Australian Strategic Materials (Holdings) Ltd

ABN 51 091 489 511

Annual Review
&
Annual Rehabilitation Report

1 July 2019 – 30 June 2020

View towards Dubbo from the Dubbo Project (Trig Offset). Photo taken 16 August 2020.

Table of Contents

DEFINITIONS III

TITLE BLOCK IV

1 STATEMENT OF COMPLIANCE 1

2 INTRODUCTION 2

2.1 Dubbo Project 2

2.2 Mine Contacts 2

3 OPERATIONS SUMMARY 8

3.1 Construction 8

3.2 Operations 8

3.3 Next reporting period 8

4 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW 9

5 ENVIRONMENTAL PERFORMANCE 10

5.1 Air Quality 10

5.1.1 Management Measures 13

5.1.2 Proposed Improvements 13

5.2 Biodiversity 13

5.2.1 Management Measures 14

5.2.2 Proposed Improvements 16

5.3 Heritage 19

5.3.1 Management Measures 20

5.3.2 Proposed Improvements 20

5.4 Meteorological Monitoring 20

5.4.1 Proposed Improvements 21

6 WATER MANAGEMENT 22

6.1 Water Supply 24

6.2 Water Balance 25

6.3 Clean Water Management (Surface) 25

6.3.1 Site Water 25

6.3.2 Surface Water Monitoring results 26

6.3.3 Discharge 26

6.4 Mine Water Management 26

6.5 Erosion and Sediment Control 26

6.6 Groundwater 26

6.7 Proposed Water Management Improvements 27

7 REHABILITATION 28

7.1 Rehabilitation during reporting period 28

7.2 Post Rehabilitation Landuse 28

7.3 Trials, Monitoring and Research 31

7.4 Key rehabilitation risks 31

7.5 Actions for next reporting period 31

8 COMMUNITY 32

8.1 Consultation 32

8.2 Support 33

8.3 Complaints and enquiries 33

9 INDEPENDENT ENVIRONMENTAL AUDIT 34

10 INCIDENTS AND NON-COMPLIANCES DURING REPORTING PERIOD 35

10.1 Official Regulatory Interaction 35

11 ACTIVITIES TO BE COMPLETED IN NEXT REPORTING PERIOD 36

APPENDIX A - Pink-tailed Worm-lizard Monitoring Report April 2020 - Area Environmental Consultants & Communication (AREA 2020)

APPENDIX B - Meteorological Data July 2019 - June 2020

APPENDIX C - Water Monitoring Location Photographs 10 February 2020

APPENDIX D - Water Monitoring results 2016 -2020

APPENDIX E - Correspondence between Planning & Environment and Australian Strategic Materials Ltd

Definitions

Term	Definition
ASM	Australian Strategic Materials Ltd (formerly known as AZL)
AZL	Australian Zirconia Ltd
BOA	Biodiversity Offset Area
$CaCO_3$	Calcium carbonate
CCC	Community Consultative Committee
CPVP	Conservation Property Vegetation Plan
DP	Dubbo Project (formerly known as DZP - Dubbo Zirconia Project)
DPIE	Department of Planning Industry & Environment
DRC	Dubbo Regional Council
DSC	Dam Safety Committee
EC	Electrical Conductivity
EEC	Endangered ecological community
EP&A	*Environment Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPBC	*Environment Protection & Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ERML	Environmental Radiation Monitoring Location
Ha	Hectares
HVAS	High volume air sampler
LDP	Licensed discharge point
LFA	Landscape function analysis
LLS	Local Land Services
LOR	Limit of Reporting
LRSF	Liquid Residue Storage Facility
MEG	Mining Energy & Geoscience (formerly Department of Resources and Geoscience)
Mining Act	*Mining Act 1992*
ML	Mining Lease
MOP	Mining Operations Plan
NGERS	National Greenhouse and Energy Reporting Scheme
NMP	Noise Management Plan
NOW	NSW Office of Water
OEH	Office of Environment and Heritage
PM10	Particulate matter 10 microns and smaller
PTWL	Pink-tailed Worm-lizard (*Aprasia parapulchella*)
PVP	Property Vegetation Plan
RAP	Registered Aboriginal Party
REE	Rare Earth Elements
RMS	Roads and Maritime Services
ROM	Run of Mine
SEC	Salt Encapsulation Cell
SEEC	Strategic Environmental and Engineering Consulting
SRSF	Solid Residue Storage Facility
TARP	Trigger action response plan
TEOM	Tapered Element Oscillating Microbalance
TIM	Total Insoluble Matter
TPC	Toongi Pastoral Company Pty Ltd
TSP	Total suspended particulates
WAL	Water access licence
WHS	Workplace Health & Safety
WRE	Waste Rock Emplacement

Title Block

Table 1: Annual Review Title Block

Name of operation	Dubbo Project
Name of operator	Australian Strategic Materials Ltd
Development consent / project approval #	SSD-5251
Name of holder of development consent / project approval	Australian Strategic Materials Ltd
Mining lease #	ML 1724
Name of holder of mining lease	Australian Strategic Materials Ltd
Water licence #	WALs; 19994, 9191, 3396, 13599, 36409, 3412, 302259, 36790
Name of holder of water licence	Australian Strategic Materials Ltd
MOP/RMP start date	TBA
MOP/RMP end date	TBA
Annual Review start date	1 July 2018
Annual Review end date	30 June 2019
I, Michael Sutherland, certify that this audit report is a true and accurate record of the compliance status of the Dubbo Project for the period 1 July 2018 to 30 June 2019 and that I am authorised to make this statement on behalf of Australian Strategic Materials Ltd. Note. The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000. The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).	
Name of authorised reporting officer	Michael Sutherland
Title of authorised reporting officer	General Manager NSW
Signature of authorised reporting officer	
Date	30 August 2020

1. Statement of Compliance

Table 2 provides a statement of compliance status for Australian Strategic Materials Ltd (ASM) with its project approval (SSD) and mining lease (ML), as at the end of the reporting period.

Table 2: Statement of Compliance

Were all conditions of the following approvals complied with?	
SSD-5251	YES
ML 1724	YES

Table 3 provides a summary of approval conditions not complied with as at the end of the reporting period.

Table 3: Non-compliances

Relevant approval	Condition #	Condition description (summary)	Compliance status	Comment	Relevent Section
SSD-5152	NA	NA	NA	NA	NA

Compliance status key for Table 3		
Risk level	Colour Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2. Introduction

2.1 Dubbo Project

The Dubbo Project has not yet commenced construction on site, however, this Annual Review reports on environmental management activities undertaken by Australian Strategic Materials Ltd (ASM) at the Dubbo Project (DP) during the financial year (FY) 2018-2019, and provides details on activities proposed for FY 2019/2020. The report has been produced in accordance with the *Post-approval requirements for State significant mining developments - Annual Review Guideline* (DP&E, October 2015) to meet the annual reporting requirements conditioned in the DZP Mining Lease (ML 1724) and Project Approval (SSD-5251). **See Figure 1**.

The DP was approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015 and will comprise a small scale open cut mine supplying ore containing rare metals and rare earth elements to a processing plant near the locality of Toongi, approximately 25km south of Dubbo (the DP Site) (**see Figure 2**). The DP has made significant steps towards offtake agreements and funding during the reporting period but is yet tocommence construction and thus there has been no rehabilitation activity to report.

Annual extraction of ore from the open cut is planned to be approximately one million tonnes per year which would generate approximately 35 000t of products. Waste residues produced by the processing operations will be managed in residue storage facilities, designed to contain and encapsulate these residues.

The DP also includes the construction of a water pipeline between the processing plant and the Macquarie River, a pipeline to carry natural gas between Dubbo and the DP Site, and the upgrades of the following linear infrastructure;

- Toongi Road;
- Obley Road; and
- the Toongi-Dubbo section of the currently disused Dubbo-Molong Rail Line.

Collectively, these are referred to as the DP linear infrastructure.

2.2 Mine Contacts

The primary contacts for the DP during the review period are detailed in **Table 4**. This table will be updated when construction gets underway in the next reporting period.

Table 4. Dubbo Zirconia Project Key Contacts

Key Contact	Position	Contact Details
David Woodall	Managing Director	PO Box 4384, Victoria Park, WA 6979 Phone (08) 9200 1681
Michael Sutherland	General Manager NSW	PO Box 910 Dubbo NSW 2830 Phone: (02) 6882 2866
Community Information Line	General Manager NSW	(02) 6882 2866

