



POST MINE LAND USE PLAN

LUCKY BREAK PROJECT
POST MINE LAND USE PLAN

PREPARED FOR
SCONI MINING OPERATIONS PTY LTD

MAY 2020

Document Control

Project Name:	Lucky Break Project
Report Title:	Post Mine Land Use Plan
Client:	Sconi Mining Operations Pty Ltd
Project Manager:	Stuart Ritchie

Version	Comments	Author	Reviewer	Date
Draft issued for client review		CC, HD	SR	19 May 2020
Final issued to client		CC, HD	SR	21 May 2020

This document is the property of AARC Environmental Solutions Pty Ltd ('AARC') and all rights are reserved in respect of it. This document has been prepared for the exclusive of AARC's client and may not be reproduced or disclosed in any manner whatsoever, in whole or in part, without the prior written consent of AARC. AARC expressly disclaims, to the maximum extent permitted by law, all responsibility for or liability arising from the use of this document by any third party. This document has been prepared subject to the instructions and scope of work agreed to with AARC's client. Any opinions or judgements expressed herein are based on our understanding and interpretation of current regulatory standards relevant to the specific needs of the client and should not be construed as legal opinions or legal advice. Information provided by the client while instructing AARC has been assumed to be correct and complete, and, where this report relies on field information, the condition of the assessed area as at the time of conducting any field assessment. AARC assumes no liability or responsibility for any inaccuracies or omissions outside of AARC's direct control. AARC makes no statement, representation or warranty about the accuracy or completeness of information relating to items not visible, accessible, or able to be inspected at the sites at the time of the site visits.

Table of Contents

1	Introduction	1
1.1	Scope and objectives	1
1.2	Project location and background information	1
1.3	Project description	2
2	Existing environment.....	6
2.1	Geology	6
2.2	Soil	6
2.2.1	Soil Type 1: Barkla	8
2.2.2	Soil Type 2: Cape	8
2.2.3	Soil Type 3: Conolly	8
2.2.4	Soil Type 4: Corea	8
2.3	Vegetation.....	8
2.4	Hydrology and topography	11
2.4.1	Surface water and stream sediment quality	11
3	Pre- and post-mine land use	14
4	Project features post-rehabilitation	16
4.1	Residual void	16
4.1.1	Void geotechnical assessment	16
4.1.2	Void hydrology and water quality	18
4.1.3	Seepage and overland flow	22
4.2	Waste rock dump	22
4.2.1	Waste rock geochemistry	23
4.2.2	Waste rock dump stability.....	26
4.3	Sediment dam, ROM pad and office area	27
4.4	Haul road.....	28
4.5	Existing water management infrastructure	28
4.5.1	Stormwater management	29
4.6	Rehabilitation methods applied	33
4.6.1	Topsoil management.....	33
4.6.3	Topsoil treatment and placement.....	34
4.6.4	Rehabilitation progress assessment.....	34
5	Rehabilitation objectives and methods.....	35
5.1	Rehabilitation targets and objectives	35
5.2	Revegetation methods	35
5.2.2	Propagation	36

5.3	Maintenance	37
5.3.1	Watering.....	37
5.3.2	Weed control.....	37
5.3.3	Reparation.....	38
6	Completion criteria	39
7	References	43

List of Figures

Figure 1:	Regional location of the Project site	4
Figure 2:	Lucky Break Project current disturbance footprint.....	5
Figure 3:	Distribution of soils on the Project site (Source: AARC 2006a).....	7
Figure 4:	Distribution of vegetation communities (AARC 2006b)	10
Figure 5:	Regional and local drainage systems	12
Figure 6:	Surface water and stream sediment sampling locations	13
Figure 7:	Project features.....	16
Figure 8:	Dingo Dam Mine void configuration (Source: ATCW 2019b).....	18
Figure 9:	Photographs of site conditions at the void	19
Figure 10:	Modelled probabilistic accumulated spill volumes in the void	19
Figure 11:	Modelled probabilistic water storage volume in the void	20
Figure 12:	ARD classification plot of NAPP versus NAG pH—surface soil samples	22
Figure 13:	Acid base account plot of total S versus ANC—ore body samples	24
Figure 14:	ARD classification plot of NAPP versus NAG pH—Ore body samples	26
Figure 15:	Existing catchment conditions at the Project (Source: ATCW 2019a)	30
Figure 16:	Proposed stormwater management features (Source: ATCW 2019a).....	31
Figure 17:	Proposed catchment conditions at the Project (Source: ATCW 2019a)	32

List of Tables

Table 1:	Lucky Break Project tenements (AARC 2018)	2
Table 2:	Pre-mining vegetation community summary (AARC 2006)	9
Table 3:	Summary of land suitability limitations for beef cattle grazing	14
Table 4:	Final land uses.....	15
Table 5:	Waste rock characterisation results (MFL 2011)	23
Table 6:	Standard geochemical classification criteria (source: Jones et al. 2016)	25
Table 7:	Summary of storage volumes of site structures	28
Table 8:	Consequence Category Assessment summary	29
Table 9:	Rehabilitation material balance	33
Table 10:	Species selected for the rehabilitation use	36
Table 11:	Mine domains with corresponding rehabilitation indicators and completion criteria	39
Table 12:	Revegetation completion criteria	41
Table 13:	Landform rehabilitation success criteria	42

List of Appendices

Appendix A	Rehabilitation Monitoring Program
Appendix B	Rehabilitation Soils Assessment
Appendix C	Surface Water and Sediment Quality Analysis Results
Appendix D	Mine Void Geotechnical Stability Study, Hydrological Assessment and Consequence Category Assessment of the Void (ATCW 2019 b-d)
Appendix E	Stormwater Management Plan (ATCW 2019a)

List of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
AHD	Australian Height Datum
ANC	Acid Neutralising Capacity
ARD	Acid Rock Drainage
ATCW	ATC Williams Pty Ltd
AUZ	Australian Mines Ltd
CCA	Consequence Category Assessment
DAF	Queensland Department of Agriculture and Fisheries
DES	Department of Environment and Science
EA	Environmental Authority
EC	Electrical Conductivity
MFL	Metals Finance Limited
ML	Mining Lease(s)
MPA	Maximum Potential Acidity
NAF	Non-acid Forming
NAG	Net Acid Generation Capacity
NAPP	Net Acid Producing Potential
NATA	National Association of Testing Authorities
NUMA	Non-use management area
PCMP	Post Closure Management Plan
pH OX	Final pH of a sample after oxidation
PMLUP	Project Post Mine Land Use Plan
PoO	Plan of Operations
QNPL	Queensland Nickel Pty Ltd
RE	Regional Ecosystem
RL	Reference Level
REMP	Receiving Environmental Monitoring Program
RMP	Rehabilitation Monitoring Program
ROM	Run of Mine
SLSA	Soil and Land Suitability Assessment
WRD	Waste Rock Dump

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Australian Mines Limited (AUZ) to develop a Post Mine Land Use Plan (PMLUP) to guide the rehabilitation work at the Lucky Break Project (the Project). The PMLUP is applicable to the rehabilitation areas and Mining Leases (ML) (ML10324 and ML10332) in accordance with the Project's Environmental Authority (EA) (EPML00900713).

1.1 Scope and objectives

The purpose of this PMLUP is to describe how the rehabilitation objectives listed in condition C1 and Table C1 of the EA for the Project will be achieved. The PMLUP is also required to address condition C4, which states that the PMLUP must include:

- (a) residual void investigation in accordance with condition (C9);*
- (b) schematic representation of final land form inclusive of drainage features;*
- (c) slope design;*
- (d) cover design;*
- (e) drainage design;*
- (f) erosion controls proposed on reformed land;*
- (g) description of experimental design for monitoring of analogue and rehabilitated areas inclusive of statistical design;*
- (h) proposed revegetation methods inclusive of plant species selection, re-profiling, resspreading soil, soil ameliorants/amendments, surface preparation and method of propagation;*
- (i) materials balance including available top soil and low permeability capping material;*
- (j) geotechnical, geochemical and hydrological studies;*
- (k) chemical, physical and biological properties of soil and water;*
- (l) performance criteria for the cover system; and*
- (m) a rehabilitation monitoring program.*

These requirements are addressed within this PMLUP. The requirements of condition C9 which include a pit void geochemical and hydrological assessment are addressed in Section 4.1. Conditions C4(g) and C4(m) are addressed within an accompanying Rehabilitation Monitoring Program (RMP, AARC 2020a) (Appendix A). The remaining requirements of condition C4 are addressed within relevant sections of this PMLUP.

Rehabilitation indicators and completion criteria provided in the Lucky Break Project Plan of Operations 2018 – 2023 (AARC 2018) have been reviewed and a complete set of site-specific rehabilitation goals, objectives, indicators and completion criteria have been developed to satisfy the requirements of EA condition C1.

1.2 Project location and background information

The Project is located at the Spyglass Beef Research Station, approximately 100 km north of Charters Towers and 140 km west of Townsville in north Queensland (Figure 1). The Project incorporates two MLs identified as ML10324 and ML10332, which combined encompass approximately 103 ha of land.

Between March 2015 and July 2015 Queensland Nickel Pty Ltd (QNPL) mined approximately 114 kilotonnes (ore product tonnes) of nickel ore from the Dingo Dam deposit (ML10324) under EA EPML009007131 held by Nornico Pty Ltd. The mining campaign specifically targeted nickel ore within the deposit that was suitable for processing at the QNPL Refinery near Townsville. Nickel ore mined by QNPL was transported to Townsville in B-Double trucks via the approved B-double route; Gregory Development Road, Harvey's Range Road, Black River Road, Bruce Hwy and Greenvale Street.

At the completion of mining activities at the site, QNPL commenced rehabilitation of the site, including the removal of all infrastructure, re-profiling of the waste dump, reducing batter angles of the residual void, installing stormwater controls, ripping hardstand areas, spreading topsoil, seeding and installing fences.

ML10332 has been subject only to exploration drilling which is understood to have occurred in 2004 and 2005.

1.3 Project description

All tenements associated with the Project are detailed in Table 1. The entire Project site falls within the Spyglass Station research facility (Lot 1 OC57), which is owned and operated by the Queensland Department of Agriculture and Fisheries (DAF).

Table 1: Lucky Break Project tenements (AARC 2018)

Permit number	Permit name	Permit status	Grant date	Expiry date	Surface area (hectares [ha])	Real property description
ML10324	Dingo Dam	Granted	16/02/2005	28/02/2026	36.2	Lot 1 OC57
ML10332	Lucky Break	Granted	22/11/2007	30/11/2027	66.5	Lot 1 OC57

The Project's EA authorises the mine to conduct environmentally relevant activities on the MLs, including the mining of nickel ore, and crushing, grinding, milling or screening of more than 5000 tonnes of mineral in a year.

To date, mining activity has occurred entirely within the Dingo Dam ML (10324). No mining activities are currently occurring on either of the Project's MLs. The Project is currently in care and maintenance with no further mining activities planned for either ML.

Existing disturbance—Dingo Dam (ML10324)

ML10324 has been subjected to a range of disturbances associated with the earlier mining activities. Disturbances have been categorised as rehabilitation areas and improvement areas and include:

- a residual pit void;
- a sediment dam;
- Dingo Dam;
- a single waste rock dump (WRD);
- a former Run of Mine (ROM) pad;
- a portion of the former haul road; and
- various earthen bunds.

The current disturbance footprint within ML10324 is shown in Figure 2. The boundary of the ML intersects Dingo Dam with only a small portion of the dam being included within the ML.

Existing disturbance—Lucky Break (ML10332)

Exploration and drilling activities were undertaken within the Lucky Break ML (ML10332) during 2004 and 2005. No mining activities followed. Air core drilling was utilised negating the need for sumps to be dug. Photographic records suggest that drill pad clearing was minimal. All exploration holes were permanently plugged, and drill pad areas rehabilitated.

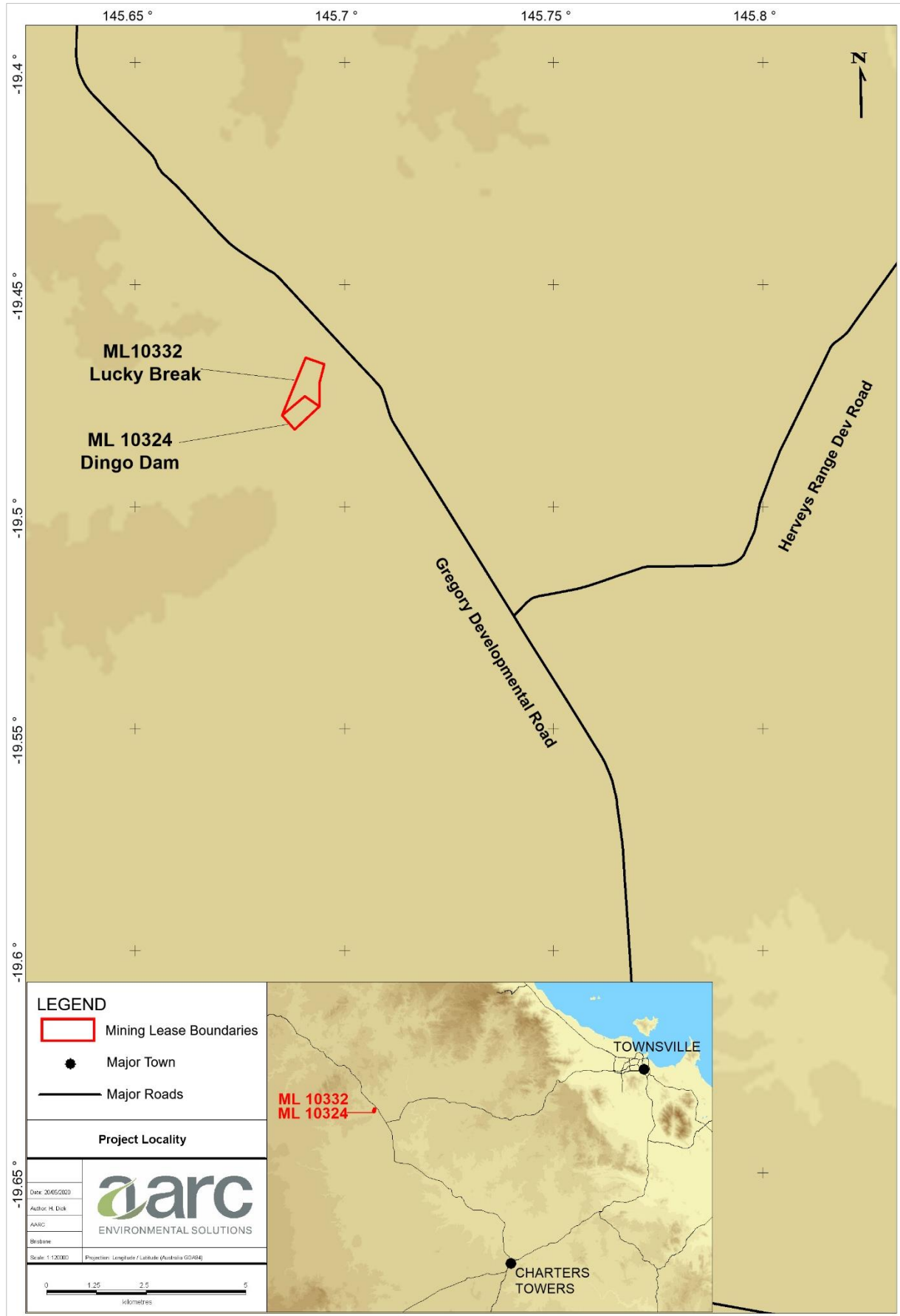


Figure 1: Regional location of the Project site

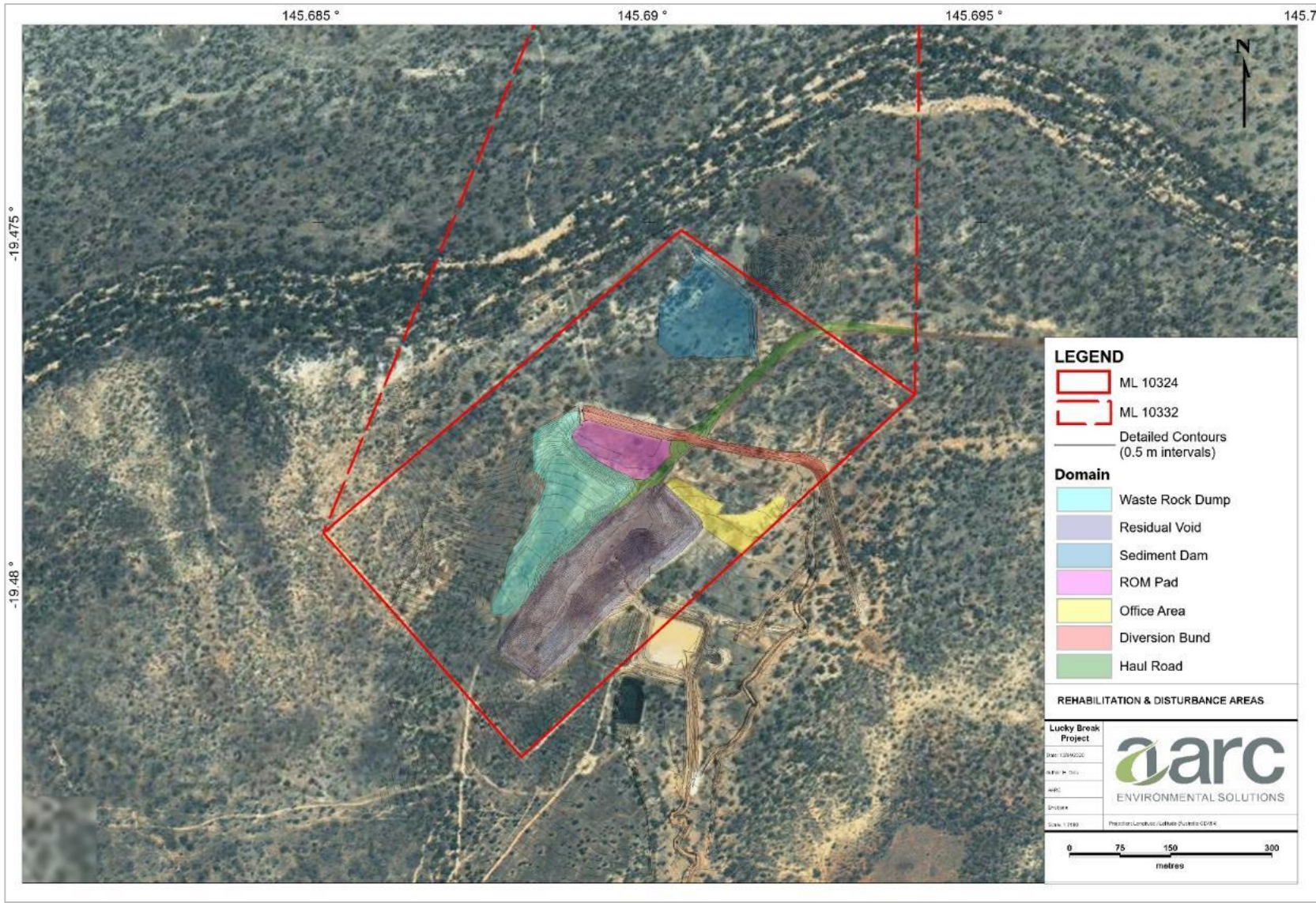


Figure 2: Lucky Break Project current disturbance footprint

2 Existing environment

2.1 Geology

The geology of the region comprises the Oweenee Granite and the Argentine Metamorphics, which include meta-siltstones, calc-silicate, gneiss, amphibolite and serpentinitised ultramafic rocks. Lateritised and weathered siliceous duricrust over ultramafic rocks are exposed in the Dingo Dam-Snake Creek-Gregory road area. Soil cover and Quaternary sediments mask the majority of basement rocks.

Locally, tertiary sediments, laterite and Quaternary alluvium underlie approximately 70% of the tenement. At Dingo Dam (ML10324), granite of the Oweenee Granite batholith is present surrounding the lateritised ultramafic forming the Project area. Pink sandy soil is developed over granitic sub-crop. Amphibolite schist is present in the western and northern parts of the prospect area, where it forms small, scattered resistant outcrops and sub-crop. A characteristic dark brown to black soil is associated with this unit. The rock is very fresh, unweathered, fine-grained, black-dark grey in colour, hard, dense, magnetic and has a weakly developed schistose texture evident in hand specimen. The amphibolite schist is of sufficient hardness and quality to be considered for road aggregate material. As such, it may form a viable quarry by-product material from the mining of nickel laterite.

A laterite terrace or duricrust of tertiary age is developed over granite to the south of the Project area. Within ML10324, resistant lateritised serpentinite is exposed as low relief within an eroded flood plain associated with Snake and Stockyard Creeks. The original laterite terrace that connected ML10324 with the surrounding laterite overlying the granite has been removed by Quaternary—recent age erosion associated with these creeks.

Four lateritised serpentinite bodies outcrop within the tenement and are known as the Dingo Dam, Snake Creek, Circular and Road Cut laterites. The Dingo Dam and Circular laterites occur as distinct low-lying features and sub-surface units characterised by siliceous honeycomb textured rocks. At the Snake Creek and Road Cut laterites the siliceous outcropping serpentinites form distinct topographic highs which rise between 5–10 m above the surrounding alluvial plain. Drilling indicates that the serpentinite units dip moderately to the southeast.

Widespread scattered sub-crop and outcrops of silica-goethite laterite zones form hard, resistant, smooth weathered areas at all of the four identified laterites.

2.2 Soil

Red-brown soils are well developed over areas of laterite outcrop and sub-crop, generally with abundant colluvial scree.

Chromite, a normal constituent of peridotite-rich ultramafic rocks, is residually enriched in the limonite zone. Black chromite grains are present in soils developed over the silica-goethite boxwork unit. These grains reflect the insoluble nature of chromite in the laterite environment. Dark brown to black soils are present over the amphibolite schist. Soils overlying granite are characterised by sandy, pink to light-brown quartz-rich soils.

A Soil and Land Suitability Assessment (SLSA) was conducted to classify soil types (AARC 2006a), assess the suitability of topsoil material, and identify potential management limitations associated with soil characteristics. Based on field observations and laboratory analysis, four broad soil types were confirmed within the Project area (Figure 3). A description of the dominant soil types identified, together with typical chemical characteristics, is included below.

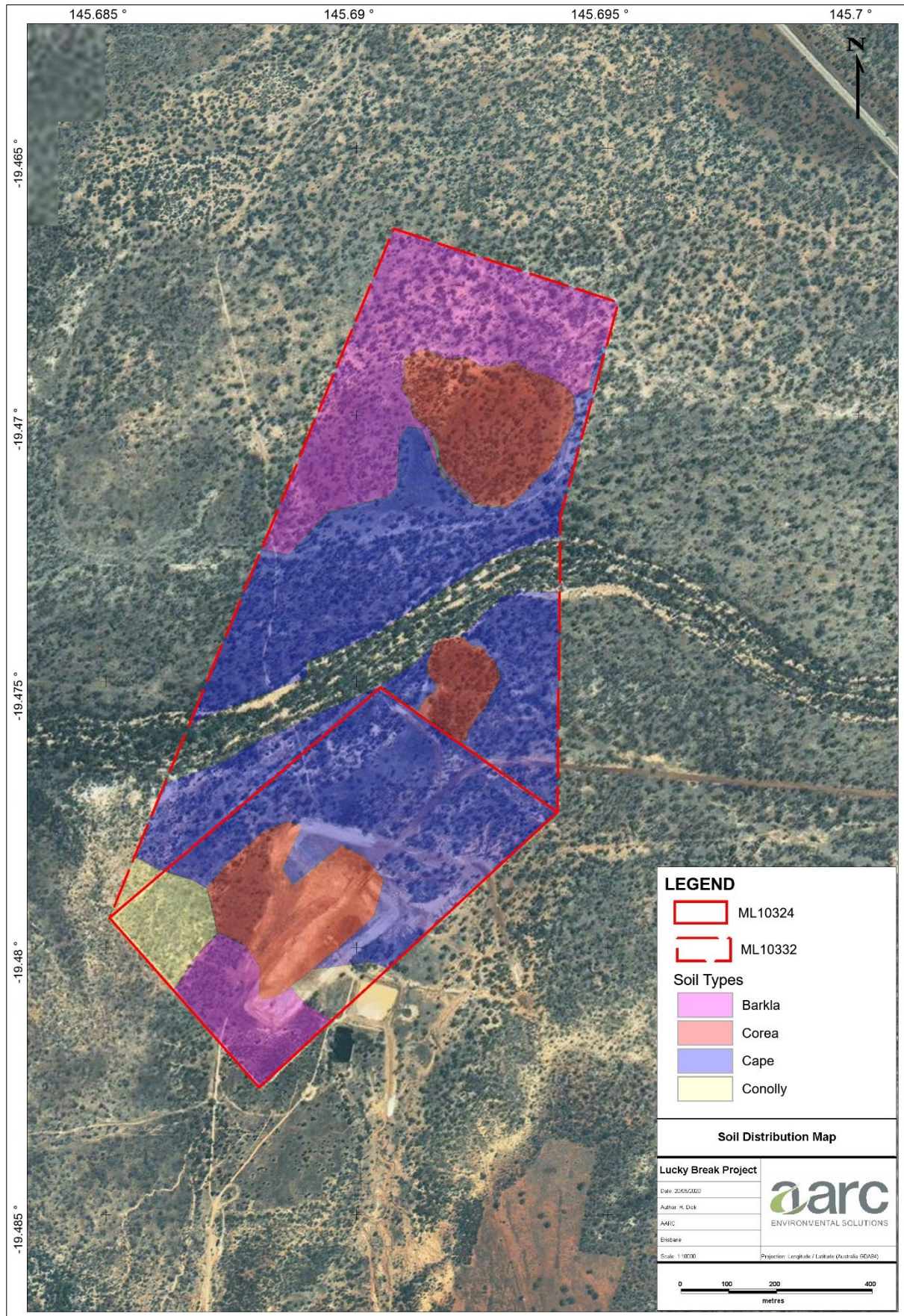


Figure 3: Distribution of soils on the Project site (Source: AARC 2006a)

2.2.1 Soil Type 1: Barkla

Barkla is a greyish brown sandy loam that overlays loamy sand or loamy clay at variable depths. A strong texture is sometimes evident. The soil is of low fertility and slightly acidic (average pH 6.0, 0–10 cm), and is low in organic carbon, nitrogen, cation exchange capacity and phosphorous. This soil occurs on gently sloping alluvial plains that are occasionally dissected by washouts. The Barkla soil type covers approximately 63% of the Project area.

2.2.2 Soil Type 2: Cape

Cape is a greyish brown silty loam over loam to clay loam over moderately sodic brownish yellow clay. The soil is of moderate fertility, but nutrient levels, particularly phosphorous, fall significantly below the upper 200mm. The moderately sodic subsoils may be highly dispersive. The Cape soil occurs on gently sloping alluvial plains that form the upper levee of Snake Creek. Washouts dissecting this soil unit are common. The Cape soil type covers approximately 28% of the Project area.

2.2.3 Soil Type 3: Conolly

The Conolly soil type is gravely sand formed from granite on dense brown clay at a depth of less than 300 mm. The soil unit has steep slopes up to 30% and is heavily dissected by gullies. There is very little soil development and nutrient levels and vegetation cover are low. The Conolly soil type covers only about 2% of the Project area. It is understood that there has been no or minimal disturbance to this soil unit.

2.2.4 Soil Type 4: Corea

The Corea soil type forms lateritic clay outcrops of the protruding ore bodies within the Project area. This soil type is a massive reddish-brown clay with a surface often consisting of greater than 60% rock. The soil unit has gentle to steep slopes up to 40%, and the soils are non-acid and non-sodic with low nutrient levels. The Corea soil type covers about 7% of the Project area.

2.3 Vegetation

An assessment of vegetation communities and ecological values was undertaken to determine the pre-mining conditions at the Project. A full description of the assessment findings is reported in AARC (2006b).

Within the Project area, three distinct vegetation communities were identified (Figure 4), with five corresponding regional ecosystems (REs). The three vegetation communities include:

- Community 1—River Red Gum Riparian Woodland;
- Community 2—Narrow Leaved Ironbark Woodland; and
- Community 3—Silver Leaved Ironbark Woodland.

All REs described within the Project area are listed as being 'not of concern' under Queensland's *Vegetation Management Act 1999*. They are not listed as 'threatened' under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*. Two of the REs have a biodiversity status listed as 'of concern' but are not generally proximate to disturbance zones or have limited distribution in the Project area. As a consequence, disturbance was understood to have been limited.

One rare flora species, *Acacia polyadenia*, is listed under the *Nature Conservation Act 1992* and is known to possibly occur within the region of the Project. Targeted searches for this species were undertaken, but no instances were located within the Project area. The dominant species identified within each community and the corresponding RE's are described in Table 2.

Table 2: Pre-mining vegetation community summary (AARC 2006)

Community No.	Community 1	Community 2	Community 3
Community name	River Red Gum Riparian Woodland	Narrow Leaved Ironbark Woodland	Silver Leaved Ironbark Woodland
Regional ecosystem	9.3.1	9.5.3 9.5.11 9.3.22	9.12.4a
Canopy	<i>Eucalyptus camaldulensis</i> ; <i>Casuarina cunninghamiana</i> ; <i>Corymbia tessellaris</i>	<i>Eucalyptus crebra</i> ; <i>Corymbia clarksoniana</i> ; <i>Corymbia erythrophloia</i> ; <i>Corymbia tessellaris</i>	<i>Eucalyptus shirleyi</i> ; <i>Corymbia peltata</i>
Sub-canopy	<i>Melaleuca fluviatilis</i>	—	—
Understorey	—	<i>Atalaya hemiglauc</i> ; <i>Carissa lanceolata</i> ; <i>Grevillea striata</i> ; <i>Hakea chordophylla</i>	<i>Acacia disparrima</i>
Shrub layer	—	<i>Neptunia dimorphantha</i> ; * <i>Sida spinosa</i> ; <i>Sida subspicata</i> ; * <i>Sida cordifolia</i> ; <i>Trema tomentosa</i>	<i>Neptunia dimorphantha</i> ; * <i>Sida spinosa</i> ; * <i>Sida cordifolia</i>
Ground layer	* <i>Mitracarpus hirtus</i> ; <i>Lomandra longifolia</i> ; * <i>Cryptostegia grandiflora</i> ; <i>Chloris virgata</i> ; <i>Crotalaria dissitiflora</i> ; <i>Heteropogon contortus</i> ; <i>Setaria surgens</i> ; * <i>Sida cordifolia</i> ; <i>Sida subspicata</i>	<i>Heteropogon contortus</i> ; <i>Aristida calycina</i> var. <i>calycina</i> ; * <i>Rhynchelytrum repens</i>	<i>Aristida calycina</i> var. <i>calycina</i> ; <i>Eriachne ciliata</i> ; * <i>Mitracarpus hirtus</i> ; * <i>Rhynchelytrum repens</i>

Note: * indicates introduced species; Bold italicised texts indicate dominant species



Figure 4: Distribution of vegetation communities (AARC 2006b)

2.4 Hydrology and topography

The Project is situated within the Burdekin River Basin located approximately 28 km from the Burdekin River channel, and approximately 230 km from the confluence of the Burdekin River with Dalrymple Lake (Burdekin Falls Dam). From the Burdekin Falls Dam, the Burdekin River flows approximately 160 km to the Coral Sea. The Burdekin River falls about 620 m over its approximate 886 km length.

The two MLs are dissected by Snake Creek, a tributary of Stockyard Creek which reports to the Burdekin River approximately 4 km to the east. Both MLs grade to Snake Creek.

The highest elevation on the Dingo Dam site is RL 365.5 m at the south-western extent of ML10324, with the lowest elevation being RL 336.0 m in the north-eastern extent. The Project area is characterised by generally gentle slopes (average 2-3%) with overland flow paths becoming channelised in the steeper upstream areas and, in some case, transecting the Project site which borders the alluvial floodplain in the north.

A number of diversion bunds and dams have previously been constructed within the ML, which have resulted in significant alteration to natural flow paths. The Project site, with respect to local hydrological features, is provided in Figure 5.

2.4.1 Surface water and stream sediment quality

AARC has undertaken water quality sampling within the Project site and the receiving environment on several occasions since September 2018. Sampling has been conducted during flow or release events and routine receiving environment monitoring. Samples have been collected from the residual pit void (OCP), Dingo Dam, the sediment dam and at upstream and downstream receiving environment sampling points on Snake Creek and one of its unnamed tributaries. Stream sediment sampling was undertaken in conjunction with water quality sampling on two occasions at the sampling locations shown in Figure 6. Results of water quality and sediment quality analysis are provided in Appendix C.

Water quality characteristics in the receiving environment are, in most cases higher than residual void water quality and are considered independent and the result of natural variation. Concentrations of total aluminium tend to occur higher in the residual void due to the nature of the current water management strategy in which runoff with high suspended sediment loads is released from Dingo Dam to the void. Regardless, water quality analysis indicates that the Project, in its current state, is not causing environmental harm with respect to the water quality of the downstream receiving environment.

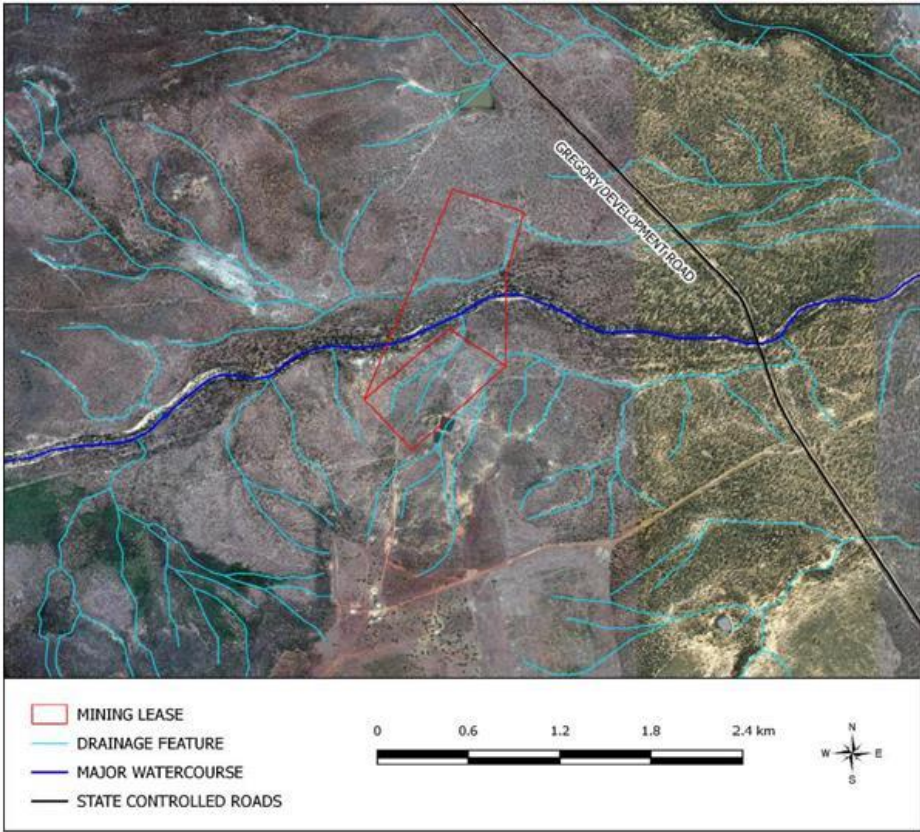
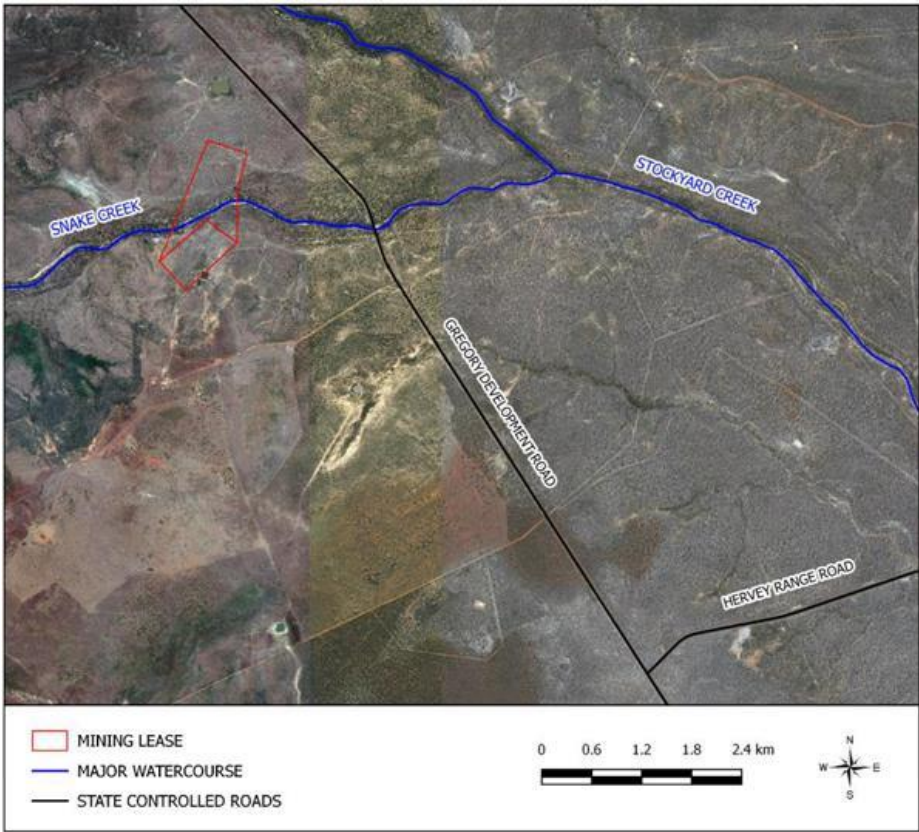


Figure 5: Regional and local drainage systems

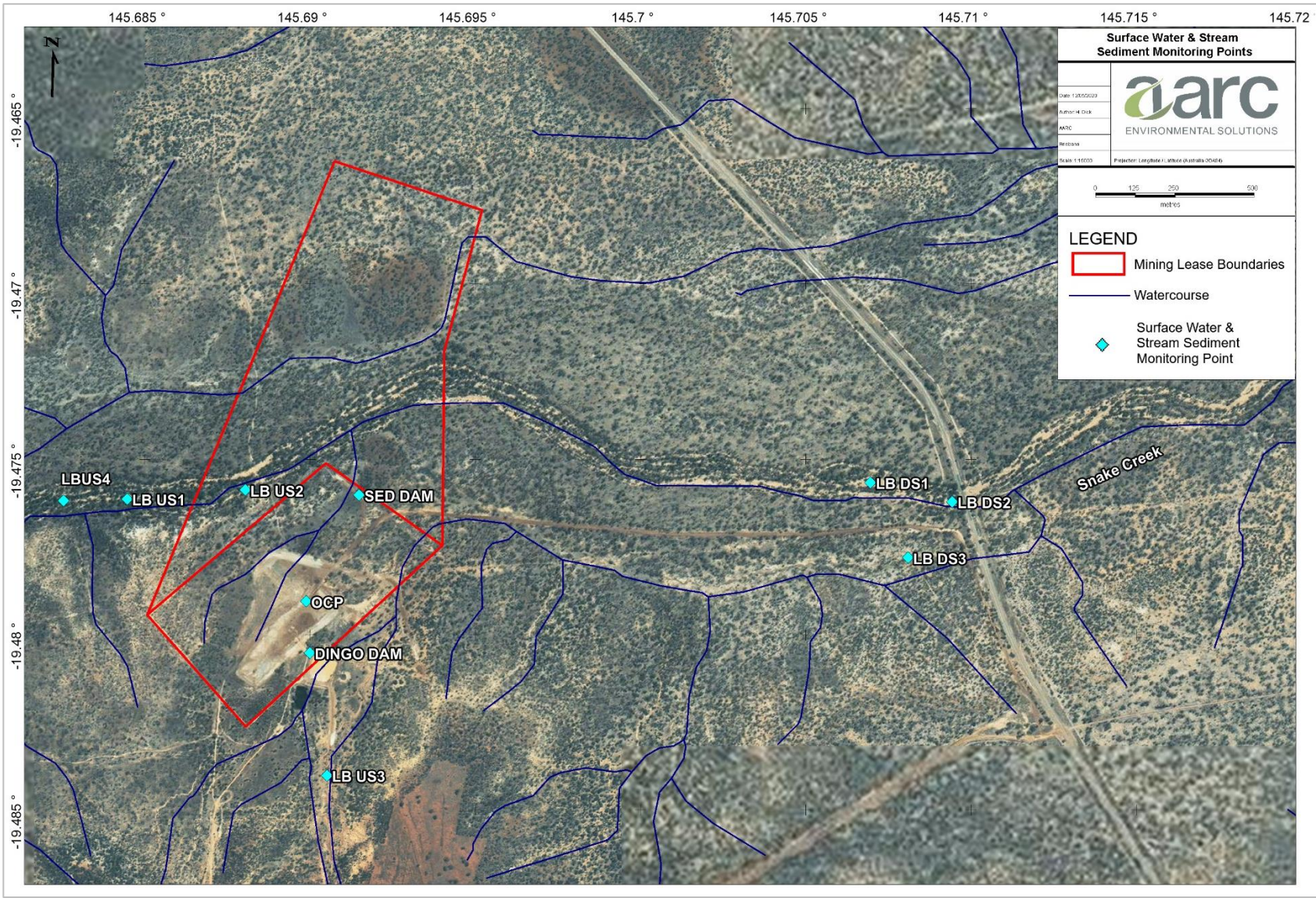


Figure 6: Surface water and stream sediment sampling locations

3 Pre- and post-mine land use

The Project area lies in a rural landscape and historically has been subject to low-intensity cattle grazing with limited exploration and mining activities. Dominant regional land uses in the Upper Burdekin catchment are grazing on natural pastures (88%) and conservation areas (11%) (NQ Dry Tropics 2016). The pre-mining use of the land within both MLs is low-intensity cattle and horse grazing, and mineral exploration.

The SLSA (AARC 2006a) evaluated the land suitability of the Project area prior to mining. As summarised in Table 3, all soil types are classified as Land Suitability Class 4 for Beef Cattle Grazing. The main limiting factors preventing all soil types from being a higher land suitability class are water availability and nutrients, with topography an additional factor exclusive to the Corea and Conolly soil types.

Land Suitability Class 4 means the soils are marginally suitable for beef cattle grazing with major inputs required to ensure sustainable use. The sustainable use of the Project area for beef cattle grazing would be largely dependent on appropriate stocking rates being employed. These stocking rates would need to consider seasonal and annual variations in rainfall, availability of and appropriate management of water resources, the availability of land of similar quality in the immediate vicinity and implementation of appropriate management practices.

Table 3: Summary of land suitability limitations for beef cattle grazing

Parameter	Barkla	Cape	Conolly	Corea
Plant available water capacity	4	2	4	4
Nutrients	4	4	4	4
Physical	2	2	3	3
Salinity	1	1	1	1
Rockiness	1	1	4	3
Micro-relief	1	1	1	1
pH	1	2	4	2
Exchangeable sodium percentage	1	2	2	2
Wetness	1	2	1	1
Topography	1	1	4	4
Erosion	1	1	3	3
Flooding	2	2	2	2
Overall suitability rating	4	4	4	4

Source: Soil and Land Suitability Assessment Report (AARC 2006a)

It is intended that previously disturbed mine domains will largely be returned to a grazing/native ecosystem land use with the exception of the residual pit void. The residual pit void will have a final land use of a non-use management area (NUMA). At closure, the residual void will meet the rehabilitation goals of being safe, non-polluting and stable. The final land uses for the Project are described in Table 4.

Table 4: Final land uses

Project area	Pre-mining land use	Post-mine land use
Infrastructure areas		
Office area	Grazing/native ecosystem	Grazing/native ecosystem
Diversion bunds	Grazing/native ecosystem	Grazing/native ecosystem
Haul road	Grazing/native ecosystem	Grazing/native ecosystem
Stormwater management features	Grazing/native ecosystem	Grazing/native ecosystem
Waste		
WRD	Grazing/native ecosystem	Grazing/native ecosystem
Run of Mine (ROM)		
ROM pad	Grazing/native ecosystem	Grazing/native ecosystem
Voids		
Residual void	Grazing/native ecosystem	Non-use management area
Dams		
Sediment Dam	Grazing/native ecosystem	Grazing/native ecosystem
Dingo Dam*	Water storage	Water storage

Note: * Dingo Dam is a pre-existing structure and owned by the DAF; a small section falls within the ML

Spyglass Station (DAF) is currently the landholder of both MLs as well as the existing user of the land and retained infrastructures. Dingo Dam is a pre-existing structure and owned by the landholder. The final land uses and rehabilitation responsibilities of both MLs have been negotiated and shared with the landholder. It is anticipated that water quality monitoring as proposed in the RMP for Dingo Dam and the sediment dam may demonstrate that water resources are suitable for livestock, thus only minor negotiation would be required to consent to a stock water storage structure.

While all areas of existing mine disturbance on ML10324 have undergone rehabilitation, rehabilitation success to date has been limited. All areas previously disturbed by mining activities will be subject to rehabilitation maintenance and monitoring activities. Some areas of existing disturbance may require remedial works such as erosion control, ripping and seeding to encourage the establishment of vegetation. Further rehabilitation works required are discussed in the following sections.

4 Project features post-rehabilitation

Following the completion of mining in 2015, all areas of mine disturbance underwent rehabilitation. Consequently, a number of rehabilitation areas can be defined on ML10324, as described in the following sections. With respect to ML10332, the only activities that have occurred were exploration activities, with all holes having been capped and surface disturbance rehabilitated. Figure 7 depicts the location and extent of the remaining features on ML10324. Several technical studies were undertaken before, during and after the completion of mining to inform the rehabilitation works carried out at the site.

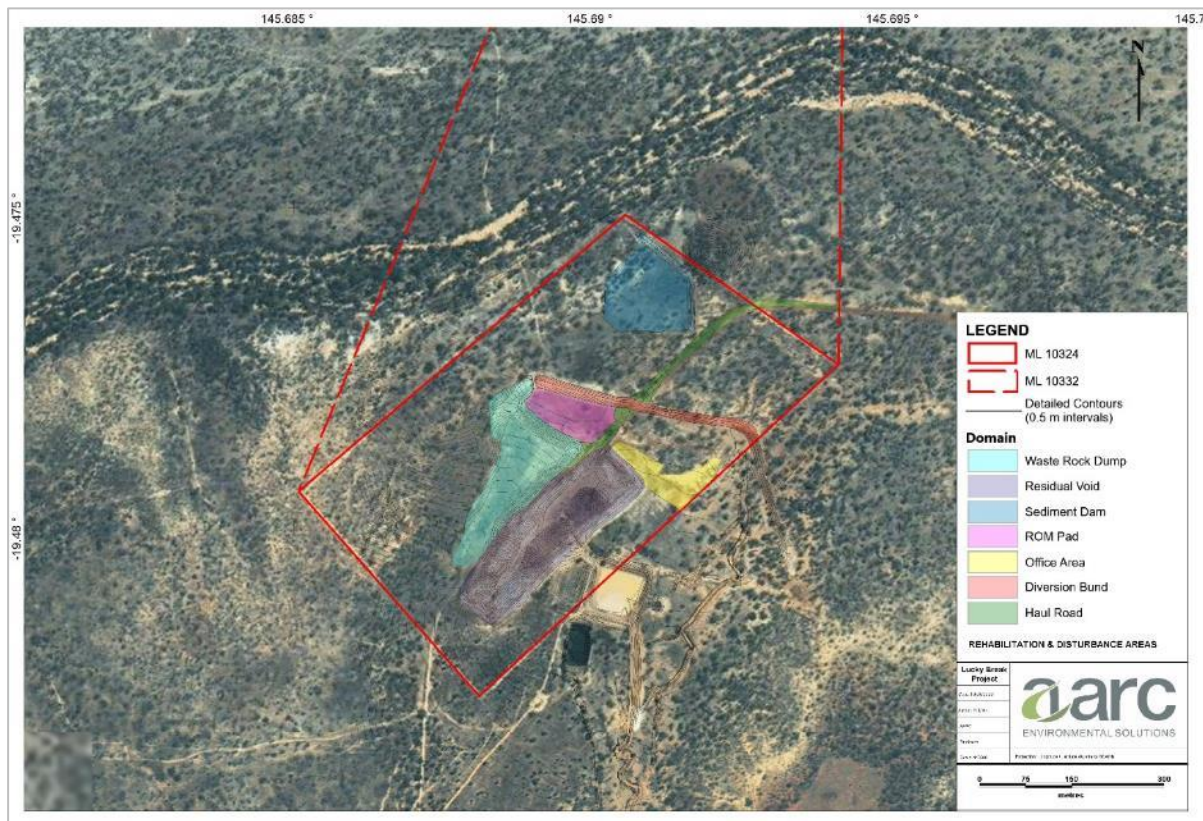


Figure 7 Project features

4.1 Residual void

A single pit void with approximate dimensions of 400 m long, 80 m wide and 12-15 m below natural surface remains within ML10324. The approximate footprint area of the pit void is 4.1 ha. Under the ML10324 landowner compensation agreement, the pit void was intended to be left as a stock water storage; with adjacent lands being shaped to direct water into the void, including any overflow from the upstream Dingo Dam, which sits immediately adjacent on the south-eastern side of the pit void; its northernmost corner located within the ML10324 boundary (refer Figure 7). Dingo Dam is a significant stock watering dam for the Spyglass Research Station and is to remain in place under the control and management of the landowner.

4.1.1 Void geotechnical assessment

Rehabilitation of the final void included reducing pit batter angles to a typical maximum of 20°. The Plan of Operations current at the time of undertaking this rehabilitation work indicated that topsoiling would occur, but that revegetation would rely on natural establishment with a review at

12 months to assess whether additional revegetation works would be required. ATC Williams (2019b) reported that sparse vegetation has established on the void batters, but that erosion rills were present.

A Mine Void Geotechnical Stability Study was undertaken by ATCW (2019b), and the report is provided in Appendix D. The void wall geotechnical stability assessment is based on associated drill logs, Geoscience Australia geological maps, site photographs and void wall slope angles from an available survey.

Available topographical maps indicate that ML10324 comprises gently undulating hillslopes and minor watercourses with natural elevations in the order of approximately RL 330 m to 360 m AHD. Local elevations around the residual void range from approximately RL 350 m in the southwest to RL 340 m AHD in the northeast. The void floor lies at approximately RL 335 m to RL 338 m AHD (refer to Figure 8). The void is approximately 400 m long by 80 m wide, and approximately 13 m deep, with batter angles indicated to be in the order of 20° based on available survey. The void exists on an unnamed southwest to northeast flowing tributary of the west-east oriented Snake Creek. Stockyard Creek is found to the northeast beyond the ML boundaries.

The assessment of available site photos indicated that the void becomes waterfilled periodically, dependent on weather conditions. Sparse vegetation has established on the batters in the period following construction; however, erosion rills on the batter slopes suggest that water is freely draining down the batters. The associated hydrological risks and an overtopping incident that occurred in February 2019 are discussed at Section 4.1.2.

From a stability perspective, the geotechnical study determined that there is a very low risk of geotechnical instability affecting the void, other than the existing erosion from water flowing into the void. It is understood that bunding of the void is to be undertaken, which will further minimise the erosion of the batter. Nonetheless, it would be prudent to encourage additional vegetation to establish on the batters as a control measure to minimise ongoing erosion. Should any slip failures occur in the relatively weak soils and upper portion of the weathered rock, it is likely that this would be a relatively low-angle failure with materials being contained within the void. The relatively shallow batter slope angles reduce the risk of toppling or wedge failures in any exposed rock.

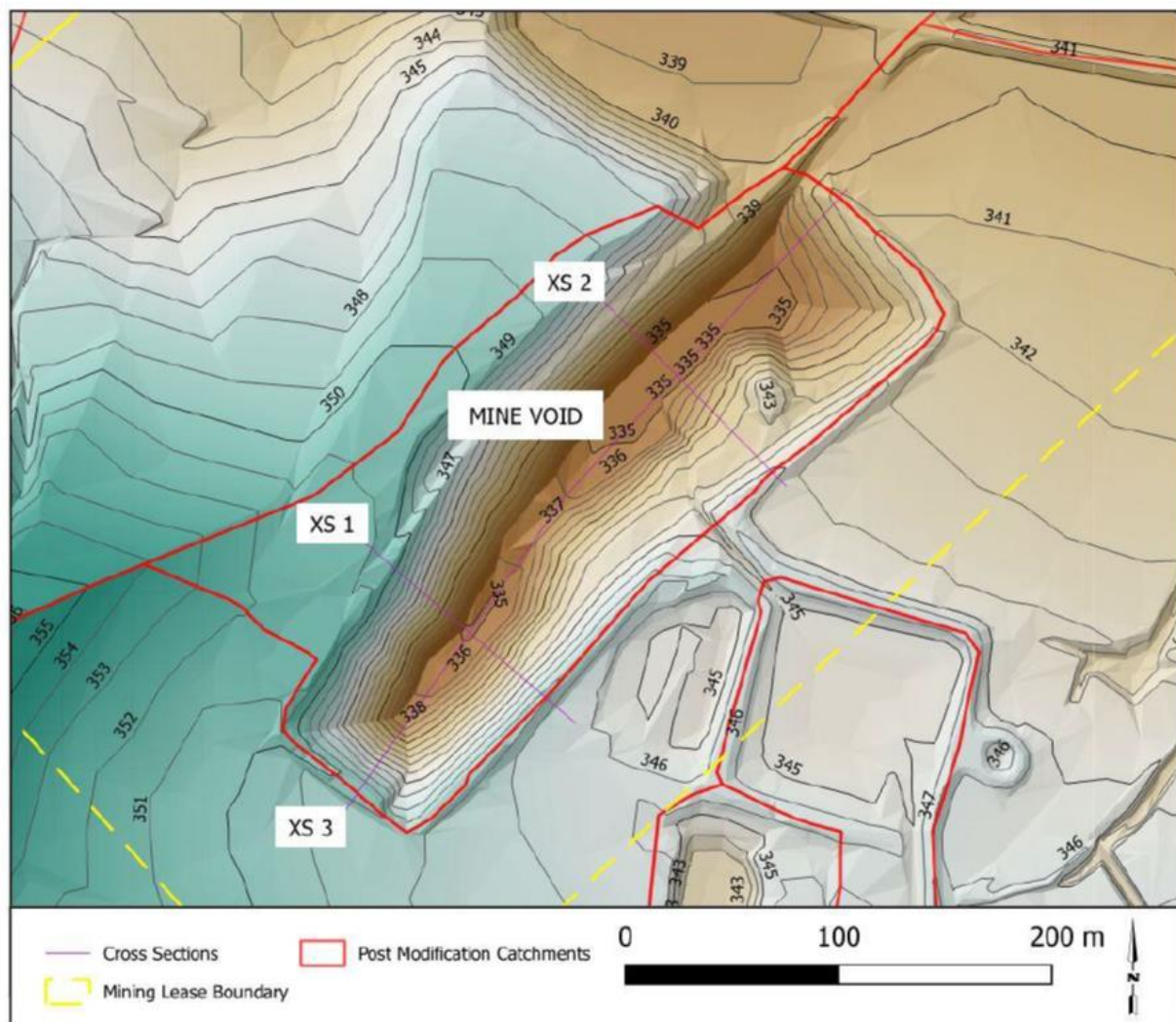


Figure 8: Dingo Dam Mine void configuration (Source: ATCW 2019b)

4.1.2 Void hydrology and water quality

A hydrological assessment of the site to determine the potential for surface water interaction with the residual void was undertaken by ATCW (2019c). Figure 9 demonstrates hydrological conditions in the residual void as photographed at various points in time. A water balance model was developed to calculate the spill risk of the residual void and a long-term equilibrium void water level. The modelled probabilistic accumulated spill volume in the void is illustrated in Figure 10.

The water balance modelling results show that the residual void has the potential to overflow during periods of high/extreme rainfall, with modelled overflows typically occurring in response to consecutive high rainfall events over a short period as can occur during the wet season, rather than in response to a single storm event (Figure 10). Analysis of the model from an initial dry condition shows that overtopping was modelled in two of the 127 years of climate data utilised, indicating the low probability of a spill from the void.

The water balance model results also indicate that the median modelled water storage volume generally trends consistently around 10 ML with no overall increase or decrease over the modelled rainfall sequence (refer Figure 11). Therefore, the annual spill risk would not be expected to increase over time.

September 2018 void conditions (looking SW)



September 2018 void conditions (looking NE)



Void conditions in December 2018 (looking SW)



Void condition in April 2019 (looking NE)



Figure 9: Photographs of site conditions at the void

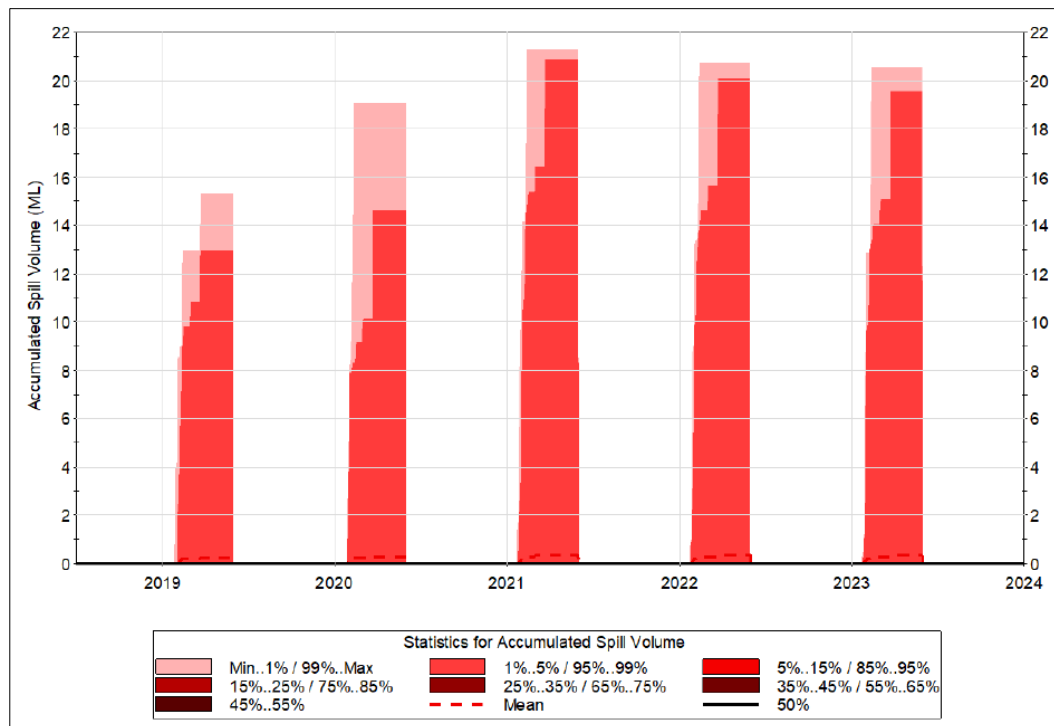


Figure 10: Modelled probabilistic accumulated spill volumes in the void

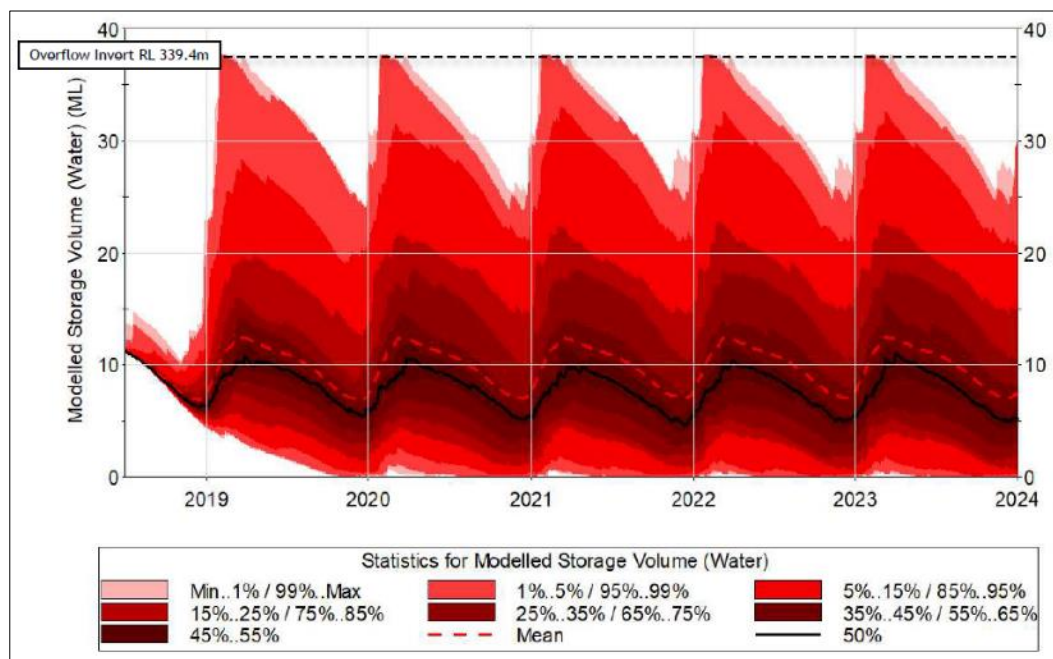


Figure 11: Modelled probabilistic water storage volume in the void

Void overtopping and release to the receiving environment (February 2019)

As the water balance model results indicated, a spill from the void is possible during a high rainfall wet season (refer Figure 10). Mine-affected water was released from the site to the receiving environment during a release event that occurred between 8 February and 2 March 2019. This release event coincided with a heavy and prolonged rainfall event that led to flooding in the Townsville region. The sequence of events relating to the release event were:

- At the time of the release from the sediment dam, a total of 30 mm rainfall had been recorded in the previous 24-hour period with a cumulative total monthly rainfall of 335.6 mm recorded at the nearest rainfall gauging station. Continuous rainfall was recorded on-site between January 26 and February 8, with a total of 384.3 mm of rainfall recorded during that period (Spyglass office rainfall gauge).
- The heavy rainfall led to overtopping from the Dingo Dam stock watering dam into the adjacent residual void. On February 7, the continued rainfall and surface run-off caused overtopping from the residual void to the diversion bunds with mine-affected water flowing into the ROM pad area and eventually the sediment dam.
- The clean water catchment upstream of the site was also captured by the diversion bunds and directed to the sediment dam.
- The sediment dam reached capacity and began releasing to the receiving environment on February 8.
- Receiving environment water samples were collected from the locations specified in the EA on February 7 and followed up on February 18 and February 19.
- The volume of water released to Snake Creek via overland flow from the site is unknown as no flowmeter is installed at the release point.
- Advice and notifications were provided to DES regarding the release conditions, the ongoing source of release and mitigation measures implemented to prevent future releases.

- On the morning of 15 February, the pipe between the two stock dams was blocked off, and pumping from Dingo Dam commenced in an effort to prevent any further overtopping into the void.
- The release from the sediment dam ceased on 2 March 2019 following 14 consecutive days of dry conditions. A moderate rainfall event (17 mm) that occurred on February 18 was likely a contributing factor to the prolonged release period.

Void water quality investigation

To assess the potential impact on void water quality as a result of leaching of any contaminants from the void surfaces, AARC (2019a) undertook geochemical analysis of eight surface material grab samples within the void. The samples were selected as being representative of the different void surface materials.

The surface soil grab samples were analysed to assess:

- pH, electrical conductivity (EC) and sulphur;
- acid neutralising capacity (ANC);
- acid forming potential; and
- water extractable elements.

Existing pH provides an indication of the likely pH condition of runoff from the pit walls. The results show that materials represented by the samples were neutral to alkaline at the time of testing.

The EC provides an indication of the inherent salinity of topsoil material that forms the walls of the pit void. The EC results indicate that the samples were non-saline.

The total sulphur content of all samples was very low ranging from < 0.01 to 0.03%. With the exception of one sample, all samples from the walls of the pit void recorded a total sulphur content below the limit of reporting (0.01%).

The ANC results indicated that the majority of samples have a low ANC, however the analysis of acid forming potential indicated that all samples are classified as non-acid forming (NAF) according to the acid rock drainage (ARD) classification. Results are illustrated in the plot of Net Acid Producing Potential (NAPP) versus Net Acid Generation (NAG) pH (Figure 12).

In order to evaluate any potential impacts to the receiving environment of water released from the pit void, the mean and median values of the metal concentrations extracted from the void samples were compared against:

- past void water quality data, and
- downstream receiving water quality as recorded during the void overtopping and release event that occurred in February 2019.

The comparison indicates that under low storage volume and no flow conditions, void water quality can exhibit elevated concentrations of dissolved aluminium, chromium, copper and nickel. However, under high flow conditions and significant dilution, as observed during the release event (February 2019), aluminium was the only metal recorded above EA trigger levels in both stored void water, and downstream receiving water.

These findings indicate that at full capacity, and with the exception of aluminium, the extractable metal concentrations in stored void water are likely to be sufficiently diluted below trigger levels in an overtopping scenario. The downstream receiving water quality results indicate further dilution of dissolved metals (including aluminium) is likely due to upstream inputs and the settlement of

suspended sediment in overland runoff. Although dissolved aluminium concentrations in the downstream receiving environment remained above the EA trigger level (0.055 mg/L), this exceedance was consistent with concentrations recorded in the upstream receiving environment at this time (AARC 2019a) and is considered a reflection of baseline conditions for the catchment.

It should be noted also that mean and median extractable metal/metalloid concentrations in void material fall below the ANZECC & ARMCANZ (2000) guideline values for Livestock Drinking Water and the EA contaminant release limits.

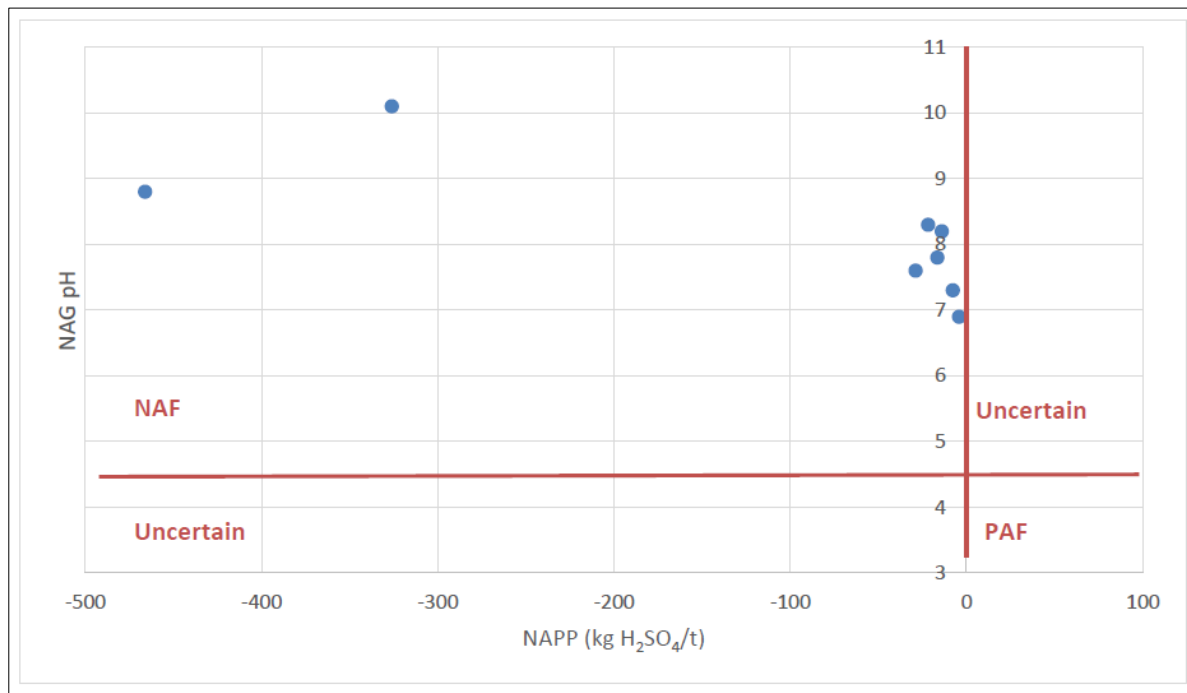


Figure 12 ARD classification plot of NAPP versus NAG pH—surface soil samples

4.1.3 Seepage and overland flow

A hydrogeological assessment was undertaken by Geosquare in June 2019 (Geosquare 2019). Their findings are that the void is located in an area of very low hydraulic permeability resulting in minimal transport potential of water and dissolved solids. Seepage potential to outflow points is minimal and would require an extensive time period for migration through the subsurface. The assessment identifies that core hole logging data and modelling suggests that the area surrounding ML10324 is heterogenous. An impermeable intrusive body is present upgradient from the site, while ML10324 is located in lateritic material with down-gradient geological formations consisting of intrusive bodies with highly weathered material intercalating these formations resulting in low to near-impermeable zones in the subsurface.

Current understanding of the topographical, geological and hydrogeological setting would indicate that flow or seepage between Snake Creek and the open pit void is extremely unlikely with overland flow the most likely pathway to connect these bodies.

4.2 Waste rock dump

A WRD having a footprint of approximately 2.8 ha is located immediately to the west of the pit void within ML 10324.

As part of the 2015 rehabilitation works, the WRD was re-profiled to reduce batter angles and create a stable free-draining surface, then topsoiled and seeded.

4.2.1 Waste rock geochemistry

Geology underlying the Lucky Break Project site comprises the Oweenee Granite and the Argentine Metamorphics, which include meta-siltstones, calc-silicate, gneiss, amphibolite and serpentinised ultrafamic rocks. The major rock units consist of the Precambrian Argentine Metamorphics, Carboniferous Oweenee granite, the Late Carboniferous – Early Permian intrusive rhyolites and breccias and tertiary sediment and duricrust cover. Tertiary sediments, laterite and Quaternary alluvium underly the majority of the Project area.

The Dingo Dam deposit consists of a laterised serpentinite body and occurs as a distinct low-lying feature with sub-surface units characterised by siliceous honeycomb textured rocks. The body contains scattered sub-crop and outcrops of silica-geothite laterite zones forming hard, resistant, smooth weathered areas. The Project site comprises a hard layer of soil or duricrust composed predominantly of silica, iron, calcium and gypsum. Weathering has removed the original duricrust that once connected the deposit with the surrounding laterite. Mineralisation is generally restricted to the top 30m of the weathered profile. Red-brown soils are well developed over areas of lateritic outcrop and sub-crop and are generally covered with colluvial scree.

Geochemical assessment of the Dingo Dam lateritic ore body was undertaken during the Project's exploration phase. Samples were collected from the waste rock zone (to a depth of 4 m) of the Dingo Dam deposit. The samples were sent to a NATA accredited laboratory for analysis to determine the acid producing potential of the waste rock material. Parameters tested include:

- NAG capacity at pH 4.5 and 7 (kg H₂SO₄/tonne);
- NAG pH (pH OX)—final pH of the sample after oxidation;
- per cent total sulphur;
- ANC (kg H₂SO₄/t);
- Net Acid Producing Potential (NAPP) (kg H₂SO₄/t); and
- fizz rating.

Results from the waste rock characterisation testing are presenting in Table 5.

Table 5 Waste rock characterisation results (MFL 2011)

Analyte	Units	Level of reporting	Sample 1	Sample 2
NAPP	kg H ₂ SO ₄ /t	0.5	-8.5	-6.8
NAG (pH (OX))	pH unit	0.1	7.4	8.9
NAG (pH 4.5)	kg H ₂ SO ₄ /t	0.	< 0.1	< 0.1
NAG (pH 7.0)	kg H ₂ SO ₄ /t	0.1	< 0.1	< 0.1
ANC as H ₂ SO ₄ equiv.	kg H ₂ SO ₄ /t	0.5	8.5	6.8
Fizz Rating	Fizz Unit	1	0	0
Sulphur (total as S)	%	0.01	< 0.01	< 0.01

As shown in Table 5, each sample recorded a low ANC with values ranging from 6.8 to 8.5 kg H₂SO₄/t.

The acid forming potential of the waste rock material was assessed using the acid base account method which evaluates the balance between acid generation processes (oxidation of sulphide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases and weathering of silicates) (Jones *et al.* 2016). The acid base account is based on the Maximum Potential Acidity (MPA) and the inherent ANC of the tested samples. Total sulphur has been used as a conservative estimate of pyritic sulphur (i.e. all sulphur is assumed to be present in the form of pyrite) to calculate MPA (MPA = weight% S x 30.6).

If the MPA is less than the ANC then the NAPP is negative, indicating that the sample may have sufficient ANC to prevent acid generation. If the MPA exceeds the ANC then the NAPP is positive, indicating that the material may be acid generating (Jones *et al.* 2016).

