W5D_20221220	N2_20221220	D01_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Date analysed	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Fluoride, F	mg/L	<0.1	23	0.4	3.0	1,200
Total Cyanide	mg/L	<0.004	0.50	0.006	0.027	220
Free Cyanide in Water	mg/L	<0.004	<0.004	<0.004	<0.004	0.005

Miscellaneous Inorganics						
Our Reference		313871-17	313871-18	313871-19	313871-20	313871-21
Your Reference	UNITS	W15_20221221	G6_20221221	A7_20221221	G5_20221221	F5_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Date analysed	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Fluoride, F	mg/L	12	0.7	340	0.2	0.2
Total Cyanide	mg/L	1.2	<0.004	55	<0.004	<0.004
Free Cyanide in Water	mg/L	<0.004	<0.004	0.005	<0.004	<0.004

Miscellaneous Inorganics						
Our Reference		313871-22	313871-23	313871-24	313871-25	313871-26
Your Reference	UNITS	E4_20221221	F6_20221221	W1D_20221221	R01_20221221	D02_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Date analysed	-	30/12/2022	30/12/2022	30/12/2022	30/12/2022	30/12/2022
Fluoride, F	mg/L	780	0.5	10	<0.1	810
Total Cyanide	mg/L	210	0.004	1.2	<0.004	210
Free Cyanide in Water	mg/L	0.004	<0.004	<0.004	<0.004	0.005

HM in water - dissolved						
Our Reference		313871-1	313871-2	313871-3	313871-4	313871-5
Your Reference	UNITS	W2S_20221220	W2D_20221220	PUMP_20221220	W7M_20221220	W3S_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	1,900	550	950	250	370

HM in water - dissolved						
Our Reference		313871-6	313871-7	313871-8	313871-9	313871-10
Your Reference	UNITS	E5_20221220	E5D_20221220	G2_20221220	N8_20221220	N9_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	80	<10	<10	20	1,100

HM in water - dissolved						
Our Reference		313871-11	313871-12	313871-13	313871-14	313871-16
Your Reference	UNITS	W6D_20221220	E11_20221220	W5D_20221220	N2_20221220	D01_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	30	470	<10	1,900	510

HM in water - dissolved						
Our Reference		313871-17	313871-18	313871-19	313871-20	313871-21
Your Reference	UNITS	W15_20221221	G6_20221221	A7_20221221	G5_20221221	F5_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	80	16,000	140	80	2,100

HM in water - dissolved						
Our Reference		313871-22	313871-23	313871-24	313871-25	313871-26
Your Reference	UNITS	E4_20221221	F6_20221221	W1D_20221221	R01_20221221	D02_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	380	<10	90	<10	370

HM in water - total						
Our Reference		313871-1	313871-2	313871-3	313871-4	313871-5
Your Reference	UNITS	W2S_20221220	W2D_20221220	PUMP_20221220	W7M_20221220	W3S_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Total	µg/L	63,000	450	8,500	3,400	3,700

HM in water - total						
Our Reference		313871-6	313871-7	313871-8	313871-9	313871-10
Your Reference	UNITS	E5_20221220	E5D_20221220	G2_20221220	N8_20221220	N9_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Total	µg/L	300	1,200	160	340	2,000

HM in water - total						
Our Reference		313871-11	313871-12	313871-13	313871-14	313871-16
Your Reference	UNITS	W6D_20221220	E11_20221220	W5D_20221220	N2_20221220	D01_20221220
Date Sampled		20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Total	µg/L	1,400	1,100	50	2,600	450

HM in water - total						
Our Reference		313871-17	313871-18	313871-19	313871-20	313871-21
Your Reference	UNITS	W15_20221221	G6_20221221	A7_20221221	G5_20221221	F5_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Total	µg/L	280	17,000	150	450	2,500

HM in water - total						
Our Reference		313871-22	313871-23	313871-24	313871-25	313871-26
Your Reference	UNITS	E4_20221221	F6_20221221	W1D_20221221	R01_20221221	D02_20221221
Date Sampled		21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Date analysed	-	03/01/2023	03/01/2023	03/01/2023	03/01/2023	03/01/2023
Aluminium-Total	µg/L	390	70	720	<10	370

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjusted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hypochlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-022	Determination of various metals by ICP-MS.

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	313871-2
Date prepared	-			30/12/2022	1	30/12/2022	30/12/2022		30/12/2022	30/12/2022
Date analysed	-			30/12/2022	1	30/12/2022	30/12/2022		30/12/2022	30/12/2022
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	53	51	4	99	#
Total Cyanide	mg/L	0.004	Inorg-014	<0.004	1	1.4	[NT]		104	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	<0.004	1	<0.004	[NT]		102	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	313871-13
Date prepared	-			[NT]	8	30/12/2022	30/12/2022		30/12/2022	30/12/2022
Date analysed	-			[NT]	8	30/12/2022	30/12/2022		30/12/2022	30/12/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	8	0.3	[NT]		104	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	8	<0.004	<0.004	0	98	97
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	8	<0.004	<0.004	0	97	85

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	313871-21
Date prepared	-			[NT]	10	30/12/2022	30/12/2022		[NT]	30/12/2022
Date analysed	-			[NT]	10	30/12/2022	30/12/2022		[NT]	30/12/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	10	2.9	2.9	0	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	10	0.076	[NT]		[NT]	90
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	10	<0.004	[NT]		[NT]	87

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	313871-22
Date prepared	-			[NT]	11	30/12/2022	30/12/2022		[NT]	30/12/2022
Date analysed	-			[NT]	11	30/12/2022	30/12/2022		[NT]	30/12/2022
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	<0.1	[NT]		[NT]	#
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	11	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	20	30/12/2022	30/12/2022		[NT]	[NT]
Date analysed	-			[NT]	20	30/12/2022	30/12/2022		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	20	0.2	[NT]		[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	20	<0.004	<0.004	0	[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	20	<0.004	<0.004	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	30/12/2022	30/12/2022		[NT]	[NT]
Date analysed	-			[NT]	21	30/12/2022	30/12/2022		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	21	0.2	0.3	40	[NT]	[NT]
Total Cyanide	mg/L	0.004	Inorg-014	[NT]	21	<0.004	[NT]		[NT]	[NT]
Free Cyanide in Water	mg/L	0.004	Inorg-014	[NT]	21	<0.004	[NT]		[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	313871-2
Date prepared	-			03/01/2023	1	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Date analysed	-			03/01/2023	1	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	1900	1900	0	104	#

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	313871-23
Date prepared	-			[NT]	11	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Date analysed	-			[NT]	11	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	11	30	30	0	95	93

QUALITY CONTROL: HM in water - dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	22	03/01/2023	03/01/2023		[NT]	[NT]
Date analysed	-			[NT]	22	03/01/2023	03/01/2023		[NT]	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	[NT]	22	380	380	0	[NT]	[NT]

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	313871-3
Date prepared	-			03/01/2023	1	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Date analysed	-			03/01/2023	1	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Aluminium-Total	µg/L	10	Metals-022	<10	1	63000	67000	6	103	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	313871-12
Date prepared	-			[NT]	11	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Date analysed	-			[NT]	11	03/01/2023	03/01/2023		03/01/2023	03/01/2023
Aluminium-Total	µg/L	10	Metals-022	[NT]	11	1400	1500	7	105	#

QUALITY CONTROL: HM in water - total					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	03/01/2023	03/01/2023		[NT]	[NT]
Date analysed	-			[NT]	21	03/01/2023	03/01/2023		[NT]	[NT]
Aluminium-Total	µg/L	10	Metals-022	[NT]	21	2500	2600	4	[NT]	[NT]

Result Definitions	
NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Flouride # Percent recovery is not applicable due to the high concentration of the analytes/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - dissolved - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

8 HM in water - total - # Percent recovery is not applicable due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

CHAIN OF COUSTODY - Client

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.: 318001362	
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	
Sampler: Jake Bourke	Date results required: Please report in EQuIS format	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Comments: Provide as much information about the sample as you can
1	W2S		20/12/2022	WATER	X	X	X	X	X	*Envirolab Services 12 Ashley St Chatswood NSW 2067 Ph: (02) 9910 6200*
2	W2D		20/12/2022	WATER	X	X	X	X	X	
3	PUMP		20/12/2022	WATER	X	X	X	X	X	
4	W7M		20/12/2022	WATER	X	X	X	X	X	Job No: 313871
5	W3S		20/12/2022	WATER	X	X	X	X	X	23/12/22
6	E5		20/12/2022	WATER	X	X	X	X	X	Date Received: 0945
7	E5D		20/12/2022	WATER	X	X	X	X	X	Time Received: CR
8	G2		20/12/2022	WATER	X	X	X	X	X	Received By: Temp: Cool/Ambient
9	N8		20/12/2022	WATER	X	X	X	X	X	Cooling: Ice/Icepack 09°C
10	N9		20/12/2022	WATER	X	X	X	X	X	Security: Intact/Broken/None
11	W6D		20/12/2022	WATER	X	X	X	X	X	
12	E11		20/12/2022	WATER	X	X	X	X	X	
13	W5D		20/12/2022	WATER	X	X	X	X	X	
14	N2		20/12/2022	WATER	X	X	X	X	X	

Relinquished by (company): Ramboll	Received by (company): ELS Sydney	*Lab use only:* 313871
Print Name: Jake Bourke	Print Name: Crosemen	Samples Received: Cool or Ambient (circle one)
Date & Time: 22/12/2022	Date & Time: 23/12/22 0945	Temperature Received at: 09°C (if applicable)
Signature:	Signature:	Transported by: Hand delivered / courier

* extra samples rec'd. written on next page -CR

Ramboll 31800136 2 extras

313871 ELS.

15 - T01_20221220 20/12

16 - D01_20221220 20/12

17 - W15 21/12

18 - G6

19 - A7

20 - G5

21 - ~~A~~F5

22 - E4

23 - F6

24 - W10

25 - R01_20221221

26 - D02_20221221

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Ramboll Australia Pty Ltd
Attention	J Bourke, J Kirsch

Sample Login Details	
Your reference	Hydro Groundwater Plume Monitoring - 318001362
Envirolab Reference	313871
Date Sample Received	23/12/2022
Date Instructions Received	23/12/2022
Date Results Expected to be Reported	09/01/2023

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	26 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	9
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	Fluoride, F	Total Cyanide	Free Cyanide in Water	HM in water - dissolved	HM in water - total	On Hold
W2S_20221220	✓	✓	✓	✓	✓	
W2D_20221220	✓	✓	✓	✓	✓	
PUMP_20221220	✓	✓	✓	✓	✓	
W7M_20221220	✓	✓	✓	✓	✓	
W3S_20221220	✓	✓	✓	✓	✓	
E5_20221220	✓	✓	✓	✓	✓	
E5D_20221220	✓	✓	✓	✓	✓	
G2_20221220	✓	✓	✓	✓	✓	
N8_20221220	✓	✓	✓	✓	✓	
N9_20221220	✓	✓	✓	✓	✓	
W6D_20221220	✓	✓	✓	✓	✓	
E11_20221220	✓	✓	✓	✓	✓	
W5D_20221220	✓	✓	✓	✓	✓	
N2_20221220	✓	✓	✓	✓	✓	
T01_20221220						✓
D01_20221220	✓	✓	✓	✓	✓	
W1S_20221221	✓	✓	✓	✓	✓	
G6_20221221	✓	✓	✓	✓	✓	
A7_20221221	✓	✓	✓	✓	✓	
G5_20221221	✓	✓	✓	✓	✓	
F5_20221221	✓	✓	✓	✓	✓	
E4_20221221	✓	✓	✓	✓	✓	
F6_20221221	✓	✓	✓	✓	✓	
W1D_20221221	✓	✓	✓	✓	✓	
R01_20221221	✓	✓	✓	✓	✓	
D02_20221221	✓	✓	✓	✓	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2246862**	Page	: 1 of 2
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 30-Dec-2022 12:00
Order number	: 318001362	Date Analysis Commenced	: 03-Jan-2023
C-O-C number	: ----	Issue Date	: 10-Jan-2023 16:25
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**T01_20221220**	----	----	----	----
			Sampling date / time	20-Dec-2022 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2246862-001**	--------	--------	--------	--------
				Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.22**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**1.74**	----	----	----	----
EK025SF: Free CN by Segmented Flow Analyser								
Free Cyanide	----	0.004	mg/L	**0.621**	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	**214**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**1050**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES2246862**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 30-Dec-2022
Order number	: 318001362	Date Analysis Commenced	: 03-Jan-2023
C-O-C number	: ----	Issue Date	: 10-Jan-2023
Sampler	: JAKE BOURKE		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4802976)									
ES2246808-003	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2300020-001	Anonymous	EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.05	0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4805121)									
ES2246866-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	1.48	1.53	3.4	0% - 20%
ES2246783-001	Anonymous	EG020A-T: Aluminium	7429-90-5	0.01	mg/L	10.2	8.91	13.5	0% - 20%
EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 4800193)									
ES2246862-001	T01_20221220	EK025SF: Free Cyanide	----	0.004	mg/L	0.621	0.690	10.5	0% - 20%
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 4800192)									
ES2246862-001	T01_20221220	EK026SF: Total Cyanide	57-12-5	0.004	mg/L	214	217	1.5	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 4799192)									
ME2202316-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.4	0.0	No Limit
ES2246733-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.2	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4802976)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	87.1	80.0	116
EG020T: Total Metals by ICP-MS (QCLot: 4805121)								
EG020A-T: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	92.1	82.0	120
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4800193)								
EK025SF: Free Cyanide	----	0.004	mg/L	<0.004	0.2 mg/L	102	88.0	128
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4800192)								
EK026SF: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.2 mg/L	120	73.0	133
EK040P: Fluoride by PC Titrator (QCLot: 4799192)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	103	82.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK025SF: Free CN by Segmented Flow Analyser (QCLot: 4800193)							
ES2246862-001	T01_20221220	EK025SF: Free Cyanide	----	2 mg/L	93.4	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 4800192)							
ES2246862-001	T01_20221220	EK026SF: Total Cyanide	57-12-5	200 mg/L	98.3	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4799192)							
ES2246733-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	113	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2246862**	Page	: 1 of 5
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Telephone	: +61-2-8784 8555
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Date Samples Received	: 30-Dec-2022
Site	: ----	Issue Date	: 10-Jan-2023
Sampler	: JAKE BOURKE	No. of samples received	: 1
Order number	: 318001362	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	**Days overdue**	*Date analysed*	*Due for analysis*	**Days overdue**
EK025SF: Free CN by Segmented Flow Analyser						
Clear Plastic Bottle - NaOH						
T01_20221220	----	----	----	05-Jan-2023	03-Jan-2023	**2**
EK026SF: Total CN by Segmented Flow Analyser						
Clear Plastic Bottle - NaOH						
T01_20221220	----	----	----	05-Jan-2023	03-Jan-2023	**2**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
T01_20221220	**20-Dec-2022**	**----**	----	----	**06-Jan-2023**	18-Jun-2023	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
T01_20221220	**20-Dec-2022**	**09-Jan-2023**	18-Jun-2023	✓	**09-Jan-2023**	18-Jun-2023	✓
EK025SF: Free CN by Segmented Flow Analyser							
Clear Plastic Bottle - NaOH (EK025SF)							
T01_20221220	**20-Dec-2022**	**----**	----	----	**05-Jan-2023**	03-Jan-2023	×
EK026SF: Total CN by Segmented Flow Analyser							
Clear Plastic Bottle - NaOH (EK026SF)							
T01_20221220	**20-Dec-2022**	**----**	----	----	**05-Jan-2023**	03-Jan-2023	×

