SURFACE WATER SAMPLING PROCEDURE

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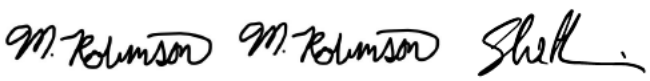
Project Name: Nolans Rare Earths

REVISION HISTORY



Date	Description	Prepared	Reviewed	Approved	3rd Party Approval
July 2022	Rev 1 Issued to DITT	Michael Robinson, ESG Manager	Michael Robinson, ESG Manager	Stewart Watkins, GM Projects	
23/07/2021	Rev 0 Draft	Michael Robinson, ESG Manager	Brian Fowler, GM NT & Sustainability	Stewart Watkins, GM Projects	

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1.0 INTRODUCTION

1.1 Background

The Nolans Rare Earths Project (the Project) is located approximately 135 km north west of Alice Springs, Northern Territory. The Project targets the Nolans Bore mineral deposit for rare earth elements. Activities will focus on construction, mining, processing, rehabilitation and decommissioning of an open-cut, rare earth mine, and its associated infrastructure.

1.2 Purpose

The Water Management Plan (WMP) for the Nolans Project (Project) provides a framework for the management of summary of sampling requirements at the site. The WMP has been designed to collect data throughout the construction and operations phase to assess the performance of water management onsite. In order to facilitate consistency in sampling, and comply with quality assurance and control methodologies, a series of sampling procedures have been established including:

- Surface Water Sampling Procedure (this procedure);
- Mine Site Groundwater Sampling Procedure; and
- Sediment Sampling Procedure.

1.3 Objectives

The primary objective of the Surface Water Sampling Procedure is to prevent contamination or alteration in water chemistry during sample collection. The collected sample should represent the physical, chemical and biological characteristics of surface water in the targeted water body as closely as possible.

1.4 Planning and Equipment

A number of factors must be considered during the field planning phase, prior to surface water sampling. These include consideration of ground condition at targeted locations and safety requirements. A summary of equipment and associated suppliers are provided in Table 1—1. All equipment in relation to surface water sampling should be ordered a minimum of four weeks prior to sampling.

Table 1—1 Summary of Planning

Timing	Details	Supplier
At least 4 weeks prior to sampling potential sampling at start of wet season	**Order** Lab Bottles Laboratory bottles Eskies and Cool Bricks	tbc
	Hire / Maintenance Check Long arm sampler	Eco Environmental 6/509-511 South Rd, Ashford SA 5031 08 8293 3355 adelaide@ecoenvironmental.com.au Thermo Fisher Scientific 5 Caribbean Dv, Scoresby Vic 3179 03 9757 4377 RentalsAU@thermofisher.com
	Purchase 0.45µm Stericup filters Stericup vacuum pump Nitrile gloves Decon N	Eco Environmental 6/509-511 South Rd, Ashford SA 5031 08 8293 3355 adelaide@ecoenvironmental.com.au Thermo Fisher Scientific 5 Caribbean Dv, Scoresby Vic 3179 03 9757 4377 RentalsAU@thermofisher.com
1 day prior to sampling	**Calibrate** Water quality meter	

2.0 SURFACE WATER SAMPLING PROCEDURE

2.1 Sampling Equipment

Surface water sampling requires the following:

- Surface Water Quality Sheet (Appendix A);
- Long arm sampler;
- Water quality meter (calibrated);
- 0.45µm water filters and suction pump;
- Eskies and cool bricks;
- Laboratory bottles;
- Nitrile gloves;
- Decontaminated plastic or stainless-steel bucket;
- Tool kit including screw drivers, tape measure and shovel; and
- Permanent marker.