Figure 1: Dubbo Project – Local Setting

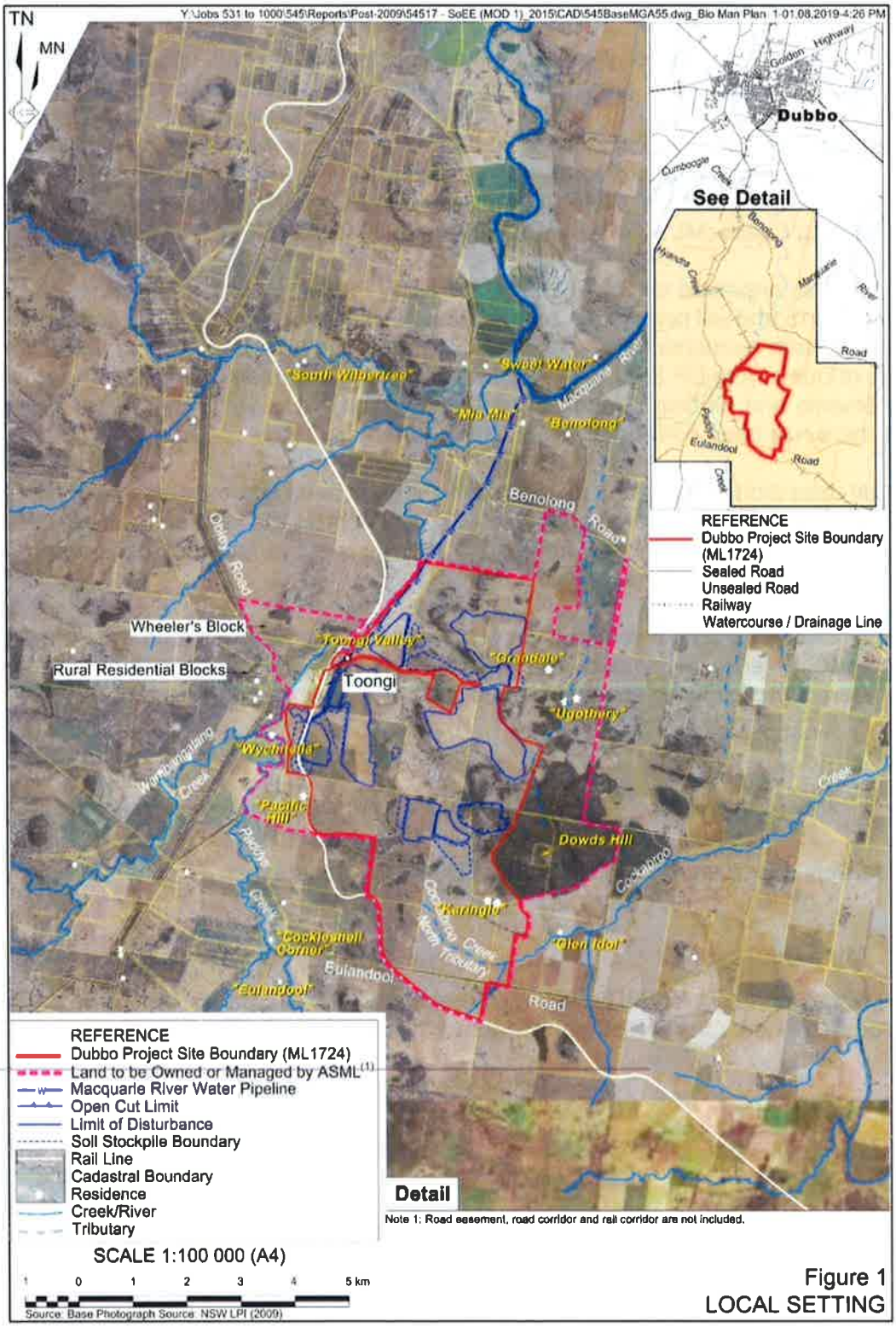


Figure 2: Dubbo Project – Site Layout

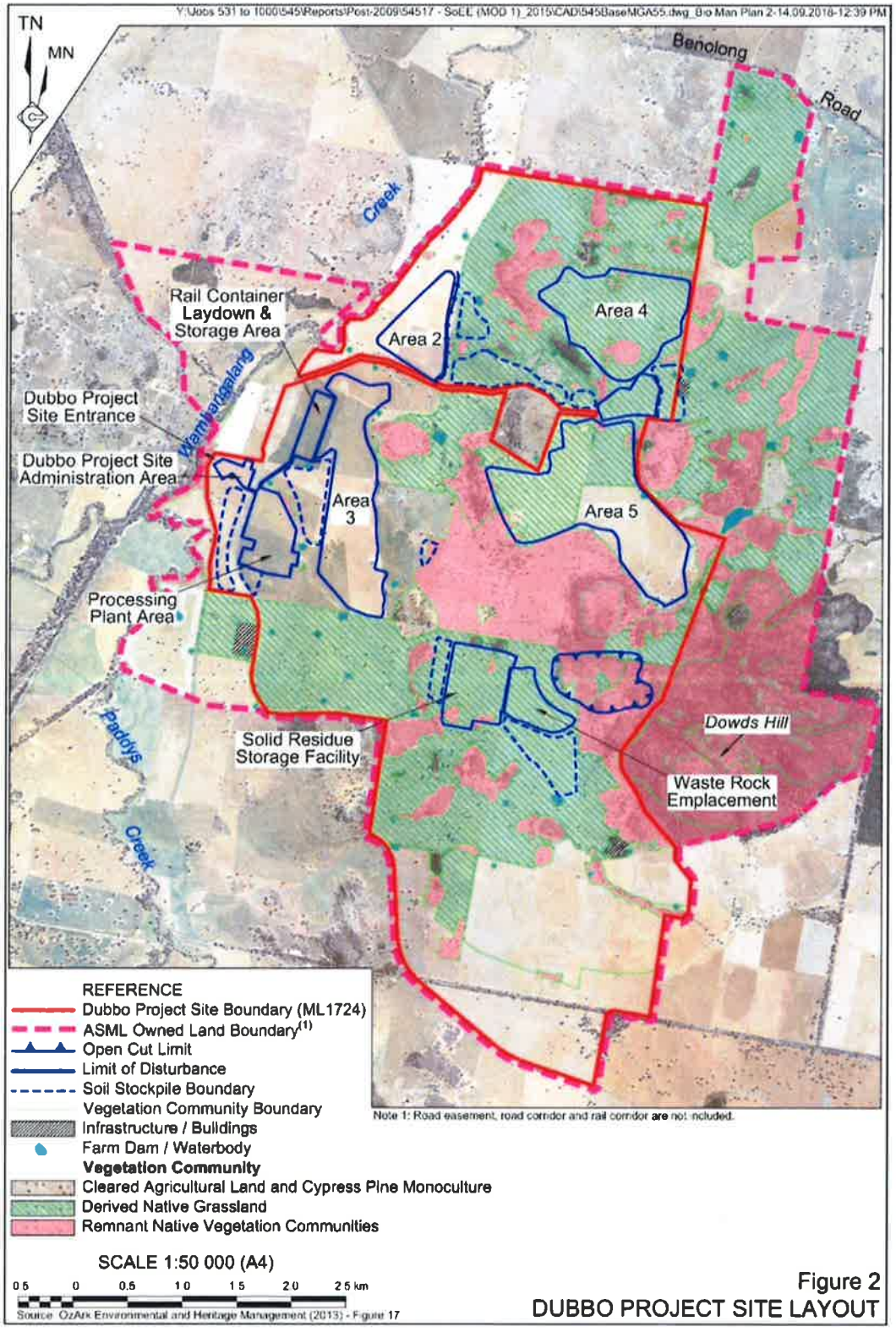


Figure 3: Dubbo Project – Environmental Monitoring Locations

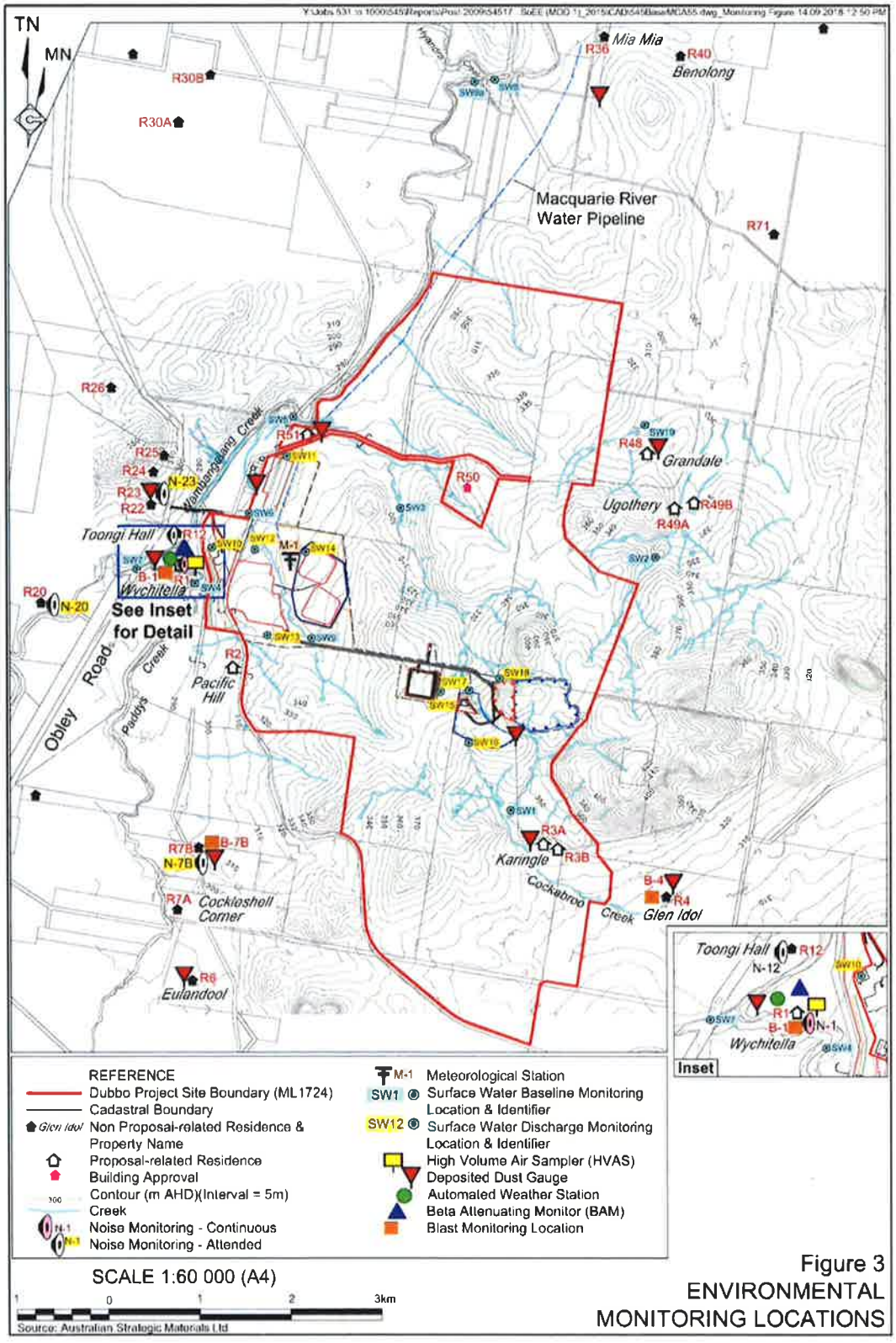
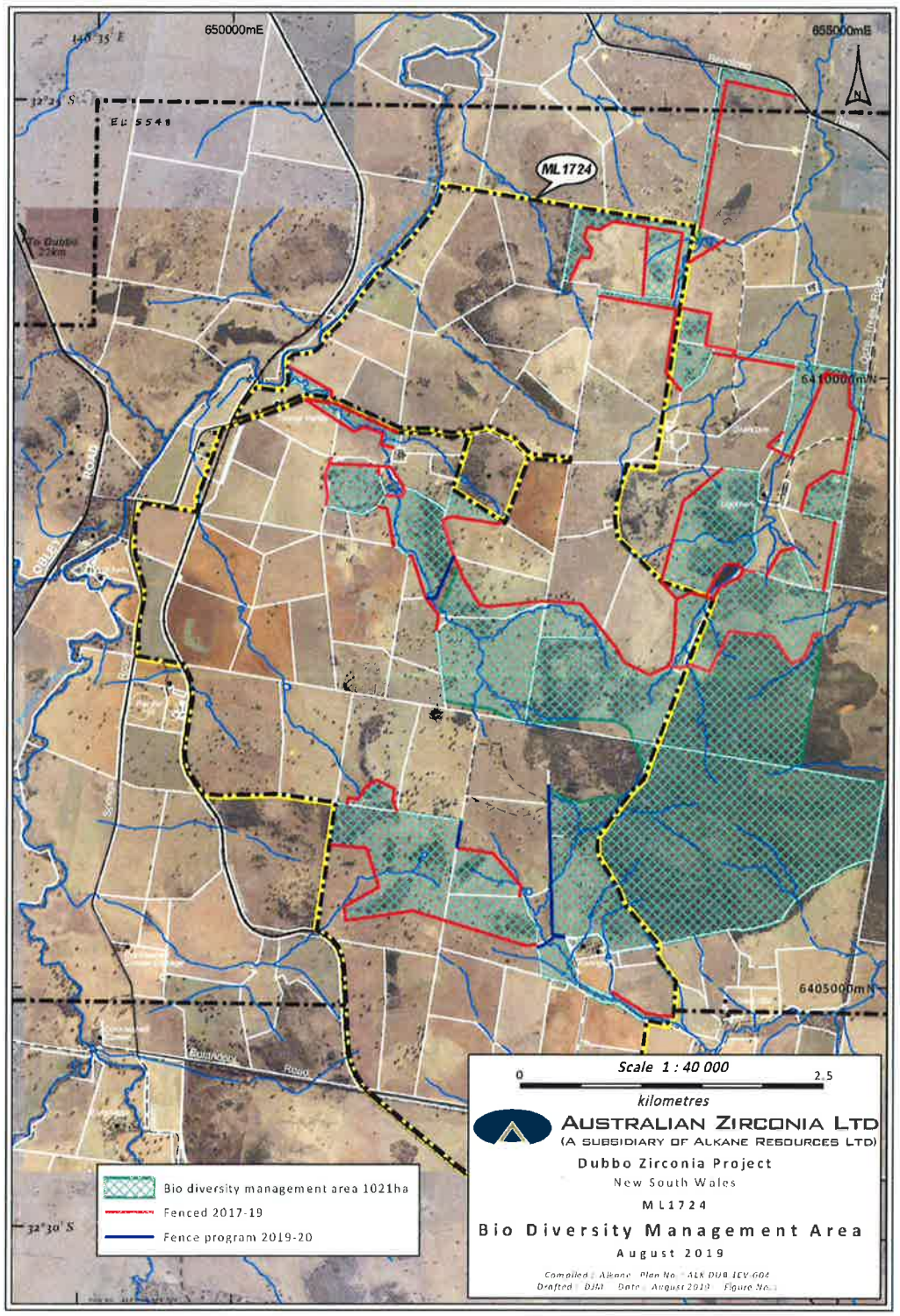