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
T01_20221220	**20-Dec-2022**	**----**	----	----	**03-Jan-2023**	17-Jan-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	17	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Free CN by Segmented Flow Analyser	EK025SF	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	0	14	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Free CN by Segmented Flow Analyser	EK025SF	WATER	In house: Referenced to ASTM D7237, APHA 4500-CN-C&O and ISO 14403: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	WATER	In house: Referenced to APHA 4500-CN C&O / ASTM D7511 / ISO 14403. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM Schedule B(3)
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES2246862**		
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: JORDYN KIRSCH	Contact	: Cez Bautista
Address	: EASTPOINT COMPLEX SUITE 19B, LEVEL 2 50 GLEBE ROAD THE JUNCTION NSW 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: jkirsch@ramboll.com	E-mail	: cez.bautista@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: HYDRO GROUNDWATER PLUME MONITORING - 318001362	Page	: 1 of 2
Order number	: 318001362	Quote number	: EB2017ENVIAUS0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: JAKE BOURKE		

Dates

Date Samples Received	: 30-Dec-2022 12:00	Issue Date	: 30-Dec-2022
Client Requested Due Date	: 10-Jan-2023	Scheduled Reporting Date	: **10-Jan-2023**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 2.4'C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method / Sample ID	Sample Container Received	Preferred Sample Container for Analysis
Free CN by Segmented Flow Analyser : EK025SF		
T01_20221220	- Clear Plastic Bottle - NaOH	- Opaque plastic bottle - NaOH - Pb Acetate
Total Cyanide by Segmented Flow Analyser : EK026SF		
T01_20221220	- Clear Plastic Bottle - NaOH	- Opaque plastic bottle - NaOH - Pb Acetate

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EG020F Dissolved Metals by ICP/MS	WATER - EG020T Total Metals by ICP/MS (including digestion)	WATER - EK025SF Free CN By Segmented Flow Analyser	WATER - EK026SF Total Cyanide by Segmented Flow Analyser	WATER - EK040-P Fluoride (Auto Titrator)
ES2246862-001	20-Dec-2022 00:00	T01_20221220	✓	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	AsiaPac-Accounts@Ramboll.com

JAKE BOURKE

- *AU Certificate of Analysis - NATA (COA)	Email	JBOURKE@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	JBOURKE@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	JBOURKE@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	JBOURKE@ramboll.com
- Chain of Custody (CoC) (COC)	Email	JBOURKE@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	JBOURKE@ramboll.com
- EDI Format - XTab (XTAB)	Email	JBOURKE@ramboll.com

JORDYN KIRSCH

- *AU Certificate of Analysis - NATA (COA)	Email	jkirsch@ramboll.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jkirsch@ramboll.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jkirsch@ramboll.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jkirsch@ramboll.com
- Chain of Custody (CoC) (COC)	Email	jkirsch@ramboll.com
- EDI Format - EQUIS_ENVIRON (EQUIS_ENVIRON)	Email	jkirsch@ramboll.com
- EDI Format - XTab (XTAB)	Email	jkirsch@ramboll.com

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067 Phone: 02 9910 6200 Fax :02 9910 6201 E-mail: ahie@envirolabservices.com.au Contact: Aileen Hie
Contact person: Jake Bourke	PO No.: 318001362	
Project Mgr: Jordyn Kirsch	Envirolab Quote No. :	
Sampler: Jake Bourke	Date results required: Please report in excel, PDf and EQuIS formats	
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154 Phone: 08 9317 2505 Fax :08 9317 4163 E-mail: lab@mpl.com.au Contact: Joshua Lim
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	
Fax:	Lab comments: Highly contaminated	
Email: jkirsch@ramboll.com; jbourke@ramboll.com		

Sample information					Tests Required					Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Provide as much information about the sample as you can
1	W2S_20221220		20/12/2022	WATER	X	X	X	X	X	
2	W2D_20221220		20/12/2022	WATER	X	X	X	X	X	
3	PUMP_20221220		20/12/2022	WATER	X	X	X	X	X	
4	W7M_20221220		20/12/2022	WATER	X	X	X	X	X	
5	W3S_20221220		20/12/2022	WATER	X	X	X	X	X	
6	E5_20221220		20/12/2022	WATER	X	X	X	X	X	
7	E5D_20221220		20/12/2022	WATER	X	X	X	X	X	
8	G2_20221220		20/12/2022	WATER	X	X	X	X	X	
9	N8_20221220		20/12/2022	WATER	X	X	X	X	X	
10	N9_20221220		20/12/2022	WATER	X	X	X	X	X	
11	W6D_20221220		20/12/2022	WATER	X	X	X	X	X	
12	E11_20221220		20/12/2022	WATER	X	X	X	X	X	
13	W5D_20221220		20/12/2022	WATER	X	X	X	X	X	
14	N2_20221220		20/12/2022	WATER	X	X	X	X	X	

Environmental Division
Sydney
Work Order Reference
ES2246862

Telephone : + 61-2-8784 8555

Relinquished by (company): Ramboll	ELS Sydney	Received by (company): ALS	*Lab use only:*
Print Name: Jake Bourke	Closmer	Print Name: Thady G	Samples Received: Cool or Ambient (circle one)
Date & Time: 22/12/2022	30/12/22 1200	Date & Time: 30/12/22 1200	Temperature Received at: (if applicable)
Signature:		Signature:	Transported by: Hand delivered / courier

ENVIROLAB GROUP

Client: Ramboll	Client Project Name / Number / Site etc (ie report title): Hydro Groundwater Plume Monitoring - 318001362	**Envirolab Services** 12 Ashley St, Chatswood, NSW 2067
Contact person: Jake Bourke		Phone: 02 9910 6200 Fax :02 9910 6201
Project Mgr: Jordyn Kirsch	PO No.: 318001362	E-mail: ahie@envirolabservices.com.au
Sampler: Jake Bourke	Envirolab Quote No. :	Contact: Aileen Hie
Address: Level 2 Suite 18, 50 Glebe Road, The Junction	Date results required: Please report in excel, PDf and EQuIS formats Or choose: standard / same day / 1 day / 2 day / 3 day	**Envirolab Services WA t/a MPL** 16-18 Hayden Crt, Myaree WA 6154
Phone: (02) 49625444 Mob: 0467580473	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	Phone: 08 9317 2505 Fax :08 9317 4163
Fax:	Lab comments: Highly contaminated	E-mail: lab@mpl.com.au
Email: jkirsch@ramboll.com; jbourke@ramboll.com		Contact: Joshua Lim

Sample information					Tests Required					Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Soluble Fluoride	Total Cyanide	Free Cyanide	Total Aluminium	Dissolved Aluminium	Provide as much information about the sample as you can
21	F5_20221221		21/12/2022	WATER	X	X	X	X	X	
20	G5_20221221		21/12/2022	WATER	X	X	X	X	X	
23	F6_20221221		21/12/2022	WATER	X	X	X	X	X	
18	G6_20221221		21/12/2022	WATER	X	X	X	X	X	
19	A7_20221221		21/12/2022	WATER	X	X	X	X	X	
22	E4_20221221		21/12/2022	WATER	X	X	X	X	X	
17	W1S_20221221		21/12/2022	WATER	X	X	X	X	X	
24	W1D_20221221		21/12/2022	WATER	X	X	X	X	X	
16	D01_20221220		20/12/2022	WATER	X	X	X	X	X	
15	T01_20221220		20/12/2022	WATER	X	X	X	X	X	Please forward to ALS
26	D02_20221221		21/12/2022	WATER	X	X	X	X	X	
25	R01_20221221		21/12/2022	WATER	X	X	X	X	X	

Relinquished by (company): Ramboll	ELS Sydney	Received by (company): ALS	*Lab use only:*
Print Name: Jake Bourke	Closeman	Print Name: Thanh L	Samples Received: Cool or Ambient (circle one)
Date & Time: 22/12/2022	30/12/22 1200	Date & Time: 30/12/22 1200	Temperature Received at: (if applicable)
Signature:		Signature:	Transported by: Hand delivered / courier

APPENDIX 6
CALIBRATION CERTIFICATES

28/2/22

Oil / Water Interface Meter

Instrument **Interface Meter (30M)**
Serial No. **312530**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	Intrinsically safe
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Darcy Keogh**

Calibration date: **28/02/2022**

Next calibration due: **29/04/2022**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Calibration Value	After Calibration	Comment
pH	pH	29.11	4.01	4.01	Pass
pH	pH	28.84	7.00	7.00	Pass
pH	pH	28.69	9.96	9.96	Pass
ORP	pH	-	240	240.00	Pass
Conductivity	mS/cm	-	0.00	0.00	Pass
Conductivity	mS/cm	30.71	0.800	0.800	Pass
Conductivity	mS/cm	29.42	7.18	7.18	Pass
Conductivity	mS/cm	29.47	63.10	63.10	Pass
Turbidity	NTU	-	0	0	Pass
Turbidity	NTU	-	8	8	Pass
Turbidity	NTU	-	80	80	Pass
Turbidity	NTU	-	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	Pass
D.O. Span	mg/L	31.21	7.41	7.41	Pass

Calibrated by: **Jake Bourke**

Calibration date: **31/01/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Sensor	Solution	Temperature	Calibration Point	Measurement Value
pH	pH 4 standard solution phthalate	22.05	4.00	4.00
	pH 7 standard solution Neutral phosphate	21.77	7.02	7.02
	pH 10 standard solution Neutral phosphate	22.02	10.06	10.06

Calibrated by: **Jake Bourke**

Calibration date: **17/03/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

7/6/22

Oil / Water Interface Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument Interface Meter (30M)
Serial No. 348884

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Adam Nikolic

Calibration date: 7/06/2022

Next calibration due: 6/08/2022

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Calibration Value	After Calibration	Comment
pH	pH	24.17	4.00	4.00	Pass
pH	pH	23.91	7.02	7.02	Pass
pH	pH	23.6	10.06	10.06	Pass
ORP	pH	-	240	240	Pass
Conductivity	mS/cm	-	0.00	0.00	Pass
Conductivity	mS/cm	21.92	0.677	0.677	Pass
Conductivity	mS/cm	21.2	6.16	6.16	Pass
Conductivity	mS/cm	21.37	54.10	54.10	Pass
Turbidity	NTU	-	0	0	Pass
Turbidity	NTU	-	8	8	Pass
Turbidity	NTU	-	80	80	Pass
Turbidity	NTU	-	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	Pass
D.O. Span	mg/L	22.27	8.72	8.72	Pass

Calibrated by: **Jake Bourke**

Calibration date: **2/05/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.

For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Sensor	Solution	Temperature	Calibration Point	Measurement Value
pH	pH 4 standard solution phthalate	9.73	4.00	4.00
	pH 7 standard solution Neutral phosphate	10.05	7.06	7.06
	pH 10 standard solution Neutral phosphate	9.57	10.19	10.19

Calibrated by: **Jake Bourke**

Calibration date: **15/06/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

30/8/22

Oil / Water Interface Meter

Instrument Interface Meter (60M)
Serial No. 484842

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Lebelle Chee

Calibration date: 30/08/2022

Next calibration due: 29/10/2022

RAMBOLL

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Calibration Value	After Calibration	Comment
pH	pH	21.52	4.00	4.00	Pass
pH	pH	21.63	7.02	7.02	Pass
pH	pH	22.03	10.06	10.06	Pass
ORP	mV	-	240	240	Pass
Conductivity	mS/cm	-	0.00	0.00	Pass
Conductivity	mS/cm	19.16	0.636	0.636	Pass
Conductivity	mS/cm	18.91	5.90	5.90	Pass
Conductivity	mS/cm	18.76	51.90	51.90	Pass
Turbidity	NTU	-	0	0	Pass
Turbidity	NTU	-	8	8	Pass
Turbidity	NTU	-	80	80	Pass
Turbidity	NTU	-	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	Pass
D.O. Span	mg/L	19.87	9.07	9.07	Pass

Calibrated by: **Jake Bourke**

Calibration date: **28/07/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Sensor	Solution	Temperature	Calibration Point	Measurement Value
pH	pH 4 standard solution phthalate	14.68	4.00	4.00
	pH 7 standard solution Neutral phosphate	15.01	7.04	7.04
	pH 10 standard solution Neutral phosphate	15.12	10.12	10.12

Calibrated by: **Jake Bourke**

Calibration date: **19/09/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

14/12/22

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 484664

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: **Adam Nikolic**

Calibration date: **14/12/2022**

Next calibration due: **12/02/2023**

Multi-Parameter Water Quality Meter Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Parameter	Units	Temp. (°C)	Calibration Value	After Calibration	Comment
pH	pH	19.70	4.00	4.00	Pass
pH	pH	19.76	7.02	7.02	Pass
pH	pH	20.06	10.06	10.06	Pass
ORP	mV	-	240	240	Pass
Conductivity	mS/cm	-	0.00	0.00	Pass
Conductivity	mS/cm	19.74	0.649	0.649	Pass
Conductivity	mS/cm	19.94	6.03	6.03	Pass
Conductivity	mS/cm	19.83	53.00	53.00	Pass
Turbidity	NTU	-	0	0	Pass
Turbidity	NTU	-	8	8	Pass
Turbidity	NTU	-	80	80	Pass
Turbidity	NTU	-	400	400	Pass
D.O. Zero	mg/L	-	0.00	0.00	Pass
D.O. Span	mg/L	18.38	9.45	9.45	Pass