Figure 13 shows the results of the waste rock material samples and a NAPP = 0 line, which separates NAPP positive and negative domains and is equivalent to an ANC/MPA ratio of 1. This chart shows both samples lie in the NAPP negative domain.

Both samples have an ANC/MPA ratio greater than 3. The ANC/MPA ratio is used as an indication of the relative factor of safety within the NAPP negative domain. Usually a ratio of 2 or more signifies a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to ARD (Jones *et al.* 2016). An ANC/MPA ratio of 3 or higher indicates a high probability that the material will be NAF.

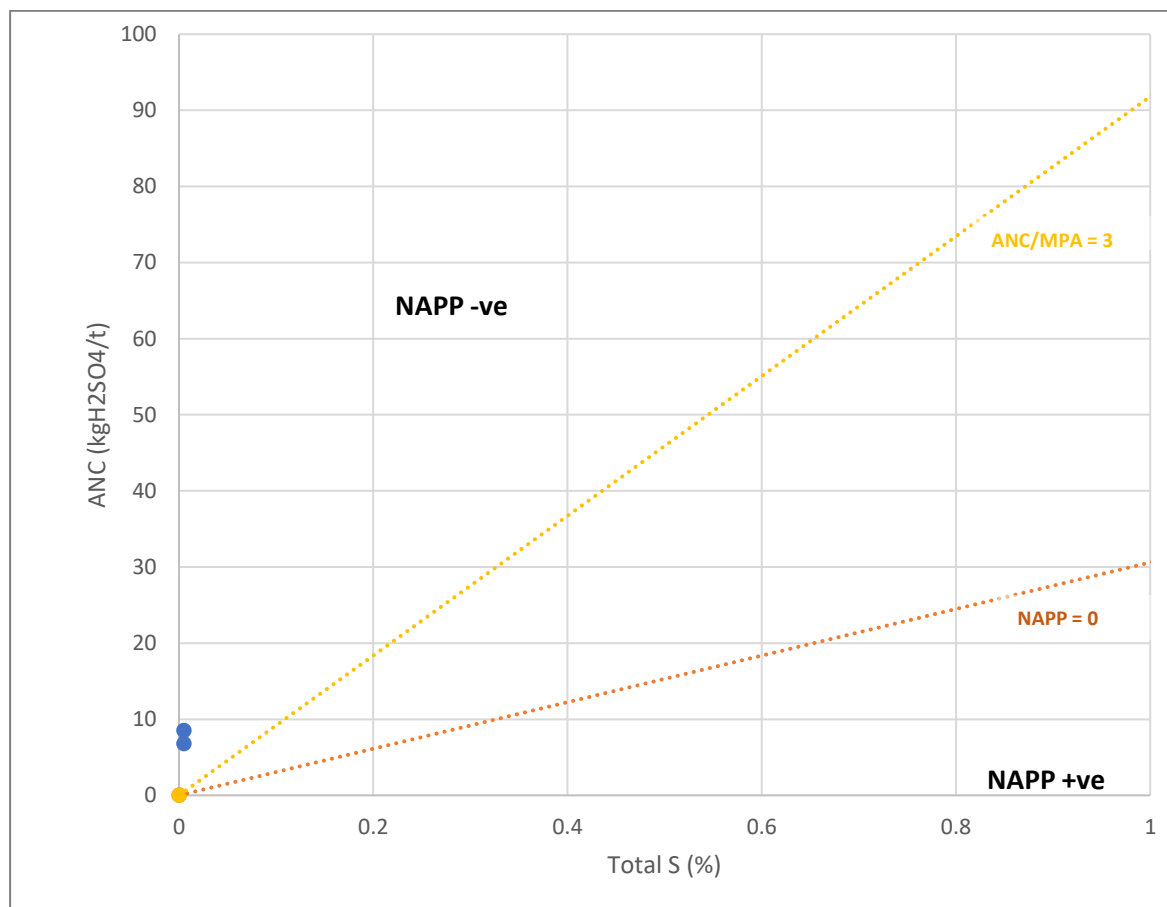


Figure 13 Acid base account plot of total S versus ANC—ore body samples

The NAG pH test is used in association with the NAPP to classify the acid generating potential of a sample. As the NAG pH test is completely independent of the NAPP approach, the combination of the NAPP and NAG pH provides greater certainty to the assessment of ARD potential (Jones *et al.* 2016).

The standard criteria used to classify the ARD potential of the void material samples are shown in Table 6.

Table 6 Standard geochemical classification criteria (source: Jones *et al.* 2016)

Primary geochemical material type	NAPP (kg H ₂ SO ₄ /t)	NAG pH
Potentially Acid Forming (PAF)	> 10	< 4.5
Potentially Acid Forming–Low Capacity (PAF–LC)	0 to 10	< 4.5
Non-Acid Forming (NAF)	Negative	≥ 4.5
Acid Consuming (AC)	< -100	≥ 4.5
Uncertain	Positive	≥ 4.5
	Negative	< 4.5

The primary geochemical classification types are described as follows:

Potentially Acid Forming (PAF)	Likely to result in acidification and ARD generation during exposure to atmospheric conditions.
Non-Acid Forming (NAF)	Generally contains ANC sufficient to neutralise any acid that might have been produced by sulphide oxidation.
Uncertain (UC)	Disparity occurs between the NAPP and NAG results. Under certain conditions a sample may have either a negative NAPP and a positive NAG, or a sample may have a positive NAPP and negative NAG. Further testing is required to determine the acid producing potential.

The ARD classification plot of NAPP versus NAG pH is shown in Figure 14. The plot demonstrates that both samples were classified as NAF with a negative NAPP and pH of > 4.5.

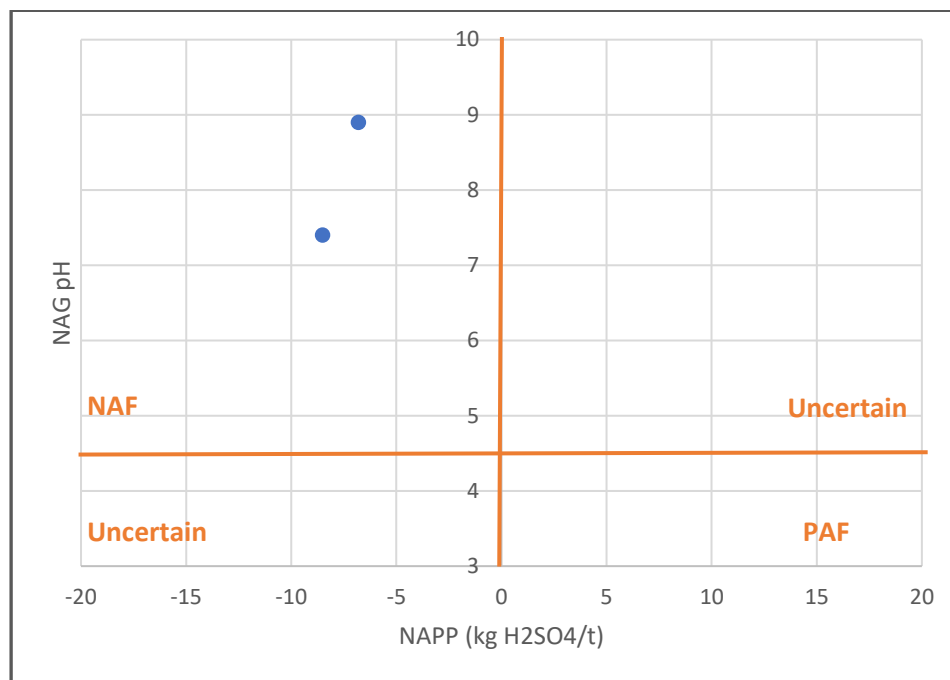


Figure 14 ARD classification plot of NAPP versus NAG pH—Ore body samples

The waste rock testing results from the Dingo Dam pit demonstrate that the material is NAF due to the negative NAPP. Total sulphur concentrations also fell below detection limits.

The geochemical assessment identified significant nickel enrichment. The main phyllosilicate minerals such as smectite, chlorite, talc and serpentine were identified as likely to host the nickel mineralisation with chlorite and smectite being preferred. The Global Acid Rock Drainage Guide (INAP 2018), focuses on drainage produced by sulphide mineral oxidation with potential sources for generation of ARD, NMD and saline drainage being reactive sulphide minerals and their oxidation products. A review of the resource mineralogy for the Lucky Break Project revealed a distinct absence of sulphur containing minerals and acid forming species (MFL 2011). The absence of any sulphur containing minerals confirms that the waste rock does not pose a threat from ARD from the WRD in the long-term.

Overall, the waste rock characterisation results demonstrate that the waste rock is a net acid consumer and does not produce saline runoff (MFL 2011).

4.2.2 Waste rock dump stability

At the completion of mining, the WRD was reshaped to reduce batter angles and create a stable landform prior to topsoiling and seeding. Site investigations conducted since September 2018 revealed that the WRD landform remains stable with an intact surface of rock-raked, gravelly topsoil and no presence of erosion. A minor erosion gully occurs down the side of the void / WRD access ramp. Four minor erosion gullies (approximately 40cm deep) and one moderate gully (approximately 80 cm deep) were also recorded on the eastern face of the WRD. A small number of pioneering Acacia shrubs were noted on the surface of the WRD along with a variety of grasses (*Heteropogon contortus*, *Aristida sp.* and *Chloris sp.*) and forbs (*Stylosanthes scabra*, *Sclerolaena sp.* and *Chenopodium sp.*).

Site investigations suggest that topsoil material was likely sourced from one of the topsoil stockpiles stripped from the Corea, Cape or Barkla soil units prior to the commencement of mining. The topsoil was applied across the current mine disturbance areas (pit void, WRD and ROM pad). The topsoil quality is largely representative of the red-brown soils overlying laterite bodies. Topsoil quality

characteristics recorded throughout the rehabilitation areas are described in Appendix B. Black chromite grains are present in the soils of the Project region and reflect the insoluble nature of chromite in the laterite environment. The presence of chromite is evident in the elevated chromium levels recorded in the WRD topsoil. Levels of cobalt and nickel are also elevated due to the naturally high levels present in Corea topsoils and subsoils as shown in the geological testing conducted at the time of exploration activities (AARC 2019c).

Given that the elevated metals in the WRD soils are naturally high in the surface and subsoils overlying lateritic outcrops, the WRD is considered to present a minimal risk of causing environmental harm to the receiving environment. Recent downstream water quality data indicates the WRD material poses a very low risk of causing harm to the receiving environment. Following the release of mine-affected water, water quality in the downstream receiving environment was consistent with upstream reference water quality. Runoff from the WRD and other mine disturbance areas was found to have no measurable impact on the downstream receiving water quality (refer also Section 4.1.2).

4.3 Sediment dam, ROM pad and office area

The sediment dam consists of a shallow depression formed from an approximately 1m high constructed diversion bund along its eastern boundary. At a site inspection carried out in December 2019, this area was dry and contained mature trees with scattered groundcover vegetation. Rehabilitation of the sediment dam shall include sediment removal, re-profiling of the sediment dam banks/bunds to create a free-draining landform and re-seeding. Sediment removed from the dam footprint shall be placed in the residual void.

The ROM pad was a levelled area immediately to the northeast of the WRD used for storing, crushing, screening and load-out of ROM product. Similarly, the office area was a levelled site to the north-east of the pit void used for and housing a secondary bunded fuel tank, storage containers, two demountable offices and an ablutions demountable, a shipping container dome shed used as a workshop and various other miscellaneous materials. Rehabilitation of both areas involved removal of all infrastructure and product material and ripping to aid rainfall infiltration. Soil samples tested from the footprint of the ROM pad were found to contain concentrations of chromium, cobalt and nickel that exceeded the upgradient reference site (REF 4) soil quality characteristics. Cobalt and nickel results also exceeded the mean values for all shallow (0-1 m) drill data, but well within the range of results obtained. It is considered that the data is representative of the naturally mineralised characteristics of soil in this area. Some remedial rehabilitation actions are proposed for these areas including remedial ripping, re-seeding and soil amelioration (where required) to facilitate vegetation establishment.

Various earthen bunds were constructed to control and contain stormwater runoff with some of these retained post-mining. ATC Williams were commissioned to review and assess the status of site stormwater management with a view to recommending modifications to the retained stormwater drainage system. The assessment nominated the following objectives to be achieved (ATC Williams 2019a):

- to protect the receiving environment from adverse water quality impacts as a result of overtopping of the void; and
- maintain appropriate management of peak storm water flow releases from the site (i.e. ensure that peak stored water flows from the site will not adversely affect the receiving environment).

ATC Williams (2019a) have proposed an amended stormwater drainage system that involves relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and, at certain locations levelling or grading works to create new preferable flow

paths. These works are proposed to be undertaken early within the period of the Post Closure Management Plan (PCMP, AARC 2020b).

4.4 Haul road

The Project's haul road remains in the eastern portions of ML10324 and ML10332. The haul road footprint traverses from the north-eastern corner of the WRD in an easterly direction across the ML boundary and towards the Gregory Developmental Road.

The haul road was retained at the completion of mining but will require ripping, grading and seeding to achieve final rehabilitation success. These works are proposed to be undertaken early within the period of the PCMP.

4.5 Existing water management infrastructure

Existing water management infrastructure at Lucky Break includes the sediment dam, the residual pit void and Dingo Dam.

The sediment dam consists of a partially bunded, shallow depression. The sediment dam is typically dry except during heavy or prolonged rainfall events. The sediment dam is to be rehabilitated to create a free-draining landform as described in Section 4.3. Potentially contaminated sediments are to be removed from the dam and placed in the residual void.

The residual pit void has been approved as a NUMA in the current Plan of Operations. Under the ML10324 landowner compensation agreement, the residual pit void was intended to be left as a stock water storage; with adjacent lands being shaped to direct water into the void, including any overflow from the upstream Dingo Dam, which sits immediately adjacent on the south-eastern side of the pit void. The pit void will have a final land use of NUMA, although over time, this area may prove to be a suitable stock water supply.

Dingo Dam is a significant stock watering dam for the Spyglass Research Station and is to remain in place under the control and management of the landowner.

A Consequence Category Assessment (CCA) was undertaken by ATCW (2019d) (Appendix D) on the site storage infrastructures. Storage volumes were calculated using the site survey data and are provided in Table 7 below, along with the post-mining use.

At the time of mine closure and rehabilitation, a portion of the bund between Dingo Dam and the residual pit void was constructed as a spillway at the landholder's request (i.e. Spyglass Research Station) (see Section 4.5.1, Figure 15). The spillway has since eroded to create a gully allowing the release of water from Dingo Dam into the void.

Table 7: Summary of storage volumes of site structures

Storage	Configuration	Spill invert (RL m)	Volume (ML)
Dingo Dam	Embankment	345.0	1.7
Residual void	Excavation	339.4	37.7
Sediment Dam	Embankment	337.3	10.3

Source: ATCW (2019d)

The summary of the CCA outcomes for the site structures are provided in Table 8. In accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (DES 2016), the adopted consequence category for the structure is the highest category determined for the assessed failure event scenarios. The risks of the overall consequence for all three storages are rated low, with both 'failure to contain overtopping' and 'dam break' risks being 'low' for all relevant storage structures.

Table 8: Consequence Category Assessment summary

Dam	Failure to contain seepage	Failure to contain overtopping	Dam break	Overall consequence	Regulated structure (as defined in the manual Y/N)
Residual void	NA	Low	NA	Low	N
Sediment Dam		Low	Low	Low	N
Dingo Dam		Low	Low	Low	N

Source: ATCW (2019d)

4.5.1 Stormwater management

As previously discussed in Section 2.4.1 and Section 4.1.2, the Project site has experienced issues regarding poor water quality and overtopping of the residual void. Currently, the total catchment area reporting to the residual void is 79.4 ha, and the area of the site reporting to the sediment dam is 165.5 ha. The current catchment boundaries are shown in Figure 15.

ATC Williams (2019a) has proposed an amended stormwater drainage system that involves relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and, at certain locations, levelling or grading works to create new preferable flow paths or restore natural flow paths where possible. These works are proposed to be undertaken early within the period of the PCMP and are anticipated to address all remaining stormwater drainage management issues identified at the site. The proposed stormwater management features are shown in Figure 16 and proposed flow conditions and catchment boundaries are shown in Figure 17.

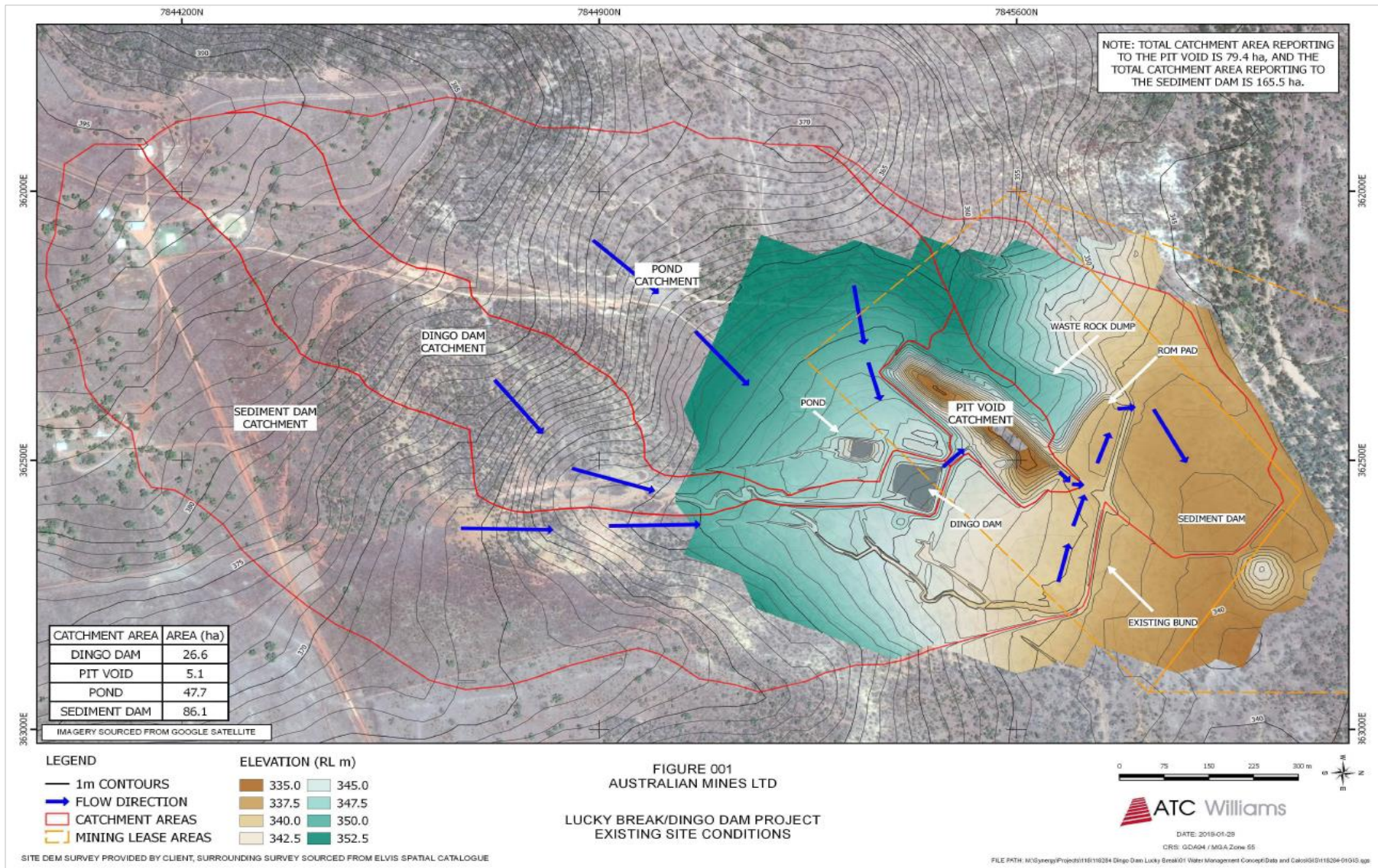


Figure 15: Existing catchment conditions at the Project (Source: ATCW 2019a)

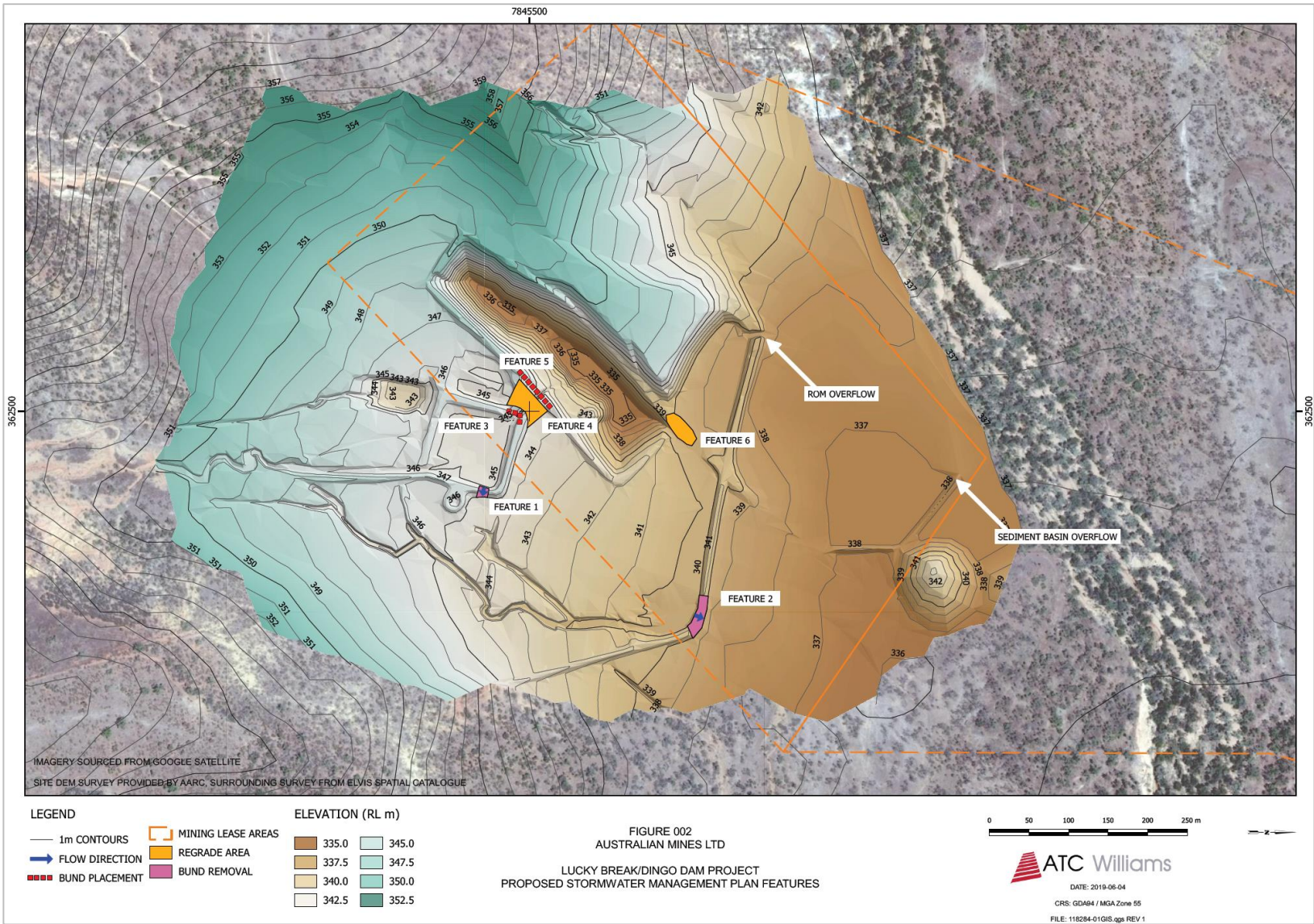
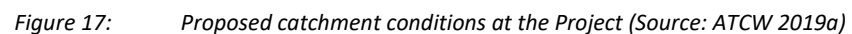


Figure 16: Proposed stormwater management features (Source: ATCW 2019a)



4.6 Rehabilitation methods applied

4.6.1 Topsoil management

The majority of the Project site (within both ML10324 and ML10332) is covered by two alluvial soil types known as the Barkla association (Soil Type 1) and the Cape association (Soil Type 2). Two other soil types cover the remaining small areas, which include the Conolly association (Soil Type 3) and the Corea association (Soil Type 4). The Conolly unit is restricted to the western edge of Dingo Dam ML (ML10324), and the Corea unit forms the lateritic clay outcrops of the protruding ore bodies on the Project site. As described in the SLSA (AARC 2006a), Soil Type 3 (the Conolly association) lacks soil structure, is low in nutrients and has other characteristics unfavourable for use in rehabilitation.

Topsoil on the Project site was of sufficient depth and quality to enable stripping to occur to a depth of 300 mm and once stripped, was stored in stockpiles no larger than 2 m high and 5 m wide, prior to use in the rehabilitation program.

Topsoil and material balance

The topsoil material balance presented in the SLSA was based on the proposal current at that time which involved stripping over large areas of both MLs. Since the final extent of Project disturbance was significantly less, the SLSA topsoil and material balance is irrelevant to the Lucky Break Project.

Table 9 records the locations and types of material currently available for use in rehabilitation.

Table 9: Rehabilitation material balance

Material type	Location of material/ rehabilitation domain	Volume of material required (m ³)	Volume of material available (m ³)
Soil Type: 1 - Barkla; 2 - Cape (Refer to Figure 2 for locations of the Mine Domains)	ROM	N/A	N/A
	Sediment Dam	2985	N/A
	Sediment Dam Bund	N/A	5068
	Haul road footprint	N/A	5320
	Sub-total	2985	10 388
Soil Type: 1 - Barkla; 2 – Cape (Refer to Stormwater Management Features described in section 4.5.1 and shown in Figure 16).	Feature 1	N/A	307
	Feature 2	N/A	1580
	Feature 3	1046	N/A
	Feature 4	1910	1524
	Feature 5	4436	N/A
	Feature 6	N/A	1714
	Sub-total	7392	5125
Total volume		10 377	15 513

4.6.3 Topsoil treatment and placement

Where possible, placement of topsoil at a thickness of approximately 0.2 m was applied across the rehabilitated area, to create a growth medium of sufficient depth to hold water and support revegetation. Ripping of the surface occurred prior to spreading topsoil to allow the subsurface and topsoil materials to blend and to minimise the potential for a hardpan layer to form under the topsoil. Grass and woody vegetation remaining after land clearing was incorporated into the rehabilitation at strategic locations to help limit run-off/erosion (by slowing down overland flow), retain active biological activity and provide habitat for returning fauna.

A phosphorous based fertiliser was applied to topsoils after respreading to assist in the establishment of self-sustaining plant communities. This was necessary due to the low phosphorous levels in all soils present at the Project area.

Prior to the placement of topsoil, constructed landforms such as the ROM pad were contoured to resemble the original local topography as far as practicable.

Landforms were deep ripped where required to alleviate compaction prior to seeding.

4.6.4 Rehabilitation progress assessment

A field-based assessment of rehabilitation progress was undertaken in September 2018 to provide a broad assessment of final landform stability and the success of past rehabilitation activities. The assessment involved surface water, stream sediment, topsoil quality sampling and analysis and a visual assessment of vegetation establishment and erosion to determine environmental values on the Project site and surrounding receiving environments.

For the most part, final landforms were found to be stable with minor and moderate areas of erosion occurring infrequently on the slopes of the WRD and residual void. Rehabilitation success in terms of vegetation cover was limited across the Project site with the western portion of the WRD supporting the most prominent area of established groundcover vegetation. Groundcover species identified in rehabilitation areas include *Heteropogon contortus*, *Aristida spp.*, *Chloris gayana*, *Stylosanthes scabra* and *Sclerolaena spp.* A small number of pioneering *Acacia* shrubs were scattered across the rehabilitation areas.

Soils were sampled from representative sites within each rehabilitation domain and samples were analysed to identify soil characteristics in rehabilitation areas. Soil quality results from rehabilitation areas were compared to results obtained from representative reference sites as well as guideline values identified from various 'best practice' sources.

Where possible, stream sediment and surface water sampling was undertaken in Dingo Dam, the void, sediment dam spillway (Sed Dam 1) and upstream and downstream sites in the receiving environment of Snake Creek (LBUS1 and LBDS2) (Figure 6). The sediment dam and upstream sampling site on Snake Creek (LBUS1) were dry at the time of sampling and could not be sampled for surface water.

The findings of the rehabilitation soils assessment as well as the surface water and stream sediment analysis are provided in Appendix B and Appendix C respectively.

5 Rehabilitation objectives and methods

5.1 Rehabilitation targets and objectives

Rehabilitation goals, objectives, indicators and completion criteria for the Project are set out in accordance with the Guideline: Rehabilitation Requirements for Mining Resource Activities (DES 2014).

The general rehabilitation goals for the Project are to achieve long-term safe, stable and sustainable land uses, with the following objectives:

- The rehabilitated site is safe for humans and animals now and in the foreseeable future.
- Establish specified self-sustaining natural vegetation or habitat.
- Establish land use with comparable management requirements to similarly used non-mined land.

These goals are applicable to the ancillary infrastructure areas. For structures such as the WRD, ROM pad, dams and the residual void, it is also critical to ensure that the rehabilitated areas are non-polluting, that is:

- Any hazardous material is appropriately managed.
- Any contaminated water is contained on-site.

Rehabilitation activities still required to meet the rehabilitation objectives include:

- minor earthworks to repair erosion on the slopes of the WRD and access ramps;
- ripping and seeding to all areas of existing disturbance where vegetation establishment has not been successful;
- soil amelioration in conjunction with ripping and seeding in the WRD and ROM pad areas; and
- rehabilitation maintenance of rehabilitation areas including minor re-seeding, erosion repairs and weed management.

Based on the rehabilitation works previously undertaken, other remaining rehabilitation efforts would include additional seeding and fertiliser applications.

Rehabilitation methods to be implemented are outlined in the subsections below.

5.2 Revegetation methods

Where rehabilitation monitoring undertaken in accordance with the RMP identifies a need for maintenance revegetation, the following method will be adopted:

- Fertiliser will be spread at an appropriate rate (where required) governed by the nutrient status of the surface material, volume of available topsoil on-site, and requirements of vegetation selected.
- Selected native tree, shrub and pasture grass species will be sown (seeds and/or tube stock).

Species selection

Where practicable, plant species known to succeed for grazing purposes in the local area will be used for rehabilitation. Revegetation of disturbed areas will occur by direct seed application using either manual or mechanical techniques. Species have been chosen based on the underlying vegetation communities mapped across the Project area pre-mining (AARC 2006b), or through the selected post-mine land use for each domain. The species selected for use in each mine domain are outlined in Table 10.

Table 10: Species selected for the rehabilitation use

Mine domain/s	Chosen veg community	Vegetation layer	Common name	Scientific name
WRD Office area Diversion bunds Stormwater management features ROM pad	Community 2 (RE 9.3.22) / Community 3 (RE 9.5.3 / 9.5.11)	Canopy layer	Narrow Leaved Ironbark	<i>Eucalyptus crebra</i>
			Clarkson's Bloodwood	<i>Corymbia clarksoniana</i>
			Gum-topped Bloodwood	<i>Corymbia erythrophloia</i>
			Morton Bay Ash	<i>Corymbia tessellaris</i>
		Understorey	Whitewood	<i>Atalaya hemiglauca</i>
			Conkerberry	<i>Carissa lanceolata</i>
			Beefwood	<i>Grevillia striata</i>
			Bull Oak	<i>Hakea chordophylla</i>
		Shrub layer	Sensitive Plant	<i>Neptunia dimorphantha</i>
			Spiked Sida	<i>Sida subspicata</i>
		Ground layer	Black Spear Grass	<i>Heteropogon contortus</i>
			Dark Wiregrass	<i>Aristida calycina</i> var. <i>calycina</i>
			Red Natal	<i>Rhynchelytrum repens</i>

5.2.2 Propagation

Direct seeding

Direct seeding should be used in areas where consistent dispersal over a relatively large area is required. Seeds utilised for this process should be available in large quantities, suited to direct seeding, and have undergone all necessary pre-treatments prior to dispersal. If the seed is robust, agricultural machinery may be used for this purpose, dictated by the size of the area and ease of access (Chambers *et al.* 2002).

Tube stock revegetation

The use of tube stock is more appropriate for plants that have limited seed availability, or where specific seasonal conditions are required for reliable germination. Established seedlings are wetted,

then hand planted into the soil. Hand tools such as a Potti Putki or Hamilton Planter should be used to increase planting efficiency and reduce bending.

Tube stock can be prepared either by direct planting of seeds into a tube or germinated on a seed tray and transferred to a tube afterward. Species with lower germination rates, or rarer seed types, are generally tray seeded first.

5.3 Maintenance

5.3.1 Watering

Depending on seasonal conditions, watering of seeded/planted areas shall be carried out over a 12-week period immediately following revegetation to ensure the successful establishment of vegetation. Watering may be avoided during this period if sufficient rainfall is experienced in the target area. This can be ensured by installing a rain gauge, and planning rehabilitation such that the establishment period falls within the wet season (ideally towards the end of the wet season, typically the beginning of February).

Watering should continue at a reasonable rate to maintain suitable soil moisture content, which will ultimately depend on seasonal conditions. In addition to this, watering should be avoided during the hotter parts of the day, to ensure evaporation is minimised. Any tube stock utilised in rehabilitation should be irrigated to maximum water holding capacity prior to planting.

Depending on access, irrigation may be completed by water trucks, tray-based hose pumps or in-built irrigation systems.

5.3.2 Weed control

Following revegetation, rehabilitated areas should be checked for weed proliferation. Maximum allowable targets are outlined in Table 12 (section 6) and indicate that rehabilitated sites should have equal or greater than 60% of comparable species to the analogue site, with weeds not exceeding 10% of analogue site cover.

Weed control incorporates:

- preventing the introduction of exotic/invasive weeds (through the use of seed-free topsoil and appropriate washdown procedures);
- minimising the spread of existing weeds (removing weeds prior to seed formation, ensuring known weed infestations are avoided on foot and in vehicles); and
- controlling weed infestations using either mechanical or herbicidal treatments (targeted chain-sawing, mulching, soil solarisation, weed pulling, or use of handheld weed sprayers).

The first few years following planting are the most important for controlling the spread of invasive species. As pioneer species, weeds tend to out-compete native species on disturbed soils before desirable species have had time to set roots and adequately cover a rehabilitated area. During the first three growing seasons, botanical surveys and hand removal of weeds or targeted herbicide applications should be pursued vigorously.

Rehabilitated areas will be checked for weed proliferation during qualitative monitoring periods (see Appendix A). Maximum allowable weed cover targets set in Table 12 (section 6) should be treated as a key performance indicator for revegetated areas, with areas not meeting the set criteria managed appropriately. Weed control should also be conducted for sites that are meeting performance

indicators for weed coverage if the relative cover of non-native/native species is increasing between surveys.

5.3.3 Reparation

Should rehabilitated areas exhibit loss of vegetation, erosion or weed infestations, reparation will be required to ensure the success of the area. Depending on the specific issue, reparation may include:

- replanting failed/unsatisfactory areas;
- repairing eroded areas;
- pest and weed control;
- fertiliser applications;
- watering plants in drier areas, especially during the establishment phase; and
- applying lime or gypsum to control pH and improve soil structure.

Visual inspection of revegetated areas should be undertaken regularly to determine maintenance requirements. In addition to this, Table 12 (section 6) outlines the completion criteria for vegetation establishment throughout the various domains of the Project.

6 Completion criteria

Completion criteria provide a clear definition of successful rehabilitation for each mine domain or rehabilitation area in the form of a set of measurable benchmarks. These benchmarks can be compared to the rehabilitation indicators to determine whether rehabilitation objectives are being met (DES 2014). Through the RMP (Appendix A), evidence of the success of the completion criteria will be provided. The domains within the Project area are deemed to be successfully rehabilitated when completion criteria for each rehabilitation goal and objective have been met over a long-term period, determined appropriate to the level of environmental risk presented by the final landform.

The general completion criteria for the Project's mine domains are provided in Table 11.

In addition, revegetation completion criteria have been developed to measure the progress of vegetation growth towards successful completion. This means that once rehabilitated sites have met the revegetation criteria over a period of time (typically three years), it is reasonable to assume that these sites are capable of self-sustaining natural vegetation or habitat.

Table 11: Mine domains with corresponding rehabilitation indicators and completion criteria

Project area	Indicators	Completion criteria
Infrastructure		
Office area ML10324	Safety assessment of final landform by suitably qualified person	Certification that structurally sound and safe for post mine land use
Diversion bunds ML10324	Contamination assessment of final landforms by suitably qualified person	Evidence of low risk of land contamination in a contaminated land assessment report
Haul road ML10324	Engineers assessment of design and construction of structures to control water flow	Engineers certification that infrastructure sites (both remaining and decommissioned) have the required structures to control water flow and run-off
	Residual risk assessment of final landforms Vegetation cover assessment including percentage of cover	Appropriate risk assessment and control measures have been undertaken Vegetation cover to meet the completion criteria set in Table 12
Run of Mine (ROM)		
ROM pad ML10324	Safety assessment of final landform by suitably qualified person Contamination assessment of final landform by suitably qualified person Engineers assessment of design and construction of structures to control water flow Geotechnical assessment of final landforms Residual risk assessment of final landforms Vegetation cover assessment including percentage of cover	Certification that structurally sound and safe for post mine land use Evidence of low risk of land contamination in a contaminated land assessment report Engineering studies that the Project site (both remaining and decommissioned areas) has the required structures to adequately control water flow and runoff Geotechnical studies indicating that the final landform is of a stable design Appropriate risk assessment and control measures undertaken Vegetation cover to meet the completion criteria set in Table 12

Project area	Indicators	Completion criteria
Waste		
WRD ML10324	Safety assessment of final landform by suitably qualified person RMP in place to monitor environmental values and rehabilitation progress towards final land use Water quality established by monitoring of receiving environment (i.e. downstream surface water) Contamination assessment of final landform by suitably qualified person Geotechnical assessment of final landforms Residual risk assessment of final landforms Vegetation cover assessment including percentage of cover	Certification that structurally sound and safe for post mine land use Post closure monitoring shows the final landform is compliant with established and applicable limits Certification that the WRD has an adequate landform design and construction and is not releasing hazardous or contaminated material to the receiving environment Monitoring data demonstrates the landform is benign and functioning with no release of hazardous or contaminated material to the receiving environment Geotechnical assessment to determine landform stability Appropriate risk assessment and control measures undertaken Vegetation cover to meet the completion criteria set in Table 12.
Voids		
Dingo Dam Pit ML10324	Safety barriers and signage to preclude humans and animals (e.g. safety bunds and fencing, signage at entrance and access roads blocked off) Safety assessment of final landform by suitably qualified person (i.e. geotechnical assessment with photographic evidence) Geotechnical assessment of risk on final voids with photographic evidence Contamination assessment of final landform by suitably qualified person Monitoring (void water quality, surface water and stream sediment) to meet the site-specific WQO and limits Residual risk assessment of final landforms	All safety precautions undertaken in accordance with the relevant legislation—signs comply with AS1319:1994—Safety Signs for the Occupational Environment Geotechnical assessment to determine risk of wall failure/suitable extent of safety bund wall Evidence of low risk of land contamination in a contaminated land assessment report Assessment and certification of analytical results (through the RMP) within applicable guideline values (water, sediment and soils) Residual risk assessment and control measures undertaken
Water Management		
Sediment Dam ML10324	Hydrological studies to establish water levels and connectivity Contamination assessment of final landform by suitably qualified person Receiving water quality established by monitoring or modelling validated by monitoring RMP in place to monitor environmental values and rehabilitation progress towards final land use	Confirmation that the area is free-draining Evidence of low risk of land contamination in a contaminated land assessment report Assessment and certification of analytical results (through the RMP) within applicable guideline values (water, sediment and soils)

Project area	Indicators	Completion criteria
Stormwater management structures ML10324	Safety assessment of final landform by suitably qualified person Contaminated land assessment Engineers assessment of design and construction of structures to control water flow Residual risk assessment of final landforms Vegetation cover assessment including percentage of cover	Certification that structurally sound and safe for post mine land use Evidence of low risk of land contamination in a contaminated land assessment report Engineering studies that the Project site (both remaining and decommissioned areas) has the required structures to adequately control water flow and runoff Appropriate risk assessment and control measures have been undertaken Vegetation cover to meet the completion criteria set in Table 12
Exploration		
Exploration areas ML10322	Safety assessment of final landform by suitably qualified person. RMP in place to monitor environmental values and rehabilitation progress towards final land use Water quality established by monitoring of receiving environment (i.e. downstream surface water) Residual risk assessment of final landforms Vegetation cover assessment including percentage of cover	Certification structurally safe for post mine land use Post closure monitoring shows the final landform is compliant with established and applicable limits Monitoring data demonstrates the landform is benign and functioning with no release of hazardous or contaminated material to the receiving environment Appropriate risk assessment and control measures have been undertaken Vegetation cover to meet the completion criteria set in Table 12

Proposed general revegetation completion criterion are presented in Table 12 and will be used to compare the success of rehabilitation sites against analogue monitoring sites as described in the RMP provided in Appendix A.

Table 12: *Revegetation completion criteria*

Criteria	Revegetation completion criteria
Vegetation density/percentage of ground cover	Equal or greater than 60% of comparable species to the analogue site
Abundance of weeds	Weeds not to exceed 10% more than percentage cover of analogue site

Landform completion criteria for disturbed and constructed landforms to meet post-mine land use and prior to relinquishment are described in Table 13.

Table 13: Landform rehabilitation success criteria

Criteria	Rehabilitation success criteria
Landforms	Non-polluting, safe and stable with no rill erosion deeper than 30 cm
Landform design	WRD batter slopes are < 36 degrees to the angle of repose Residual void – assessed as safe and/or bunds provided where required to limit access
Land capability	WRD—Land Class VIII—not suitable for agricultural purposes Residual void—Land Class VIII— not suitable for agricultural purposes Mine Infrastructure Areas—Land Class VI —low-intensity grazing

7 References

AARC (2006a), *Lucky Break Nickel Project - Soil and Land Suitability Assessment Report*, AustralAsian Resource Consultants Pty Ltd, Brisbane.

AARC (2006b), *Lucky Break Nickel Project - Terrestrial Flora and Fauna Assessment*, AustralAsian Resource Consultants Pty Ltd, Brisbane.

AARC (2018), *Lucky Break Nickel Project - Plan of Operations (2018–2023)*, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC (2019), *Receiving Environment Monitoring Program (REMP) 2019 Progress Report*, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC (2020a), *Lucky Break Project – Rehabilitation Monitoring Program*, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC (2020b), *Lucky Break Project – Post Closure Management Plan*, AARC Environmental Solutions Pty Ltd, Brisbane.

ATC Williams (2019a), *Lucky Break Project - Dingo Dam Stormwater Management Plan*, ATC Williams Pty Ltd, Brisbane.

ATC Williams (2019b), *Lucky Break Project - Dingo Dam Mining Void; Pit Wall Desktop Stability Study*, ATC Williams Pty Ltd, Brisbane.

ATC Williams (2019c), *Hydrological Assessment of the Dingo Dam Residual Mine Void*, ATC Williams Pty Ltd, Brisbane.

ATC Williams (2019d), *Lucky Break Project - Dingo Dam Consequence Category Assessment*, ATC Williams Pty Ltd, Brisbane.

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

Chambers, B., Jones, C., and Ward, L. (2002), *Native Vegetation Guide for the Riverina*. Charles Sturt University, Australia (<http://www.csu.edu.au/faculty/science/herbarium/riverina/index.htm>)

Department of Environment and Heritage Protection (DEHP) (2001), *Code of environmental compliance for Exploration and Mineral Development Projects*, Queensland Government.

Department of Environment and Science (DES) (2014), *Guideline: Rehabilitation Requirements for Mining Resource Activities*, Queensland Government.

Department of Environment and Science (DES) (2016), *Manual: Manual for assessing consequence categories and hydraulic performance of structures* (ESR/2016/1933) (Formerly E365). Queensland Government.

GeoSquare (2019), *Dingo Dam - Hydrogeological Assessment*, prepared for Australian Mines Limited, GeoSquare Consulting Pty Ltd

Greig-Smith, P., (1964), *Quantitative Plant Ecology*, Butterworths, London.

MFL (2011), *Lucky Break Operation Plan of Operations: Appendix C—Waste Rock Management Plan*, Metals Finance Limited.

NQ Dry Tropics (2016), *Burdekin Dry Tropics Natural Resource Management Plan 2016–2026*, NQ Dry Tropics, Townsville, (<http://nrm.nqdrytropics.com.au/downloadpdf/>).

Ralph, M., (2003), *Growing Australian Native Plants from Seed* (2nd Edition), Bushland Horticulture, Bullarto.

Appendix A **Rehabilitation Monitoring Program**



REHABILITATION MONITORING PROGRAM

LUCKY BREAK PROJECT
REHABILITATION MONITORING PROGRAM

PREPARED FOR
SCONI MINING OPERATIONS PTY LTD

APRIL 2020



BRISBANE OFFICE
Suite 5, 1 Swann Road
Taringa, QLD 4068
P +61 7 3217 8772

CAIRNS OFFICE
PO Box 4887
Cairns, QLD 4879
P +61 7 4057 9402

E info@aacrc.net.au
AARC.NET.AU
—
ACN. 077 456 074
ABN. 96 077 456 074

Document Control

Author(s):	Natasha Jensen/Hollie Dick
Project Manager:	Stuart Ritchie
Name of Client:	Sconi Mining Operations
Name of Project:	Lucky Break Mine
Title of Document:	Rehabilitation Monitoring Program
Document Version:	Final

Version	Comments	Author	Reviewer	Date
Draft issued for client review		CC	SR	15 April 2020
Final		CC	SR	30 April 2020

This document is the property of AARC Environmental Solutions Pty Ltd ('AARC') and all rights are reserved in respect of it. This document has been prepared for the exclusive of AARC's client and may not be reproduced or disclosed in any manner whatsoever, in whole or in part, without the prior written consent of AARC. AARC expressly disclaims, to the maximum extent permitted by law, all responsibility for or liability arising from the use of this document by any third party. This document has been prepared subject to the instructions and scope of work agreed to with AARC's client. Any opinions or judgements expressed herein are based on our understanding and interpretation of current regulatory standards relevant to the specific needs of the client and should not be construed as legal opinions or legal advice. Information provided by the client while instructing AARC has been assumed to be correct and complete, and, where this report relies on field information, the condition of the assessed area as at the time of conducting any field assessment. AARC assumes no liability or responsibility for any inaccuracies or omissions outside of AARC's direct control. AARC makes no statement, representation or warranty about the accuracy or completeness of information relating to items not visible, accessible, or able to be inspected at the sites at the time of the site visits.

Table of Contents

1	Introduction	1
1.1	Purpose.....	1
1.2	Scope	1
1.3	Background.....	1
1.4	Current rehabilitation monitoring activities.....	4
2	Rehabilitation requirements.....	5
2.1	Environmental authority requirements.....	5
2.2	Final land use and rehabilitation	7
2.3	Rehabilitation goals, objectives, indicators and criteria.....	8
3	Monitoring program design and methodology	16
3.1	Monitoring program design.....	16
3.2	ML10324 (Dingo Dam) rehabilitation monitoring program	16
3.2.1	Sampling locations	16
3.2.2	Vegetation monitoring	23
3.2.3	Erosion monitoring.....	24
3.2.4	Soil monitoring	25
3.2.5	Photographic monitoring	26
3.2.6	Fauna observations	27
3.2.7	Surface water quality	27
3.2.8	Stream sediment monitoring	29
3.3	ML10332 (Lucky Break) rehabilitation monitoring.....	30
3.3.1	Sampling sites.....	30
3.3.2	Survey methodology	30
4	Data analysis, interpretation and reporting	32
4.1	Laboratory analysis	32
4.2	Progress reporting	32
4.2.1	Interpretation.....	32
4.2.2	Statistical analysis.....	32
5	References	33
6	Glossary of terms	34
A1	Appendix 1: Field data sheets	38

List of Figures

Figure 1:	Project features	3
Figure 2:	Historical monitoring locations	20
Figure 3:	Proposed terrestrial monitoring locations	21
Figure 4:	Surface water and stream sediment monitoring sites	22
Figure 5:	Guide to monitoring canopy cover (after Eyre et al. 2017)	24
Figure 6:	Proposed terrestrial monitoring locations	31
Figure 7:	Types of erosional landform patterns by slope and relief class (Source: after Neldner 2019)	44
Figure 8:	Guide to estimating ground cover percentage.....	45

List of Tables

Table 1:	Rehabilitation features and activities	2
Table 2:	Rehabilitation approach and final land use	9
Table 3:	Applicable goals, objectives and completion criteria	10
Table 4:	Revegetation completion criteria	15
Table 5:	Landform rehabilitation success criteria	15
Table 6:	Proposed rehabilitation monitoring sites	17
Table 7:	Proposed rehabilitation monitoring sites	18
Table 8:	Surface water and stream sediment sampling locations.....	19
Table 9:	Erosion classifications.....	25
Table 10:	On-site water storages assessment criteria	28
Table 11:	Receiving waters assessment criteria	28

List of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
AUZ	Australian Mines Limited
DES	Department of Environment and Science
DSITI	Department of Science, Information Technology and Innovation
EA	Environmental Authority
EC	Electrical Conductivity
GPS	Global Positioning System
ML	Mining Lease(s)
QNPL	Queensland Nickel Pty Ltd
PCMP	Post Closure Management Plan
PMLUP	Post Mine Land Use Plan
PoO	Plan of Operations
RE	Regional Ecosystem
RMP	Rehabilitation Monitoring Program
ROM	Run of Mine
SCONI	Sconi Mining Operations Pty Ltd
WRD	Waste Rock Dump

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Australian Mines Limited (AUZ) on behalf of Sconi Mining Operations Pty Ltd (Sconi) to develop a Rehabilitation Monitoring Program (RMP) to guide the monitoring of rehabilitation performance for the Lucky Break Project (the Project). This RMP is applicable to rehabilitation activities associated with Mining Leases (ML) ML10324 and ML10332 in accordance with the Project's Environmental Authority (EA) (EPML00900713).

1.1 Purpose

The purpose of the RMP is to guide assessment of the condition of rehabilitated areas through the collection and comparison of quantitative data from rehabilitated and reference sites. Comparison of data from rehabilitated sites against reference sites and post land-use criteria is used to assess the performance of rehabilitation works.

The program has been designed to meet the rehabilitation goals, objectives, indicators and criteria defined in condition C4 and Table C1–Rehabilitation Requirements of the Project's EA and in the Post Mine Land Use Plan (PMLUP) for the Project (AARC 2020a).

1.2 Scope

This RMP incorporates the following components to ensure sufficient data is collected to assess the progress of the Project's rehabilitation works over time against the identified completion criteria:

- a rehabilitation monitoring design that determines the progress of existing project rehabilitation through quantitative assessments;
- identification of existing reference and rehabilitation monitoring locations and, for all monitoring locations, ensure that adequate spatial and temporal coverage is established to address the RMP objectives;
- a specified frequency for monitoring events and an overall duration for the rehabilitation monitoring program;
- the definition of sampling methods that are repeatable and comparable over time and between different observers;
- analysis techniques suited to the field monitoring data being collected; and
- reporting on the progress of rehabilitation against the identified rehabilitation objectives and completion criteria for the Project.

1.3 Background

The Project is located at the Spyglass Beef Research Station (Lot 1 on OC57), which is now owned and operated by the Queensland Department of Agriculture and Fisheries, approximately 100 km north of Charters Towers and 140 km west of Townsville in North Queensland. The Project incorporates two MLs identified as ML10324 and ML10332 and known as Dingo Dam and Lucky Break respectively, and which combined total approximately 103 ha in area.

Between March 2015 and July 2015 Queensland Nickel Pty Ltd (QNPL) mined approximately 114,000 tonnes (ore product tonnes) of nickel ore from the Dingo Dam deposit (ML10324) under EA

EPML009007131 held by Nornico Pty Ltd. The mining campaign specifically targeted nickel ore within the deposit that was suitable for processing at the QNPL Refinery near Townsville.

At the completion of mining activities, QNPL commenced rehabilitation of the site including removal of infrastructure, re-profiling of the waste dump, reducing batter angles of the residual void, installing stormwater controls, ripping hardstand areas, spreading topsoil, seeding and installing fences. The Project has been in care and maintenance mode since the cessation of mining activities in 2015.

No mining activities or related disturbance, with the exception of exploration drilling have been undertaken within ML10332 with all holes having been capped and surface disturbance rehabilitated

Several rehabilitation areas can be defined on ML10324, as described in the following sections. Table 1 depicts the location and extent of remaining features.

Table 1: Rehabilitation features and activities

Mine domain/disturbance area	Rehabilitation activities	Existing rehabilitation area (ha)	Proposed rehabilitation area (ha)
Infrastructure areas (ML1324)			
Office area	Infrastructure removed, footprint ripped	0.81	0.81
Diversion bunds	Retained in agreement with the landholder as a component of site water management to direct overland flow to the pit void	0.75	0.75
Haul road	Yet to be ripped, graded and seeded	0.9*	0.9
Waste (ML1034)			
WRD	Stockpiles removed and shaped to remove batter angles and create a stable free-draining surface, top soiled and seeded	2.81	2.81
Product stockpiling area (ML10324)			
ROM pad	Product stockpile removed and ripped	0.87	0.87
Voids			
Pit void	Pit walls stabilized, reprofiled and top soiled to reduce batter angles. Safety berm installed in parts around the top of the pit	4.10	0.92 km
Water management (ML10324)			
Sediment Dam	Rehabilitation of the sediment dam to include sediment removal, re-profiling of the sediment dam banks/bunds to create a free-draining landform and re-seeding	1.99*	1.99
Stormwater management structures	Reconfiguration as per PCMP (AARC 2020b)	0.69*	0.69
Mining exploration activities (ML10332)			
Exploration holes	Capped and surface disturbance rehabilitation	-	-

* yet to be rehabilitated

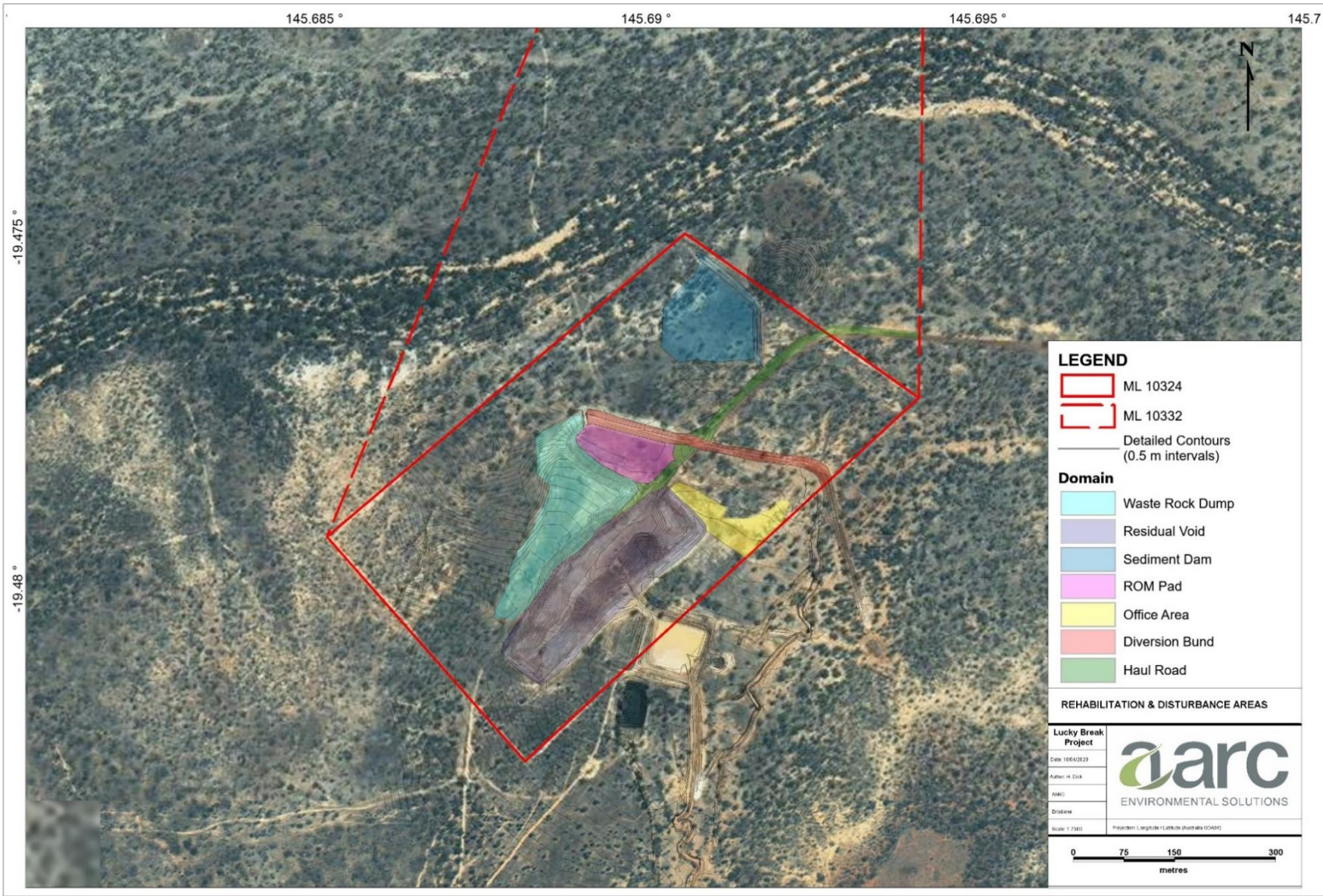


Figure 1: Project features

1.4 Current rehabilitation monitoring activities

Following the transfer of the Project EA to Sconi in March 2018, a field-based assessment of rehabilitation progress was undertaken on ML10324 in September 2018. The assessment involved surface water, stream sediment, topsoil quality sampling and analysis and a visual assessment of vegetation establishment and erosion to determine environmental values on the Project site and surrounding receiving environments.

A summary of the findings is detailed below:

- Final landforms were found to be stable with minor and moderate areas of erosion occurring infrequently on the slopes of the WRD and pit.
- Successful rehabilitation with regards to vegetation cover was limited across the Project Site with the western portion of the WRD supporting the most prominent area of established groundcover vegetation.
- Soil quality at analogue sites is generally performing better than impact sites, and topsoil amelioration was recommended at identified sites.
- Elevated water quality characteristics in the downstream receiving environment are potentially a result of natural variation, indicating that the mine has not resulted in environmental harm to the water quality values of the downstream receiving environment.
- The impact of sulphates and total metals are confined to areas of mine disturbance with no detrimental impacts on the environmental value of downstream sediments.

2 Rehabilitation requirements

In accordance with the Project's EA, Sconi is required to undertake progressive rehabilitation of land disturbed by mining activities. These rehabilitation areas must be monitored at an appropriate frequency to demonstrate that site specific rehabilitation goals are likely to be achieved upon completion of the Project.

2.1 Environmental authority requirements

This RMP is intended to satisfy requirements prescribed in relevant conditions of the Project's EA which are:

- C1 Land disturbed by mining must be rehabilitated in accordance with Table C1 – Rehabilitation Requirements.*
- C2 Rehabilitation must commence progressively as areas become available and in accordance with the Plan of Operations*

Table C1 Rehabilitation requirements

Mine domain and tenure	Mine feature name	Rehabilitation goal	Rehabilitation objectives, indicators and completion criteria
Dams ML10324, ML10332	Sediment Dam 1 Sediment Dam 2	All land subject to mining activities must be rehabilitated to meet the requirements of the administering authority guideline for Rehabilitation of Mining Projects and must be defined in the Post Mine Land Use Plan (PMLUP)	To be provided in the PMLUP in accordance with Condition C4
Waste ML10324, ML10332	Overburden Dumps		
Run of Mine (ROM) ML10324, ML10332	ROM pad Low grade ore stockpiles		
Ancillary infrastructure ML10324, ML10332	Workshop Office Fuel storage Roads and Tracks Diesel Backup		
Voids ML10324, ML10332	Circular Laterite Pit Dingo Dam Pit		
Exploration ML10324, ML10332	Circular Laterite South East Extension		
Mining area ML10324, ML10332	Topsoil Dumps		
Services ML10332	Waste Disposal Trench		

- C4 The holder must develop and submit to the administering authority a PMLUP (PMLUP) by November 2016 and update and resubmit the plan with each subsequent PoO. The PMLUP must describe how the rehabilitation objectives in Table C1 – Rehabilitation requirements will be achieved. On acceptance of the PMLUP by the administering authority, rehabilitation objectives, indicators and completion criteria must be specified in the environmental authority.*

The Post Mine Land Use Plan must include:

- (a) residual void investigation in accordance with condition (C9);*
- (b) schematic representation of the final land form inclusive of drainage features;*
- (c) slope design;*
- (d) cover design;*
- (e) drainage design;*
- (f) erosion controls proposed on reformed land;*
- (g) description of experimental design for monitoring of analogue and rehabilitated areas inclusive of statistical design;*
- (h) proposed revegetation methods inclusive of plant species selection, re-profiling, resspreading soil, soil ameliorants/amendments, surface preparation and method of propagation;*
- (i) materials balance including available top soil and low permeability capping material;*
- (j) geotechnical, geochemical and hydrological studies;*
- (k) chemical, physical and biological properties of soil and water;*
- (l) performance criteria for the cover system; and*
- (m) a rehabilitation monitoring program.*

- C7 Residual Void Outcome*

Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself, subject to any other condition within this Environmental Authority.

- C8 The holder of this Environmental Authority must manage mining voids during the operation and decommissioning phases to maximise the potential post mine beneficial uses, by consideration of the following:*

- (a) limiting sulphide exposures in void walls; and*
- (b) capping of sulphide exposures in void base; and*
- (c) limiting period of exposure of sulphides in void walls and base to oxidising conditions; and*
- (d) managing catchment into the void; and*

(e) geo-technical stability of final void.

D25 After decommissioning, all significantly disturbed land caused by the carrying out of the environmentally relevant activity(ies) must be rehabilitated to meet the following final acceptance criteria:

- (a) the landform is safe for humans and fauna;*
- (b) the landform is stable with no subsidence or erosion gullies for at least three (3) years;*
- (c) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;*
- (d) not allowing for acid mine drainage; or*
- (e) there is no ongoing contamination to waters (including groundwater);*
- (f) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the Instructions for the treatment and management of acid sulfate soils (2001);*
- (g) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;*
- (h) for land that is not being cultivated by the landholder:*
 - a. groundcover, that is not a declared pest species is established and self-sustaining*
 - b. vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining, and*
 - c. the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the petroleum activity(ies).*
- (i) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of petroleum activities being completed.*

2.2 Final land use and rehabilitation

The final land uses prescribed for each rehabilitation area will determine the rehabilitation goals, objectives, and performance indicators relevant to the Project. The post mine land descriptions, classifications and rehabilitation schedule for each area of disturbance are stipulated in the Lucky Break Project's Plan of Operations (PoO), (AARC 2018) and PMLUP (AARC 2020a).

Dominant existing land uses in the region include low intensity cattle grazing on natural pastures (88%) and conservation areas (11%) (NQ Dry Tropics 2016). Historically, land use on the Project site has included cattle grazing with limited exploration and mining activities.

To determine the suitability of land within the Project MLs to support relevant land uses (i.e. beef cattle grazing, rainfed broadacre cropping and conservation uses) prior to and following mining activities, project disturbances were subject to a pre-mining land suitability assessment in

accordance with the Land Suitability Assessment Techniques (DME 1995). Beef cattle grazing was assigned a land suitability class of 4 (AARC 2006a).

Each area of disturbance has been assigned a post mining land use on the basis of pre-mining land uses, land suitability classes, post mining land suitability classes likely to be achieved and in consultation with the landowner, as shown in Table 2. It should be noted that a number of the mine features listed in Table C1 of the EA, particularly those associated with ML10332 did not eventuate and have not been included in Table 2.

Refer to the PMLUP and Post Closure Management Plan (PCMP, AARC 2020b) for further detail regarding final land use and rehabilitation.

2.3 Rehabilitation goals, objectives, indicators and criteria

Queensland's *Mined Land Rehabilitation Policy* sets out the government's expectations in relation to progressive rehabilitation of mined land. Sufficient evidence is required supporting the justification of the post-mining land uses (PMLUs) proposed and it must be able to be demonstrated that land can be rehabilitated to a stable condition in accordance with the definition from section 111A of the *Environmental Protection Act 1994* (QLD), which states that land is in a stable condition if:

- the land is safe and structurally stable, and
- there is no environmental harm being caused by anything on or in the land, and
- the land can sustain a PMLU.

Site specific rehabilitation objectives, indicators and criteria have been developed for the Project to assist in achieving these goals for each rehabilitation area, as outlined in the PMLUP (AARC 2020) and are summarised in Table 3.

Rehabilitation indicators provide measures of progress towards rehabilitation objectives. Completion criteria are the standards which provide a clear definition of successful rehabilitation. Completion criteria take the form of a set of measurable benchmarks against which the rehabilitation indicators can be compared to determine if objectives are being met. Rehabilitation is deemed successful when completion criteria for each rehabilitation goal and objective are consistently met. Refer to the PMLUP for detail regarding rehabilitation indicators and completion criteria.

Rehabilitation approach and final land use

Table 2: Rehabilitation approach and final land use

Project area/ tenure	Rehabilitation area	Rehabilitation method summary	Rehabilitation status	Post-mining land use
Infrastructure areas ML10324	Office area	Removal of infrastructure, recontouring, topsoil application and seeding	Completed	Low intensity grazing/native ecosystem
	Haul road	Regrade to blend into surrounding land and seed	Planned	Low intensity grazing/native ecosystem
Waste ML10324	WRD	Recontouring, topsoil application and seeding	Where required ripping and re-seeding to facilitate vegetation establishment	Low intensity grazing/native ecosystem
Run of Mine (ROM) ML10324	ROM pad	Removal of infrastructure, recontouring, topsoil application and seeding	Where required ripping and re-seeding to facilitate vegetation establishment	Low intensity grazing/native ecosystem
Voids ML10324	Dingo Dam Pit	Fencing and signage to be installed around the perimeter of the pit	Fencing and signage around the perimeter of the void required. Currently fenced around the Dingo Dam ML	Non-use management area
Water management ML10324	Sediment dam	Remove sediments, regrade bunds to level and re-seed	Planned	Low intensity grazing/native ecosystem
	Stormwater management features	To be retained	Completed, subject to modifications proposed by ATC Williams (2019) to be implemented	Stormwater management
	Dingo dam*	To be retained	Completed, subject to modifications proposed by ATC Williams (2019) to be implemented	Water storage
Exploration ML10322	Exploration holes	Capping, recontouring	Completed	Low intensity grazing/native ecosystem

* Dingo Dam is partially intersected by the ML and is owned by the landowner and existed pre-mining.

Table 3: Applicable goals, objectives and completion criteria

Project area tenure	Post mining land use	Rehabilitation goal	Rehabilitation objective	Completion criteria
Infrastructure				
Office area ML10324	Low intensity grazing/native ecosystems	Long-term safety	Site is safe for humans and animals now and in the foreseeable future	Certification that structurally safe for post mine land use - all precautions implemented
		Stable	Vegetation cover to minimise erosion	Evidence of low risk of land contamination in a contaminated land assessment report
		Sustainable land use	Soil properties that support and will continue to support desired land use	Engineers certification that infrastructure sites (both remaining and decommissioned) have the required structures to control water flow and runoff
			Establish specified self-sustaining natural vegetation or habitat	Appropriate risk assessment and control measures undertaken
			Establish land use with comparable management requirements to adjacent non-mined land	Vegetation cover to meet the completion criteria set in Table 4 below
Diversion bunds ML10324	Low intensity grazing/native ecosystems	Long term safety	Site is safe for humans and animals now and in the foreseeable future	
		Stable	Vegetation cover to minimise erosion	
			Landform design achieves appropriate erosion rates	
		Sustainable land use	Soil properties that support and will continue to support desired land use	
			Establish specified self-sustaining natural vegetation or habitat	
			Establish land use with comparable management requirements to adjacent non-mined land	
Haul road ML10324		Long-term safety	Site is safe for humans and animals now and in the foreseeable future	

Project area tenure	Post mining land use	Rehabilitation goal	Rehabilitation objective	Completion criteria
	Low intensity grazing/native ecosystems	Stable	Landform design achieves appropriate erosion rates	
		Sustainable land use	Soil properties that support and will continue to support desired land use	
			Establish specified self-sustaining natural vegetation or habitat	
			Establish land use with comparable management requirements to adjacent non-mined land	
Waste				
Waste rock dump (WRD) ML10324	Low intensity grazing/native ecosystems	Long term safety	Site is safe for humans and animals now and in the foreseeable future	Certification that structurally safe for post mine land use
		Non-polluting	Hazardous material appropriately managed	Post closure monitoring shows the final landform is compliant with established and applicable limits
			Waste geochemistry acceptable or appropriately managed	Certification that the WRD has an adequate landform design and construction and is not releasing hazardous or contaminated material to the receiving environment
			Contaminated water contained on site	Monitoring data demonstrates the landform is benign and functioning with no release or seepage of hazardous or contaminated material to the receiving environment
		Stable	Very low probability of rock falls with serious consequences	Geotechnical assessment to determine landform stability
			Very low probability of slope slippage with serious consequences	
			Landform design achieves appropriate erosion rates	
			Vegetation cover to minimise erosion	
		Sustainable land use	Soil properties that support and will continue to support desired land use	Appropriate risk assessment and control measures undertaken
			Establish specified self-sustaining natural vegetation or habitat	Vegetation cover to meet the completion criteria set in Table 4
			Establish land use with comparable management requirements to adjacent non-mined land	

Project area tenure	Post mining land use	Rehabilitation goal	Rehabilitation objective	Completion criteria
Run of Mine (ROM)				
ROM pad ML10324	Low intensity grazing/native ecosystems	Long term safety	Site is safe for humans and animals now and in the foreseeable future	Certification that structurally sound and safe - all precautions implemented
		Non-polluting	Hazardous material appropriately managed	Evidence of low risk of land contamination in a contaminated land assessment report
		Stable	Vegetation cover to minimise erosion	Engineering studies that the Project site (both remaining and decommissioned areas) has the required structures to adequately control water flow and runoff
		Sustainable land use	Soil properties that support and will continue to support desired land use	Geotechnical studies indicating that the final landform is of a stable design
			Establish specified self-sustaining natural vegetation or habitat	
			Establish land use with comparable management requirements to adjacent non-mined land	
		Vegetation cover to meet the completion criteria set in Table 4		
Voids				
Dingo Dam Pit ML10324	Non-use management area	Long-term safety	Site is safe for humans and animals now and in the foreseeable future	All safety precautions undertaken in accordance with the relevant legislation—signs comply with AS1319:1994—Safety Signs for the Occupational Environment
		Non-polluting	Hazardous material appropriately managed	Geotechnical assessment to determine risk of wall failure/suitable extent of safety bund wall
			Contaminated water contained on site with low risk of groundwater contamination or overflow	Evidence of low risk of land contamination in a contaminated land assessment report
		Stable	Very low probability of rock falls with serious consequences	Assessment and certification of analytical results (through the RMP) within applicable guideline values (water, sediment and soils)
			Landform design achieves appropriate erosion rates	

Project area tenure	Post mining land use	Rehabilitation goal	Rehabilitation objective	Completion criteria
		Sustainable land use	Establish specified water body with low risk of environmental harm	Residual risk assessment and control measures undertaken
Water management				
Sediment Dam ML10324	Low intensity grazing/native ecosystems	Long-term safety	Site is safe for humans and animals now and in the foreseeable future	Confirmation that the area is free draining Evidence of low risk of land contamination in a contaminated land assessment report Assessment and certification of analytical results (through the RMP) within applicable guideline values (water, sediment and soils)
		Non-polluting	Hazardous material appropriately managed	
		Stable	Very low probability of rock falls with serious consequences	
			Landform design achieves appropriate erosion rates	
		Sustainable land use	Establish specified water body with low risk of environmental harm	
Stormwater management structures ML10324	Low intensity grazing/native ecosystems	Long term safety	Site is safe for humans and animals now and in the foreseeable future	Certification structurally sound and safe - all precautions implemented Evidence of low risk of land contamination in a contaminated land assessment report Engineering studies that the Project site (both remaining and decommissioned areas) has the required structures to adequately control water flow and runoff Appropriate risk assessment and control measures have been undertaken Vegetation cover to meet the completion criteria set in Table 4
		Non-polluting	Hazardous material adequately managed	
		Stable	Vegetation cover to minimise erosion	
		Sustainable land use	Soil properties that support and will continue to support desired land use	
			Establish specified self-sustaining natural vegetation or habitat	
			Establish land use with comparable management requirements to adjacent on-mined land	

Project area tenure	Post mining land use	Rehabilitation goal	Rehabilitation objective	Completion criteria
Exploration areas ML10322	Low intensity grazing/native ecosystems	Long-term safety	Site is safe for humans and animals now and in the foreseeable future	Certification structurally safe for post mine land use Post closure monitoring shows the final landform is compliant with established and applicable limits Monitoring data demonstrates the landform is benign and functioning with no release or seepage of hazardous or contaminated material to the receiving environment Appropriate risk assessment and control measures have been undertaken Vegetation cover to meet the completion criteria set in Table 4
		Non-polluting	Hazardous material appropriately managed	
		Stable	Vegetation cover to minimise erosion	
		Sustainable land use	Soil properties that support and will continue to support desired land use	
			Establish specified self-sustaining natural vegetation or habitat	
			Establish land use with comparable management requirements to adjacent non-mined land	

The revegetation and landform completion criteria for disturbed and constructed landforms to meet post-mine land use prior to relinquishment are described in Table 4 and Table 5.