Figure 4: Biodiversity Management Area



Approvals - DP operates under the environmental consents, leases and licenses specified in Table 5.

Table 5. Consents, leases and licenses

Title	Legislation	Regulatory Authority	Approval Duration/ Expiry
State Significant Development approval 5251	Environmental Planning & Assessment (EP&A) Act 1979	NSW Planning and Environment (DPE)	31 December 2037
EPBC 2012/6625	EPBC Act 1999	Australian Government-Dept of the Environment	31 December 2045
Mining Lease 1724	Mining Act 1992	NSW Department Resources & Geoscience (DRG)	18 December 2035
Environment Protection License (EPL) 20702	Protection of the Environment Operations (POEO) Act 1997	NSW Environment Protection Authority (EPA)	Ongoing until surrendered (14 March Anniversary)
Water Access Licences WALs; 19994, 9191, 3396, 13599, 36409, 3412, 302259, 36791	Water Management Act 2000	NSW Office of Water (NOW)	N/A
Conservation Property Vegetation Plan	Native Vegetation Act 2003	Local Land Services	In perpetuity
DA D2016-70 Karingle Quarry	Environmental Planning & Assessment (EP&A) Act 1979	Western Joint Regional Planning Panel	7 July 2021
General Terms of Approval Notice No. 1541379	Section 91A (2) EP&A Act 1979	NSW Environment Protection Authority (EPA)	N/A

3. Operations Summary

3.1 Construction

Construction of the Dubbo Project has not commenced as of 30 June 2020. There have been no on ground works associated with the DP despite all approvals being in place. The Project's financing is in the process of being secured.

3.2 Operations

All of the land enclosing the DP was aquired by Australian Strategic Materials Ltd by June 2016 and a professional Farm Manager was appointed in May 2016.

The Farm Manager has been charged with the responsibility of operating a commercially viable sheep and cattle operation (Toongi Pastoral Company Pty Ltd) on 2,500Ha of land enclosing the Mining Lease and project footprint.

Fencing and managing the 1,021Ha Biodiversity Offset Areas falls under the responsibility of the Farm Manager. The final three km of 29.2km of fencing was installed enclosing the biodiversity offsets during this reporting period (100% complete by 30 June 2019).

Environmental monitoring points are shown in **Figure 3.**

Baseline water quality, air quality and meteorological data is collected by trained ASM staff.

Ecological monitoring continues to be undetaken by qualified professionals.

A Community Consultative Committee with an independent Chirperson was established in late 2015 and has met quarterly (except when so little had happened that a meeting was deemed uneccesary).

3.3 Next reporting period

During the next reporting period, assuming project finance has been secured, construction is expected to commence, including:

- Obley and Toongi Road upgrade;
- Water supply;
- Karingle basalt quarry operations (on site supply of construction materials);
- Erosion and sediment control structures;
- Construction earthworks; and
- Processing plant construction.

Some pre-existing fences enclosing the biodiversity offset areas have been repaired and/or replaced in 2019-2020. See **Figure 4**.

4. Actions required from previous Annual Review

This is the fifth Annual Environmental Management Review for the Dubbo Project despite the project having not yet commenced construction.

Table 6. Actions from review previous Annual Reviews

Actions Required from previous Annual Review	Requested by	Action taken by Operator	Section where discussed
List of actions contained in letter from DPE dated 26 September 2018	DPE	Michael Sutherland	Appendix E
Consent project boundary clearly marked on plans	DPE	Michael Sutherland	Figures1, 2 & 3
Upload Annual Review to ASM website within one month of Annual Review letter from DPE	DPE	2018 review on website within one month	NA

5. Environmental performance

5.1 Air Quality

The DP Air Quality Management Plan (AQMP) was prepared to describe dust control measures at DP and meet the requirements of Schedule 3, Condition 18 of SSD-5251.

Management Plans can be found on the Dubbo Project web page at:

https://asm-au.com/projects/dubbo-project/environmental-reports-management-plans/

Air Quality criteria for the project are outlined in **Table 7**.

Table 7. Long term criteria for deposited dust

Pollutant	***Averaging period***	***Maximum increase in deposited dust level***	***Maximum total deposited dust level***
c Deposited dust	Annual	b 2 g/m²/month	a 4 g/m²/month

Notes to Table 7:
□ *a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources);*
□ *b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);*
□ *c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003:*

Before construcion commences a High Volume Air Sampler (HVAS) for measuring Total Suspended Particulates (TSP) and PM_{10} (particulate matter <10µm) will be installed in the at a location (WY1) between Wychitella homestead and the Toongi Hall.

Deposited dust has been monitored/measured at 12 locations within and neighbouring the project site for several years up until January 2020.

Baseline deposited dust data collection had recommenced on 29 November 2012.

Deposited dust gauges were changed over monthly and three sample sites had monthly samples amalgamated to create enough sample to do additional testwork for radionuclides.

The Cockleshell Corner dust gauge was relocated to Eulandool on 3 August 2015 to enable baseline data to be presented to the property owner.

Six and one half years of deposited dust monitoring has revealed the the project site yields low levels of nuisance dust and is typical of mixed agricultural land with an average 550mm annual rainfall.

To date there is no data on suspended particulates as the permanent environmental monitoring station has not yet been established.

2019-2020 has seen numerous raised dust events due to statewide drought conditions. HVAS sampling at Alkane's Tomingley Gold Operations provide supporting evidence of raised dust events. There were also several weeks of very poor air quality between November 2019 and January 2020 due to bushfires across eastern Australia.

Table 8. Deposited Dust Results

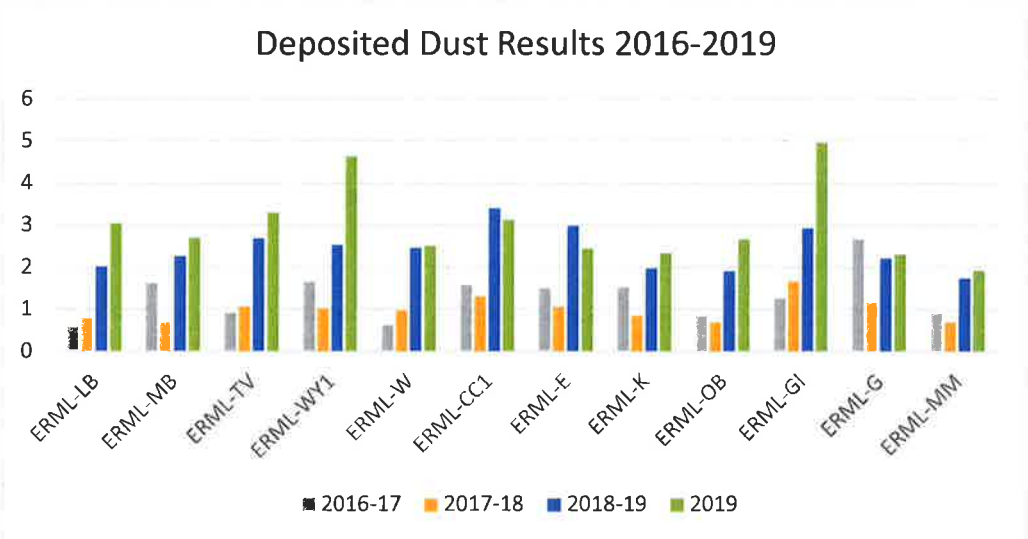
Site ID	Site Name	Annual Dust Deposition Rates (g/m^2.month)			
		2016-2017	2017-2018	2018-2019	2019-2020
		2/6/16 - 2/6/17	4/7/17 - 2/7/18	2/7/18 - 2/7/19	2/7/19 - 3/1/20
ERML-LB	Lifestyle Blocks	0.572	0.815	2.027	3.053
ERML-MB	Malcolm Bye's	1.613	0.719	2.270	2.713
ERML-TV	Toongi Valley	0.912	1.076	2.694	3.305
ERML-WY1	Wychitella Homestead	1.641	1.032	2.538	4.649
ERML-W	Wychitella	0.614	0.993	2.472	2.52
ERML-CC1	Cockleshell Corner Cottage	1.564	1.320	3.411	3.141
ERML-E	Eulandool	1.493	1.075	2.999	2.458
ERML-K	Karingle	1.514	0.862	1.99	2.347
ERML-OB	Ore Body	0.843	0.708	1.919	2.676
ERML-GI	Glen Idol	1.252	1.680	2.943	4.976
ERML-G	Grandale	2.667	1.178	2.223	2.32
ERML-MM	Mia Mia	0.911	0.713	1.753	1.937

- Approval Criteria from SSD-5251 Schedule 3, Condition 18, based on 2013 Project EIS Assessment Criteria

Raised dust at Nyngan 19 Jan 2020

Raised dust in Dubbo 26 Nov 2019

Figure 5: Deposited dust results for 2016-2019



Smoke from bushfires in Dubbo 20 Dec 2019

5.1.1 Management Measures

No dust management measures were employed during this reporting period as project construction has not commenced. These are baseline monitoring results influenced by seasonal and routine agricultural practices.