Calibrated by: **Jake Bourke**

Calibration date: **30/09/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution	pH 7 standard solution	pH 10 standard solution
5	4.00	7.09	10.24
10	4.00	7.06	10.19
15	4.00	7.04	10.12
20	4.00	7.02	10.06
30	4.01	7.00	9.96
35	4.02	6.99	9.92
40	4.03	6.97	9.90
50	4.06	6.95	9.82

Table B: Change in Conductivity with temperature (°C)

Temperature (°C)	Standard solution (0.718 mS/cm)	Standard solution (6.67 mS/cm)	Standard solution (58.6 mS/cm)
10	0.512	4.76	41.80
11	0.526	4.88	42.90
12	0.540	5.01	44.10
13	0.533	0.51	45.20
14	0.567	5.27	46.30
15	0.581	5.39	47.40
16	0.595	5.52	48.50
17	0.608	5.65	49.60
18	0.622	5.87	50.80
19	0.636	5.90	51.90
20	0.649	6.03	53.00
21	0.663	6.16	54.10
22	0.677	6.29	55.20
23	0.691	6.41	56.40
24	0.704	6.54	57.50
25	0.718	6.67	58.60
26	0.732	6.79	59.70
27	0.745	6.92	60.80
28	0.759	7.05	62.00
29	0.773	7.18	63.10
30	0.787	7.30	64.20
31	0.800	7.43	65.30

Table C: Change in Dissolved Oxygen with Temperature at 100% Relative Humidity (Altitude:sea level)

Temperature	DO (100% R.H.)
(Celsius)	(ppm, mg/L)
0.00	14.60
1.00	14.19
2.00	13.81
3.00	13.44
4.00	13.09
5.00	12.75
6.00	12.43
7.00	12.12
8.00	11.83
9.00	11.55
10.00	11.27
11.00	11.01
12.00	10.76
13.00	10.52
14.00	10.29
15.00	10.07
16.00	9.85
17.00	9.65
18.00	9.45
19.00	9.26
20.00	9.07
21.00	8.90
22.00	8.72
23.00	8.56
24.00	8.40
25.00	8.24
26.00	8.09
27.00	7.95
28.00	7.81
29.00	7.67
30.00	7.54
31.00	7.41
32.00	7.28

Values are for pressure = 760 mm Hg for measurements at sea level.
For a given temperature, the concentration of dissolved oxygen concentration decreases by 0.3 mg/L with every 500 ft (152.4 m) increase in altitude.

Multi-Parameter Water Quality Meter Calibration

pH Manual Calibration

Instrument: Horiba U-52G/10m
Control Unit Serial No: TH06G239
Sensor Probe Unit Serial No: 4KV0033X

Certificate of Calibration

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

Sensor	Solution	Temperature	Calibration Point	Measurement Value
pH	pH 4 standard solution phthalate	18.26	4.00	4.00
	pH 7 standard solution phthalate	17.89	7.02	7.02
	pH 10 standard solution phthalate	18.03	10.06	10.06

Calibrated by: **Jake Bourke**

Calibration date: **20/12/2022**

Table A: Change in pH with temperature (°C)

Temperature (°C)	pH 4 standard solution Phthalate	pH 7 standard solution Neutral phosphate	pH 9 standard solution Borate
0	4.01	6.98	9.46
5	4.01	6.95	9.39
10	4.00	6.92	9.33
15	4.00	6.90	9.27
20	4.00	6.88	9.22
25	4.01	6.86	9.18
30	4.01	6.85	9.14
35	4.02	6.84	9.10
40	4.03	6.84	9.07
45	4.04	6.84	9.04

APPENDIX 7
HISTORICAL GROUNDWATER CONTOURS

Groundwater Contours - Shallow Aquifer 2013-2021


N8
N9
W6S
E11
W5S
9
A7
W3S
W3SA
W4S
9
10.5
E5
W7S
W7M
PUMP
E4
W1S
10.5
W2D
W2S
Shallow Aquifer February 2014


N8
N9
W6S
E11
W5S
9
A7
W3S
W3SA
W4S
10.5
E5
W7M
W7S
PUMP
E4
W1S
W2D
W2S
Shallow Aquifer June 2014


N8
N9
W6S
E11
W5S
9
A7
W3S
W3SA
W4S
10.5
E5
W7M
W7S
PUMP
E4
W1S
W2S
W2D
Shallow Aquifer November 2014

Shallow Aquifer February 2015

Shallow Aquifer June 2015

Shallow Aquifer September 2015

Shallow Aquifer December 2015


N8
N9
W6S
E11
W5S
9
10
11
A7
W3S
W3SA
W4S
E5
W7M
W7S
PUMP
E4
W1S
W2S
W2D
Shallow Aquifer April 2016


N8
N9
W6S
E11
8
W5S
9
10
11
A7
W3S
W3SA
W4S
E5
W7M
W7S
PUMP
E4
W1S
W2S
W2D
Shallow Aquifer July 2016


N8
N9
W6S
E11
8
W5S
9
9
10
10
11
A7
W3S
W3SA
W4S
E5
W7M
W7S
PUMP
E4
W1S
W2S
W2D
Shallow Aquifer October 2016


N8
N9
W6S
8
E11
W5S
9
A7
W3S
W3SA
W4S
8
10
9
E5
W7M
W7S
PUMP
E4
W1S
W2S
W2D
Shallow Aquifer December 2016

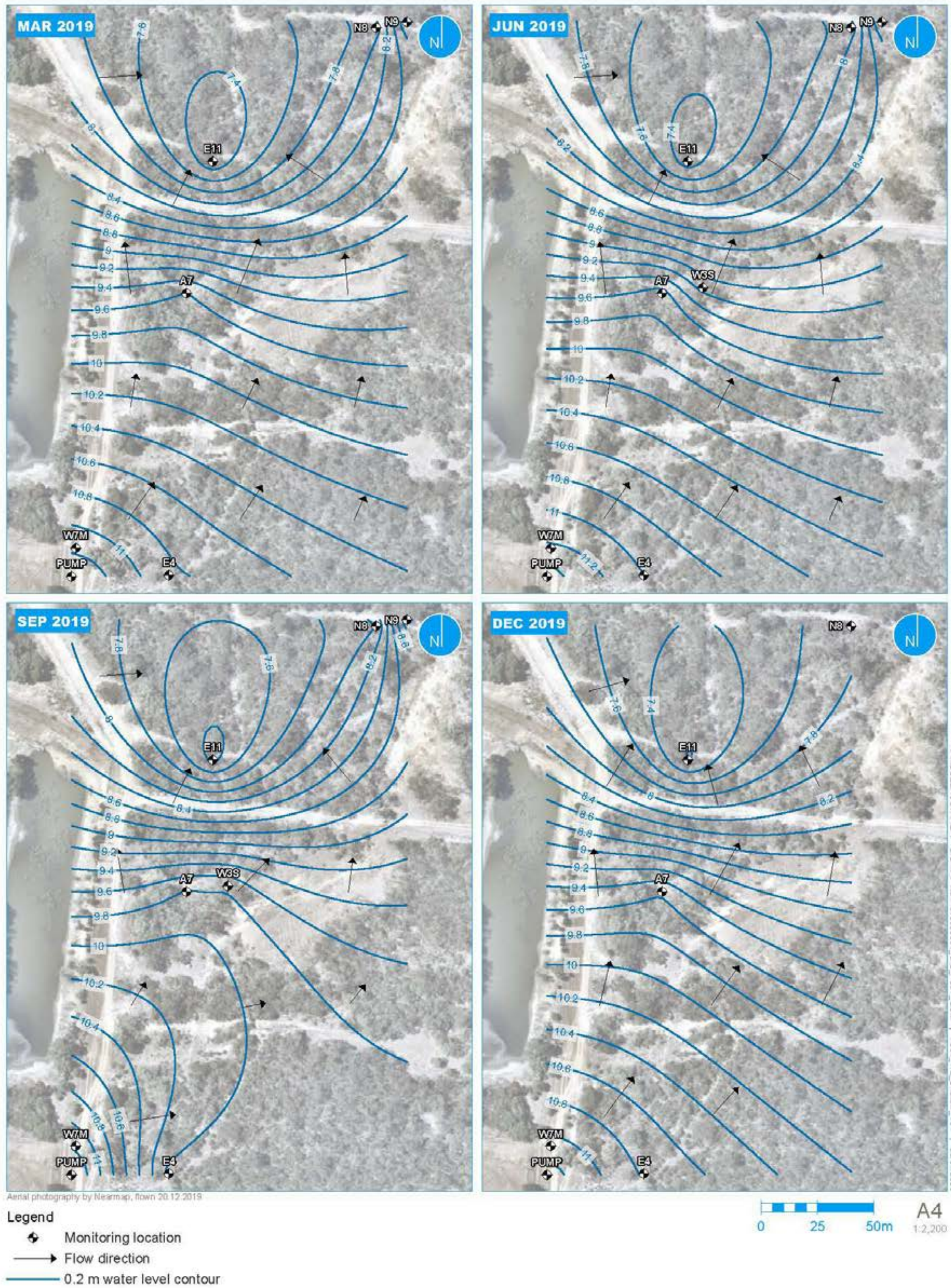

W6S
N8
N9
E11
W5S
W3S
A7
W4S
E5
W7S
W7M
E4
W1S
PUMP
W2S
8
9
10
11
Shallow Aquifer March 2017
Shallow Aquifer June 2017
Shallow Aquifer September 2017
Shallow Aquifer December 2017

Shallow Aquifer March 2018

Shallow Aquifer June 2018

Shallow Aquifer September 2018

Shallow Aquifer December 2018


MAR 2019
JUN 2019
SEP 2019
DEC 2019
N
N8
N9
E11
A7
W3S
W7M
PUMP
E4
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,200


MAR 2020
JUN 2020
SEP 2020
DEC 2020
E11
A7
E4
PUMP
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,500


MAR 2021
JUN 2021
SEP 2021
DEC 2021
E1
A7
W4S
W3S
W5S
W2S
W1S
W1M
E4
E6
PUMP
N8
N7
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.2 m water level contour
0
25
50m
A4
1:2,500

Groundwater Contours – Deep Aquifer 2013-2021

Deep Aquifer February 2014

Deep Aquifer June 2014

Deep Aquifer November 2014


W6D
G2
W5D
N2
W3D
W4D
E5D
Deep Aquifer February 2015
W6D
G2
W5D
N2
W3D
E5D
W1D
Deep Aquifer June 2015
W6D
G2
W5D
N2
W3D
E5D
W1D
Deep Aquifer September 2015
W6D
G2
W5D
N2
E5D
W1D
Deep Aquifer December 2015