Table 4: Revegetation completion criteria

Criteria	Revegetation completion criteria
Vegetation density/percentage of ground cover	Ground cover to be not less than 80% of the average percentage ground cover of analogue sites
Diversity of species	Equal to or greater than 60% of the comparable species diversity of analogue sites
Abundance of weeds	Weeds not to exceed 10% more than average percentage cover of analogue sites

Table 5: Landform rehabilitation success criteria

Criteria	Rehabilitation success criteria
Landforms	No active rill erosion deeper than 30 cm
Landform design	WRD and pit void batter slopes < 10 degrees Pit void: safety bund(s) constructed where required
Land suitability	Class 4 for beef cattle grazing based on the SLISA for the Project site (AARC 2006a)

3 Monitoring program design and methodology

3.1 Monitoring program design

The RMP is designed to assess rehabilitation progress to effect acceptance of rehabilitation by the administering authority and to support surrender of the MLS. A key assessment will be the behaviour of rehabilitated areas in comparison with surrounding non-mined lands.

To allow a comparative assessment to occur, monitoring will be carried out across both mined and rehabilitated areas as well as adjacent non-mined lands considered representative of local soils, ecology and land use.

The RMP will focus on the following environmental aspects considered to cover the rehabilitation objectives discussed section 2:

- vegetation cover and composition;
- soil erosion rates;
- surface water quality;
- stream sediment quality; and
- baseline soil characteristics.

Rehabilitation monitoring will be conducted annually to analyse the progress of rehabilitated areas against undisturbed analogue (also known as reference) sites. Monitoring will preferably be undertaken after the wet season to ensure the presence of ephemeral herbaceous plants and to assist with identification of species that require the presence of flowers/fruitlet material for accurate identification.

It is considered that an annual monitoring frequency will provide sufficient replication to enable statistical analysis of results at an acceptable power. It is important for analogue sites to remain fortified in order to provide a temporally consistent data set better able to assess rehabilitation performance against success criteria for the duration of the RMP.

To address the characteristics associated with the variation in disturbance type between ML10324 and ML10332, the RMP been designed into two programs (one for each ML).

3.2 ML10324 (Dingo Dam) rehabilitation monitoring program

3.2.1 Sampling locations

Analogue sites

Rehabilitation involves the revegetation of areas disturbed by mining that are no longer required for operational purposes. These areas need to be subsequently monitored to track their annual progress towards a self-sustaining ecosystem by comparing rehabilitated site data to analogue data from an undisturbed area, known as an analogue site.

Permanent analogue sites should be established during the first round of monitoring under this RMP. Proposed site locations will be selected for each vegetation community that is likely to be impacted by Project activities. To ensure sampling repeatability over the life of the monitoring program, each transect should be located in an area that is readily accessible and safe.

Indicative locations (transect starting point) and vegetation communities for analogue monitoring sites are listed in Table 6. The proposed survey sites have been selected to align, where possible, with historical survey data collected at the site (Figure 2). Surface water and stream sediment sampling analogue monitoring sites listed in Table 6 have been established in the Lucky Break Projects annual Receiving Environment Monitoring Program (AARC 2019). Due to the characteristics of the Dingo Dam ML, a minimum of three analogue sites will be monitored with four sites proposed as per Table 6. Proposed monitoring locations are illustrated in Figure 3 and Figure 4. The locations of all analogue sites will be finalised and the GPS coordinates documented during the first round of rehabilitation monitoring.

Table 6: Proposed rehabilitation monitoring sites

Proposed analogue site	Northing [^] (GDA 94)	Easting [^] (GDA 94)	Regional ecosystem (re)
Terrestrial sites			
REF1	–19.4777	145.6872	9.3.22 <i>Eucalyptus crebra</i> woodland ¹
REF2	–19.4775	145.692	9.3.22 <i>Eucalyptus crebra</i> woodland ¹
REF3	–19.4795	145.6873	9.5.3/9.5.11 <i>Eucalyptus crebra</i> woodland ¹
REF4	–19.4803	145.6872	9.5.3/9.5.11 <i>Eucalyptus crebra</i> woodland ¹
Surface water and stream sediment sites			
LBUS1*	–19.47575	145.684626	-
LBUS2*	–19.475378	145.688209	-
LBUS3	-19.484011	145.690512	-
LBUS4	–19.476178	145.68254	-

¹ AARC 2006b

[^] Approximate coordinates—locations to be confirmed in the first round of monitoring, and table to be updated

*Receiving water reference site prescribed in EA Table G5

Rehabilitation sites

Rehabilitation site sampling density has been based on the sum of all disturbance areas within a particular domain or rehabilitation area (e.g. total area occupied by all dams belonging to the water storage domain). The sampling densities proposed are designed to enable the RMP to be statistically robust. However, due to the space limitations given the small size of the site and its characteristics, the number of transects will be confirmed by experienced ecologists during the first round of rehabilitation monitoring.

To determine rehabilitation performance, permanent rehabilitation monitoring sites have been proposed in impacted areas depending on the local site characteristics. The proposed survey sites have been selected to align, where possible, with historical survey data collected at the site (Figure 2). Terrestrial monitoring locations will be finalised during the first round of rehabilitation monitoring and the GPS coordinates will be recorded updated in an updated RMP document. A descriptor of

each monitoring site location and its characteristics for terrestrial monitoring are outlined in Table 7 and the approximate location of each site illustrated in Figure 3. Surface water and stream sediment sites have been previously established and are outlined in Table 8 and illustrated in Figure 4. Some of these sites may be impacted by proposed stormwater management works.

Table 7: Proposed rehabilitation monitoring sites

Mine domain	Site reference name	Site/transect location descriptor	Northing (GDA 94)	Easting (GDA 94)
Waste rock dump	WRD1	Located on the northern slope facing the ROM pad	TBA	TBA
	WRD2	Located on the south-western face of the WRD, facing the pit void	TBA	TBA
	WRD3	Located on the top of the WRD	TBA	TBA
ROM	ROM 1	Positioned to be determined during the first round of monitoring	TBA	TBA
	ROM 2	Positioned to be determined during the first round of monitoring	TBA	TBA
Office	OFFICE 1	Positioned to be determined during the first round of monitoring	TBA	TBA
	OFFICE 2	Positioned to be determined during the first round of monitoring	TBA	TBA
Sediment Dam	SED DAM 1	Located in the northern area of the sediment dam	TBA	TBA
	SED DAM 2	Located in the southern area of the sediment dam	TBA	TBA
Pit void	VOID 1	Located on the pit void slope, below the current sampling location WRD1 (Figure 2)	TBA	TBA
	VOID 2	Located below Dingo Dam, on the north-west aspect slope of the pit void	TBA	TBA
	VOID 3	Located on the pit void slope on the northern most region of the void	TBA	TBA

Table 8: Surface water and stream sediment sampling locations

Site reference name	Northing (GDA 94)	Easting (GDA 94)
Open Cut Pit	-19.4791	145.6899
Dingo Dam	-19.4805	145.69
Sediment Dam 1	-19.476	145.6915
Downstream Monitoring locations		
LBDS1*	-19.47549	145.69960
LBDS2*	-19.47621	145.70943
LBDS3	-19.477806	145.708092

* Receiving water downstream monitoring point prescribed in EA Table G5



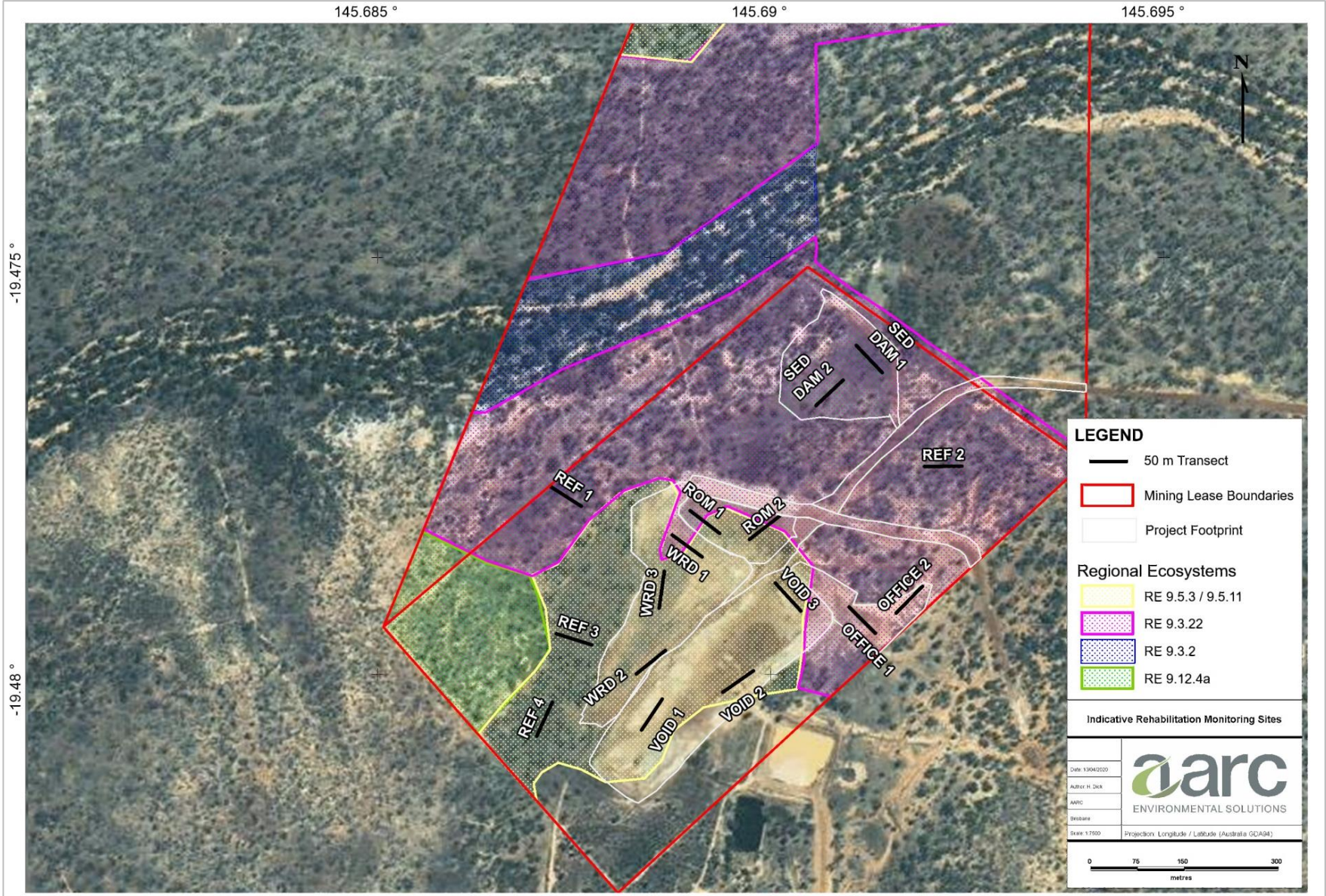


Figure 3: Proposed terrestrial monitoring locations

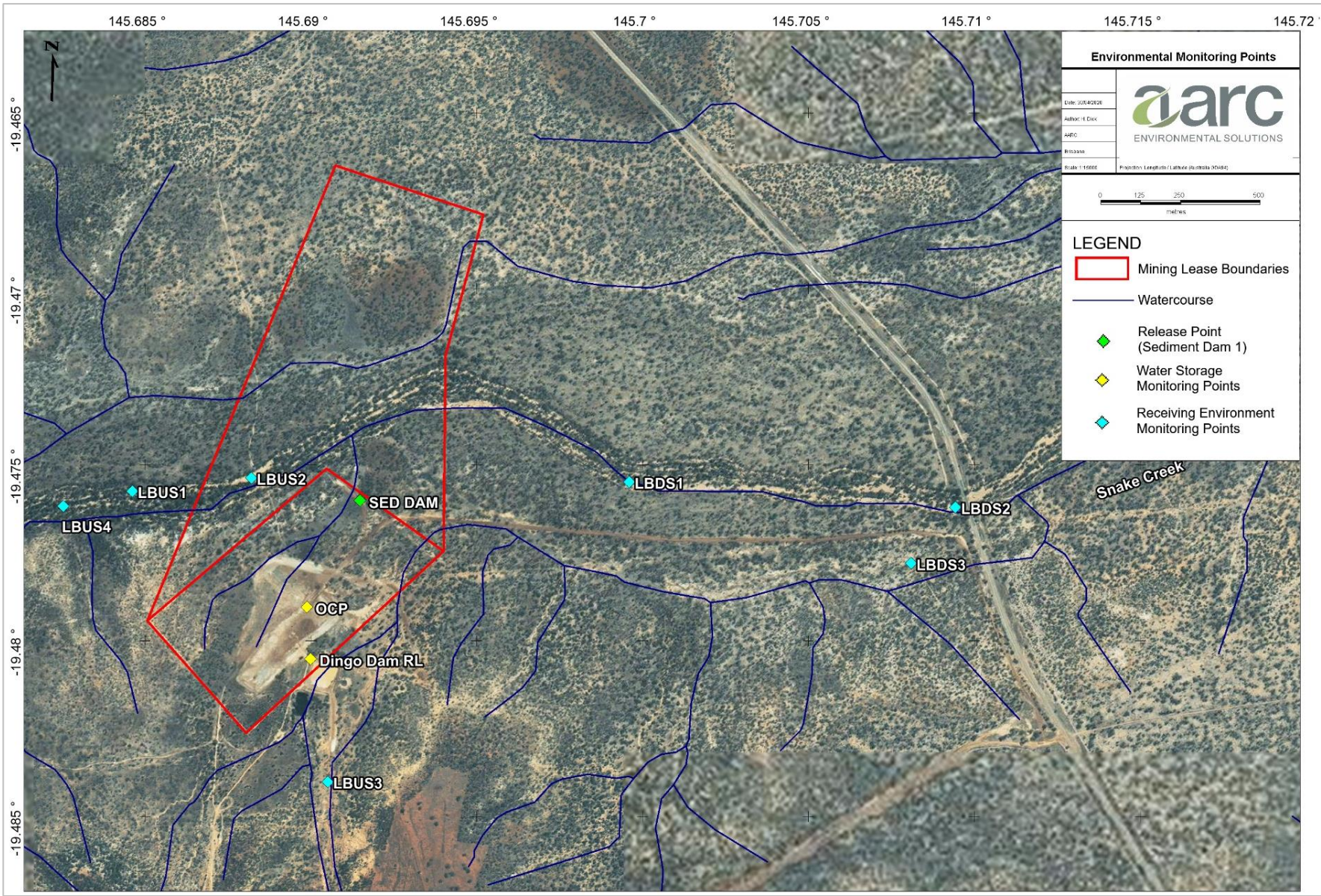


Figure 4: Surface water and stream sediment monitoring sites

3.2.2 Vegetation monitoring

Vegetation monitoring will involve the collection of the following quantitative data relevant to vegetation:

- ground cover percentage;
- canopy cover;
- species richness;
- woody stem density;
- recruitment; and
- weeds.

At each monitoring site a 50 m tape is extended, with the coordinates of each end recorded, to establish a permanent 50 m transect. A star picket is installed at each end of the transect to consistently and precisely identify the transect location during each monitoring period. The transect area extends 5 m on either side of the 50 m tape,

Survey methodologies outlined below have been adapted from the Queensland Herbarium survey technique (Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 5.0)) (Neldner *et al.* 2019) and the Method for the Establishment and Survey of Reference Sites for BioCondition (Eyre *et al.* 2017).

Results from this survey will be used to compare plant communities between analogue and rehabilitated sites, including the metrics for species diversity, and ground cover referred to in Table 4.

The permanent location of these monitoring transects will be decided during the first annual RMP, with coordinates to be included in the RMP before the next annual monitoring occurs.

Field sheets that should be used to collect rehabilitation survey data are provided in Appendix A.

Ground cover

Ground cover monitoring involves the collection of quantitative data on average ground cover (percent) where the percentage of all types of ground cover within ten 1 m x 1 m quadrats is determined. Similar to the transect above, the quadrat shall be placed every 5 m on alternating sides of the transect, commencing at 0 m on the right and the final quadrat at 45 m. In each quadrat the total percentage ground foliage cover of each plant species and the percentage cover of bare soil, rock and organic litter is recorded.

Ground foliage cover incorporates native perennial grass cover, native annual grass cover, native forbs and other species, native shrubs (< 1m height), non-native grass, non-native forbs and shrubs, litter, rock, bare ground and cryptogams. A datasheet for the collection of data is provided in Appendix A and to ensure consistency a guide to estimating percentage ground cover is also included Figure 8.

Species richness

Species richness is assessed using the method outlined in Eyre *et al.* (2017) where all vascular plants that occur within a 10 m x 50 m plot area are recorded. The surveyor is to walk along each side of the 50 m transect centre-line and record all trees, shrubs, forbs/other species and grasses occurring within 5 m of either side of the centre-line. Species that cannot be identified within the field are collected for later identification or sent to the Queensland Herbarium for identification.

Woody stem density

Woody stem density is calculated using methodology adapted from the Method for the Establishment and Survey of Reference Sites for BioCondition (Eyre *et al.* 2017). All woody stems for each tree and shrub species are counted within the 10 m x 50 m plot area (i.e. 5 m either side of each 50 m transect). From this data, both total woody stem density as well as the density of each individual tree or shrub species is calculated. The density of species and growth forms on the monitoring sites is then calculated using the following equation:

Density per hectare (ha) = Number of stems recorded within the transect x 20.

Recruitment

Recruitment is assessed using methodology adapted from Eyre *et al.* 2015 whereby recruitment is assessed over the 10 m x 50 m plot (5 m either side of each 50 m transect) (refer to Figure 5). Within this plot, the proportion of dominant species found to be regenerating are counted. A regenerating individual is identified as a woody stem species with a diameter at breast height of <5 cm. For each dominant canopy species present, at least one individual must be present as a sapling or seedling for the species to be considered as regenerating. The presence of all dominant species in the regenerative state would make up 100% recruitment.

Canopy Cover

Tree canopy cover can be used to characterise stand productivity and the distribution and abundance of biomass (Eyre *et al.* 2017). It refers to the estimation of the percentage canopy cover of the living, native tree layer along a 50 m transect, using the line intercept method (Greig-Smith 1964). For this attribute, the vertical projection of tree canopy cover of the species making up the tree canopy cover is assessed. The vertical projection of the tree canopy over the 50 m transect is recorded as illustrated in Figure 5. The total length of the projected canopy of each layer is then divided by the total length of the tape to give an estimate of percentage canopy cover on the site.

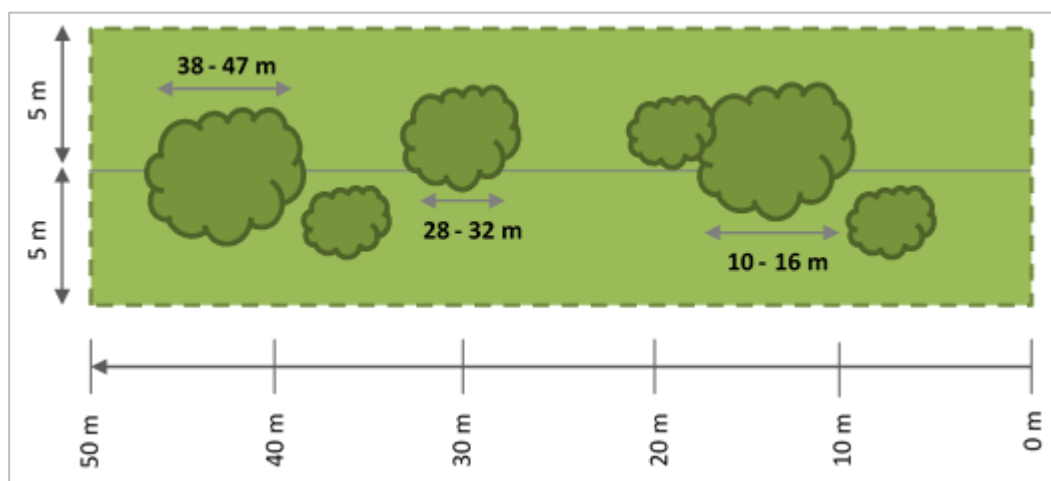


Figure 5: Guide to monitoring canopy cover (after Eyre *et al.* 2017)

3.2.3 Erosion monitoring

An erosion monitoring methodology has been developed by experienced AARC ecologists with consideration to relevant guidelines and research (Neldner *et al.* 2019, Eyre *et al.* 2017 and DSITI 2015). Erosion monitoring is to be conducted across all analogue and rehabilitation monitoring locations. Rehabilitation areas will be inspected to assess the extent of erosion features and an

erosion rating for each site will be determined. Erosion features or indicators may include wind or sheet erosion, erosion rills, gullies or tunnels, or signs of slumping.

Erosion at the survey sites is monitored through visual assessment over time. Assessment is undertaken by traversing the 50 m transects described in section 3.2.2, and recording the number and average depth of any erosion features or rill lines. Table 9 is used to record and classify these observations. The overall classification of the erosion on each transect is determined by the higher classification attributed to either the number of rills/gullies or the average depth. For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a Moderate erosion classification.

Obvious cases of localised settlement which are not causing any subsequent erosion are not counted as instances of erosion.

Table 9: Erosion classifications

Erosion classification	Minor	Moderate	Severe	Extreme
No. of rills/gully	< 15	15–30	31–50	> 50
Average depth (cm)	< 10	10–30	30–60	> 60
Proportion of site affected by disturbance (%) ¹	< 1	1–5	> 5	—

¹ after Neldner *et al.* 2019

It should be noted that the placement of the permanent transects may not be representative of the level of erosion across the entire rehabilitation area landforms. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance. The location of any severe erosion outside the transect (i.e. tunnels, mass wasting, large gullies) is also recorded and marked with a handheld Global Positioning System (GPS).

The following information is recorded at each site:

- GPS reading of location;
- general description of type of erosion (gully [> 30 cm], rill line [<30 cm], circular failure, tunnelling etc.) and possible causes, refer to the glossary of terms for definitions of erosion types;
- depth of erosion;
- width of erosion;
- length of erosion;
- where eroded material is being deposited; and
- whether the erosion line is being stabilised by vegetation.

3.2.4 Soil monitoring

Topsoil sampling is not considered to be an annual requirement of the rehabilitation monitoring program, but it is recommended to be undertaken at the commencement of rehabilitation monitoring to identify and address any deficiencies in the chemical composition or exceedances in the metal composition of the soil that may be detrimental to vegetation health.

Soil monitoring involves the collection of topsoil samples from a maximum depth of 10 cm to obtain quantitative data on the chemical and physical properties of soil. Soil sampling methodology has been adapted from Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009 (DES 2018). Soil sampling is conducted by collecting approximately 200 g samples with a clean non-metallic shovel and bucket every 10 m along the 50 m transect. The first sample is collected at 0 m. These five samples are mixed in the bucket. The final 200 g soil sample is taken from the mix and placed into plastic sample bag. Samples are sent to a National Association of Testing Authorities (NATA) certified laboratory for analysis of indicators of soil nutrition and land contamination including:

- ph;
- electrical conductivity;
- soluble chloride;
- moisture content;
- Emerson aggregate stability test;
- exchange acidity;
- exchangeable cations (calcium, magnesium, potassium, sodium and aluminium);
- cation exchange capacity;
- calcium : magnesium ratio (Ca: Mg);
- exchangeable sodium percentage (ESP);
- total nitrogen, nitrite and nitrate;
- sulphate;
- extractable potassium and phosphorous (Colwell);
- total organic carbon and organic matter; and
- trace elements (arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel and zinc).

Soil moisture content shall be measured for interpretive purposes only and will not be assessed in determining rehabilitation performance.

Ideally, rehabilitation site data should reflect that of analogue sites, though data indicating a trajectory to meet performance criteria may be sufficient in supporting the chosen post-mining land use.

3.2.5 Photographic monitoring

Photographic monitoring provides a visual record of the vegetation, ground cover, erosion and general appearance of each analogue and rehabilitation site, allowing these sites to be compared over time (Eyre *et al.* 2015). A digital camera is used to take the photos so that a permanent record can be kept for each site. The process of taking the monitoring photos is as follows:

- 1) The person taking the photograph stands at the star picket which marks the beginning of the 50 m.
- 2) The camera is then aimed directly toward the end of the 50 m transect and a single photograph is taken.
- 3) The person then stands at the star picket which marks the end of the 50 m transect.
- 4) The camera is then aimed directly toward the start of the 50 m transect and a single photograph is taken.
- 5) Steps 1 – 6 are repeated for all terrestrial monitoring sites.

6) The digital photographs are then downloaded and stored for future reference.

3.2.6 Fauna observations

Observations of any fauna species presence within or in the vicinity of the rehabilitation areas will be noted as part of the rehabilitation monitoring program.

3.2.7 Surface water quality

The surface water quality monitoring component of the RMP will be undertaken as part of the current Lucky Break annual Receiving Environment Monitoring Program (AARC 2019).

Samples will be collected from each of the surface water monitoring sites, where surface water is present in accordance with the methodology specified in the Department of Environment and Science (DES) Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009 (DES 2018). The surface water quality monitoring sites include on-site water storages, on-site surface water ponding and the receiving environment in accordance with Schedule – Water and Land of the Lucky Break Projects EA.

Field readings of pH, dissolved oxygen, oxygen reduction potential, turbidity, total dissolved solids, electrical conductivity (EC) and temperature will be recorded in-situ using a multi-parameter water quality meter that is laboratory calibrated to the manufacturers' specifications.

Grab samples will be collected at a depth of 10 to 20 cm, where sufficient water is available. Two water samples, one total (unfiltered) and one dissolved (field filtered) will be collected at each site. Water quality samples will be analysed under laboratory testing conditions for the parameters outlined below.

Samples will be collected in suitable sample collection bottles provided by the laboratory with preservative added where required. All water samples will be kept on ice or refrigerated during storage and transport to a National Association of Testing Authorities (NATA) accredited laboratory for analysis.

The site-specific water quality parameters have been determined according to the Projects EA and are as follows:

- pH;
- EC; and
- aluminium, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, sulphate and zinc.

Data will be assessed against the criteria outlined in EA for the Project. The sediment dam (Sed Dam) and Dingo Dam (Dingo Dam RL) monitoring sites will be assessed against Table G4 – Onsite Water Storage Contaminant Limits, reproduced here as Table 10. The open cut pit (OCP) (now the pit void) surface water sampling site will be assessed against Table G6 – Receiving Waters Contaminant Trigger and Contaminant Level Limits, reproduced here as Table 11.

Table 10: On-site water storages assessment criteria

Sampling location	Quality characteristic	Test value	Contaminant limit ³
Sed Dam ¹ Dingo Dam RL	pH (pH unit)	Range	> 4 and < 9 ²
	EC (µS/cm)	Maximum	59701
	Sulphate (mg/L)	Maximum	10001
	Aluminium (mg/L)	Maximum	51
	Arsenic (mg/L)	Maximum	0.51
	Cadmium (mg/L)	Maximum	0.011
	Cobalt (mg/L)	Maximum	11
	Copper (mg/L)	Maximum	11
	Lead (mg/L)	Maximum	0.011
	Nickel (mg/L)	Maximum	11
	Zinc (mg/L)	Maximum	201

¹ Contaminant limit based on ANZECC and ARMCANZ (2000) stock water quality guidelines.

² Page 4.2-15 of ANZECC and ARMCANZ (2000) "Soil and animal health will not generally be affected by water with pH in the range of 4-9".

³ Total measurements (unfiltered) must be taken and analysed.

Table 11: Receiving waters assessment criteria

Sampling location	Quality characteristic	Limit type	Contaminant limit
OCP	pH (pH unit)	Range	6.0 –9.01
	EC (µc/cm)	Maximum	1,000 ² or 95th percentile of reference ³ value whichever is lower
	Sulphate (mg/L)	Maximum	1,000 ² or 95th percentile of reference ³ value whichever is lower
	Aluminium (mg/L)	Maximum	5 ² or 95th percentile of reference ³ value whichever is lower
	Arsenic (mg/L)	Maximum	0.5 ² or 95th percentile of reference ³ value whichever is lower
	Cadmium (mg/L)	Maximum	0.01 ² or 95th percentile of reference ³ value whichever is lower

Sampling location	Quality characteristic	Limit type	Contaminant limit
	Chromium	Maximum	1 ² or 95th percentile of reference ³ value whichever is lower
	Cobalt (mg/L)	Maximum	1 ² or 95th percentile of reference ³ value whichever is lower
	Copper (mg/L)	Maximum	1 ² or 95th percentile of reference ³ value whichever is lower
	Lead (mg/L)	Maximum	0.01 ² or 95th percentile of reference ³ value whichever is lower
	Nickel (mg/L)	Maximum	1 ² or 95th percentile of reference ³ value whichever is lower
	Zinc (mg/L)	Maximum	20 ² or 95th percentile of reference ³ value whichever is lower

¹ Based on ANZECC (2000) value for Livestock Drinking Water Quality, section 4.2.10.1– Volume 1 Note: This does not apply to dams containing hazardous waste.

² Contaminant limits based on ANZECC (2000) values for Livestock Drinking Water Quality, Table 4.3.1 and 4.3.2 and are to be analysed as Total Metals (unfiltered).

³ Reference sites must be from the same bio-geographic and climatic region; and have similar geology, soil types and topography; and contain a range of habitats similar to those at the potentially impacted sites; and have a similar flow regime; and not be so close to the test sites that any disturbance at the test site also results in a change at the reference site.

The surface water quality monitoring component of the RMP will be undertaken as part of the current Lucky Break annual Receiving Environment Monitoring Program (AARC 2019).

3.2.8 Stream sediment monitoring

Sediment quality sampling is to be undertaken in accordance with the Queensland Monitoring and Sampling Manual 2018 (DES 2018) and the EA for the Project.

Five sub-samples (approximately 500 g each) of the stream bed substrate will be taken at each monitoring site along a 50 m) transect. Samples will be collected using a non-metallic shovel. The subsamples will be mixed in a clean plastic bucket to obtain a composite sample (approximately 500g) which were sealed in sterilised glass jars or plastic sample bags and sent to a NATA accredited laboratory for analysis of trace metals and particle size.

The results of the receiving environment will be compared with upstream sites and the site-specific sediment quality parameters as follows:

- aluminium (mg/kg dry wt.);
- arsenic (mg/kg dry wt.);

- cadmium (mg/kg dry wt.); and
- chromium (mg/kg dry wt.).

The stream sediment monitoring component of the RMP will be undertaken as part of the current Lucky Break annual Receiving Environment Monitoring Program (AARC 2019).

3.3 ML10332 (Lucky Break) rehabilitation monitoring

The Lucky Break ML10332 is located north of Snake Creek and disturbance has been limited to 36 exploration drill sites in 2004/2005. Given the limited disturbance of ML10332 and time lapsed, data collected will be used to complete a final rehabilitation assessment and final rehabilitation report in preparation for relinquishment.

3.3.1 Sampling sites

Exploration drilling was conducted in a 20 x 40 m grid. Disturbance sampling locations have been strategically selected to capture the maximum amount of disturbance possible within the survey design. A total of three disturbance sites and two analogue sites will be sampled. The proposed sampling locations are illustrated in Figure 6. Sampling sites will be finalised in the field based on accessibility, as this location is largely undisturbed.

3.3.2 Survey methodology

Sampling will be undertaken using a combination of transects and photographic records. At each monitoring site a 50 m tape is extended, with the coordinates of each end recorded, to establish a permanent 50 m transect. A star picket is installed at each end of the transect to consistently and precisely identify the transect location. The transect area extends 5 m on either side of the 50 m tape.

Photographic recording, along the transect, of drill holes will be undertaken to confirm that capping and revegetation has occurred. The methodology for photographic recording is outlined below:

- 1) The person taking the photograph stands at the star picket which marks the beginning of the 50 m.
- 2) The camera is then aimed directly toward the end of the 50 m transect and a single photograph is taken.
- 3) The person then slowly walks along the 50 m transect and photographs all drill sites.
- 4) The person then stands at the star picket which marks the end of the 50 m transect.
- 5) The camera is then aimed directly toward the start of the 50 m transect and a single photograph is taken.
- 6) Steps 1–7 is repeated for all monitoring sites.
- 7) The digital photographs are then downloaded and stored for future reference.

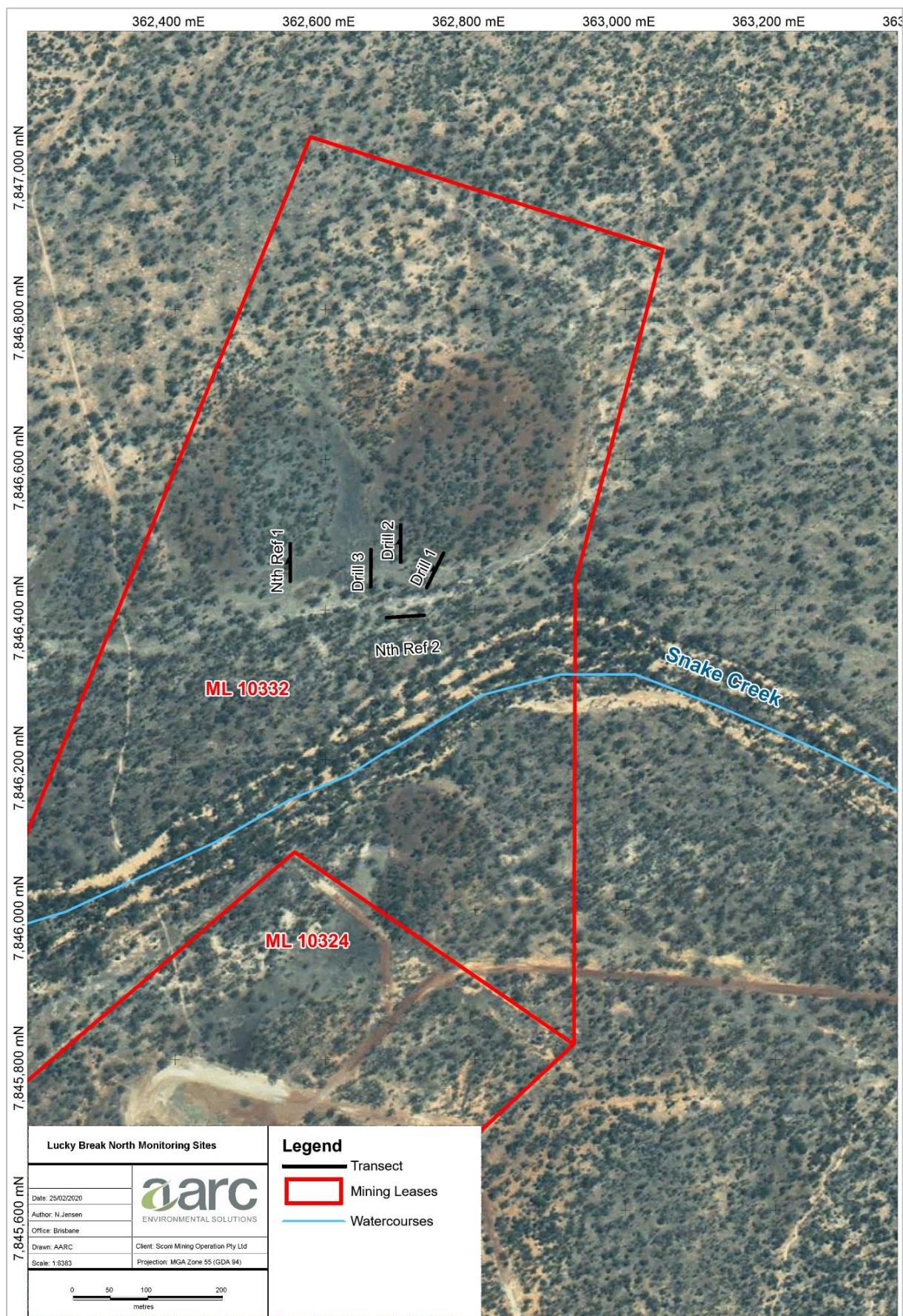


Figure 6: Proposed terrestrial monitoring locations

4 Data analysis, interpretation and reporting

4.1 Laboratory analysis

All soil samples collected during rehabilitation monitoring will be sent to a NATA certified laboratory for analysis of the recommended parameters.

In the event that, any plants cannot be identified in the field, samples will be sent to the Queensland herbarium for identification.

4.2 Progress reporting

A rehabilitation report will be prepared annually following the collection of monitoring data to provide a detailed analysis of monitoring results and evaluate rehabilitation progress towards completion criteria. This ongoing evaluation will enable the early detection of unfavourable trends in measured indicators and identify any requirements for adaptive management practices to ensure rehabilitation success and certification in the long term.

4.2.1 Interpretation

Rehabilitation monitoring results will be analysed both categorically and temporally. Results obtained from rehabilitation sites will be compared to analogue sites from the same final land use vegetation community. Rehabilitation monitoring results will also be compared with historical data where possible to detect any trends over time. Common variables such as climatic conditions, seasonal variation and other event specific circumstances will also be considered in the analysis of rehabilitation data.

4.2.2 Statistical analysis

Given the small disturbance footprint of the Project, statistical analysis will involve the comparison of vegetation and soil monitoring characteristics recorded from analogue sites at the same point in time. The analysis of rehabilitation monitoring results will involve comparing rehabilitation sites generally across the Project using the following analytical methods where appropriate:

- Statistical analysis will be undertaken where required to identify any significant differences between sample means. To determine any significant differences ($\alpha = 0.05$) between the means of rehabilitation characteristics recorded across analogue and rehabilitation sites, it is recommended that rehabilitation performance be assessed using a t-test (where a minimum of three sites are available providing sufficient statistical replication) or a similar nonparametric test where the data is not normally distributed. Variables measured at analogue and rehabilitation sites are considered statistically comparable where no significant difference between the means is detected.
- in relation to vegetation and soil quality characteristics, the mean values ± 1 standard deviation will be calculated for comparison of analogue and rehabilitation site data; and
- temporal variation will be presented graphically for vegetation and soil quality variables as required to identify any outliers or ongoing trends.

5 References

AARC 2006a, *Soils and land suitability assessment report*, prepared on behalf of Qld Gold Pty Ltd, 100 % subsidiary of Metallica Minerals Limited, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC 2006b, *Lucky Break Nickel Project, Terrestrial Flora and Fauna Assessment*, prepared on behalf of Qld Gold Pty Ltd, 100 % subsidiary of Metallica Minerals Limited, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC 2018, *Lucky Break Project –Plans of Operations (2018–2023)*, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC 2019, *Receiving environment monitoring program–2019 progress report*, prepared on behalf of Australian Mines Limited, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC 2020a, *Lucky Break Project–Post Mine Land Use Plan*, AARC Environmental Solutions Pty Ltd, Brisbane.

AARC 2020b, *Lucky Break Project–Post Mine Closure Plan*, AARC Environmental Solutions Pty Ltd, Brisbane.

DES 2014, *Guideline–Rehabilitation Requirements for Mining Resource Activities*, Version 2.01, Department of Environment and Science, Brisbane, Queensland.

DES 2018, *Monitoring and Sampling Manual Environmental Protection (Water) Policy 2009*, Version 2, July 2018, Department of Environment and Science, Queensland Government, Brisbane.

DME 1995, *Technical guidelines for Environmental Management of Exploration and Mining in Queensland*, Department of Mines and Energy, Queensland, Brisbane.

DSITI 2015, *Chapter 1: Introduction, in Soil conservation guidelines for Queensland*, Department of Science, Information Technology and Innovation, Brisbane.

Eyre, T, Kelly, A, Neldner, V, Wilson, B, Ferguson, D, Laidlaw, M and Franks, A 2015, *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual*, Version 2.2, Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.

Eyre, T, Kelly, A and Neldner, V 2017, *Method for the Establishment and Survey of Reference Sites for BioCondition*, Version 3, Queensland Herbarium, Department of Science, Information Technology and Innovation, Brisbane.

Greig-Smith, P 1964, *Quantitative Plant Ecology*, Butterworths, London.

Minerals Council of Australia 2016, *Mine rehabilitation in the Australian minerals industry*, prepared by Andrew Mattiskes, Minerals Council of Australia Sydney.

Neldner, V, Wilson, B, Dillewaard, H, Ryan, T, Butler, D, McDonald, W, Addicott E, and Appelman, C 2019, *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*, Version 4.0, updated March 2019, Queensland Herbarium, Department of Environment and Science, Brisbane.

NQ Dry Tropics 2016, *Burdekin Dry Tropics Natural Resource Management Plan 2016–2026*, NQ Dry Tropics, Townsville <<http://nrm.nqdrytropics.com.au/downloadpdf/>>.

6 Glossary of terms

Analogue site	Permanent monitoring sites used for comparison with rehabilitation areas that are representative of the target final land use. They represent an example of a regional ecosystem in its reference state, typically a site that is relatively unmodified or represents the “best on offer” for that RE. Data obtained from reference sites are used to establish baseline target conditions for each RE, which will be used to determine rehabilitation success in areas representative of each RE.
Bare ground	The amount of ground surface not covered by litter, coarse woody debris, cryptogams or rock.
Canopy	The layer formed collectively by the crowns of adjacent trees or shrubs in the case of shrub lands. The layer may be continuous or discontinuous. The canopy refers to the ecological dominant layer.
Canopy cover	Canopy cover is the cover, measured as crown cover or projective foliage cover, of the canopy.
Co-dominant species	Two or more flora species that contribute more or less equally to form the dominant above-ground biomass of a particular stratum.
Completion criteria	These are the standards that are to be met by successful rehabilitation. They will generally be in the form of numerical values that can be verified by measurement of the indicators selected for the rehabilitation objectives.
Domain	Land management units within a mine site, usually with similar geophysical characteristics (e.g. mine pit, waste rock piles, tailings dam, infrastructure area). Within domains, elements may be designated where different rehabilitation techniques and/or timing of work is required, e.g. an access road.
Dominant species	A species that contributes most to the overall above-ground biomass of a particular stratum (or layer).
Ecologically Dominant layer	The stratum (or layer) that contains the greatest amount of above ground vegetation biomass.
Emergent Layer	The tallest stratum (or layer) is regarded as the emergent layer if it does not form the most above-ground biomass, regardless of its canopy cover.
Erosional pattern	Erosional pattern is a combination of local relief (hill, plain) and slope class (flat, undulating, steep). The slope class may not be the same as the slope recorded for the site (for example, a site situated on a hill crest landform element of a steep mountain landform pattern).

Forb	Herbaceous or slightly woody, annual or sometimes perennial plants, other than grasses, and including ground orchids.
Foliage cover	The percentage of the ground occupied by the vertical projection of foliage and branches.
Goals	These are the policy objectives for rehabilitation that are set (often informally) by Government.
Grass	A grass is any plant of the family Gramineae or Poaceae, characterised by jointed stems, sheathing leaves, flower spikelets, and fruit consisting of a seed-like grain or caryopsis (true grasses).
Grazing/native ecosystem	The proposed final (post-mined) land use consisting of ecosystems that are native to the local area and capable of supporting low intensity cattle grazing. The intent for this vegetation community is commonly to incorporate ground cover species at a sufficient density to support grazing but not out-compete native vegetation species in the area.
Ground cover	Ground cover incorporates the cover of ground foliage (grasses, forbs and shrubs <1 m in height), bare ground, rock and organic litter.
Ground Foliage	Refers to grasses, forbs and shrubs <1 m in height.
Ground Foliage Cover	The percentage of the ground occupied by the vertical projection of ground foliage and branches.
Gully erosion	A complex of processes whereby the removal of soil is characterised by large incised channels in the landscape. Such channels are generally deep enough (usually > 0.3 m) to interfere with, and not to be obliterated by, normal tillage operations.
Indicator	An indicator is something that can be measured and audited according to an established protocol and used to evaluate changes in a system.
Land suitability class	Classification of the capacity of land to achieve and sustain specified land uses. Class I land is capable of supporting most agricultural and grazing activities whilst class VIII land imposes severe limitations on agricultural or grazing uses. "Average" management inputs are assumed.
Leaf litter	Refer to Organic litter.
Litter cover	Estimate of the percentage of the ground surface that is covered by detached plant material or organic litter.

Objectives	The end points that rehabilitation aims to achieve. May be described in terms of future land use, biodiversity values, conservation values, health and safety outcomes, aesthetics or social outcomes or a combination of these.
Other species	Slightly woody plants or ferns, vines, sedges or rushes. Less than 1 m in height.

Perennial Species	Perennial species are long-lived plants, tending to persist for three or more years. Generally perennial grasses are characterized by larger bulk than annual grasses i.e. forming tussocks and large root mass with evidence of previous seasons growth i.e. remains of last year's tiller bases, and presence of stolons or rhizomes.
Regional Ecosystem (RE)	Regional Ecosystems (RE) are defined under the Vegetation Management Act (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil.
Rill erosion	Removal of soil by runoff from the land surface whereby numerous small channels are formed, generally no more than 30 cm deep.
Sheet erosion	Removal of a fairly uniform layer of soil from the land surface by raindrop splash and/or runoff without forming perceptible channels.
Shrub	Woody plant that is multi-stemmed from the base (or within 200 mm from ground level) or if single stemmed, less than 2 m tall.
Species richness	Species richness provides a measure of floristic diversity and refers to the number of species of trees, shrubs, forbs/other species and grasses occurring within a surveyed plot.
Stable	Resistant to change in landform, pollution generation or land use potential to an extent that is similar to unmined land in the locality. The acceptable rates of change of specified parameters or the maximum risk of specified environmental harm may be set in an environmental authority.
Stratum	A layer in a community produced by the occurrence at approximately the same level (height) of an aggregation of plants of the same habit.
Subdominant species	A species is considered to be subdominant when it contributes less biomass than the dominant species but occurs as more than an isolated individual. As a general rule, the species must individually contribute more than an associated species i.e. more than 20% of the total biomass of the stratum in which it occurs.
Woody stem density	The density of woody stems, which, for the purposes of the Rehabilitation Monitoring Program (RMP) includes woody trees and shrubs.

Topsoil	For the purposes of this RMP topsoil incorporates the soil covering the surface to a depth of 200 mm.
Trees	Woody plants, more than 2 m tall with a single stem or branches well above the base.
Tunnel erosion	A process involving the hydraulic removal of subsurface soil, causing the formation of underground passageways (i.e. tunnels) in landscapes.
Recruitment	The natural regeneration of woody stem tree canopy species.
Slumping	Slumping is a form of erosion in which the mass movement of earth occurs on cleared slopes as gravity slowly moves earth, rock and soil material downslope.
Wind erosion	Wind erosion is the wind induced movement of light textured soils resulting in scalding and the formation of smooth, bare areas on impermeable subsoils.

A1 Appendix 1: Field data sheets

A.1 Rehabilitation Transect Pro-forma

Project:	Luck Break Project Rehabilitation Monitoring Program			
Date:		Season:	Wet	Dry
Recorder:				
Transect name:				
Start point:	Easting:		Northing:	
End point:	Easting:		Northing:	
Datum:			Zone:	
Photo No:	Start (0 m):	Mid (50 to 0 m)	Mid (50 to 100 m)	End (100 m):

Site Location:	
Landscape Context*:	
Notes:	

* rocky hill, slope, valley bottom, floodplain, clay plains, etc.

Erosion pattern[^]	Slope (°)	Slope aspect# (e.g. Slope direction in degrees)

[^] refers to the combination of local relief and slope class (refer to Speight (2009) classification system attached).

At the mid-point record the direction in degrees, of the downward slope of the transect. For flat areas record a dash.

Rehabilitation Transect Pro-forma

Disturbance	Severity of Disturbance (circle relevant score)			Disturbance	Severity of Disturbance (circle)
	Proportion*	Age*	Height*		
Storm damage Estimate the proportion of the crown cover damaged at the site and the age of the damage.	0 1 2 3	1 2	N/A	Remnant	Yes No
Vehicle tracks Record old or recent tracks present at the site. Record proportion and age of the site affected.	0 1 2 3	1 2	N/A	Weeds Estimate percentage cover of exotic plant species. Sum of cover for all weed species.	Cover %:
Fire Record proportion of the site burnt, age and tallest vegetation affected.	0 1 2 3	1 2	1 2 3	Grazing Evidence of grazing (damage to ground layer plants, evidence of livestock faeces or tracks). ^Severe means major impact on groundcover abundance or composition.	Not apparent Present ^Severe
*Proportion: 0 = 0; 1 ≤ 1%; 2 1-5%; 3 ≥5% *Age: 1 ≤ 3 yrs. (short term impact still evident); 2: >3yrs * Fire height: 1 ≤1m; 2 1-6m; 3 6-12 m			Clearing Proportion of site previously cleared / thinned and regrown	No Present Severe	
Other (note any other disturbance):					

*Leave blank where disturbance is absent

Rehabilitation Transect Pro-forma

Erosion classification	Minor	Moderate	Severe	Extreme	Notes/observations
No. of rills	< 15	15–30	31–50	> 50	
Average depth (cm)	< 10	10–30	30–60	> 60	
Proportion of site affected by disturbance (%) ¹	< 1	1–5	> 5	—	

* Provide GPS co-ordinates for any areas of moderate or heavy erosion

Geology:			
Soil description:			
Soil sample taken:	YES / NO	Date:	
Sample ID:		Time:	

Topsoil	5 m	10 m	15 m	20 m	25 m	30 m	35 m	40 m	45 m	50 m
Depth (cm)										

Canopy coverage (length of tape under canopy)	Total (m)	%
(example) 0–4, 8–13, 28–31, 45–48	= 15/50 * 100	30

Vegetation Layer	E	T1	T2	T3	S1	S2	G
Height (m)							

E = Emergent; T1, T2 and T3 – Refers to tree layers where T1 is the tallest tree canopy layer (or Ecologically Dominant Layer) and T3 is the shortest tree layer ; S1 and S2 – Refers to the shrub layers where S1 is the tallest shrub layer and S2 is the shortest shrub layer; G – Refers to the Ground layer.

[illegible]

Additional notes (sketch if required)

Rehabilitation Transect Pro-forma

Species dominance (D, CD, A, O)							Species	Woody stem count	Sample #/code	Photo #	Ground cover percentage*									
E	T1	T2	T3	S1	S2	G					Q1	Q2	Q3	Q4	Q5	Q6	A7	Q8	Q9	Q10
							Bare													
							Litter													
							Rock													
							1.													
							2.													
							3.													
							4.													
							5.													
							6.													
							7.													
							8.													
							9.													
							10.													
							11.													
							12													
							13.													
							14.													
							15.													

Species dominance (D, CD, A, O)							Species	Woody stem count	Sample #/code	Photo #	Ground cover percentage*									
E	T1	T2	T3	S1	S2	G					Q1	Q2	Q3	Q4	Q5	Q6	A7	Q8	Q9	Q10
							16.													
							17.													
							18.													
							19.													
							20.													
							21.													
							22.													
							23.													
							24.													
							25.													
							26.													
							27.													
							28.													
							29.													
							30.													
							31.													

Key: D = dominant, CD = Co-Dominant, A = Associated and O = Occasional

*To be assessed as per ground cover assessment methodology and includes cover of bare ground, organic litter, rock and foliage cover

Slope class							
Class	LE Level	VG Very gently inclined	GE Gently inclined	MO Moderately inclined	ST Steep	VS Very steep	PR Precipitous
Percentage	<1	1–3	3–10	10–32	32–56	56–100	100
Degrees (rounded to nearest whole number)	0–0°35'	>0°35'– 1°45'	>1°45'– 5°45'	>5°45'–18°	>18°–30°	>30–45	>45
Relief class	Erosional landform pattern						
M Very high >300 m (about 500 m)	–	–	–	RM Rolling mountains	SM Steep mountains	VM Very steep mountains	PM Precipitous
H High 90– 300 m (about 150 m)	–	–	UH Undulating hills	RH Rolling hills	SH Steep hills	VH Very steep hills	PH Precipitous hills
L Low 30– 90 m (about 50 m)	–	–	UL Undulating low hills	RL Rolling low hills	SL Steep low hills	VL Very steep low hills	B Badlands
R Very low 9– 30 m (about 15 m)	–	GR Gently undulating rises	UR Undulating rises	RR Rolling rises	SR Steep rises	B Badlands	B Badlands
P Extremely low <9 m)	LP Level plain	GP Gently undulating plain	UP Undulating plain	RP Rolling plain	B Badlands	B Badlands	B Badlands

Source: Speight (2009), table 2

Figure 7: Types of erosional landform patterns by slope and relief class (Source: after Neldner 2019)

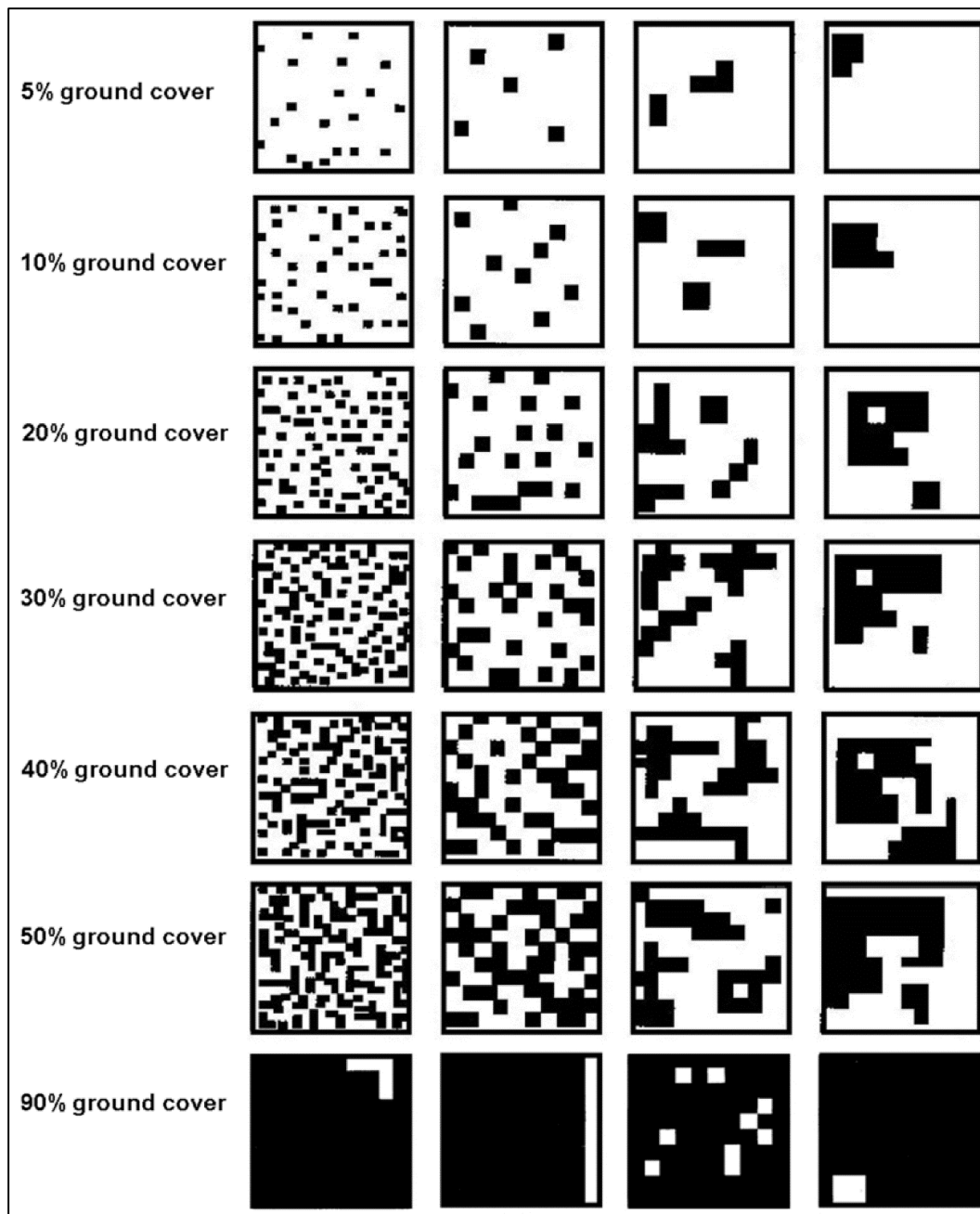


Figure 8: Guide to estimating ground cover percentage(Eyre et al. 2017)

A.2 Soil Profile Proforma

[Site Description]

Date:		Site:		
Location:		Coordinates:	E	N
Landform Pattern:		Micro Relief:		
Landform Element:		Rock Outcrops:		
Morphological Type:		S C Fragments:		
Site Disturbance:		Substrate:		
Erosion:		Surface Condition:		
Landform	Elevation:		Permeability:	
	Slope (%):		Drainage:	
	Relief:		Run-off:	

[Soil Description]

Horizon	Depth (mm)	Boundary	Colour	Mottles	Texture	Coarse Fragments	Structure	Segregations	Consistency	Field pH	

Vegetation:

Notes

Appendix B Rehabilitation Soils Assessment

Background

To determine the quality of topsoil in rehabilitated mine domains at the Lucky Break Project site, topsoil samples were collected across the Dingo Dam Mining Lease (ML) and were analysed by a NATA accredited laboratory. Sampling locations are shown in Figure B1.

The findings of this study indicate that soils occurring in some mine domains contain elevated levels of chromium (Cr), cobalt (Co) and nickel (Ni), which are known to occur at high concentrations throughout the laterite ore body. The sampling program revealed high levels of Cr, Co and Ni at two reference sites, reference site 1 (REF 1) and reference site 4 (REF 4) (Figure B1). While REF 1 was located immediately downstream of the previous ROM area and waste rock dump (WRD) and is not considered a valid source of reference data, REF 4 (Photo Plate 1) was located upgradient from all mine disturbance. Both reference sites are mapped as occurring in the Argentine Metamorphics geological unit associated with the laterite ore body. REF 4 was located immediately adjacent to a low relief rocky outcrop with no disturbance evident at this site (Photo Plate 2). Mineralisation observed at REF 4 is therefore indicative of background metal levels in the region. Table B1 below provides a comparison of soil quality of reference site 4 and all mine domains.

Comparison of rehabilitation soil quality results against the REF 4 values for cobalt and nickel indicate that cobalt levels are higher in concentration at the ROM and diversion bund and at one site on the WRD (WRD 3). Nickel levels in the rehabilitation soils are comparatively higher across the ROM and diversion bund. As demonstrated in these results, chromium is known to be present at elevated levels in the soils of the Lucky Break Project site due to the presence of black chromite grains which reflect the insoluble nature of chromite in the laterite environment.

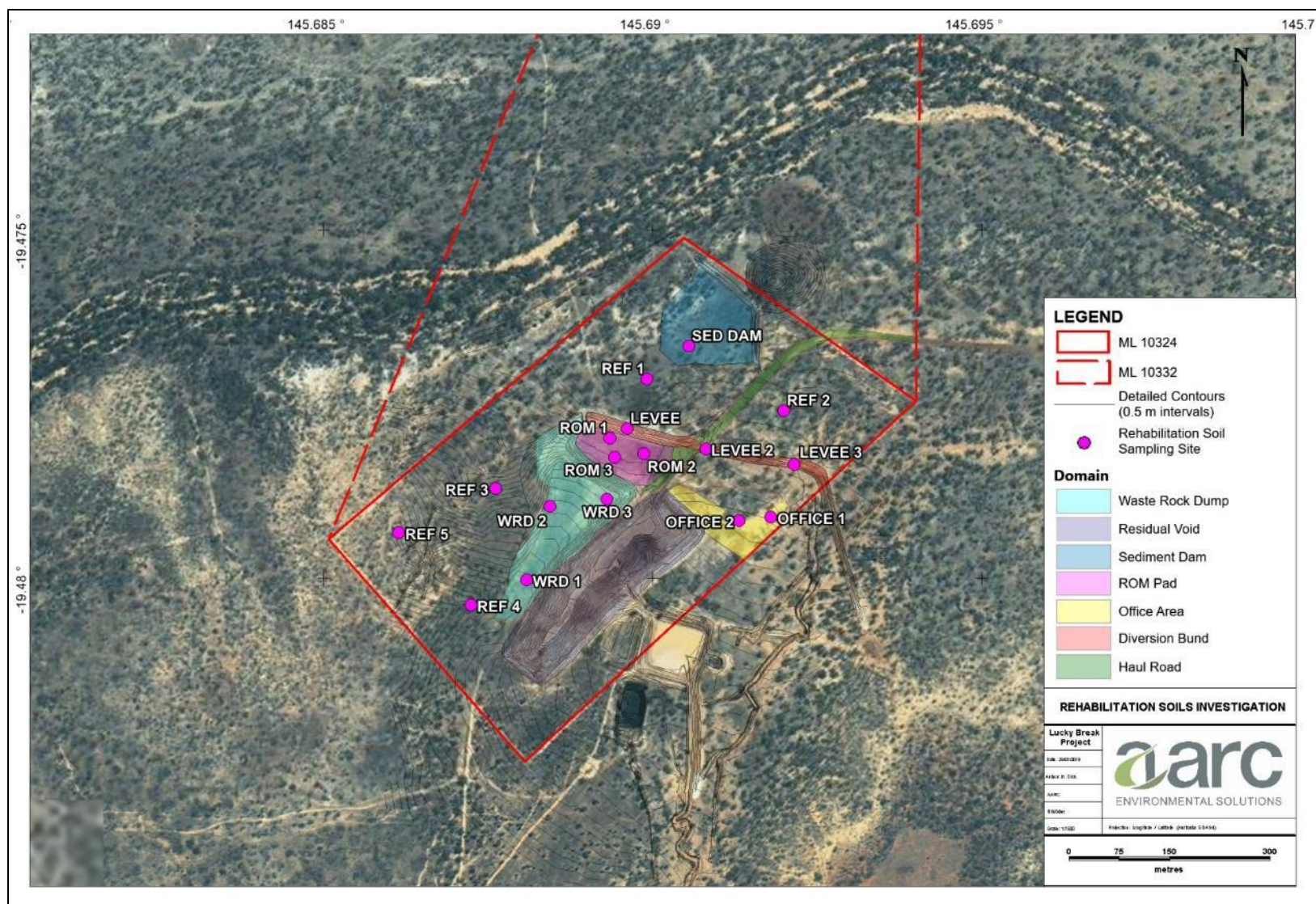


Figure B1 – Rehabilitation Sampling Sites at Lucky Break

Table B1 – Reference Site 4 Comparison of Mine Rehabilitation Soils

Domain	Site ID	Analyte		Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc
		Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Waste Rock Dump	WRD1		Total Metals	11 800	13	<50	<1	297	131	26	16	1440	1090	34
	WRD2			14 200	13	<50	2	275	128	49	18	896	1040	79
	WRD3			8240	6	<50	3	861	197	43	26	1570	1890	75
ROM	ROM 1			11 200	9	<50	3	1130	472	45	18	2050	7350	231
	ROM 2			9700	7	<50	3	1370	191	28	12	1240	2540	94
	ROM 3			13 000	12	<50	3	816	465	60	23	2150	5310	176
Office	OFFICE 1			4890	<5	<50	1	688	74	13	12	518	515	21
	OFFICE 2			5710	7	<50	<1	156	36	22	7	242	368	32
Sediment Dam	LEVEE			13 200	116	<50	2	337	495	79	19	2450	3620	158
	LEVEE 2			6750	6	<50	3	551	731	102	36	5320	4180	204
	LEVEE 3			4740	<5	<50	2	963	80	20	23	880	1940	54
	SED DAM 1			13 600	10	<50	1	429	101	34	20	462	1910	105
Reference Sites	REF 1			20 500	12	<50	1	508	90	35	20	874	1110	59
	REF 2			8870	8	<50	<1	58	8	14	11	276	25	24
	REF 3			6350	45	<50	<1	54	12	20	<5	233	34	22
	REF 4			15 700	6	<50	2	589	148	14	<5	1160	3420	108
	REF 5			3290	11	<50	<1	4	4	18	6	383	7	15

Note: Values shaded in blue are higher than the representative reference site REF 4 values.



Photo Plate 1 – REF 4 Topsoil Sampling Site



Photo Plate 2 - Rocky outcrop at REF 4

Reference sites 2 and 3 (REF 2 and REF 3) are mapped as occurring in the same surface geology unit (Argentine Metamorphics) as reference sites 1 and 4 (REF 1 and REF 4) (Figure B2) but were found to contain low metal concentrations. It should be noted however, that these sites are located close to the boundary of the very small Argentine Metamorphic geology unit and the results may be indicative of the surrounding geological unit (Quaternary alluvial) (Figure B2).

Reference site 5 (REF 5) was located in a different geological unit (Whipole Spring Granite) to that of the mine disturbance areas and recorded low metal concentrations. Detailed surface geology mapping indicates that areas of mine disturbance predominantly occur in the Argentine Metamorphics geological unit (Figure B2).

Assessment of Background Drilling Data

During the drilling campaign at Lucky Break, background metal levels for Cr, Co and Ni were recorded within the Dingo Dam ore body. Geological data recorded to a depth of 1 m from 211 drilling sites was extracted from the drill database to demonstrate the extent of background mineralisation at shallow depths across the Project site. The shallow depth metals distributed across the laterite ore body are also represented graphically in the drilling cross-sections provided in Figure B3.

Table B2 provides a comparison of the quality characteristics of rehabilitation soils against mean, median and 95th percentile values for the Project's surface geology data (to a depth of 1 m). All available metals data for Cr, Co and Ni recorded in the 0 to 1 m section of the Lucky Break drilling samples is provided in Table 3.

This comparative analysis revealed that, of the existing rehabilitation topsoils, no areas contain concentrations of Cr, Co or Ni close to or above the 95th percentile of the surface geology data. Parts of the ROM pad (ROM 1 and ROM 3) and diversion bunds (Levee and Levee 2) were found to contain Co concentrations above the mean (345.6 mg/kg) and median (170 mg/kg) values, while ROM 1 recorded a Ni concentration above the mean (6018.5 mg/kg) and median (4350 mg/kg) values.

Summary and Conclusions

The findings of these comparative analyses indicate that within the office area, Sediment Dam and WRD area, metal concentrations are generally consistent with background levels recorded at reference site 4 and are lower than mean surface (to 1 m deep) geology concentrations. For the most part, this analysis suggests the rehabilitation soils are consistent with natural mineralisation of topsoil associated with the lateritic ore body. The ROM pad and diversion bunds may contain traces of subsurface material.

Table B2 - Lucky Break Soil Quality Results for each Mine Domain

Domain	Site ID	Analyte	Total Metals	Aluminium	Arsenic	Boron	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Zinc
		Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DRILLING DATA	All Drill Sites	mean		n/a	n/a	n/a	n/a	4505	345.6	n/a	n/a	n/a	6018.5	n/a
		median		n/a	n/a	n/a	n/a	3760	170	n/a	n/a	n/a	4350	n/a
		min		n/a	n/a	n/a	n/a	550	10	n/a	n/a	n/a	300	n/a
		max		n/a	n/a	n/a	n/a	12 700	3460	n/a	n/a	n/a	25 200	n/a
		95th %ile		n/a	n/a	n/a	n/a	12 590	1256	n/a	n/a	n/a	16 360	n/a
Waste Rock Dump	WRD1			11 800	13	<50	<1	297	131	26	16	1440	1090	34
	WRD2			14 200	13	<50	2	275	128	49	18	896	1040	79
	WRD3			8240	6	<50	3	861	197	43	26	1570	1890	75
ROM	ROM 1			11 200	9	<50	3	1130	472	45	18	2050	7350	231
	ROM 2			9700	7	<50	3	1370	191	28	12	1240	2540	94
	ROM 3			13 000	12	<50	3	816	465	60	23	2150	5310	176
Office	OFFICE 1			4890	<5	<50	1	688	74	13	12	518	515	21
	OFFICE 2			5710	7	<50	<1	156	36	22	7	242	368	32
Water Management Structures	LEVEE			13 200	116	<50	2	337	495	79	19	2450	3620	158
	LEVEE 2			6750	6	<50	3	551	731	102	36	5320	4180	204
	LEVEE 3			4740	<5	<50	2	963	80	20	23	880	1940	54
	SED DAM 1			13 600	10	<50	1	429	101	34	20	462	1910	105
Reference Sites	REF 1			20 500	12	<50	1	508	90	35	20	874	1110	59
	REF 2			8870	8	<50	<1	58	8	14	11	276	25	24
	REF 3			6350	45	<50	<1	54	12	20	<5	233	34	22
	REF 4			15 700	6	<50	2	589	148	14	<5	1160	3420	108
	REF 5			3290	11	<50	<1	4	4	18	6	383	7	15

Note: Values shown in **bold** are higher than the representative median values for all drill data (0 to 1 m depth). Values shaded in **green** are higher than the representative mean values for all drill data (0 to 1 m depth).