Toongi Pastoral Company is relatively conservatively stocked and has maintained good pasture cover in all but cropping paddocks. De-stocking continued as the drought conditions extended to March 2020 by which time seasonal conditions were significantly improved.

5.1.2 Proposed Improvements

It is proposed by the proponent that deposited dust monitoring be stopped at the end of December 2019. Several years of baseline data has now been collected.
Monitoring is proposed to re-start when project construction commences.

5.2 Biodiversity

Biodiversity at DP is managed under the Biodiversity Management Plan (BMP), which was completed in accordance with Schedule 3, Condition 31-35 of SSD-5251.

A component of the BMP is the Biodiversity Offset Strategy, which delineates the 1,021Ha of biodiversity offset areas and management actions selected to protect and enhance remnant vegetation communities. (see **Figure 4**.). The Biodiversity Offset Area (BOA) is protected in perpetuity with the registration on land title of a Conservation Property Vegetation Plan (CPVP) under the *Native Vegetation Act 2003*.

The CPVP was signed by ASM Directors on 22 May 2017 and Central West Local Land Services on 31 May 2017.

A Conservation Bond will be lodged with DPE prior to commencement of any development. The Department will be advised in writing at least three months pror to construction commencing.

5.2.1 Management Measures

Biodiversity management actions for the DP are focussed towards protection and enhancement of habitat for the State and Commonwealth listed Pink-tailed Worm-lizard (PTWL) (*Aprasia parapulchella*).

ASM has prepared a PTWL Management Plan (Version 2.3) and a PTWL Biodiversity Offset Management Plan both of which are appendices in the Biodiversity Management Plan (V2.0) which was approved by DPE on 8 February 2017. (see ASM website).

DP biodiversity monitoring is completed annually and is based on ecosystem diversity habitat value measurements adapted from the Biometric methodology.

Four vegetation community benchmarks and one control site were established around and neighbouring the project site in May 2016.

The Pink-tailed Worm-lizard Biodiversity Offset Managment Plan has been prepared with specific actions targeting habitat enhancement for this listed species.

One PTWL survey was conducted on 1 April 2020 by an ecologist, an assistant and two ASM staff under ideal PTWL survey conditions (fine and warm conditions after 33mm of rain fell over the preceding week).See Appendix A for survey results. No PTWL were found during the survey. However, four other species of reptiles. Reptiles were found under 9% of the tiles and invertebrates under 36% of the tiles.

Durign a vegetation survey in 2019 one PTWL was opportunistically sighted. It is a cryptic species.

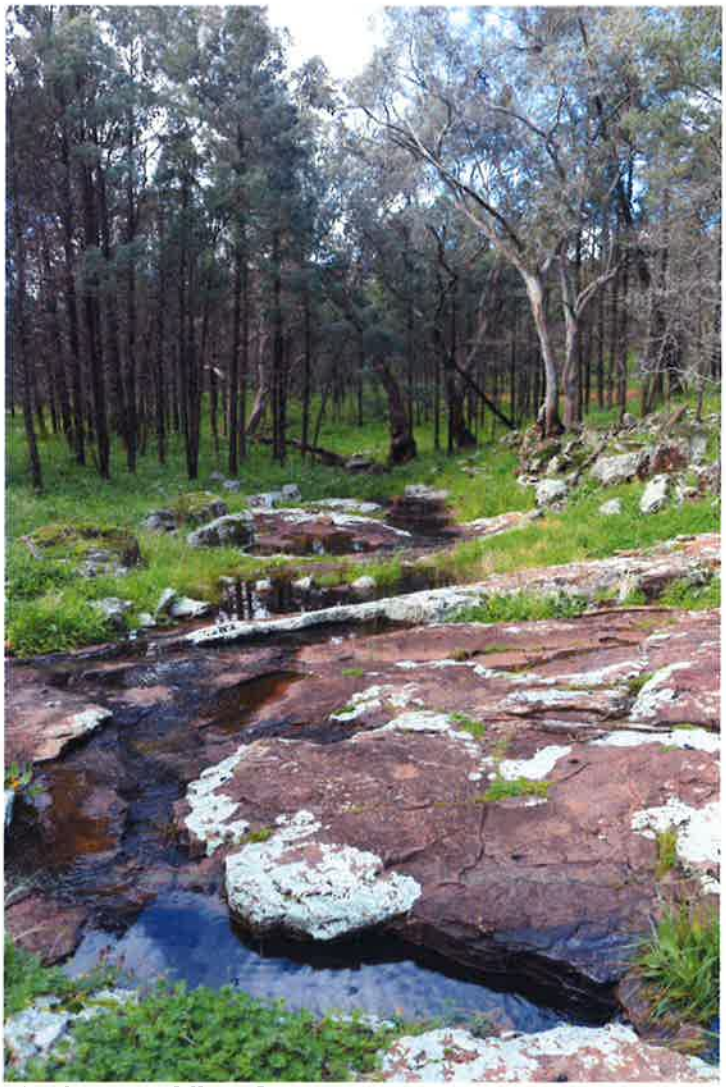
The survey method followed the accepted *Clearing Procedure: Pink-tailed Worm-lizard* issued by OzArk EHM in November 2013.

ASM settled on the last of the Dubbo Project property aquisitions in June 2016 which created the opportunity for a change in focus of land management to biodiversity enhancement. This is a significant change in focus after 150 years of management for agricultural production.

Regenerating white box (*Eucalyptus albens*) in Springs Offset. Photo taken 16 July 2020.

Remnant vegetation monitoring sites are recovering at varying rates, depending on grazing and cultivation history. Plague numbers of Eastern Grey Kangaroos have heavily impacted the BOAs in the winter spring of 2019. Kangaroos have been culled by a licenced contractor.

Dowd's Hill offset (18 months after livestock were removed). Photo taken 15 June 2018 (18 months before the drought started to break. Overgrazing by macropods removed almost all groundcover.



Drainage line in Shaley's Mountain Offset. Photo taken 16 August 2020 in the best season in 100 years.

The ability to turn off watering points (on farmland) and newly erected electric fencing will likely discourage kangaroo numbers continuing to build up in the BOAs during dry periods.

Kangaroos, feral pigs, foxes and cats have been the focus of pest control programs during this period.

5.2.2 Proposed Improvements

During the next reporting period;

- ASM will maintainfences around the biodiversity offset areas,
- Livestock will be excluded from BOAs to allow for natural regeneration,
- White Cypress Pine will be thinned to improve grass cover and reduce rainfall runoff,
- Introduced vetebrate pest (pig, fox, cat and rabbit) control will continue,

- Eastern Grey Kangaroo (*Macropus giganteus*) will be culled under licence to reduce grazing pressure in the BOAs and across agricultural land,
- Signage in strategic areas will be installed to restrict access to BOAs to authorised personnel only and
- Vegetation plots will be monitored in September 2020 which will likley provide baseline data on the effects of high rainfall (autumn -winter) on vegetation (ungrazed by livestock) that is being protected for its biodiversity value

It should be noted that there has been significant dieback of trees across the whole project site from 2017 to January 2020. Black and white cypress pine, hill oak and even red stringybark have died due to prolonged dry. With that dieback more sunlight is reaching the ground which has enabled growth of grasses and forbs as they have not done in a century. Thick stands of pine trees have groundcover up to 100cm where in normal season there would be very low and sparse cover. The photos below illustrate this fact.

Typical low level of groundcover in thick White Cypress Pine (Callitris glaucophylla). Photo taken 15 June 2018 in Dowd's Hill Offset.

Blue Crowsfoot (*Erodium crinitum*) and White Clover (*Trifolium repens*) groundcover under dead pines. Photo taken 16 August 2020 in Shaley's Mountain Offset.

Trig Offset 16 August with mauve of Notched Swainson Pea (*Swainsona monticola*) in flower. Note dieback of pines and Hill Oak (*Allocasuarina verticillata*). Photo taken 16 August 2020.

Red Stringybark (*Eucalyptus macrorhyncha*) exhibiting epicormic growth due to drought conditions. Some large trees on the slopes of Dowds Hill have died during the extreme drought 2017-2020.

5.3 Heritage

A Heritage Management Plan (HMP), which outlines measures to manage Aboriginal and Non-Aboriginal heritage sites at DP was approved by DPE on 8 February 2017.

The Farm Manager has use of a database to ensure that heritage sites outside of the project footprint and BOAs are not further disturbed by routine agricultural activities.

Additional sites outside the impact footprint have been identified and added to the heritage database.

With all existing or relocated sites adequately maintained, no active cultural heritage management occurred during the reporting period.

5.3.1 Management Measures

Management of the existing sites consisted of the Farm Manager and Stationhand familiarising themselves with the sites across the land controlled by Toongi Pastoral Company.

5.3.2 Proposed Improvements

RAPs will be invited to review heritage sites across the project at an agreed frequency once construction commences.

5.4 Meteorological Monitoring

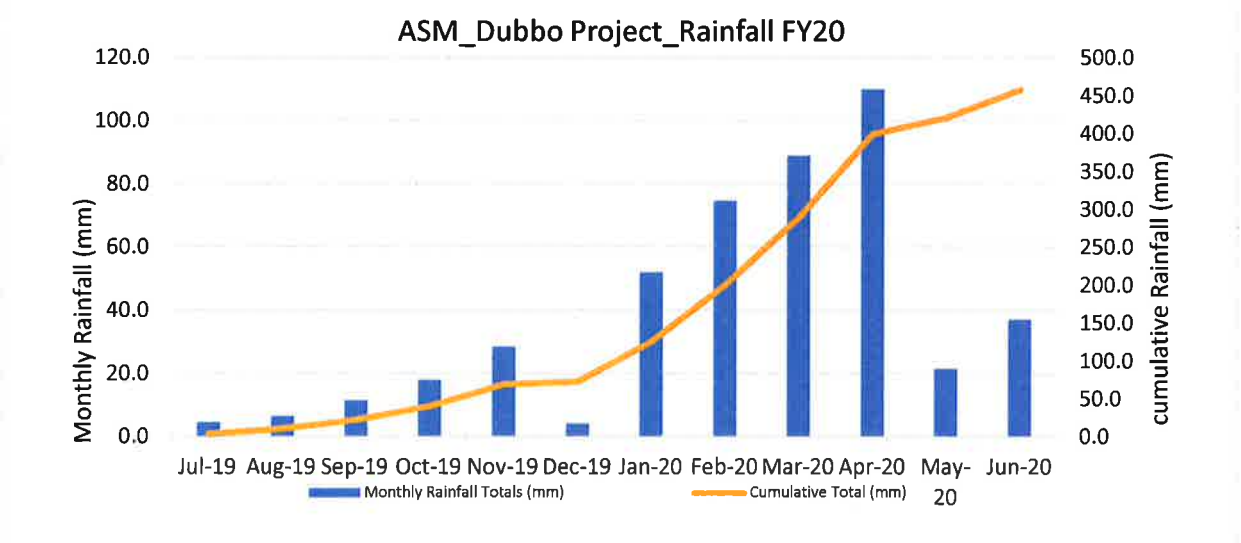
The met station at Wychitella has been operating since 2001.