W6D
G2
W5D
N2
E5D
W1D
Deep Aquifer April 2016


W6D
G2
W5D
N2
E5D
W1D
Deep Aquifer July 2016

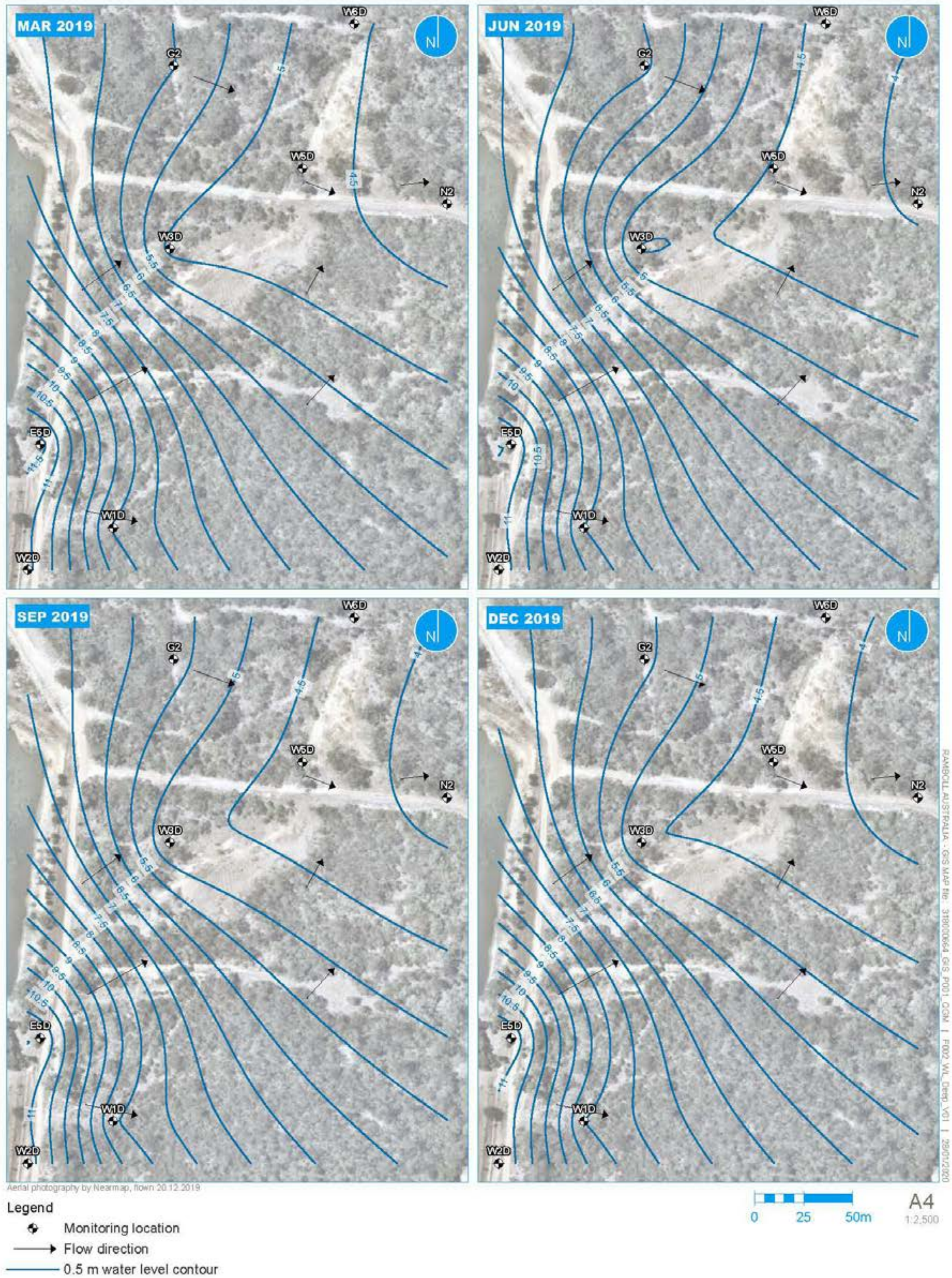

W6D
N2
E5D
W1D
Deep Aquifer October 2016

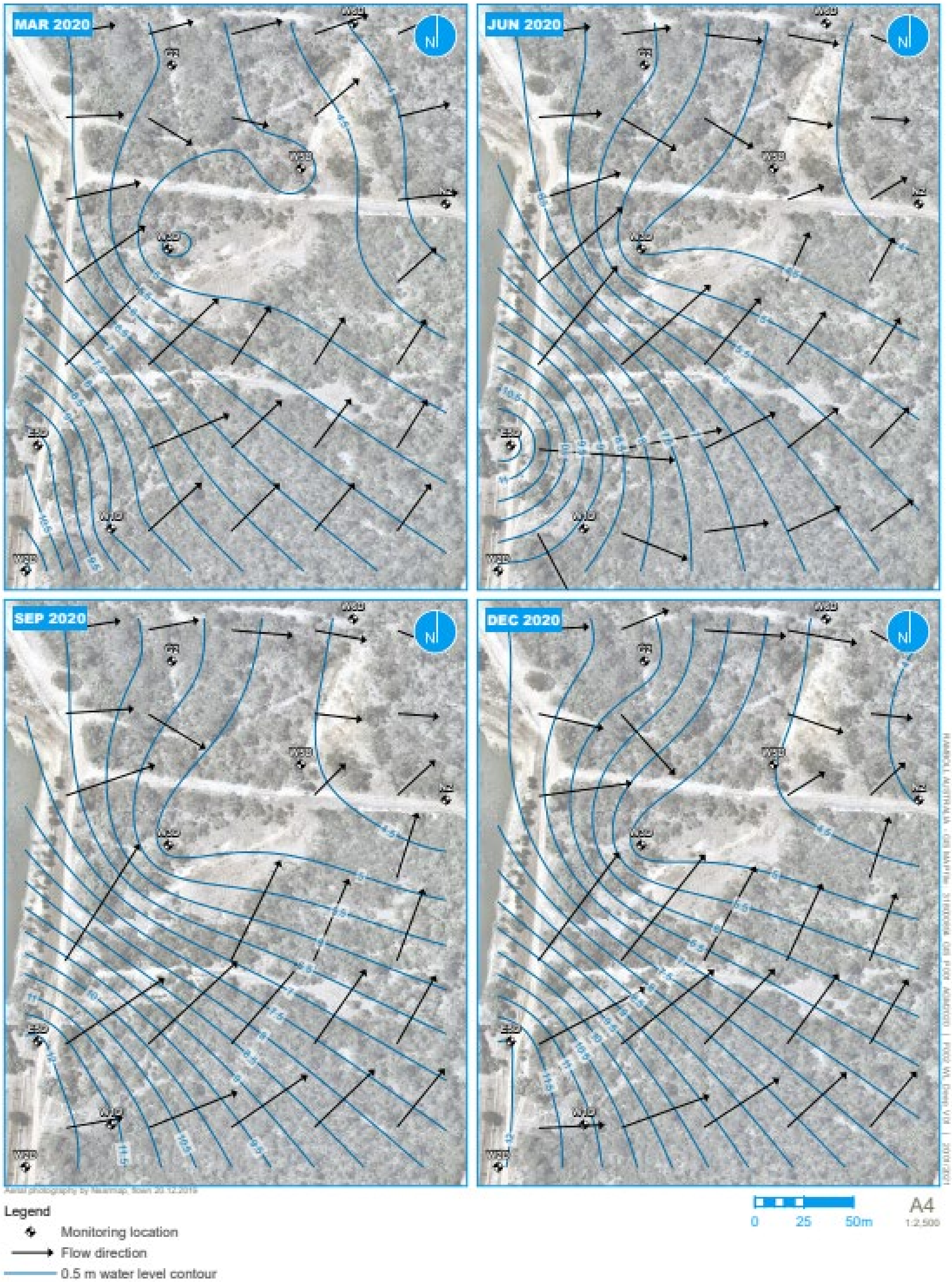

W6D
G2
W5D
N2
E5D
W1D
Deep Aquifer December 2016


W6D
G2
W5D
N2
E5D
W1D
6.5
9
Deep Aquifer March 2017
7
9.5
Deep Aquifer June 2017
6.5
9
Deep Aquifer September 2017
6.5
Deep Aquifer December 2017

Deep Aquifer September 2018

Deep Aquifer December 2018


MAR 2019
JUN 2019
SEP 2019
DEC 2019
N
W6D
G2
W5D
N2
W3D
E5D
W1D
W2D
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.5 m water level contour
0
25
50m
A4
1:2,500


MAR 2020
JUN 2020
SEP 2020
DEC 2020
N
Legend
Monitoring location
Flow direction
0.5 m water level contour
0
25
50m
A4
1:2,500

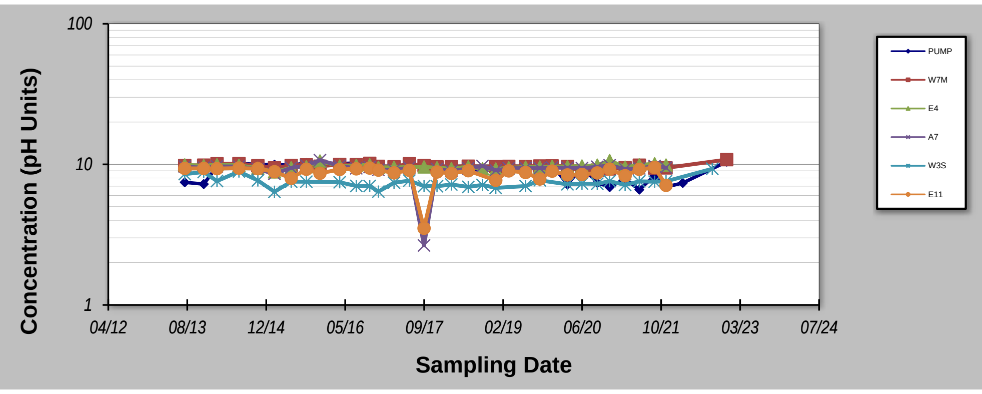

MAR 2021
JUN 2021
SEP 2021
DEC 2021
W6D
G2
W5D
N2
W1D
Aerial photography by Nearmap, flown 20.12.2019
Legend
Monitoring location
Flow direction
0.5 m water level contour
0
25
50m
A4
1:2,500

APPENDIX 8
MANN-KENDALL TREND ANALYSIS

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **23-Jan-23** Job ID: **318001362**
Facility Name: **Hydro Kurri Kurri** Constituent: **pH**
Conducted By: **Jordyn Kirsch** Concentration Units: **pH Units**

Sampling Event	Sampling Date	PUMP	W7M	E4	A7	W3S	E11
		PH CONCENTRATION (pH Units)					
1	29-Jul-13	7.45	9.81	9.91	9.63	8.53	9.36
2	26-Nov-13	7.24	9.87	9.79	9.47	8.82	9.36
3	18-Feb-14	9.65	10.1	9.94	9.67	7.61	9.33
4	7-Jul-14	10.14	10.12	9.84	9.66	8.89	9.41
5	4-Nov-14	10.01	9.78	9.4	9.24	7.68	9.32
6	17-Feb-15	9.95	9.44	8.84	8.56	6.38	8.86
7	3-Jun-15	9.87	9.82	9.46	9.45	7.53	7.97
8	7-Sep-15	10.22	9.91	9.62	9.8	7.53	9.23
9	2-Dec-15	10.27	9.7	10.57	10.71		8.65
10	5-Apr-16	10.13	9.99	9.73	9.75	7.46	9.2
11	19-Jul-16	10.22	9.95	9.83	9.37	7.02	9.29
12	12-Oct-16	9.98	10.17	9.94	9.57	7.01	9.41
13	6-Dec-16	9.72	9.68	9.53	9.15	6.4	9.1
14	15-Mar-17	9.56	9.61	9.53	9.12	7.4	8.7
15	20-Jun-17	9.2	10.1		9.49	7.66	9.07
16	21-Sep-17	9.9	9.8	9.59	2.65	7	3.51
17	12-Dec-17	9.6	9.6	9.46	9.27	6.99	8.83
18	13-Mar-18	9.73	9.61	9.32	8.96	7.19	8.62
19	28-Jun-18	9.17	9.7	9.62	9.36	6.91	9.02
20	26-Sep-18			9.29	9.75	7.14	
21	19-Dec-18	9.55	9.63	9.27	9.06	6.8	7.7
22	11-Mar-19	9.42	9.68	9.47	9.38		8.99
23	26-Jun-19	9.43	9.65	9.56	9.4	7.01	8.76
24	24-Sep-19	9.89	9.73	9.58	9.39	7.7	7.87
25	11-Dec-19	9.93	9.75	9.67	9.48		8.95
26	17-Mar-20	7.2	9.67	9.65	9.46	7.21	8.41
27	17-Jun-20	9.59	8.97	9.73	9.4	7.29	8.48
28	22-Sep-20	7.4	9.1	9.87	9.6	7.28	8.69
29	9-Dec-20	6.88	9.28	10.64	9.85	7.59	9.24
30	17-Mar-21	7.9	9.47	9.56	9.26	7.14	8.3
31	15-Jun-21	6.61	9.86	9.91	9.36	7.57	9.21
32	20-Sep-21	8.32	9.42	10.1	9.73	7.53	9.48
33	1-Dec-21	6.91	9.44	9.89	9.46	7.58	7.09
34	17-Mar-22	7.37	9.29	9.82	9.5	8.21	6.88
35	15-Jun-22	9.56	10.39	10.28	9.78	8.96	7.37
36	20-Sep-22	9.78	10.16	10.45	9.98	9.3	6.91
37	20-Dec-22	10.45	10.81	10.7	10.2	8.3	8.8
38							
39							
40							
Coefficient of Variation:		0.13	0.03	0.04	0.13	0.09	0.13
Mann-Kendall Statistic (S):		-137	-85	177	120	66	-32
Confidence Factor:		97.8%	90.3%	99.8%	96.8%	86.4%	69.1%
Concentration Trend:		Decreasing	Prob. Decreasing	Increasing	Increasing	No Trend	Stable



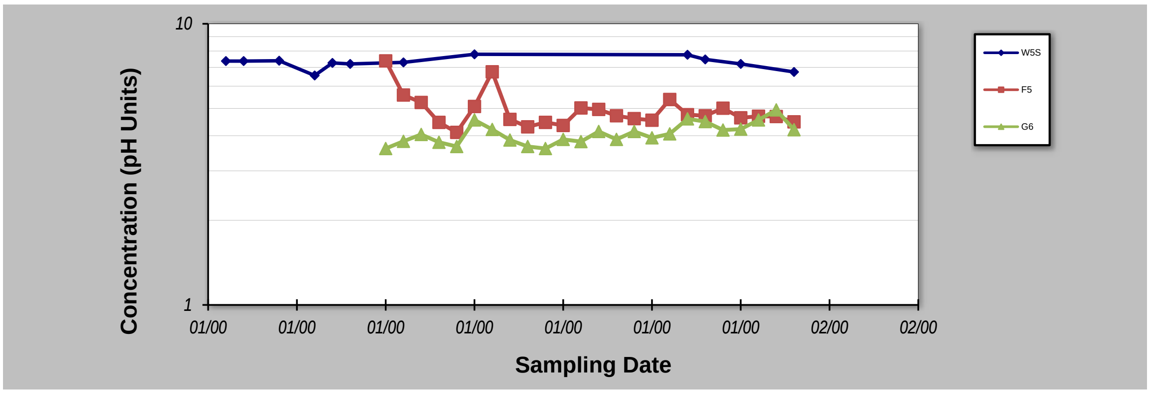
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jordyn Kirsch	Concentration Units:	pH Units

	Sampling Point ID:	N8	N9	W5S	F5	G6		
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	29-Jul-13	6.36	9.16	7.37				
2	26-Nov-13	6.38	8.9	7.37				
3	18-Feb-14	6.48						
4	7-Jul-14	6.53	9.17	7.39				
5	4-Nov-14	6.39	8.91					
6	17-Feb-15	6.11	8.46	6.55				
7	3-Jun-15	6.49	7.22	7.26				
8	7-Sep-15	6.69	7.34	7.2				
9	2-Dec-15	6.74	7.7					
10	5-Apr-16	6.59	6.61		7.38	3.6		
11	19-Jul-16	6.63	8.11	7.29	5.58	3.82		
12	12-Oct-16	6.92	8.54		5.25	4.04		
13	6-Dec-16	6.4			4.46	3.79		
14	15-Mar-17	6.54	8.61		4.11	3.66		
15	20-Jun-17	6.78	9.32	7.79	5.08	4.55		
16	21-Sep-17	6.76			6.75	4.21		
17	12-Dec-17	6.67	8.6		4.57	3.86		
18	13-Mar-18	6.45	8.65		4.3	3.66		
19	28-Jun-18	6.71	8.72		4.46	3.6		
20	26-Sep-18				4.35	3.88		
21	19-Dec-18	6.51	8.72		5.02	3.81		
22	11-Mar-19	6.81	8.33		4.96	4.14		
23	26-Jun-19	6.68	8.71		4.71	3.88		
24	24-Sep-19	6.6	8.5		4.6	4.14		
25	11-Dec-19	6.67			4.54	3.93		
26	17-Mar-20	6.76	8.64		5.38	4.06		
27	17-Jun-20	6.77	8.53	7.76	4.75	4.59		
28	22-Sep-20	6.77	8.7	7.47	4.71	4.49		
29	9-Dec-20	6.95	8.69		5.01	4.19		
30	17-Mar-21	6.54	8.21	7.2	4.63	4.22		
31	15-Jun-21	6.85	8.67		4.69	4.55		
32	20-Sep-21	7.19	8.68		4.68	4.94		
33	1-Dec-21	6.63	8.27	6.74	4.48	4.2		
34	18-Mar-22	6.91	8.26		5.45	4.37		
35	16-Jun-22	7.11	8.86		5.37	4.29		
36	21-Sep-22	7.52	8.41		5.07	5.3		
37	21-Dec-22	7.54	7.81		4.74	4.1		
38								
39								
40								
	Coefficient of Variation:	0.03	0.07	0.05	0.15	0.09		
	Mann-Kendall Statistic (S):	365	99	-4	48	233		
	Confidence Factor:	>99.9%	97.4%	58.0%	87.7%	>99.9%		
	Concentration Trend:	Increasing	Increasing	Stable	No Trend	Increasing		