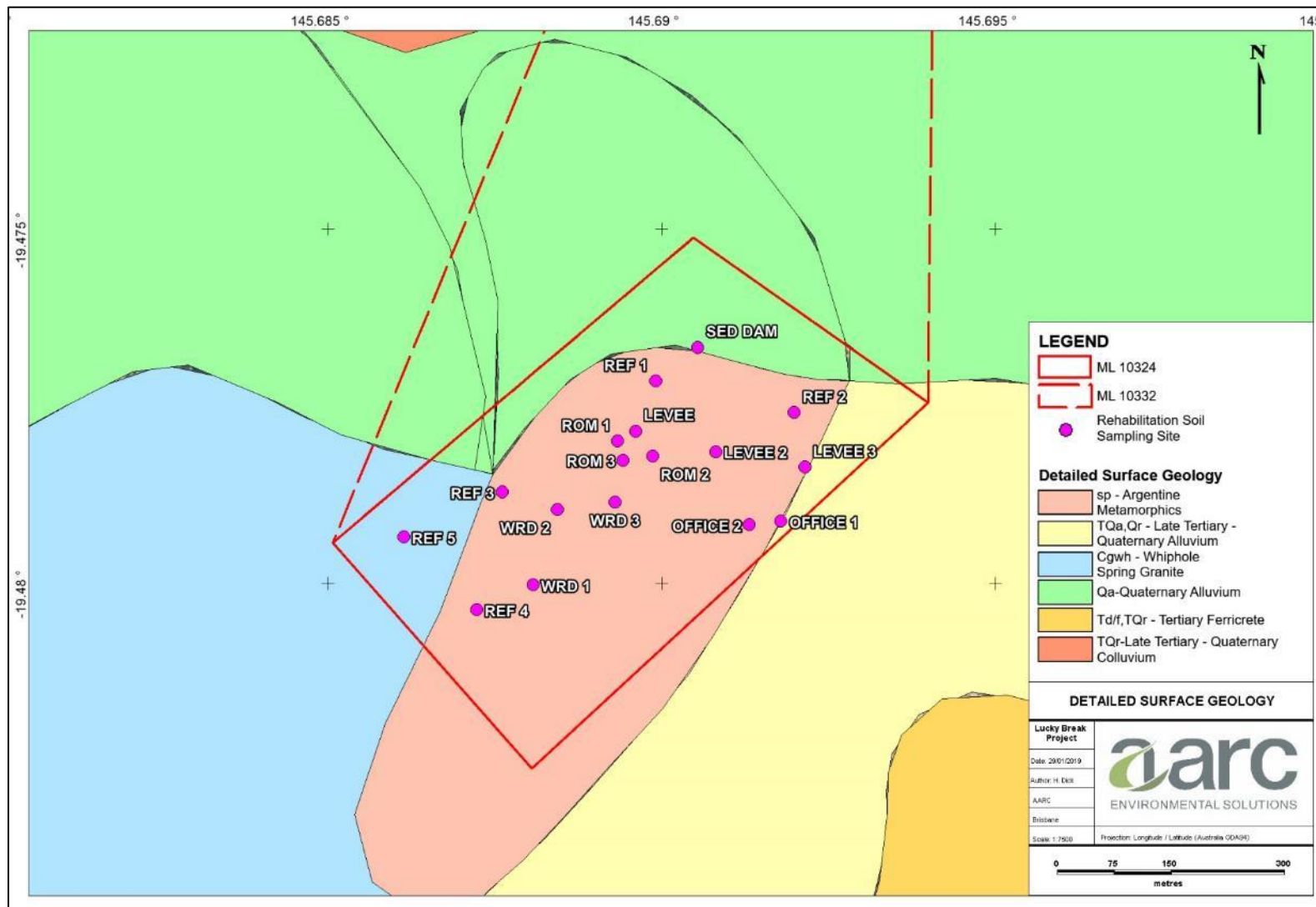


Figure B2 – Detailed Surface Geology of the Lucky Break Project Site

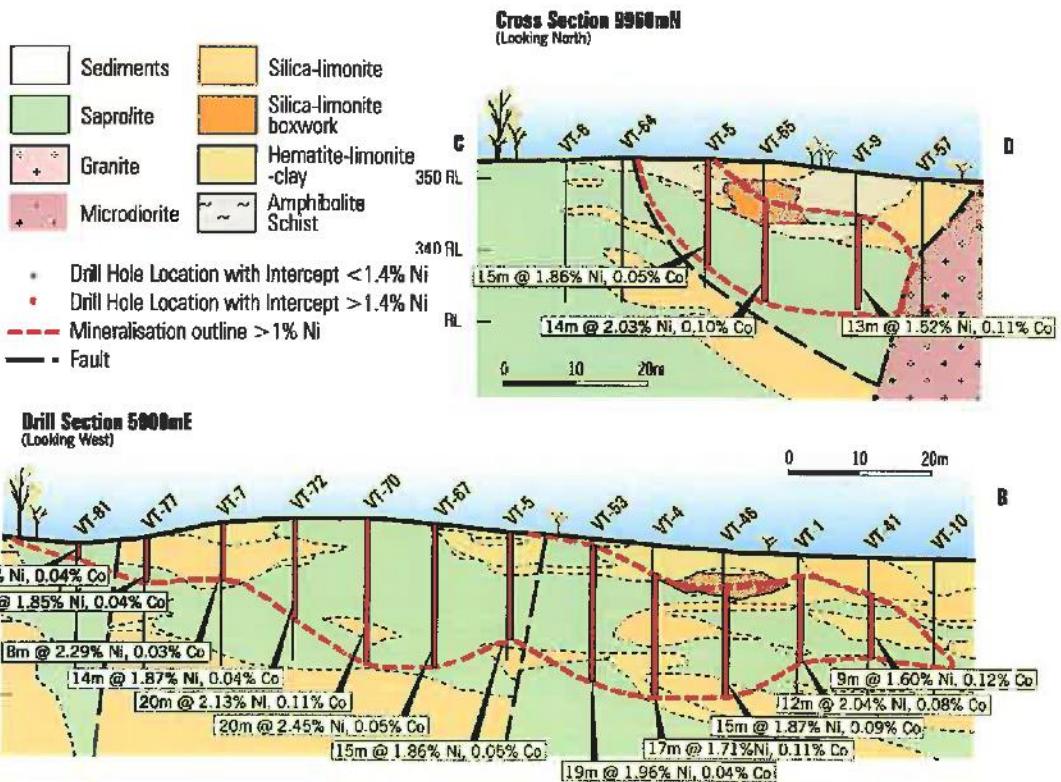
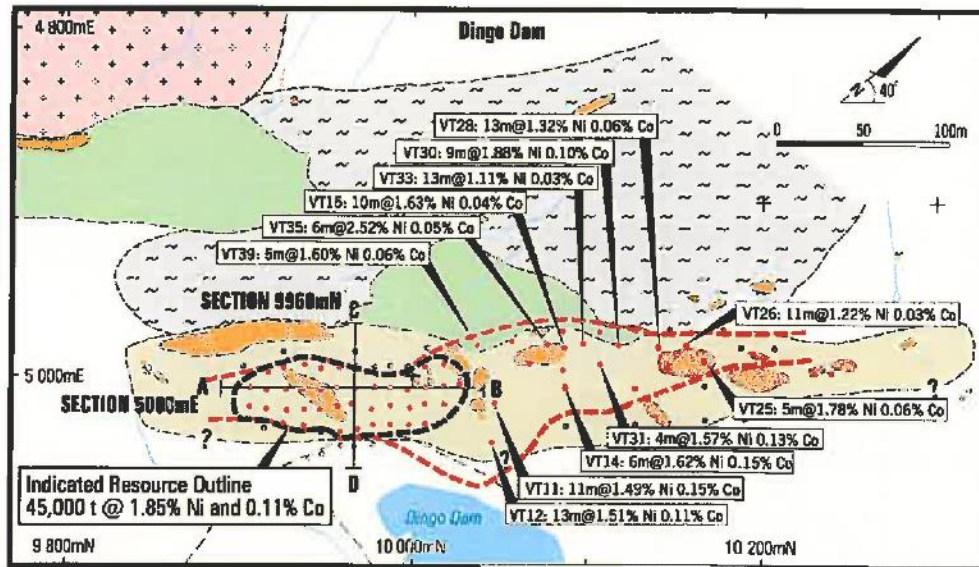


Figure B3 - Lucky Break Drilling Cross-sections

Table B3 - Lucky Break Drilling Data – Metals Data from 0 to 1 m deep

DRILL DATA (0 - 1 m)					
Hole identification	Sample depth (m) - From	Sample depth (m) - To	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)
DD001	0	1		240	6100
DD002	0	1		440	8500
DD003	0	1		660	2600
DD004	0	1		630	3500
DD005	0	1		410	4000
DD006	0	1		1520	8000
DD007	0	1		10	300
DD009	0	1		140	2300
DD010	0	1		450	4600
DD011	0	1		360	15 400
DD012	0	1		240	12 300
DD013	0	1		40	1200
DD014	0	1		130	5100
DD015	0	1		50	1800
DD016	0	1		70	4400
DD017	0	1		210	5900
DD018	0	1		40	3800
DD019	0	1		580	7500
DD020	0	1		110	3800
DD021	0	1		160	4400
DD022	0	1		420	16 600
DD023	0	1		270	16 600
DD024	0	1		90	1500
DD025	0	1		100	1400
DD026	0	1		70	1700
DD027	0	1		470	5400
DD028	0	1		410	10 200
DD029	0	1		2580	8500
DD030	0	1		720	3400
DD031	0	1		180	11 000
DD032	0	1		90	4200
DD033	0	1		80	1700
DD034	0	1		3460	2900
DD035	0	1		60	1300
DD036	0	1		20	300
DD037	0	1		50	500
DD038	0	1		20	400
DD039	0	1		140	2000
DD040	0	1		140	3500
DD041	0	1		80	1800
DD042	0	1		170	3100
DD043	0	1		680	4000
DD044	0	1		70	1600
DD045	0	1		90	2800

DRILL DATA (0 - 1 m)					
Hole identification	Sample depth (m) - From	Sample depth (m) - To	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)
DD046	0	1		70	3400
DD047	0	1		180	6400
DD048	0	1		100	3900
DD049	0	1		250	5900
DD050	0	1		70	2800
DD051	0	1		390	4800
DD052	0	1		630	5900
DD053	0	1		1070	5300
DD054	0	1		720	25 200
DD055	0	1		1810	10 700
DD056	0	1		70	3700
DD057	0	1		90	6500
DD058	0	1		110	3700
DD059	0	1		120	3400
DD060	0	1		160	6500
DD061	0	1		120	7300
DD062	0	1		170	7200
DD063	0	1		250	8700
DD064	0	1		60	3600
DD065	0	1		60	6300
DD066	0	1		100	2900
DD067	0	1		50	1800
DD068	0	1		90	3800
DD069	0	1		80	2700
DD070	0	1		100	4300
DD071	0	1		160	4800
DD072	0	1		1020	15 700
DD073	0	1		70	4000
DD074	0	1		60	1600
DD075	0	1		80	4200
DD076	0	1		50	1900
DD077	0	1		70	3700
DD078	0	1		70	2600
DD079	0	1		160	5800
DD080	0	1		170	2300
DD081	0	1		60	2200
DD083	0	1		290	14 200
DD084	0	1		200	8200
DD085	0	1		200	3900
DD086	0	1		70	4300
DD087	0	1		60	4000
DD088	0	1		90	3900
DD089	0	1		830	24 500
DD090	0	1		610	21 700
DD091	0	1		1220	8800

DRILL DATA (0 - 1 m)					
Hole identification	Sample depth (m) - From	Sample depth (m) - To	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)
DD092	0	1		100	2900
DD093	0	1		80	2700
DD094	0	1		110	2900
DD095	0	1		150	3700
DD096	0	1		310	4200
DD097	0	1		120	2800
DD098	0	1		150	4600
DD099	0	1		200	3000
DD100	0	1		150	2700
DD101	0	1		130	2000
DD102	0	1		120	2100
DD103	0	1		100	4600
DD104	0	1		160	4300
DD118	0	1		860	4000
DD121	0	1		340	5400
DD130	0	1		460	8500
DD131	0	1		1610	6700
DD133	0	1		390	9000
DD136	0	1		650	4900
DD141	0	1	550	110	2870
DD142	0	1	5120	130	3430
DD143	0	1	5870	70	1750
DD144	0	1	4040	160	4020
DD145	0	1	2190	230	6830
DD146	0	1	6590	130	4210
DD166	0	1	720	40	910
DD167	0	1	12 700	3190	7150
DD174	0	1	1680	170	3080
DD182	0	1	6180	190	4180
DD183	0	1	7940	700	5370
DD184	0	1	1830	1060	7060
DD186	0	1	1250	70	3810
DD187	0	1	10 500	140	6790
DD194	0	1	3450	170	6760
DD195	0	1	4330	670	8010
DD196	0	1	2240	1090	8400
DD197	0	1	3480	260	5510
DD198	0	1	6470	140	6510
DD246	0	1	2970	230	3430
VT001	0	1		115	4290
VT002	0	1		60	3040
VT003	0	1		160	9820
VT004	0	1		115	2830
VT005	0	1		1310	17 400
VT006	0	1		185	5530

DRILL DATA (0 - 1 m)					
Hole identification	Sample depth (m) - From	Sample depth (m) - To	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)
VT007	0	1		260	24 000
VT008	0	1		160	4320
VT009	0	1		56	3810
VT010	0	1		94	2970
VT011	0	1		120	6970
VT012	0	1		130	3940
VT013	0	1		210	7120
VT014	0	1		105	2800
VT015	0	1		670	9560
VT016	0	1		82	4240
VT017	0	1		92	3060
VT018	0	1		48	1150
VT019	0	1		110	2110
VT020	0	1		120	2530
VT021	0	1		135	1940
VT022	0	1		160	3440
VT023	0	1		160	3380
VT024	0	1		625	5140
VT025	0	1		375	4640
VT026	0	1		690	7270
VT027	0	1		240	7600
VT028	0	1		255	6030
VT029	0	1		525	11 600
VT030	0	1		125	3000
VT031	0	1		160	4840
VT032	0	1		1640	10 900
VT033	0	1		1050	7740
VT034	0	1		480	16 000
VT035	0	1		665	18 400
VT036	0	1		145	4940
VT037	0	1		195	5050
VT038	0	1		420	7980
VT039	0	1		670	10 000
VT040	0	1		170	5630
VT041	0	1		360	9660
VT042	0	1		215	5210
VT043	0	1		180	11 700
VT044	0	1		150	3700
VT045	0	1		275	3780
VT046	0	1		140	4030
VT047	0	1		175	4470
VT048	0	1		180	4320
VT049	0	1		205	7730
VT050	0	1		98	2670
VT051	0	1		190	2660

DRILL DATA (0 - 1 m)					
Hole identification	Sample depth (m) - From	Sample depth (m) - To	Cr (mg/kg)	Co (mg/kg)	Ni (mg/kg)
VT052	0	1		235	3930
VT053	0	1		320	7160
VT054	0	1		285	4190
VT055	0	1		270	4810
VT056	0	1		76	1650
VT057	0	1		170	4910
VT058	0	1		170	7410
VT059	0	1		170	7600
VT060	0	1		110	3840
VT061	0	1		460	8090
VT062	0	1		2250	8480
VT063	0	1		150	7000
VT064	0	1		160	3240
VT065	0	1		56	3390
VT066	0	1		170	2390
VT067	0	1		1680	11 300
VT068	0	1		715	13 200
VT069	0	1		555	16 800
VT070	0	1		270	8090
VT071	0	1		475	10 700
VT072	0	1		1040	13 000
VT073	0	1		300	16 200
VT074	0	1		135	6580
VT075	0	1		78	3080
VT076	0	1		210	10 700
VT077	0	1		340	13 300
VT078	0	1		265	4350
VT079	0	1		555	7050
VT080	0	1		86	2240
VT081	0	1		285	12 400
VT082	0	1		850	21 500
VT083	0	1		220	12 400
Mean			4505	345.6	6018.5
Median			3760	170	4350
Minimum			550	10	300
Maximum			12 700	3460	25 200
95th % ile			12 590	1256	16 360

Appendix C **Surface Water and Sediment Quality Analysis Results**

Table C1: Surface Water Quality Analysis Data

Analyte grouping/Analyte	Sampling Site Type		Receiving Water		Receiving Water Reference Monitoring Points						Receiving Water Downstream Monitoring Points							Site Water Storages (SED DAM 1, OCP, Dingo Dam RL)									
	Sample Date:		EA Trigger Level	EA Release Contaminant Limit	07/02/2019	19/02/2019	02/04/2019	19/02/2019	04/04/2019	05/04/2019	07/02/2019	19/02/2019	03/04/2019	19/09/2018	13/12/2018	19/02/2019	03/04/2019	04/04/2019	19/09/2018	07/02/2019	19/02/2019	18/09/2018	13/12/2018	18/02/2019	07/02/2019	19/02/2019	
					SNAKE CREEK US	LB US1	LB US1	LB US2	LB US2	LB US4	SNAKE CREEK DS	LB DS1	LB DS1	LB DS2	LB DS2	LB DS2	LB DS2	LB DS3	DINGO DAM	DINGO DAM RL	DINGO DAM RL	OCP	OCP	OCP	SED DAM	SED DAM	
	Sampling Site Name																										
	Unit	LOR																									
Laboratory Measurements - Physico-chemical Parameters																											
pH Value	pH Unit	0.01	---	---	6.75	6.8	7.27	6.94	6.69	6.51	6.83	7.14	7.24	8.07	8.63	7.12	7.29	7.17	7.72	6.78	6.86	7.64	7.5	6.87	6.72	7.06	
Sodium Adsorption Ratio		0.01	---	---	0.77	1.63	1.79	1.63	1.92	2.15	0.77	1.63	1.92	2.47	0.57	1.53	1.92	1.43	1.53	1.86	1.55	2.16	1.2	1.55	1.2	1	
Electrical Conductivity @ 25°C	µS/cm	1	888	1000	59	108	102	107	109	116	58	108	104	496	205	108	105	110	261	90	95	162	110	96	75	183	
Total Dissolved Solids (Calc.)	mg/L	1	---	---	38	70	66	70	71	75	38	70	68	322	133	70	68	72	170	58	62	105	72	62	49	119	
Total Hardness as CaCO3	mg/L	1	---	---	12	18	12	18	12	13	12	18	12	112	70	18	12	16	64	11	13	21	19	13	11	48	
Hydroxide Alkalinity as CaCO3	mg/L	1	---	---	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	<1	<1	<1	<1	<1	<1	<1	<1	
Carbonate Alkalinity as CaCO3	mg/L	1	---	---	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	11	0.5	0.5	0.5	<1	<1	<1	<1	<1	<1	<1	<1	
Bicarbonate Alkalinity as CaCO3	mg/L	1	---	---	25	31	29	32	22	31	27	34	30	163	75	38	31	28	82	24	22	37	32	23	26	64	
Total Alkalinity as CaCO3	mg/L	1	---	---	25	31	29	32	22	31	27	34	30	163	87	38	31	28	82	24	22	37	32	23	26	64	
Sulfate as SO4 - Turbidimetric	mg/L	1	---	1000	0.5	0.5	0.5	0.5	12	0.5	0.5	1	0.5	3	2	1	0.5	2	2	3	2	4	3	4	2	2	
Chloride	mg/L	1	---	---	5	14	13	14	13	16	5	13	14	58	10	13	13	15	32	12	14	28	16	13	8	14	
Calcium	mg/L	1	---	---	3	4	3	4	3	2	3	4	3	30	20	4	3	3	9	1	2	2	1	2	1	6	
Magnesium	mg/L	1	---	---	1	2	1	2	1	2	1	2	1	9	5	2	1	2	10	2	2	4	4	2	2	8	
Sodium	mg/L	1	---	---	6	16	14	16	15	18	6	16	15	60	11	15	15	13	28	14	13	23	12	13	9	16	
Potassium	mg/L	1	---	---	3	2	2	2	2	1	3	2	2	5	7	2	2	4	2	2	3	3	1	3	3	7	
Fluoride	mg/L	0.1	---	---	0.05	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	
Ammonia as N	mg/L	0.01	---	---	0.06	0.03	0.04	0.03	0.08	0.09	0.07	0.04	0.06	0.04	0.03	0.04	0.05	0.09	0.01	0.1	0.07	<0.01	0.14	0.06	0.11	0.06	
Nitrite as N	mg/L	0.01	---	---	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrate as N	mg/L	0.01	---	---	0.05	0.2	0.005	0.18	0.01	0.04	0.005	0.01	0.005	0.01	0.02	0.01	0.01	0.005	<0.01	0.34	0.01	0.04	0.24	0.16	0.17	<0.01	
Nitrite + Nitrate as N	mg/L	0.01	---	---	0.05	0.2	0.005	0.18	0.01	0.04	0.005	0.01	0.005	0.01	0.02	0.01	0.01	0.005	<0.01	0.34	0.01	0.04	0.24	0.16	0.17	<0.01	
Total Kjeldahl Nitrogen as N	mg/L	0.1	---	---	0.3	0.5	0.3	0.2	0.2	0.4	0.3	0.2	0.2	1.7	1.8	0.2	0.3	1.3	0.7	0.5	0.5	1.3	2.4	0.5	0.5	0.9	
Total Nitrogen as N	mg/L	0.1	---	---	0.4	0.7	0.3	0.4	0.2	0.4	0.3	0.2	0.2	1.7	1.8	0.2	0.3	1.3	0.7	0.8	0.5	1.3	2.6	0.7	0.7	0.9	
Total Phosphorus as P	mg/L	0.01	---	---	0.03	0.04	0.02	0.01	0.02	0.03	0.02	0.01	0.02	0.09	0.11	0.02	0.02	0.19	0.05	0.12	0.04	0.15	0.85	0.08	0.08	0.07	
Reactive Phosphorus as P	mg/L	0.01	---	---	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Total Anions	meq/L	0.01	---	---	0.64	1.01	0.95	1.03	1.06	1.07	0.68	1.07	0.99	4.96	2.06	1.15	0.99	1.02	2.58	0.88	0.88	1.61	1.15	0.91	0.79	1.72	
Total Cations	meq/L	0.01	---	---	0.57	1.11	0.89	1.11	0.94	1.07	0.57	1.11	0.94	4.98	2.07	1.07	0.94	0.98	2.54	0.87	0.91	1.51	0.95	0.91	0.68	1.83	
Ionic Balance	%	0.01	---	---			2.94		6.05	0.1			3.04	0.2			2.63	2.1	----	----	----	----	----	----	----	----	

Analyte grouping/Analyte	Sampling Site Type		Receiving Water		Receiving Water Reference Monitoring Points						Receiving Water Downstream Monitoring Points							Site Water Storages (SED DAM 1, OCP, Dingo Dam RL)									
	Sample Date:		EA Trigger Level	EA Release Contaminant Limit	07/02/2019	19/02/2019	02/04/2019	19/02/2019	04/04/2019	05/04/2019	07/02/2019	19/02/2019	03/04/2019	19/09/2018	13/12/2018	19/02/2019	03/04/2019	04/04/2019	19/09/2018	07/02/2019	19/02/2019	18/09/2018	13/12/2018	18/02/2019	07/02/2019	19/02/2019	
					SNAKE CREEK US	LB US1	LB US1	LB US2	LB US2	LB US4	SNAKE CREEK DS	LB DS1	LB DS1	LB DS2	LB DS2	LB DS2	LB DS2	LB DS3	DINGO DAM	DINGO DAM RL	DINGO DAM RL	OCP	OCP	OCP	SED DAM	SED DAM	
	Unit	LOR																									
Dissolved Metals																											
Aluminium	mg/L	0.01	0.055	---	0.53	0.43	0.55	0.35	0.48	0.22	0.67	0.5	0.43	0.02	0.07	0.29	0.4	0.67	0.1	1.19	0.69	0.13	0.2	0.6	1.06	0.4	
Arsenic	mg/L	0.001	0.013	---	0.001	0.002	0.002	0.002	0.002	0.008	0.001	0.002	0.002	0.01	0.014	0.002	0.002	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.004	
Cadmium	mg/L	0.0001	0.0002	---	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	mg/L	0.001	0.001	---	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	<0.001	0.002	<0.001	0.001	0.002	0.001	0.002	<0.001	
Cobalt	mg/L	0.001	0.0014	---	0.0005	0.0005	0.0005	0.0005	0.0005	0.005	0.0005	0.0005	0.0005	0.002	0.001	0.0005	0.0005	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	
Copper	mg/L	0.001	0.0014	---	0.002	0.001	0.001	0.0005	0.001	0.002	0.003	0.001	0.001	0.003	0.0005	0.001	0.0005	0.002	0.001	0.002	0.001	0.002	<0.001	0.001	0.002	<0.001	
Lead	mg/L	0.001	0.0034	---	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Nickel	mg/L	0.001	0.011	---	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.003	0.003	0.0005	0.0005	0.004	0.002	0.006	0.004	0.008	0.02	0.005	0.01	0.026	
Zinc	mg/L	0.005	0.008	---	0.0025	0.0025	0.014	0.0025	0.014	0.01	0.0025	0.0025	0.007	0.0025	0.0025	0.0025	0.0025	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Mercury	mg/L	0.0001	---	---	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Total Metals																											
Aluminium	mg/L	0.01	---	5	2.21	1.73	1.87	1.42	1.16	1.39	1.51	1.57	1.32	0.57	1.3	1.57	0.98	12.4	2.83	7.4	2.46	8.04	43.1	5.42	6.13	1.68	
Arsenic	mg/L	0.001	---	0.5	0.002	0.003	0.003	0.003	0.003	0.01	0.002	0.003	0.003	0.013	0.015	0.003	0.002	0.004	0.002	0.002	0.002	0.003	0.009	0.002	0.002	0.005	
Cadmium	mg/L	0.0001	---	0.01	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	
Chromium	mg/L	0.001	---	1	0.002	0.0005	0.001	0.0005	0.0005	0.001	0.001	0.0005	0.001	0.0005	0.001	0.0005	0.0005	0.022	0.008	0.029	0.007	0.036	0.666	0.021	0.029	0.006	
Cobalt	mg/L	0.001	---	1	0.0005	0.0005	0.0005	0.0005	0.0005	0.006	0.0005	0.0005	0.0005	0.003	0.003	0.0005	0.0005	0.006	<0.001	0.004	<0.001	0.003	0.111	0.003	0.004	0.006	
Copper	mg/L	0.001	---	1	0.004	0.002	0.002	0.002	0.002	0.005	0.004	0.002	0.002	0.003	0.004	0.003	0.002	0.014	0.003	0.011	0.004	0.012	0.066	0.008	0.01	0.002	
Lead	mg/L	0.001	---	0.1	0.005	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.004	0.008	0.002	0.002	0.014	0.001	0.005	0.001	0.005	0.042	0.004	0.004	<0.001	
Nickel	mg/L	0.001	---	1	0.001	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.004	0.005	0.0005	0.0005	0.026	0.019	0.063	0.009	0.095	3.6	0.039	0.094	0.042	
Zinc	mg/L	0.005	---	20	0.007	0.0025	0.0025	0.0025	0.0025	0.008	0.007	0.0025	0.0025	0.0025	0.011	0.0025	0.0025	0.026	0.008	0.022	0.011	0.026	0.168	0.016	0.017	0.006	
Mercury	mg/L	0.0001	---	---	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Table C2: Stream Sediment Quality Analysis Data

Analyte	Unit	LOR	EA Trigger Level	EA Contaminant Limit	Sep-18		Apr-19								
					Reference	Downstream	Reference						Downstream		
					REMP DS2	REMP US2	LB US1	LBUS2	LBUS3	LBUS4	LBDS1	LBDS2	LBDS3		
Sulfate as SO4 2-	mg/kg	100	---	---	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	
Aluminium	mg/kg	50	---	---	1300	1150	430	600	1670	520	460	620	970		
Arsenic	mg/kg	5	20	70	7	7	<5	<5	<5	<5	<5	<5	<5		
Cadmium	mg/kg	1	1.5	10	<1	<1	<1	<1	<1	<1	<1	<1	<1		
Chromium	mg/kg	2	80	370	4	3	<2	<2	36	<2	<2	<2	8		
Cobalt	mg/kg	2	---	---	<2	<2	<2	<2	4	<2	<2	<2	4		
Copper	mg/kg	5	65	270	<5	<5	<5	<5	5	<5	<5	<5	<5		
Lead	mg/kg	5	50	220	7	5	<5	6	6	7	6	9	14		
Nickel	mg/kg	2	21	52	<2	<2	<2	<2	8	<2	<2	<2	2		
Zinc	mg/kg	5	200	410	6	5	<5	<5	7	<5	<5	5	<5		

Appendix D **Mine Void Geotechnical Stability Study,
Hydrological Assessment and Consequence
Category Assessment of the Void (ATCW 2019
b-d)**

Our Ref: 118284-02-L001-1.docx

16 August 2019

Australian Mine Limited
C/-
AARC Environmental Solutions Ltd
Suite 5, 1 Swann Road
TARINGA QLD 4068

ATTENTION HOLLIE DICK:

Dear Hollie,

**ASSESSMENT OF THE DINGO DAM RESIDUAL MINE VOID & DINGO DAM MINING LEASE
CONSEQUENCE CATEGORY ASSESSMENTS.**

1 PROJECT BACKGROUND

The Lucky Break Project is an open cut nickel mine located in central Queensland, some 90km northwest of Charters Towers. The Project encompasses two MLs known as Dingo Dam (ML 10324) and Lucky Break (ML 10332).

Mining activities have previously been undertaken on the Dingo Dam ML in which Queensland Nickel Pty Ltd (QNPL) extracted ore product on behalf of NORNICO, the previous Environmental Authority holder (EPML00900713). Mining ceased in July 2015 at which point the balance of ore reserves in the Dingo Dam deposit have been left in place for potential later mining by the Lucky Break Project.

At the cessation of mining the Project entered a care and maintenance period and QNPL commenced rehabilitation of the site. Rehabilitation activities undertaken include the removal of infrastructure, re-profiling of the waste dump, reducing batter angles of the residual void, installing stormwater controls, ripping hardstand areas, spreading topsoil and seeding and installing fences. Sconi Mining Operations Pty Ltd, a subsidiary of Australian Mines Limited (AML), has since taken over the Lucky Break Project.

1.1 Assessment Objectives

The objective of the Residual Void Assessment carried out by ATC Williams (ATCW) is to present the focussed risks associated with the residual mining void within the Dingo Dam Mining Lease. This short letter report presents the findings of three individual focus studies carried out as per ATCW project proposal *118284-02P001-rev0*. The studies are:

- Hydrological Study
- Hydrogeological Study
- Mine Void Geotechnical Stability Study

Subsequent to the Dingo Dam mine void assessment A Consequence Category Assessment (CCA) was carried out for relevant structures within the Dingo Dam ML and is also presented by this letter report.

As per the project proposal, the Site's EA conditions addressed by submission of this report are as follows:

- *D1 - Assessment of consequence category*

The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635) at the following times:

- a) prior to the design and construction of the structure, if it is not an existing structure; or*
- b) if it is an existing structure, prior to the adoption of this schedule; or*
- c) prior to any change in its purpose or the nature of its stored contents*

- *D2 - A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.*

- *D3 - Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635).*

- **D26 - Register of Regulated Dams**

A Register of Regulated Dams must be established and maintained by the holder for each regulated dam.

- **C7 - Residual Void Outcome**

Residual voids must not cause any serious environmental harm to land, surface waters or any

recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself, and subject to any other condition within this Environmental Authority

- *C8 - The holder of this Environmental Authority must manage mining voids during the operation and decommissioning phases to maximise the potential post mine beneficial uses, by consideration of the following:*

- a) limiting sulphide exposures in void walls; and*
- b) capping of sulphide exposures in void base; and*
- c) limiting period of exposure of sulphides in void walls and base to oxidising conditions; and*
- d) managing catchment into the void; and*
- e) geo-technical stability of final void.*

- *C9 - Decommissioning strategies for the final voids must be provided in the Post Mine Land Use Plan including the following information:*

- a) final potential wall and base rock exposure quality in terms of acid producing potential and levels of environmentally relevant salts and metals; and*
- b) expected periods of exposure for wall and base rock with acid producing potential; and*
- c) management options for maximising final void water quality; and*
- d) assessment of potential final void water quality.*

1.2 Assessments Summary

Hydrological Study (Dingo Dam Mining Void)

A hydrological assessment of the site to determine the potential for surface water interaction with the residual void was conducted. A water balance model using GoldSIM calculated the spill risk of the void and a long-term equilibrium pit water level.

The Hydrological Assessment is presented in **Attachment 1**.

Hydrogeological Desktop Study (Dingo Dam Mining Void)

ATCW sub-contracted GeoSquare to carry out a hydrogeological assessment of the site to determine the potential for groundwater interaction with the residual void. The hydrogeological study will assess the potential for groundwater inflow into the residual void, the potential for pit water to seep into any local groundwater aquifer. The assessment is based on existing available data and associated interpretation by a hydrogeologist.

The Hydrogeological study is presented in **Attachment 2**.

Pit Wall Desktop Stability Study (Dingo Dam Mining Void)

The pit wall geotechnical stability assessment is based on associated drilling logs, Geoscience Australia geological maps, site photographs and pit wall slope angles from available survey. The potential long-term stability of the void, including geotechnical issues and the effects of erosion and weathering is assessed.

The Pit Wall Stability Assessment is presented in **Attachment 3**.

Consequence Category Assessment (relevant storages on Dingo Dam ML)

ATC Williams carried out a Consequence Category Assessment (CCA) for the Dingo Dam mining void, Dingo Dam and the Sediment Dams. The CCA is carried out in accordance with *The Manual*¹ and categorised each structure appropriate for submission to the regulator. The CCA was completed in conjunction with the AARC Environmental Solutions Letter Report (RE: Environmental Consequence Advice - Lucky Break Project, 01 May 2019). The CCA includes a certification statement for submission to the Regulator.

The Consequence Category Assessment is presented in **Attachment 4**.

¹ *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures • ESR/2016/1933 • Version 5.01 • Effective: 29 MAR 16*

2 CONCLUDING COMMENTS

We trust this meets your current requirements.

Yours sincerely,



THOMAS ROSE
Project Engineer
ATC Williams Pty Ltd



LIS BOCZEK
Principal Engineer
ATC Williams Pty Ltd

Our Ref: 118284-02-L002-2.docx

16 August 2019

Australian Mines Limited
C/-
AARC Environmental Solutions Ltd
Suite 5, 1 Swann Road
TARINGA QLD 4068

ATTENTION: HOLLIE DICK

Dear Hollie,

HYDROLOGICAL ASSESSMENT OF THE DINGO DAM RESIDUAL MINE VOID

1 ASSESSMENT OBJECTIVE

The objective of the Water Balance assessment carried out by ATCW is to estimate the spill risk of the residual mining void at Dingo Dam. The assessment utilised a probabilistic water balance model (WBM) to estimate water inventories within the Dingo Dam mining void and the modelled probability of the void overflowing (spilling) and associated modelled spill volume.

2 DINGO DAM MINING VOID WATER BALANCE MODEL

A water balance model was developed to provide an understanding the expected water levels within the mining void over time and assess the annual spill risk probability. Model development was based on the Dingo Dam survey (2019), geological information, site rainfall data and assumed the implementation of various bunding which effectively isolates the pit from external catchment inflows.

The water balance model was developed using Goldsim Pro, a dynamic probabilistic simulation program. The model uses a range of parameters to represent the catchment surface water flow system, being routed through a time series of daily rainfall data for an estimate of daily runoff. Monte Carlo simulations are performed to assess the water balance subject to the uncertainty of the input data (principally rainfall).



ATC Williams Pty Ltd
ABN 64 005 931 288
Melbourne T: +61 3 8587 0900 Perth T: +61 8 9213 1600 Brisbane T: +617 3352 7222
www.atcwilliams.com.au



2.1 Model Inputs

Input data adopted for the water balance model are summarised in **Table 1**.

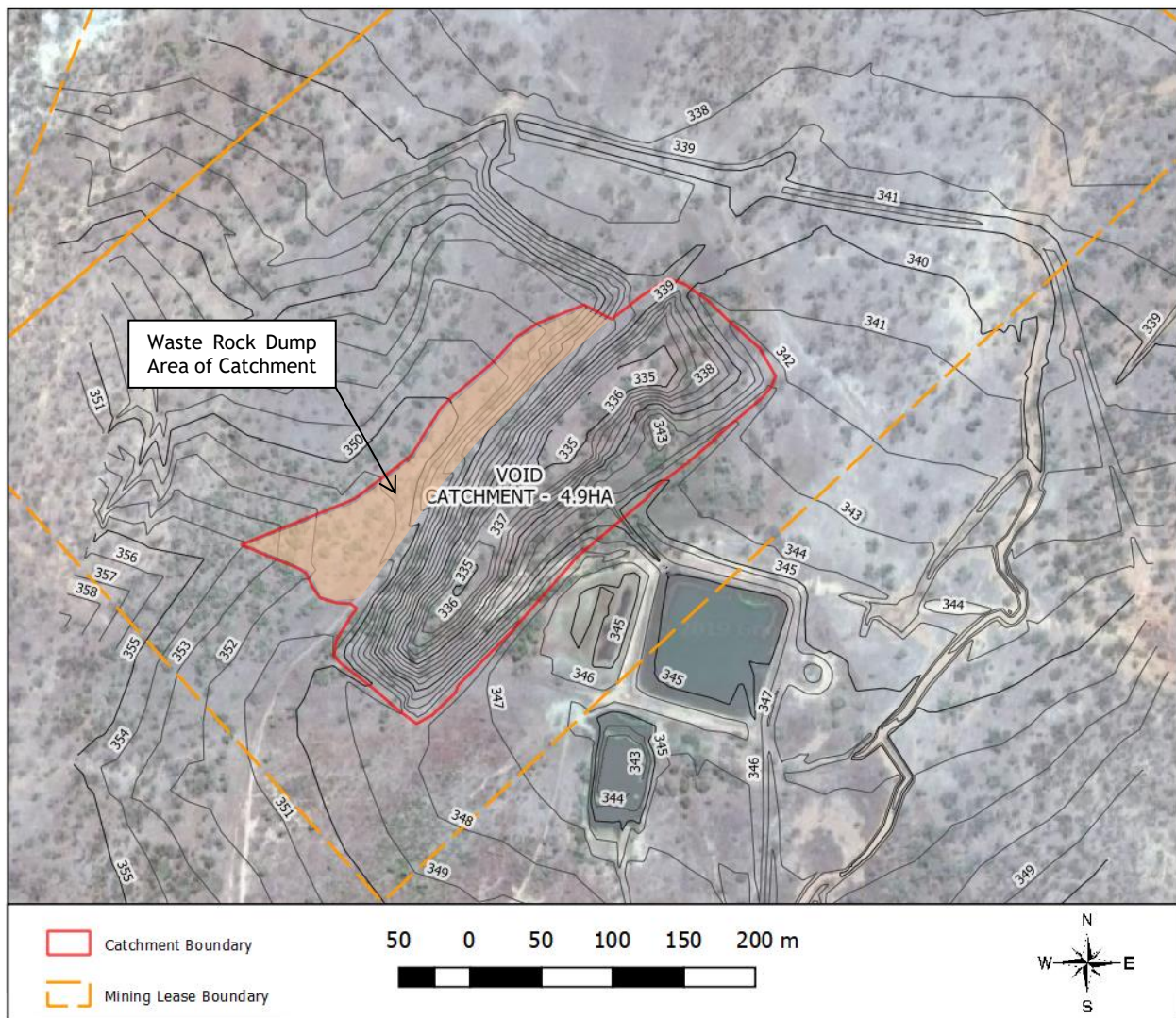
Table 1
Site Water Balance - Input Data

Model Parameter	Available Data	Data Source	Comments
Climate Data			
Rainfall	Daily rainfall (1889 to 2018)	SILO Datadrill for Site	Input to the surface runoff model (AWBM) and incident rainfall over site structures.
Evaporation	Morton’s (1983) evaporation over shallow lakes		Input to the calculated evaporative loss from site structures based on water surface area within the structure.
Evapotranspiration	Daily evapotranspiration data calculated using the FAO’s reference short crop method, assuming a constant wind speed of 2 m/s. (1889-2018)		Input to the surface runoff model (AWBM) defining potential evapotranspiration losses from catchment surfaces
Storage Data and Catchment			
Stage Storage Curve	Digital Elevation Model	Site Survey (Rowlands, 2019)	High quality recent ground survey data suitable for stage storage curve development
Soil Data			
Groundwater Interaction	Hydrogeological Model	Geosquare Hydrogeological report (2019)	Report indicates no discernible groundwater interaction at the site

2.1.1 Mining Void Catchment

The catchment area adopted for the mining void assumes various works at site are undertaken with the resulting catchment area shown in **Plate 1**. The full footprint of the Waste Rock Dump (located at the western spur of the catchment shown) is assumed to report to the mining void, however underlying ground conditions may result in these flows reporting elsewhere. In this regard, the model is considered conservative and represents the maximum possible inflow conditions.

Plate 1
Adopted Mining Void Catchment



2.1.2 Climate and Rainfall

The project site, located in Northern Queensland, is subject to a tropical climate. This climate is associated with variable rainfall conditions; however, average values indicate a distinct seasonal pattern with lower rainfall conditions associated with winter months and higher rainfall conditions during the summer months. The wet season occurs from November to March, with 81% of mean annual rainfall occurring during these months.

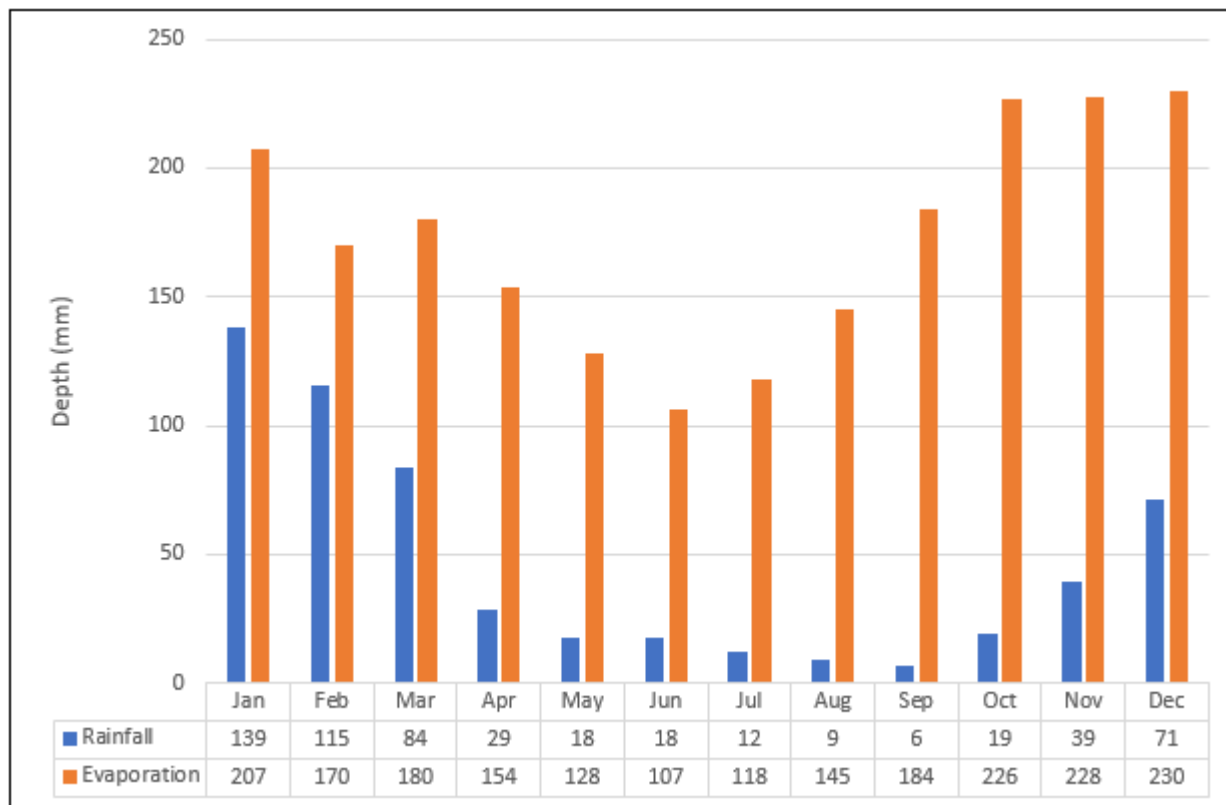
The nearest Bureau of Meteorology station to the site, with the longest data history, is Hillgrove weather station (No. 30137), located approximately 18km to the south-east. Data from this station shows that mean annual rainfall is some 553mm. The months with the highest and lowest average rainfall are January and August, respectively.

Hillgrove station does not have long term evaporation data; therefore, all climate data has been sourced from a SILO Data Drill specific to the site location, with details as follows:

Latitude: 19° 30' S
Longitude: 145° 42' E
Elevation: 388m
Period: 01/01/1889 - 28/03/2019 (truncated to 2018)

Plate 2 summarises the average rainfall and evaporation for all months of the year for the SILO Data Drill location. Evaporation was assessed from Class A evaporation pan data existing between 1970 and 2018 within the SILO Data Drill series.

Plate 2
Mean Rainfall and Evaporation



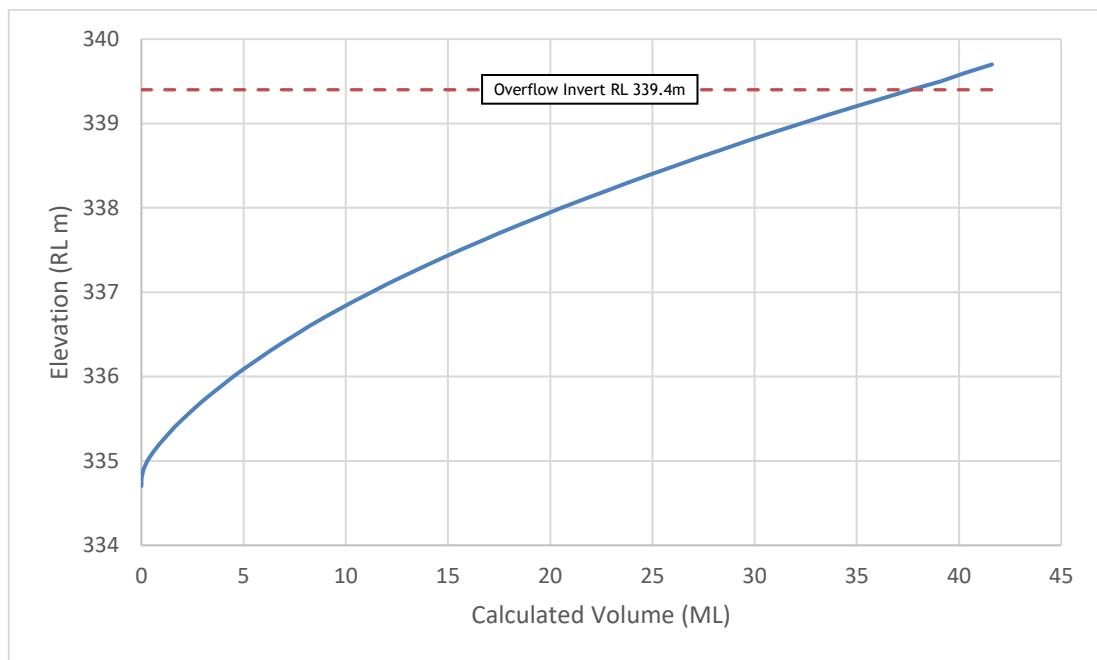
Source: BOM Hillgrove station (No. 30137) and SILO Data Drill requested for the site location.

Plate 2 indicates that evaporation exceeds mean monthly rainfall throughout the entire year. On an average monthly basis, maximum evaporation occurs later in the year (October to December). During the dry season months, evaporation is significantly lower, with the lowest monthly total typically occurring in June.

2.1.3 Mining Void Stage Storage Curve

A stage storage curve was developed for the Dingo Dam mining void to facilitate the water balance model and is based on the Rowlands (2019) ground survey of the site (refer **Plate 3**). The overflow elevation is noted as RL 339.4m, which was assessed through interpretation of the survey. The storage volume to the overflow invert level is estimated at 37.7 ML.

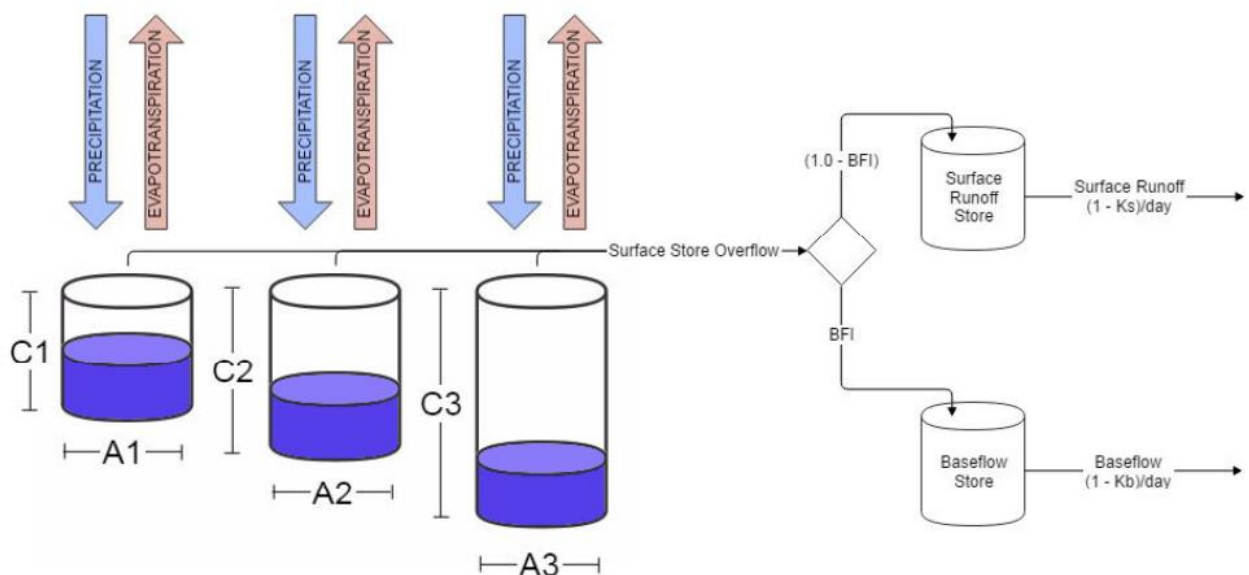
Plate 3
Dingo Dam Mining Void Stage Storage Curve



2.1.4 Catchment Runoff Estimation

The Australian Water Balance Model (AWBM, 2004) was utilised to simulate daily runoff from rainfall generated within the various sub-catchment types that are present on the project site. **Plate 4** represents a schematic of the AWBM model, reproduced from Boughton (2009).

Plate 4
Schematic of the AWBM Rainfall-Runoff Model



Source: Boughton, 2009.

Where:
 C1 - C3 = Surface Storage Capacities
 A1 - A3 = Partial Areas Represented by Surface Storages
 BFI = Baseflow Index
 K_b = Daily Baseflow Recession Constant
 BS = Current Volume in Baseflow Store
 K_s = Daily Surface Flow Recession Constant
 S = Current Volume in Surface Store Routing

The catchment types and AWBM model parameters used to simulate these different catchment types and the average yields from these catchments are summarized in **Table 2**. AWBM model parameters have been selected based on experience with similar water balance model studies.

Table 2
AWBM Model Parameters

Catchment	Split Areas (sum=1.0)			Storage Capacities (mm)			Average Surface Store	K _s (day-1)	BFI	K _b (day-1)
	A1	A2	A3	C1	C2	C3				
WRD (1.19ha)	0.2	0.8	0	10	300	300	242 mm	0.9	0.2	0.9
Void (3.71ha)	0.1	0.9	0	5	20	20	18.5 mm	0	0	1

2.2 Modelled Scenarios

The Dingo Dam mining void is a single structure and assumed to be isolated from external catchments based on the proposed construction of various bunds at site (refer ATCW 118284-01L001-0). No active management occurs at the site (i.e. transfer of water to other storages, or usage of water for other activities such as construction or dust suppression) so only a single scenario has been modelled.

The water balance model was run for a period of 5 years to help understand the impact of consecutive high rainfall wet seasons and determine whether a long-term water level trend would establish.

2.3 Initial Condition

Site photographs of the mine void taken by AARC during site inspection in September 2018, December 2018, February 2019 and April 2019 show the void water level progressing from practically empty in September 2019 to overflowing in February 2019 followed by minor recession to April 2019.

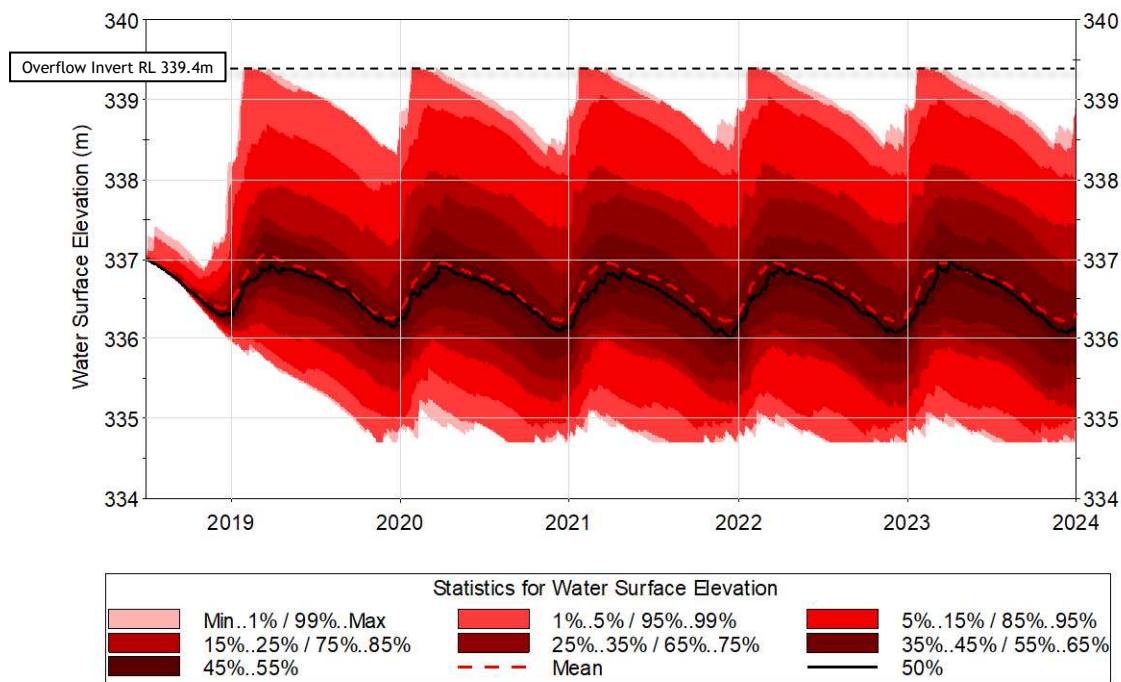
Within the water balance model the initial water level was adopted at RL 337m (2.4m below the overflow invert level), equating to an initial water storage volume of 11.2ML. This level was adopted as the initial condition as it represents a level of roughly half the depth of the void and would provide opportunity to assess whether the median water level is trending higher or low in subsequent modelled years. Note that the catchment conditions present during the site photographs listed above are dissimilar to that used within the water balance model and that correlation between model response and site observations would not be possible.

3 WATER BALANCE MODEL RESULTS

3.1 Modelled Water Surface Elevation

The modelled Water Surface Elevation (WSE) outcomes are shown in **Plate 5**, presented as calculated probabilities, based upon simulating each year of the available climate record (127 years). The plotted results represents the probability of a modelled outcome of WSE at that time of year. The 99th percentile result (shown as the lightest colour shading) represents an outcome with less than 1% chance of occurring, and so on. It is important to note that the probabilistic outcomes shown in the graphs do not directly translate to Annual Exceedance Probabilities (AEPs) of rainfall events.

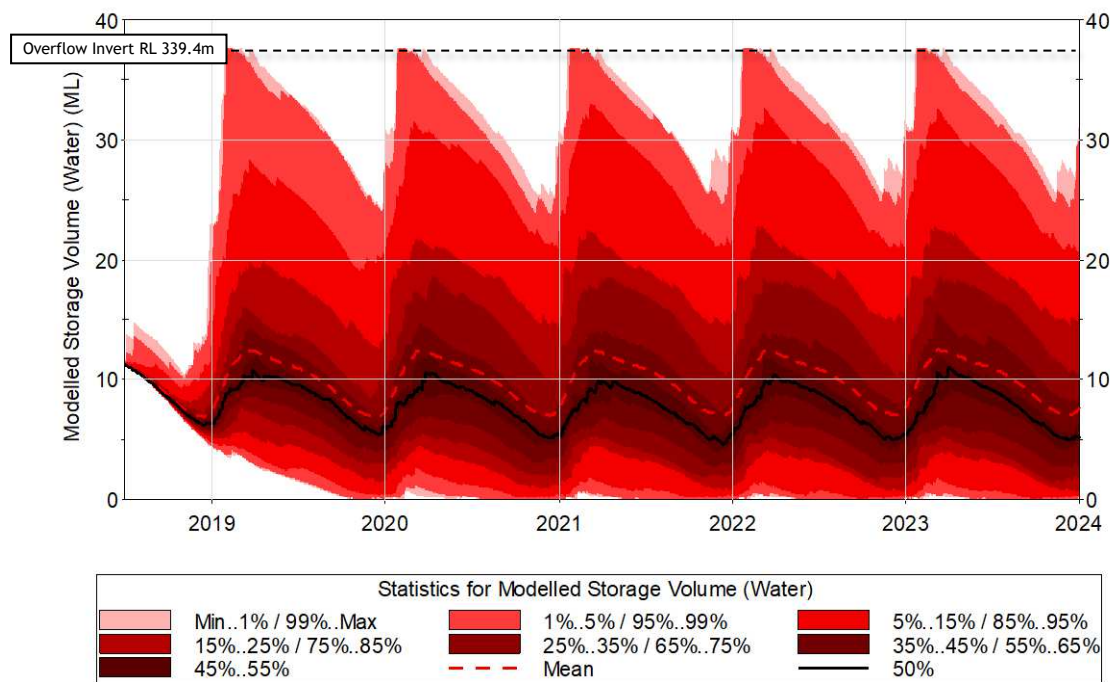
Plate 5
Modelled Probabilistic Water Surface Elevation in Dingo Dam Mine Void



3.2 Modelled Water Storage Volume

The modelled Water Storage Volume outcomes is shown in **Plate 6**, as calculated probabilities, based upon simulating each year of the available climate record (127 years). The plotted results represents the probability of a modelled outcome of WSE at that time of year. This graph represents the same information as **Plate 5**, however is shown as a volume.

Plate 6
Modelled Probabilistic Water Storage Volume in Dingo Dam Mine Void



3.3 Modelled Accumulated Spill Volume

The modelled Accumulated Spill Volume outcomes is shown in **Plate 7**, as calculated probabilities, based upon simulating each year of the available climate record (127 years). The plotted results represents the modelled cumulative volume of water which spills from the void at that time of year. The model results indicate that spills occurred in less than 5% of the modelled years of rainfall (realisations). For those sequences where spills events were modelled, multiple spills generally occurred, accumulating to total spill volumes between approximately 15ML and 21ML each year.

Plate 7
Modelled Probabilistic Accumulated Spill Volumes in Dingo Dam Mine Void



3.4 Modelled Annual Spill Probability

The modelled annual spill probability of the Dingo Dam mine void ranges between 1.6% (2 of 127 realisations) and 2.5% (3 of 127 realisations).

3.5 Model Results Discussion

The water balance modelling results show that the mining void at Dingo Dam has the potential to overflow during periods of high/extreme rainfall, with modelled overflows typically occurring in response to consecutive high rainfall events over a short period (i.e. wet season), rather than a single storm event. As seepage losses are negligible and evaporation is low compared to rainfall during the wet season, the modelled results indicates that the void overtops multiple times during a high/extreme rainfall wet season (as show on **Plate 7**).

Analysis of the Water Balance Model from an initial dry condition (no water within the mine void) shows that overtopping was modelled in 2 of the 127 years of climate data available, indicating that a single wet season has the potential to result in a spill from the mine void.

The results indicate that the median modelled water storage volume generally trends consistently around 10ML with no overall increase or decrease over the modelled rainfall sequence. It is therefore that the annual spill risk would not be expected to increase over time.

3.6 Limitations

The WBM models the accumulation of water within the Dingo Dam mine void. The WBM does not analyse groundwater flow interactions, or saturated / unsaturated flow (seepage) regimes. Accordingly, ingress through seepage, or other hydrogeological systems was not modelled.

It is noted that the Dingo Dam mining void water balance model has an unknown degree of error due to limited calibration opportunities and the accuracy and resolution of model input data. As such the results presented in the assessment should be considered with a level of conservatism.

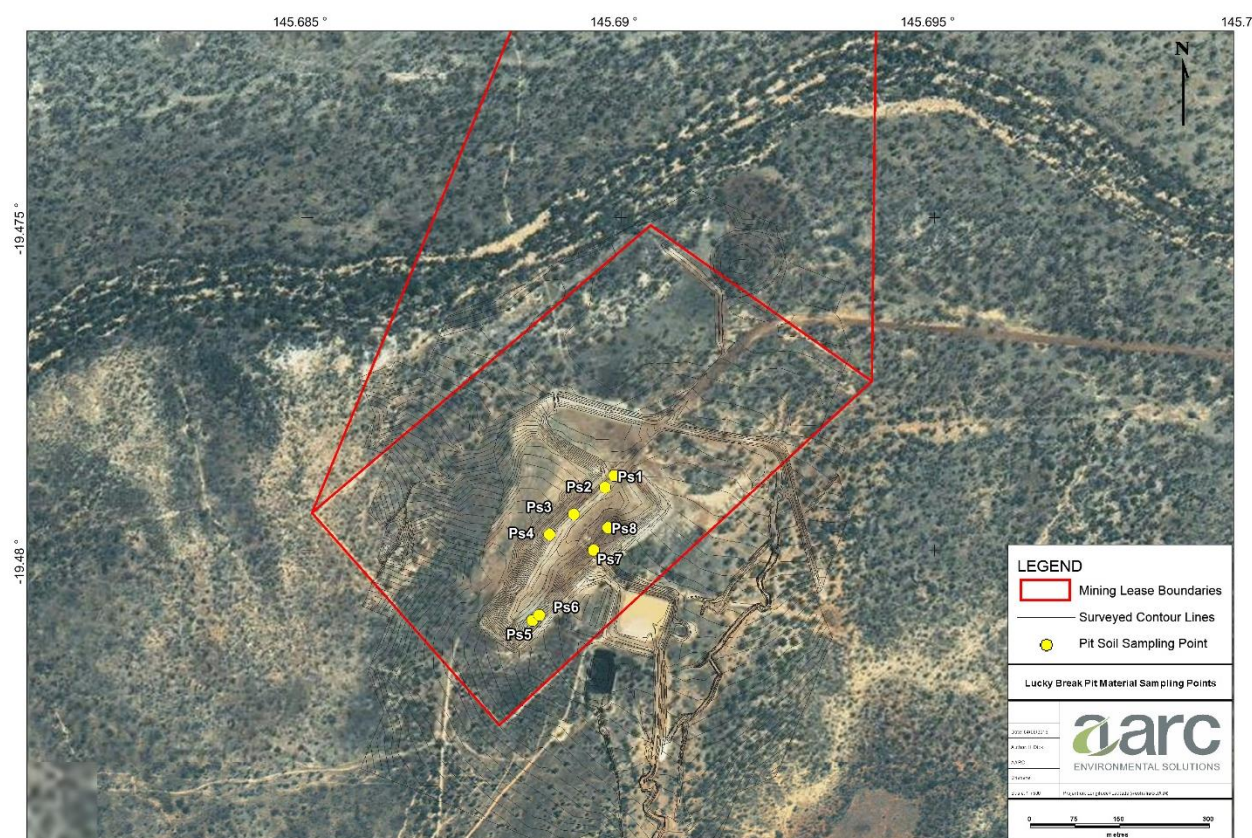
The length of the modelled time period within the water balance model may also impact the reliability of the result, with the uncertainty within the model result increasing with length of time period modelled.

4 VOID WATER QUALITY CONSIDERATIONS

As presented in **Section 3**, a spill from the Dingo Dam mining void is possible during a high rainfall wet season (November to April - see **Section 3.4 and 3.5** for modelled spill probability and discussion). The water likely to be contained within the void and potentially released to the environment due to spills would primarily be accumulated rain water; however, contaminants which could potentially enter the void would be primarily associated with leaching from the surrounding surface soils and void surfaces.

To assess the potential water quality from runoff into the void and as a result of leaching of any contaminants from the void surfaces, AARC undertook geochemical analysis of eight surface material grab samples within the void at the locations identified in **Plate 8**. The samples were selected as they were considered representative of the different void surface materials.

Plate 8
Location of AARC Surface Material Grab Samples in Dingo Dam Mine Void



The surface soil grab samples were analysed to assess:

- pH, Electrical Conductivity (EC) and Sulphur
- Acid Neutralising Capacity
- Acid Forming Potential
- Water Extractable Elements

4.1 Assessment of Laboratory Analysis

Assessment of the laboratory analysis (**Attachment 1**) was undertaken by AARC and provided to ATCW, summarised in Sections 4.1.1 to 4.1.4.:

4.1.1 pH, EC & Sulphur

Existing pH provides an indication of the likely pH condition of runoff from the pit walls. The results show that the pH (1 soil :5 water leach (1:5)) ranged from 7.6 to 8.5, indicating that materials represented by the samples were neutral to alkaline at the time of testing.

The EC provides an indication of the inherent salinity of a topsoil material that forms the walls of the residual void. The EC (1:5) ranged from 11 to 66 $\mu\text{S}/\text{m}$ indicating that the samples were non-saline.

The total sulphur contents of the samples were very low ranging from <0.01 to 0.03 %. With the exception of one sample, all samples from the walls of the residual void recorded a total S content below the limit of reporting (0.01%).

4.1.2 Acid Neutralising Capacity

The ANC of the samples varied greatly from 4.1 to 466 $\text{kg H}_2\text{SO}_4/\text{t}$, with an average of 110.7 $\text{kg H}_2\text{SO}_4/\text{t}$ and a median value of 19.05 $\text{kg H}_2\text{SO}_4/\text{t}$. 75% of the samples had an ANC of less than 30 $\text{kg H}_2\text{SO}_4/\text{t}$ indicating that the majority of samples have a low ANC.

4.1.3 Acid Forming Potential

The Acid Base Account (ABA) evaluates the balance between acid generation processes (oxidation of sulfide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases and weathering of silicates) (Jones *et al.*, 2016). The acid base account is based on the Maximum Potential Acidity (MPA) and the inherent ANC of the tested samples. Total sulfur has been used as a conservative estimate of pyritic sulfur (i.e. all S is assumed to be present in the form of pyrite) to calculate MPA ($\text{MPA} = \text{weight\% S} \times 30.6$).

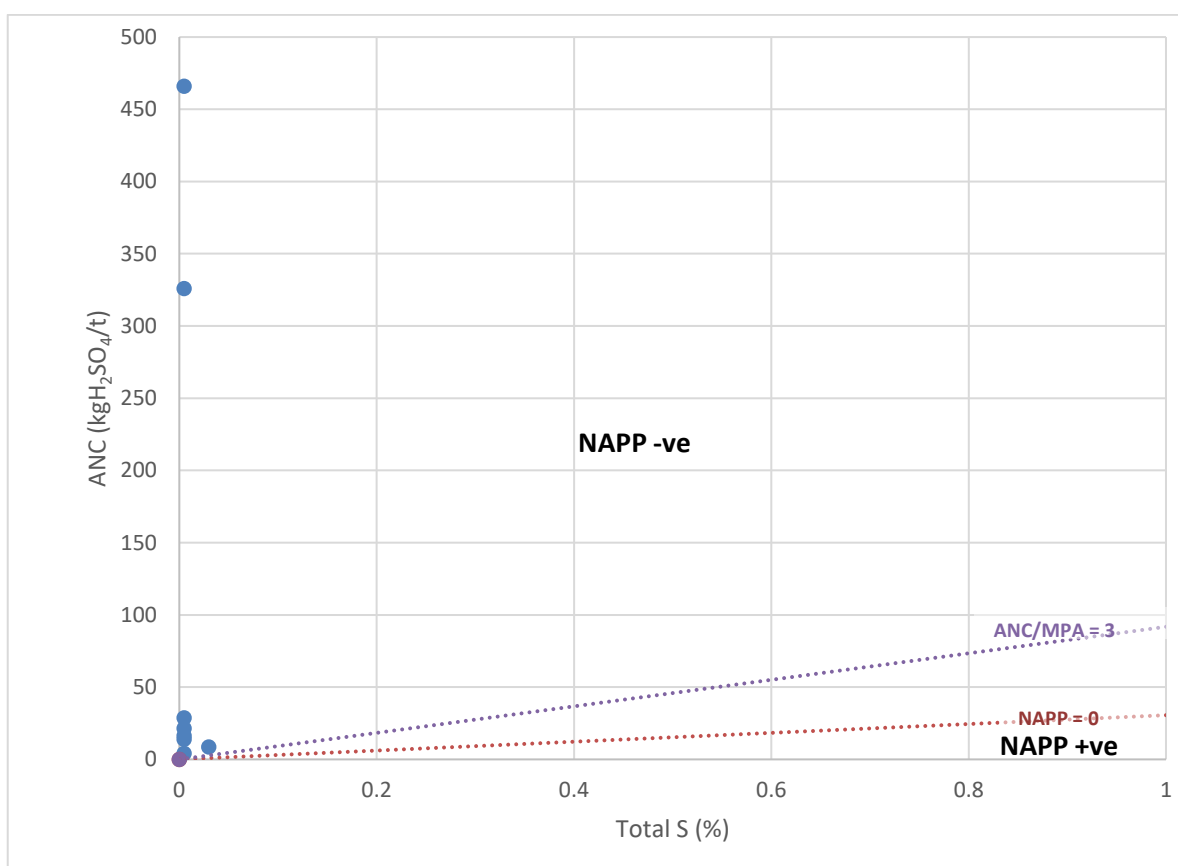
If the MPA is less than the ANC then the NAPP is negative, indicating that the sample may have sufficient ANC to prevent acid generation. If the MPA exceeds the ANC then the NAPP is positive, indicating that the material may be acid generating (Jones *et al.*, 2016).

The acid forming characteristics of the samples are presented in **Attachment 1. Plate 9** presents the ABA plot of the void surface material samples indicating NAPP negative and positive domains. A $\text{NAPP} = 0$ line is included in the ABA plot to separate NAPP positive and negative domains and is equivalent to an ANC/MPA ratio of 1. This plot has been scaled to demonstrate the distribution of all samples which have a total S content less than 1 % S. **Plate 9** shows all samples lie in the NAPP negative domain.

All of the samples tested have an ANC/MPA ratio greater than 3. The ANC/MPA ratio is used as an indication of the relative factor of safety within the NAPP negative domain. Usually a ratio of 2 or more signifies a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to Acid Rock Drainage (ARD) (Jones *et al.*, 2016). An ANC/MPA ratio of 3 or higher indicates a high probability that the material will be non-acid forming (NAF).

Most samples recorded an ANC of less than 50 $\text{kg H}_2\text{SO}_4/\text{t}$, while two samples recorded significant excess ANC (>100 $\text{kg H}_2\text{SO}_4/\text{t}$). On average the pit material contains an ANC of 110.7 $\text{kg H}_2\text{SO}_4/\text{t}$ which can be classified as Acid Consuming (NAF-AC).

Plate 9
Acid Base Account Plot of total S versus ANC



The NAG pH test is used in association with the NAPP to classify the acid-generating potential of a sample. As the NAG pH test is completely independent of the NAPP approach, the combination of the NAPP and NAG pH provides greater certainty to the assessment of ARD potential (Jones *et al.*, 2016)¹.

The standard criteria used to classify the ARD potentials of the void material samples are shown in **Table 3**.

Table 3
Standard Geochemical Classification Criteria (source: Jones et al., 2016)

Primary Geochemical Material Type	NAPP (kg H ₂ SO ₄ /t)	NAG pH
Potentially Acid Forming (PAF)	>10	< 4.5
Potentially Acid Forming - Low Capacity (PAF-LC)	0 to 10	< 4.5
Non-Acid Forming (NAF)	Negative	≥ 4.5
Acid Consuming (AC)	Less than -100	≥ 4.5
Uncertain	Positive	≥ 4.5
	Negative	< 4.5

¹ Jones, D. R., Taylor, J., Pape, S., McCullough, C. D., Brown, P., Garvie, A., Appleyard, S., Miller, S., Unger, C. J., Laurencont, T., Slater, S., Williams, D., Scott, P., Fawcett, M., Waggitt, P. and Robertson, A. (2016) *Preventing acid and metalliferous drainage - Leading Practice Sustainable Development Program for the Mining Industry*. Canberra: Commonwealth of Australia.

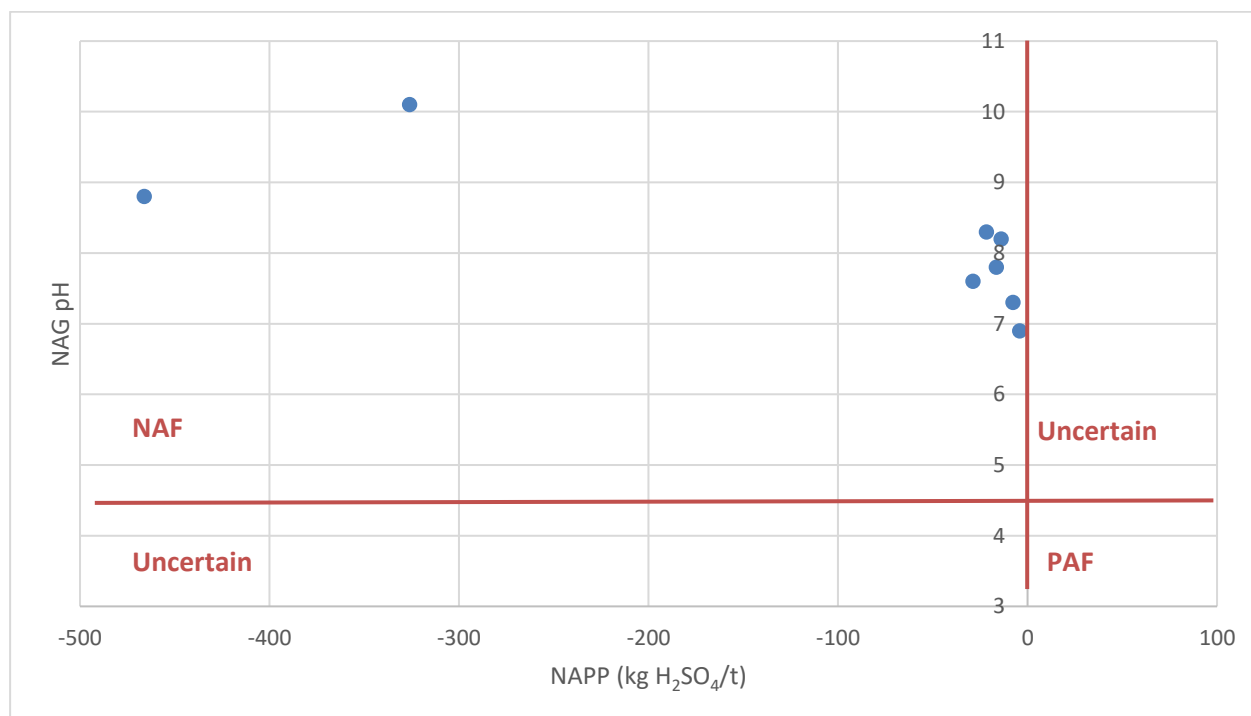
The primary geochemical classification types are described as follows:

- Potentially Acid Forming (PAF) material is likely to result in acidification and ARD generation during exposure to atmospheric conditions; and
- Non-Acid Forming (NAF) material generally contains ANC sufficient to neutralise any acid that might have been produced by sulphide oxidation; and
- Uncertain (UC) material shows disparity between the NAPP and NAG results. A sample may have a negative NAPP and a positive NAG if the ANC within sample is not readily available under NAG test conditions. Conversely, a sample may have a positive NAPP and negative NAG if some or all of the sulphur occurs in non-acid generating forms such as sulphate.