Wind speed and direction, temperature and rainfall are collected. Monthly meteorological data is contained in **Appendix B**.

A total 458.9mm of rain fell over the reporting period which has seen prolonged drought conditions persist up until January 2020. A below average total of 393.4 mm rain fell in the preceeding twelve months.

Seasonal conditions at the time of writing this report are anecdotally the best in 100 years (pers comm Warwick Harper).

Figure 6: Monthly and cumulative rainfall on project site to 30 June 2020.



5.4.1 Proposed Improvements

In March 2017 ASM converted the weather station at Wychitella to a cloud based data storage system with real time access to data. There is a break in weather data for this reporting period though rainfall data is continuous from the Met Station or Grandale Homestead rain gauge.

The weather station will have an equipment upgrade before any construction activities commence on site. Maintenance was carried out on the met station in July 2020.

6. Water Management

The DP Water Management Plan (Version 2.1 dated 16 Oct 2016) was approved by DPE on 12 October 2016.

During the reporting period *Water Performance Measures* were included in the DP project approval, Condition 29 of Schedule 3 of SSD- requires ASM to comply with these measures. **Table 10** presents these *Water Performance Measures* and where each measure is addressed in this Water Management section.

As no construction has commenced on site the measures below have not yet been installed.

The NSW Soil Conservation Service have been consulted during the reporting period regarding the design and construction of erosion and sediment control structures for the site.

Redundant farm dams have been filled in and advice has been provided on restoration/rehydation of watercourse B.

Table 10. Water management performance measures

Feature	***Performance Measure***
Water Management – General	Minimise the use of clean water on site. Minimise the need for make-up water from external supplies.
Construction and operation of infrastructure	Design, install and maintain all infrastructure within 40 m of watercourses to: minimise the impact on watercourse water quality, hydrology and function; minimise the impact on the habitat of aquatic species, populations or communities, consistent with the *Guidelines for fish habitat conservation and management – Chapter 4* (DPI 2013), or its latest version; ensure pipelines across perennial watercourses are installed by directional drilling (under-boring) or attached to rail or road bridge crossings; and be in accordance with NOW's *Guidelines for Controlled Activities on Waterfront Land* (2012), or the latest version(s).
Macquarie River Pumping Station	Design, construct and operate the water intake structure to prevent to the greatest extent practicable the entrapment and/or extraction of aquatic fauna species including juvenile fish and larvae.
Mine Water Management System - General	Design, install and/or maintain mine water storage infrastructure to prevent the discharge of mine water off-site (this does not apply to sediment control structures that can be designed to discharge in accordance with an EPL). On-site storages are suitably designed, installed and/or maintained to minimise permeability.

Table 10. Water management performance measures

Feature	***Performance Measure***
	Maintain adequate freeboard at all times to minimise the risk of discharge to surface waters.
Waste Residue Storage Facilities and Salt Encapsulation Cells	Nil discharge from site. Design, construct and maintain: in accordance with the recommendations of the NSW Dam Safety Committee; to be stable over the long term and under all expected loading conditions; in accordance with the standards set out in the *Environmental Guidelines – Management of Tailings Storage Facilities* (VIC DPI, 2006); and to be lined with HDPE liners or equivalent that complies with a minimum permeability standard of < 1 x 10-9 m/s in accordance with the *NSW Environmental Guidelines for Solid Waste Landfills* (EPA, 1996), unless otherwise agreed with the EPA; and to ensure the Solid Residue Storage Facility and Salt Encapsulation Cells are double-lined and include an adequate leak detection system. Ensure that at all times a freeboard of at least 600 mm (or 1000 mm for liquid residue storage facility) or a freeboard capable of accommodating a 1 in 100-year ARI, 72-hour rainfall event (or 1 in 10,000 year for the liquid residue storage facility) without overtopping, whichever is greater.
Waste Rock Emplacement	Design, install and maintain the emplacement to encapsulate and prevent: migration of potentially acid forming material, and saline and sodic material; and/or manage long term saline groundwater seepage.
Clean water diversion & storage infrastructure	*Design, install and maintain the clean water diversion system to capture and convey the 100-year ARI flood around the perimeter of the site. Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site.
Flood mitigation measures	Design, install and maintain flood mitigation measures ensuring that the Processing Plant, Administration areas, Waste Residue Storage Facilities, Salt Encapsulation Cells and Waste Rock Emplacement are appropriately protected from flooding up to the 1 in 100 ARI. Residual impacts downstream must be managed in an appropriate manner.
Sediment control structures	Design, install and maintain erosion and sediment controls generally in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 1* and *Volume 2E Mines and Quarries*.

Table 10. Water management performance measures

Feature	Performance Measure
Chemical and hydrocarbon storage	Chemical and hydrocarbon products to be stored in covered, impervious bunded areas in accordance with the relevant Australian Standards.
Aquatic and riparian ecosystem	Maintain or improve baseline channel stability. Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and *Using the ANZECC Guidelines and Water Quality Objectives in NSW* procedures (DECC 2006), or its latest version

Note *: a diversion system around the project site is not possible nor feasible but clean and dirty water systems will be kept separate through engineering design.

6.1 Water Supply

The principal source of water for DP is the Macquarie River which is seven kilometres north of the processing plant. A pump station within an easement on Mia Mia will supply water via a buried poly pipeline to the plant.

A combination of High and General security Macquarie River water licences will provide the DP with processing water. This river water can be supplemented with temporary water (through seasonal purchase) and also with bore water from a licenced bore established on "Sweet Water" 600m northeast of the pump station.

The production bore was established on Sweet Water in October 2016 and was pump tested for seven days in February 2017. An application for a Works Approval has been made with NSW Office of Water and the allocation will be determined subject to minimising the impact on a potable well water supply on "Retford Park".

Maximum Harvestable Rights Dams Capacity (MHRDC) is the volume of water landholders are entitled to capture and use without need for licencing. The maximum capacity of rainfall/runoff captured on ASM-owned land is 223ML/yr.

Sediment or pollution control structures are exempt from the MHRDC consideration, unless the water captured is to be re-used on the site/property for non-environmental purposes.

An onsite water treatment plant will be used to produce potable water, eliminating the requirement to import potable water.

Table 11. Water Supply

Water Licences	Water sharing plan, source and management zone (as applicable)	Entitlement (ML)	Active pumping
WALs:19994, 9191, 3396, 36409, 3412	High Security Macquarie/Cudgegong	856	0
WAL30259	General Security Macquarie/Cudgegong	750	0
N/A	NSW Murray Darling Basin Fractured Rock *Aquifer*	Stock & domestic	Stock & domestic
N/A	Onsite dams, under harvestable rights	223	Stock & domestic
WAL 36791	Upper Macquarie Alluvial Groundwater Source	470	Nil

6.2 Water Balance

The site water balance was being reviewed during the reporting period in line with a proposed modification of the project.

The water balance indicates that DP will be dependent on a combination of river and bore water.

The project is designed for zero discharge of 'dirty water' which will kept separate from existing 'clean' water discharges from the ephemeral drainage lines that drain the Toongi Pastoral Comopany property.

6.3 Clean Water Management (Surface)

For reporting purposes, clean water management is divided into:

- onsite management;
- Wambangalang and Cockabroo Creeks; and
- offsite discharge.
-

6.3.1 Site Water

Clean water consists of through-flow from drainage of the undistrubed Dowd's Hill and water from onsite non-mine disturbed catchments. This water is diverted away from contamination sources (mine disturbance and infrastructure) and directed offsite. Management includes the construction of drains and bunds to collect and divert surface water flow past, or away from, mining disturbed catchments.

6.3.2 Surface Water Monitoring results

Baseline surface water monitoring was carried out on one occasion only (10 February 2020). February 2020 saw the first flows in Wambangalang and Paddy's Creeks since March 2019. The flows were terracotta in colour as was the Macquarie River through Dubbo owing to the soil erosion exacerbated by drought condions in trhe catchments. Large amounts of organic matter were flushed down the creeks and rivers as the drought started to break with thundertorm events.

Sample results indicate increasiong salinity levels in Wambanagalang and Paddys Creeks when flows diminish.

Results from the previous period are included for comparison with surface water sampling events on 4 & 9 Aug 2016, 5 &6 Sep 2016, 4 Oct 2016, 23 Nov 2016 and 14 Jul 2017.

Monitoring Results are contained in **Appendix D**.

It is expected that all of the baseline data collected to date will enable water quality trigger values for the project to be established in consultation with the EPA.

6.3.3 Discharge

No licenced discharges occurred during the reporting period.

6.4 Mine Water Management

This section does not apply as no construction has commenced.

6.5 Erosion and Sediment Control

This section does not apply as no construction has commenced.

6.6 Groundwater

Sampling and pump testing of the stock and domestic bores around and neighbouring the project site occurred in June 2016. These bores have been established for many years to supply stock and domestic water to several properties.

All DP groundwater bores (mostly in the fractured rock aquifers of the Lachlan Fold Belt) provide less than 2L/sec of stock quality drinking water.
Springs in the Springs Offset and Mine South Offset re-commenced flowing in winter 2020 after two years of no flow.

Table 12. Stock and dometic bore depth and yield

Sample Reference	Bore Name	Location	Total Depth	L/sec	LPM	SWL
GW-001	Ugothery	Shed	67.24	0.37	21.9	11.05
GW-002	Grandale	West Bore	28.31	0.30	18.1	13.24
GW-003	Toongi Valley 2	Shearing Shed	36.96	0.91	54.6	8.95
GW-004	Wychitella	House	47.33	1.53	91.8	5.4
GW-005	Pacific Hill 1	Shed	48.55	1.40	84.1	18.52
GW-006	Karingle 2	Lane West of House	38.98	1.41	84.6	13.3
GW-007	Toongi Valley 3	Spring	12.86	1.64	98.3	2.61
GW-008	Karingle 1	House	39.66	1.32	79	16.29
GW-009	Toongi Village	Well	15.4	1.43	85.6	7.32

Seven geotech bores/piezometres (installed September 2014) were dipped for water levels on 7 September 2017, 11 September 2018, 21 August 2019 and 30 July 2020. The drought conditions over the reporting period has seen the local water table fall in all three wet piezos up to 3.69m over 24 months. Four of seven piezos are currently dry.