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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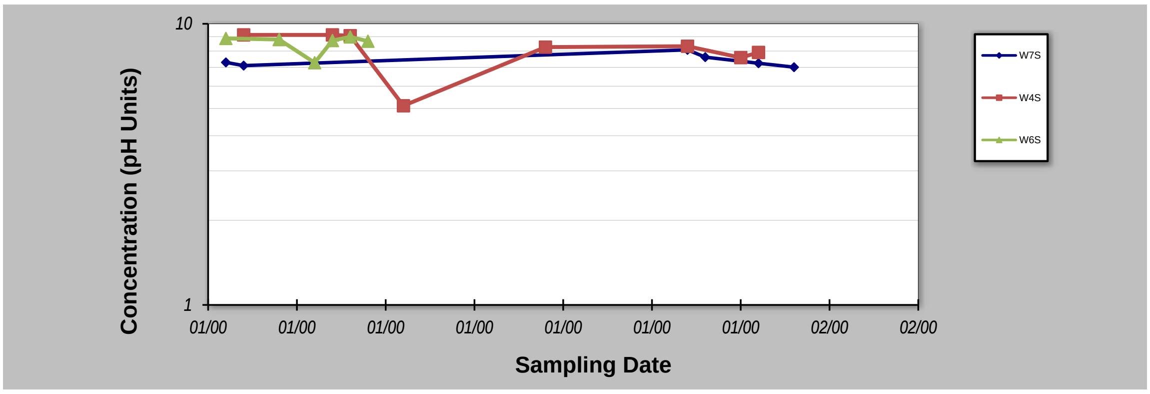
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jordyn Kirsch	Concentration Units:	pH Units

	Sampling Point ID:	W1S	W2S	E5	W7S	W4S	W6S	
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	29-Jul-13	7.22	7.33	9.54	7.29		8.87	
2	26-Nov-13	7.17	6.82	9.37	7.1	9.13		
3	18-Feb-14	6.84		9.78				
4	7-Jul-14	6.9					8.79	
5	4-Nov-14							
6	17-Feb-15	6.66					7.27	
7	3-Jun-15	6.83		9.14		9.13	8.72	
8	7-Sep-15	6.86		9.42		9.07	8.98	
9	2-Dec-15						8.67	
10	5-Apr-16	7.21		9.48				
11	19-Jul-16					5.11		
12	12-Oct-16							
13	6-Dec-16							
14	15-Mar-17							
15	20-Jun-17							
16	21-Sep-17							
17	12-Dec-17							
18	13-Mar-18							
19	28-Jun-18					8.26		
20	26-Sep-18							
21	19-Dec-18		7.47					
22	11-Mar-19							
23	26-Jun-19							
24	24-Sep-19							
25	11-Dec-19							
26	17-Mar-20							
27	17-Jun-20			8.79	8.08	8.32		
28	22-Sep-20	7.89	6.73	9.11	7.61			
29	9-Dec-20	8.24	6.97	9.2				
30	17-Mar-21	7.55	7.19	8.89		7.58		
31	15-Jun-21	7.99	7.32	9.15	7.24	7.91		
32	20-Sep-21	8.11		9.36				
33	1-Dec-21	7.61	6.89	9.16	7.01			
34	17-Mar-22	7.48	6.51	9.27	6.95			
35	15-Jun-22	8.6	6.77	9.63	7.38			
36	20-Sep-22	8.1	7.02	9.84	7.13		8.56	
37	20-Dec-22	7.98	7.17	10.19				
38								
39								
40								
Coefficient of Variation:		0.07	0.04	0.03	0.05	0.16	0.07	
Mann-Kendall Statistic (S):		97	36	28	14	-15	3	
Confidence Factor:		100.0%	100.0%	95.0%	99.6%	95.8%	64.0%	
Concentration Trend:		Increasing	Increasing	Prob. Increasing	Increasing	Decreasing	No Trend	



Notes:
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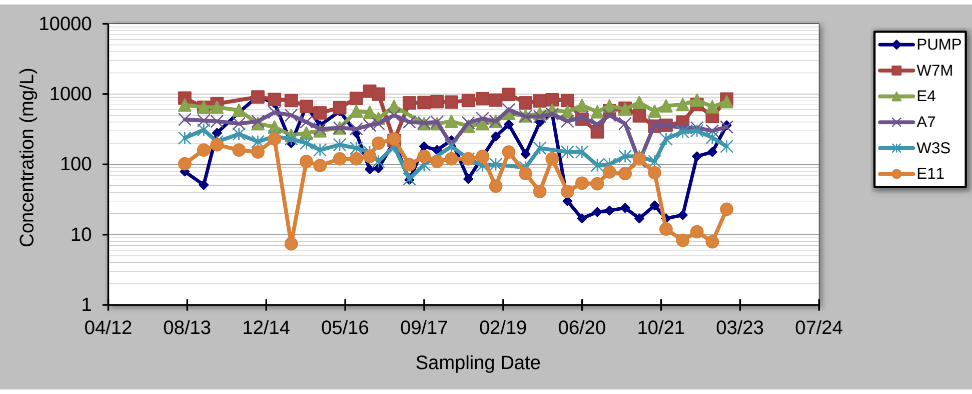
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jordyn Kirsch	Concentration Units:	mg/L

Sampling Point ID:		PUMP	W7M	E4	A7	W3S	E11	
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	79	878	699	436	237	102	
2	26-Nov-13	51	650	650	420	310	160	
3	18-Feb-14	280	730	650	410	210	190	
4	7-Jul-14	550		590	380	270	160	
5	4-Nov-14	930	910	380	410	210	150	
6	17-Feb-15	740	840	340	550	250	230	
7	3-Jun-15	200	810	260	500	230	7.4	
8	7-Sep-15	680	670	280	400	200	110	
9	2-Dec-15	360	540	300	320	160	96	
10	5-Apr-16	570	640	330	330	190	120	
11	19-Jul-16	280	870	570	320	170	120	
12	12-Oct-16	85	1100	550	360	150	130	
13	6-Dec-16	88	1000	450	380	110	200	
14	15-Mar-17	210	220	670	500	180	230	
15	20-Jun-17	60	750		400	62	99	
16	21-Sep-17	180	760	380	390	99	130	
17	12-Dec-17	160	780	380	400		110	
18	13-Mar-18	220	770	410	190	180	120	
19	28-Jun-18	62	810	350	390	120	120	
20	26-Sep-18		860	380	450	96	130	
21	19-Dec-18	250	820	410	410	100	49	
22	11-Mar-19	370	990	530	600		150	
23	26-Jun-19	140	750	490	480	90	74	
24	24-Sep-19	400	800	530	480	170	41	
25	11-Dec-19	530	830	590	520		120	
26	17-Mar-20	30	810	560	410	150	41	
27	17-Jun-20	17	440	690	470	150	54	
28	22-Sep-20	21	290	560	370	97	53	
29	8-Dec-20	22	580	680	500	100	78	
30	17-Mar-21	24	630	610	380	130	74	
31	15-Jun-21	17	490	760	110	130	120	
32	20-Sep-21	26	350	570	370	110	76	
33	1-Dec-21	17	360	680	360	230	12	
34	17-Mar-22	19	400	710	330	290	8.3	
35	15-Jun-22	130	710	820	330	300	11	
36	20-Sep-22	150	480	660	300	240	7.9	
37	20-Dec-22	360	850	780	340	180	23	
38								
39								
40								
Coefficient of Variation:		1.02	0.30	0.29	0.23	0.38	0.61	
Mann-Kendall Statistic (S):		-217	-160	257	-127	-123	-310	
Confidence Factor:		99.9%	98.5%	>99.9%	95.1%	96.5%	>99.9%	
Concentration Trend:		Decreasing	Decreasing	Increasing	Decreasing	Decreasing	Decreasing	



Notes:

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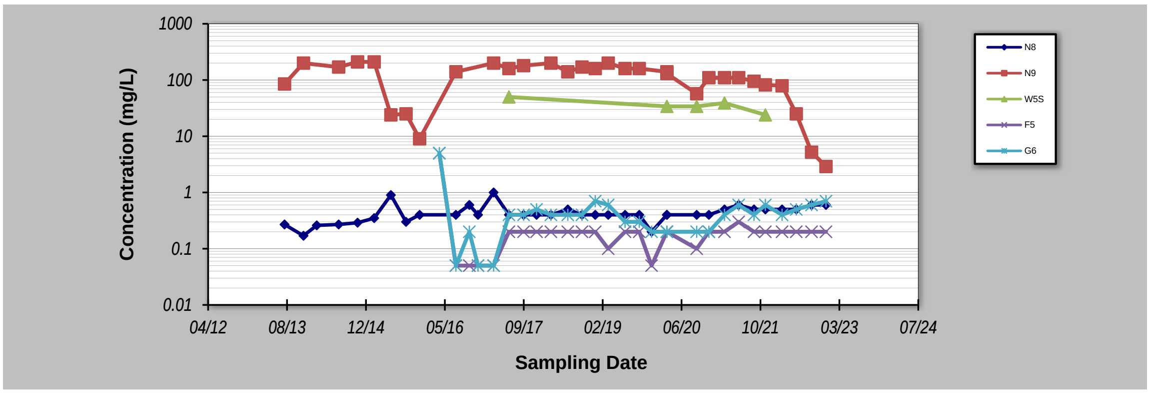
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	**23-Jan-23**	Job ID:	**318001362**
Facility Name:	**Hydro Kurri Kurri**	Constituent:	**Soluble Fluoride**
Conducted By:	**Jordyn Kirsch**	Concentration Units:	**mg/L**

Sampling Point ID:		N8	N9	W5S	F5	G6		
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	0.27	85					
2	26-Nov-13	0.17	200					
3	18-Feb-14	0.26						
4	7-Jul-14	0.27	170					
5	4-Nov-14	0.29	210					
6	17-Feb-15	0.35	210					
7	3-Jun-15	0.9	24					
8	7-Sep-15	0.3	25					
9	2-Dec-15	0.4	9					
10	5-Apr-16				5	5		
11	19-Jul-16	0.4	140		0.05	0.05		
12	12-Oct-16	0.6			0.05	0.2		
13	6-Dec-16	0.4			0.05	0.05		
14	15-Mar-17	1	200		0.05	0.05		
15	20-Jun-17	0.4	160	50	0.2	0.4		
16	21-Sep-17	0.4	180		0.2	0.4		
17	12-Dec-17	0.4			0.2	0.5		
18	13-Mar-18	0.4	200		0.2	0.4		
19	28-Jun-18	0.5	140		0.2	0.4		
20	26-Sep-18	0.4	170		0.2	0.4		
21	19-Dec-18	0.4	160		0.2	0.7		
22	11-Mar-19	0.4	200		0.1	0.6		
23	26-Jun-19	0.4	160		0.2	0.3		
24	24-Sep-19	0.4	160		0.2	0.3		
25	11-Dec-19	0.2			0.05	0.2		
26	17-Mar-20	0.4	140		0.2	0.2		
27	17-Mar-20	0.4	130	34	0.2	0.2		
28	22-Sep-20	0.4	57	34	0.1	0.2		
29	8-Dec-20	0.4	110		0.2	0.2		
30	17-Mar-21	0.5	110	39	0.2	0.4		
31	15-Jun-21	0.6	110		0.3	0.6		
32	20-Sep-21	0.5	95		0.2	0.4		
33	1-Dec-21	0.5	82	24	0.2	0.6		
34	17-Mar-22	0.5	79		0.2	0.4		
35	15-Jun-22	0.5	25		0.2	0.5		
36	20-Sep-22	0.6	5.2		0.2	0.6		
37	20-Dec-22	0.6	2.9		0.2	0.7		
38								
39								
40								
Coefficient of Variation:		0.37	0.55	0.26	2.68	1.68		
Mann-Kendall Statistic (S):		274	-204	-5	74	87		
Confidence Factor:		>99.9%	>99.9%	82.1%	92.5%	95.5%		
Concentration Trend:		Increasing	Decreasing	Stable	Prob. Increasing	Increasing		



Notes:

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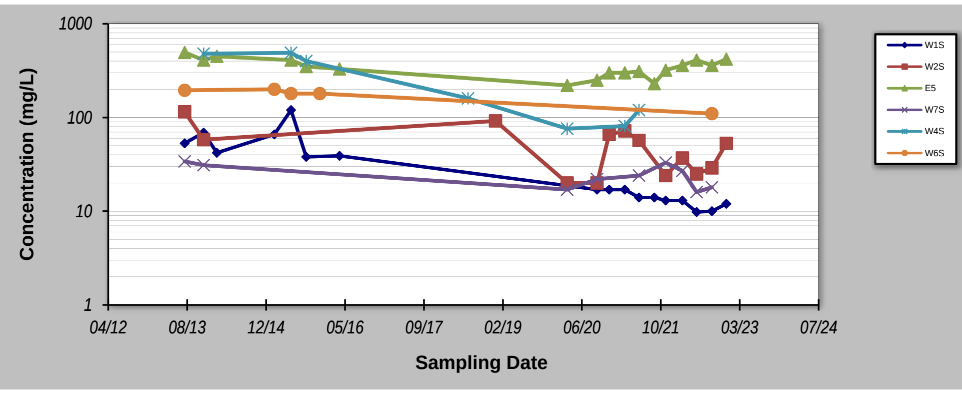
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jordyn Kirsch	Concentration Units:	mg/L