2.2 Sampling Locations

There are a number of surface water sampling locations across the Mine and Processing Project Area. These sampling locations are positioned to assess upstream, onsite and downstream impacts from the Mine Site Project. Rising stage samplers have been installed at a number of location in the Kerosene Camp Creek, the Nolans Creek and the western tributary of the Kerosene Camp Creek where the intended diversion will flow to. These gauging stations are both up and downstream of the project and creek confluences. In addition, gauging stations have been installed downstream of the processing site in drainage lines to try and capture run-off quality. This area is difficult to sample because of the very poorly defined drainage and the frequency of rainfall resulting in stream flows. The area typically only has sheet flow with minor drainage gutters intermittently scattered across the area. These limited drainage lines ultimately fan out and disperse. If significant rainfall occurs, sampling will not be possible and many locations due to boggy and muddy ground access conditions, but opportunistic sampling may be possible at other locations. All sample locations are approximate and will vary depending on rainfall amounts and ground conditions.

The sampling program has been primarily designed to assess Nolans Creek, Kerosene Camp Creek, the Kerosene Camp Creek western tributary and other minor drainage lines in and around the Project. Down gradient of the processing facility, modified sampling techniques are being investigated to enable capture of surface flows because of the nature of the runoff when it occurs.

A summary of sampling locations, frequency and suites are provided in Table 2—1 and illustrated on Figure 2—1 and Figure 2—2.

Table 2—1 Surface Water Monitoring Locations

Site ID	Coordinates		Type	Description	Sample Frequency	
	Easting	Northing			Baseline	Operation
Surface Water						
SW01	[redacted]	[redacted]	Control	Nolans Creek Eastern boundary inflow of the Mine Site, upstream of the South Eastern WRD.	Early and late flows with a minimum of 0.1 m flowing water.	
SW02	[redacted]	[redacted]		Schafer Creek, upstream tributary to Kerosene Camp Creek, southern border of the mine site area.		
SW03	[redacted]	[redacted]	Control	Kerosene Creek, upstream of the LOM Pit and stage 1 and 2 diversion		
SW04	[redacted]	[redacted]	Impact	Kerosene Creek Realignment Downstream of West WRD within the inlet to the creek realignment.		
SW05	[redacted]	[redacted]	Impact	Kerosene Creek, downstream of Sediment Control Downstream of pit and Sediment control		
SW06	[redacted]	[redacted]		Nolans Creek Downstream of Sediment Control and East WRD		
Stormwater sediment retention ponds						
SB01	[redacted]	[redacted]	Impact-	Down gradient of western sediment control	Not required.	Field measurements monthly when rain accumulates. Field and laboratory sample assay suite quarterly when rain
SB02	[redacted]	[redacted]	Impact-	Down gradient of sediment control		
SB03	[redacted]	[redacted]	Impact-	Topsoil stockpile, up gradient of sediment control		
SB04	[redacted]	[redacted]	Impact-	South Eastern WRD		

Site ID	Coordinates		Type	Description	Sample Frequency	
	Easting	Northing			Baseline	Operation
SB05	[redacted]	[redacted]	Impact-	Mine Facilities		accumulates. Field and laboratory sample assay suite quarterly.
SB06	[redacted]	[redacted]	Impact-	Western WRD		
SB07	[redacted]	[redacted]	Impact	South Eastern WRD		
SB08	[redacted]	[redacted]	Impact-	RSF Event Pond		
SB09	[redacted]	[redacted]	Impact-	Accommodation		
Mine Pit and Processing Infrastructure						
Mine pit sump water and RSF ponded water should be monitored during operation of the mine site. The location of these monitoring points should be developed during construction to ensure that accessible / production efficient points can be determined. Once determined, the location should be labelled clearly, such as Mine Pit Sump, with a monitoring location marker surveyed in for continuity of monitoring across the operational period.						

Notes

1: Coordinates are approximate and should be used as a guide. Locations should be chosen to provide safe access. Many locations remain inaccessible after rainfall.

2: All permanent surface water sampling points should be defined with a marker post, surveyed and clearly marked.

3: Any event-based monitoring points should be surveyed to note Easting / Northing so that they can be referenced in future events to determine if a permanent location should be established.

4: If concentrations are noted at boundary locations, additional down gradient locations should be assessed and installed as appropriate.

5: During the operational period, the monitoring schedule should be reviewed annually to focus on any potential trends of operational impacts on surface water.