Table 13. Geotech bores in the DP footprint

Bore	Piezo Depth	Wet /Dry	Depth to SWL (m) Sep 2017	Depth to SWL (m) Sep 2018	Depth to SWL (m) Aug 2019	Depth to SWL (m) Jul 2020	Reference Point (m above ground level)
C	13.06	Dry	Dry	Dry	Dry	Dry	N/A
S	15.72	Wet	10.73	12.86	14.42	14.8	0.75
W	15.27	Wet	15.24	15.26	Mud	Dry	0.7
E	14.95	Wet	Dry	Moist	Dry	Dry	0.9
Q	15.66	Wet	11.61	12.00	12.34	12.8	0.85
I	16.3	Dry	Dry	N/A	Dry	Dry	N/A
Y	11.6	Wet	8.93	9.45	9.8	9.7	0.9

6.7 Proposed Water Management Improvements

No improvements are proposed to groundwater management at DP in the next reporting period.

7. Rehabilitation

The Dubbo Project has not yet commenced construction.

7.1 Rehabilitation during reporting period

No rehabilitated activities were completed during the reporting period.

7.2 Post Rehabilitation Land use

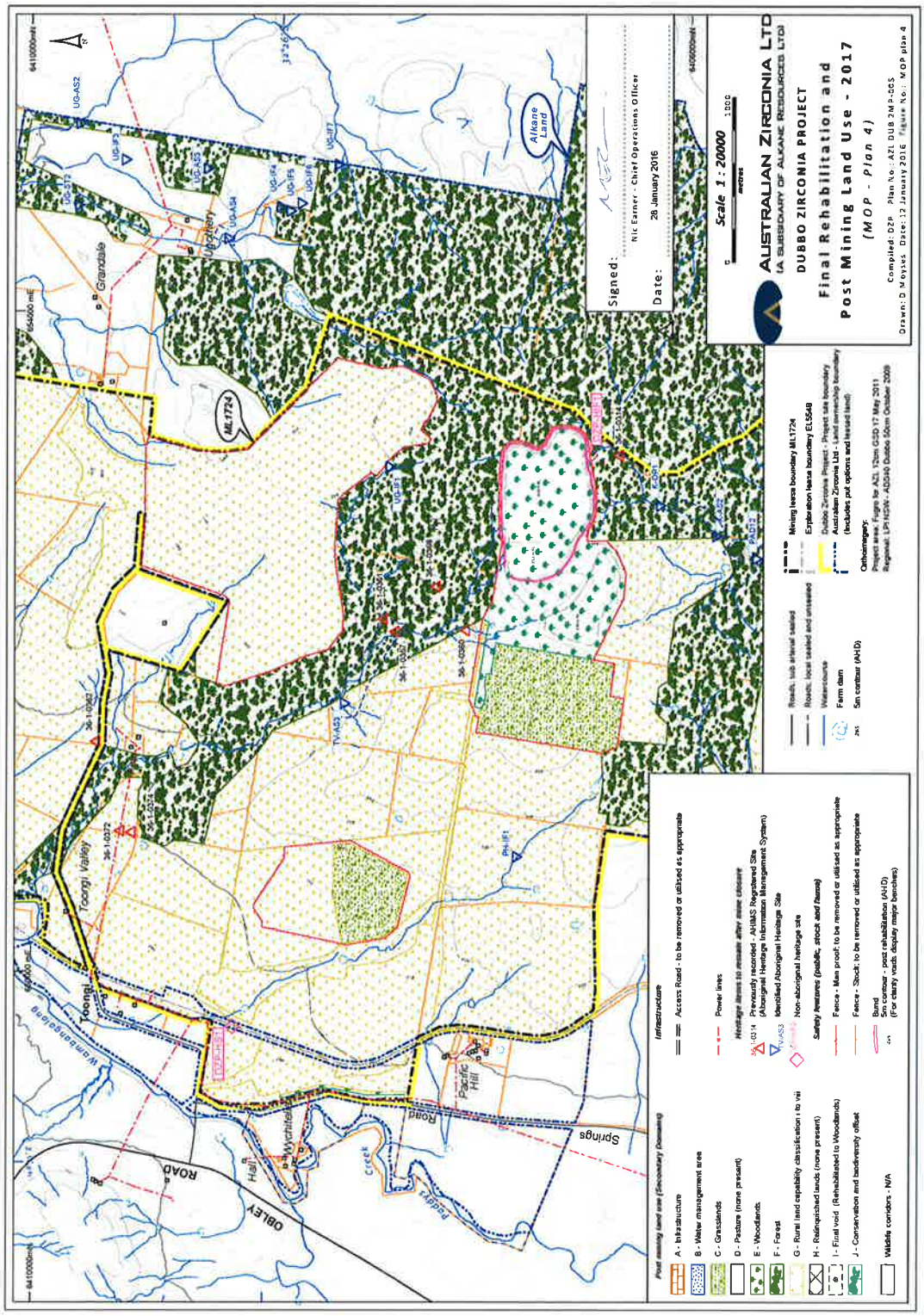
These post-rehabilitation land use objectives and targets are contained in the draft 2015-2017 MOP. The MOP has not yet been approved by DRG.

Table 14: Rehabilitation and BOS Objectives and Targets

Category	Objective		Target(s)
	Rehabilitation	**BOA**	
Ecosystem Development (Final Land Use)	Protect, enhance and extend areas of remnant native vegetation.		Secure the BOA under PVP or equivalent mechanism.
	Maintain habitats on the final landform which encourage colonisation by native flora and fauna with specific niche requirements.		Species diversity and density of rehabilitated landforms equivalent to analogue sites established within the BOA.
	Extend, improve, protect and link areas of remnant native vegetation.		Secure the BOA under PVP or equivalent mechanism. Prepare and implement a Biodiversity Management Plan (BMP).
	Retain areas on the DP Site amenable to future agricultural or industrial activities.	-	Agricultural productivity of land equivalent to pre-mining landforms.
Post-Mining Land Use	Maximise positive and minimise adverse socio-economic outcomes following mine closure.	-	Consult with the community and government agencies in relation to the post-mining land use. Rehabilitate the Mine in accordance with **Plan 4**, unless otherwise agreed.

Table 14: Rehabilitation and BOS Objectives and Targets			
Category	**Objective**		**Target(s)**
	Rehabilitation	**BOA**	
	Provide rehabilitated woodland communities which adjoin the established Biodiversity Offset Area to maximise the wildlife corridors created within the local setting.	Undertake habitat augmentation to improve and promote corridors for fauna movement linking adjacent remnant woodland vegetation with the rehabilitation of the Mine.	Establish woodland vegetation over the landform equivalent to local analogues of that community. Visual identification of wildlife corridors within the largely agricultural setting. Conserve under a Conservation PVP 1021ha of remnant native vegetation in accordance with a Biodiversity Offset Strategy.
	Integrate areas of biodiversity enhancement and conservation with agriculture.		Undertake agricultural activities on the Mine Site, including within the BOA in accordance with a PVP and BMP.
Other	Allow for the relinquishment of the Mining Lease and the return of the security lodged over the Mining Lease within a reasonable time after the end of the mine life.		50% within 5 years of final rehabilitation. 100% within 10 years of final rehabilitation.

Figure 7: MOP Plan 4 showing proposed final land uses at DZP



7.3 Trials, Monitoring and Research

No trials nor monitoring of rehab was undertaken during this period. During the 2017 reporting period, four benchmark vegetation communities benchmarks were identified and described by OzArk as a goal against which to measure rehabilitation success.

7.4 Key rehabilitation risks

A key rehabilitation risk in the next reporting period will be weather related. Stripping and handling topsoil resources should ideally be performed when soils are not too wet nor too dry.

7.5 Actions for next reporting period

Topsoil stripping and stockpiling will take place during the next reporting period only if construction has commenced. Trials will examine productive pasture establishment techniques on the soil stockpiles. It is intended to establish productive perennial pastures on the soil stockpiles and include those stockpiles as a resource to be opportunely grazed by livestock.

The soil stockpiles will be managed for their long term soil health to ensure they are a suitable medium for the final landform rehabilitation in 20+ years time.

Toongi Pastoral Compnay will register the farm (surrounding the mine site) as a Commonwealth carbon project with the aim of sequestering carbon in the farms soils. A preliminary assessment has been undertaken and the baseline soil sampling will be conducted during this reporting period.

8. Community

8.1 Consultation

The key strategy to ensure an effective passage of information between ASM and the surrounding community is the Community Consultative Committee (CCC). The CCC is an independently chaired member committee representing DP, the local community and the Aboriginal community. During the reporting period, the CCC met during the period only once - on 2 December 2019.

The scheduled November meeting was postponed as DPIE was revising the operations of the CCCs and had called the Chairs to Syndey for meeting.

The scheduled March meeting was cancelled due to lack of new information on the project.

A Dubbo Proejct Community Update (newsletter) was published in April 2020 introducing David Woodall as the Managing Director of ASM. The demerger was explained as was progress of the metallisation technology that ASM holds in a joint venture with Ziron Tech in South Korea.

Emails were circultated regarding the proposed demerger of Australian Strategic Materials from parent company Alkane Resources and it was agreed to hold the next meeting once ASM was successfully demerged on 29 July 2020.

A representative from Dubbo Local Aboriginal Lands Council was appointed to the Committee by DPE on 26 April 2019 but has since resigned.

As soon as some significant change in the project status eventuates, the CCC will be reactivated as the project moves towards the construction phase.

At CCC meetings, typically held quarterly, members are updated by ASM personnel on the progress of current and proposed mining operations and projects. Community representatives are given the opportunity to raise concerns regarding the project and to offer advice regarding consultation with the community. CCC meeting minutes are available via the ASM website (www.asm-au.com).

In addition to the CCC, ASM utilised a number of methods of communication/consultation with the community during the reporting period, including:

- Making relevant information regarding mine approvals, operations and environmental monitoring available to the public on the Alkane Resources website;
- Distributing a community newsletter, to provide the Dubbo-Toongi community and any other interested parties with information on the DP development;
- Attending vocational and tertiary information days at schools;
- Presentations to interest groups (Rotary, DIIS, university excursions, schools career expos);
- Providing a 24-hour community information; and
- Sending issue-specific letters to members of the public in response to queries regarding the project.

These methods of community consultation will continue during the next reporting period.

8.2 Support

Over the life of the development, ASM has committed to a Voluntary Planning Agreement with Dubbo Regional Council to contribute annually:

- $300 000 to the maintenance of Obley/Toongi Road
- $42,000 Roads Contributions (to and from work)
- $42,000 Roads Contributions (other direct vehicle trips for employees) and
- $230, 000 for Boundary Road (Keswick Parkway South to Sheraton Road).

CPI adjustment to apply after year one. VPA contributions to commence on 1 January or 1 July following commencement of Obley/Toongi Road upgrade.

8.3 Complaints and enquiries

ASM manage complaints in accordance with the protocols and procedures contained in the EMS. During the reporting period no complaints were received.