Sampling Event	Sampling Date	W1S	W2S	E5	W7S	W4S	W6S	
		SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	53	115	495	34		195	
2	26-Nov-13	69	58	410	31	480		
3	18-Feb-14	42		450				
4	7-Jul-14							
5	4-Nov-14							
6	17-Feb-15	66					200	
7	3-Jun-15	120		410		490	180	
8	7-Sep-15	38		350		400		
9	2-Dec-15						180	
10	5-Apr-16	39		330				
11	19-Jul-16							
12	12-Oct-16							
13	6-Dec-16							
14	15-Mar-17							
15	20-Jun-17							
16	21-Sep-17							
17	12-Dec-17							
18	13-Mar-18							
19	28-Jun-18					160		
20	26-Sep-18							
21	19-Dec-18		92					
22	11-Mar-19							
23	26-Jun-19							
24	24-Sep-19							
25	11-Dec-19							
26	17-Mar-20							
27	17-Mar-20		20	220	17	76		
28	22-Sep-20	17	20	250	22			
29	8-Dec-20	17	66	300				
30	17-Mar-21	17	72	300		81		
31	15-Jun-21	14	57	310	24	120		
32	20-Sep-21	14		230				
33	1-Dec-21	13	24	320	33			
34	17-Mar-22	13	37	360	27			
35	15-Jun-22	9.8	25	410	16			
36	20-Sep-22	10	29	360	18		110	
37	20-Dec-22	12	53	420				
38								
39								
40								
Coefficient of Variation:		0.90	0.58	0.22	0.28	0.74	0.21	
Mann-Kendall Statistic (S):		-109	-21	-13	-12	-13	-7	
Confidence Factor:		>99.9%	88.6%	68.7%	87.0%	96.5%	92.1%	
Concentration Trend:		Decreasing	Stable	Stable	Stable	Decreasing	Prob. Decreasing	



Notes:

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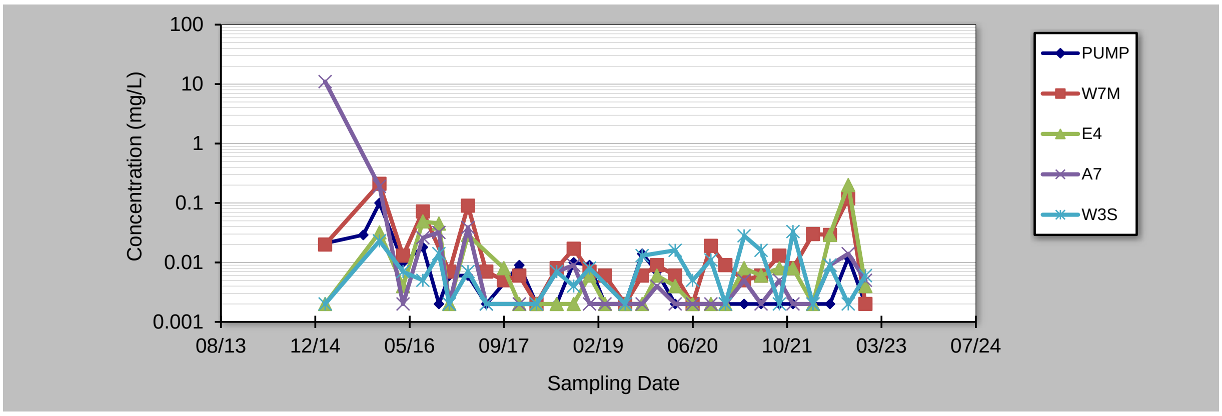
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **23-Jan-23**
Facility Name: **Hydro Kurri Kurri**
Conducted By: **Jordyn Kirsch**
Job ID: **318001362**
Constituent: **Free Cyanide**
Concentration Units: **mg/L**

Sampling Point ID:		PUMP	W7M	E4	A7	W3S		
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.021	0.02	0.002	11	0.002		
2	3-Jun-15							
3	7-Sep-15	0.029						
4	2-Dec-15	0.1	0.21	0.032	0.19	0.023		
5	5-Apr-16	0.01	0.013	0.004	0.002	0.007		
6	19-Jul-16	0.018	0.072	0.049	0.026	0.005		
7	12-Oct-16	0.002		0.045	0.032	0.014		
8	6-Dec-16	0.006	0.007	0.002	0.002	0.002		
9	15-Mar-17	0.006	0.09	0.029	0.039	0.007		
10	20-Jun-17	0.002	0.007		0.002	0.002		
11	21-Sep-17		0.005	0.008				
12	12-Dec-17	0.009	0.006	0.002	0.002			
13	13-Mar-18	0.002	0.002	0.002	0.002	0.002		
14	28-Jun-18	0.002	0.008	0.002	0.007	0.007		
15	26-Sep-18	0.01	0.017	0.002	0.009	0.004		
16	19-Dec-18	0.009	0.007	0.006	0.002	0.008		
17	11-Mar-19	0.002	0.006	0.002	0.002			
18	26-Jun-19	0.002	0.002	0.002	0.002	0.002		
19	24-Sep-19	0.014	0.006	0.002	0.002	0.013		
20	11-Dec-19	0.007	0.009	0.006	0.004			
21	17-Mar-20	0.002	0.006	0.004	0.002	0.016		
22	17-Jun-20	0.002	0.002	0.002	0.002	0.005		
23	22-Sep-20	0.002	0.019	0.002	0.002	0.011		
24	8-Dec-20	0.002	0.009	0.002	0.002	0.002		
25	17-Mar-21	0.002	0.005	0.008	0.005	0.028		
26	15-Jun-21	0.002	0.006	0.006	0.002	0.016		
27	20-Sep-21	0.002	0.013	0.008	0.005	0.002		
28	1-Dec-21	0.002	0.008	0.008	0.002	0.033		
29	17-Mar-22	0.002	0.03	0.002	0.002	0.002		
30	15-Jun-22	0.002	0.029	0.029	0.009	0.009		
31	20-Sep-22	0.012	0.12	0.2	0.014	0.002		
32	20-Dec-22	0.002	0.002	0.004	0.005	0.006		
33								
34								
35								
Coefficient of Variation:		1.93	1.78	2.32	5.20	0.96		
Mann-Kendall Statistic (S):		-164	-33	17	-52	18		
Confidence Factor:		99.9%	72.4%	61.7%	82.9%	64.5%		
Concentration Trend:		Decreasing	No Trend	No Trend	No Trend	No Trend		



Notes:

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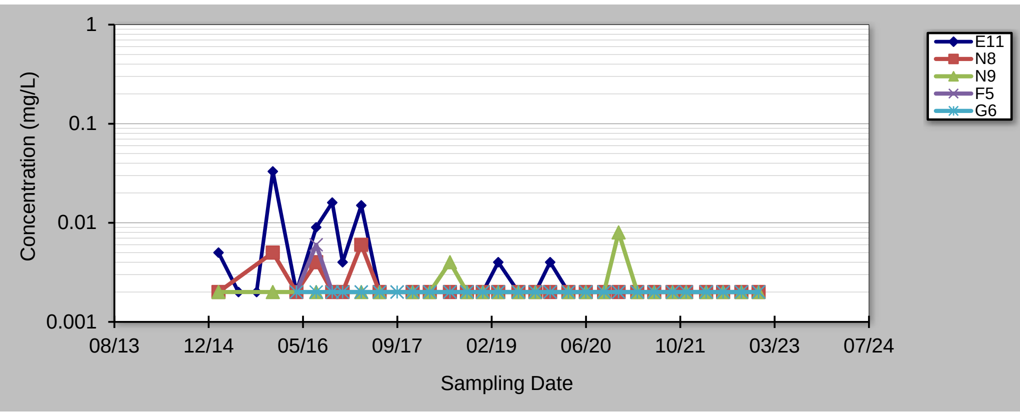
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	Free Cyanide
Conducted By:	Jordyn Kirsch	Concentration Units:	mg/L

Sampling Event	Sampling Date	E11	N8	N9	F5	G6		
		FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.005	0.002	0.002				
2	3-Jun-15	0.002						
3	7-Sep-15	0.002						
4	2-Dec-15	0.033	0.005	0.002				
5	5-Apr-16	0.002	0.002		0.002	0.002		
6	19-Jul-16	0.009	0.004	0.002	0.006	0.002		
7	12-Oct-16	0.016	0.002		0.002	0.002		
8	6-Dec-16	0.004	0.002		0.002	0.002		
9	15-Mar-17	0.015	0.006	0.002	0.002	0.002		
10	20-Jun-17	0.002	0.002	0.002	0.002	0.002		
11	21-Sep-17				0.002	0.002		
12	12-Dec-17	0.002	0.002	0.002	0.002	0.002		
13	13-Mar-18	0.002	0.002	0.002	0.002	0.002		
14	28-Jun-18	0.002	0.002	0.004	0.002	0.002		
15	26-Sep-18	0.002	0.002	0.002	0.002	0.002		
16	19-Dec-18	0.002	0.002	0.002	0.002	0.002		
17	11-Mar-19	0.004	0.002	0.002	0.002	0.002		
18	26-Jun-19	0.002	0.002	0.002	0.002	0.002		
19	24-Sep-19	0.002	0.002	0.002	0.002	0.002		
20	11-Dec-19	0.004	0.002		0.002	0.002		
21	17-Mar-20	0.002	0.002	0.002	0.002	0.002		
22	17-Jun-20	0.002	0.002	0.002	0.002	0.002		
23	22-Sep-20	0.002	0.002	0.002	0.002	0.002		
24	8-Dec-20	0.002	0.002	0.008	0.002	0.002		
25	17-Mar-21	0.002	0.002	0.002	0.002	0.002		
26	15-Jun-21	0.002	0.002	0.002	0.002	0.002		
27	20-Sep-21	0.002	0.002	0.002	0.002	0.002		
28	1-Dec-21	0.002	0.002	0.002	0.002	0.002		
29	17-Mar-22	0.002	0.002	0.002	0.002	0.002		
30	15-Jun-22	0.002	0.002	0.002	0.002	0.002		
31	20-Sep-22	0.002	0.002	0.002	0.002	0.002		
32	20-Dec-22	0.002	0.002	0.002	0.002	0.002		
33								
34								
35								
Coefficient of Variation:		1.45	0.42	0.54	0.35	0.00		
Mann-Kendall Statistic (S):		-127	-63	-1	-25	0		
Confidence Factor:		98.4%	87.6%	50.0%	68.1%	49.2%		
Concentration Trend:		Decreasing	Stable	Stable	Stable	Stable		



Notes:

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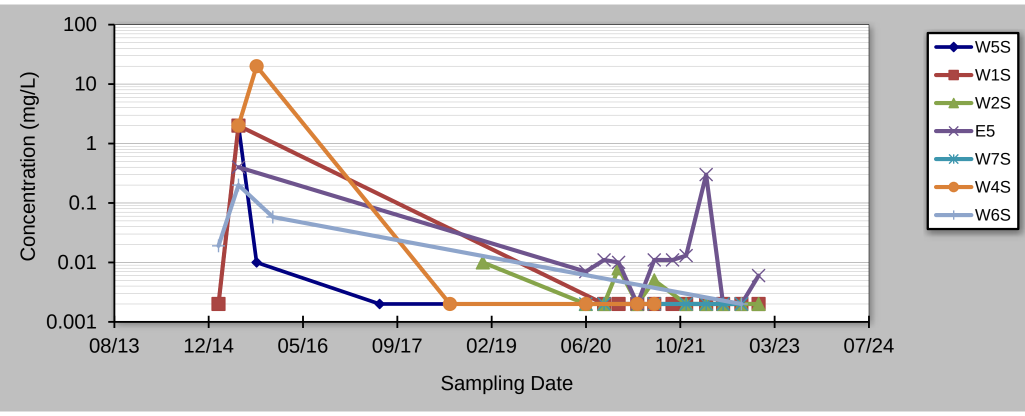
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	**23-Jan-23**	Job ID:	**318001362**
Facility Name:	**Hydro Kurri Kurri**	Constituent:	**Free Cyanide**
Conducted By:	**Jordyn Kirsch**	Concentration Units:	**mg/L**

	Sampling Point ID:	**W5S**	**W1S**	**W2S**	**E5**	**W7S**	**W4S**	**W6S**
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.002	0.002					0.019
2	3-Jun-15	2	2		0.4		2	0.2
3	7-Sep-15	0.01					20	
4	2-Dec-15							0.058
5	5-Apr-16							
6	19-Jul-16							
7	12-Oct-16							
8	6-Dec-16							
9	15-Mar-17							
10	20-Jun-17	0.002						
11	21-Sep-17							
12	12-Dec-17							
13	13-Mar-18							
14	28-Jun-18						0.002	
15	26-Sep-18							
16	19-Dec-18			0.01				
17	11-Mar-19							
18	26-Jun-19							
19	24-Sep-19							
20	11-Dec-19							
21	17-Mar-20							
22	17-Jun-20	0.002		0.002	0.007	0.002	0.002	
23	22-Sep-20	0.002	0.002	0.002	0.011	0.002		
24	8-Dec-20		0.002	0.008	0.01			
25	17-Mar-21	0.002	0.002	0.002	0.002		0.002	
26	15-Jun-21		0.002	0.005	0.011	0.002	0.002	
27	20-Sep-21		0.002		0.011			
28	1-Dec-21	0.002	0.002	0.002	0.013	0.002		
29	17-Mar-22		0.002	0.002	0.3	0.002		
30	15-Jun-22		0.002	0.002	0.002	0.002		
31	20-Sep-22		0.002	0.002	0.002	0.002		0.002
32	20-Dec-22		0.002	0.002	0.006			
33								
34								
35								
	Coefficient of Variation:	2.79	3.42	0.81	2.09	0.00	2.19	1.29
	Mann-Kendall Statistic (S):	-9	-9	-17	-12	0	-7	-2
	Confidence Factor:	83.2%	70.4%	89.1%	77.0%	37.9%	86.4%	62.5%
	Concentration Trend:	No Trend	No Trend	Stable	No Trend	Stable	No Trend	No Trend



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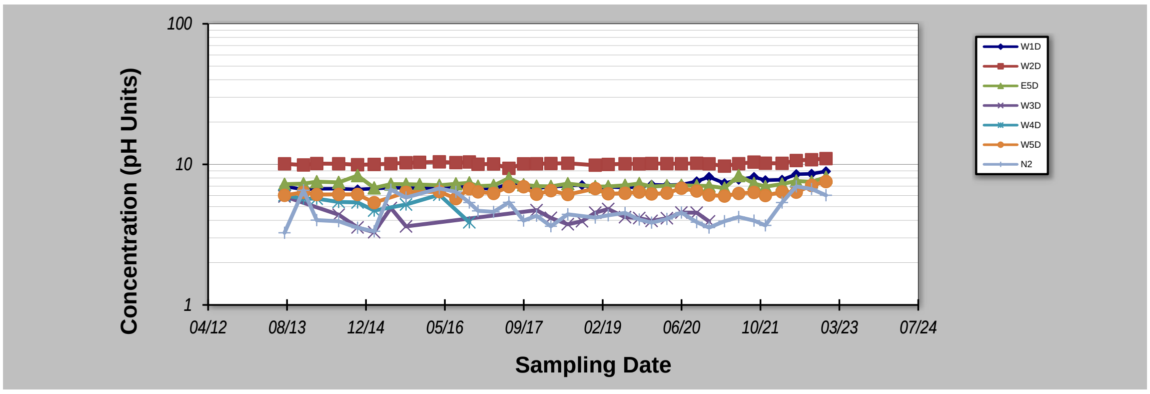
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	pH
Conducted By:	Jordyn Kirsch	Concentration Units:	pH Units