The ARD classification plot of NAPP versus NAG pH is shown in **Plate 10**. The plot clearly shows that all samples are classified as NAF.

The NAF samples are further broken down into the classification of NAF and NAF-Acid Consuming (NAF - AC). Two samples are classified as NAF - AC with $<0.5\%$ total S, $\text{pH} \geq 4.5$ and NAPP value of $<-100 \text{ kg H}_2\text{SO}_4/\text{t}$. Due to their excess ANC, these samples are classified as acid consuming. The remaining samples are classed as NAF with a negative NAPP and pH of >4.5 . NAF samples that are essentially devoid of sulphur and ANC are referred to as barren. A barren classification is given to samples which have a total sulphur content less than 0.1% sulphur and ANC less than or equal to $5 \text{ kg H}_2\text{SO}_4/\text{t}$. One sample, PS7 was considered barren with a total S concentration of $<0.1\%$ and an ANC of $4.1 \text{ kg H}_2\text{SO}_4/\text{t}$.

Plate 10
ARD Classification Plot of NAPP versus NAG pH



4.1.4 Water Extractable Elements

To evaluate the potential for leaching of metals, metalloids and other elements of environmental interest from the residual void, surface soil samples were assessed using batch extraction with deionised water using the Australian Standard Leaching Procedure (ASLP). The results show that all the samples tested had an alkaline pH (ASLP) ranging from 8.1 to 9.7. The electrical conductivities (1:5) ranged from 11 to 66 $\mu\text{S}/\text{m}$, indicating that the samples were non-saline.

The static leach testing results presented in **Table 4** show that all metals except mercury were elevated in one or more samples when compared to EA release trigger levels. The mean and median extractable concentrations for aluminium, cadmium, chromium, cobalt, copper, nickel and zinc exceeded the EA release trigger levels for dissolved metals. While all samples contained elevated concentrations of soluble aluminium, three samples (PS5 -PS7) contained particularly high concentrations ranging from 6.6 mg/L to 16.6 mg/L. As the pH of these samples is alkaline, it is most likely that the aluminium is present as colloidal forms rather than the dissolved, biologically available state.

Table 4
Dissolved Metal Concentrations extracted from Void Topsoil Material

Analyte	Aluminium	Arsenic	Cadmium	Chromium	Cobalt	Copper	Lead	Nickel	Zinc	Mercury
Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Limit of reporting	0.01	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.005	0.0001
EA Trigger Level	0.055	0.013	0.0002	0.001	0.0014	0.0014	0.0034	0.011	0.008	n/a
PS1	1.43	0.006	0.0003	0.067	0.014	0.003	0.006	0.453	0.106	<0.0001
PS2	1.45	0.001	0.0002	0.048	0.008	0.032	0.0005	0.411	0.101	<0.0001
PS3	0.33	0.0005	0.00005	0.004	0.0005	0.029	0.0005	0.011	0.029	<0.0001
PS4	0.3	0.003	0.0002	0.012	0.0005	0.029	0.0005	0.04	0.083	<0.0001
PS5	6.6	0.025	0.0004	0.062	0.023	0.075	0.003	0.365	0.169	<0.0001
PS6	16.6	0.014	0.0005	0.556	0.115	0.081	0.003	1.79	0.597	<0.0001
PS7	9.52	0.003	0.0004	0.054	0.005	0.012	0.009	0.072	0.299	<0.0001
PS8	1.48	0.002	0.0004	0.061	0.001	0.006	0.002	0.053	0.167	<0.0001
Mean	4.714	0.0068	0.0003	0.108	0.0209	0.0334	0.0031	0.3994	0.1939	<0.0001
Median	1.465	0.003	0.00035	0.0575	0.0065	0.029	0.0025	0.2185	0.1365	<0.0001

Note: Values shown in **bold** fall above the relevant EA trigger level.

To evaluate the impacts of the extractable metal concentrations on final void water quality, mean and median metal concentrations extracted across the void material samples were compared against; (a) past void water quality data, and (b) downstream receiving water quality as recorded during the recent void overtopping and release event (February 2019) (**Table 5**).

Under low storage volumes and no flow conditions, void water quality has been found to exhibit elevated concentrations of dissolved aluminium, chromium, copper and nickel. However, under high flow conditions and significant dilution, as observed during the February 2019 release event, aluminium was the only metal recorded above EA trigger levels in both stored void water, and downstream receiving water (**Table 5**).

These findings indicate that at full capacity, with the exception of aluminium, the extractable metal concentrations in stored void water are likely to be sufficiently diluted below trigger

levels in an overtopping scenario. The downstream receiving water quality results indicate further dilution of dissolved metals (including aluminium) is likely due to upstream inputs and the settlement of suspended sediment in overland runoff. Although dissolved aluminium concentrations in the downstream receiving environment remained above the EA trigger level (0.055 mg/L), this exceedance was consistent with concentrations recorded in the upstream receiving environment at this time (AARC 2019) and is considered a reflection of baseline conditions for the catchment. It should be noted also, that mean and median extractable metal/metalloid concentrations in void material fall below the Australian and New Zealand Environment and Conservation Council (ANZECC)² & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) guideline values for Livestock Drinking Water and the EA contaminant release limits (Table 5).

Table 5
Comparison of Dissolved Metal Concentrations - Extractable Concentrations in Void Material versus Void and Receiving Water Quality

Analyte	Unit	Limit of Reporting	EA Trigger Level*	EA Contaminant Limit#	Full Capacity		No Flow Conditions		High Flow Release Event		
					19/02/2019		18/09/18	13/12/18	18/02/19	19/02/19	
					Void Material - Water Extractable Concentration		Void Water Quality				Mean Receiving Water Quality
					Mean	Median					
Dissolved Metal / Metalloid											
Aluminium	mg/L	0.01	0.055	5	4.7138	1.465	0.13	0.2	0.6	0.395	
Arsenic	mg/L	0.001	0.013	0.5	0.0068	0.003	<0.001	<0.001	<0.001	0.002	
Cadmium	mg/L	0.0001	0.0002	0.01	0.0003	0.00035	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	mg/L	0.001	0.001	1	0.108	0.0575	0.001	0.002	0.001	<0.001	
Cobalt	mg/L	0.001	0.0014	1	0.0209	0.0065	<0.001	<0.001	<0.001	<0.001	
Copper	mg/L	0.001	0.0014	1	0.0334	0.029	0.002	<0.001	0.001	0.001	
Lead	mg/L	0.001	0.0034	0.1	0.0031	0.0025	<0.001	<0.001	<0.001	<0.001	
Nickel	mg/L	0.001	0.011	1	0.3994	0.2185	0.008	0.02	0.005	<0.001	
Zinc	mg/L	0.005	0.008	20	0.1939	0.1365	<0.005	<0.005	<0.005	<0.005	
Mercury	mg/L	0.0001	n/a	n/a	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	

Note: Values shown in **bold blue** shading indicate an exceedance when compared to EA trigger levels.

* EA trigger levels are based on the ANZECC & ARMCANZ (2000) guideline values for Aquatic Ecosystem Protection.

EA contaminant limits are based on the ANZECC & ARMCANZ (2000) guideline values for Livestock Drinking Water Quality.

Based on the results of the surface grab samples and the water quality during the most recent release events (see **Attachment 2**), it is considered that the long-term water quality within the mining void would be similar or better than those reported in the AARC letter dated 14 March 2019. Improvement of water quality would be expected with isolation of the void from overland inflows (as outlined in ATCW report 118284-01) and eliminating inflow of turbulent water carrying suspended sediment.

² ANZECC & ARMCANZ. (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra: Australian and New Zealand Environment & Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

5 CLOSURE

We trust that this assessment meets your current requirements.

Yours sincerely,



THOMAS ROSE
Project Engineer
ATC Williams Pty Ltd



LIS BOCZEK
Principal Engineer
ATC Williams Pty Ltd

CERTIFICATE OF ANALYSIS

Work Order : **EB1904433**
Client : **AARC Environmental Solutions Pty Ltd**
Contact : **MS HOLLIE DICK**
Address :
Telephone : **+61 07 3217 8772**
Project : **AML LUCKY BREAK**
Order number :
C-O-C number : **----**
Sampler : **HOLLIE DICK**
Site : **----**
Quote number : **EN/222**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 6
Laboratory : Environmental Division Brisbane
Contact : Customer Services EB
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61-7-3243 7222
Date Samples Received : 21-Feb-2019 09:35
Date Analysis Commenced : 25-Feb-2019
Issue Date : 04-Mar-2019 16:42



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. 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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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.

- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Client sample ID

				PS1	PS2	PS3	PS4	PS5
Client sampling date / time				19-Feb-2019 09:45	19-Feb-2019 10:00	19-Feb-2019 10:15	19-Feb-2019 10:18	19-Feb-2019 10:30
Compound	CAS Number	LOR	Unit	EB1904433-001	EB1904433-002	EB1904433-003	EB1904433-004	EB1904433-005
				Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.43	1.45	0.33	0.30	6.60
Arsenic	7440-38-2	0.001	mg/L	0.006	0.001	<0.001	0.003	0.025
Cadmium	7440-43-9	0.0001	mg/L	0.0003	0.0002	<0.0001	0.0002	0.0004
Chromium	7440-47-3	0.001	mg/L	0.067	0.048	0.004	0.012	0.062
Cobalt	7440-48-4	0.001	mg/L	0.014	0.008	<0.001	<0.001	0.023
Copper	7440-50-8	0.001	mg/L	0.003	0.032	0.029	0.029	0.075
Lead	7439-92-1	0.001	mg/L	0.006	<0.001	<0.001	<0.001	0.003
Nickel	7440-02-0	0.001	mg/L	0.453	0.411	0.011	0.040	0.365
Zinc	7440-66-6	0.005	mg/L	0.106	0.101	0.029	0.083	0.169
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001



Analytical Results

Sub-Matrix: DI WATER LEACHATE
 (Matrix: WATER)

Client sample ID

				PS6	PS7	PS8	----	----
Client sampling date / time				19-Feb-2019 10:40	19-Feb-2019 10:50	19-Feb-2019 10:55	----	----
Compound	CAS Number	LOR	Unit	EB1904433-006	EB1904433-007	EB1904433-008	-----	-----
				Result	Result	Result	----	----
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	16.6	9.52	1.48	----	----
Arsenic	7440-38-2	0.001	mg/L	0.014	0.003	0.002	----	----
Cadmium	7440-43-9	0.0001	mg/L	0.0005	0.0004	0.0004	----	----
Chromium	7440-47-3	0.001	mg/L	0.556	0.054	0.061	----	----
Cobalt	7440-48-4	0.001	mg/L	0.115	0.005	0.001	----	----
Copper	7440-50-8	0.001	mg/L	0.081	0.012	0.006	----	----
Lead	7439-92-1	0.001	mg/L	0.003	0.009	0.002	----	----
Nickel	7440-02-0	0.001	mg/L	1.79	0.072	0.053	----	----
Zinc	7440-66-6	0.005	mg/L	0.597	0.299	0.167	----	----
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PS1	PS2	PS3	PS4	PS5
Client sampling date / time					19-Feb-2019 09:45	19-Feb-2019 10:00	19-Feb-2019 10:15	19-Feb-2019 10:18	19-Feb-2019 10:30
Compound	CAS Number	LOR	Unit		EB1904433-001	EB1904433-002	EB1904433-003	EB1904433-004	EB1904433-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.0	8.3	8.9	9.0	8.9
EA009: Nett Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-21.6	-28.7	-326	-466	-16.5
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		50	11	66	50	35
EA011: Net Acid Generation									
pH (OX)	----	0.1	pH Unit		8.3	7.6	10.1	8.8	7.8
NAG (pH 4.5)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	<0.1	<0.1
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		21.6	28.7	326	466	16.5
ANC as CaCO3	----	0.1	% CaCO3		2.2	2.9	33.3	47.5	1.7
Fizz Rating	----	0	Fizz Unit		1	1	4	5	1
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		<0.01	<0.01	<0.01	<0.01	<0.01
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		9.7	9.0	8.4	9.2	9.4



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	PS6	PS7	PS8	----	----
Client sampling date / time					19-Feb-2019 10:40	19-Feb-2019 10:50	19-Feb-2019 10:55	----	----
Compound	CAS Number	LOR	Unit		EB1904433-006	EB1904433-007	EB1904433-008	-----	-----
					Result	Result	Result	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		7.6	7.3	9.4	----	----
EA009: Nett Acid Production Potential									
Net Acid Production Potential	----	0.5	kg H2SO4/t		-13.9	-4.1	-7.7	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		55	11	63	----	----
EA011: Net Acid Generation									
pH (OX)	----	0.1	pH Unit		8.2	6.9	7.3	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t		<0.1	<0.1	<0.1	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t		<0.1	0.2	<0.1	----	----
EA013: Acid Neutralising Capacity									
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t		13.9	4.1	8.6	----	----
ANC as CaCO3	----	0.1	% CaCO3		1.4	0.4	0.9	----	----
Fizz Rating	----	0	Fizz Unit		1	0	0	----	----
ED042T: Total Sulfur by LECO									
Sulfur - Total as S (LECO)	----	0.01	%		<0.01	<0.01	0.03	----	----
EN60: Bottle Leaching Procedure									
Final pH	----	0.1	pH Unit		8.5	8.1	9.5	----	----

Matt Anscomb
Environmental Services and Regulation (North Queensland Compliance)
Department of Environment and Science
Level 10 Flinders Street
Townsville QLD 4810

14 March 2019

RE: Release Investigation for Sconi Mining Operations (EPML00900713) - Lucky Break Project

Dear Matt,

This notification letter is prepared on behalf of Sconi Mining Operations Pty Ltd (Sconi), whom is the Project's Environmental Authority (EA) (EPML00900713) holder. Sconi is providing further written advice to the Department regarding a release event at the Lucky Break Project site. The release event occurred between 8 February 2019 and 2 March 2019, during a heavy and prolonged rainfall event that lead to flooding in the Townsville region.

This letter of further written advice has been prepared in accordance with conditions A12 and A13 of the Project's EA (EPML00900713) as defined below.

- (A12) *The holder of this environmental authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.*
- (A13) *Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:*
- (a) results and interpretation of any samples taken and analysed;*
 - (b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm;*
 - (c) proposed actions to prevent a recurrence of the emergency or incident.*

Previously Reported Details of Incident (Condition A12)

In accordance with Condition A12 of the EA, AARC on behalf of Sconi Mining Operations Pty Ltd, initially advised of a release incident at the Lucky Break site on February 7 and 8, 2019. The release commenced on 8 February 2019 when mine affected water was released from the sediment dam to the receiving environment.

At the time of the release from the sediment dam, a total of 30 millimeters (mm) rainfall had been recorded in the previous 24 hour period with a cumulative total monthly rainfall of 335.6 mm recorded at the nearest rainfall gauging station - Hillgrove Station (30137). Continuous rainfall was recorded on site between January 26 and February 8 with a total of 384.3 mm of rainfall recorded during that period (source: Spyglass Office rainfall gauge).

The heavy rainfall lead to overtopping from the Dingo Dam stock watering dam into the adjacent mine void. On February 7, the continued rainfall and surface runoff caused overtopping from the mine void to the diversion bunds with mine affected water flowing into the ROM pad area and eventually the sediment dam. The clean water catchment upstream of the Project site was also captured by the diversion bunds and directed to the sediment dam. The sediment dam reached capacity and began releasing to the receiving environment on February 8.

The volume of water released to Snake Creek via overland flow from the sediment dam is unknown as no flow measuring devices are installed at the release point. While Snake Creek was in flood at the time of the release, the flow rate remains unknown due to the lack of stream gauging stations or instream loggers.

Receiving environment water samples were collected from the sediment dam, Dingo Dam, and the ROM Pad, as well as upstream and downstream points in Snake Creek on February 7, 2019. Follow up water sampling was completed by AARC on February 18 and 19. The slow release from the sediment dam was ongoing at this time. Surface water sampling locations are shown in Figure 1.

Advice was provided to the department on 15 February 2019 regarding the ongoing source of release and mitigation measures implemented to prevent future releases. At the time, Dingo Dam was collecting runoff from the upstream clean water catchment (via an adjacent stock water dam) and was overtopping into the residual void. On the morning of 15 February, the pipe between the two stock dams was blocked off and pumping from Dingo Dam commenced in an effort to prevent any further overtopping into the void.

The release from the sediment dam ceased on 2 March 2019 following 14 consecutive days of dry conditions. A moderate rainfall event (17 mm) that occurred on February 18 was likely a contributing factor to the prolonged release period.

Results and Analysis of Sampling Undertaken (Condition A13(a))

Background

Water quality sampling was initially completed at the time of void overtopping (7/02/2019). AARC completed follow-up water sampling (18-19/02/2019) to identify potential impacts on the receiving environment.

Water quality data from both sampling events has been analysed and compared against EA trigger levels and contaminant limits. Water quality within and downstream of the Mining Lease (ML) has been compared to the default trigger values and contaminant limits as defined in the EA. Where quality characteristics in water stored or released from site, or downstream receiving water exceed any of the trigger levels, the downstream results have been compared to the reference site values.

Water quality data collected during each release sampling event is provided in Table 1.

Physico-chemical Parameters

The analysis of pH levels across the Project ML and downstream receiving environment indicates that pH levels at all potentially impacted sites were consistent with those recorded at upstream reference sites. All pH readings fell within the EA trigger level range (6.0 – 8.6).

All field measurements of electrical conductivity (EC) collected in-situ during the follow up sampling fell well below the contaminant release limit of 1000 microSiemens per centimeter ($\mu\text{S}/\text{cm}$), with all mine affected and downstream sites recording EC levels in the range of 89.3 to 173.1 $\mu\text{S}/\text{cm}$. EC levels across the mine affected and downstream sites were generally consistent with levels recorded at upstream reference sites.

Turbidity levels were highest in the residual void or OCP (460.2 nephelometric turbidity units (NTU)), followed by the run of mine (ROM) release point (ROM RL – 313.9 NTU), Dingo Dam (184 NTU), the southern diversion bund (STH BUND – 155.3 NTU) and the sediment dam (91.8 NTU). Turbidity readings in the downstream receiving environment of Snake Creek (29.6 - 30.1 NTU) had returned to near background levels (21.3 – 21.8 NTU) as recorded at the upstream reference sites. Given that no turbidity trigger levels or release limits are defined in the EA, no exceedances were recorded during the follow-up sampling event.

Total and Dissolved Metals

A number of metals were found to be present in higher concentrations than the EA contaminant limits at upstream, mine affected and / or downstream sites during the release event. A description of the release and downstream water quality is provided below in comparison with upstream reference values.

Aluminium

Dissolved aluminium concentrations recorded at all potentially mine impacted sites exceeded the EA trigger level of 0.055 milligrams per litre (mg/L), with values recorded between 0.29 mg/L at LBDS2 (19/02/19) and 4.16 mg/L at ROM RL (7/02/2019). All upstream or reference sites were found to contain dissolved aluminium concentrations above the EA trigger levels, with values falling in the range of 0.35 mg/L to 1.19 mg/L. The highest dissolved aluminium reading from an upstream site was recorded from Dingo Dam on 7 February. These findings indicate aluminium typically has an elevated presence in the waters of Project region while levels were found to be particularly high in Dingo Dam. Results from the follow-up sampling revealed that dissolved aluminium concentrations remained higher in Dingo Dam than mine affected sites such as the OCP, STH BUND, ROM RL and SED DAM.

The analysis of total aluminium concentrations from the initial release event revealed contaminant limit (5 mg/L) exceedances at the upstream Dingo Dam sampling point as well as the ROM RL and SED DAM. Analysis of water quality sampled from the Snake Creek downstream site during the same sampling event revealed total aluminium fell below the contaminant limit. The follow-up water quality sampling revealed one exceedance at the OCP sampling point, where a total aluminium concentration of 5.42 mg/L was recorded. No other sites recorded elevated total aluminium during the follow-up sampling.

Chromium

During the initial release sampling event, dissolved chromium concentrations were found to be elevated at one upstream site (Dingo Dam) and two downstream sites (ROM RL and SED

DAM) when compared to the EA trigger level of 0.001 mg/L. Sampling at the downstream site on Snake Creek recorded a dissolved chromium concentration below detection limits. During the follow-up sampling all upstream and potentially mine impacted sites recorded dissolved chromium concentrations below detection limits.

These results are indicative of a first flush affect whereby the large volume of surface runoff has likely caused an accumulation of dissolved chromium from the chromium rich soils known to occur in the Project region.

Total chromium concentrations were recorded below the EA contaminant limit of 1 mg/L at all sites during both release sampling events.

Cobalt

During the follow-up sampling event, the sediment dam recorded an elevated cobalt level of 0.002 mg/L when compared to the EA trigger level of 0.0014 mg/L. All other water quality samples collected during the initial and follow-up sampling events were found to contain dissolved cobalt levels below detection limits. No impacts were recorded downstream of the release point with cobalt concentrations falling below detection limits in the downstream receiving environment.

Total cobalt concentrations were recorded below the EA contaminant limit of 1 mg/L at all sites during both release sampling events.

Copper

Dissolved copper concentrations were found to be elevated at three downstream sites during the initial release sampling event, when compared to the EA trigger level of 0.0014 mg/L. The ROM RL and Snake Creek Downstream sites both recorded a concentration of 0.003 mg/L. The sediment dam recorded a concentration of 0.002 mg/L, which was consistent with concentrations recorded at upstream sampling points Snake Creek US and Dingo Dam RL. All sites sampled during the follow-up sampling event recorded dissolved copper concentrations at or below the detection limit (0.001 mg/L).

Total copper concentrations were recorded below the EA contaminant limit of 1 mg/L at all sites during both release sampling events.

Nickel

Dissolved nickel concentrations were recorded below the EA trigger level of 0.011 mg/L. One exceedance of the trigger level was recorded at the sediment dam (0.026 mg/L) during the follow-up sampling event. Given that both downstream sampling points on Snake Creek recorded dissolve nickel concentrations below detection limits (0.001 mg/L), no impacts were detected downstream of the release point.

Total nickel concentrations were recorded below the EA contaminant limit of 1 mg/L at all sites during both release sampling events.

No other water quality exceedances were recorded during either of the release sampling events.

In summary, the only metal concentration exceedance noted in the Project's downstream receiving environment was dissolved aluminium. Dissolved aluminium concentrations

recorded at upstream sites on Snake Creek were equally elevated indicating these levels may be indicative of natural concentrations in the region of the Project site. Overall, the release event is not considered to have had detrimental impacts on the Project's receiving environment.

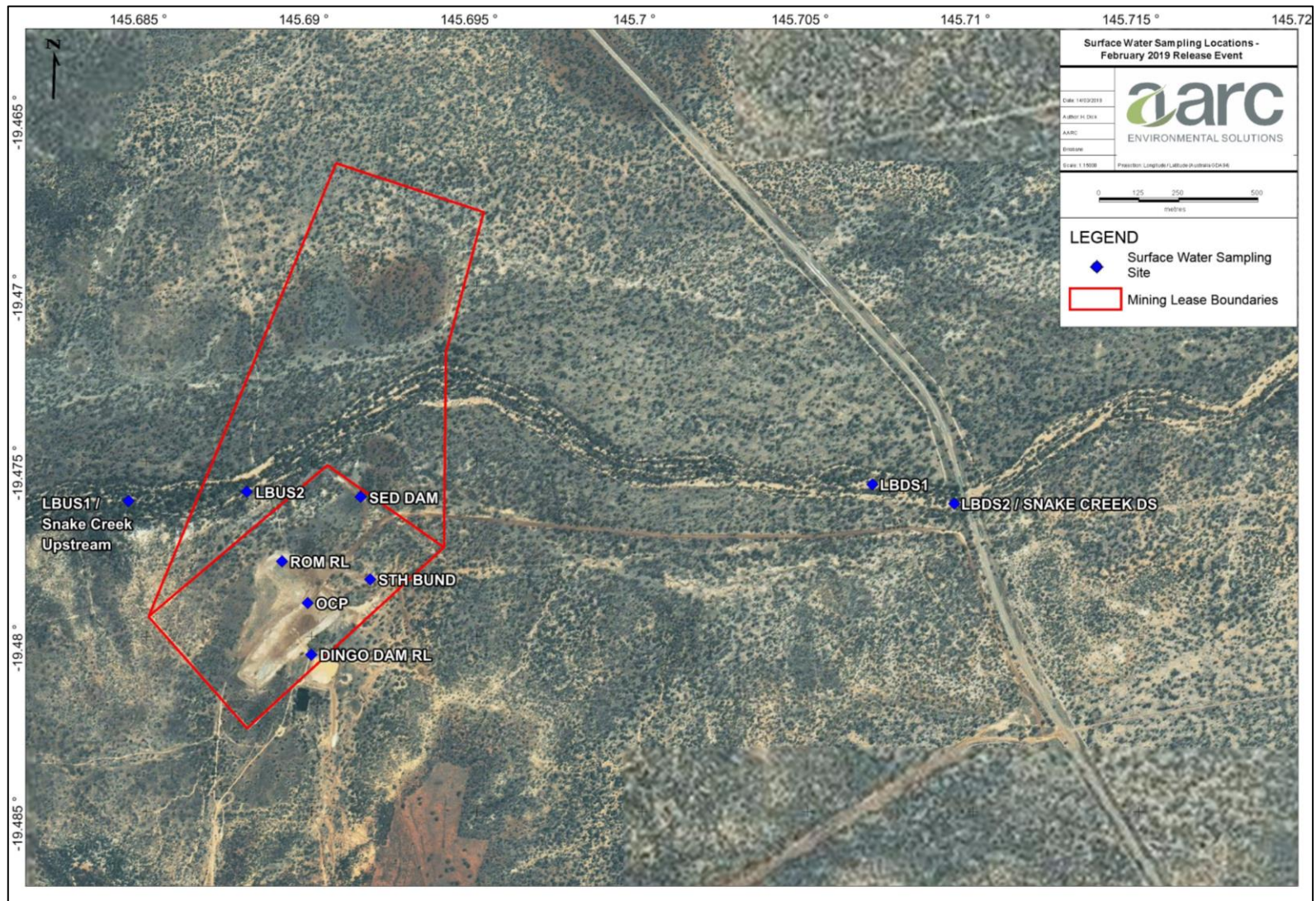


Figure 1 Surface Water Sampling Locations

Table 1 Release Event Water Quality Results and Analysis

Sample Date:			EA Trigger Level	EA contaminant Limit	07/02/2019	07/02/2019	19/02/2019	19/02/2019	19/02/2019	07/02/2019	07/02/2019	07/02/2019	19/02/2019	18/02/2019	18/02/2019	19/02/2019	19/02/2019	19/02/2019
Sample ID:					SNAKE CREEK US	DINGO DAM RL	LBUS1	LBUS2	DINGO DAM RL	ROM RL	SED DAM	SNAKE CREEK DS	STH BUND	OCP	ROM RL	SED DAM	LBDS1	LBDS2
					UPSTREAM / REFERENCE SITES							DOWNSTREAM / IMPACT SITES						
Analyte	Unit	LOR																
In-situ Measurements																		
pH		low	6	6	---	---	7.08	7.26	7.58	---	---	---	7.35	7.52	7.39	7.03	7.27	7.75
		high	8.6	9														
Electrical Conductivity @ 25°C	µS/cm	---	888	1000	---	---	101.1	100.9	91.8	---	---	---	108.9	89.3	111.5	173.1	103	102.7
Turbidity	NTU	---	---	---	---	---	21.8	21.3	184	---	---	---	155.3	460.2	313.9	91.8	29.6	30.1
Total Dissolved Solids	mg/L	---	---	---	---	---	65.7	65.6	27.18	---	---	---	70.79	58.05	72.5	112.5	66.92	66.75
Laboratory Testing																		
pH Value	pH Unit	0.01	---	---	6.75	6.78	6.8	6.94	6.86	6.64	6.72	6.83	6.94	6.87	7.02	7.06	7.14	7.12
Sodium Adsorption Ratio		0.01	---	---	0.77	1.86	1.63	1.63	1.55	1.69	1.2	0.77	1.27	1.55	1.55	1	1.63	1.53
Electrical Conductivity @ 25°C	µS/cm	1	---	---	59	90	108	107	95	68	75	58	119	96	100	183	108	108
Total Dissolved Solids (Calc.)	mg/L	1	---	---	38	58	70	70	62	44	49	38	77	62	65	119	70	70
Total Hardness as CaCO3	mg/L	1	---	---	12	11	18	18	13	4	11	12	20	13	13	48	18	18
Hydroxide Alkalinity as CaCO3	mg/L	1	---	---	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1	---	---	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1	---	---	25	24	31	32	22	16	26	27	35	23	32	64	34	38
Total Alkalinity as CaCO3	mg/L	1	---	---	25	24	31	32	22	16	26	27	35	23	32	64	34	38
Sulfate as SO4 - Turbidimetric	mg/L	1	---	1000	<1	3	<1	<1	2	4	2	<1	2	4	3	2	1	1
Chloride	mg/L	1	---	---	5	12	14	14	14	9	8	5	15	13	13	14	13	13
Fluoride	mg/L	0.1	---	---	<0.1	0.2	0.1	0.1	0.1	0.2	0.1	<0.1	0.1	0.1	0.1	0.2	0.1	0.1
Ammonia as N	mg/L	0.01	---	---	0.06	0.1	0.03	0.03	0.07	0.18	0.11	0.07	0.13	0.06	0.04	0.06	0.04	0.04
Nitrite as N	mg/L	0.01	---	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.01	---	---	0.05	0.34	0.2	0.18	0.01	0.34	0.17	<0.01	<0.01	0.16	0.14	<0.01	0.01	0.01
Nitrite + Nitrate as N	mg/L	0.01	---	---	0.05	0.34	0.2	0.18	0.01	0.34	0.17	<0.01	<0.01	0.16	0.14	<0.01	0.01	0.01
Total Kjeldahl Nitrogen as N	mg/L	0.1	---	---	0.3	0.5	0.5	0.2	0.5	0.7	0.5	0.3	0.6	0.5	0.6	0.9	0.2	0.2
Total Nitrogen as N	mg/L	0.1	---	---	0.4	0.8	0.7	0.4	0.5	1	0.7	0.3	0.6	0.7	0.7	0.9	0.2	0.2
Total Phosphorus as P	mg/L	0.01	---	---	0.03	0.12	0.04	0.01	0.04	0.1	0.08	0.02	0.05	0.08	0.09	0.07	0.01	0.02

Sample Date:			EA Trigger Level	EA contaminant Limit	07/02/2019	07/02/2019	19/02/2019	19/02/2019	19/02/2019	07/02/2019	07/02/2019	07/02/2019	19/02/2019	18/02/2019	18/02/2019	19/02/2019	19/02/2019	19/02/2019
Sample ID:					SNAKE CREEK US	DINGO DAM RL	LBUS1	LBUS2	DINGO DAM RL	ROM RL	SED DAM	SNAKE CREEK DS	STH BUND	OCP	ROM RL	SED DAM	LBDS1	LBDS2
Analyte	Unit	LOR			UPSTREAM / REFERENCE SITES							DOWNSTREAM / IMPACT SITES						
Reactive Phosphorus as P	mg/L	0.01	---	---	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Anions	meq/L	0.01	---	---	0.64	0.88	1.01	1.03	0.88	0.66	0.79	0.68	1.16	0.91	1.07	1.72	1.07	1.15
Total Cations	meq/L	0.01	---	---	0.57	0.87	1.11	1.11	0.91	0.52	0.68	0.57	1.09	0.91	0.91	1.83	1.11	1.07
Ionic Balance	%	0.01	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Calcium	mg/L	1	---	---	3	1	4	4	2	<1	1	3	3	2	2	6	4	4
Magnesium	mg/L	1	---	---	1	2	2	2	2	1	2	1	3	2	2	8	2	2
Sodium	mg/L	1	---	---	6	14	16	16	13	9	9	6	13	13	13	16	16	15
Potassium	mg/L	1	---	---	3	2	2	2	3	2	3	3	5	3	3	7	2	2
Dissolved Metals																		
Aluminium	mg/L	0.01	0.055	---	0.53	1.19	0.43	0.35	0.69	4.16	1.06	0.67	0.48	0.6	0.46	0.4	0.5	0.29
Arsenic	mg/L	0.001	0.013	---	0.001	<0.001	0.002	0.002	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.004	0.002	0.002
Cadmium	mg/L	0.0001	0.0002	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	0.001	---	<0.001	0.002	<0.001	<0.001	<0.001	0.004	0.002	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.001	0.0014	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001
Copper	mg/L	0.001	0.0014	---	0.002	0.002	0.001	<0.001	0.001	0.003	0.002	0.003	0.001	0.001	0.001	<0.001	0.001	0.001
Lead	mg/L	0.001	0.0034	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.001	0.011	---	<0.001	0.006	<0.001	<0.001	0.004	0.004	0.01	<0.001	0.004	0.005	0.008	0.026	<0.001	<0.001
Zinc	mg/L	0.005	0.008	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	mg/L	0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Metals																		
Aluminium	mg/L	0.01	---	5	2.21	7.4	1.73	1.42	2.46	7.08	6.13	1.51	2.47	5.42	4.97	1.68	1.57	1.57
Arsenic	mg/L	0.001	---	0.5	0.002	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.003	0.003
Cadmium	mg/L	0.0001	---	0.01	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L	0.001	---	1	0.002	0.029	<0.001	<0.001	0.007	0.023	0.029	0.001	0.007	0.021	0.019	0.006	<0.001	<0.001
Cobalt	mg/L	0.001	---	1	<0.001	0.004	<0.001	<0.001	<0.001	0.003	0.004	<0.001	0.001	0.003	0.004	0.006	<0.001	<0.001
Copper	mg/L	0.001	---	1	0.004	0.011	0.002	0.002	0.004	0.01	0.01	0.004	0.003	0.008	0.007	0.002	0.002	0.003
Lead	mg/L	0.001	---	0.1	0.005	0.005	0.002	0.002	0.001	0.004	0.004	0.003	0.002	0.004	0.004	<0.001	0.002	0.002
Nickel	mg/L	0.001	---	1	0.001	0.063	<0.001	<0.001	0.009	0.017	0.094	<0.001	0.014	0.039	0.046	0.042	<0.001	<0.001
Zinc	mg/L	0.005	---	20	0.007	0.022	<0.005	<0.005	0.011	0.02	0.017	0.007	0.007	0.016	0.015	0.006	<0.005	<0.005
Mercury	mg/L	0.0001	---	---	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Key:
LOR refers to the Limit of Reporting.
xxxx indicates an exceedance of the EA Trigger Level.
xxxx indicates an exceedance of the EA Contaminant Release Limit.

Outcomes of Actions Taken (Condition A13b)

The following Actions were undertaken during the release event:

- a) Water quality sampling was completed both at the time of the release and during a follow-up sampling event; and
- b) The flow of stormwater runoff was redirected to prevent further overtopping of the residual void, thereby minimising environmental harm.

Water quality samples were collected from the upstream and downstream receiving environment and mine affected sampling points including the sediment dam. Mine affected water reaching the sediment dam was likely to be significantly diluted by overland flows from upstream of the mine. Water quality results confirmed that any contaminants sourced from the ML were significantly diluted in the downstream receiving environment.

Throughout the release period, the stormwater diversion bund in the south of the ML and the two dams located adjacent to the ML collected a large volume of stormwater which under the current water management strategy is directed onto the ML and eventually into the sediment dam. To minimise the clean water catchment reaching the residual void, Dingo Dam was isolated from the upstream stock watering dam and excess water was pumped out of Dingo Dam.

Proposed actions to prevent a recurrence (Condition A13(c))

At the time of mine closure and site rehabilitation, a portion of the bund between Dingo Dam and the residual void was constructed as a spillway at the landholder's request (i.e. Spyglass Research Station). The spillway has since eroded to create a significant gully allowing the release of water from Dingo Dam into the residual void.

The rainfall event that occurred at the time of the release was more severe than '1 in 100 year' event and is not likely to be repeated. As with the current release, site conditions will be closely monitored during any future periods of heavy or prolonged rainfall. With assistance from Spyglass personnel, dam levels and site rainfall will be monitored closely. A pump is permanently installed at Dingo Dam and water will be pumped out of the dam as soon as any potential for overtopping is identified. This stormwater management strategy was successfully implemented during the release event to prevent further overtopping from Dingo Dam into the residual void. With the knowledge of the risk and cause of overtopping gained during this release event, a more proactive water management approach will be implemented prior to the dams reaching critical levels.

I trust this notification meets the EA requirements.

Kind regards,



Hollie Dick
Environmental Scientist
AARC Environmental Solutions Pty Ltd
hdick@aacrc.net.au

REPORT

AUSTRALIAN MINES LIMITED

DINGO DAM – HYDROGEOLOGICAL ASSESSMENT

Short Report



4/06/2019

Submitted to:
**Hollie Dick and
Thomas Rose**

Report Number: 19040104-020-R02

Executive Summary

The open pit is located in an area of very low hydraulic permeability resulting in minimal transport potential of water and dissolved solids. Based on current information, seepage potential to outflow points is minimal and would require an extensive time period to migrate through the subsurface.

In the assessment a homogenous composition of the sub-base was assumed, however from core hole logging data and modelling, the area surrounding Dingo Dam is heterogenous. An impermeable intrusive body is present up-gradient from the site, Dingo Dam is located in lateritic material and down-gradient geological formations consist of intrusive bodies with highly weathered material intercalating these formations resulting in low to near-impermeable zones in the subsurface.

Overland flow is the most likely source of impact on the environment and Dingo Dam which can be augmented with culverts to minimise catchment area.

Current understanding of the geological and hydrogeological setting would indicate that flow from Snake Creek into the open pit void is extremely low with overland flow the most likely pathway to connect these bodies.

Contents

1	Introduction.....	1
1.1	Background Information	1
1.1.1	Bore Hole Data	1
2	Site Data.....	2
2.1	Land Surface and Slope.....	2
2.2	Rainfall and Evaporation.....	2
2.3	Soils.....	4
2.4	Local Geology	7
2.4.1	Regional Geological Cross-sections	8
2.4.2	Pit void cross-sectional analysis	10
3	Hydrogeology	13
3.1	Permeability Estimates of Strata Identified.....	13
3.1.1	Drainage Potential of Soils	13
3.1.2	Alluvium (All)	13
3.1.3	Laterite and Saprolite Units (Lfe, Lsi, Wum and Lsap)	14
3.1.4	Intrusives (Amp, Grn and Ser).....	14
3.2	Conceptual Hydrogeological Model	14
3.3	Water Quality Data.....	17
4	Conclusion	18
5	References.....	19
6	Appendix.....	20
6.1	Groundwater Bore Data	20

List of Figures

Figure 2-1	Aerial image of Dingo Dam and Luck Break areas with general slope directions ..	2
Figure 2-2	Averaged daily rainfall, land evaporation and shallow lake evaporation rates (mm/d).....	3
Figure 2-3	Annual rainfall and evaporation values.....	4
Figure 2-4	Cross-cut section of pit zone (complements of AARC 2019).....	5
Figure 2-5	Soil types at Dingo Dam site and Snake Creek.....	5
Figure 2-6	Local surface geology of Dingo Dam Site.....	8
Figure 2-7	Drill hole data points and cross-sections.....	9
Figure 2-8	Cross-section A-A'	9
Figure 2-9	Cross-section B-B'.....	10
Figure 2-10	Detailed cross-sectional model areas	10

Figure 2-11 Cross-sections 1-1' and 2-2'	11
Figure 2-12 Cross-section 3-3' and 4-4'	12
Figure 3-1 Calculated seepage rates and duration in years (labels) to reach seepage target of Alluvium materials.....	16
Figure 3-2 Calculated seepage rates and duration in years (labels) to reach seepage target of Snake Creek	17
Figure 3-3 Piper Diagram of open cut water quality	17

List of Tables

Table 1-1 Summary of bores in 20 km radius of Dingo Dam	1
Table 2-1 Soil class and properties	6
Table 2-2 Generalised soil profiles to a depth of 180 cm	7

1 INTRODUCTION

The Project Site is located on Lucky Break Station, approximately 90 km north of Charters Towers. The tenements include Mining Lease (ML) 10324 with an area of 78.2 ha (Dingo Dam) and ML 10332 which occupies an area of approximately 153 ha (Lucky Break).

The Dingo Dam Pit is approximately 350-400 m long by 50-80 m wide (3.2 ha) with a surveyed depth of less than 12 m from natural surface level to bottom of pit. Pit floor elevation on the north-east is estimated to be located at 335 mAHD while the south-western section is at 336 mAHD. For the purposes of this assessment it will be assumed that the pit floor is flat with a mean elevation of 335 mAHD. Due to the geometry of the pit it will be assumed that a seepage face of 100 m is sufficient to describe the properties of the volume produced in the down-gradient direction.

1.1 Background Information

1.1.1 Bore Hole Data

A twenty-kilometre search radius (DNRM, 2018a) was applied to identify relevant bores, with a total of seven data points identified (Appendix A). These bores are list in Table 1-1, with bores 125281, 166167 and 166783 within a ten-kilometre radius. The three bores were selected due to proximity and higher likelihood to reflect local hydrogeological conditions.

- Bore 166167 had a water strike in a gravel sand layer contact between two clay lenses at a depth of 51 mbgl and is approximately five-kilometres east of the site. A yield of 5.0 L/s were reported but water quality was brackish. Groundwater level was 33 mbgl.
- Bore 125281 had a water strike in basalt at 59 mbgl and is approximately seven-kilometres south-west of the site. It reported a yield of 4.5 L/s and water quality was potable. Groundwater level was 12 mbgl.
- Bore 166783 had a water strike in a gravel-sand layer contact and is at the eastern periphery of the ten-kilometre radius. It reported a yield of 2.5 L/s and water quality was potable. Groundwater level was 17 mbgl. It is located to the east of Bore 166167.

Table 1-1 Summary of bores in 20 km radius of Dingo Dam

Bore ID	Purpose	Geology	Lat	Long	Bore Depth (m)	Aquifer Depth (mbgl)	SWL (m)	Yield (L/s)
125281	Water Supply	Basalt	-19.5695	145.6813	68	59	-12	4.5
166167	Water Supply	Gravel	-19.5179	145.7777	63	51	-33	5.0
166783	Water Supply	Gravel	-19.5171	145.8419	33	24	-17	2.5
166533	Water Supply	Granite	-19.3733	145.6323	32	21	-10	0.3
120100014	Monitoring	Basalt	-19.6649	145.7257	49	32		0.5
166125	Water Supply	Granite	-19.3307	145.6537	43	29	-23	0.1
12010002	Monitoring	Basalt	-19.6654	145.7065	55	34	-26	

Groundwater data indicates that potable groundwater resource is present at the site but that it is located at depths in excess of 50 – 60 mbgl. Potable water supply exists within basalt and

brackish water between clay lenses. In the latter instance it could be present above the basalt layer.

2 SITE DATA

2.1 Land Surface and Slope

Dingo Dam and Lucky Break is bisected by Snake Creek, with the major portion of Lucky Break located to the north of the creek while Dingo Dam is to the south (Figure 2-1). The terrain slope is moderate to low, with an estimated slope of less than 1° or 1.5% for Dingo Dam while Lucky Break indicates a similar profile. General contour slope directions are indicated in Figure 2-1 with the mining lease boundaries of the site included.

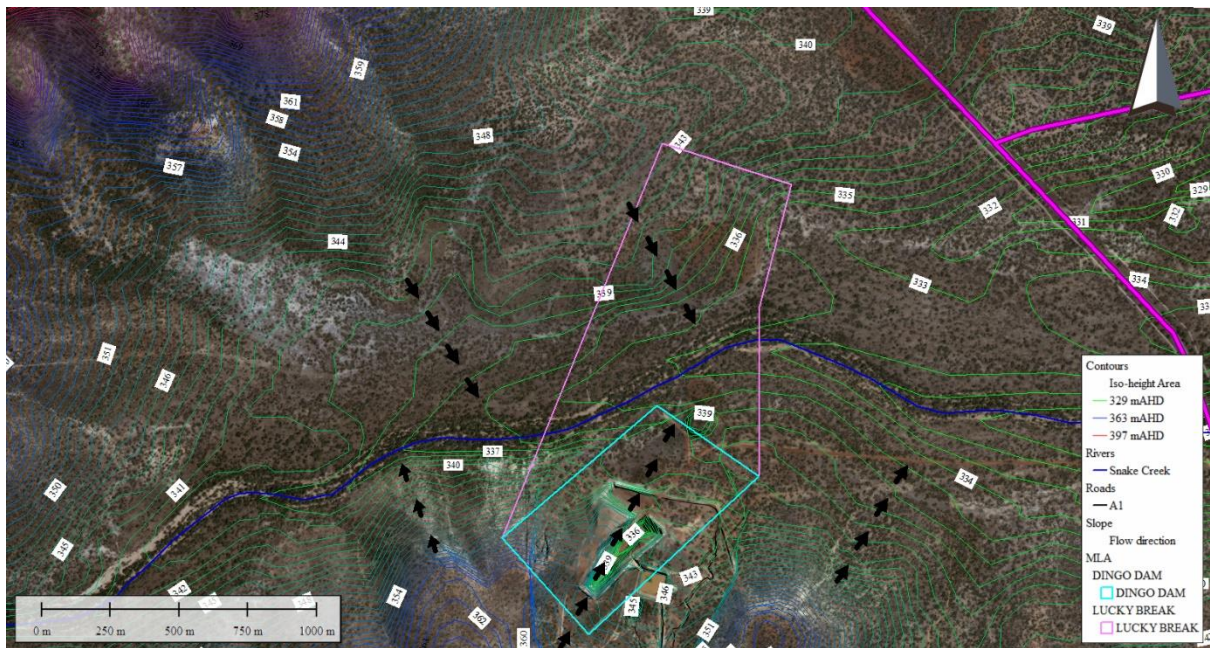


Figure 2-1 Aerial image of Dingo Dam and Luck Break areas with general slope directions

2.2 Rainfall and Evaporation

The Queensland Government Department of Science, Information Technology and Innovation (DSITI) Data Drill system was used to extract SILO (Jeffrey et al., 2001) data for the coordinates -19.45, 145.70 (Lat, Long) with an elevation of 397 m. The Morton data set format was used as it supplies evaporation over shallow lakes and actual evapotranspiration over land (Morton, 1983). Data interval ranged from 1 January 1889 to 31 March 2019.

Average daily rainfall is shown in Figure 2-2 and is accompanied with the average daily evaporation rate over shallow lakes and actual land evaporation. A general deficit is observed on a daily basis for shallow lake evaporation rates compared to rainfall. However, actual land evaporation average values are less than rainfall in January and February with the remainder of the year indicating a substantial difference favouring evaporation.

This trend of increased evaporation rates is propagated to annualised totals (Figure 2-3). The calculated long-term average rainfall is approximately 606 mm/year while evaporation from

land surface is approximately 1216 mm/year. In contrast evaporation from shallow lakes (proxy for Dingo Dam) is in the order of 1851 mm/year. From Figure 2-3 there is limited probability that rainfall will exceed land-based evaporation totals which is significantly less than lake evaporation values. It is considered that on an annual basis, limited potential for long-term storage of water in dam structures would be viable in this area unless enough catchment and storage capacity is available to overcome the deficit.

A water balance model is currently being prepared by ATC Williams but for the purposes of this assessment it will be assumed that no long-term ponding of water captured within the pit is possible and would be available for infiltration for less than 3 days. A similar approach is followed for Snake Creek which will have a limited potential to retain flood levels for more than three consecutive days.

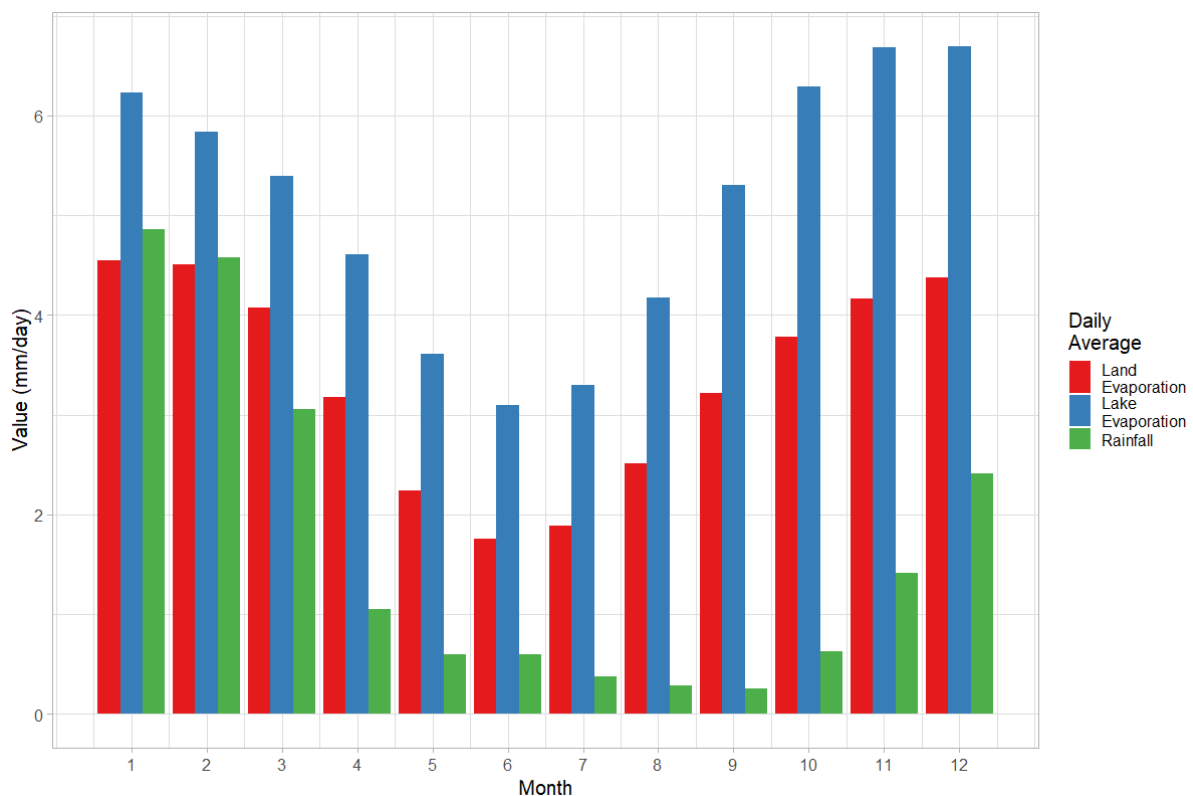


Figure 2-2 Averaged daily rainfall, land evaporation and shallow lake evaporation rates (mm/d)

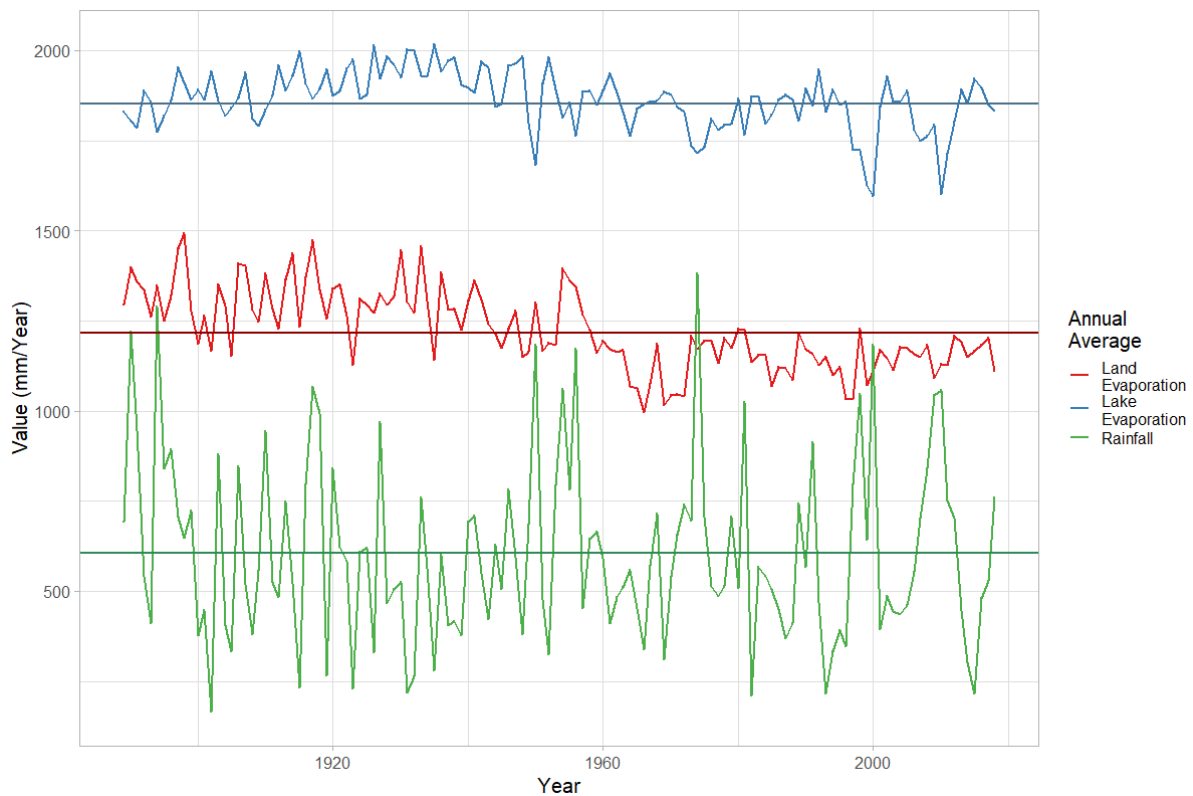


Figure 2-3 Annual rainfall and evaporation values

2.3 Soils

Data for this section is derived from the Dalrymple land resource survey (DNRQ980090) completed in 1999. Permeability of soils were estimates from cumulative infiltration data for soil types in Table 16 of the report as well as guidance from ASRIS spatial database maintained by the CSIRO (ASRIS, 2016). The site is located in an elevated position on a crest line with a gentle slope toward Snake Creek.

Table 2-1 and Table 2-2 presents a summary of soil types available at the site with a spatial distribution of soils shown in Figure 2-5. The Dingo Dam site is generally located within the Corea – CR3t unit which is indicative of a Cainozoic chromosol with an extremely low permeable base layer at an approximate depth of 0.5 m below ground level (mbgl). This massively structured clay layer has a permeability of 9 mm/hr or 216 mm/day infiltration potential (Figure 2-4).



Figure 2-4 Cross-cut section of pit zone (complements of AARC 2019)

In contrast to the Corea soil types, the Conolly – CO4d is located to the west and represents a modern soil with high permeability and minimal depth of soil development. It is a result of weathering and classed as rapidly draining over the underlying bedrock unit. Upgradient, to the south of the site, Pentland – PE1n soil is present which is moderately well drained but has limited deep drainage potential due to clay layers from 0.5 mbgl to 1.5 mbgl.

Down gradient of the site, Cape/Burdekin – CPBU2t, soils are present that are poorly drained and low to moderate infiltration capacity of approximately 60 mm/hr or 1440 mm/day. It is attributed to silty loam or clay that is present in the subsurface although the soil profile is not extensively developed. However, laterite outcrops have been mapped in this soil class zone (Figure 2-5) and would indicate alluvium being washed over a reworked paleo-land surface.

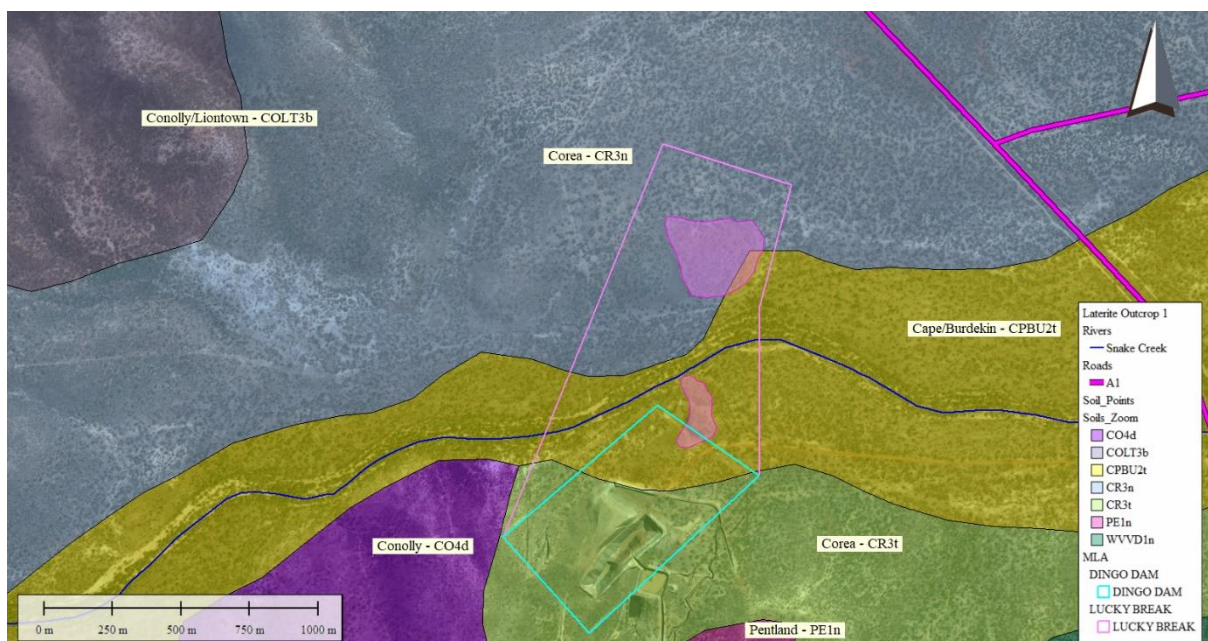


Figure 2-5 Soil types at Dingo Dam site and Snake Creek

Table 2-1 Soil class and properties

Map code	Description	Permeability (mm/hr)
CO4d – Conolly, Moderately inclined (10 - 32%); shallow (50 cm) to hard rock	Shallow grey, brown and yellowish-brown sands on granite. Rudosol – Igneous	1 – 226 (25) 3 – 199 (38)
COLT3b – Conolly/Liontown, Gently inclined (3 - 10%); badlands, badly eroded with steep short slopes	Shallow grey, brown and yellowish-brown sands on granite. Rudosol – Igneous	1 – 145 (19) 3 – 115 (30)
CR3n – Corea, gently inclined (3-10%)	Very dark grey to dark brown sand to sandy loam over massive to structured yellowish-brown clay. Chromosol – Cainozoic	1 – 182 (18) 2 – 122 (42) 3 – 7 (28)
CR3t – Corea, Gently inclined (3 - 10%); short slopes / dissected	Very dark grey to dark brown sand to sandy loam over massive to structured yellowish brown clay. Chromosol – Cainozoic	1 – 206 (18) 2 – 118 (41) 3 – 9 (31)
CPBU2t – Cape/Burdekin, very gently inclined (1 - 3%); short slopes / dissected	Very dark greyish brown silty loam to clay loam over alkaline structured dark brown/yellowish to brown clay/often mottled. Tenosol – Alluvial	1 – 76 (13) 3 – 51 (22) 4 – 49 (80)
PE1n – Pentland, Level (0 - 1%); no apparent limitation	Dark reddish brown to dark brown sandy clay loams grading to earthy red-light clay. Kandosol – Cainozoic	1 – 27 (1) 2 – 18 (20) 3 – 9 (21) 4 – 6 (84)
WVVD1n – Wattle Vale/Victoria Downs, Level (0 - 1%); no apparent limitation	Dark greyish brown loose to firm loamy sand to sandy loam grading to yellowish brown to yellow sandy clay loams. Vertosol – Cainozoic	1 – 112 (21) 3 – 7 (24)

Table 2-2 Generalised soil profiles to a depth of 180 cm

Cape	Burdekin	Pentland	Corea
Conolly	Liontown	Victoria Downs	Wattle Vale

2.4 Local Geology

The surface geological setting of the site is presented in Figure 2-6, with the open pit located in a region dominated by remnants of an ultramafic rock intrusion (sp) from the Argentine Metamorphics from Neoproterozoic – early Palaeozoic age. It consists of serpentinite, minor talc-tremolite schist and clinopyroxenite and has limited water production capacity due to limited fracture networks (DNRM, 2018b).

To the west of the open pit, Whipple Spring Granite (Cgwh) intrusion is present and is defined as a coarse-grained porphyritic biotite granite (Figure 2-6).

To the west and south of the open pit, poorly consolidated sediments (TQa,Qr) of the late tertiary and quaternary age is present. It consists of locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits, generally dissected,

and related to present stream valleys. Due to clay content of this formation, hydraulic conductivity is generally low.

North of the open pit, quaternary age alluvium (Qa) is present which is related to flood-plains and consist of clay, silt, sand and gravel. This zone is expected to act as a receptor for seepage from the open pit, should it occur.

In the far north, colluvium (TQr) is present in the subsurface and consist of clay, silt, sand, and gravel.

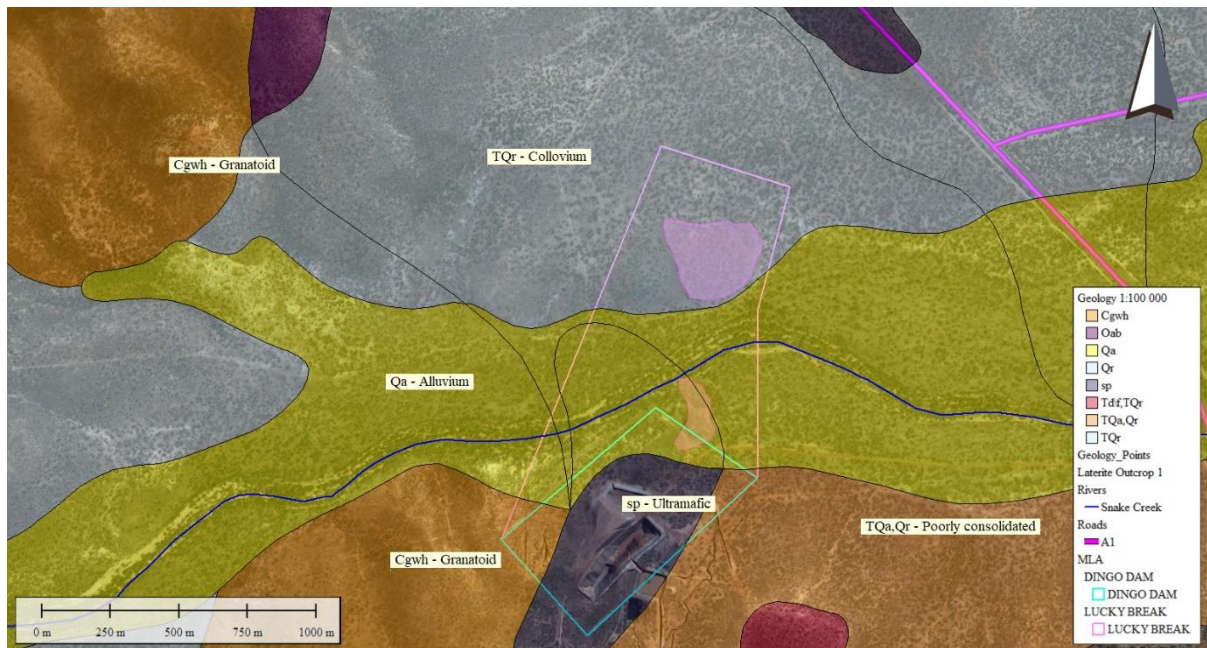


Figure 2-6 Local surface geology of Dingo Dam Site

2.4.1 Regional Geological Cross-sections

Due to the setting of the open pit, a block model was developed in RockWorks and cross-sections that extend down-gradient were prepared (RockWare, 2016). Drill hole data and cross-sections are shown in Figure 2-7. The model was constructed with all the available information to ensure that the greatest number of data points were included in the three-dimensional lithological model. It should be noted that logging data was used without modification and is based on the current understanding and interpretation of the data.

The first cross-section (A-A') is presented in Figure 2-8, the open pit void is approximately located at 0 – 50 m with the embankment in the interval of 50 – 150 m. A bund wall is approximately positioned at 400 m and Snake Creek zone extends from 750 – 1000 m in the cross-section. The model indicates that the Pit Void is located within amphibolite and ferruginous laterite. The embankment is placed on the ferruginous laterite and weathered ultramafic unit material. Snake Creek is in an Alluvium channel deposit and is emplaced in granitoid rock, ferruginous laterite and weathered ultramafic unit material.

Cross-section (B-B') is shown in Figure 2-9 with the open pit void approximately located at 1200 m, embankment at 1000 m, bund at 900 m and Snake Creek zone from 500 – 750 m. The pit void is located on top of a weathered ultramafic unit and is mainly located in

ferruginous laterite. An edge of the pit does seem to extend into alluvium type material to an approximate depth of 340 mAHD.

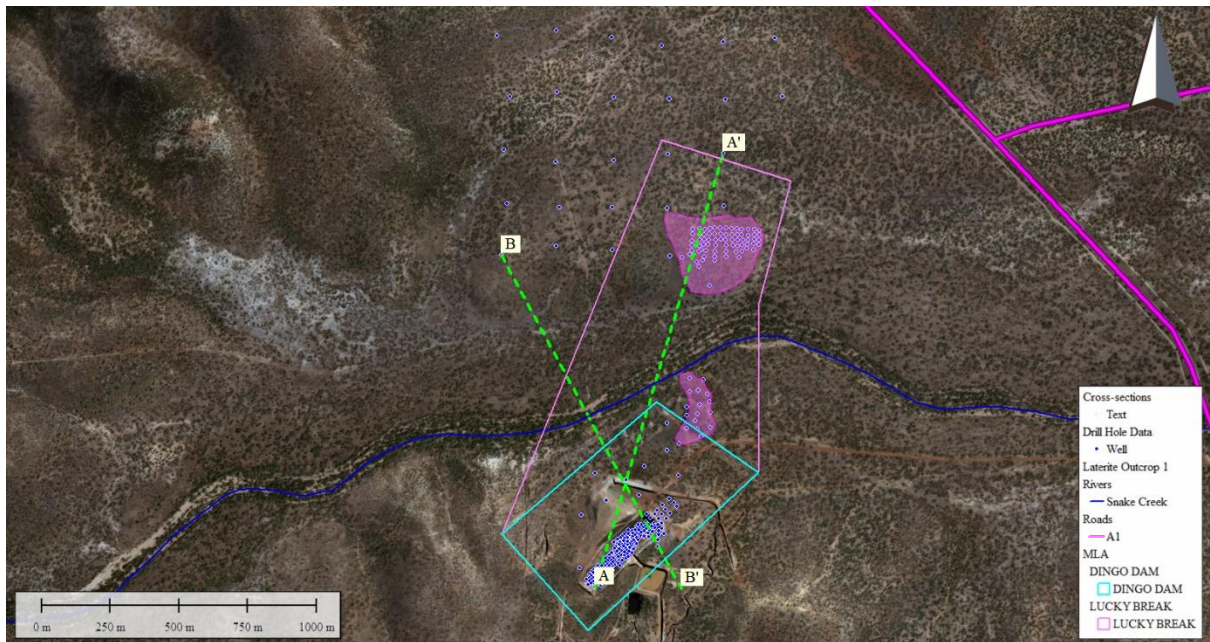


Figure 2-7 Drill hole data points and cross-sections

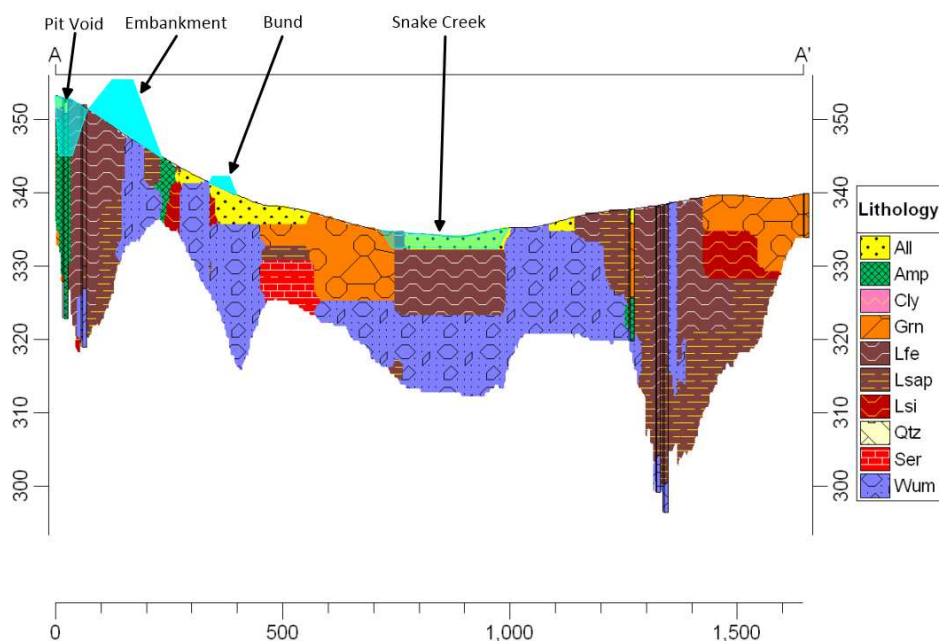


Figure 2-8 Cross-section A-A'

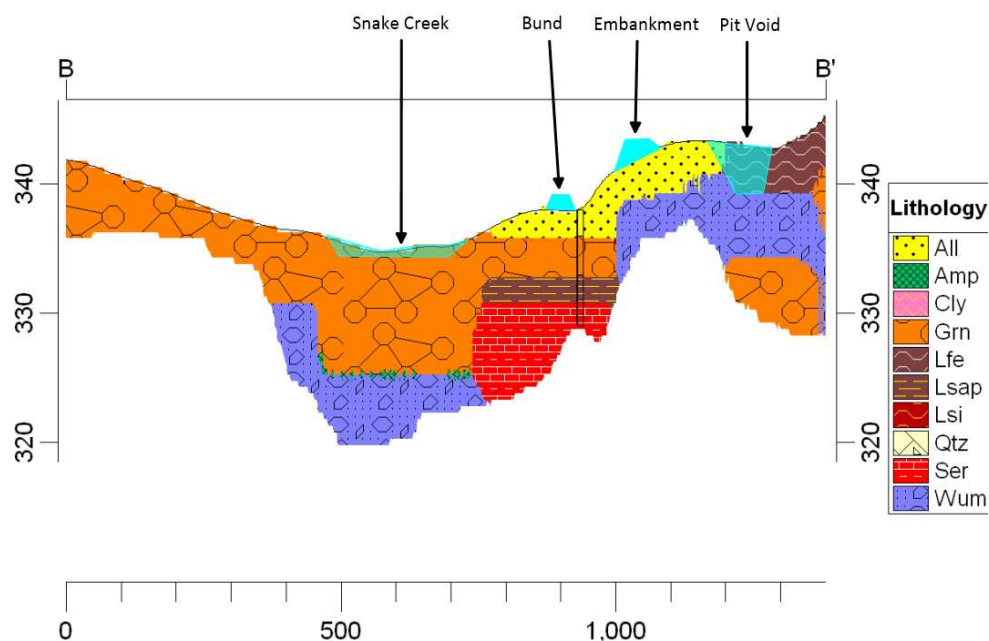


Figure 2-9 Cross-section B-B'

2.4.2 Pit void cross-sectional analysis

In Figure 2-9 a section of the pit void does seem to extend into an alluvium type material. To investigate the extent of this modelled zone, a detailed cross-sectional zone of the pit void area was developed. Cross-sections were selected that included most of the drill core data with four transects selected as shown in Figure 2-10. Three transects were near parallel to the pit main long axis with two crossing the pit and the third running parallel to the down-gradient pit area. The fourth transect is perpendicular to the long axis of the pit.