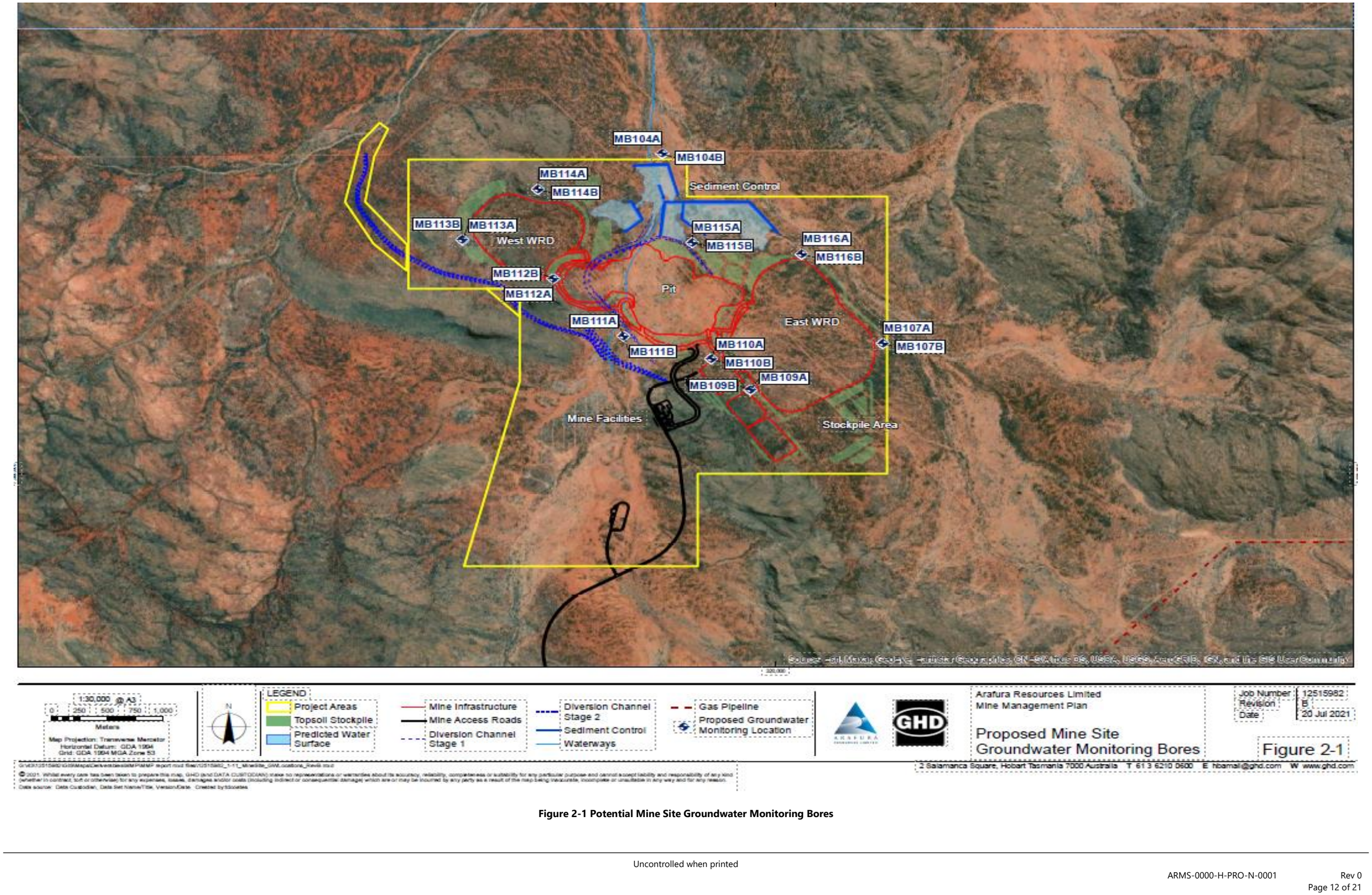

Figure 2-1 Potential Mine Site Groundwater Monitoring Bores

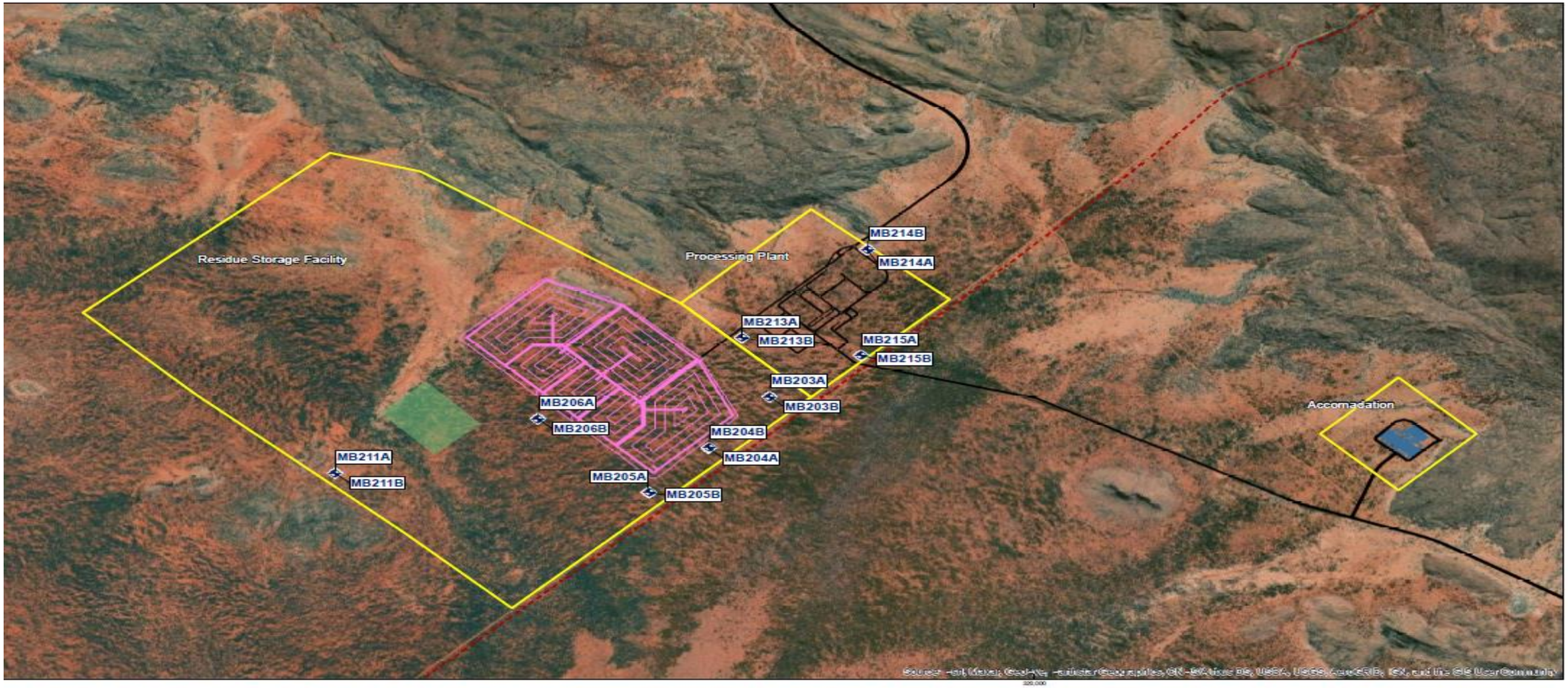

Figure 2-2 Potential Processing Site Groundwater Monitoring Bores

2.2.1 Surface Water Sample Assay Suite

The sampling suite for surface water quality includes either field measurement or field and laboratory measurements. The suites are summarised as follows:

Field Measurements

Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Turbidity and Oxidation Reduction Potential. Depth at location and photo point monitoring (photos of sample location, upstream and downstream).

Field and Laboratory Measurements

In field: Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Turbidity and Oxidation Reduction Potential. Depth at location and photo point monitoring (photos of sample location, upstream and downstream).