Sampling Point ID:		W1D	W2D	E5D	W3D	W4D	W5D	N2
Sampling Event	Sampling Date	PH CONCENTRATION (pH Units)						
1	29-Jul-13	6.98	10.09	7.22	5.91	6.02	6.02	3.26
2	26-Nov-13	6.62	9.9	7.29		5.7	6.32	6.54
3	18-Feb-14	6.7	10.13	7.53		5.7	6.1	4.01
4	7-Jul-14	6.71	10.1	7.44	4.38	5.4	6.11	3.94
5	4-Nov-14	6.63	9.94	8.32	3.56	5.36	6.11	3.54
6	17-Feb-15		9.99	6.8	3.29	4.69	5.34	3.34
7	3-Jun-15	6.82	10.11	7.23	4.89			6.61
8	7-Sep-15	6.79	10.27	7.23	3.62	5.18	6.32	5.81
9	2-Dec-15		10.34	7.18				
10	5-Apr-16	6.73	10.42	7.1		6.08	6.4	6.75
11	19-Jul-16	6.82	10.29	7.27			5.7	6.37
12	12-Oct-16	7.02	10.4	7.39		3.87	6.7	5.35
13	6-Dec-16	6.78	10.02	7			6.37	4.67
14	15-Mar-17	6.67	10.07	7.08			6.21	4.59
15	20-Jun-17	7.3	9.37	7.97			6.94	5.37
16	21-Sep-17	6.95	10.08	7.16			6.93	3.98
17	12-Dec-17	6.78	10.1	7	4.72		6.13	4.31
18	13-Mar-18	6.91	10.14	6.97	4.16		6.5	3.63
19	28-Jun-18	7.07	10.18	7.29	3.75		6.1	4.41
20	26-Sep-18	7.12			3.94			
21	19-Dec-18	6.76	9.87	6.95	4.53		6.72	4.18
22	11-Mar-19	6.92	9.99	6.96	4.81		6.18	4.34
23	26-Jun-19	6.83	10.1	7.1	4.21		6.23	4.51
24	24-Sep-19	6.91	10.08	7.3	4.15		6.35	4.05
25	11-Dec-19	7.16	10.14	6.95	3.96		6.16	3.85
26	17-Mar-20	7.12	10.12	7.05	4.14		6.24	4.09
27	17-Jun-20	7.17	10.11	7.1	4.54		6.76	4.54
28	22-Sep-20	7.57	10.18	7.04	4.53		6.46	3.88
29	9-Dec-20	8.14	10.09	7.02	3.93		6.05	3.55
30	17-Mar-21	7.34	9.72	6.77			5.95	3.94
31	15-Jun-21	7.78	10.11	8.32			6.21	4.22
32	20-Sep-21	8.13	10.37	7.31			6.31	3.98
33	1-Dec-21	7.71	10.19	6.95			6	3.68
34	17-Mar-22	7.77	10.17	7.24			6.36	5.35
35	15-Jun-22	8.51	10.65	7.62			6.34	6.97
36	20-Sep-22	8.57	10.79	7.51			7.08	6.68
37	20-Dec-22	8.92	10.99	8.1			7.54	6.03
38								
39								
40								
Coefficient of Variation:		0.08	0.03	0.05	0.14	0.13	0.06	0.24
Mann-Kendall Statistic (S):		411	167	-44	-2	-19	111	-4
Confidence Factor:		>99.9%	98.9%	72.0%	51.4%	97.0%	94.8%	51.7%
Concentration Trend:		Increasing	Increasing	Stable	Stable	Decreasing	Prob. Increasing	Stable



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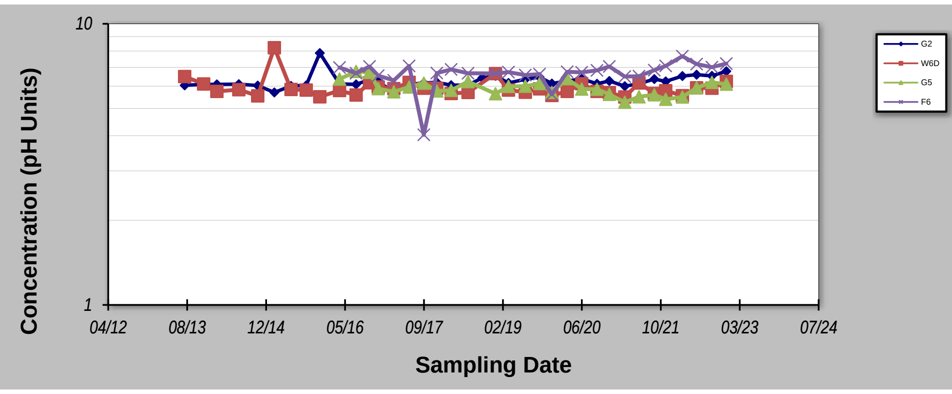
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	**23-Jan-23**	Job ID:	**318001362**
Facility Name:	**Hydro Kurri Kurri**	Constituent:	**pH**
Conducted By:	**Jordyn Kirsch**	Concentration Units:	**pH Units**

Sampling Event	Sampling Date	G2	W6D	G5	F6			
		PH CONCENTRATION (pH Units)						
1	29-Jul-13	6.04	6.49					
2	26-Nov-13	6.09	6.11					
3	18-Feb-14	6.09	5.75					
4	7-Jul-14	6.1	5.83					
5	4-Nov-14	6.03	5.54					
6	17-Feb-15	5.7	8.22					
7	3-Jun-15	6.01	5.84					
8	7-Sep-15	6.04	5.81					
9	2-Dec-15	7.87	5.5					
10	5-Apr-16	6.11	5.79	6.36	6.99			
11	19-Jul-16	6.09	5.58	6.77	6.67			
12	12-Oct-16	6.33	6.17	6.72	7.05			
13	6-Dec-16	6.22	5.96	5.88	6.54			
14	15-Mar-17	5.71	5.88	5.73	6.29			
15	20-Jun-17	6.08	6.19	5.96	7.08			
16	21-Sep-17	6.16	5.9	6.15	4.03			
17	12-Dec-17	6.19	5.9	5.77	6.68			
18	13-Mar-18	6.05	5.65	5.8	6.88			
19	28-Jun-18	6.05	5.7	6.23	6.67			
20	26-Sep-18	6.42						
21	19-Dec-18	6.53	6.65	5.64	6.66			
22	11-Mar-19	6.16	5.81	5.99	6.73			
23	26-Jun-19	6.35	5.71	6	6.57			
24	24-Sep-19	6.46	5.87	6.13	6.62			
25	11-Dec-19	6.13	5.56	5.7	5.61			
26	17-Mar-20	6.26	5.75	6.38	6.75			
27	17-Jun-20	6.37	6.12	5.86	6.72			
28	22-Sep-20	6.12	5.75	5.85	6.83			
29	9-Dec-20	6.26	5.69	5.61	7.05			
30	17-Mar-21	6	5.49	5.26	6.49			
31	15-Jun-21	6.12	6.16	5.5	6.51			
32	20-Sep-21	6.36	5.65	5.59	6.84			
33	1-Dec-21	6.24	5.78	5.39	7.08			
34	17-Mar-22	6.52	5.55	5.49	7.67			
35	15-Jun-22	6.59	5.92	5.92	7.19			
36	20-Sep-22	6.53	5.9	6.19	7.01			
37	20-Dec-22	6.78	6.24	6.1	7.22			
38								
39								
40								
	Coefficient of Variation:	**0.06**	**0.08**	**0.06**	**0.10**			
	Mann-Kendall Statistic (S):	**283**	**-54**	**-113**	**94**			
	Confidence Factor:	**>99.9%**	**76.3%**	**99.1%**	**97.4%**			
	Concentration Trend:	Increasing	Stable	Decreasing	Increasing			



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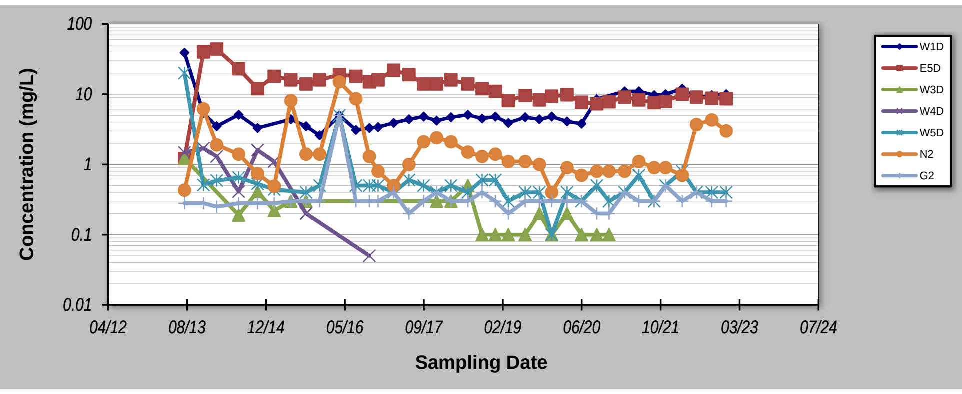
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	**23-Jan-23**	Job ID:	**318001362**
Facility Name:	**Hydro Kurri Kurri**	Constituent:	**Soluble Fluoride**
Conducted By:	**Jordyn Kirsch**	Concentration Units:	**mg/L**

Sampling Event	Sampling Date	W1D	E5D	W3D	W4D	W5D	N2	G2
	Sampling Point ID:	**W1D**	**E5D**	**W3D**	**W4D**	**W5D**	**N2**	**G2**
		SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	39	1.21	1.23	1.48	20	0.43	0.28
2	26-Nov-13	5.4	40		1.7	0.51	6.2	0.28
3	18-Feb-14	3.5	44		1.3	0.59	1.9	0.25
4	7-Jul-14	5.1	23	0.19	0.41	0.65	1.4	0.28
5	4-Nov-14	3.3	12	0.41	1.6	0.53	0.74	0.28
6	17-Feb-15		18	0.22	1.1	0.44	0.49	0.28
7	3-Jun-15	4.4	16	0.3			8.1	0.3
8	7-Sep-15	3.5	14	0.3	0.2	0.4	1.4	0.3
9	2-Dec-15	2.6	16			0.5	1.4	0.3
10	5-Apr-16	5	19			5	15	5
11	19-Jul-16	3.1	18			0.5	8.6	0.3
12	12-Oct-16	3.3	15		0.05	0.5	1.3	0.3
13	6-Dec-16	3.4	16			0.5	0.8	0.3
14	15-Mar-17	3.9	22			0.4	0.5	0.4
15	20-Jun-17	4.4	19			0.6	1	0.2
16	21-Sep-17	4.8	14			0.5	2.1	0.3
17	12-Dec-17	4.2	14	0.3		0.4	2.4	0.4
18	13-Mar-18	4.7	16	0.3		0.5	2.1	0.3
19	28-Jun-18	5.1	14	0.5		0.4	1.5	0.3
20	26-Sep-18	4.5	12	0.1		0.6	1.3	0.4
21	19-Dec-18	4.8	11	0.1		0.6	1.4	0.3
22	11-Mar-19	3.9	8.1	0.1		0.3	1.1	0.2
23	26-Jun-19	4.7	9.6	0.1		0.4	1.1	0.3
24	24-Sep-19	4.4	8.3	0.2		0.4	1	0.3
25	11-Dec-19	4.8	9.4	0.1		0.1	0.4	0.3
26	17-Mar-20	4.1	9.8	0.2		0.4	0.9	0.3
27	17-Jun-20	3.8	7.7	0.1		0.3	0.7	0.3
28	22-Sep-20	8.5	7.3	0.1		0.5	0.8	0.2
29	8-Dec-20		7.8	0.1		0.3	0.8	0.2
30	17-Mar-21	11	9.1			0.4	0.8	0.4
31	15-Jun-21	11	8.3			0.7	1.1	0.3
32	20-Sep-21	9.7	7.6			0.3	0.9	0.3
33	1-Dec-21	10	7.9			0.5	0.9	0.5
34	17-Mar-22	12	10			0.8	0.7	0.3
35	15-Jun-22	8.8	9.1			0.4	3.7	0.4
36	20-Sep-22	9.7	8.8			0.4	4.3	0.3
37	20-Dec-22	10	8.6			0.4	3	0.3
38								
39								
40								
	Coefficient of Variation:	0.93	0.60	1.01	0.68	2.94	1.31	1.80
	Mann-Kendall Statistic (S):	223	-367	-80	-18	-194	-86	134
	Confidence Factor:	99.9%	>99.9%	99.8%	98.4%	99.6%	86.6%	95.9%
	Concentration Trend:	Increasing	Decreasing	Decreasing	Decreasing	Decreasing	No Trend	Increasing



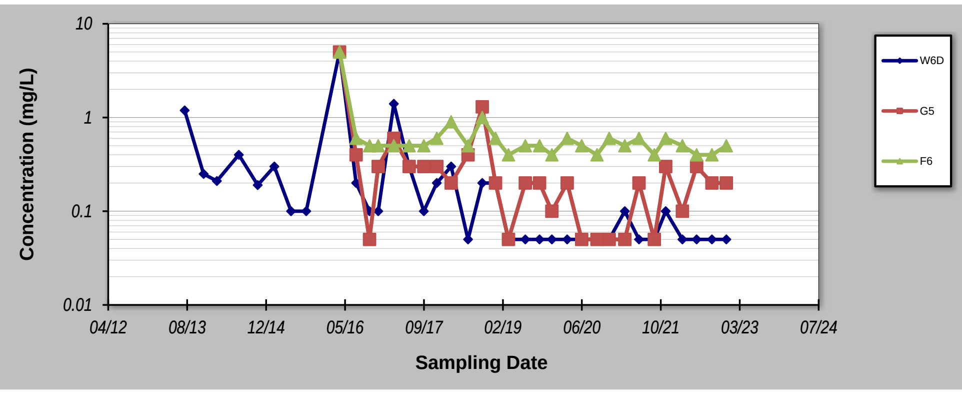
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	23-Jan-23	Job ID:	318001362
Facility Name:	Hydro Kurri Kurri	Constituent:	Soluble Fluoride
Conducted By:	Jordyn Kirsch	Concentration Units:	mg/L