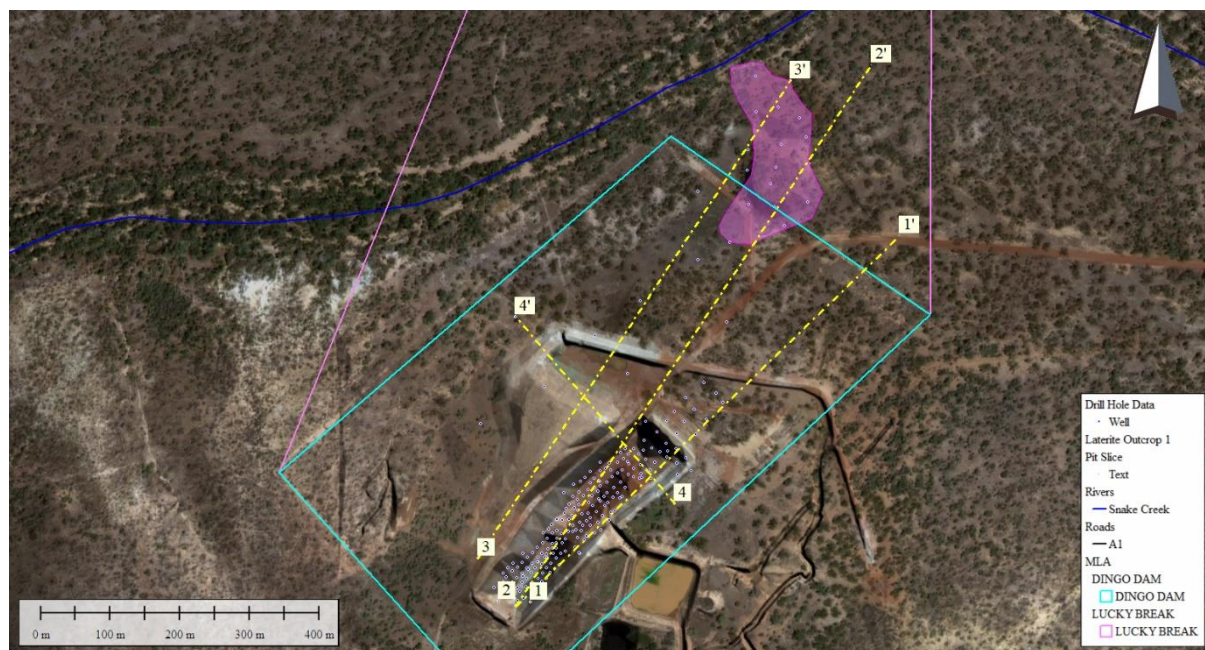


Figure 2-10 Detailed cross-sectional model areas

The four cross-sections are presented in Figure 2-11 and Figure 2-12. Relevant structures were indicated, i.e., pit void, embankments and bund walls.

In Figure 2-11, cross-sections 1-1' and 2-2' are presented with the pit void developed in the ferruginous laterite zone. Down-gradient of the site alluvium type material is present indicating a limited lateral scope before extending into granitoids and ferruginous laterite. No significant sand lenses are observed in the profile, which would be consistent with laterization of the profile.

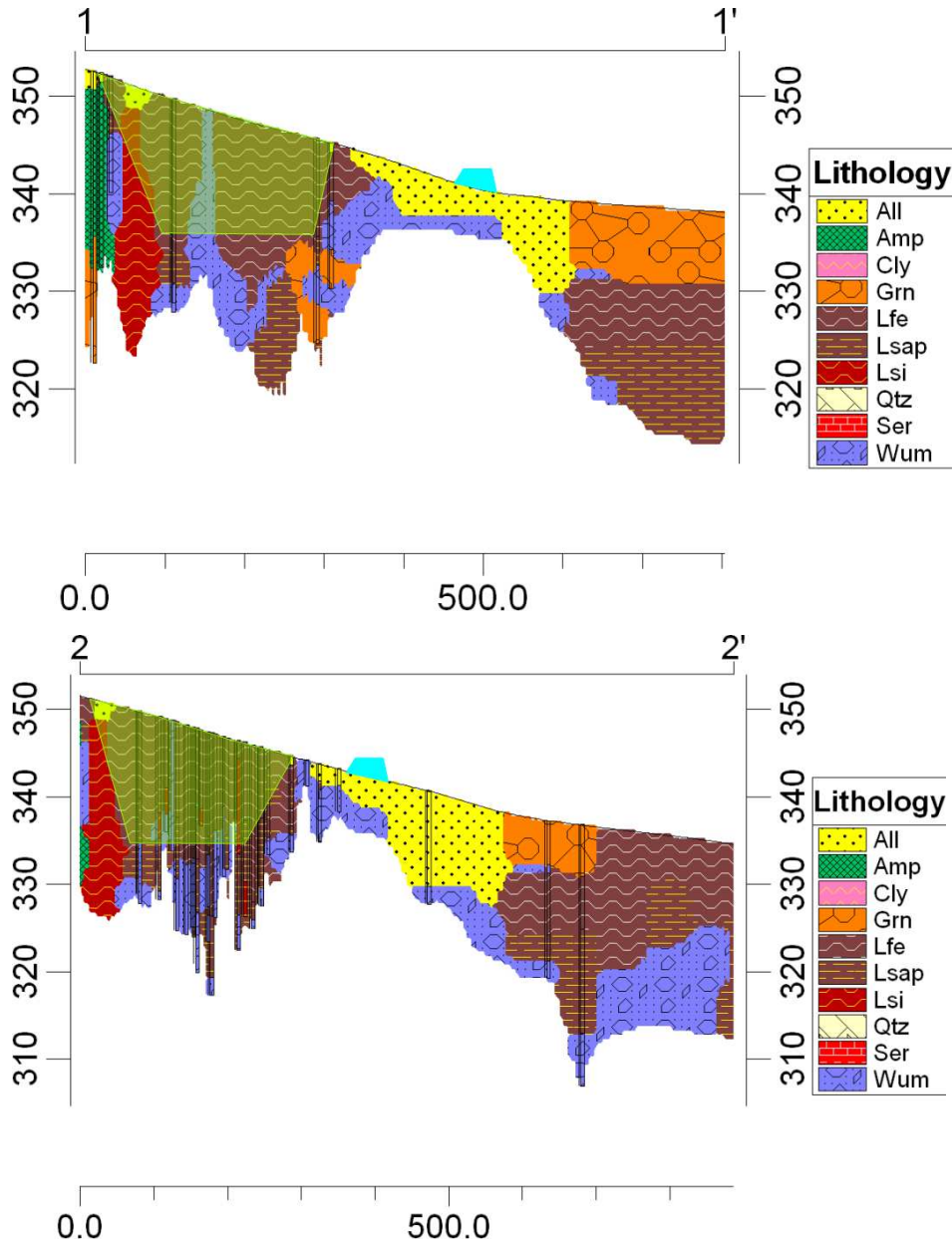


Figure 2-11 Cross-sections 1-1' and 2-2'

Cross-section 3-3' (Figure 2-12) is parallel to the pit long axis but is located approximately 5 to 20 m down-gradient of the pit void. Ferruginous laterite is observed as streamers with weathered ultramafic material present in profile along this cross-section. Limited alluvial material is present on surface which terminates on a granitic intrusion.

Cross-section 4-4' is the perpendicular cross-section that transects the pit void. The pit is developed in the ferruginous laterite and limited alluvial material is recorded in the vicinity

of the cross-section. Instead siliceous laterite is present before transgressing in weathered ultramafic material.

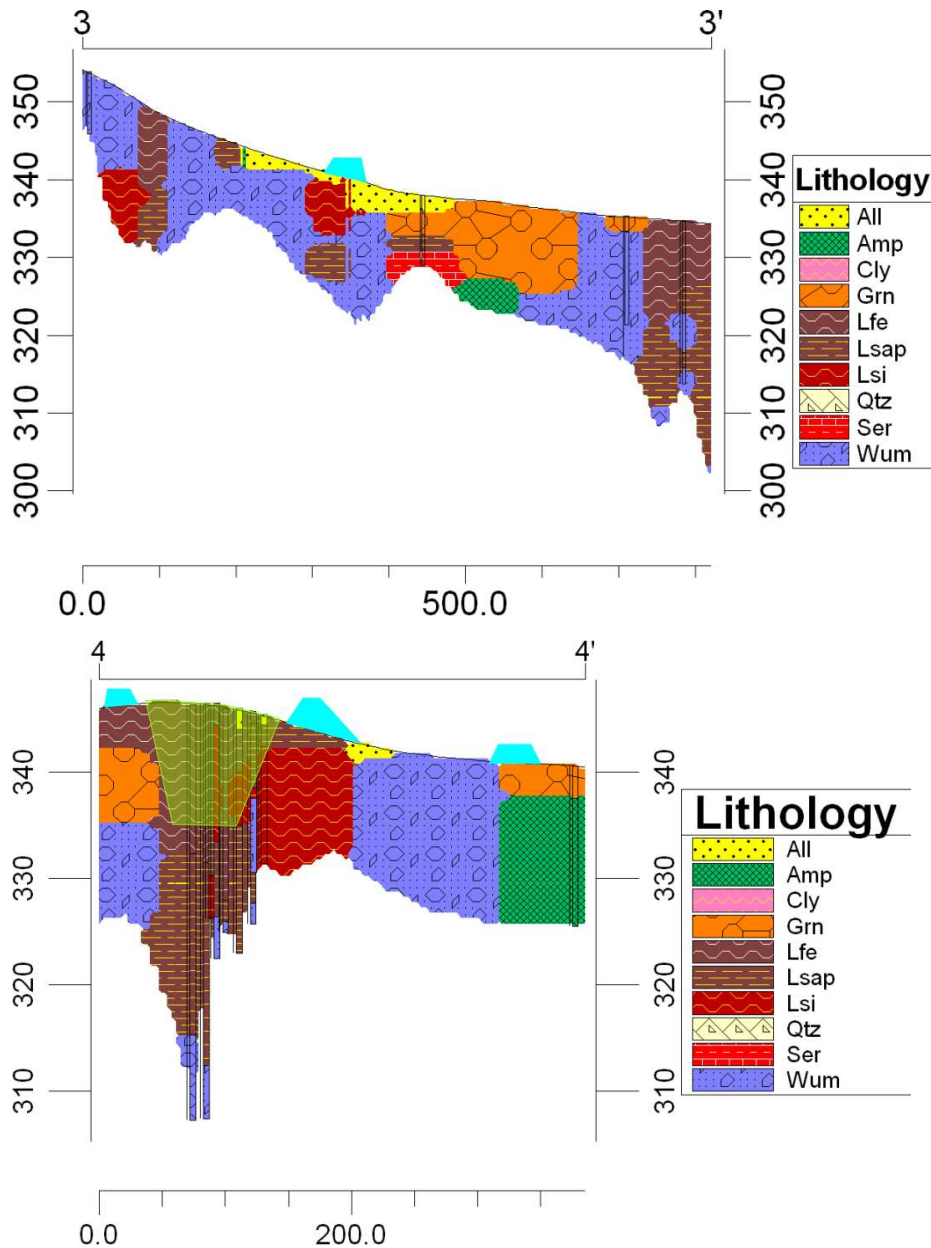


Figure 2-12 Cross-section 3-3' and 4-4'

Material classification is obtained from Lucky Break 5th Annual Report (1102-EPM14392).

- Granite – At Dingo Dam, granite of the Oweenee Granite batholith is present surrounding the lateritised ultramafic forming the prospect area. Pink sandy soil is developed over granitic sub-crop.
- Amphibolite schist – Amphibolite schist is present in the western and northern parts of the prospect area, where it forms small, scattered resistant outcrops and sub-crop. A characteristic dark brown to black soil is associated with this unit. The rock is very fresh, unweathered, fine grained, black-dark grey in colour, hard, dense, magnetic and has a weakly developed schistose texture evident in hand specimen. The

amphibolite schist is of sufficient hardness and quality to be considered for road aggregate material.

- Tertiary Laterite – A laterite terrace or duricrust of Tertiary age is developed over granite to the south of the Dingo Dam prospect. At Dingo Dam, resistant lateritised serpentinite is exposed as low relief within an eroded flood plain associated with Snake and Stockyard Creeks. The original laterite terrace that connected Dingo Dam with the surrounding laterite overlying the granite has been removed by Quaternary-Recent age erosion associated with these creeks.
- Lateritised Serpentinite – Four lateritised serpentinite bodies outcrop within EPM 14392 and are known as: The Dingo Dam, Snake Creek, Circular and Road Cut laterites. The Dingo Dam and Circular laterites occur as distinct low-lying features and sub-surface units characterised by siliceous honeycomb textured rocks. At the Snake and Road Cut Laterite the siliceous outcropping serpentinites form distinct topographic highs which rise between 5 – 10m about the surrounding flat lying alluvial plain. Drilling indicates that the serpentinite units dip moderately to the southeast.
- Widespread scattered sub-crop and outcrops of silica-goethite laterite zones, form hard, resistant, smooth weathered areas at the four identified laterites.

3 HYDROGEOLOGY

3.1 Permeability Estimates of Strata Identified

3.1.1 Drainage Potential of Soils

Soils located in the vicinity of the open pit belong to the Corea group (chromosol) and have a low infiltration potential and transport capability. The upper 0.5 m layer has capability to transport water but below this depth water migration is inhibited due to massive structured clay units. Soil depths is considerable due to underlying lateritic material. Hydraulic conductivity estimates for the unit is split into an upper ($\sim 1 \times 10^{-6}$ m/s or 0.1 m/d) consisting of silt and clay; while the lower clay unit is in the order of 1×10^{-9} m/s or 0.0001 m/d.

In the low-lying areas associated with the Snake Creek system a mixture of Cape/Burdekin soils (Tenosol) are present and represent low to moderate permeability characteristics due to heterogenous clay loam overlying clay units. Depth of soil can reach depths of 1.8 mbgl. Hydraulic conductivity estimates for the upper unit is 2×10^{-5} m/s or 1.7 m/d and the lower unit in the order of 2×10^{-6} m/s or 0.17 m/d. These hydraulic conductivity values are overly conservative due to the presence of laterite outcrops in this zone and potential migration of clay in the upper layer (ASRIS, 2016).

3.1.2 Alluvium (All)

In this assessment alluvium material is assumed to be either associated with Cape/Burdekin soils if located in the Snake Creek area or Corea group due to close association with lateritic transport material.

3.1.3 Laterite and Saprolite Units (Lfe, Lsi, Wum and Lsap)

Laterite formations are generally strongly iron-cemented and acts as an aquitard that restricts downward infiltration of rainfall into the groundwater units underlying these structures. Percolation through these strata can be in the order of hundreds to thousands of years, this type of material enables farmers to maintain surface dams for water storage. The presence of weathered ultramafic material is indicative of a low permeability unit that is intercalated with lateritic or saprolitic units. It has been mapped in a single drill hole log with either unit, and is included in this section for completeness.

Permeability for reworked material that has been mildly compacted is in the order of 1×10^{-7} m/s or 0.01 m/d, while in-situ undisturbed material have permeability values in the order of 1×10^{-9} m/s or 1×10^{-4} m/d (Delleur, 1999; Umar et al., 2015).

3.1.4 Intrusives (Amp, Grn and Ser)

Intrusive material includes amphibolite schist, granite and serpentinite which have presented as fresh rocks in geological analysis. Data would indicate that fracturing is minimal, and the rock units would act as a hydraulic barrier and is classed as an aquitard and forms part of the ultramafic intrusion that underlies the open pit area. Material hydraulic conductivity is estimated to be in the order of 1×10^{-11} m/s or 2×10^{-6} m/d (Delleur, 1999).

3.2 Conceptual Hydrogeological Model

Conceptual setting

- A no-flow barrier consisting of intrusives are present on the up-gradient side of the open pit. It is assumed all subsurface flow would be directed in the direction of Snake Creek.
- No recharge below the open pit to aquifer units are possible due to the intrusive body and in-situ lateritic materials. Water in the open pit can either evaporate or permeate laterally through the subsurface based on hydraulic head.
- The open pit is developed in a low permeability laterite and saprolite zone. Hydraulic conductivity is assumed to be at the upper limit for this type of material, 1×10^{-9} m/s or 1×10^{-4} m/d.
- Pit walls reach and elevation of 347 mAHD and has a depth of 335 mAHD with a permeable wall section of 100 m.
- Flow pathway to Snake Creek is approximately 750 m horizontally from pit wall and is located at an elevation of 335 mAHD.
- Persistent (3 days) flood level within Snake Creek does not extend beyond 338 mAHD, data obtained from Queensland flood maps.
- A potential seepage target, alluvium bed, is present at 50 m down-gradient from the pit wall with the base of the strata located at an elevation of 338 mAHD and extends for 250 m before terminating in a granite formation. Depth of alluvium formation is estimated to be 1-2 m, i.e. ~340 – 338 mAHD.
- Regional groundwater level is estimated to be 30 mbgl.

To evaluate seepage potential from the open pit, steady flow in an unconfined aquifer (Fetter, 2001) is applied.

A summary is provided for clarity.

Darcy's Law ($q' = -Kh \frac{dh}{dx}$) states that the flow per unit width (q' , m²/d) is equal to the product of hydraulic conductivity (K , m/d), head (m or mAHD) and gradient (i , unitless). By integration and applying boundary conditions, discharge per unit length over a sectional length, equates to $q'L = -K \left(\frac{h_2^2 - h_1^2}{2} \right)$. The equation can be rearranged to yield the Dupuit equation $q' = \frac{K(h_1^2 - h_2^2)}{2L}$. It is assumed that surface recharge would not play a role in water table elevation. The latter assumption would indicate a potential water divide between the open pit and Snake Creek or Alluvium bed which is highly unlikely. In this assessment h_1 is the water level in the open pit (origin) and h_2 is the water level in the receptor.

Assessment of scenarios to indicate potential seepage rates and likelihood is provided in the following paragraphs.

1. Water flow from the open pit towards the alluvium layer down-gradient.
It is assumed that the base of the aquifer is located at 320 mAHD and that it forms a continuous layer over the total conceptual model area.

$$q' = \frac{K(h_1^2 - h_2^2)}{2L} = \frac{10^{-4}((347 - 320)^2 - (338 - 320)^2)}{2(50)}$$

$$q' = \frac{10^{-4}(405)}{100} = 4.05 \times 10^{-4} \text{ m}^2/\text{d}$$

Assuming there is a seepage face of 100 m the discharge would be in the order of 0.04 m³/d or 40 l/d into the alluvial base layer. An estimate of flow period to reach the alluvium can be calculated from an average linear velocity (v_x); i.e.,

$$v_x = \frac{Q}{n_e A} = \frac{-Kdh}{n_e dl}$$

$$v_x = \frac{0.04}{0.5 \times 100 \times 18} = 4.4 \times 10^{-5} \text{ m/d}$$

Estimated travel time over a distance of 50 m is 3 044 years.

2. Potential discharge into Snake Creek at Open Pit water elevation of 347 mAHD can be calculated as

$$q' = \frac{K(h_1^2 - h_2^2)}{2L} = \frac{10^{-4}((347 - 320)^2 - (335 - 320)^2)}{2(800)}$$

$$q' = \frac{10^{-4}(405)}{1600} = 3.15 \times 10^{-5} \text{ m}^2/\text{d}$$

Assuming there is a seepage face of 100 m the discharge would be in the order of 0.003 m³/d or 3 l/d into Snake Creek.

An estimate of flow period to reach the alluvium can be calculated from an average linear velocity (v_x); i.e.,

$$v_x = \frac{Q}{n_e A} = \frac{-Kdh}{n_e dl}$$

$$v_x = \frac{0.003}{0.5 \times 800 \times 18} = 3.5 \times 10^{-6} m/d$$

Estimated travel time over a distance of 800 m is 626 223 years.

The calculated values and time frames are presented in Figure 3-1 for alluvium material and Figure 3-2 for Snake Creek.

To evaluate the potential water quality from seepage, would be problematic due to the extensive travel time involved in laterite formations. It is expected that mineralisation process would be dominant resulting in enrichment of dissolved salt content that is obtained from lateritic clays and iron oxide matrix. Water quality parameters presenting to seepage zones on down-gradient areas would resemble background water quality values.

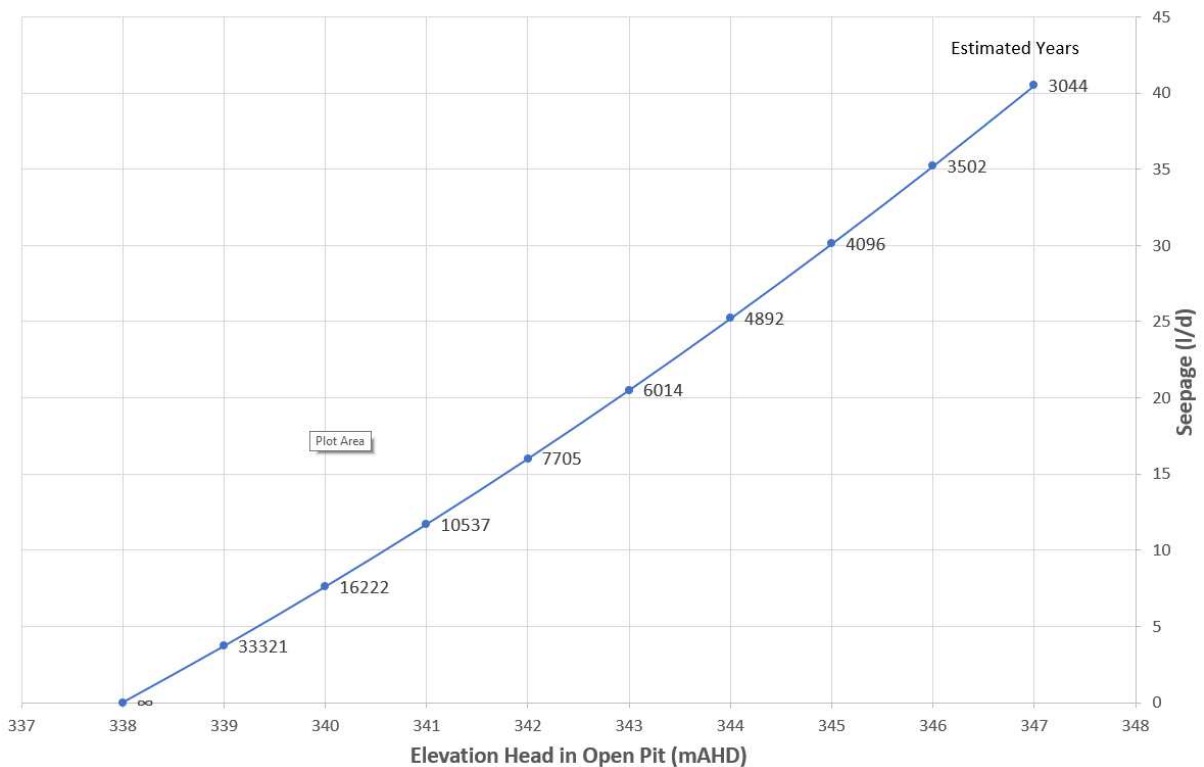


Figure 3-1 Calculated seepage rates and duration in years (labels) to reach seepage target of Alluvium materials

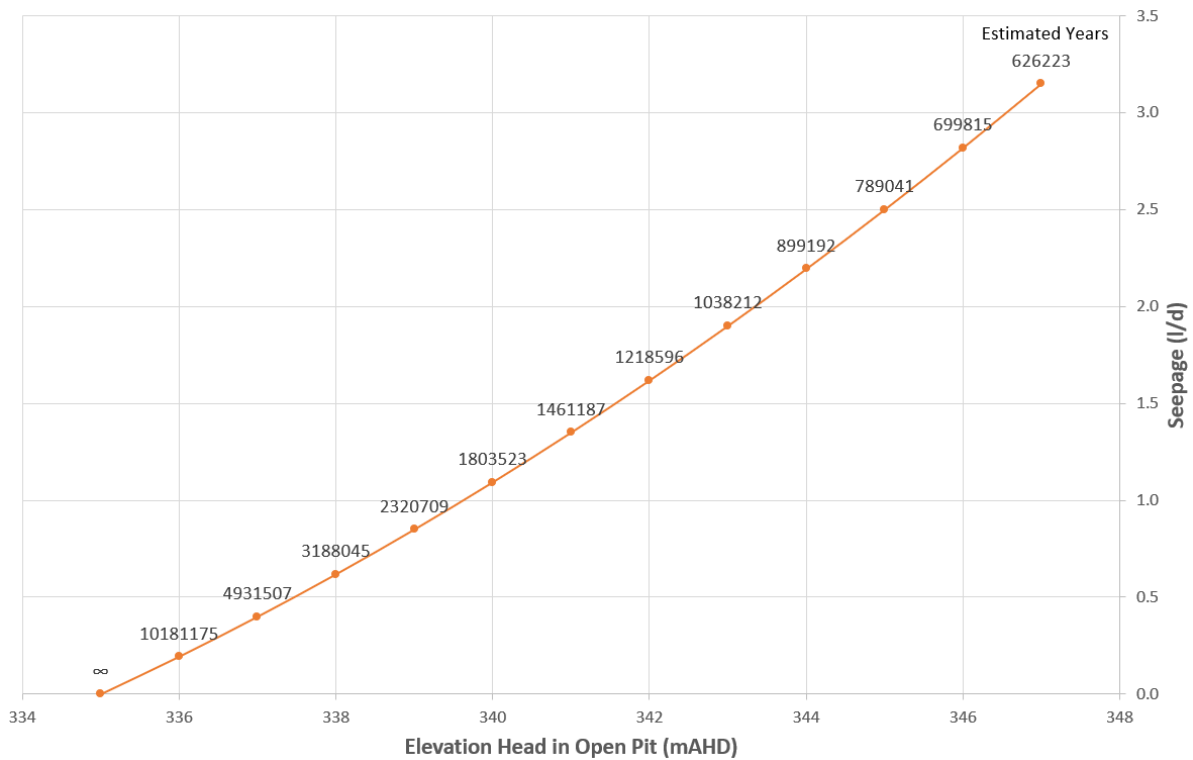


Figure 3-2 Calculated seepage rates and duration in years (labels) to reach seepage target of Snake Creek

3.3 Water Quality Data

Open cut water quality samples were collected on 18 September 2018 and 13 December 2018. A summary of the results is shown in the Piper Diagram (Figure 3-3) with total dissolved solids content reported in the order of 72 – 105 mg/L. The water can be classed as dominant sodium and potassium cationic component with a mixed bicarbonate and chloride anionic character. The water present in the open pit is indicative of rain water from coastal origin that has undergone nominal evaporation to form a mixed water type.

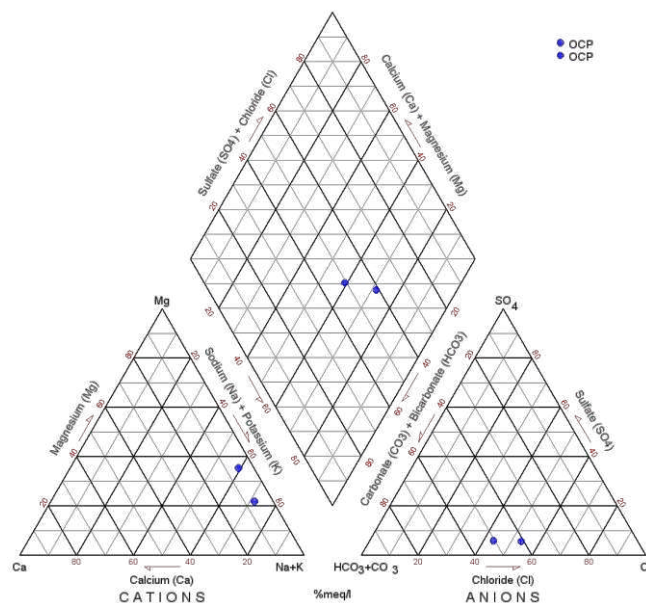


Figure 3-3 Piper Diagram of open cut water quality

In respect to seepage water quality that can be produced, it is probable that the current water quality in the pit and transport timeframes would undergo mineralisation as it migrates through the laterite formation. It will result in a water quality that is more likely to be associated with the interstitial water quality than pit water but is beyond the scope of the current assessment.

4 CONCLUSION

The hydraulic properties of the lateritic and saprolitic material can be associated with undisturbed clay material that has undergone cementation over extended time period since forming in place due to weathering processes.

An assessment of flow volume and duration to two identified target zones in the area of Dingo Dam has been performed, and migration potential of chemical components are highly unlikely.

In the assessment a homogenous composition of the sub-base was assumed, however from core hole logging data and modelling, the area surrounding Dingo Dam is heterogenous. An impermeable intrusive body is present up-gradient from the site, Dingo Dam is located in lateritic material and down-gradient geological formations consist of intrusive bodies with highly weathered material intercalating these formations resulting in low to near-impermeable zones in the subsurface.

Current understanding of the geological and hydrogeological setting would indicate that flow from Snake Creek through the subsurface to the open pit void is extremely low. Similarly, subsurface flow from the open pit to Snake Creek is extremely low due to limited hydraulic head and low permeability zones.

Overland flow is the most likely source of impact on the environment and Dingo Dam seepage potential is low to very low to reach the two identified receptors.

5 REFERENCES

- ASRIS (2016) National soil data provided by the Australian Collaborative Land Evaluation Program ACLEP, endorsed through the National Committee on Soil and Terrain NCST (www.clw.csiro.au/aclep).
- Delleur, J.W. (1999) Handbook of Groundwater Engineering. Springer-Verlag Berlin Heidelberg.
- DNRM (2018a) Groundwater Database - Queensland, in: Natural Resources, M.a.E. (Ed.). Queensland Government, Brisbane.
- DNRM (2018b) Queensland Globe, in: Natural Resources, M.a.E. (Ed.). Queensland Government, Brisbane.
- Fetter, C.W. (2001) Applied hydrogeology, 4th ed. Prentice Hall, Upper Saddle River, N.J.
- Jeffrey, S.J., Carter, J.O., Moodie, K.B. and Beswick, A.R. (2001) Using spatial interpolation to construct a comprehensive archive of Australian climate data External link icon. Environmental Modelling and Software 16, 309-330.
- Morton, F.I. (1983) Operational estimates of areal evapotranspiration and their significance to the science and practice of hydrology. Journal of Hydrology 66, 1-76.
- RockWare (2016) RockWorks17: Integrated geological data management, analysis, and visualization, Colorado.
- Umar, S.Y., Elinwa, A.U. and Matawal, D.S. (2015) Hydraulic Conductivity of Compacted Lateritic Soil Partially Replaced with Metakaolin. Journal of Environment and Earth Science 5, 53-64.

6 APPENDIX

6.1 Groundwater Bore Data

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
125281	Sub-Artesian Facility	Existing	15/04/2005	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-34-10	Basin 1201
Parish	2327 - HILLGROVE		Longitude	145-40-52	Sub-area
Original Name			GIS Latitude	-19.5695259	Lot 1
			GIS Longitude	145.6812373	Plan OC68
			Easting	361670	
Driller Name	BROWN, JOHN EDWARD		Northing	7835621	Map Scale
Drill Company	BROWN DRILL		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	20	Map Name
D/O File No	520/000(0076	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	16/05/2005	Data Owner			
Roles	Water Supply				

Casing 3 records for RN 125281

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	15/04/2005	1	0.00	67.57	Plastic Casing	5.900	WT - Wall Thickness	140
A	15/04/2005	2	59.00	67.00	Perforated or Slotted Casing	3.000	AP - Aperture Size	140
A	15/04/2005	3	0.00	6.00	Grout			202

Strata Logs 7 records for RN 125281

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	2.00	SANDY SOIL
2	2.00	3.00	IRONSTONE
3	3.00	21.00	HARD SANDY CLAY
4	21.00	49.00	BASALT AND CLAY AREAS
5	49.00	59.00	HARD BASALT
6	59.00	63.00	BASALT RUBBLE*
7	63.00	67.57	HARD BASALT

Stratigraphies

0 records for RN 125281

Aquifers

1 records for RN 125281

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	59.00	63.00	BSLT - Basic Volcanic	15/04/2005	-12.00	N	POTABLE	4.50	N	FR	

Pump Tests Part 1

0 records for RN 125281

Pump Tests Part 2

0 records for RN 125281

Bore Conditions

0 records for RN 125281

Elevations

0 records for RN 125281

Water Analysis Part 1

0 records for RN 125281

Water Analysis Part 2

0 records for RN 125281

Water Levels

0 records for RN 125281

Wire Line Logs

0 records for RN 125281

From Year:

Field Measurements	0 records for RN 125281
Special Water Analysis	0 records for RN 125281

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
166125	Sub-Artesian Facility	Existing	10/08/2014	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-19-50	Basin 1201
Parish	3716 - OWEENEE		Longitude	145-39-13	Sub-area
Original Name	BLUE ROCK BORE		GIS Latitude	-19.33067752	Lot 2
			GIS Longitude	145.65361347	Plan OC66
			Easting	358565	
Driller Name	CALVERT, JOHN		Northing	7862033	Map Scale
Drill Company	FOX DRILLING PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	4	Map Name
D/O File No	NOR/078820	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	24/08/2014	Data Owner	DNR		
Roles	Water Supply				

Casing 4 records for RN 166125

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	10/08/2014	1	0.00	43.00	Polyvinyl Chloride	5.900	WT - Wall Thickness	125
A	10/08/2014	2	25.00	43.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	125
X	10/08/2014	3	6.00	43.00	Gravel Pack	10.000	GR - Gravel Size	205
X	10/08/2014	4	0.00	6.00	Grout			205

Strata Logs 12 records for RN 166125

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.10	TOP SOIL
2	0.10	1.00	REDY BROWN SANDY CLAY
3	1.00	3.00	WEATHERED REDY BROWN GRANITE
4	3.00	25.00	BLUE GREY GRANITE
5	25.00	25.50	BROWN FRACTURED GRANITE - MIST @ 25 METRES
6	25.50	29.00	REDY BROWN GRANITE
7	29.00	29.50	FRACTURED GRANITE - WATER @ 29 METRES
8	29.50	34.00	REDY GRANITE & QUARTZ
9	34.00	34.50	FRACTURED - WATER @ 34 METRES
10	34.50	37.00	REDY BROWN GRANITE
11	37.00	37.50	FRACTURED - WATER @ 37 METRES
12	37.50	43.00	REDY BROWN GRANITE

Stratigraphies

0 records for RN 166125

Aquifers

3 records for RN 166125

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	29.00	29.50	GNTE - Acid Intrusive, Granite	10/08/2014	-23.00	N	POTABLE	0.14	Y	XX	
2	34.00	34.50	GNTE - Acid Intrusive, Granite	10/08/2014	-23.00	N	POTABLE	0.32	Y	XX	
3	37.00	37.50	GNTE - Acid Intrusive, Granite	10/08/2014	-23.00	N	POTABLE	0.45	Y	XX	

Pump Tests Part 1

0 records for RN 166125

Pump Tests Part 2

0 records for RN 166125

From Year:

Bore Conditions	0 records for RN 166125
Elevations	0 records for RN 166125
Water Analysis Part 1	0 records for RN 166125
Water Analysis Part 2	0 records for RN 166125
Water Levels	0 records for RN 166125
Wire Line Logs	0 records for RN 166125
Field Measurements	0 records for RN 166125
Special Water Analysis	0 records for RN 166125

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
166167	Sub-Artesian Facility	Existing	28/03/2015	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-31-04	Basin 1201
Parish	4011 - RIMBANDA		Longitude	145-46-39	Sub-area
Original Name			GIS Latitude	-19.51791169	Lot 3
			GIS Longitude	145.77763624	Plan CP898336
			Easting	371742	
Driller Name	BROWN, JOHN EDWARD		Northing	7841408	Map Scale
Drill Company	BROWN DRILL		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	4	Map Name
D/O File No	NOR/078820	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	02/06/2015	Data Owner	DNR		
Roles	Water Supply				

Casing 4 records for RN 166167

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	28/03/2015	1	0.00	63.00	Polyvinyl Chloride	7.650	WT - Wall Thickness	140
A	28/03/2015	2	51.00	63.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	140
X	28/03/2015	3	5.00	6.00	Bentonite Seal			178
X	28/03/2015	4	0.00	5.00	Grout			202

Strata Logs 8 records for RN 166167

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	7.00	GRAVELY SANDY CLAY
2	7.00	15.00	CLAY
3	15.00	25.00	MIX SANDY CLAY
4	25.00	29.00	GREY CLAY
5	29.00	31.00	SAND AND GRAVEL
6	31.00	51.00	RED SANDY CLAY
7	51.00	56.00	GRAVEL AND SAND - WATER AT 51 METRES
8	56.00	63.00	CLAY

Stratigraphies

0 records for RN 166167

Aquifers

1 records for RN 166167

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	51.00	56.00	SAGR - Sand and Gravel	28/03/2015	-33.00	N	BRACKISH	5.00	Y	XX	

Pump Tests Part 1

0 records for RN 166167

Pump Tests Part 2

0 records for RN 166167

Bore Conditions

0 records for RN 166167

Elevations

0 records for RN 166167

Water Analysis Part 1

0 records for RN 166167

Water Analysis Part 2

0 records for RN 166167

Water Levels

0 records for RN 166167

Report Date: 07/04/2019 15:43

Queensland Government
Groundwater Information
Bore Report

Page: 3 of 4
GWDB8250

From Year:

Wire Line Logs

0 records for RN 166167

Field Measurements

1 records for RN 166167

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	28/03/2015	51.00	2000							AI	Air Lifting	GB	Groundwater - from Bore

Special Water Analysis

0 records for RN 166167

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
166533	Sub-Artesian Facility	Existing	28/09/2015	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-22-24	Basin 1201
Parish	6000 - NO LONGER USED		Longitude	145-37-56	Sub-area
Original Name			GIS Latitude	-19.37333333	Lot 2
			GIS Longitude	145.63222222	Plan OC66
			Easting	356355	
Driller Name	PULMAN, MICHAEL		Northing	7857294	Map Scale
Drill Company	DRILL NORTH		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	5	Map Name
D/O File No	NOR/078820	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	02/12/2015	Data Owner	DNR		
Roles	Water Supply				

Casing 7 records for RN 166533

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	28/09/2015	1	0.00	2.00	Polyvinyl Chloride		WT - Wall Thickness	220
A	28/09/2015	2	0.00	30.00	Polyvinyl Chloride	7.650	WT - Wall Thickness	140
A	28/09/2015	3	30.00	32.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	140
X	28/09/2015	4	19.00	30.00	Gravel Pack			200
X	28/09/2015	5	18.00	19.00	Cement or Grout Plug			200

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	28/09/2015	6	6.00	18.00	Cuttings or other fill between casing and hole wall			200
X	28/09/2015	7	0.00	6.00	Grout			200

Strata Logs

4 records for RN 166533

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	2.00	SAND
2	2.00	21.00	DECO GRANITE
3	21.00	22.00	BROKEN GRANITE - WATER @ 21 METRES
4	22.00	30.00	GRANITE

Stratigraphies

0 records for RN 166533

Aquifers

1 records for RN 166533

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	21.00	22.00	GNTE - Acid Intrusive, Granite	28/09/2015	-10.00	N	POTABLE	0.25	Y	XX	

Pump Tests Part 1

0 records for RN 166533

Pump Tests Part 2

0 records for RN 166533

Bore Conditions

0 records for RN 166533

Elevations

0 records for RN 166533

Water Analysis Part 1

0 records for RN 166533

From Year:

Water Analysis Part 2	0 records for RN 166533
Water Levels	0 records for RN 166533
Wire Line Logs	0 records for RN 166533
Field Measurements	0 records for RN 166533
Special Water Analysis	0 records for RN 166533

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

Queensland Government
Groundwater Information
Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
166783	Sub-Artesian Facility	Existing	07/05/2016	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-31-02	Basin 1201
Parish	6000 - NO LONGER USED		Longitude	145-50-31	Sub-area
Original Name	STOCK BORE		GIS Latitude	-19.51708736	Lot 3
			GIS Longitude	145.84184211	Plan CP898336
			Easting	378479	
Driller Name	BROWN, JOHN EDWARD		Northing	7841546	Map Scale
Drill Company	BROWN DRILL		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	4	Map Name
D/O File No	NOR/078820	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	08/07/2016	Data Owner	DNR		
Roles	Water Supply				

Casing 5 records for RN 166783

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	07/05/2016	1	0.00	33.00	Polyvinyl Chloride	5.900	WT - Wall Thickness	140
A	07/05/2016	2	24.00	33.00	Perforated or Slotted Casing	1.000	AP - Aperture Size	140
X	07/05/2016	3	6.00	33.00	Gravel Pack	5.000	GR - Gravel Size	178
X	07/05/2016	4	5.00	6.00	Bentonite Seal			178
X	07/05/2016	5	0.00	5.00	Grout			178

From Year:

Strata Logs

4 records for RN 166783

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	3.00	CLAY DECO
2	3.00	24.00	GREY CLAY
3	24.00	31.00	SAND & ROCK - WATER @ 24 METRES
4	31.00	33.00	CLAY - WATER

Stratigraphies

0 records for RN 166783

Aquifers

1 records for RN 166783

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	24.00	31.00	SAGR - Sand and Gravel	07/05/2016	-17.00	N	POTABLE	2.50	Y	XX	

Pump Tests Part 1

0 records for RN 166783

Pump Tests Part 2

0 records for RN 166783

Bore Conditions

0 records for RN 166783

Elevations

0 records for RN 166783

Water Analysis Part 1

0 records for RN 166783

Water Analysis Part 2

0 records for RN 166783

Water Levels

0 records for RN 166783

Wire Line Logs

0 records for RN 166783

Field Measurements

0 records for RN 166783

From Year:

Special Water Analysis	0 records for RN 166783
------------------------	-------------------------

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
- You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
- You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
12010002	Sub-Artesian Facility	Existing	21/01/1976	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-39-56	Basin 1201
Parish	6000 - NO LONGER USED		Longitude	145-42-24	Sub-area 000
Original Name			GIS Latitude	-19.66548764	Lot
			GIS Longitude	145.70653202	Plan
			Easting	364404	
Driller Name	J.L.DIXON		Northing	7825020	Map Scale
Drill Company	I.W.S.C.		Zone	55	Map Series
Const Method	ROTARY		Accuracy	GPS	Map No V 43604
Bore Line			GPS Accuracy	10	Map Name
D/O File No	Polygon		Checked	Yes	Prog Section
R/O File No	Equipment	AR			
H/O File No	RN of Bore Replaced				
Log Received Date	Data Owner	DNR			
Roles	Sub-Artesian Monitoring				

Casing 2 records for RN 12010002

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/07/1975	1	0.00	37.31	Polyvinyl Chloride	3.350	WT - Wall Thickness	60
A	03/07/1975	2	34.31	37.31	Perforated or Slotted Casing	1.000	AP - Aperture Size	1

Strata Logs 34 records for RN 12010002

Rec	Top (m)	Bottom (m)	Strata Description
-----	---------	------------	--------------------

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	TOPSOIL,CLAY AND BOULDERS
2	1.00	2.00	CLAY AND BOULDERS MULTICOLOURED
3	2.00	2.40	BASALT SOFT/HARD
4	2.40	3.40	BASALT
5	3.40	6.40	BASALT WITH WEATHERED BAND
6	6.40	10.50	ROCK DECOMPOSED
7	10.50	11.50	ROCK DECOMPOSED AND WEATHERED
8	11.50	12.50	BASALT WEATHERED
9	12.50	14.10	BASALT WEATHERED AND FRACTURED
10	14.10	15.10	BASALT WEATHERED AND FRACTURED WITH
11			DECOMPOSED BANDS
12	15.10	20.20	BASALT FRACT,DECOMPOSED AND WEATHERED
13	20.20	20.90	CLAY BROWN
14	20.90	21.90	CLAY MULTICOLOURED
15	21.90	22.90	CLAY MULTICOLOURED AND FRACTURED
16			BASALT
17	22.90	23.30	BASALT FRACTURED
18	23.30	24.30	ROCK AND BASALT DECOMPOSED & WEATHERED
19	24.30	30.80	BASALT FRACTURED AND WEATHERED
20	30.80	31.80	BASALT FRACTURED AND WEATHERED WITH
21			HARD BAND
22	31.80	32.40	BASALT DECOMPOSED,FRACTURED AND
23			WEATHERED, WITH CLAYBOUND
24	32.40	38.00	BASALT FRACTURED
25	38.00	39.00	BASALT FRACTURED AND ROCK DECOMPOSED
26	39.00	41.00	ROCK DECOMPOSED

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
27	41.00	41.60	ROCK DECOMPOSED, FRACTURED
28	41.60	43.40	ROCK DECOMPOSED
29	43.40	44.40	ROCK HARD
30	44.40	45.40	ROCK BANDS HARD AND SOFT
31	45.40	53.70	ROCK DECOMPOSED MULTICOLOURED
32	49.80	54.70	ROCK DECOMPOSED MULTICOLOURED WITH
33			HARD BAND
34	54.70	55.30	ROCK DECOMPOSED MULTICOLOURED

Stratigraphies

0 records for RN 12010002

Aquifers

0 records for RN 12010002

Pump Tests Part 1

0 records for RN 12010002

Pump Tests Part 2

0 records for RN 12010002

Bore Conditions

0 records for RN 12010002

Elevations

2 records for RN 12010002

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
A	13/07/2015	331.45	SVY	Surveyed	AHD - Aust. Height Datum	R	Reference Point	
X	13/07/2015	331.12	SVY	Surveyed	AHD - Aust. Height Datum	N	Natural Surface	

Water Analysis Part 1

1 records for RN 12010002

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
------	------	-----	---------	-------------	-----------	------	-----	--------------	----	-----------	-------------------	---------------------	------	-----	---------------	-----	-----

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH	Si (mg/L)	Total Ions (mg/L)	Total Solids (mg/L)	Hard	Alk	Fig. of Merit	SAR	RAH
A	10/05/1982	1	GCL	094349			GB	960	7.6	10	686.20	485.26	309	342	1.8	1.9	0.65

Water Analysis Part 2

1 records for RN 12010002

Pipe	Date	Rec	Na	K	Ca	Mg	Mn	HCO3	Fe	CO3	Cl	F	NO3	SO4	Zn	Al	B	Cu
A	10/05/1982	1	78.0	3.0	53.0	43.0		415.0		1.1	87.0	0.10	0.0	6.0				

Water Levels

1333 records for RN 12010002

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	21/01/1976		-30.48	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	19/04/1976		-30.44	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	05/07/1976		-30.49	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	20/09/1976		-30.38	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	18/04/1977		-30.29	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	24/10/1977		-30.30	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	24/04/1978		-30.30	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	21/05/1979		-30.15	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	28/04/1980		-29.97	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	10/05/1982		-29.21	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	18/07/1983		-29.36	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	23/07/1984		-29.42	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	19/08/1985		-29.61	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	07/07/1986		-29.75	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	31/08/1998		-30.98	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality
A	17/07/2000		-29.94	R	Reference Point		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	23/04/2013	1127	-11.05	R	Reference Point		NR	Not Recorded	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	25/07/2013	0950	-11.06	R	Reference Point		NR	Not Recorded	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	18/12/2013	1214	-24.43	R	Reference Point		NR	Not Recorded	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	29/05/2014		-24.87	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	27/10/2014		-25.24	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	16/04/2015		-25.70	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	07/05/2015	1553	-25.71	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	20/05/2015	1641	-25.76	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	16/08/2015	1248	-25.98	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	17/08/2015		-25.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/08/2015		-25.98	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/08/2015		-25.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/08/2015		-26.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/08/2015		-26.00	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	27/08/2015		-26.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/08/2015		-26.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/08/2015		-26.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/08/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	01/09/2015		-26.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/09/2015		-26.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/09/2015		-26.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/09/2015		-26.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/09/2015		-26.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/09/2015		-26.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/09/2015		-26.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/09/2015		-26.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/09/2015		-26.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/09/2015		-26.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/09/2015		-26.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/09/2015		-26.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/09/2015		-26.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/09/2015		-26.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/09/2015		-26.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	26/09/2015		-26.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/09/2015		-26.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/09/2015		-26.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/09/2015		-26.09	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/09/2015		-26.10	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/10/2015		-26.10	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/10/2015		-26.10	R	Reference Point		ACT	Actual	DG	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	15/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/10/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/10/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/10/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	20/10/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/10/2015		-26.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/10/2015		-26.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/10/2015		-26.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/10/2015		-26.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/11/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/11/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/11/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/11/2015		-26.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/11/2015		-26.16	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/11/2015		-26.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/11/2015		-26.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/11/2015		-26.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/11/2015		-26.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/11/2015		-26.16	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/11/2015		-26.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	26/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/11/2015		-26.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/12/2015		-26.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/12/2015		-26.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/12/2015		-26.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/12/2015		-26.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/12/2015		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	21/12/2015		-26.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/12/2015		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/12/2015		-26.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/12/2015		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/12/2015		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/12/2015		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/12/2015		-26.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/12/2015		-26.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/12/2015		-26.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/01/2016		-26.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/01/2016		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/01/2016		-26.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/01/2016		-26.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/01/2016		-26.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/01/2016		-26.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/01/2016		-26.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	15/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/01/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/01/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/01/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/01/2016		-26.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/01/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/01/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/01/2016		-26.32	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/02/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/02/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/02/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/02/2016		-26.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/02/2016	0902	-26.31	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	05/02/2016		-26.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/02/2016		-26.31	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/02/2016		-26.33	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	08/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/02/2016		-26.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/02/2016		-26.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/02/2016		-26.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/02/2016		-26.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/02/2016		-26.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/02/2016		-26.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/02/2016		-26.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/02/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/02/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/02/2016		-26.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/02/2016		-26.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/02/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/02/2016		-26.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/02/2016		-26.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/02/2016		-26.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/02/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	04/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/03/2016		-26.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/03/2016		-26.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/03/2016		-26.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/03/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/03/2016		-26.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/03/2016		-26.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/03/2016		-26.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/03/2016		-26.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/03/2016		-26.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/03/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/03/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/03/2016		-26.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/03/2016		-26.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/03/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	29/03/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/03/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/03/2016		-26.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/04/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/04/2016		-26.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/04/2016		-26.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/04/2016		-26.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/04/2016		-26.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/04/2016		-26.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/04/2016		-26.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/04/2016		-26.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/04/2016		-26.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/04/2016		-26.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/04/2016		-26.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/04/2016		-26.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	23/04/2016		-26.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/04/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/04/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/04/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/04/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/05/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/05/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/05/2016		-26.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/05/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/05/2016		-26.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/05/2016		-26.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/05/2016		-26.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/05/2016		-26.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/05/2016		-26.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/05/2016		-26.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/05/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/05/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	18/05/2016		-26.54	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/05/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/05/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/05/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/05/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/05/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/05/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/05/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/05/2016		-26.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/05/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/05/2016		-26.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/05/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/05/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/06/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/06/2016		-26.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/06/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/06/2016	1458	-26.54	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	04/06/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/06/2016		-26.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/06/2016		-26.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/06/2016		-26.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/06/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/06/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/06/2016		-26.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	20/06/2016		-26.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/06/2016		-26.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/06/2016		-26.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/06/2016		-26.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/06/2016		-26.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/06/2016		-26.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/06/2016		-26.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/06/2016		-26.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/06/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/06/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/06/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/07/2016		-26.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/07/2016		-26.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/07/2016		-26.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/07/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	15/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/07/2016		-26.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/07/2016		-26.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/07/2016		-26.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/07/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/07/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/07/2016		-26.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/07/2016		-26.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/07/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/07/2016		-26.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/07/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/07/2016		-26.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/07/2016		-26.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/07/2016		-26.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/07/2016		-26.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/07/2016		-26.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/08/2016		-26.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	12/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/08/2016		-26.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/08/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/08/2016		-26.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/08/2016		-26.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/08/2016		-26.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/08/2016		-26.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/08/2016		-26.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/08/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/08/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/08/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/08/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/08/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/09/2016		-26.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/09/2016		-26.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/09/2016		-26.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	06/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/09/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/09/2016		-26.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/09/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/09/2016		-26.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/09/2016	0814	-26.78	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	18/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/09/2016		-26.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/09/2016		-26.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/09/2016		-26.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/09/2016		-26.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	30/09/2016		-26.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/10/2016		-26.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/10/2016		-26.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/10/2016		-26.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/10/2016		-26.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/10/2016		-26.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/10/2016		-26.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/10/2016		-26.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/10/2016		-26.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/10/2016		-26.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/10/2016		-26.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/10/2016		-26.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/10/2016		-26.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/10/2016		-26.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	25/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/10/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/10/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/10/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/10/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/11/2016		-26.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/11/2016		-26.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/11/2016		-26.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/11/2016		-26.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/11/2016		-26.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/11/2016		-26.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/11/2016		-26.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	19/11/2016	1236	-26.87	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	19/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/11/2016		-26.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/11/2016		-26.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/11/2016		-26.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/11/2016		-26.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/11/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/12/2016		-26.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/12/2016		-26.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/12/2016		-26.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/12/2016		-26.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	13/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/12/2016		-26.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/12/2016		-26.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/12/2016		-26.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/12/2016		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/12/2016		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/01/2017		-26.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/01/2017		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/01/2017		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/01/2017		-26.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/01/2017		-26.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/01/2017		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	07/01/2017		-26.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/01/2017		-26.95	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/01/2017		-26.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/01/2017		-26.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/01/2017		-26.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/01/2017		-26.97	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/01/2017		-26.98	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/01/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/01/2017		-26.99	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/01/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/01/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/01/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/01/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	01/02/2017		-27.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/02/2017		-27.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/02/2017		-27.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/02/2017		-27.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/02/2017		-27.01	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/02/2017		-27.00	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/02/2017		-27.02	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/02/2017		-27.02	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/02/2017		-27.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/02/2017		-27.03	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/02/2017		-27.02	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/02/2017		-27.02	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/02/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/02/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	26/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/02/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/02/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/03/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/03/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/03/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/03/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/03/2017		-27.04	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/03/2017		-27.06	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/03/2017		-27.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/03/2017	1046	-27.09	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand	GWAN	1 Good - Actual Manual Measurements
A	20/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/03/2017		-27.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	22/03/2017		-27.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/03/2017		-27.08	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/03/2017		-27.07	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/03/2017		-27.05	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/03/2017		-27.09	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/03/2017		-27.10	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/04/2017		-27.10	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/04/2017		-27.12	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/04/2017		-27.10	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/04/2017		-27.11	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	16/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/04/2017		-27.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/04/2017		-27.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/04/2017		-27.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/04/2017		-27.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/04/2017		-27.13	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/04/2017		-27.14	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/04/2017		-27.16	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/04/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/05/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/05/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/05/2017		-27.16	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/05/2017		-27.16	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/05/2017		-27.15	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	11/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/05/2017		-27.17	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/05/2017		-27.19	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/05/2017		-27.18	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/05/2017		-27.19	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/05/2017		-27.19	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/05/2017		-27.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/05/2017		-27.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/05/2017		-27.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/05/2017		-27.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/05/2017		-27.20	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/05/2017		-27.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/05/2017		-27.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/05/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/06/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/06/2017		-27.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	05/06/2017		-27.21	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/06/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/06/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/06/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/06/2017		-27.22	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/06/2017		-27.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/06/2017		-27.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/06/2017		-27.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/06/2017		-27.24	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/06/2017		-27.23	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	30/06/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	60 Data is estimated
A	03/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/07/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/07/2017		-27.25	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/07/2017		-27.26	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/07/2017		-27.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/07/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/07/2017		-27.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/07/2017		-27.27	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	60 Data is estimated
A	20/07/2017		-27.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	60 Data is estimated
A	21/07/2017		-27.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/07/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/07/2017		-27.28	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/07/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	25/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/07/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/07/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/08/2017		-27.30	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/08/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/08/2017		-27.29	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/08/2017		-27.32	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/08/2017		-27.32	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/08/2017		-27.33	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/08/2017		-27.33	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/08/2017		-27.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/08/2017		-27.33	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/08/2017		-27.33	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/08/2017		-27.34	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	19/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/08/2017		-27.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/08/2017		-27.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/08/2017		-27.35	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/08/2017		-27.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/08/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/08/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/09/2017		-27.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	13/09/2017		-27.36	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/09/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/09/2017		-27.37	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/09/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/09/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/09/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/10/2017		-27.38	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	02/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	08/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/10/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/10/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/10/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/10/2017		-27.39	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/10/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/10/2017		-27.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/10/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/10/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	27/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/10/2017		-27.40	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	31/10/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/11/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	02/11/2017		-27.41	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	03/11/2017		-27.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	04/11/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	05/11/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	06/11/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	07/11/2017		-27.42	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	08/11/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	09/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	10/11/2017		-27.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	11/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	12/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	13/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	14/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	15/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	16/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	17/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	18/11/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	19/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	20/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	21/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	22/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	23/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	24/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	25/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	26/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	27/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	28/11/2017		-27.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	29/11/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	30/11/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	10 Good
A	01/12/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/12/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/12/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/12/2017		-27.43	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/12/2017		-27.44	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/12/2017		-27.45	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/12/2017		-27.46	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/12/2017		-27.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/12/2017		-27.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/12/2017		-27.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/12/2017		-27.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	22/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/12/2017		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/12/2017		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/12/2017		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/12/2017		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/12/2017		-27.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/12/2017		-27.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/12/2017		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/12/2017		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/01/2018		-27.47	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/01/2018		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/01/2018		-27.48	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/01/2018		-27.50	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/01/2018		-27.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/01/2018		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/01/2018		-27.49	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	16/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/01/2018		-27.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/01/2018		-27.54	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/01/2018		-27.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/01/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/01/2018		-27.51	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/02/2018		-27.52	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/02/2018		-27.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/02/2018		-27.53	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/02/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	10/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/02/2018		-27.54	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/02/2018		-27.55	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/02/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/02/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/02/2018		-27.56	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/02/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/02/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/03/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/03/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/03/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	07/03/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/03/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/03/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/03/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/03/2018		-27.58	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/03/2018		-27.57	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/03/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/03/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/03/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	01/04/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/04/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/04/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/04/2018		-27.59	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/04/2018		-27.60	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/04/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/04/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/04/2018		-27.61	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/04/2018		-27.63	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/04/2018		-27.62	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	26/04/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/04/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/04/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/04/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/04/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/05/2018	0951	-27.66	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	04/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/05/2018		-27.64	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	20/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/05/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/05/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/05/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/05/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/05/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/05/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/05/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/06/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/06/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/06/2018		-27.65	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/06/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/06/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/06/2018		-27.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/06/2018		-27.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/06/2018		-27.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/06/2018		-27.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/06/2018		-27.68	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/06/2018		-27.66	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/06/2018		-27.67	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	14/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/06/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/06/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/06/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/07/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/07/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/07/2018		-27.69	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	09/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/07/2018		-27.70	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/07/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/07/2018		-27.71	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/07/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/07/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/07/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	03/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/08/2018		-27.72	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/08/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/08/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/08/2018		-27.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/08/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/08/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/08/2018		-27.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/08/2018		-27.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/08/2018		-27.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/08/2018		-27.73	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/08/2018		-27.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/08/2018		-27.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/08/2018		-27.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/08/2018		-27.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/08/2018	1445	-27.71	R	Reference Point		ACT	Actual	DH	MA	Manual/Hand		1 Good - Actual Manual Measurements
A	22/08/2018		-27.75	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/08/2018		-27.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/08/2018		-27.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/08/2018		-27.76	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/08/2018		-27.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	27/08/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/08/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/08/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/08/2018		-27.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/08/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/09/2018		-27.77	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/09/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/09/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/09/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/09/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/09/2018		-28.74	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/09/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/09/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/09/2018		-27.78	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/09/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/09/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	21/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/09/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/09/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/09/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/09/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/09/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/10/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/10/2018		-27.79	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/10/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/10/2018		-27.80	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	16/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/10/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/10/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/10/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/10/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/10/2018		-27.81	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/10/2018		-27.82	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/10/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/10/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/11/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/11/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/11/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/11/2018		-27.83	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/11/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	10/11/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/11/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/11/2018		-27.84	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/11/2018		-27.85	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/11/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/11/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/12/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/12/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	05/12/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/12/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/12/2018		-27.86	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/12/2018		-27.87	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/12/2018		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/12/2018		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/12/2018		-27.88	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/12/2018		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/12/2018		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/12/2018		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/12/2018		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/12/2018		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/12/2018		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/12/2018		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality	
A	30/12/2018		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	31/12/2018		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	01/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	02/01/2019		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	03/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	04/01/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	05/01/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	06/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	07/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	08/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	09/01/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	10/01/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	11/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	12/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	13/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	14/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	15/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	16/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	17/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	18/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	19/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	20/01/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	21/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	22/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality
A	23/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130	Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	24/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/01/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/01/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/01/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/02/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/02/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/02/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/02/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/02/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/02/2019		-27.89	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/02/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/02/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/02/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/02/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/02/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/02/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/02/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/02/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	15/02/2019		-27.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/02/2019		-27.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/02/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	18/02/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/02/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/02/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/02/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/02/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/02/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/02/2019		-27.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/02/2019		-27.96	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/02/2019		-27.95	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/02/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/02/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	01/03/2019		-27.95	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	02/03/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	03/03/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	04/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	05/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	06/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	07/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	08/03/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	09/03/2019		-27.95	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	10/03/2019		-27.94	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	11/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	12/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	13/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	14/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	15/03/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	16/03/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	17/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	18/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	19/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	20/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	21/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	22/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	23/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	24/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	25/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	26/03/2019		-27.92	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	27/03/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	28/03/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	29/03/2019		-27.90	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	30/03/2019		-27.91	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality
A	31/03/2019		-27.93	R	Reference Point		DM	Daily Mean	DH	DL	Data Logger	GWAN	130 Data is of unknown quality

Wire Line Logs

0 records for RN 12010002

Field Measurements

20 records for RN 12010002

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	21/01/1976		920									GB	Groundwater - from Bore
A	19/04/1976		890									GB	Groundwater - from Bore

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	05/07/1976		940									GB	Groundwater - from Bore
A	20/09/1976		960									GB	Groundwater - from Bore
A	18/04/1977		980							BA	Bailer - Other	GB	Groundwater - from Bore
A	24/10/1977		1000									GB	Groundwater - from Bore
A	24/04/1978		990									GB	Groundwater - from Bore
A	23/10/1978		1080									GB	Groundwater - from Bore
A	21/05/1979		1100							BA	Bailer - Other	GB	Groundwater - from Bore
A	28/04/1980		1140									GB	Groundwater - from Bore
A	10/05/1982		950							BA	Bailer - Other	GB	Groundwater - from Bore
A	18/07/1983		1000							BA	Bailer - Other	GB	Groundwater - from Bore
A	23/07/1984		1050							BA	Bailer - Other	GB	Groundwater - from Bore
A	19/08/1985		1100							BA	Bailer - Other	GB	Groundwater - from Bore
A	07/07/1986		1230							BA	Bailer - Other	GB	Groundwater - from Bore
A	29/05/2014		1524		27.6					AI	Air Lifting	GB	Groundwater - from Bore
A	27/10/2014		1690		28.1					AI	Air Lifting	GB	Groundwater - from Bore
A	16/04/2015		1745		28.4					AI	Air Lifting	GB	Groundwater - from Bore
A	27/08/2015		1768		27.7					AI	Air Lifting	GB	Groundwater - from Bore
A	15/10/2015		1804		27.8					AI	Air Lifting	GB	Groundwater - from Bore

From Year:

Special Water Analysis	0 records for RN 12010002
------------------------	---------------------------

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

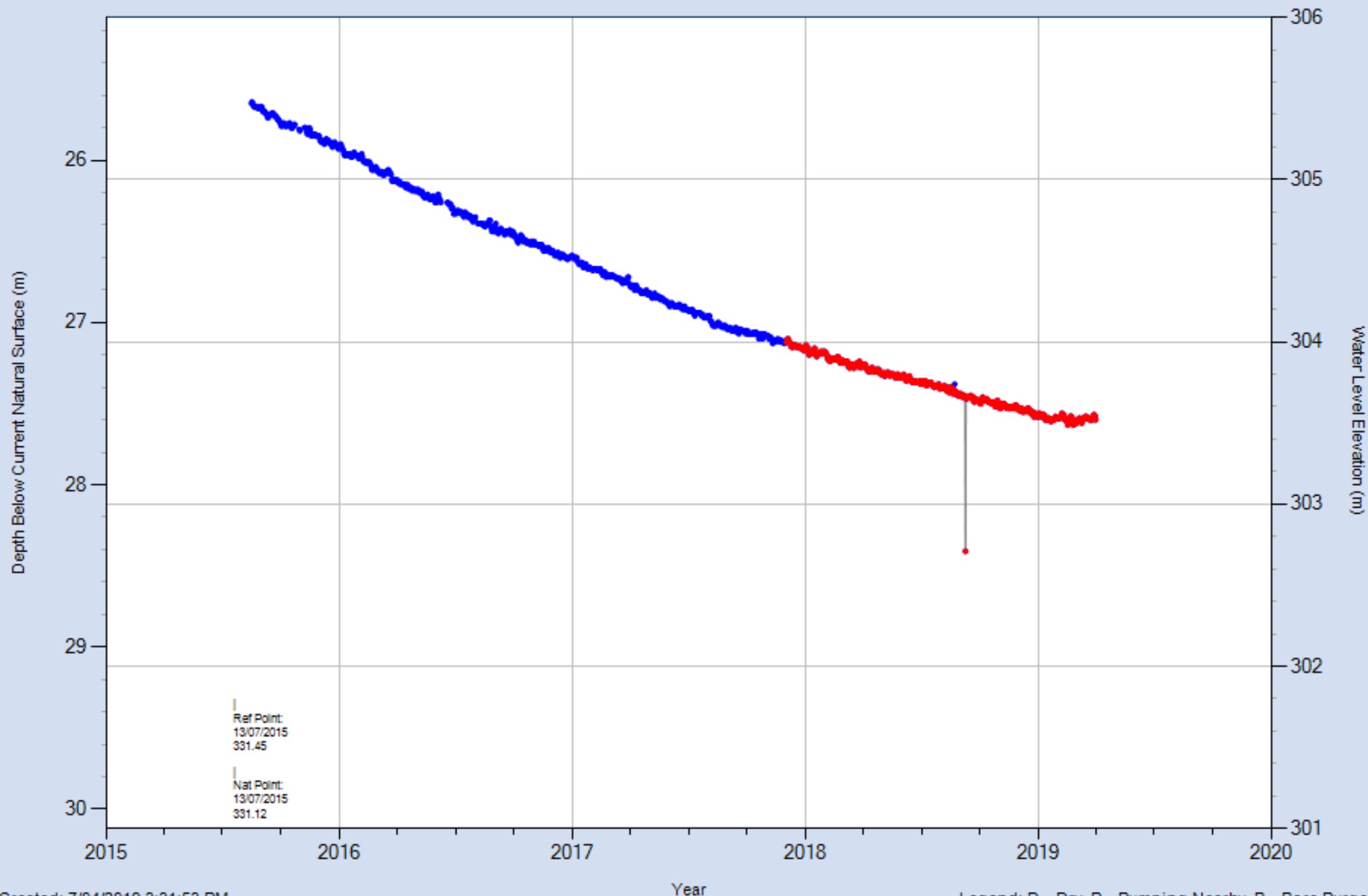
Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

RN - 12010002 Pipe - A



Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: “© State of Queensland 2019”.
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): “Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.”
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

**** End of Report. Produced: 7/04/2019 3:31:53 PM ****

Queensland Government
Groundwater Information
Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
12010014	Sub-Artesian Facility	Abandoned and Destroyed	14/07/2012	Ayr	2310 - CHARTERS TOWERS REGIONAL
Details			Location		
Description			Latitude	19-39-54	Basin 1201
Parish	2327 - HILLGROVE		Longitude	145-43-32	Sub-area
Original Name	UB7		GIS Latitude	-19.66492832	Lot
			GIS Longitude	145.7256218	Plan
			Easting	366405	
Driller Name	MATT, WILLIAM JOHARN		Northing	7825097	Map Scale
Drill Company	DNR		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	25	Map Name
D/O File No	Polygon		Checked	Yes	Prog Section
R/O File No	Equipment	NE			
H/O File No	RN of Bore Replaced				
Log Received Date	03/09/2012	Data Owner	DSI		
Roles	Sub-Artesian Monitoring				

Casing 3 records for RN 12010014

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	14/07/2012	1	0.00	5.00	Grout			215
X	14/07/2012	2	5.00	5.50	Cuttings or other fill between casing and hole wall			215
X	14/07/2012	3	5.50	49.50	Cuttings or other fill between casing and hole wall			152

Strata Logs 17 records for RN 12010014

From Year:

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.10	BROWN CLAYEY SAND SOIL
2	0.10	4.00	GREY BASALT, VESICULAR, WEATHERED, FRACTURED
3	4.00	5.00	RED BROWN CLAY; DECOMPOSED BASALT
4	5.00	7.00	DARK BROWN BASALT, VERY WEATHERED, FRACTURED
5	7.00	13.00	GREY BASALT, MINOR VESICLES, WEAKLY WEATHERED, FRACTURED
6	13.00	21.00	GREY BROWN BASALT, VESICULAR, WEATHERED, FRACTURED, FE STAINING **SOAK
7	21.00	28.00	GREY BROWN BASALT, WEATHERED, FRACTURED, FE STAINING
8	28.00	29.00	BROWN SANDY CLAY
9	29.00	32.00	OFF WHITE SANDY CLAY
10	32.00	33.00	GREY BROWN BASALT, WEATHERED, FRACTURED
11	33.00	35.00	DARK GREY BROWN BASALT, WEAKLY WEATHERED
12	35.00	40.00	GREY BROWN BASALT, WEATHERED, FRACTURED
13	40.00	42.50	BLACK GREY OLIVINE BASALT
14	42.50	44.00	RED BROWN VF-VC SAND & GRAVEL
15	44.00	47.00	RED SANDY CLAY
16	47.00	49.00	LIGHT BROWN SANDY CLAY
17	49.00	49.50	WHITE F-VC SAND & GRAVEL

Stratigraphies

2 records for RN 12010014

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	42.50	NULLA BASALT
DNR	2	42.50	49.50	TERTIARY - UNDEFINED

Aquifers

2 records for RN 12010014

Rec	Top (m)	Bottom	Lithology	Date	SWL	Flow	Quality	Yield	Contr	Cond	Formation Name
-----	---------	--------	-----------	------	-----	------	---------	-------	-------	------	----------------

Queensland Government
Groundwater Information
Bore Report

From Year:

		(m)		(m)		(L/s)			
1	13.00		BSLT - Basic Volcanic	N		0.10	N	WZ	NULLA BASALT
2	32.00	40.00	BSLT - Basic Volcanic	N	1604US/C M	0.45	N	WZ	NULLA BASALT

Pump Tests Part 1

0 records for RN 12010014

Pump Tests Part 2

0 records for RN 12010014

Bore Conditions

0 records for RN 12010014

Elevations

1 records for RN 12010014

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
X	14/07/2012	338.00	GPS	Global Positioning System	AHD - Aust. Height Datum	N	Natural Surface	WGS 84

Water Analysis Part 1

0 records for RN 12010014

Water Analysis Part 2

0 records for RN 12010014

Water Levels

0 records for RN 12010014

Wire Line Logs

2 records for RN 12010014

Date	Run	Type		Source	Top (m)	Bottom (m)	Operator	Comments
14/07/2012	1	GR	Gamma Ray	DNR	0.00	39.260		RUN WITH CIEL LOG
14/07/2012	1	CIEL	Conductivity Induction Electricity	DNR	0.00	39.260		

Field Measurements

1 records for RN 12010014

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
X	08/07/2012	38.00	1601		28.1					AI	Air Lifting	GB	Groundwater - from

Report Date: 07/04/2019 15:33

Queensland Government
Groundwater Information
Bore Report

From Year:

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp Method	Samp Source
											Bore

Special Water Analysis 0 records for RN 12010014

From Year:

User Licence and Conditions

Disclaimer

Open Licence (Single Supply)

Permitted use:

- You may use the supplied data for your own purposes (including supply to consultants for a specific consultancy project for you but the consultants must return or destroy the supplied data when the project is finished). You must not sell or distribute the supplied data.
- You must display this copyright notice on any copies of the supplied data however altered, reformatted or redisplayed if you supply to a consultant or copy for back up purposes: "© State of Queensland 2019".
- You may create and distribute hardcopy and digital products based on or containing the supplied data, provided all the following conditions are met:
 - You must display this acknowledgment on the product(s): "Based on or contains data provided by the State of Queensland 2019. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws."
 - You must include metadata with the product(s) you create that use or incorporate the supplied data and the metadata must incorporate as a minimum the metadata provided with this supplied data.

Obligations:

- You must not use the data for direct marketing or in breach of the privacy laws.

Ownership:

The State of Queensland is the owner of the intellectual property rights in and to the supplied data or has the right to make this supplied data available.