- Laboratory Analysis
  - Total Dissolved Solids
  - Total suspended solids (TSS)
  - Total hardness
  - Total acidity and alkalinity;
  - Major ions ($CaCO_3$, CO_3, HCO_3, Ca, Mg, K, Na, Cl, SO_4, NO_3)
  - Metals total and dissolved[1]: Al, As, B, Ba, Cd, Co, Cu, Fe, Li, Pb, P, Mn, Hg, Mo, Ni, Rb, Se, Sr, Ag, U, Th and Zn

Note – these are indicative analytes. The final suite of analytes will be determined following review the baseline data. Sampling is to be completed in accordance with the sampling procedure provided in Section 3.0.

2.3 Sampling Frequency

Sampling will be completed in accordance with the frequency identified in Table 2—1 when sufficient water is available to collect a sample without sediments being disturbed. Depending on the amount of rainfall and ground access conditions, surface water sampling will attempt to be completed during flow events where a minimum of 0.1m of flowing water is present, but may occur after flowing water ceases.

2.3.1 Seepages

Water retention structures including stormwater sediment retention ponds will be installed across the site to reduce potential impacts on the receiving environment from floatation tailing storage facility, residual storage facility and evaporation pond. If seepage is identified during routine inspections the following will be completed:

[1] Samples for dissolved metals are field filtered using 0.45 µm Stericup filter or similar

- Location and Extent: a summary of the location of the seep will be recorded and indicated on map (Figure 2—2). The extent of the seep will be recorded including visible on the ground and surface water influence;
- Volume: the volume of seepage will be recorded as an estimate in (L/minute or L/day);
- Duration: the duration including commencement and ceasing date will be recorded;
- Photographs: a photographic log will be taken to visualise the seep;
- Sampling: Field: field water quality of the seep will be completed;
- Sampling: Laboratory: if sufficient water can be collected and/or the seep continues for three consecutive days a laboratory sample will be collected.

2.3.2 Discharges / Emergency Overflows

Mine site infrastructure has the potential to overflow during significant rainfall events. In the event of a discharge (stormwater overflowing basins), the discharge water and receiving waterbodies will be sampled. Sampling will be completed as soon as practical after an overflow is noted, and will be analysed for field and laboratory suites. The standard surface water sampling procedures will be followed in addition to the following:

- Location and Extent: a summary of the location of the discharge will be recorded and indicated on map including estimation of its extent.
- Volume: the volume of discharge will be recorded daily as an estimate in L/minute.
- Duration: the duration including commencement and ceasing date will be recorded.
- Photographs: a photographic log will be taken at the Sample locations (discharge location, upstream and downstream).
- Sampling – Field: daily field water quality of the discharge will be completed.
- Sampling – Laboratory: daily laboratory sampling of discharge, upstream and downstream receiving environment locations.

3.0 SURFACE WATER SAMPLING PROCEDURES

3.1 Field Measurements

Surface water gauging is to be completed in accordance with the following:

- Complete surface water quality sheet for location (Appendix A)
- Water Quality Parameters - Record field water quality parameters by either suspending the water quality meter within the water body or collecting a sample and placing into a clean bucket for measurements to be taken
- Photographs - Photographs of the sample location should be taken include the sampling point, upstream and downstream. Photographs to be logged into a filing system indicating site location and date.

3.2 Field and Laboratory Measurements

Surface water sampling is only to be completed during periods of flow greater than 0.1m deep. The process is to be completed in accordance with the following:

- Complete surface water quality sheet for location (Appendix A)
- Water Quality Parameters - Record field water quality parameters by either suspending the water quality meter within the water body or collecting a sample and placing into a clean bucket for measurements to be taken
- Photographs - Photographs of the sample location should be taken where access is possible, likely including the sampling point, upstream and downstream. Photographs to be logged into a filing system indicating site location and date;
- Grab Sample - Rinse long arm sampler container in the water body to be sampled three times. Place long arm sampler directly into water body, open end vertically down and fill with an arc motion with the bottle mouth facing upstream. Take care to avoid collecting surface films.
  For waters less than half a metre in depth, collect a grab sample at half the water depth. For waters greater than half a metre in depth, a grab sample should be taken at 20 to 30 cm below the surface water.
  - Field Filtering
    A total metals sample (not filtered) and a dissolved metal sample should be collected. The dissolved metal sample requires field filtration through a disposable 0.45 µm filter;
- Waste Disposal - Excess surface water is to be returned to ground and all disposable sampling equipment used should be stored for disposal at the Process Site including filters; and
- Electronic Transfer - All water quality results, duplicate locations and Chain of Custody (CoC) are to be scanned and kept on file. The purging results are to be entered into the surface water database.