	Sampling Point ID:	W6D	G5	F6				
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	1.19						
2	26-Nov-13	0.25						
3	18-Feb-14	0.21						
4	7-Jul-14	0.4						
5	4-Nov-14	0.19						
6	17-Feb-15	0.3						
7	3-Jun-15	0.1						
8	7-Sep-15	0.1						
9	2-Dec-15							
10	5-Apr-16	5	5	5				
11	19-Jul-16	0.2	0.4	0.6				
12	12-Oct-16	0.1	0.05	0.5				
13	6-Dec-16	0.1	0.3	0.5				
14	15-Mar-17	1.4	0.6	0.5				
15	20-Jun-17	0.3	0.3	0.5				
16	21-Sep-17	0.1	0.3	0.5				
17	12-Dec-17	0.2	0.3	0.6				
18	13-Mar-18	0.3	0.2	0.9				
19	28-Jun-18	0.05	0.4	0.5				
20	26-Sep-18	0.2	1.3	1				
21	19-Dec-18	0.2	0.2	0.6				
22	11-Mar-19	0.05	0.05	0.4				
23	26-Jun-19	0.05	0.2	0.5				
24	24-Sep-19	0.05	0.2	0.5				
25	11-Dec-19	0.05	0.1	0.4				
26	17-Mar-20	0.05	0.2	0.6				
27	17-Jun-20	0.05	0.05	0.5				
28	22-Sep-20	0.05	0.05	0.4				
29	8-Dec-20	0.05	0.05	0.6				
30	17-Mar-21	0.1	0.05	0.5				
31	15-Jun-21	0.05	0.2	0.6				
32	20-Sep-21	0.05	0.05	0.4				
33	1-Dec-21	0.1	0.3	0.6				
34	17-Mar-22	0.05	0.1	0.5				
35	15-Jun-22	0.05	0.3	0.4				
36	20-Sep-22	0.05	0.2	0.4				
37	20-Dec-22	0.05	0.2	0.5				
38								
39								
40								
	Coefficient of Variation:	2.60	2.24	1.23				
	Mann-Kendall Statistic (S):	-325	-124	-90				
	Confidence Factor:	>99.9%	99.3%	96.1%				
	Concentration Trend:	Decreasing	Decreasing	Decreasing				



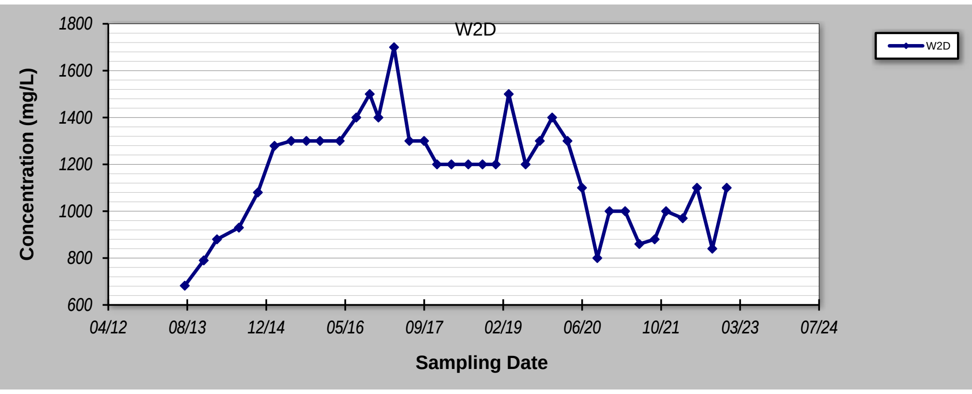
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **23-Jan-23** Job ID: **318001362**
Facility Name: **Hydro Kurri Kurri** Constituent: **Soluble Fluoride**
Conducted By: **Jordyn Kirsch** Concentration Units: **mg/L**

	Sampling Point ID:	W2D						
Sampling Event	Sampling Date	SOLUBLE FLUORIDE CONCENTRATION (mg/L)						
1	29-Jul-13	682						
2	26-Nov-13	790						
3	18-Feb-14	880						
4	7-Jul-14	930						
5	4-Nov-14	1080						
6	17-Feb-15	1279						
7	3-Jun-15	1300						
8	7-Sep-15	1300						
9	2-Dec-15	1300						
10	5-Apr-16	1300						
11	19-Jul-16	1400						
12	12-Oct-16	1500						
13	6-Dec-16	1400						
14	15-Mar-17	1700						
15	20-Jun-17	1300						
16	21-Sep-17	1300						
17	12-Dec-17	1200						
18	13-Mar-18	1200						
19	28-Jun-18	1200						
20	26-Sep-18	1200						
21	19-Dec-18	1200						
22	11-Mar-19	1500						
23	26-Jun-19	1200						
24	24-Sep-19	1300						
25	11-Dec-19	1400						
26	17-Mar-20	1300						
27	17-Jun-20	1100						
28	22-Sep-20	800						
29	8-Dec-20	1000						
30	17-Mar-21	1000						
31	15-Jun-21	860						
32	20-Sep-21	880						
33	1-Dec-21	1000						
34	17-Mar-22	970						
35	15-Jun-22	1100						
36	20-Sep-22	840						
37	20-Dec-22	1100						
38								
39								
40								
	Coefficient of Variation:	0.20						
	Mann-Kendall Statistic (S):	-106						
	Confidence Factor:	91.5%						
	Concentration Trend:	Prob. Decreasing						



Notes:
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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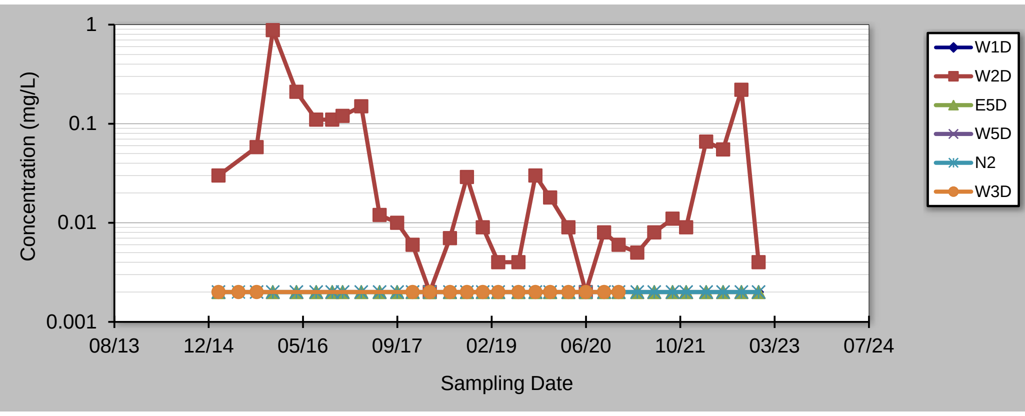
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **23-Jan-23** Job ID: **318001362**
Facility Name: **Hydro Kurri Kurri** Constituent: **Free Cyanide**
Conducted By: **Jordyn Kirsch** Concentration Units: **mg/L**

Sampling Point ID:		W1D	W2D	E5D	W5D	N2	W3D	
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15		0.03	0.002	0.002	0.002	0.002	
2	3-Jun-15					0.002	0.002	
3	7-Sep-15		0.058		0.002	0.002	0.002	
4	2-Dec-15		0.88	0.002	0.002	0.002		
5	5-Apr-16	0.002	0.21	0.002	0.002	0.002		
6	19-Jul-16	0.002	0.11	0.002	0.002	0.002		
7	12-Oct-16	0.002	0.11	0.002	0.002	0.002		
8	6-Dec-16	0.002	0.12	0.002	0.002	0.002		
9	15-Mar-17	0.002	0.15	0.002	0.002	0.002		
10	20-Jun-17	0.002	0.012	0.002	0.002	0.002		
11	21-Sep-17		0.01	0.002	0.002	0.002		
12	12-Dec-17	0.002	0.006	0.002	0.002	0.002	0.002	
13	13-Mar-18	0.002	0.002	0.002	0.002	0.002	0.002	
14	28-Jun-18	0.002	0.007	0.002	0.002	0.002	0.002	
15	26-Sep-18	0.002	0.029	0.002	0.002	0.002	0.002	
16	19-Dec-18	0.002	0.009	0.002	0.002	0.002	0.002	
17	11-Mar-19	0.002	0.004	0.002	0.002	0.002	0.002	
18	26-Jun-19	0.002	0.004	0.002	0.002	0.002	0.002	
19	24-Sep-19	0.002	0.03	0.002	0.002	0.002	0.002	
20	11-Dec-19	0.002	0.018	0.002	0.002	0.002	0.002	
21	17-Mar-20	0.002	0.009	0.002	0.002	0.002	0.002	
22	17-Jun-20	0.002	0.002	0.002	0.002	0.002	0.002	
23	22-Sep-20	0.002	0.008	0.002	0.002	0.002	0.002	
24	8-Dec-20	0.002	0.006	0.002	0.002	0.002	0.002	
25	17-Mar-21	0.002	0.005	0.002	0.002	0.002		
26	15-Jun-21	0.002	0.008	0.002	0.002	0.002		
27	20-Sep-21	0.002	0.011	0.002	0.002	0.002		
28	1-Dec-21	0.002	0.009	0.002	0.002	0.002		
29	17-Mar-22	0.002	0.066	0.002	0.002	0.002		
30	15-Jun-22	0.002	0.055	0.002	0.002	0.002		
31	20-Sep-22	0.002	0.22	0.002	0.002	0.002		
32	20-Dec-22	0.002	0.004	0.002	0.002	0.002		
33								
34								
35								
Coefficient of Variation:		0.00	2.28	0.00	0.00	0.00	0.00	
Mann-Kendall Statistic (S):		0	-118	0	0	0	0	
Confidence Factor:		49.2%	97.7%	49.3%	49.4%	49.4%	48.2%	
Concentration Trend:		Stable	Decreasing	Stable	Stable	Stable	Stable	



Notes:

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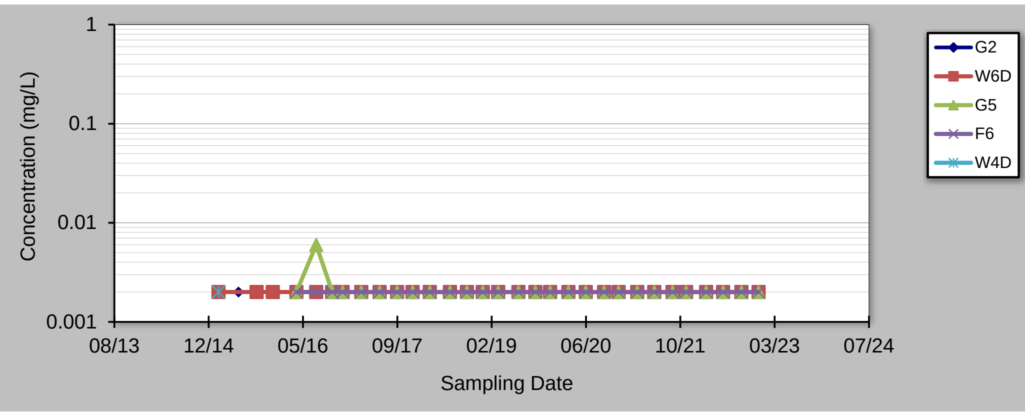
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **23-Jan-23**
Facility Name: **Hydro Kurri Kurri**
Conducted By: **Jordyn Kirsch**

Job ID: **318001362**
Constituent: **Free Cyanide**
Concentration Units: **mg/L**

Sampling Point ID:		G2	W6D	G5	F6	W4D		
Sampling Event	Sampling Date	FREE CYANIDE CONCENTRATION (mg/L)						
1	17-Feb-15	0.002	0.002			0.002		
2	3-Jun-15	0.002						
3	7-Sep-15		0.002					
4	2-Dec-15	0.002	0.002					
5	5-Apr-16	0.002	0.002	0.002	0.002			
6	19-Jul-16	0.002	0.002	0.006	0.002			
7	12-Oct-16	0.002	0.002	0.002	0.002			
8	6-Dec-16	0.002	0.002	0.002	0.002			
9	15-Mar-17	0.002	0.002	0.002	0.002			
10	20-Jun-17	0.002	0.002	0.002	0.002			
11	21-Sep-17	0.002	0.002	0.002	0.002			
12	12-Dec-17	0.002	0.002	0.002	0.002			
13	13-Mar-18	0.002	0.002	0.002	0.002			
14	28-Jun-18	0.002	0.002	0.002	0.002			
15	26-Sep-18	0.002	0.002	0.002	0.002			
16	19-Dec-18	0.002	0.002	0.002	0.002			
17	11-Mar-19	0.002	0.002	0.002	0.002			
18	26-Jun-19	0.002	0.002	0.002	0.002			
19	24-Sep-19	0.002	0.002	0.002	0.002			
20	11-Dec-19	0.002	0.002	0.002	0.002			
21	17-Mar-20	0.002	0.002	0.002	0.002			
22	17-Jun-20	0.002	0.002	0.002	0.002			
23	22-Sep-20	0.002	0.002	0.002	0.002			
24	8-Dec-20	0.002	0.002	0.002	0.002			
25	17-Mar-21	0.002	0.002	0.002	0.002			
26	15-Jun-21	0.002	0.002	0.002	0.002			
27	20-Sep-21	0.002	0.002	0.002	0.002			
28	1-Dec-21	0.002	0.002	0.002	0.002			
29	17-Mar-22	0.002	0.002	0.002	0.002			
30	15-Jun-22	0.002	0.002	0.002	0.002			
31	20-Sep-22	0.002	0.002	0.002	0.002			
32	20-Dec-22	0.002	0.002	0.002	0.002			
33								
34								
35								
Coefficient of Variation:		0.00	0.00	0.35	0.00			
Mann-Kendall Statistic (S):		0	0	-25	0			
Confidence Factor:		49.4%	49.4%	68.1%	49.2%			
Concentration Trend:		Stable	Stable	Stable	Stable			



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