Disclaimer and indemnity:

You agree to accept all responsibility and risks associated with the use of the supplied data. The State makes no representations or warranties in relation to the supplied data, and, you agree that, to the extent permitted by law, all warranties relating to accuracy, reliability, completeness, currency or suitability for any particular purpose and all liability for any loss, damage or costs (including consequential damage) incurred in any way (including but not limited to that arising from negligence) in connection with any use of or reliance on the supplied data are excluded or limited. You agree to continually indemnify the State of Queensland (and its officers and employees) against any loss, cost, expense, damage and liability of any kind (including consequential damage and liability in negligence) arising directly or indirectly from or related to any claim relating to your use of the supplied data or any product made from the data.

Our Ref: 118284-02-L003-0.docx

7 June 2019

Australian Mine Limited
C/-
AARC Environmental Solutions Ltd
Suite 5, 1 Swann Road
TARINGA QLD 4068

ATTENTION: HOLLIE DICK

Dear Hollie,

LUCKY BREAK PROJECT, DINGO DAM MINING VOID, PIT WALL DESKTOP STABILITY STUDY

1 PROJECT BACKGROUND

The Lucky Break project is an open cut nickel mine located within Mining Lease (ML) 10324 approximately 90 km west of Townsville and 90 km northwest of Charters Towers in northeast Queensland. Two distinct surface outcropping nickel ore bodies (i.e. Dingo Dam and Circular Laterite) are the focus of the project.

Extraction at the mine was undertaken between March and July 2015 by Queensland Nickel Pty Ltd (QNPL) for Metallica Minerals Ltd (MML), a subsidiary of NORNICO Pty Ltd, under the previous Environmental Authority (EA, EPML00900713). After mining ceased the project entered a care and maintenance phase, with the balance of ore reserves in the Dingo Dam deposit left in place for potential later mining by the Lucky Break Project. Rehabilitation was undertaken during this period including removal of infrastructure, re-profiling of the waste dump, reducing batter angles of the residual void, installing stormwater controls, ripping hardstand areas, spreading topsoil and seeding and installing fences.

The current EA holder, Sconi Mining Operations Pty Ltd (SMO), a subsidiary of Australian Mines Ltd (AML) recently acquired the Lucky Break Project, and with AARC Environmental Solutions Ltd (AARC) acting on their behalf, has requested that ATCW provides geotechnical engineering assessment of the stability of the Dingo Dam mining void. For this scope of work, ATCW has undertaken desktop review of available reports, maps and photographs as discussed below.

2 SUMMARY OF REVIEW OF AVAILABLE DOCUMENTATION

AARC provided ATCW with site-specific information for desktop review of the existing geological and hydrogeological conditions at site, which would be anticipated to affect stability in the mining void. The primary sources of information reviewed included:

- Geological Survey of Queensland (1968), 1:250,000 geological series Townsville geological map explanatory notes;
- Geological Survey of Queensland (1997), 1:250,000 geological series Townsville geological map (Sheet SE55-14. 2nd Edition);
- Geological Survey of Queensland (2005), 1:100,000 geological series Ewan geological map (Sheet 8059);
- Internal drilling summary report prepared for MML (Anon., 2005);
- Miscellaneous historical site photographs (Anon., 2008 to 2018);
- Results of geochemical analysis of percussion drill samples by Australian Laboratory Services Pty Ltd (ALS, 2005);
- Resource update report prepared by Computer Aided Geoscience Pty Ltd (CAG, 2006) for MML;
- Detail and Level Survey prepared by Rowlands Surveys Pty Ltd for SMO (2019); and
- Dingo dam hydrogeological assessment prepared by Geosquare Consulting Pty Ltd (GC, 2019).

Other public access data sources including topographical mapping were also accessed for review to complement the above references.

3 REGIONAL TOPOGRAPHY AND GEOLOGY OF DINGO DAM MINING VOID

Available topographical maps indicate that the ML comprises gently undulating hillslopes and minor watercourses with elevations in the order of approximately RL 330 m to 360 m AHD. Local elevations around the Dingo Dam mining void range from approximately RL 350 m in the southwest to RL 340 m AHD in the northeast, with the pit floor indicated to be at approximately RL 335 m to RL 338 m AHD (refer to **Plate 1; Figures 1 to 3**). The void is approximately 400 m long by 80 m wide with batter angles indicated to be in the order of 20° angles based on available survey. The void exists on an unnamed southwest to northeast flowing tributary of the west-east oriented Snake Creek. Stockyard Creek is found to the northeast beyond the ML boundaries.

The Geological Survey of Queensland's geological mapping (GSQ, 1997, 2005) was reviewed to assess the subsurface geology at the ML, and in particular at the pit location. Locally, shallow subsurface cover materials are indicated to comprise Quaternary alluvium, Tertiary duricrust soils and Late Tertiary colluvial clay, silt, sand and gravel mixtures. The regional geology consists of Neoproterozoic to Early Palaeozoic aged basement rocks of the Argentine Metamorphics and these rocks typically comprising mica schist, quartzite, amphibolite, and serpentinite with minor talc-tremolite schist and clinopyroxenite. Early Carboniferous aged rocks of the Whipple Spring Granite are shown to have been intruded into these basement rocks to the west of the site.

At the site of the Dingo Dam mining void, the mapping shows that the underlying rocks are expected to consist predominantly of serpentinite. In terms of structural geology, the mapping (GSQ, 1997, 2005) indicates that there are no geological faults or any other fracture zones locally.

Plate 1 Mining Void Configuration

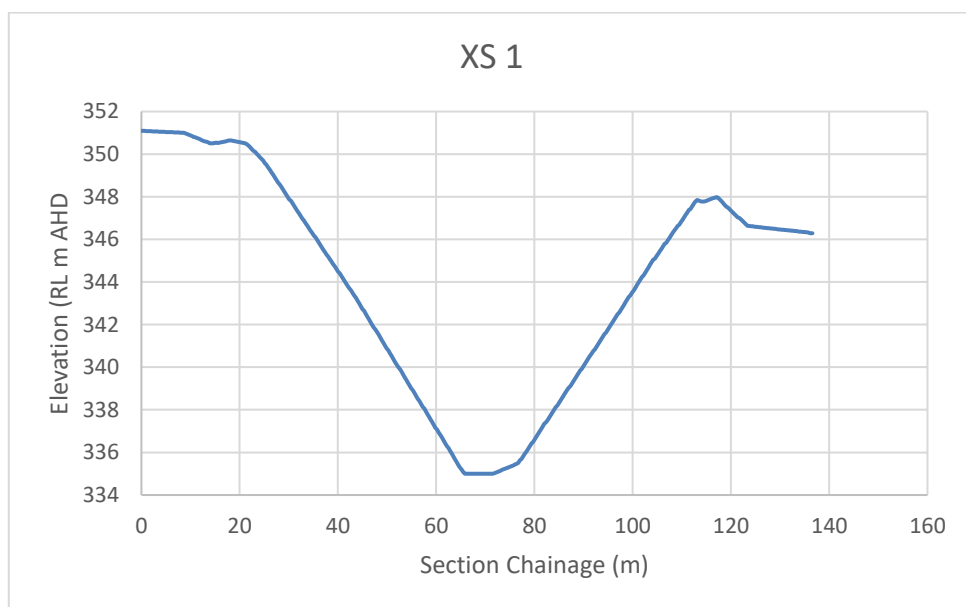
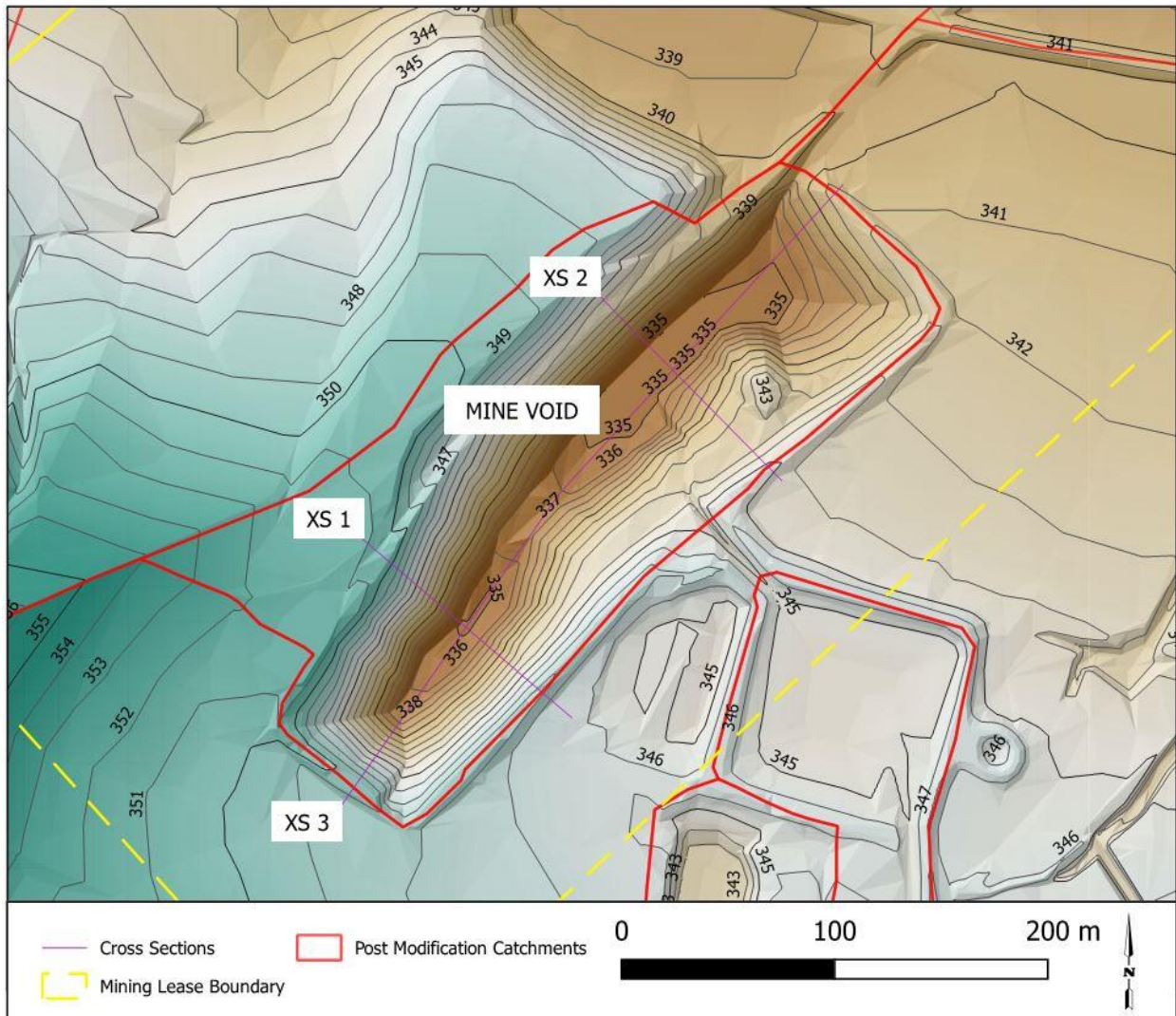


Figure 1: Mining Void Cross Section XS1

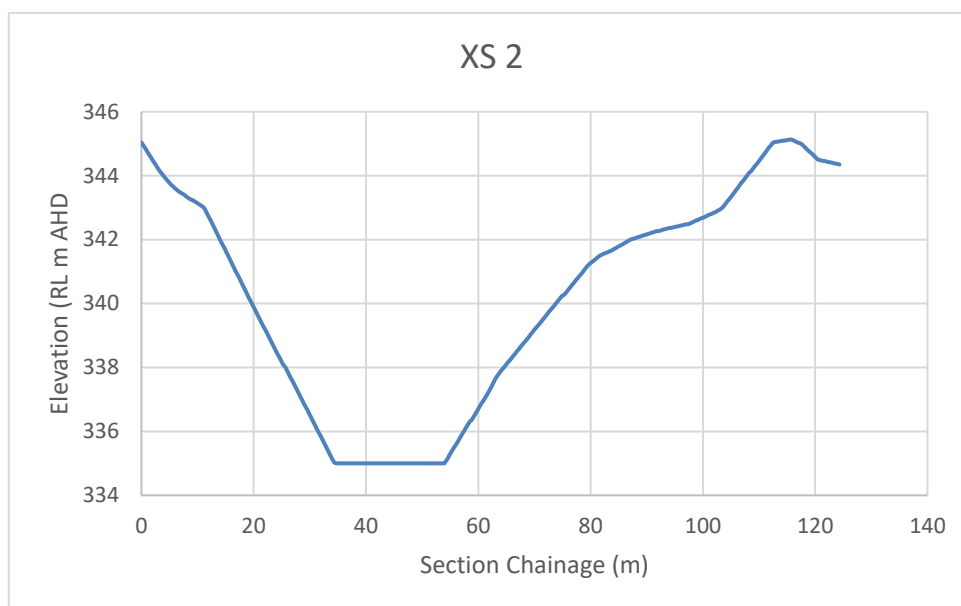


Figure 2: Mining Void Cross Section XS2

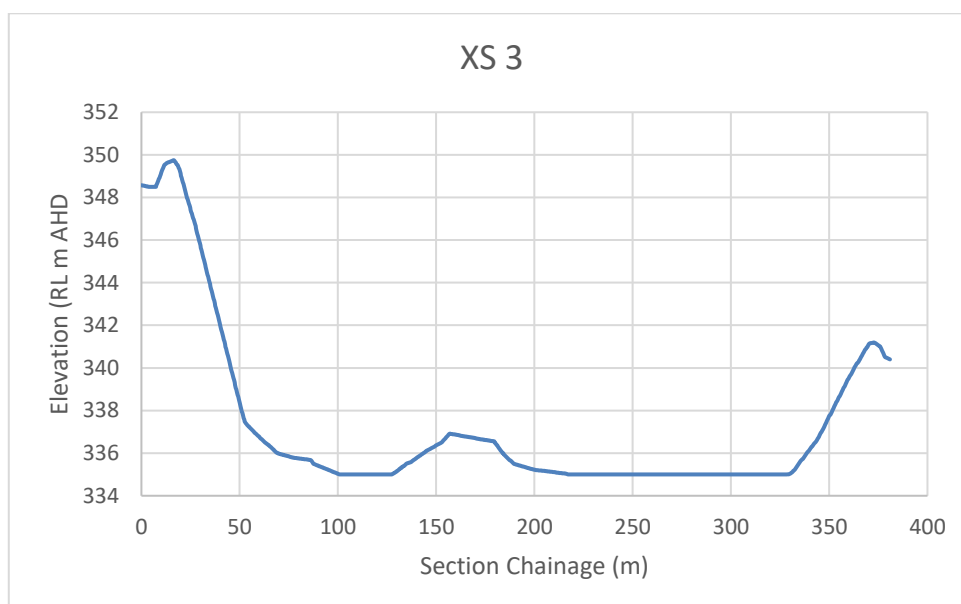


Figure 3: Mining Void Cross Section XS3

4 REVIEW OF HISTORICAL PHOTOGRAPHS

ATCW has undertaken review of a series of photographs supplied by AARC which show conditions during the construction of the Dingo Dam mining void (refer **Plate 2**), conditions shortly after construction and conditions during recent site inspections (refer **Plate 3**). The photographs from the construction period generally suggest that the void was excavated into relatively shallow and weak clay soils underlain by estimated very low to low strength basement rock. The near-vertical benches shown in the photographs (**Plate 2**) appeared relatively stable in dry conditions however it appears that the benches were flattened out into batters (**Plate 3**) at a later stage.

Plate 2
Photographs of site conditions during Dingo Dam mining void construction

Excavation of mining void



Weathered soils and rock at excavation batter



View of benching at excavation batter



Serpentinite rock exposed in batter face



Weathered rock and clay exposed in batter



Overview of mining void



Plate 3
Photographs of site conditions at Dingo Dam mining void

Batter slopes at mining void



Batter slopes at mining void (looking NE)



September 2018 void conditions (looking SW)



September 2018 void conditions (looking NE)



Void conditions in December 2018 (looking SW)



Void condition in April 2019 (looking NE)



5 MINING VOID STABILITY ASSESSMENT

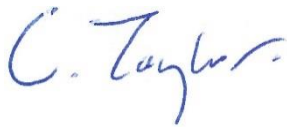
Reference to the photographs from 2018 and 2019 indicate that the mining void becomes water-filled periodically, dependent on weather conditions. Sparse vegetation has established on the batters in the period following construction, however erosion rills on the batter slopes suggest that water is freely draining down the batters.

From a stability perspective, it is considered that there is a very low risk of geotechnical instability affecting the mining void, other than the existing erosion from water flowing into the pit. It is understood that bunding of the mining void is to be undertaken which will further minimise the erosion of the batter. Nonetheless, it would be prudent to encourage additional vegetation to establish on the batters as a control measure to minimise ongoing erosion. Should any slip failures occur in the relatively weak soils and upper portion of the weathered rock, it is likely that this would be a relatively low-angle failure with materials being contained within the mining void. The relatively shallow batter slope angles reduce the risk of toppling or wedge failures in any exposed rock (noting that these conditions were not observed in the photographs).

6 CONCLUDING COMMENTS

We trust that this meets your current requirements.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "C. Taylor".

CHRIS TAYLOR
Senior Engineering Geologist
ATC Williams Pty Ltd

A handwritten signature in blue ink, appearing to read "L. Boczek".

LIS BOCZEK
Principal Engineer
ATC Williams Pty Ltd



REPORT

AUSTRALIAN MINES LTD

LUCKY BREAK PROJECT

**DINGO DAM CONSEQUENCE
CATEGORY ASSESSMENT**

Date: June 2019

Report Number: 118284-02 R001

Document History and Status

Title: Lucky Break - Dingo Dam Consequence Category Assessment
Job Number/Extension: 118284-02
Document Number: 118284-02 R001-0
Project Office: Brisbane
File Path: M:\Synergy\Projects\118\118284 Dingo Dam Lucky Break\02 Residual Void Ass and CCAs\Documents\R01 - CCA\04 Final\118284-02-R001-0.docx
Authors: Andronikus Dreyer
Reviewer: Lis Boczek
Job Manager: Thomas Rose

Rev.	Status	Issued to	Issue Date	Signatures	
				Author	Reviewer
A	Draft	AARC/AML		AD	LB
0	Final	AARC/AML	07/06/2019	AD	LB

IMPORTANT NOTICE

Please refer to our Conditions of Investigation and Report



ATC Williams Pty Ltd
ABN 64 005 931 288
Melbourne T: +61 3 8587 0900 Perth T: +61 8 9213 1600 Brisbane T: +61 7 3352 7222
www.atcwilliams.com.au



Conditions of Report

1. This report has been prepared by us for the purposes stated herein. We do not accept responsibility for the consequences of extrapolation, extension or transference of the findings and recommendations of this report to different sites, cases or conditions.
2. This report is based in part on information which was provided to us by the client and/or others and which is not under our control. We do not warrant or guarantee the accuracy of this information.
3. We believe the conclusions and recommendations contained herein were reasonable and appropriate at the time of issue of the report. However, the user is cautioned that fundamental input assumptions upon which this report is based may change with time. It is the user's responsibility to ensure that input assumptions remain valid.
4. This report must be read in its entirety. This notice constitutes an integral part of the report, and must be reproduced with every copy.
5. This report is prepared solely for the use of the person or company to whom it is addressed. No responsibility or liability to any third party is accepted for any damages howsoever arising out of the use of this report by any third party.
6. Unless specifically agreed otherwise in the contract of engagement, ATC Williams retains Intellectual Property Rights over the contents of this report. The client is granted a licence to use the report for the purposes for which it was commissioned.



ATC Williams Pty Ltd
ABN 64 005 931 288
Melbourne T: +61 3 8587 0900 Perth T: +61 8 9213 1600 Brisbane T: +61 7 3352 7222
www.atcwilliams.com.au



TABLE OF CONTENTS

1	INTRODUCTION.....	2
1.1	Background	2
1.2	Site Layout.....	2
2	WATER MANAGEMENT	4
2.1	Regional Hydrology	4
2.2	Site Storage Configuration.....	5
3	WATER QUALITY	6
3.1	Receiving Environment.....	6
3.2	Environmental Values	7
3.3	Groundwater.....	8
3.4	Water Quality Requirements	9
3.5	Site Water Quality	9
4	CONSEQUENCE CATEGORY ASSESSMENT	10
4.1	Methodology	10
4.2	Adopted Failure Scenarios.....	12
4.3	Consequence Category Assessment	12
5	CONCLUSIONS	17
6	REFERENCES	18

TABLES

Table 1	Summary of Storage Volumes - Site Structures.....	5
Table 2	Significant Values - Downstream Receiving Environment	8
Table 3	Water Quality Conditions - EA Requirements	9
Table 4	Site Water Quality - Dams and Storages.....	9
Table 5	Consequence Category Assessment Criteria ⁷	11
Table 6	Consequence Category Assessment - Mine Void Criteria	13
Table 7	Consequence Category Assessment - Pond Criteria	14
Table 8	Consequence Category Assessment - Sediment Dam Criteria.....	15
Table 9	Consequence Assessment Summary - Dingo Dam	17

PLATES

Plate 1	Dingo Dam Site Location.....	3
Plate 2	Site Layout & Infrastructure	4
Plate 3	Site Layout - Catchment Delineation.....	6

APPENDICES

Appendix A - CCA Certification

1 INTRODUCTION

1.1 Background

Sconi Mining Operations Pty Ltd, a subsidiary of Australian Mines Ltd (AML) owns the Lucky Break project located approximately 120km southwest of Townsville and some 90km northwest of Charters Towers, in Northern Queensland. The Lucky Break project is an open cut nickel mine located on Gregory Development Road, encompassing two Mining Leases (ML) known as Dingo Dam (ML 10324) and Lucky Break (ML 10332). Mining operations were undertaken through use of an open-cut pit method from which approximately 114 thousand tonnes (kt) of ore was extracted, before mining ceased in July 2015. Mining was conducted only on the Dingo Dam ML, with the Lucky Break ML undisturbed. The project operates under Environmental Authority (EA) Permit No. EPML00900713 issued by the Department of Environment and Science (DES), dated 9 March 2018. It is understood that the project is currently in Care and Maintenance following mine closure and previous rehabilitation works.

A consequence category assessment (CCA), with reference to the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (the Manual)*, is required to meet condition D1-3 of the EA. AML have engaged ATC Williams Pty Ltd (ATCW) to conduct the CCA for the Lucky Break Project's structures located within the Dingo Dam ML.

1.2 Site Layout

The project site comprises of two Mining Leases known as Dingo Dam (ML 10324) and Lucky Break (ML 10332). The site location is provided in **Plate 1**, shown below.

The site is currently occupied by the Spyglass Beef Research Station, which is utilised for cattle grazing, however cattle grazing is not currently a land use on the project site. The Spyglass Beef Research Station occupies approximately 38,300 hectares, which encompasses this site.

Key infrastructure associated with the Dingo Dam ML is shown in **Plate 2**, including the following:

- Dingo Dam
- Sediment Dam
- Waste Rock Dump
- Open Cut Pit (referred to as the Mine Void)
- ROM Pad
- Various bunds

Plate 1
Dingo Dam Site Location

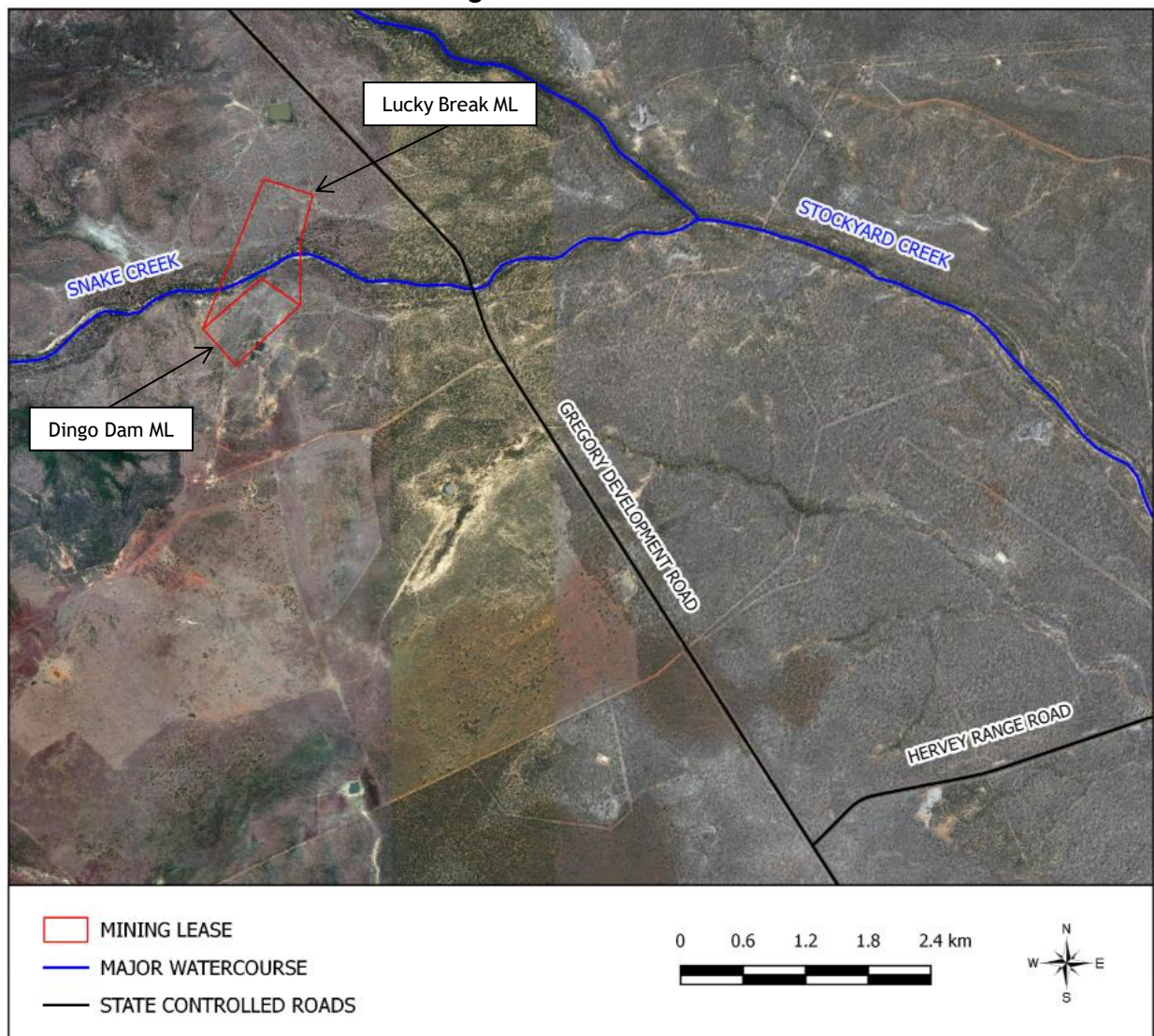
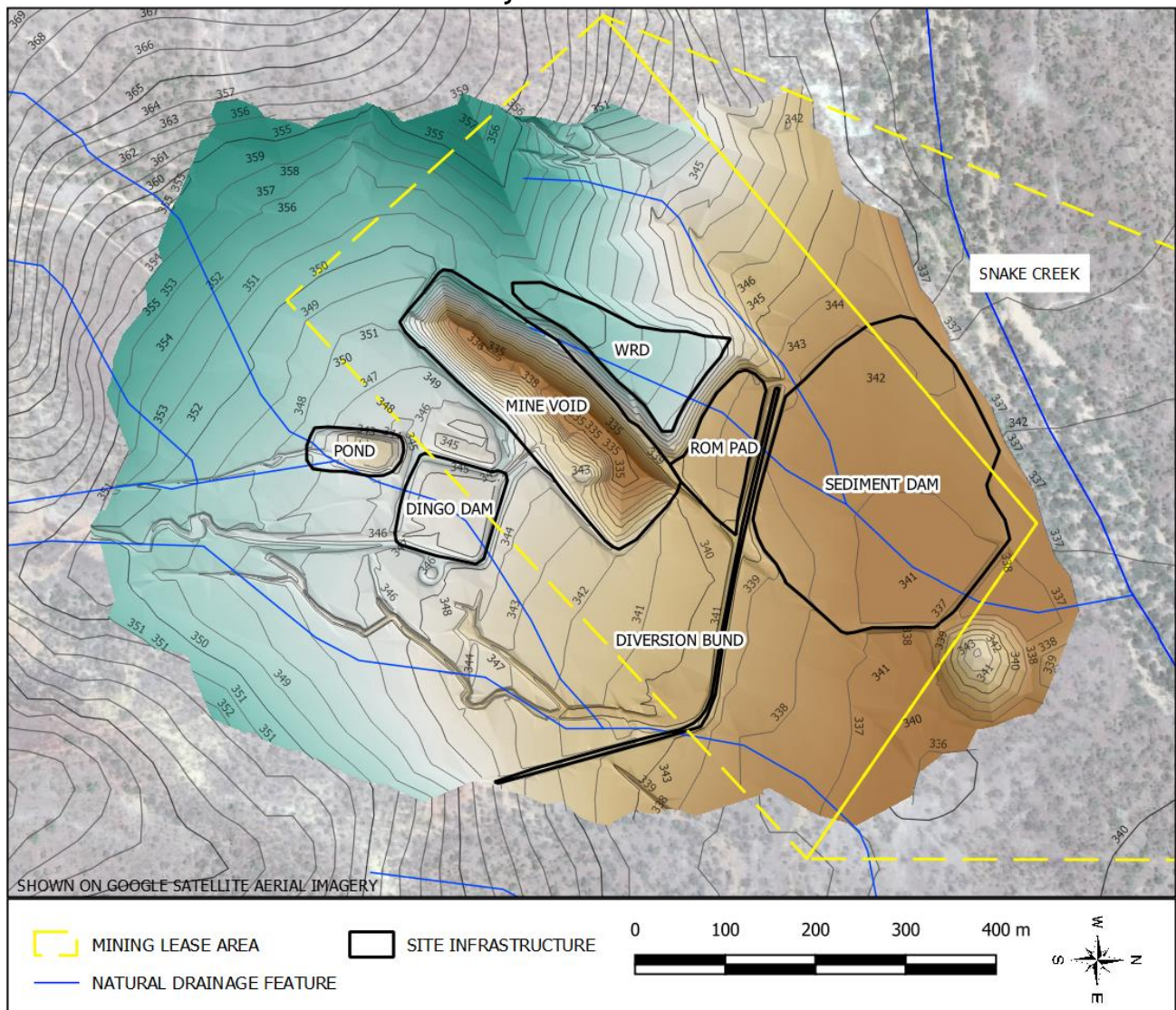


Plate 2
Site Layout & Infrastructure



2 WATER MANAGEMENT

2.1 Regional Hydrology

The Lucky Break Site is located within the north-central section of the Burdekin River catchment, situated within the lower reaches of Snake Creek catchment. Most of the land on the Project Site slopes gently towards Snake Creek. Snake Creek drains to Stockyard Creek less than 5km south-east of the Project Site. Stockyard Creek then drains into the Basalt River approximately 20km further to the south-east. The Basalt River travels a short distance from its confluence with Stockyard Creek before discharging into the Burdekin River.

AARC (2006) describes Snake Creek as highly ephemeral, with no permanent ponds being present in the vicinity of the Project Site. The creek width is variable and is between 10m and 30m wide with the bed consisting of coarse sand interspersed with tall Eucalypts, Melaleucas and Casuarinas.

The downstream use of water flowing in Snake Creek is stock watering. Once the water reaches the Burdekin River it contributes to water allocations for agricultural purposes. The Burdekin Dam is located more than 150km further downstream.

Environmental management issues along Snake Creek are typical of those for the region, including bank erosion, weed infestation and eutrophication due to cattle grazing within the broader catchment.

2.2 Site Storage Configuration

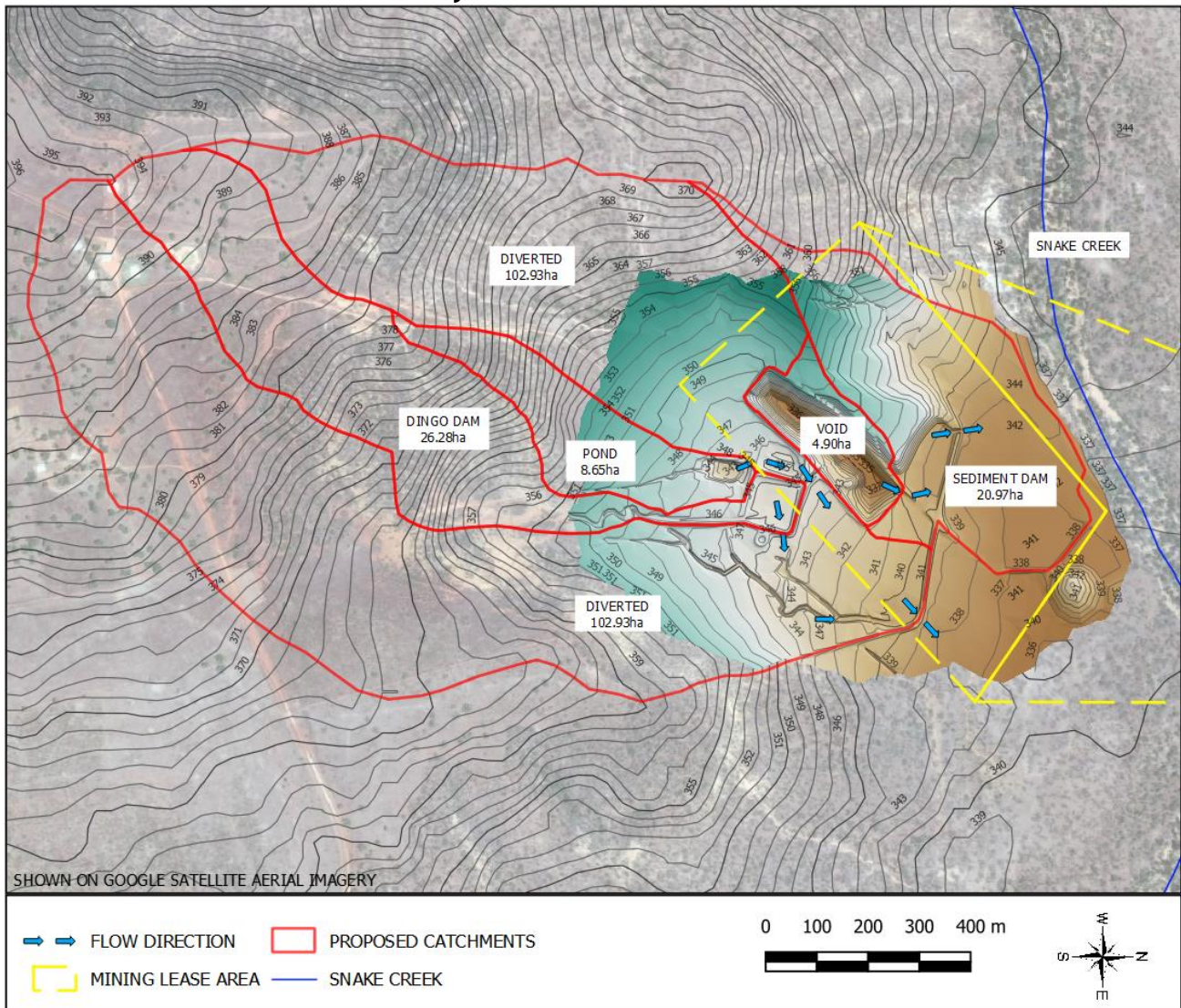
Storage volumes were calculated using the site survey data (provided by client) and are provided for information purposes in **Table 1** along with the post mining use. The estimated volumes shown are to estimated spillway invert of the structure, and assume that various changes to the site configuration have been implemented as discussed in ATCW report 118284-01-1.

Table 1
Summary of Storage Volumes - Site Structures

Storage	Configuration	Spill Invert (RL m)	Volume (ML)	Post Mining Use
Dingo Dam	Embankment	345.0	1.7	Stock water
Mine Void	Excavation	339.4	37.7	No intended use post mining
Sediment Dam	Embankment	337.3	10.3	No intended use post mining
Pond	Excavation	345.7	6.6	No intended use post mining

At the time of mine closure and site rehabilitation, a portion of the bund between Dingo Dam and the residual void was constructed as a spillway at the landholder's request (i.e. Spyglass Research Station). The spillway has since eroded to create a significant gully allowing the release of water from Dingo Dam into the residual void. The proposed catchments (as per ATCW 118284-01-1) for the site structures are shown in **Plate 3**.

Plate 3
Site Layout - Catchment Delineation



3 WATER QUALITY

AARC Environmental Solutions (AARC) prepared a document, namely Environmental Consequence Advice - Lucky Break Project (AARC, 2019), describing the downstream environmental values for consideration when assessing the potential risk of General Environmental Harm in the event of a 'failure to contain - overtopping' for the Mine Void as part of the CCA. Section 3.1 and 3.2 summarise the outcomes from AARC's report.

3.1 Receiving Environment

The Lucky Break Project is located at the Spyglass Beef Research Station, with the regional hydrology described in **Section 2.1**. The area of disturbance and structure of interest is confined to the Dingo Dam Mining Lease (ML) (ML 10324), which is drained via ephemeral drainage features originating within and to the south west of the ML. Runoff from the ML drains to a sandy, ephemeral watercourse known as Snake Creek. From this point, the Basalt River flows 1.2 km downstream before reaching the Burdekin River. The Project's immediate receiving environment (within 5 km) is situated toward the bottom of the Basalt River sub-catchment which flows into the Burdekin River (Blue Range) sub-catchment.

3.2 Environmental Values

Environmental Values listed in The Manual, include the following:

- *High Ecological Values (HEV)* - Required to meet the water quality objectives
- *Matters of National Environmental Significance (MNES)*
- *Matters of State Environmental Significance (MSES)*

AARC (2019) prepared a discussion to aid the CCA of the residual Mine Void structure, identifying the following environmental values.

The Project site lies in a rural landscape and historically has been subject to low intensity cattle grazing with limited exploration and mining activities. Dominant land uses in the Upper Burdekin catchment are grazing on natural pastures (88%) and conservation areas (11%) (NQ Dry Tropics, 2016b).

Water resource values in the catchments downstream of Lucky Break were assessed in accordance with Section 6 of the Environmental Protection (Water) Policy 2009 (EPP Water) and the Burdekin Region Water Quality Improvement Plan 2016 (BWQIP) (NQ Dry Tropics, 2016b). The assessment included a review of water resource condition and analysis of water, assessment of pre-existing land-use and survey of potential end uses for the water resource. While watercourses downstream of the Project are not listed in Schedule 1 of the EPP Water, environmental values have been drafted as part of the BWQIP.

Draft Environmental Values (EV) for the sub-catchment are provided in the BWQIP. EVs of the Basalt River sub-catchment include aquatic ecosystems, stock watering, human consumption, farm and industrial uses, primary, secondary and visual recreation and cultural and spiritual uses.

Waters of the Project's receiving environment and downstream Basalt River sub-catchment are considered to contain Slightly to Moderately Disturbed (SMD) aquatic ecosystem values.

A desktop assessment of Significant Values in the broader region of the Project site identified several Matters of National Environmental Significance (MNES), Matters of State Environmental Significance (MSES) and High Ecological Value (HEV) waters as identified in the EPP Water and BWQIP. MNES, MSES and HEV waters identified within the Project's downstream receiving environment or broader region (within 50 km) are listed in **Table 2** below.

Table 2
Significant Values - Downstream Receiving Environment

Environmental Value	Description	Proximity to Project Site
Matters of National Environmental Significance (MNES)		
Nationally Important wetland	Lake Dalrymple	Approximately 190 km
Listed Threatened Species	29 Threatened species	Possible presence within 50 km radius.
Listed Migratory Species	26 Migratory Species	Possible presence within 50 km radius.
Matters of State Environmental Significance (MSES)		
Regulated Vegetation	Of Concern Regional Ecosystems (RE 9.4.2)	Adjacent and downstream lands.
	Regulated Vegetation intersecting a watercourse	Receiving environment (i.e. Snake Creek).
	Essential Habitat	Squatter Pigeon (<i>Geophaps scripta scripta</i>) habitat within receiving environment
High Ecological Value (HEV) waters		
Burdekin River (Blue Range) sub-catchment	Dalrymple National Park	Approximately 190 km downstream, at the base of the Burdekin River (Blue Range) sub-catchment.

3.3 Groundwater

Geo Square prepared the report, Dingo Dam - Hydrogeological Assessment, on behalf of Australian Mines Limited to address the risk of groundwater infiltration between the open cut pit and the downstream Snake Creek. The outcomes from the *Dingo Dam - Hydrogeological Assessment* are reproduced below.

Soils located in the vicinity of the open pit belong to the Corea group (chromosol) and has a low infiltration potential and transport capability. The upper 0.5 m layer has capability to transport water but below this depth water migration is inhibited due to massive structured clay units. Soil depths is considerable due to underlying lateritic material. Hydraulic conductivity estimates for the unit is split into an upper ($\sim 1 \times 10^{-6}$ m/s or 0.1 m/d) consisting of silt and clay; while the lower clay unit is in the order of 1×10^{-9} m/s (meters per second) or 0.0001 m/d (meters per day).

In the low-lying areas associated with the Snake Creek system a mixture of Cape/Burdekin soils (Tenosol) are present and represent low to moderate permeability characteristics due to heterogenous clay loam overlying clay units. Depth of soil can reach depths of 1.8 mbgl. Hydraulic conductivity estimates for the upper unit is 2×10^{-5} m/s or 1.7 m/d and the lower unit in the order of 2×10^{-6} m/s or 0.17 m/d. These hydraulic conductivity values are overly conservative due to the presence of laterite outcrops in this zone and potential migration of clay in the upper layer (ASRIS, 2016).

The hydraulic properties of the lateritic and saprolitic material can be associated with undisturbed clay material that has undergone cementation over extended time period since forming in place due to weathering processes. An assessment of flow volume and duration to two identified target zones in the area of Dingo Dam has been performed, and migration potential of chemical components are highly unlikely.

3.4 Water Quality Requirements

Water quality requirements specified within the EA, Tables G4 and G6, are summarised in **Table 3**.

Table 3
Water Quality Conditions - EA Requirements

Parameter	Unit	Water Storage Contaminant Limit	Receiving Waters Trigger Level Limit	Receiving Waters Contaminant Limit
Aluminium	mg/L	5	0.055	5
Arsenic	mg/L	0.5	0.013	0.5
Cadmium	mg/L	0.01	0.0002	0.01
Chromium	mg/L	-	0.001	1
Cobalt	mg/L	1	0.0014	1
Copper	mg/L	1	0.0014	1
Electrical Conductivity	µS/cm	5970*	888	1000
Lead	mg/L	0.1	0.0034	0.1
Nickel	mg/L	1	0.011	1
pH	-	4-9	6-8.6	6-9
Sulphate	mg/L	1000		1000
Zinc	mg/L	20	0.008	20

* Contaminant limit based on ANZECC and ARMCANZ (2000) stock water quality guidelines.

3.5 Site Water Quality

Water quality sampling was initially completed at the time of the Mine Void overtopping (7/02/2019). AARC completed follow-up water sampling (18-19/02/2019) to identify potential impacts on the receiving environment. The outcomes from the sampling have been summarised in **Table 4**.

Table 4
Site Water Quality - Dams and Storages

Parameter	Unit	Receiving Waters Trigger Level	Receiving Waters Contaminant Limit	Upstream or Reference Sites	Downstream or Impact Sites
Aluminium	mg/L	0.055	5	0.35 - 1.19	0.29 - 4.16
Arsenic	mg/L	0.013	0.5	<0.001 - 0.002	<0.001 - 0.004
Cadmium	mg/L	0.0002	0.01	<0.001	<0.001
Chromium	mg/L	0.001	1	<0.001 - 0.002	<0.001 - 0.004
Cobalt	mg/L	0.0014	1	<0.001	<0.001 - 0.002
Copper	mg/L	0.0014	1	<0.001 - 0.002	<0.001 - 0.003
EC	µS/cm	888	1000	59 - 108	58 - 183
Lead	mg/L	0.0034	0.1	<0.001	<0.001
Nickel	mg/L	0.011	1	<0.001 - 0.006	<0.001 - 0.026
pH	-	6.0 - 8.6	6.0 - 9.0	6.75 - 6.94	6.64 - 7.14
Sulphate	mg/L		1000	<1.0 - 3.0	<1.0 - 4.0
Zinc	mg/L	0.008	20	<0.005	<0.005

The only metal concentration exceedance noted in the Project's downstream receiving environment was dissolved aluminium. Dissolved aluminium concentrations recorded at upstream sites on Snake Creek were equally elevated indicating these levels may be indicative of natural concentrations in the region of the Project site. AARC (2019) assessed that the release event is not considered to have had detrimental impacts on the Project's receiving environment.

4 CONSEQUENCE CATEGORY ASSESSMENT

4.1 Methodology

Assessment criteria for Consequence Category assessments are based on the following failure event scenarios:

- (a) 'Failure to contain seepage' - Spills or releases to ground and/or groundwater via seepage from the floor and/or sides of the structure.
- (b) 'Failure to contain overtopping' - Spills or releases from the structure that result from loss of containment due to overtopping of the structure.
- (c) 'Dam Break' Collapse of the structure due to any possible cause.

The basis for assessment of Consequence Category from the *Manual* is reproduced in **Table 5**.

Table 5
Consequence Category Assessment Criteria⁷

Environmental Harm	Consequence Category		
	High	Significant	Low
Harm to Humans	Location such that people are routinely present in the failure path and if present loss of life to greater than 10 people is expected ⁸ . Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario.	Location such that people are routinely present in the failure path and if present loss of life to 1 person or greater but less than 10 people is expected ⁸ . Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario.	Location such that people are not routinely present in the failure path and loss of life is not expected ⁸ . Note: The requirement to consider the location of people in the failure path is only relevant to the 'dam break' scenario
	Location such that contamination of waters (surface and/or groundwater ⁹) used for human consumption could result in the health of 20 or more people being affected ¹⁰ .	Location such that contamination of waters (surface and/or groundwater ⁹) used for human consumption could result in the health of 10 or more people but less than 20 people being affected ¹⁰ .	Location such that contamination of waters (surface and/or groundwater ⁹) used for human consumption could result in the health of less than 10 people being affected ¹⁰ .
General environmental harm	Location such that: a) Contaminants may be released to areas of MNES, MSES or HEV waters that are not already authorised to be disturbed to at least the same extent under other conditions of this authority subject to any applicable offset commitment (Significant Values); and b) Adverse effects ¹¹ on Significant Values are likely; and c) The adverse effects ¹¹ are likely to cause at least one of the following: i) loss or damage or remedial costs greater than \$50,000,000; or ii) remediation of damage is likely to take 3 years or more; or iii) permanent alteration to existing ecosystems; or iv) the area of damage (including downstream effects) is likely to be at least 5km ² .	Location such that contaminants may be released so that adverse effects ¹¹ (that are not already authorised to be disturbed to at least the same extent under other conditions of the authority subject to any applicable offset commitment) either: a) Would be likely to be caused to Significant Values but those adverse effects ¹¹ would not be likely to meet the thresholds for the High consequence category and instead would be likely to cause at least one of the following: i) loss or damage or remedial costs greater than \$10,000,000 but less than \$50,000,000; or ii) remediation of damage is likely to take more than 6 months but less than 3 years; or iii) significant alteration to existing ecosystems; or iv) the area of damage (including downstream effects) is likely to be at least 1km ² but less than 5km ² . or b) Would be likely to be caused to environmental values classed as slightly or moderately disturbed waters ¹² , wetland of general ecological significance ¹³ , riverine areas, springs or lakes and associated flora and fauna (Moderate Values), and the adverse effects ¹¹ are likely to cause at least one of the following: i) loss or damage or remedial costs greater than \$20,000,000; or ii) remediation of damage is likely to take more than 1 year; or iii) significant alteration to existing ecosystems; or iv) the area of damage (including downstream effects) is likely to be at least 2 km ²	Location such that either: a) Contaminants are unlikely to be released to areas of Significant Values or Moderate Values; or b) Contaminants are likely to be released to those areas, but would be unlikely to meet any of the minimum thresholds specified for the Significant Consequence Category for adverse effects ¹¹ .
General economic loss or property damage	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require \$10 million or greater in rehabilitation, compensation, repair or rectification costs ¹⁴ .	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require \$1 million and greater but less than \$10 million in rehabilitation, compensation, repair or rectification costs ¹⁴ .	Location such that harm (other than a different category of harm as specified above) to third party assets in the failure path would be expected to require less than \$1 million in rehabilitation, compensation, repair or rectification costs ¹⁴ .

⁷ To be used for all failure event scenarios

⁸ 'People routinely present in the failure path' could be considered to be people who occupy buildings or other places of occupation that lie within the failure impact zone. For the purposes of this Manual, this should refer to people other than site personnel engaged by the resource operation and located on the tenements and tenure associated with the resource operation; for other ERAs, it would be the 'premises referred to in the authority'. It should be noted that while this is appropriate for the assessment of consequence categories in accordance with this Manual, adherence to the requirements of this Manual does not limit, amend or change in any way, any other requirements to be complied with under relevant health and safety acts or legislation that requires the safety of site personnel to be considered.

⁹ When considering potential impacts on groundwater, it is not envisaged that a full hydrogeological assessment will be required in all cases. Any consideration of potential impacts on groundwater systems should consider the water quality of the potential receiving aquifer as well as the quality of fluid stored in the regulated dam. Existing groundwater drawdown in areas surrounding resource operations (e.g. drawdown as a result of mine pit or underground mine dewatering) can also be considered when assessing the consequence of dam seepage on groundwater systems.

¹⁰ 'An adverse effect on human health means a physiological effect on human health and does not include an impact on the quality of downstream water that merely negatively affects taste and which is unlikely to cause persons to become physically ill.

¹¹ Adverse effects includes chronic and acute effects where an acute effect is on living organism/s which results in severe symptoms that develop rapidly, and a chronic effect is an adverse effect on a living organism/s which develops slowly. In some instances, it may be necessary to carry out or reference existing ecological/toxicological studies to assess the impacts of contaminants on living organisms.

¹² See Water EPP for definitions

¹³ Wetland of general ecological significance' means a wetland shown on a map of referable wetland as a 'general ecologically significant wetland' or 'wetland of other environmental value'.

¹⁴ This does not include the holder's own mine or gas production, on-site industrial or commercial assets, the holder's workers' accommodation, agricultural facilities on the holder's land such as a farm shed or farm dam or infrastructure solely for servicing the holder.

4.2 Adopted Failure Scenarios

Under the above scenarios, several modes of failure are possible as described below:

- Failure to contain seepage is not assessed under this CCA as the structures are pre-existing and therefore exempt from assessment of this criteria.
- A failure to contain scenario means a release from the structure that results from loss of containment due to overtopping of the structure and/or other deficiencies in water management aspects of the storage. Although such a failure mechanism is typically non-flood producing, failure to contain events may involve the release of contaminants, which could endanger environmental values or human life/wellbeing.
- A dam break scenario involves the collapse of a dam due to any possible cause. A dam break does have the potential for flood inducing impacts and rapid release of contaminants, which could endanger environmental values or human life. An embankment dam break could take place via the following failure modes:
 - spillway failure
 - erosion-induced stability failure from flooding
 - piping failure
 - static or seismic stability failure.

4.3 Consequence Category Assessment

The Consequence Category Assessment for the site structures are provided in **Table 6** through to **Table 9**.

Table 6
Consequence Category Assessment - Mine Void Criteria

Environmental Harm	Failure Event		
	Failure to Contain Seepage	Failure to Contain Overtopping	Dam Break
Harm to Humans	Assessment of the 'Failure to contain - seepage' scenario is only required for new structures and does not apply to structures approved prior to development of this version of the Manual.	It is assessed that the location of the Mine Void is such that contamination of waters (surface and/or groundwater) used for human consumption would not result in the health of more than 10 people being affected. Surface water concentrations of the analytes listed in Section 3.5 were of similar concentrations to the upstream reference points, as discussed in AARC (2019). Geo Square (2019) discusses the limited risk for transfer of water between the Mine Void and the downstream Snake Creek, as summarised in Section 3.3. Consequence Category assessed as Low.	Assessment of the 'Failure to contain - dam break' scenario is not considered credible as the structure is located below the surrounding natural surface elevation.
General environmental harm		Summarised from AARC (2019) <i>The potential zone of impact supports Significant Values including regulated vegetation (Of Concern REs, watercourse vegetation and essential habitat), as well as Moderate Values including SMD waters, wetlands of general ecological significance, riverine areas and associated flora and fauna within 3 km.</i> <i>Monitoring prior to and during the February 2019 release event identified copper and aluminium as potential contaminants of concern in the residual void. Overtopping of the void is likely to occur only during extreme local rainfall events ($\geq 1:20$ AEP). During such events, flow in the receiving environment would be high and contaminants would be significantly diluted. Experience from the February 2019 event indicates that water quality within the impact zone would likely remain consistent with background concentrations.</i> <i>In an overtopping event from the residual void, contaminants are likely to be released to areas of Significant or Moderate Values, but are not considered to meet the minimum thresholds specified for the Significant Consequence Category for adverse effects. That is, potential adverse effects to Significant or Moderate Values will likely:</i> • Cause loss, damage or remediation costs (if required) of less than \$10,000,000; and • Result in a remediation period of less than 6 months; and • Alteration of ecosystems is likely to be temporary and insignificant (based on the observations of downstream impacts during the recent overtopping event); and • The extent of damage is likely to be less than 1 km² (up to 3 km downstream and 200 m wide, incorporating stream channels and riparian vegetation). Consequence Category assessed as Low.	
General economic loss or property damage		No identifiable developments or third-party infrastructure are present immediately downstream of the Mine Void, other than the Gregory Development Road crossing. The road crossing has low flow culverts and a broad concrete floodway. It is therefore unlikely that overtopping water would have an economic impact exceeding the limits identified in The Manual. Damage caused to third party assets are expected to be below \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.	
Consequence Category	NA	Low	NA

Table 7
Consequence Category Assessment - Pond Criteria

Environmental Harm	Failure Event		
	Failure to Contain Seepage	Failure to Contain Overtopping	Dam Break
Harm to Humans	Assessment of the 'Failure to contain - seepage' scenario is only required for new structures and does not apply to structures approved prior to development of this version of the Manual.	The Pond is expected to hold runoff from the upstream undisturbed catchment. It is therefore assumed that the water quality would be of a similar level as assessed in AARC (2019), such that contamination of waters (surface and/or groundwater) used for human consumption would not result in the health of more than 10 people being affected. Consequence Category assessed as Low.	Assessment of the 'Failure to contain - dam break' scenario is not considered credible as the structure is located below the surrounding natural surface elevation.
General environmental harm		Overtopping of the Pond is likely to occur only during extreme local rainfall events during which flow in the receiving environment would be high and contaminants would be significantly diluted. AARC (2019) further discusses the impact and provide information to suggest that the overtopping of site structures are unlikely to meet the criteria below. Therefore: - It is not likely that an overtopping event from the Pond would cause an adverse effect to Significant Values for the thresholds for High and Significant consequence categories, including: - damage exceeding \$10 million; - take more than 6 months to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 1km². - Adverse effects to Moderate Values are not likely to meet the thresholds for Significant consequence categories, including: - damage exceeding \$20 million; - take more than 1 year to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 2km². Consequence Category assessed as Low.	
General economic loss or property damage		No identifiable developments or third-party infrastructure are present immediately downstream of the Pond, other than the Gregory Development Road crossing. The road crossing has low flow culverts and a broad concrete floodway. It is therefore unlikely that overtopping water would have an economic impact exceeding the limits identified in The Manual. Damage caused to third party assets are expected to be below \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.	
Consequence Category	NA	Low	NA

Table 8
Consequence Category Assessment - Sediment Dam Criteria

Environmental Harm	Failure Event		
	Failure to Contain Seepage	Failure to Contain Overtopping	Dam Break
Harm to Humans		The Sediment Dam is expected to hold runoff from the upstream catchment and overflow from upstream structures. It is therefore assumed that the water quality would be of a similar level as assessed in AARC (2019), such that contamination of waters (surface and/or groundwater) used for human consumption would not result in the health of more than 10 people being affected. Consequence Category assessed as Low.	Should the Sediment Dam fail hydraulically or geotechnically due to other forces, water could migrate into the downstream watercourse. People are not routinely present immediately downstream of the Sediment Dam failure path. The Gregory Development Road is located approximately 2km downstream of the dam. It is assumed that a dam break of Sediment Dam would not likely result in a loss of life, due to the attenuation of water within Snake Creek and the wide road crossing resulting in low flow depth over the road. Consequence Category assessed as Low.
General environmental harm	Assessment of the 'Failure to contain - seepage' scenario is only required for new structures and does not apply to structures approved prior to development of this version of the Manual.	Overtopping of the Sediment Dam is likely to occur only during extreme local rainfall events during which flow in the receiving environment would be high and contaminants would be significantly diluted. AARC (2019) further discusses the impact and provide information to suggest that the overtopping of site structures are unlikely to meet the criteria below. Therefore: - It is not likely that an overtopping event from Sediment Dam would cause an adverse effect to Significant Values for the thresholds for High and Significant consequence categories, including: - damage exceeding \$10 million; - take more than 6 months to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 1km². - Adverse effects to Moderate Values are not likely to meet the thresholds for Significant consequence categories, including: - damage exceeding \$20 million; - take more than 1 year to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 2km². Consequence Category assessed as Low.	A dam break of Sediment Dam would likely release a mixture of groundwater, surface runoff and earth material from the structure, which could smother some vegetation and release impacted water to the drainage feature. It is unlikely that a dam break would cause adverse effects to the downstream ecosystem and Environmental Value (EV). The water quality impacts discussed in Section 3.5 are unlikely to result in the designated requirements listed below. Therefore: - It is not likely that a dam break of the Sediment Dam would cause an adverse effect to Significant Values for the thresholds for High and Significant consequence categories, including: - damage exceeding \$10 million; - take more than 6 months to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 1km². - Adverse effects to Moderate Values are not likely to meet the thresholds for Significant consequence categories, including: - damage exceeding \$20 million; - take more than 1 year to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 2km². Consequence Category assessed as Low.
General economic loss or property damage		No identifiable developments or third-party infrastructure are present immediately downstream of the Sediment Dam, other than the Gregory Development Road crossing. The road crossing has low flow culverts and a broad concrete floodway. It is therefore unlikely that overtopping water would have an economic impact exceeding the limits identified in The Manual. Damage caused to third party assets are expected to be below \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.	No identifiable developments or third-party infrastructure are present immediately downstream of the Sediment Dam other than Gregory Development Road. It was also assessed that overtopping water would not likely have an economic impact with damage caused to third party assets exceeding \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.
Consequence Category	NA	Low	Low

Table 9
Consequence Category Assessment - Dingo Dam Criteria

Environmental Harm	Failure Event		
	Failure to Contain Seepage	Failure to Contain Overtopping	Dam Break
Harm to Humans		The Dingo Dam is expected to hold runoff from the upstream undisturbed catchment. It is assumed that the water quality would be of a similar level as assessed in AARC (2019), such that contamination of waters (surface and/or groundwater) used for human consumption would not result in the health of more than 10 people being affected. Consequence Category assessed as Low.	Should the Dingo Dam fail hydraulically or geotechnically due to other forces, water could migrate into the downstream watercourse. People are not routinely present immediately downstream of the Dingo Dam failure path. The Gregory Development Road is located approximately 2km downstream of the dam. It is assumed that a dam break of Dingo Dam would not likely result in a loss of life. This is based on the relatively small storage volume and the attenuation of water within Snake Creek and the wide road crossing resulting in low flow depth over the road. Consequence Category assessed as Low.
General environmental harm	Assessment of the 'Failure to contain - seepage' scenario is only required for new structures and does not apply to structures approved prior to development of this version of the Manual.	Overtopping of the Dingo Dam is likely to occur only during rare local rainfall events during which flow in the receiving environment would be high and contaminants would be significantly diluted. AARC (2019) further discusses the impact on downstream environmental value, suggesting that the overtopping of site structures are unlikely to meet the criteria below. Therefore: - It is not likely that an overtopping event from Dingo Dam would cause an adverse effect to Significant Values for the thresholds for High and Significant consequence categories, including: - damage exceeding \$10 million; - take more than 6 months to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 1km². - Adverse effects to Moderate Values are not likely to meet the thresholds for Significant consequence categories, including: - damage exceeding \$20 million; - take more than 1 year to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 2km². Consequence Category assessed as Low.	A dam break of Dingo Dam would likely release a mixture of groundwater, surface runoff and earth material from the structure, which could smother some vegetation and release impacted water to the drainage feature. It is unlikely that a dam break would cause adverse effects to the downstream ecosystem and Environmental Value (EV) due to the relatively small storage capacity of the dam. The water quality impacts discussed in Section 3.5 are unlikely to result in the designated requirements listed below. Therefore: - It is not likely that a dam break of the Dingo Dam would cause an adverse effect to Significant Values for the thresholds for High and Significant consequence categories, including: - damage exceeding \$10 million; - take more than 6 months to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 1km². - Adverse effects to Moderate Values are not likely to meet the thresholds for Significant consequence categories, including: - damage exceeding \$20 million; - take more than 1 year to remediate; - significantly alter the existing ecosystem; or - affect an area exceeding 2km². Consequence Category assessed as Low.
General economic loss or property damage		No identifiable developments or third-party infrastructure are present immediately downstream of the Dingo Dam, other than the Gregory Development Road crossing. The road crossing has low flow culverts and a broad concrete floodway. It is therefore unlikely that overtopping water would have an economic impact exceeding the limits identified in The Manual. Damage caused to third party assets are expected to be below \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.	No identifiable developments or third-party infrastructure are present immediately downstream of the Dingo Dam other than Gregory Development Road. It was also assessed that overtopping water would not likely have an economic impact with damage caused to third party assets exceeding \$1 million in remedial works, rehabilitation, compensation and repairs. Consequence Category assessed as Low.
Consequence Category	NA	Low	Low

5 CONCLUSIONS

The CCA outcomes, as determined in the **Section 3** are summarised in **Table 10**.

Table 10
Consequence Assessment Summary - Dingo Dam

Dam	Failure to Contain Seepage	Failure to Contain Overtopping	Dam Break	Overall Consequence	Regulated Structure, as defined in the Manual (Y/N)
Mine Void	NA	Low	N/A	Low	N
Sediment Dam		Low	Low	Low	N
Pond		Low	N/A	Low	N
Dingo Dam		Low	Low	Low	N

In accordance with the *Manual*, the adopted consequence category for the structure is the highest category determined for the assessed failure event scenarios.

This assessment was based on the proposed site layout and the assessment would need to be reviewed, should site conditions change in any form or if the information relied upon be revised. A Consequence Assessment Certification Form completed by a Registered Professional Engineer of Queensland, meeting the requirements of the definition of “suitably qualified and experienced person”, is included in **Appendix A** of this report.

6 REFERENCES

- [1] DES (ESR/2016/1933), Manual for Assessing Consequence Categories and Hydraulic Performance of Structures, Queensland Government Department of Environment and Heritage Protection, March 2016.
- [2] Water Act (2000), Queensland Government, current as of 25 October 2018. <https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2000-034>, accessed 12 February 2019.
- [3] Environmental Protection Act (1994), Queensland Government, current as of 1 January 2018. <https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-1994-062>, accessed 12 February 2019.
- [4] Environmental Protection Act (1994) - Environmental Protection (Water) Policy 2009, Queensland Government, current as of 6 December 2016.
- [5] Queensland Government (2017). Regional Ecosystems Descriptions. <https://environment.ehp.qld.gov.au/regional-ecosystems/>, accessed 19 January 2018.
- [6] Department of Environment and Heritage Protection (2018), Environmental authority EPML00900713, Queensland Government, 9 March 2019.
- [7] Geo Square (2019), Dingo Dam - Hydrogeological Assessment 19040104-020-R01, 24 April 2019.
- [8] AARC (2019), Environmental Consequence Advice - Lucky Break Project, 1 May 2019.

Form of Certification (Consequence Assessment)

Name of Registered Professional Engineer providing certification:

Elisabeth Boczek (9232)
on behalf of ATC Williams Pty Ltd

Address of Registered Professional Engineer providing certification:

PO Box 3309
Level 2, 16-20 Edmondstone Street
Newmarket, Queensland 4051, AUSTRALIA

This consequence category assessment was prepared by ATC Williams Pty Ltd and certified by Elisabeth Boczek (RPEQ9232).

Statement of Relevant Experience

I hereby state that I am a Registered Professional Engineer of Queensland and meet the requirements of the definition of 'suitably qualified and experienced person'.

Statement of Certification

All relevant material relied upon by me, including subsidiary certifications of specialist components, where required by the environmental authority, is provided in the attached report *Dingo Dam Consequence Category Assessment*.

I hereby certify that the Consequence Assessment section enclosed in the *Dingo Dam Consequence Category Assessment* for the Lucky Break Project:

- That the consequence category assessment (CCA) has been prepared in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (DES, 2016) and that it is not based on information that I know is false or misleading;
- That I am not the owner, an employee of the owner, the operator, or an employee of the operator of the dam being assessed;
- That the information and analyses included in the assessment are appropriate and sufficiently accurate, and that the assessment has been made from these.

I Elisabeth Boczek, declare that the information provided as part of this certification is true to the best of my knowledge. I acknowledge that it is an offence under section 480 of the Environmental Protection Act 1994 to give the administering authority a document containing information that I know is false, misleading or incomplete in a material particular.

Signature  Date: 06 June 2019

Appendix E **Stormwater Management Plan (ATCW 2019a)**



REPORT

AUSTRALIAN MINES LTD

Lucky Break Project

**Dingo Dam
Stormwater Management
Plan**

Date: June 2019

Report Number: 118284-01R001-1

Document History and Status

Title: Lucky Break Project - Stormwater Management Plan
Job Number/Extension: 118284.01
Document Number: 118281-01R001-1
Project Office: Brisbane
File Path: M:\Synergy\Projects\118\118284 Dingo Dam Lucky Break\01 Water Management Concept\Documents\R01\Text\118284-01R001-1.docx
Author: Matthew Plucknett
Reviewer: Thomas Rose
Job Manager: Thomas Rose
RPEQ Certification: Allan Watson (RPEQ no. 5721)

Rev.	Status	Issued to	Issue Date	Signatures	
				Author	Reviewer
A	Draft Issue	Hollie Dick	25/01/2019	MP	TR
0	Final Issue	Hollie Dick	31/01/2019	MP	TR
1	Final Re-Issue	Hollie Dick	07/06/2019	MP	TR

This Revision distributed To:	Hard Copy	Electronic Copy
Hollie Dick	n/a	email

IMPORTANT NOTICE

Please refer to our Conditions of Investigation and Report



ATC Williams Pty Ltd
ABN 64 005 931 288
Melbourne T: +61 3 8587 0900 Perth T: +61 8 9213 1600 Brisbane T: +61 7 3352 7222
www.atcwilliams.com.au



CONDITIONS OF REPORT

1. This report has been prepared by us for the purposes stated herein. We do not accept responsibility for the consequences of extrapolation, extension or transference of the findings and recommendations of this report to different sites, cases or conditions.
2. This report is based in part on information which was provided to us by the client and/or others and which is not under our control. We do not warrant or guarantee the accuracy of this information.
3. We believe the conclusions and recommendations contained herein were reasonable and appropriate at the time of issue of the report. However, the user is cautioned that fundamental input assumptions upon which this report is based may change with time. It is the user's responsibility to ensure that input assumptions remain valid.
4. This report must be read in its entirety. This notice constitutes an integral part of the report, and must be reproduced with every copy.
5. This report is prepared solely for the use of the person or company to whom it is addressed. No responsibility or liability to any third party is accepted for any damages howsoever arising out of the use of this report by any third party.
6. Unless specifically agreed otherwise in the contract of engagement, ATC Williams retains Intellectual Property Rights over the contents of this report. The client is granted a licence to use the report for the purposes for which it was commissioned.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	Background	1
1.2	Scope of Work	1
1.3	Structure of Report.....	1
2	SITE CHARACTERISTICS	2
2.1	Site Description	2
2.2	Hydrological Characteristics and Topography	1
2.2.1	Regional Context	1
2.2.2	Site Hydrology	2
2.3	Climate and Rainfall.....	3
2.4	Regional Flood Mapping.....	4
3	SITE STORMWATER MANAGEMENT PLAN DESIGN BASIS	5
3.1	Assessment Framework	5
3.2	Relevant Environmental Authority Conditions	5
3.3	Adopted Design Basis	6
4	STORMWATER MANAGEMENT PLAN.....	8
4.1	Stormwater Management Plan Objectives	8
4.2	Stormwater Management Features.....	8
4.3	Proposed Catchment Conditions.....	9
4.4	Hydrological and Hydraulic Calculations	9
4.5	Estimated Storage Structure Volumes	10
4.6	Ex-Mining Void Overtopping	11
5	SUMMARY AND RECOMMENDATIONS.....	12
	REFERENCES	13

FIGURES

- FIGURE 001 Existing Site Conditions
- FIGURE 002 Proposed Stormwater Management Plan Features
- FIGURE 003 Proposed Catchment Conditions

APPENDICES

- Appendix A Hydraulic Calculations

1 INTRODUCTION

1.1 Background

Australian Mines Ltd (AML) owns the Lucky Break project located approximately 120km southwest of Townsville and some 90km northwest of Charters Towers, in Northern Queensland. The Lucky Break project is an open cut nickel mine located on Gregory Development Road, encompassing two Mining Leases (ML) known as Dingo Dam (ML 10324) and Lucky Break (ML 10332). Mining operations were undertaken through use of an open-cut pit method from which approximately 114 thousand tonnes (kt) of ore was extracted, before mining ceased in July 2015. Mining was conducted only on the Dingo Dam ML, with the Lucky Break ML undisturbed. The project operates under Environmental Authority (EA) Permit No. EPML00900713 issued by the Department of Environment and Science (DES), dated 9 March 2018. It is understood that the project is currently in Care and Maintenance following mine closure and previous rehabilitation works.

It is understood that the site is currently occupied by the Spyglass Beef Research Station. Discovery of poor water quality in the void has resulted in the need to minimise surface water reporting to the void. As such, AML has commissioned ATC Williams Pty Ltd (ACTW) to develop a Stormwater Management Plan (SWMP) for the Dingo Dam site to help meet regulatory environmental compliance objectives and minimise the potential for environmental harm.

The site stormwater management strategy herein has been developed with the primary objective of minimising water reporting to the void and restoring natural drainage paths where appropriate.

1.2 Scope of Work

The scope of works for the Stormwater Management Plan are as follows:

- Review of available site data, including survey and existing site conditions;
- Review of stormwater management options;
- Development of conceptual water management design to minimise surface water reporting to the ex-mining void and restore natural drainage paths where appropriate;
- Develop peak flow estimates and indicative sizing of required hydraulic infrastructure for the proposed site configuration.