ASM staff will respond to all complainants and conduct investigations into specific concerns. Investigation outcomes consisting of corrective action, where required, and follow-up communication with the complainant will be actioned

A register of complaints and enquiries received from the commuinity is maintained by ASM. A modified version of this register (excluding personal details of complainants) is published on the Alkane Resources website.

No complaints have been received to date.

9. Independent Environmental Audit

As per Schedule 5 conditions 9 and 10 of the consent condions:

1. Within one year of commencing development under this consent, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
   (b) include consultation with the relevant agencies;
   (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any relevant EPL or Mining Lease (including any assessment, plan or program required under these approvals);
   (d) review the adequacy of strategies, plans or programs required under the abovementioned approvals; and
   (e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned approvals.

   Note: This audit team must be led by a suitably qualified auditor and include experts in water resource management, ecology, transport and road design and hazardous materials management and any other field specified by the Secretary.

2. Within 6 weeks of the completion of this audit, unless the Secretary agrees otherwise, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report. If the Applicant intends to defer the implementation of a recommendation, reasons must be documented.

As construction has not yet commenced, this condition has not yet been triggered.

10. Incidents and non-compliances during reporting period

This section provides further detail on the incidents and non-compliances reported in Section 1 as well as any other official regulatory interaction that occurred during the reporting period.

10.1 Official Regulatory Interaction

No reportable incidents or warning letters, penalty notices or prosecution proceedings by any regulatory agency were received during the reporting period.

Correspondence from DPIE is contained in **Appendix E**.

11. Activities to be completed in next reporting period

Environmental activities and initiatives to be implemented in the next reporting period (assuming constrcution has commenced) will focus on reduction of offsite impacts such as noise and dust, fencing, management and monitoring of biodiversity offset areas, finalising the final landform plans, and commencing rehabilitation of soil stockpiles and erosion and sediment control structures. Details on these activities are shown in **Table 15**.

Table 15: Activities proposed for 2019-2020

Proposed Activities	**Location**	**Proposed Completion Date**
Fauna monitoring	DZP site and offset areas	Ongoing
Control of noxious weeds	DZP site and offset areas	Ongoing
Eastern Grey Kangaroo culling	TPC and BOA	Ongoing
Feral animal control	TPC & BOA	Ongoing
Fence maintenance in accordance with the Biodiversity Offset Management Plan and PVP	Offset areas	Ongoing
Design restoration works drainage line B in the BOA for stream bed rehabilitation	Biodiversity and rehabilitation areas	June 2021
Pink-tailed Worm Lizard Survey	PTWL Offset areas	Spring 2020
Continue weed management and rubbish removal	Biodiversity offset areas	Ongoing

APPENDIX A - Pink-tailed Worm-lizard Monitoring Report 1 April 2020 - Area Enviornmental Consultants & Communication (AREA 2020);

Australian Strategic Materials, Dubbo Project

Pink-tailed Worm-lizard Monitoring Report

Dubbo Regional LGA NSW

July 2020

Australian Strategic Materials

IMAGE: Pink-tailed Worm-lizard monitoring DP 2020

AREA
ENVIRONMENTAL CONSULTANTS & COMMUNICATION

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ABN:29 616 529 867
Advanced Regional Environmental Assessments (AREA)

- ✓ Environmental impact assessment and approvals
- ✓ High level preliminary environmental assessment (PEA)
- ✓ Review of environmental factors (REF)
- ✓ Peer review
- ✓ Community engagement
- ✓ Biodiversity offsetting and assessments
- ✓ Heritage assessments and community walkovers
- ✓ Landscape design

AREA Environmental Consultants & Communication acknowledge Traditional Owners of the country on which we work

Table of Contents

1 Introduction 4

2 PTWL Monitoring 6

2.1 Background 6

2.2 Methods 6

3 Weather 8

3.1 Preceding weather conditions 8

3.2 Weather conditions on day of monitoring 11

4 Soil Parameters 12

4.1 Soil type and geology 12

4.2 Soil Temperature 12

4.3 Moisture 12

4.4 Sun Exposure 13

5 Flora 14

6 Fauna 16

6.1 Ants 16

6.2 Other invertebrates 16

6.3 Reptiles and other vertebrates 16

7 Pink-tail Worm-lizard signs 17

8 Issues and Suggestions for future monitoring efforts 18

8.1 Climate considerations 18

8.2 Artificial habitat considerations 18

8.3 Native vegetation habitat 19

9 Conclusions 20

10 References 21

Appendix A – Field Data 22

FIGURES

Figure 1-1: PTWL monitoring and detection locations 5
Figure 4-1: Air and soil temperature recorded at each tile location 12

TABLES

Table 3-1: Dubbo Airport weather station rainfall statistics 9
Table 3-2: Dubbo Airport weather station daily weather observations March 2020 10

1 Introduction

Pink-tailed Worm-lizard (PTWL) *Aprasia parapulchella* and tile (artificial habitat) monitoring was carried out on 1 April 2020. The monitoring team included Phil Cameron and Alex Cameron from AREA Environmental Consultants & Communication, Mike Sutherland (Alkane Resources NSW Manager), and Fergus Job (Alkane Resources Farm Manager).

No PTWL were sited during monitoring in April 2020.

This monitoring program is underpinned and implemented in accordance with the PTWL Plan of Management (Ozark 2016). The Dubbo Project (DP), operated Australian Strategic Materials and it continues to oversee PWTL the monitoring program.

Monitoring of the PWTL is scheduled to occur towards the end of Spring and Autumn each year. In Spring and Autumn 2019 monitoring was not conducted due to a severe drought (unfavourable rainfall and temperatures during the preceding seasons). During this time, the region experienced one of its hottest and driest periods on record. However early 2020 saw the region receive increased rainfall.

The April 2020 monitoring event was timed to fall in the week following good rainfall to increase the likelihood of PTWL detection.

This monitoring even involved checking and data collection from seven tile locations; Glen Idol, Ugothery North, Ugothery East Lower, Ugothery East Upper, Ugothery Dowds Hill, Grandale and Ugothery Dam Site.

During a vegetation survey of DP in November 2019 (early in the morning) AREA Principal Ecologist Phil Cameron did sight a PWTL individual under a naturally occurring rock outside the monitoring locations but within the southern extent of the BOA area. Figure 1 shows the locations of monitoring 2020 and PTWL location 2019.

Figure 1-1:PTWL monitoring and detection locations

2 PTWL Monitoring

2.1 Background

Monitoring of PTWL is challenging due to its cryptic nature. The PTWL can be found throughout the year by searching under rocks, however, it appears to be more difficult to detect during hot dry periods (Osborne et al. 1991). If conditions are too hot or too cold the PTWL is likely to below the ground surface taking refuge in ant burrows beneath rocks. Peak activity is likely to be late spring and early summer under warm, but not overly dry, conditions. It is not active on the ground surface by day and would only be active between sheltering sites at night.

Weather conditions, and the natural boom/bust population dynamics of the species plays a role in detection of the PTWL. When prevailing conditions are too hot and dry detection rates are low. Furthermore, the noted window of opportunity for species detection is also limited to seasonal overlap periods of March and October / November. Given the constraints on detection posed by these factors, a true reflection of population density and distribution will be provided when monitoring occurs when favourable climatic conditions (preceding inundating rains and mild temperatures) overlap with the known periods of detection.

2.2 Methods

The survey method follows the accepted Clearing Procedure: Pink-tailed Worm Lizard issued by OzArk (2013). This involves 'flipping' either natural rocks or artificial habitat (roof tiles) to ascertain what lies beneath. Data collected includes presence and abundance of the PTWL, food sources and other indicator species such as skinks, soil temperature and moisture and rock/tile temperature. Ambient weather conditions are also recorded.

The timing, frequency, number and location of monitoring is ideally twice per year (autumn and spring). However, climatic conditions are a limiting factor. Timing of the survey needs to be flexible to ensure that appropriate weather conditions exist.

During monitoring on 1 April 2020, targeted search was undertaken on the artificial habitat, where the tile is flipped, and parameters below recorded.

The existing roof tile monitoring programme was commenced in 2013. Annual roof tile monitoring occurs where ten sets (where a 'set' is one individual tile and a group of four joined tiles) are inspected. These artificial habitats are used to increase habitat options of PTWL. These locations are named as follows:

- Grandale
- Dowds Hill
- Ugothery North
- Ugothery East Upper
- Ugothery East Lower
- Ugothery Dam Site

- Glen Idol

The following survey methodology was implemented.

- Locate tiles and record ambient climatic conditions parameters
- Overturn rock/tile and look for presence/absence of PTWL. Record parameters listed below. Take photographs where possible.
    - Date and time of assessment.
    - Air and soil temperature.
    - Presence of ant nests / burrows or other insects (type / abundance).
    - Other reptiles (species / abundance).
    - Comments.

3 Weather

3.1 Preceding weather conditions

The nearest weather monitoring station recorded on the Bureau of Meteorology (BoM) website is at Dubbo Airport which lies about 25 kilometres north of DP location (Toongi).

Average annual rainfall for Dubbo is 552.8 millimetres (Bureau of Meteorology, 2020). Twelve-month rainfall for Dubbo in 2019, the year prior to this monitoring was 211.2 millimetres, which was the lowest annual rainfall on record. Average annual rainfall for 2018 was also well below average at 311.6 millimetres.

This monitoring event was undertaken following a time of extreme drought in the three previous years.

By comparison, the last 'boom' event recorded by monitoring in 2012 and 2013, where 30 PTWLs (in total) were recorded under naturally occurring rock followed years of higher than average rainfall of 577.2 millimetres in 2011 and 608.6 millimetres recorded in 2012.

Table 3.1 below shows Dubbo Airport weather station rainfall statistics from the BoM website, highlights show the relevant records discussed above.

January 2020 received below average rainfall, but February and March 2020 were above average, hence PTWL monitoring was undertaken in the following April.

Table 3.2 shows the daily weather observations for March 2020, with good rainfall (highlighted yellow) in the week prior to monitoring to increase the likelihood of PTWL detection.

Table 3-1: Dubbo Airport weather station rainfall statistics (BoM)

(Lat: 32.22° S; Lon: 148.58° E; Elevation: 284m)

Bureau Home > Climate > Climate Data Online > Monthly Rainfall

Monthly rainfall

Dubbo Airport AWS

About this page

All years of data PDF

The Monthly rainfall is the total of all available Daily rainfall for the month. Observations of Daily rainfall are nominally made at 9 am local clock time and record the total for the previous 24 hours. Rainfall includes all forms of precipitation that reach the ground, such as rain, drizzle, hail and snow. About monthly rainfall

Station: Dubbo Airport AWS | Number: 65070 | Opened: 1946 | Now: Open | Lat: 32.22° S | Lon: 148.58° E | Elevation: 284 m | Details

No highlight

Key: Units are millimetres. 12.3 = Not quality controlled.