3.3 Sample Dispatch

Water samples have a high potential to deteriorate following collection. Samples are to be placed into onsite fridge pending dispatch to laboratory. At completion of the sampling round, bottles are to be packed into eskys and ice bricks placed on top of samples and transferred to Alice Springs haulage depot. Samplers are to contact the haulage companies and the laboratory to inform them of sample delivery and requirements to keep refrigerated.

The sampler is to inform the laboratory of sample postage and provide a completed Chain of Custody (CoC). A blank CoC is provided in Appendix B.

4.0 DISCHARGE NOTIFICATIONS

Discharges from the Site will be assessed on a case-by-case basis to determine if formal notifications to the DME and NTEPA are required. All external communication of incidents will be signed and approved by Arafura Resources Management Team. In general, if there is a discharge of contained/managed water from the Project (i.e. collapse of flood levees or overflow of stormwater basins) the DME and NTEPA will be notified. A summary of the notification requirements is provided in Table 4—1.

Table 4—1 Formal Notification Requirements

Entity	Trigger	Timeframe and Contact Details	Incident Reporting Details
Department of Industry, Tourism and Trade Mines Division (DITT)	Incident which causes minor environmental impact with some minor actual or potential harm to the environment.	As soon as practicable. Mineral.Info@nt.gov.au	The Section 29 Notification of Environmental Incident Form requires the following details: Site and operator details. Location occurred and area impacted (GPS coordinates); Date and time; Description of incident Emergency and remedial actions taken. Nature of impact and severity; Current situation; Details of sampling completed; and Notification status internally and externally. The form is to be signed by the HSEC Manager and/or General Manager for submission.
Northern Territory Environmental Protection Authority (NTEPA)	Incident which causes, or is threatening or may threaten to cause pollution resulting in material environmental harm or serious harm. Qualifying triggers requiring submittal of Section 14 Incident Report to NTEPA are any of the following: is not trivial or negligible in nature; or consists of an environmental nuisance of a high impact or on a wide scale; or results, or is likely to result in $50,000 or more in taking	< 24 hrs post incident ntepa@nt.gov.au pollution@nt.gov.au	The Section 14 Incident Report Form requires the following details: Incident causing or threatening to cause pollution; Location occurred and area impacted; Date and time; How the pollution has occurred, is occurring or may occur; Attempts made to prevent, reduce, control, rectify, investigation and/or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident; and Operator details.

Entity	Trigger	Timeframe and Contact Details	Incident Reporting Details
	action to prevent or minimise environmental harm or rehabilitate the environment; or results in actual or potential loss or damage to value of $50,000 or more of the prescribed amount (whichever is the greater).		The form is to be signed by HSEC Manager and/or General Manager for submission.

APPENDIX A SURFACE WATER QUALITY SHEET (EXAMPLE)

SURFACE WATER QUALITY FIELD SHEET										
Date				Sampler						
FIELD PARAMETERS										
Location ID	Time	pH	D.O (%)	ORP (mV)	E.C (µS/cm)	TDS (mg/L)	Temp (^{0}C)	Turbidity (NTU)	Salinity (ppt)	Comments (water flow, colour, suspended sediments)
Additional Comments										

APPENDIX B CHAIN OF CUSTODY FORM (EXAMPLE)

ALS Environmental

CHAIN OF CUSTODY

ALS Laboratory: please tick

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT:	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)
OFFICE:			Custody Seal Intact? Yes No N/A
PROJECT:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: C
PROJECT MANAGER:	CONTACT PH:	OR: 1 2 3 4 5 6 7	Other comment:
SAMPLER:	SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):		
Email Reports to (will default to PM if no other addresses are listed):		DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed):			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:																	
ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information			
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS									Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.			
				TOTAL													

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.