1.3 Structure of Report

The structure of the report, to meet the above scope, is as follows:

- | | |
|--------------------|--|
| Section 2.0 | - Outlines details of the site description, providing existing site conditions, topography, drainage and climate conditions. |
| Section 3.0 | - Details the framework for the stormwater management system design, including a review of relevant conditions. |
| Section 4.0 | - Presents the details of the conceptual stormwater model and outlines calculations. |
| Section 5.0 | - Presents concluding statements about the SMWP and its objectives, and makes recommendations for future works as required. |

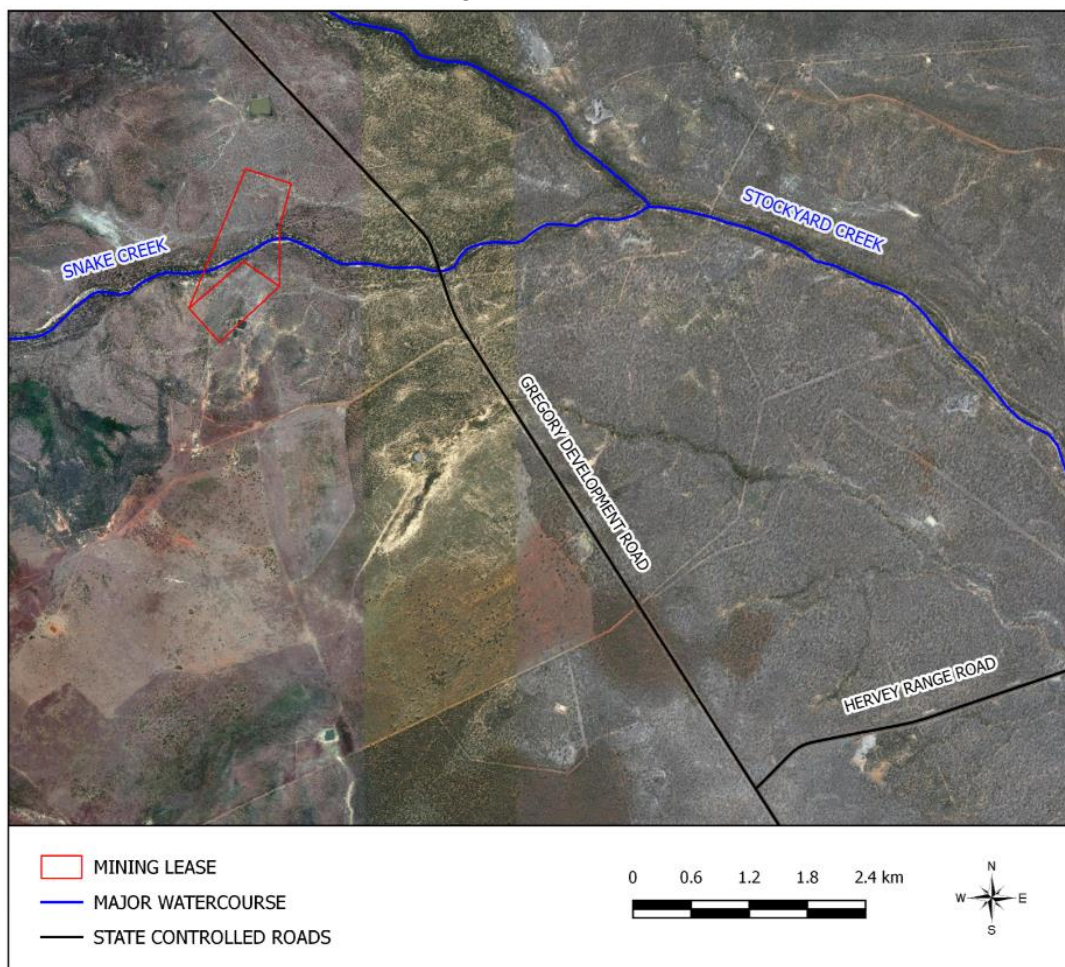
2 SITE CHARACTERISTICS

2.1 Site Description

The Lucky Break Project Site is located approximately 120km southwest of Townsville and some 90km northwest of Charters Towers, in Northern Queensland. The project site comprises of two Mining Leases known as Dingo Dam (ML 10324) and Lucky Break (ML 10332).

The site location is provided in **Plate 1**, shown below.

Plate 1
Site Location



The site is currently occupied by the Spyglass Beef Research Station with the current land use being cattle grazing. The Spyglass Beef Research Station occupies approximately 38,300 hectares, of which encompasses this site.

Key infrastructure associated with the Dingo Dam ML are shown in **FIGURE 001** and includes the following:

- Dingo Dam
- Sediment Dam
- Waste Rock Dump
- Open Cut Pit (referred to as the void)
- ROM Pad
- Various bunds

The existing catchment areas at site as shown on **FIGURE 001** are summarised in **Table 1**.

Table 1
Summary of Existing Catchment Areas

Catchment	Area (ha)
Dingo Dam	26.6
Pit Void	5.1
Pond	47.7
Sediment Dam	86.1
Total Void Catchment	79.4
Total Site to Sediment Dam	165.5

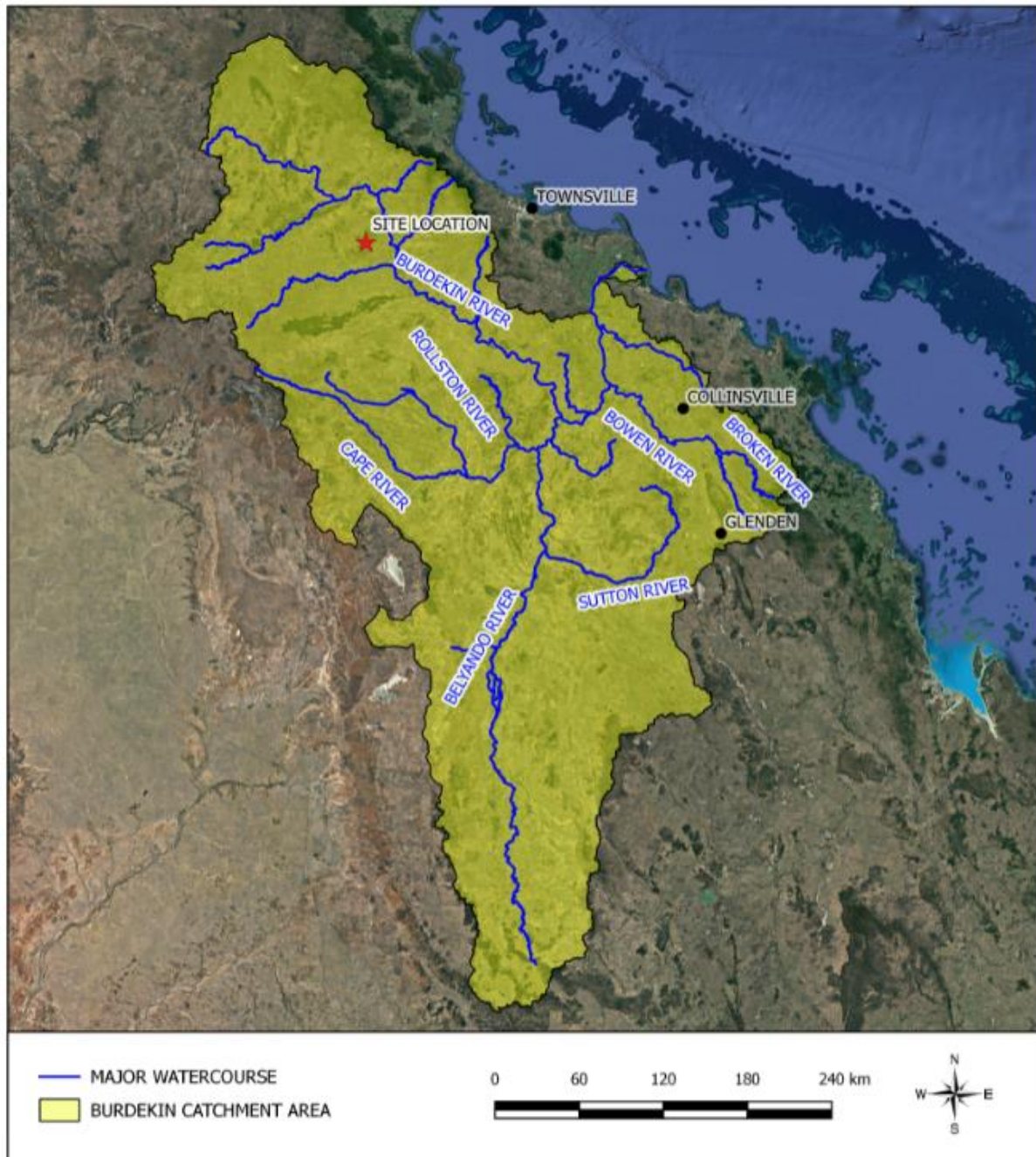
It is noted that under current site (operational) conditions, the total site, including all the sub-catchments as listed in **Table 1**, drains to the Sediment Dam.

2.2 Hydrological Characteristics and Topography

2.2.1 Regional Context

The Lucky Break project site is situated within the Burdekin River Basin (refer **Plate 2**). The site is located some 28km from the Burdekin River channel, and approximately 230km from the confluence with the Burdekin River to Dalrymple Lake (Burdekin Falls Dam). From the Burdekin Falls Dam it is approximately 160km to the Coral Sea. The Burdekin River falls some 620m over its approximately 886km length, to discharge to the Coral Sea.

Plate 2
Burdekin River Basin Catchment Map

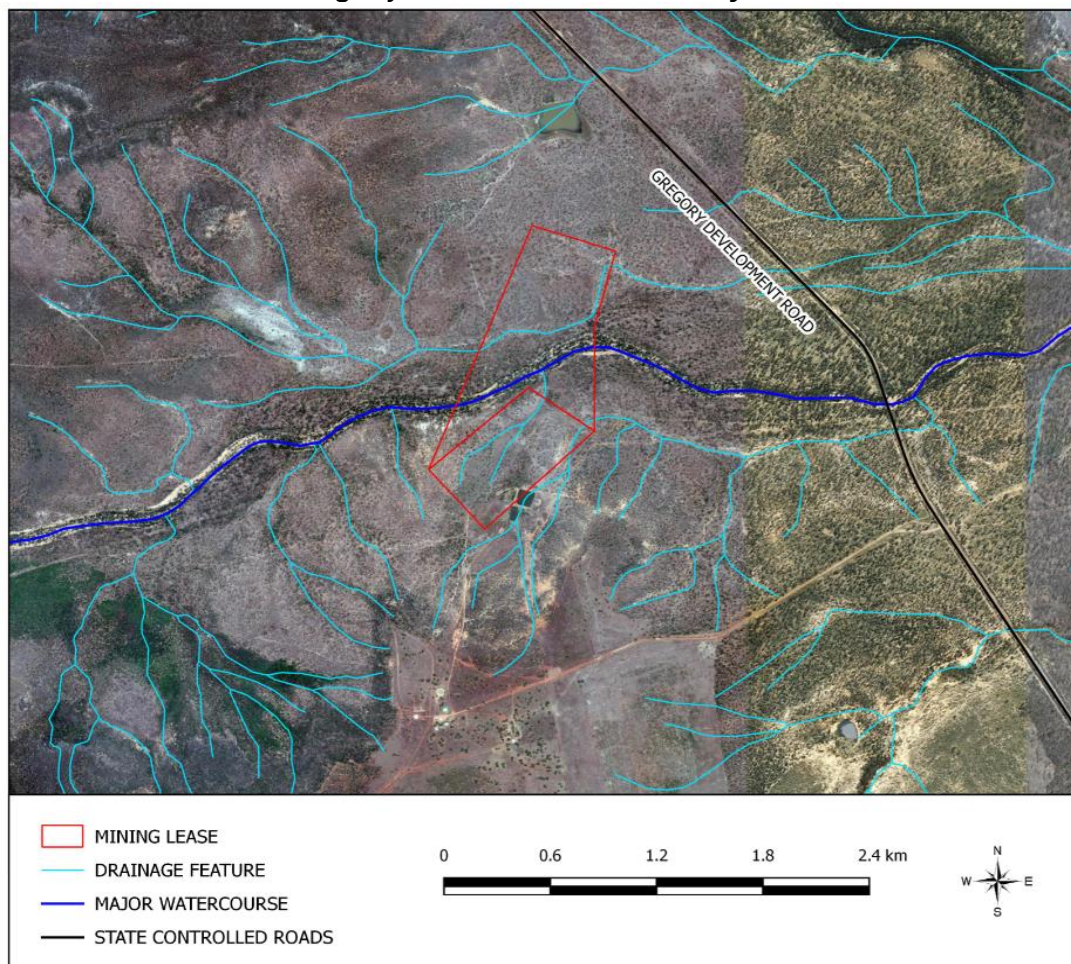


2.2.2 Site Hydrology

Locally, the Lucky Break project site is intersected through the middle of the Mining Leases by Snake Creek, a tributary of Stockyard Creek which reports to the Burdekin River to the east. The topography of the Dingo Dam ML grades away to the north, with overland flows towards Snake Creek, before subsequently joining Stockyard Creek some 4km east of the site. The highest elevation on the site is some RL 365.5m on the south-western extent of the ML, and the lowest elevation is some RL 336.0m on the north-eastern extent. The site location with respect to local hydrological features is provided on **Plate 3**, shown below.

The site is characterised by generally gentle slopes (average 2% to 3%) with overland flow paths becoming channelised upstream of the site infrastructure and subsequently transecting the site. A number of diversion bunds and dams have been previously constructed on the site which has resulted in significant alteration to the natural flow regimes.

Plate 3
Drainage System Proximate to the Project Site



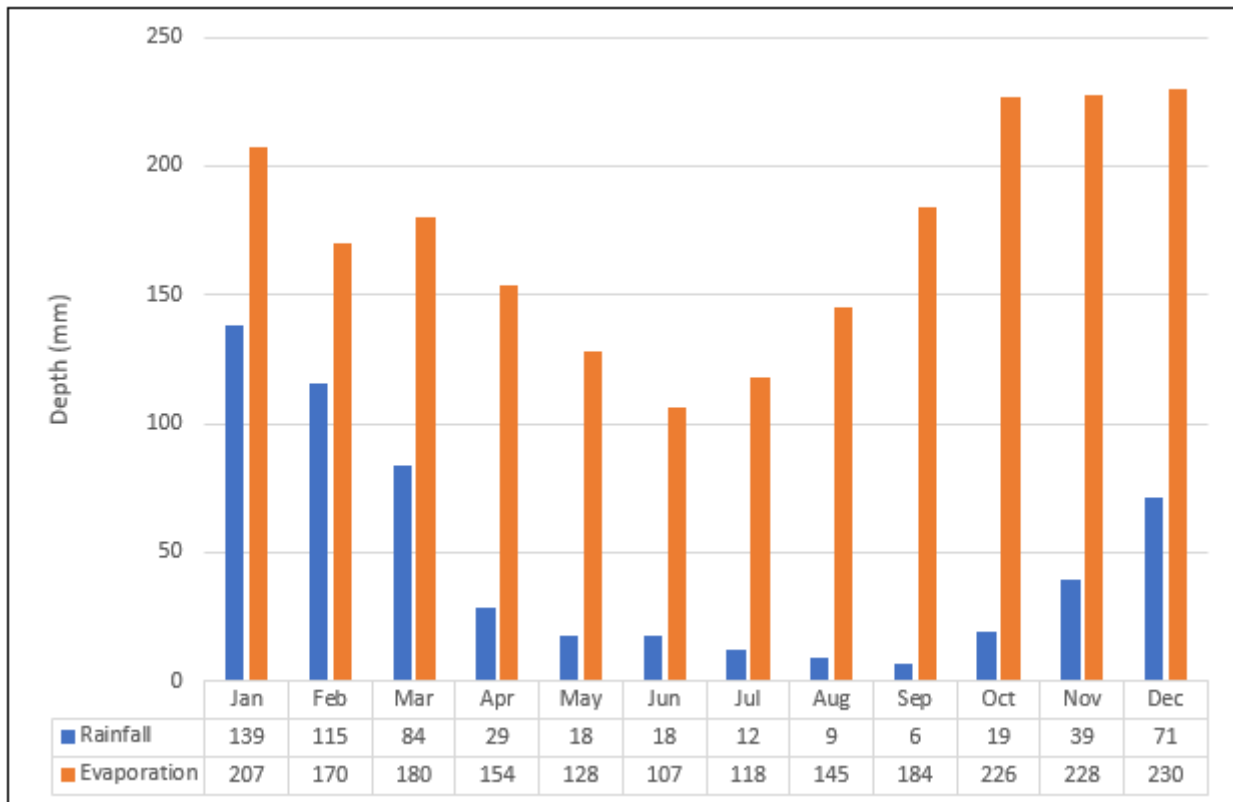
2.3 Climate and Rainfall

The project site, located in Northern Queensland, is subject to a tropical climate. This climate is associated with variable rainfall conditions; however, average values indicate a distinct seasonal pattern with lower rainfall conditions associated with winter months and higher rainfall conditions during the summer months. The wet season occurs from November to March, with 81% of mean annual rainfall occurring during these months.

The nearest meteorological station to the site, with the longest data history, is Hillgrove weather station (No. 30137), located approximately 18km to the south-east. Rainfall data from this station shows that mean annual rainfall is some 553.4mm. The month with the highest average rainfall is January, and the month with the lowest average rainfall is August. Hillgrove station does not have long term evaporation data; therefore, evaporation data has been sourced from a SILO Data Drill specific to the site location.

Plate 4 summarises the average rainfall and evaporation for all months of the year for the site. From the SILO Data series, only evaporation data ranging from 1970 to 2019 was utilized, as Class A evaporation pan data is only available in the region throughout this period.

Plate 4
Mean Rainfall and Evaporation



Source: BOM Hillgrove station (No. 30137) and SILO Data Drill requested for the site location (accessed 23 January 2019).

Plate 4 indicates that evaporation exceeds mean monthly rainfall throughout the entire year. On an average monthly basis, maximum evaporation occurs later in the year (October to December). During the dry season months, evaporation is significantly lower, with the lowest monthly total typically occurring in June.

2.4 Regional Flood Mapping

The Queensland Flood Mapping Program 2015 series provided a high-level flood mapping data set for the 1% Annual Exceedance Probability (AEP) and the Extreme Storm Event. Review of the data shows that the Dingo Dam site would not be expected to be inundated by regional storm flow from Snake Creek during the 1% AEP event, but may experience flooding up to 0.5m depth during the Extreme Storm Event.

3 SITE STORMWATER MANAGEMENT PLAN DESIGN BASIS

3.1 Assessment Framework

It is noted that currently no structures on the project site are listed as regulated structures under the site's EA. Consequently, the overarching framework for the stormwater management and design basis in relation to the site has been adopted from the 'Guideline - Stormwater and Environmentally Relevant Activities' (DEHP, 2014). This guideline does not apply to activities defined as resource activities in Schedule 2A of the EP Regulation; although does apply for activities listed under Schedule 2, including ancillary activity 33, as listed under EMPL00900713. This guideline outlines mechanisms that the site must achieve in relation to establishing environmental performance standards to help enhance or protect environmental values. These control mechanisms include the following:

- Preserving existing valuable elements of the natural stormwater system;
- Appropriate management of the quantity and quality of stormwater, at or near the source of potential contaminants;
- Using structural measures, such as treatment techniques or sediment basins, to improve water quality as appropriate; and,
- Management of the receiving water to avoid any residual impacts from stormwater pollutants or flows.

3.2 Relevant Environmental Authority Conditions

The site's EA (EPML00900713) contains a number of conditions related to stormwater management and are summarised in **Table 2**.

Table 2
Summary of Stormwater Related EA Conditions

Number	Condition
D1	Assessment of Consequence Category (CCA) The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635) at the following times: a) prior to the design and construction of the structure, if it is not an existing structure; or b) if it is an existing structure, prior to the adoption of this schedule; or c) prior to any change in its purpose or the nature of its stored contents.
D2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
D3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)
<i>Note</i>	Conditions D4 through D22 may apply depending on the outcome of a CCA
D26	Register of Regulated Dams A Register of Regulated Dams must be established and maintained by the holder for each regulated dam:

Number	Condition
<i>Note</i>	Conditions D27 through D31 may apply depending on the outcome of a CCA
C7	Residual Void Outcome Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself, and subject to any other condition within this Environmental Authority
<i>Note</i>	A residual void assessment should be undertaken to understand the residual risk to the environment. This assessment would also form part of any CCA.
G1	Water - General Contaminants that will, or have the potential to cause environmental harm, must not be released directly or indirectly to any waters except as permitted under the conditions of this Environmental Authority
<i>Note</i>	Conditions G2 through G20 contain relevant information about monitoring of site waters and the associated analytes and trigger limits. Refer to the EA for specific details.
G21	Water Management Plan A Water Management Plan must be developed by an appropriately qualified person and implemented by 31 July 2016
G22	Each year the holder of the Environmental Authority must undertake a review of the Water Management Plan prior to the wet season (i.e. by 1 November) and a further review following the wet season (i.e. by 1 May the following year) to ensure that proper and effective measures, practices or procedures are in place so that the mine is operated in accordance with the conditions of this Environmental Authority and that environmental harm is prevented or minimised

There is no list of Regulated Structures within the Site's EA, and as such there is no prescribed hydraulic performance criteria under The Manual¹.

3.3 Adopted Design Basis

The SWMP is based on the design framework outlined in **Section 3.1**, and the scope of this SWMP is outlined in **Section 1.2**. The key objectives of the SWMP for the site are therefore as follows:

- To protect the receiving environment from adverse water quality impacts as a result of overtopping of the void, and
- Maintain appropriate management of peak stormwater flow releases from the site (i.e. ensure that peak stormwater flows from the site will not adversely affect the receiving environment).

For the purpose of stormwater management system design, two specific types of stormwater will exist in relation to the site, as follows:

- Clean Stormwater

Stormwater runoff derived from stabilised surfaces upstream or outside the mine affected footprint or from stabilised/rehabilitated surfaces within the footprint.

¹ Manual for assessing consequence categories and hydraulic performance of structure, Department of Environment and Heritage Protection, 2016.

- Site Stormwater

Stormwater runoff derived from mine affected/disturbed surfaces located within the site footprint. For the context of this report, 'site stormwater' is essentially limited to the water reporting to the void.

4 STORMWATER MANAGEMENT PLAN

4.1 Stormwater Management Plan Objectives

As stated in **Section 1.2** and **Section 3.1**, the objectives are summarised as follows:

- Minimise catchment areas reporting to the ex-mining void to minimise the risk of the void overtopping
- Restore natural drainage paths, where possible, to minimise impounded water
- Minimise potential for environmental harm (ie erosion)

4.2 Stormwater Management Features

The proposed site SWMP developed is presented in this section. The SWMP involves relatively minor earthworks to create new bunds/embankments, remove bunds/embankments at various locations and also locations of levelling or grading works to create new preferable flow paths.

The proposed new site infrastructure features as shown on **FIGURE 002**, are summarised in **Table 3**.

Table 3
Summary of Proposed Stormwater Management Features

Feature (as shown on FIGURE 002)	Description
1	• Cut new trapezoidal spillway/channel through Dingo Dam embankment to direct overflow toward existing natural drainage path • Invert of cut to match downstream existing ground elevation (approx. RL 345.1m) • Base width is to be minimum 8.0m • Batter slopes to be 1 (V) : 2 (H) • Revegetate with grasses
2	• Cut new trapezoidal spillway/channel through existing embankment to allow unrestricted continuation of flow toward existing natural drainage path • Invert of cut to match downstream existing ground elevation (approx. RL 339.2m) • Base width is to be minimum 40.0m • Batter slopes to be 1 (V) : 4 (H) • Revegetate with grasses
3	• Reinstatement Dingo Dam embankment to match adjacent crest levels and batter slopes. • Use non-dispersive low permeability earthen fill • Revegetate with grasses
4	• Fill area between Dingo Dam and void to create unobstructed free-draining condition • Base width of area should be approximately 22m (varies) • Batter slopes to be 1 (V) : 4 (H) • Embankment/bund height either side should be minimum 0.5m from toe to crest • Use non-dispersive earthen fill • Revegetate with grasses

5	- Construct embankment/bund along eastern wall of the void - Use non-dispersive low permeability earthen fill - Revegetate with grasses
6	- Cut/remove existing haul road at north-western corner of the void to direct void overflow to the sediment dam via existing ROM pad embankment/bunding - Finish surface level to RL 339.4m to match current void overflow invert - Revegetate with grasses

Note: Table 3 is not intended to be used as a construction specification. Compaction, moisture conditioning and growth media specifications to be determined.

4.3 Proposed Catchment Conditions

Based on the proposed site configuration and the change to catchment areas, the catchment area reporting to the void has been minimised to 4.9ha, a reduction of 74.5 ha. The Feature 2 spillway is proposed to manage the clean water catchment, which currently collects stormwater from the southern bund located to the south of ML 10324 (Dingo Dam). The Pond and Dingo Dam catchment area will be directly released into Snake Creek, whilst the Pit Void catchment area will be managed within the ML area.

The proposed catchments are summarised in **Table 4** and are shown on **FIGURE 003**.

Table 4
Summary of Proposed Catchment Areas

Catchment	Area (ha)
Pit Void	4.9
Feature 1 (Dingo Dam)	26.6
Feature 2	65.0
Feature 4	47.8
ROM	3.1
Sediment Basin	21.2
Total Catchment to Sediment Basin	24.3
Total Catchment to Feature 2	139.4

4.4 Hydrological and Hydraulic Calculations

The Rational Method (Queensland Urban Drainage Manual, 2016) of peak flow estimation was used to assess flow rates at key locations of the site for the 1% Annual Exceedance Probability (AEP) and the 50% AEP storm events, commonly referred to as the 1-in-100-year and 1-in-2-year storm events, respectively. The locations of flow estimations and the catchments areas are relative to the proposed site configuration presented in this SWMP as described in **Table 3** and are shown on **FIGURE 003**.

The peak flow estimations were then utilised to calculate expected flow velocities at the key locations to assess whether an erosion risk exists. The hydraulic calculations presented are relative to proposed site configuration and existing ground conditions (as stated). The calculations are summarised in **Table 5**, and the locations of the features are shown on **FIGURE 003**.

Table 5
Summary of Hydrological and Hydraulic Calculations at Selected Locations

Location / Feature	Peak Flow Estimation (m ³ /s)		Peak Flow Velocity Estimation (m/s)		Peak Flow Depth Estimation (m)	
	Q2	Q100	Q2	Q100	Q2	Q100
Feature 1 (Proposed)	1.9	5.6	1.45	2.0	0.2	0.35
Feature 2 (Proposed)	11.5	32.2	1.48	2.25	0.2	0.4
Feature 4 (Proposed)	3.4	10.1	1.2	1.75	0.15	0.3
ROM Overflow (Existing)	0.3	0.8	0.95	1.42	0.1	0.2
Sediment Basin Overflow (Existing)	1.8	5.0	1.45	1.75	0.25	0.4

As is shown in **Table 5**, peak estimated velocities in the Q2 flow events are expected to be low (below 1.5m/s) which is generally considered to not result in erosion to surfaces with average grass cover. As the Q100 peak estimated flow velocities are between 1.42m/s and 2.25m/s, some erosion may occur during such rare flow events. However, the effect of routing attenuation (i.e. the delay of the flow wave caused by the site water storages) has not been considered in these flow estimations, meaning that these peak flow and velocity estimations are conservative. The calculated flow depths also show that none of the proposed or existing bund/embankment features are expected to overtop during the 1-in-100-year storm event.

The hydraulic calculations are provided in **Appendix A**.

4.5 Estimated Storage Structure Volumes

Storage volumes were calculated using the site survey data (provided by client) and are provided for information purposes in **Table 6**. The volumes shown are to estimated spillway invert of the structure.

Table 6
Summary of Proposed Catchment Areas

Storage	Spill Invert (RL m)	Volume (ML)
Dingo Dam	345.0	1.7
Void	339.4	37.7
Sediment Dam	337.3	10.3
Pond	345.7	6.6

4.6 Ex-Mining Void Overtopping

The potential for the ex-mining void to overtop has been assessed on a first principals' basis. The estimated volume of the void is 37.7ML with the proposed catchment area of 4.9ha results in a rainfall depth of some 769mm to completely fill the void, which is in excess of the mean annual rainfall value of 553.4mm as shown in **Section 2.3**. The basic calculation does not consider evaporation losses or infiltration losses. The assessment indicates that during 'average' rainfall conditions the void would not be expected to overtop, however a water balance model would be required to be developed to better understand the spill risk.

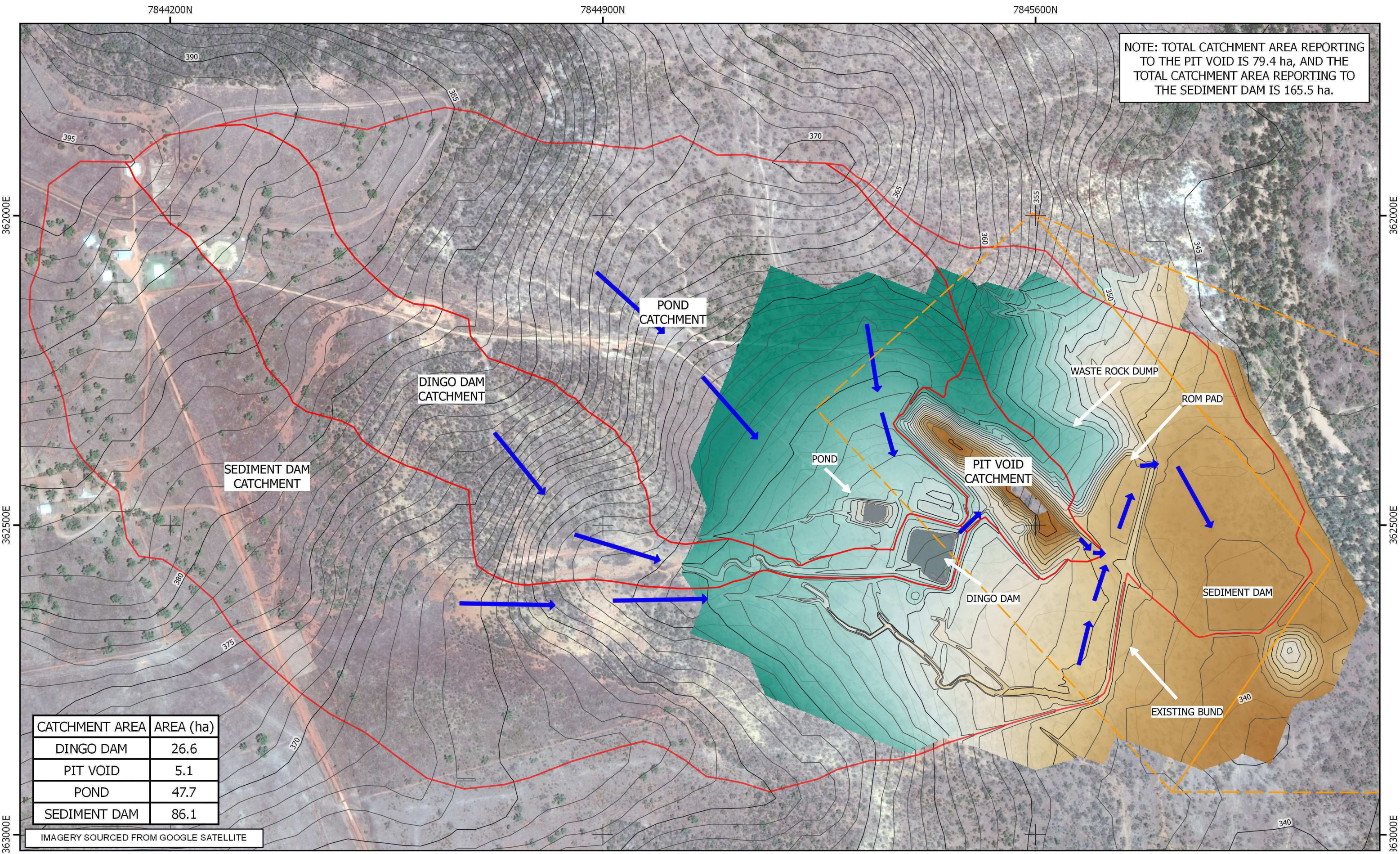
5 SUMMARY AND RECOMMENDATIONS

As is shown through the calculation of peak flow rate, depth and velocity estimates, presented in **Table 5**, for key locations of the proposed site configuration presented in this SWMP, it can be concluded that the overall objectives of the SWMP as outlined in **Section 4.1** have been achieved. This is a result of the combination of the catchment area reporting to the ex-mining void being reduced from 79.4 ha to 4.9 ha, and the calculation of relatively low flow depths and velocities at the assessed locations which are not expected to result in significant erosion of the site.

Beyond the scope of this SWMP and to meet the conditions of the site's EA, as shown in **Table 2**, it is recommend that AML engage a suitably qualified consultant to carry out a CCA (for relevant structures) and a residual void assessment to determine whether any of the site's structures are required to be listed as Regulated Structures on the site's EA.

REFERENCES

- [1] Guideline - 'Stormwater and Environmentally Relevant Activities' (2014). Department of Environment and Heritage Protection.
- [2] Queensland Regional Flood Mapping Program 2015, Queensland Reconstruction Authority <https://www.qra.qld.gov.au>
- [3] The manual for assessing consequence categories and hydraulic performance of structures (March 2016). Department of Environment and Heritage Protection.
- [4] Queensland Urban Drainage Manual, 2016. Institute of Public Works Engineers Queensland.



CATCHMENT AREA	AREA (ha)
DINGO DAM	26.6
PIT VOID	5.1
POND	47.7
SEDIMENT DAM	86.1

IMAGERY SOURCED FROM GOOGLE SATELLITE

LEGEND

- 1m CONTOURS
- FLOW DIRECTION
- CATCHMENT AREAS
- MINING LEASE AREAS

ELEVATION (RL m)

- | | |
|-------|-------|
| 335.0 | 345.0 |
| 337.5 | 347.5 |
| 340.0 | 350.0 |
| 342.5 | 352.5 |

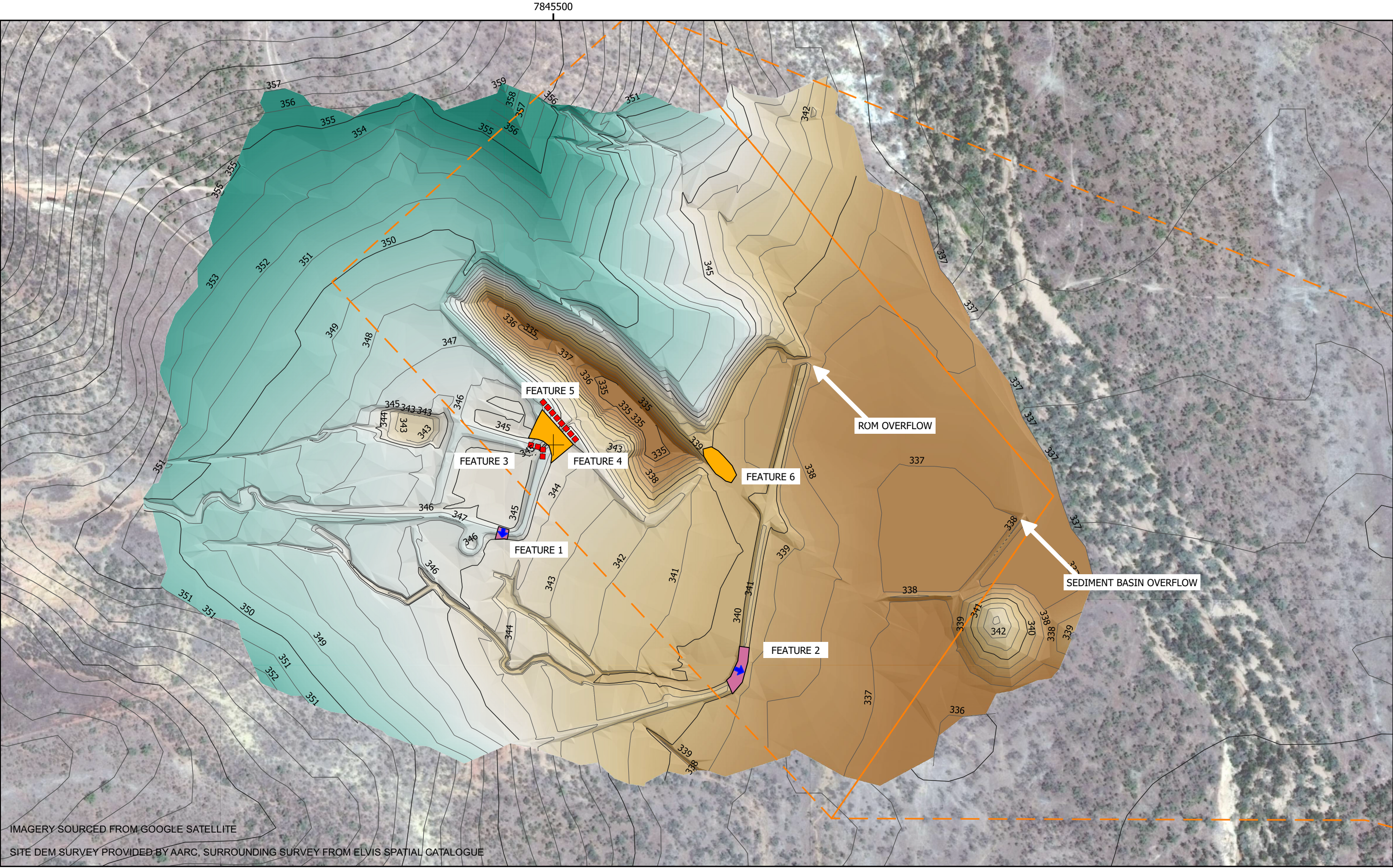
FIGURE 001
AUSTRALIAN MINES LTD

LUCKY BREAK/DINGO DAM PROJECT
EXISTING SITE CONDITIONS



DATE: 2019-01-29

CRS: GDA94 / MGA Zone 55



LEGEND

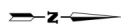
- 1m CONTOURS
- FLOW DIRECTION
- BUND PLACEMENT
- MINING LEASE AREAS
- REGRADE AREA
- BUND REMOVAL

ELEVATION (RL m)

335.0	345.0
337.5	347.5
340.0	350.0
342.5	352.5

FIGURE 002
AUSTRALIAN MINES LTD

LUCKY BREAK/DINGO DAM PROJECT
PROPOSED STORMWATER MANAGEMENT PLAN FEATURES

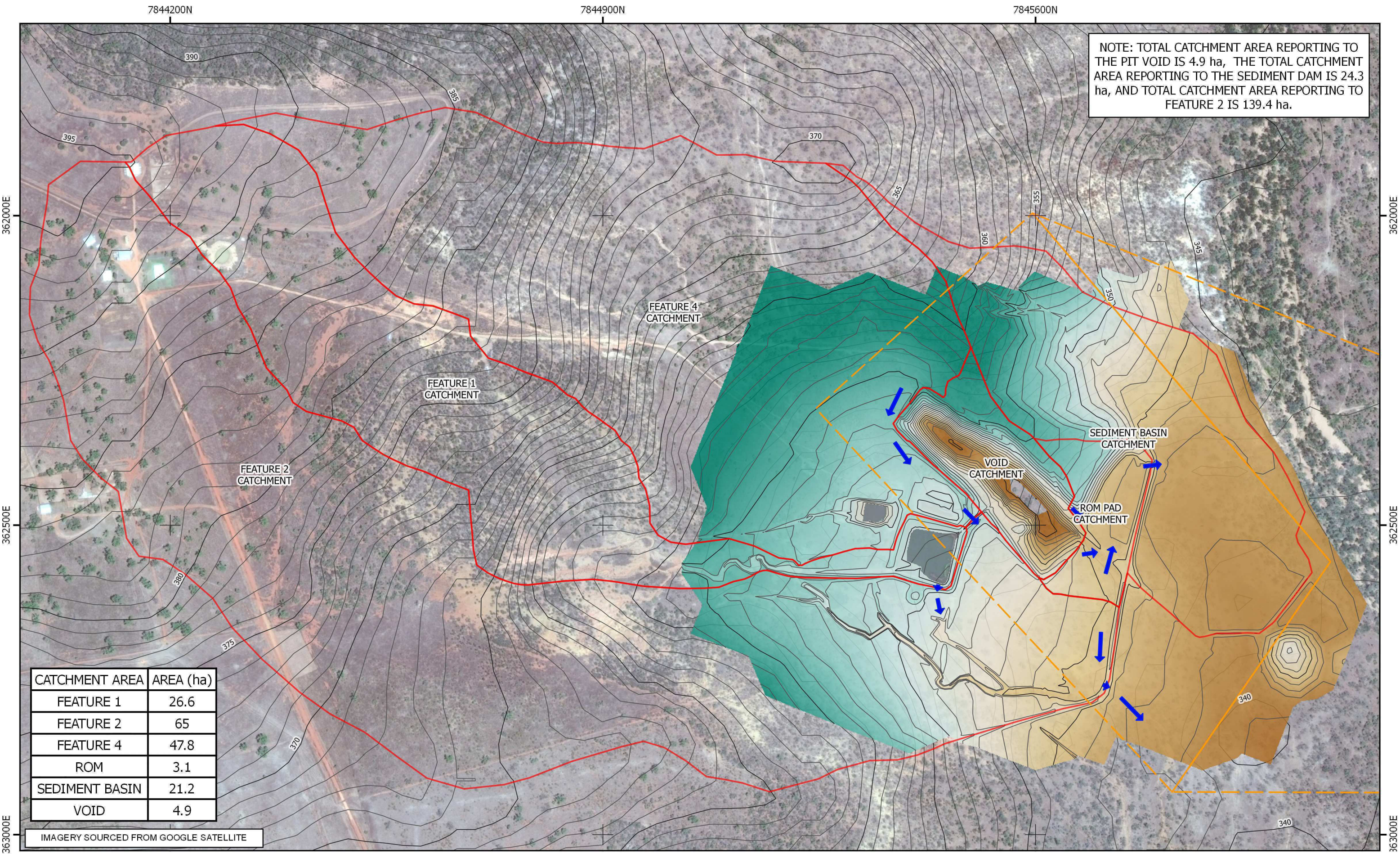


ATC Williams

DATE: 2019-06-04

CRS: GDA94 / MGA Zone 55

FILE: 118284-01GIS.qgs REV 1



LEGEND

- 1m CONTOURS
- FLOW DIRECTION
- CATCHMENT AREAS
- MINING LEASE AREAS

ELEVATION (RL m)

335.0	345.0
337.5	347.5
340.0	350.0
342.5	352.5

FIGURE 003
AUSTRALIAN MINES LTD

LUCKY BREAK/DINGO DAM PROJECT
PROPOSED CATCHMENT CONDITIONS

0 75 150 225 300 m

ATC Williams

DATE: 2019-01-29
CRS: GDA94 / MGA Zone 55

SITE DEM SURVEY PROVIDED BY CLIENT, SURROUNDING SURVEY SOURCED FROM ELVIS SPATIAL CATALOGUE

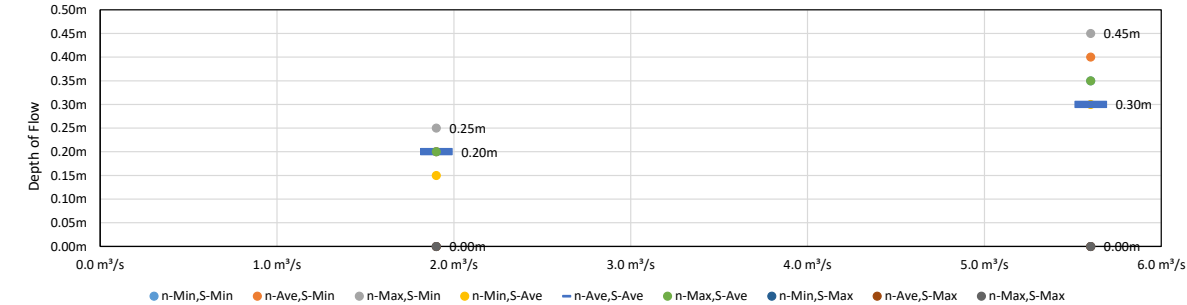
FILE PATH: M:\Synergy\Projects\118\118284 Dingo Dam Lucky Break\01 Water Management Concept\Data and Calcs\GIS\118284-01\GIS.qgs

Feature 1 - Dingo Dam Outlet

Design Event / Description	Required Discharge Rate (Q_{des})
Q2	1.9 m ³ /s
Q100	5.6 m ³ /s

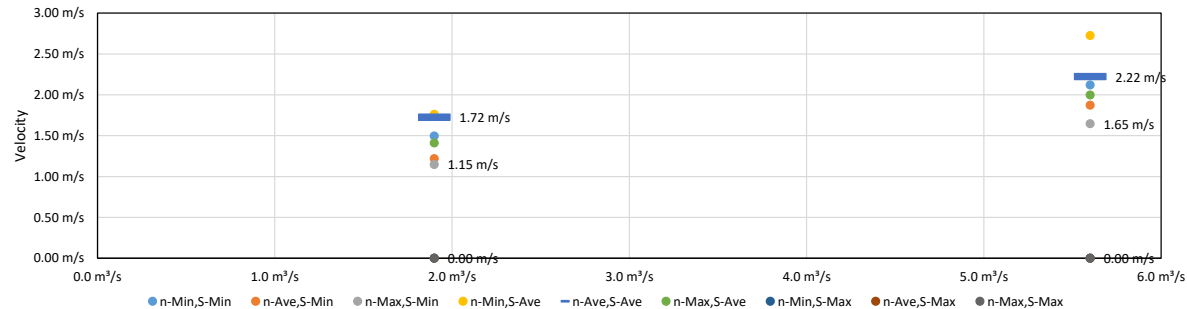
Drain Roughness	Category	Excavated Channels			
	Sub Description	Earth, straight, and uniform - with short grass, few weeds			
Use drop down menu for Category, then Sub Description (Top Right). Do not edit the mannings values directly.		Mannings	Minimum	Normal	Maximum
			0.022	0.027	0.033
Geometry	Value	Calculations are based upon the Manning's Uniform Flow Equation. As such, they assume sufficient consistent grade for uniform flow to develop. Mannings 'n' Roughness values are adopted from Ven Te Chow's "Open Channel Hydraulics" Reference (1959). Spreadsheet should not be used for rapidly varying flow. Calculation is inappropriate for high gradient flows, and these should be designed as chutes instead.			
Left Batter	1(V) : 2.0(H)				
Right Batter	1(V) : 2.0(H)				
Base width	8.0 m				
Slope					
Minimum	0.010 m/m				
Average	0.020 m/m				
Maximum					

Results



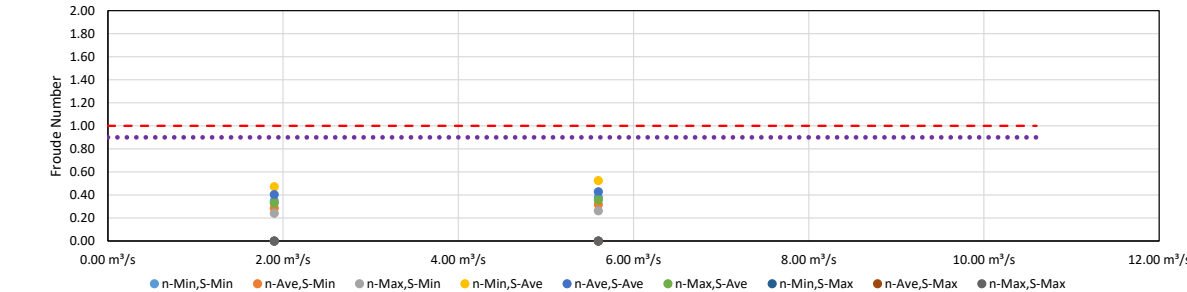
Depth vs. Discharge

Standard Uniform Flow Depth Outcomes by Mannings 'n' and Slope



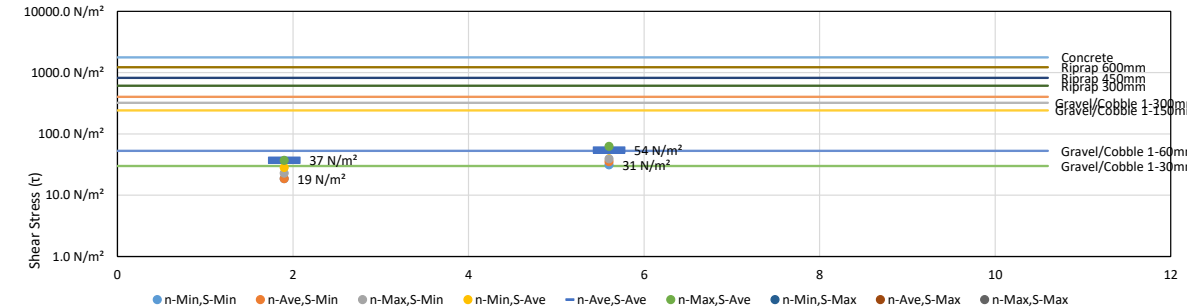
Velocity vs. Discharge

Note that the highest velocity will associate with the lowest Depth



Froude Number vs. Discharge

Note - if the Froude Number is approaching 1, then Free Standing Waves may exist - ABOVE the depth determined in the first graph. If the Froude Number exceeds 1, then the potential for Hydraulic Jump should be considered.



Shear Stress vs. Discharge

Included to give a first pass indication of required armouring - based on shear stress potential to erode material - If a rough material is required, the mannings value adopted may need to be iterated.

Feature 2 - Break in Bund

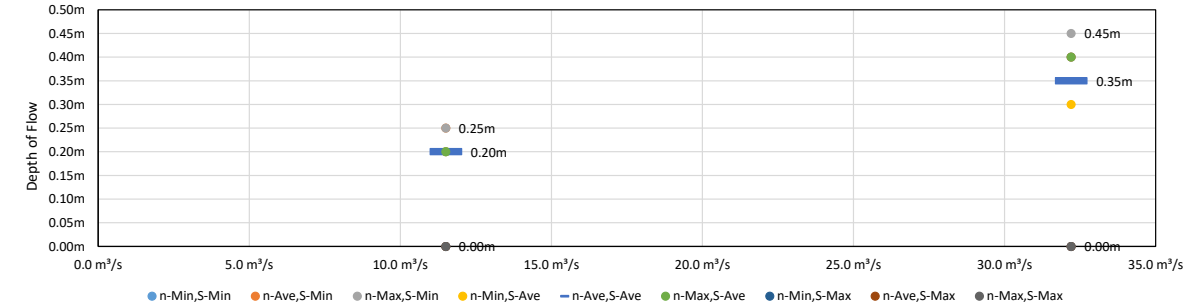
Design Event / Description	Required Discharge Rate (Q_{des})
Q2	11.5 m ³ /s
Q100	32.2 m ³ /s

Drain Roughness	Category	Excavated Channels		
	Sub Description	Earth, straight, and uniform - with short grass, few weeds		
Use drop down menu for Category, then Sub Description (Top Right). Do not edit the mannings values directly.		Mannings	Minimum	Normal
			0.022	0.027
				Maximum
				0.033

Geometry	Value
Left Batter	1(V) : 4.0(H)
Right Batter	1(V) : 4.0(H)
Base width	40.0 m
Slope	
Minimum	0.010 m/m
Average	0.020 m/m
Maximum	

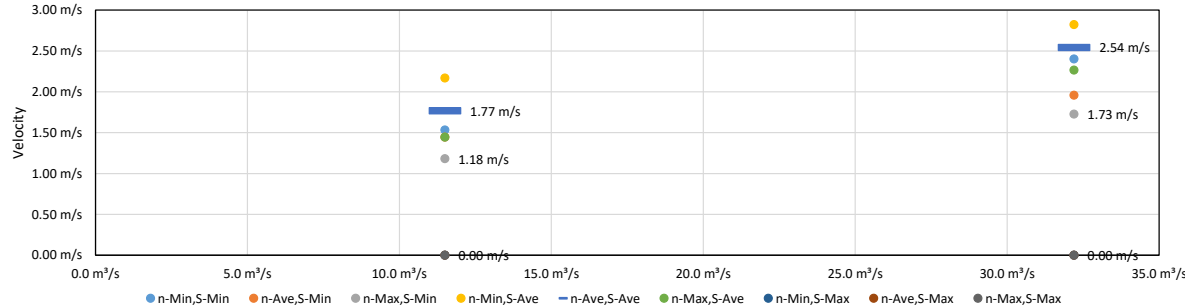
Calculations are based upon the Manning's Uniform Flow Equation. As such, they assume sufficient consistent grade for uniform flow to develop. Mannings 'n' Roughness values are adopted from Ven Te Chow's "Open Channel Hydraulics" Reference (1959). Spreadsheet should not be used for rapidly varying flow. Calculation is inappropriate for high gradient flows, and these should be designed as chutes instead.

Results



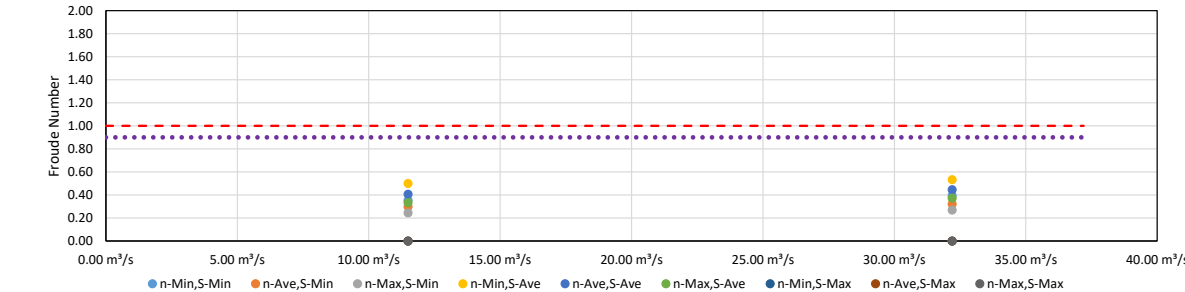
Depth vs. Discharge

Standard Uniform Flow Depth Outcomes by Mannings 'n' and Slope



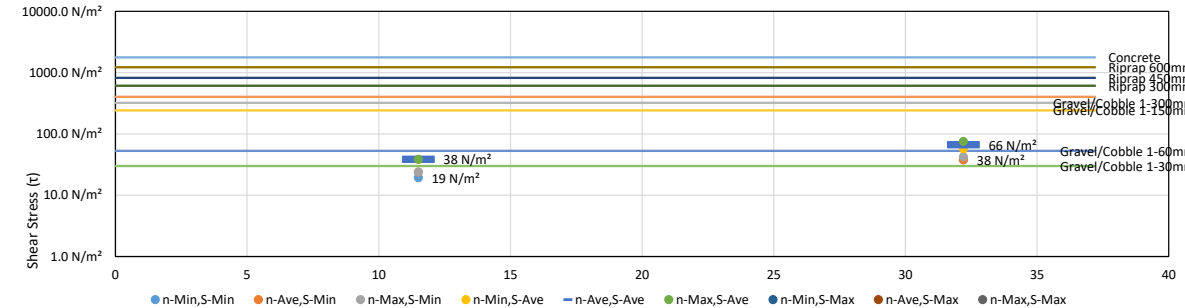
Velocity vs. Discharge

Note that the highest velocity will associate with the lowest Depth



Froude Number vs. Discharge

Note - if the Froude Number is approaching 1, then Free Standing Waves may exist - ABOVE the depth determined in the first graph. If the Froude Number exceeds 1, then the potential for Hydraulic Jump should be considered.



Shear Stress vs. Discharge

Included to give a first pass indication of required armouring - based on shear stress potential to erode material - If a rough material is required, the mannings value adopted may need to be iterated.

Feature 4 - Channel Section Between Dingo Dam and Void

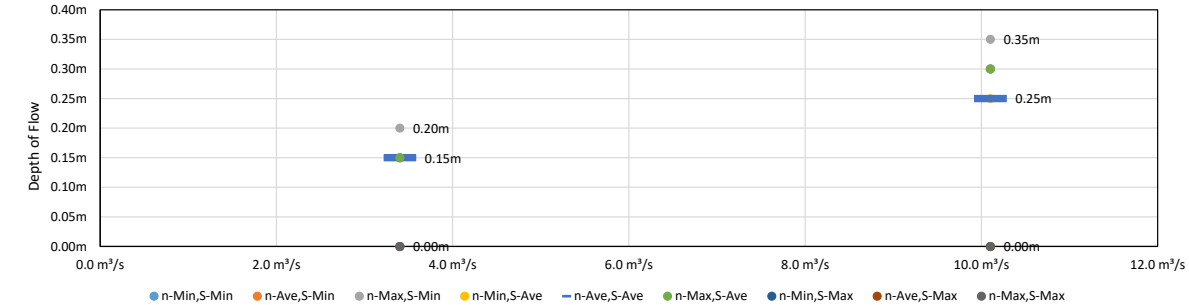
Design Event / Description	Required Discharge Rate (Q_{des})
Q2	3.4 m ³ /s
Q100	10.1 m ³ /s

Drain Roughness	Category	Excavated Channels			
	Sub Description	Earth, straight, and uniform - with short grass, few weeds			
Use drop down menu for Category, then Sub Description (Top Right). Do not edit the mannings values directly.		Mannings	Minimum	Normal	Maximum
			0.022	0.027	0.033

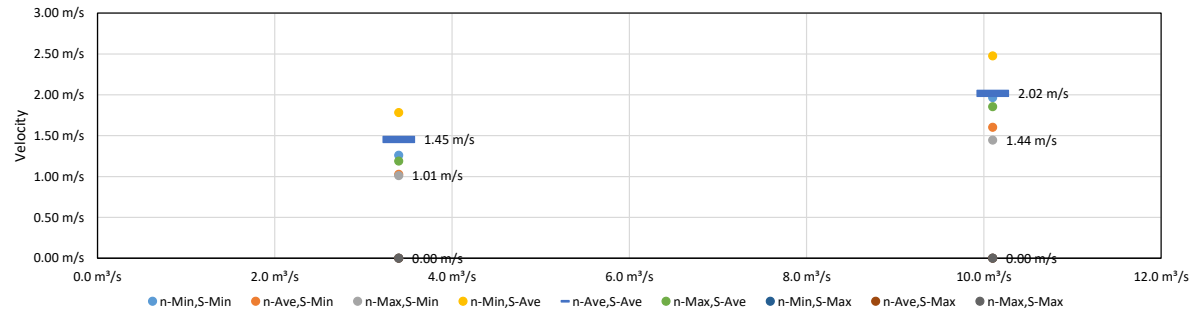
Geometry	Value
Left Batter	1(V) : 4.0(H)
Right Batter	1(V) : 4.0(H)
Base width	22.0 m
Slope	
Minimum	0.010 m/m
Average	0.020 m/m
Maximum	

Calculations are based upon the Manning's Uniform Flow Equation. As such, they assume sufficient consistent grade for uniform flow to develop. Mannings 'n' Roughness values are adopted from Ven Te Chow's "Open Channel Hydraulics" Reference (1959). Spreadsheet should not be used for rapidly varying flow. Calculation is inappropriate for high gradient flows, and these should be designed as chutes instead.

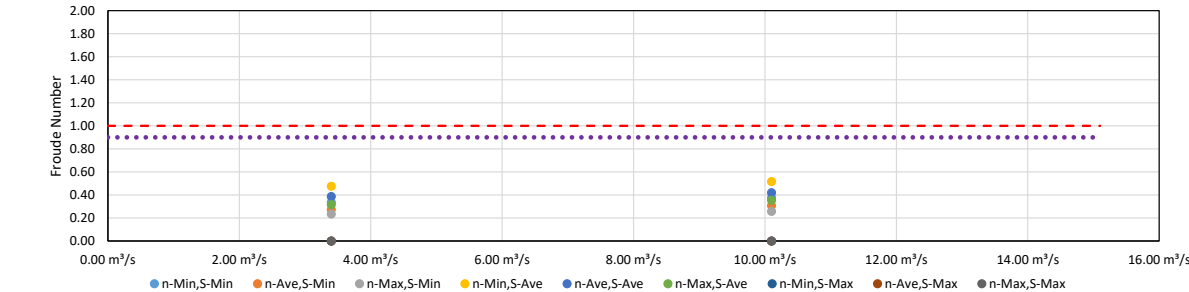
Results



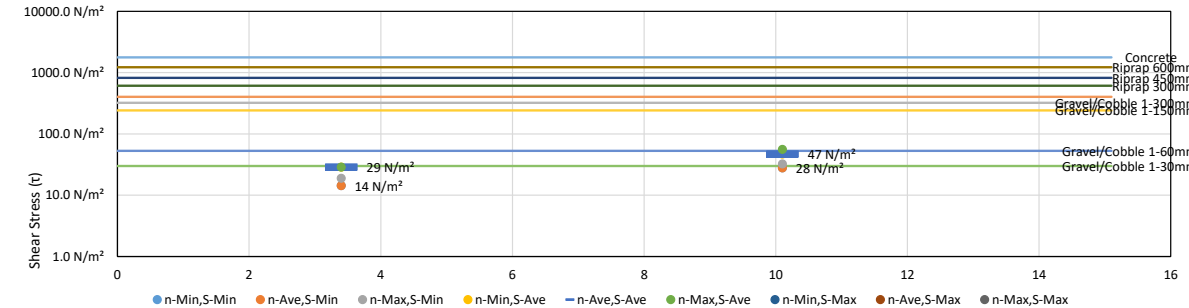
Depth vs. Discharge
Standard Uniform Flow Depth Outcomes by Mannings 'n' and Slope



Velocity vs. Discharge
Note that the highest velocity will associate with the lowest Depth



Froude Number vs. Discharge
Note - if the Froude Number is approaching 1, then Free Standing Waves may exist - ABOVE the depth determined in the first graph. If the Froude Number exceeds 1, then the potential for Hydraulic Jump should be considered.



Shear Stress vs. Discharge
Included to give a first pass indication of required armouring - based on shear stress potential to erode material - If a rough material is required, the mannings value adopted may need to be iterated.

ROM Overflow

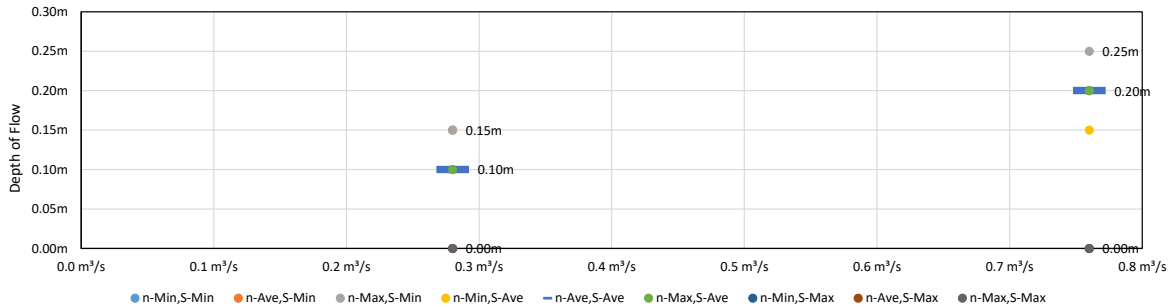
Design Event / Description	Required Discharge Rate (Q_{des})
Q2	0.3 m ³ /s
Q100	0.8 m ³ /s

Drain Roughness	Category	Excavated Channels			
	Sub Description	Earth, straight, and uniform - with short grass, few weeds			
Use drop down menu for Category, then Sub Description (Top Right). Do not edit the mannings values directly.		Mannings	Minimum	Normal	Maximum
			0.022	0.027	0.033

Geometry	Value
Left Batter	1(V) : 2.0(H)
Right Batter	1(V) : 2.0(H)
Base width	3.0 m
Slope	
Minimum	0.010 m/m
Average	0.020 m/m
Maximum	

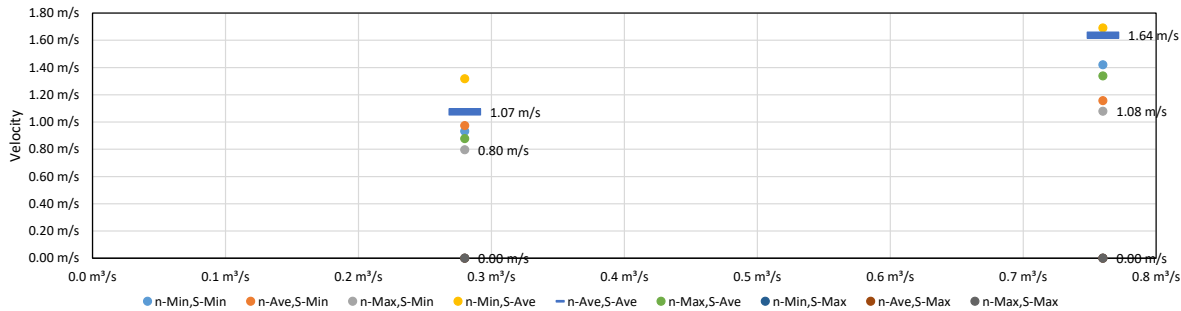
Calculations are based upon the Manning's Uniform Flow Equation. As such, they assume sufficient consistent grade for uniform flow to develop. Mannings 'n' Roughness values are adopted from Ven Te Chow's "Open Channel Hydraulics" Reference (1959). Spreadsheet should not be used for rapidly varying flow. Calculation is inappropriate for high gradient flows, and these should be designed as chutes instead.

Results



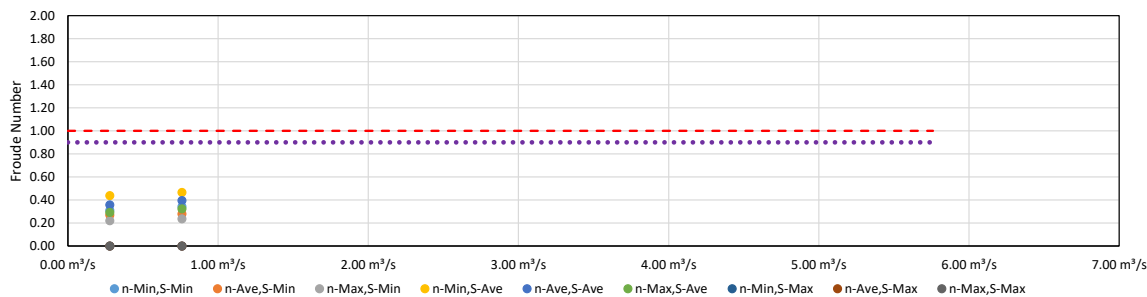
Depth vs. Discharge

Standard Uniform Flow Depth Outcomes by Mannings 'n' and Slope



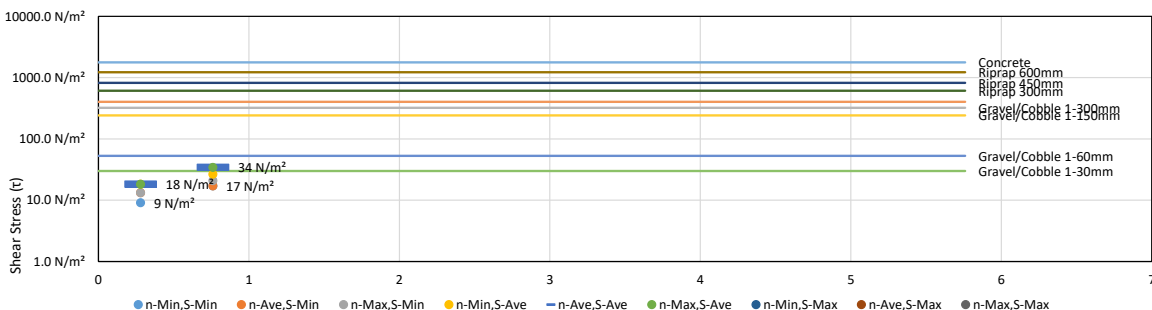
Velocity vs. Discharge

Note that the highest velocity will associate with the lowest Depth



Froude Number vs. Discharge

Note - if the Froude Number is approaching 1, then Free Standing Waves may exist - ABOVE the depth determined in the first graph. If the Froude Number exceeds 1, then the potential for Hydraulic Jump should be considered.



Shear Stress vs. Discharge

Included to give a first pass indication of required armouring - based on shear stress potential to erode material - If a rough material is required, the mannings value adopted may need to be iterated.

Sediment Basin Outlet

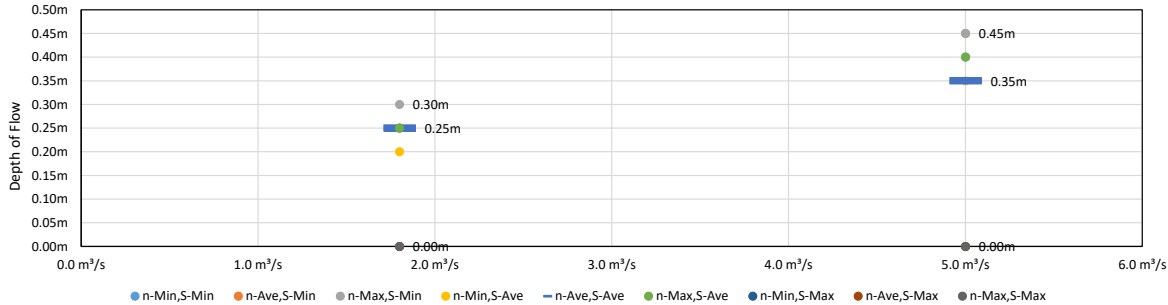
Design Event / Description	Required Discharge Rate (Q_{des})
Q2	1.8 m ³ /s
Q100	5.0 m ³ /s

Drain Roughness	Category	Excavated Channels			
	Sub Description	Earth, straight, and uniform - with short grass, few weeds			
Use drop down menu for Category, then Sub Description (Top Right). Do not edit the mannings values directly.		Mannings	Minimum	Normal	Maximum
			0.022	0.027	0.033

Geometry	Value
Left Batter	1(V) : 5.0(H)
Right Batter	1(V) : 15.0(H)
Base width	4.0 m
Slope	
Minimum	0.010 m/m
Average	0.020 m/m
Maximum	

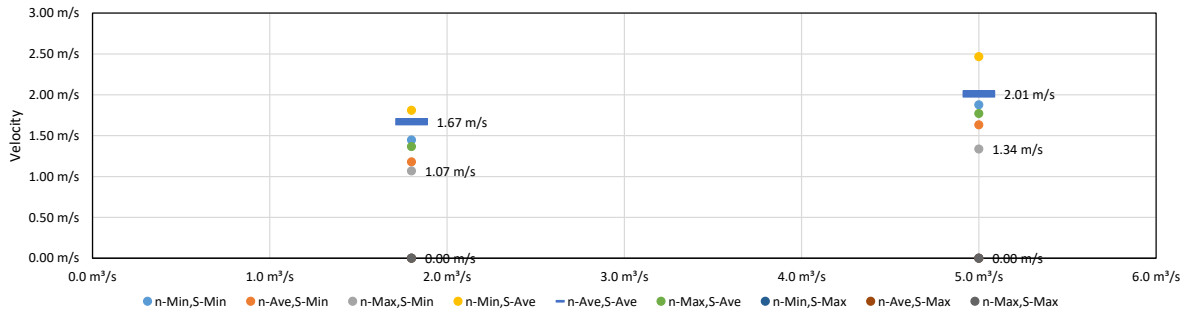
Calculations are based upon the Manning's Uniform Flow Equation. As such, they assume sufficient consistent grade for uniform flow to develop. Mannings 'n' Roughness values are adopted from Ven Te Chow's "Open Channel Hydraulics" Reference (1959). Spreadsheet should not be used for rapidly varying flow. Calculation is inappropriate for high gradient flows, and these should be designed as chutes instead.

Results



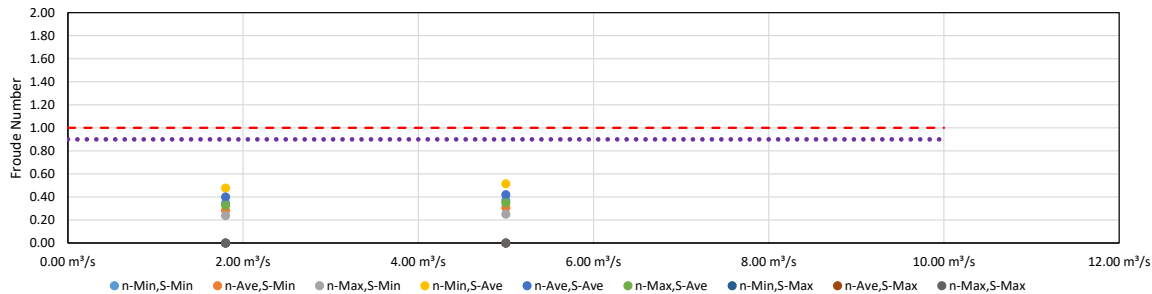
Depth vs. Discharge

Standard Uniform Flow Depth Outcomes by Mannings 'n' and Slope



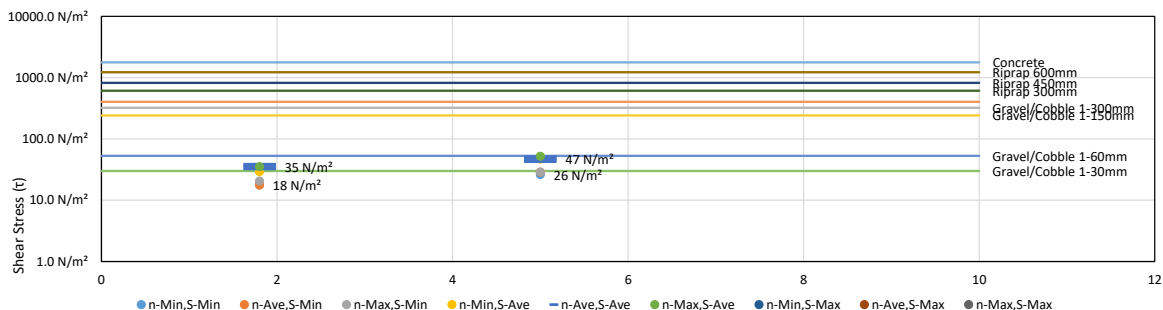
Velocity vs. Discharge

Note that the highest velocity will associate with the lowest Depth



Froude Number vs. Discharge

Note - if the Froude Number is approaching 1, then Free Standing Waves may exist - ABOVE the depth determined in the first graph. If the Froude Number exceeds 1, then the potential for Hydraulic Jump should be considered.



Shear Stress vs. Discharge

Included to give a first pass indication of required armouring - based on shear stress potential to erode material - If a rough material is required, the mannings value adopted may need to be iterated.