Period for calculating statistics: All years | 1961-1990

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Graph													
1994						4.0	51.0	15.0	8.8	20.0	46.8	20.2	
1995	191.0	7.0		0.6	102.2	13.0	31.2	0.4	32.0	24.4	94.8	58.0	
1996	97.2	30.2	20.6	0.2	74.2								
1997						17.2	23.2	13.8	78.2	30.8	11.4	37.2	
1998	48.0	31.0	10.0	84.4	75.4	82.4	138.0	151.6	111.6	46.4	66.6	5.6	851.0
1999	7.4	9.0	142.2	38.6	8.6	36.6	45.0	75.6	40.2	109.2	68.8	77.2	658.4
2000	35.0	23.6	173.8	105.8	86.8	18.4	28.4	29.4	11.6	77.4	181.8	35.0	809.0
2001	60.2	14.6	77.8	44.6	43.4	59.4	92.0	19.6	31.0	69.0	74.4	25.0	611.2
2002	13.2	218.2	27.0	17.4	17.2	14.6	4.0	2.8	42.8	3.0	0.0	21.6	381.8
2003	41.2	77.4	18.8	60.0	4.2	32.2	37.0	115.4	8.6	67.0	35.8	26.2	543.8
2004	23.6	45.6	13.2	22.0	46.8	44.4	38.2	30.4	10.2	30.6	79.4	65.0	469.4
2005	36.0	25.6	15.0	9.6	5.0	91.0	29.4	18.8	81.8	112.0	92.6	15.2	532.0
2006	37.4	29.0	24.0	10.8	0.6	35.0	39.2	14.4	9.2	1.2	10.6	17.2	228.6
2007	11.6	24.6	48.2	26.6	61.6	122.0	11.2	20.2	0.6	2.6	67.4	169.4	366.0
2008	153.2	43.2	27.4	1.4	7.2	32.0	31.0	33.6	63.8	58.6	110.0	49.2	610.6
2009	3.8	59.0	16.2	57.2	10.0	67.4	25.0	10.0	35.2	54.0	12.8	188.8	539.4
2010	25.6		69.6	62.2	54.6	34.2	64.4	58.4	51.8	54.0	144.0	167.6	
2011	8.6	37.8	49.4	28.4	60.0	11.2	8.4	59.8	81.8	55.4	101.6	74.8	577.2
2012	98.0	118.0	125.0	1.6	85.4	41.6	44.6	9.8	31.6	9.4	38.2	5.4	608.6
2013	63.4	27.8	60.8	0.4	27.0	126.0	23.2	5.4	63.2	5.2	3.0	47.6	493.0
2014	49.8	50.8	142.4	37.8	26.8	31.6	35.6	15.4	15.6	11.6	11.2	77.0	371.6
2015	130.6	31.6	8.4	61.8	47.8	72.2	60.2	39.4	6.8	46.4	66.6	59.6	631.6
2016	122.8	3.2	16.2	25.0	55.4	151.6	105.2	50.4	157.8	56.2	34.0	138.6	916.4
2017	14.8	1.6	223.0	9.4	5.2	9.2	3.0	20.6	5.0	84.6	34.8	54.2	465.4
2018	28.6	2.4	4.0	6.8	13.0	18.6	1.6	36.4	6.8	90.4	68.6	34.4	311.6
2019	64.4	18.4	46.6	0.0	23.4	10.4	6.4	6.8	11.0	1.6	19.4	2.6	211.2
2020	36.0	81.8	145.0		28.8	32.6							

Summary statistics for all years

Information about climate statistics

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	58.1	42.2	63.5	31.4	38.8	48.3	39.9	34.1	41.5	45.6	50.0	58.9	552.8
Lowest	3.8	1.6	4.0	0.0	0.6	4.0	1.6	0.4	0.6	1.2	0.0	2.6	211.2
5th %ile	7.6	2.5	8.6	0.2	4.4	9.5	3.2	3.3	5.4	1.8	4.5	5.4	228.6
10th %ile	9.8	4.3	11.0	0.5	5.1	10.8	5.0	6.0	6.8	2.8	10.8	9.4	311.6
Median	37.4	29.6	37.1	23.5	28.8	35.8	31.2	20.2	31.6	50.6	66.6	47.6	566.0
90th %ile	127.5	80.5	144.2	75.8	81.4	106.5	81.0	69.3	82.6	88.1	108.6	156.0	809.0
95th %ile	148.7	112.6	169.5	84.0	86.5	125.0	102.6	107.4	105.0	105.4	137.2	169.0	851.0
Highest	191.0	218.2	223.0	105.8	102.2	151.6	138.0	151.6	157.8	112.0	181.8	188.8	916.4

Table 3-2: Dubbo Airport weather station daily weather observations March 2020 (BoM)

Dubbo, New South Wales
March 2020 Daily Weather Observations

Date	Day	Temps Min °C	Temps Max °C	Rain mm	Evap mm	Sun hours	Max wind gust Dir	Max wind gust Spd km/h	Max wind gust Time local	9 am Temp °C	9 am RH %	9 am Cld 8ths	9 am Dir	9 am Spd km/h	9 am MSLP hPa	3 pm Temp °C	3 pm RH %	3 pm Cld 8ths	3 pm Dir	3 pm Spd km/h	3 pm MSLP hPa
1	Su	18.4	34.5	0			NW	41	13:53	22.8	72		ENE	17	1013.2	33.3	15		NW	24	1010.5
2	Mo	15.3	34.2	0			NW	39	10:27	24.2	58		NE	7	1011.1	33.5	24		W	19	1010.4
3	Tu	21.8	24.6	0			E	43	22:51	22.8	71	8	ENE	20	1015.6	21.7	83	8	ENE	20	1015.8
4	We	19.0	28.2	3.6			E	48	02:43	19.2	93	8	E	15	1016.0	25.8	66	8	E	26	1011.8
5	Th	19.2	20.7	13.8			ENE	44	09:05	19.5	97	8	ENE	17	1008.0	18.9	97	8	ENE	24	1003.5
6	Fr	18.8	26.2	51.4			SW	35	16:32	19.9	85	3	SW	20	1011.0	25.2	61	7	SW	22	1011.3
7	Sa	15.6	27.6	0			E	35	22:19	20.0	77		SE	13	1016.7	26.9	51	2	E	17	1015.3
8	Su	16.5	26.9	0			ENE	48	08:46	19.4	70		E	28	1018.0	25.9	49	2	E	15	1014.9
9	Mo	16.1	25.2	0			ENE	41	08:59	18.0	76	2	E	26	1018.1	24.1	56		E	24	1015.9
10	Tu	15.1	26.0	0			E	41	08:49	18.9	66		ESE	22	1019.6	24.5	50	5	SE	19	1017.1
11	We	14.1	27.1	0			E	39	23:30	18.8	69		ESE	19	1021.1	25.6	38	1	ESE	19	1019.2
12	Th	14.3	26.9	0			E	39	09:52	18.9	72	1	ESE	24	1022.9	26.5	42	6	NE	20	1019.9
13	Fr	12.9	26.4	0			E	37	00:34	18.3	67		E	20	1019.5	25.9	34		SSW	13	1015.5
14	Sa	13.1	27.4	0			E	44	22:32	18.9	59		SSE	6	1013.4	19.3	78	7	ENE	13	1012.4
15	Su	11.6	23.9	17.4			ESE	50	15:10	15.9	67		ESE	26	1018.8	23.1	49	4	E	24	1017.5
16	Mo	11.2	25.5	0			E	43	10:54	16.3	73		SE	20	1022.7	23.6	46	5	ESE	24	1021.3
17	Tu	11.6	25.9	0			ENE	41	10:47	16.3	72		SE	17	1026.0	25.2	39	1	ENE	17	1023.3
18	We	12.0	27.2	0			E	41	01:10	17.6	81		E	20	1026.4	26.0	34		NW	6	1022.9
19	Th	11.2	30.6	0			NW	22	11:51	17.6	75		ESE	9	1024.2	29.1	30		NNE	6	1021.0
20	Fr	13.5	32.6	0			NW	41	14:04	20.2	63		ENE	4	1019.3	31.7	28		WSW	24	1015.9
21	Sa	11.3	29.8	0			SSE	26	09:43	18.7	57		SE	13	1019.2	27.7	30		SW	7	1017.6
22	Su	11.3	28.5	0			SW	43	14:18	17.8	58		SE	9	1020.0	27.8	22	3	SW	24	1018.1
23	Mo	12.4	26.7	0			E	44	09:42	17.2	61		SSE	20	1021.8	26.3	43		ESE	19	1019.4
24	Tu	15.9	28.3	0			E	44	23:29	18.0	73	8	E	28	1021.5	26.6	51	2	N	6	1018.1
25	We	16.7	21.7	0			SE	35	17:43	19.0	79	3	E	9	1018.8	19.6	90	8	ESE	9	1016.9
26	Th	16.1	22.1	37.0			E	46	10:45	18.4	94	8	SE	13	1021.8	21.3	65	8	ESE	26	1021.5
27	Fr	13.7	24.4	0			E	46	09:09	18.1	80	6	E	24	1023.8	23.5	56	1	ENE	30	1021.5
28	Sa	13.1	25.0	0			E	39	08:41	16.7	73	2	E	19	1022.8	24.2	47		SE	11	1019.3
29	Su	15.8	28.4	0			E	33	23:10	19.0	82		E	20	1018.9	27.9	49	7	NNW	20	1015.3
30	Mo	16.8	22.8	14.8			S	48	02:53	16.8	97	8	ENE	17	1016.3	19.8	91	8	ENE	11	1014.1
31	Tu	15.6	27.4	7.0			W	28	15:58	17.1		7	NE	9	1017.3	24.9	61	8	SE	9	1015.5
Statistics for March 2020																					
	Mean	14.8	26.9							18.7	73	5		17	1018.8	25.3	50	5		17	1016.5
	Lowest	11.2	20.7	0						15.9	57	1	ENE	4	1008.0	18.9	15	1	#	6	1003.5
	Highest	21.8	34.5	51.4			ESE	50		24.2	97	8	E	28	1026.4	33.5	97	8	ENE	30	1023.3
	Total			145.0																	

IDCJDW2041.202003 Prepared at 13:00 UTC on Wednesday 17 June 2020

3.2 Weather conditions on day of monitoring

Weather was warm and sunny, see picture below. Daily maximum temperature during the monitoring event at Dubbo Airport which lies about 25 kilometres north of DP location (Toongi) was 27.6ºCelcius (BoM, 2020).

Highest air temperature recorded in the field was 31.4ºC.

Air temperature was recorded at each tile set and is compared with soil temperature under each tile set in Section 4.

View northwest from DP showing clear, warm sunny weather. Photo taken 1 April 2020.

4 Soil Parameters

4.1 Soil type and geology

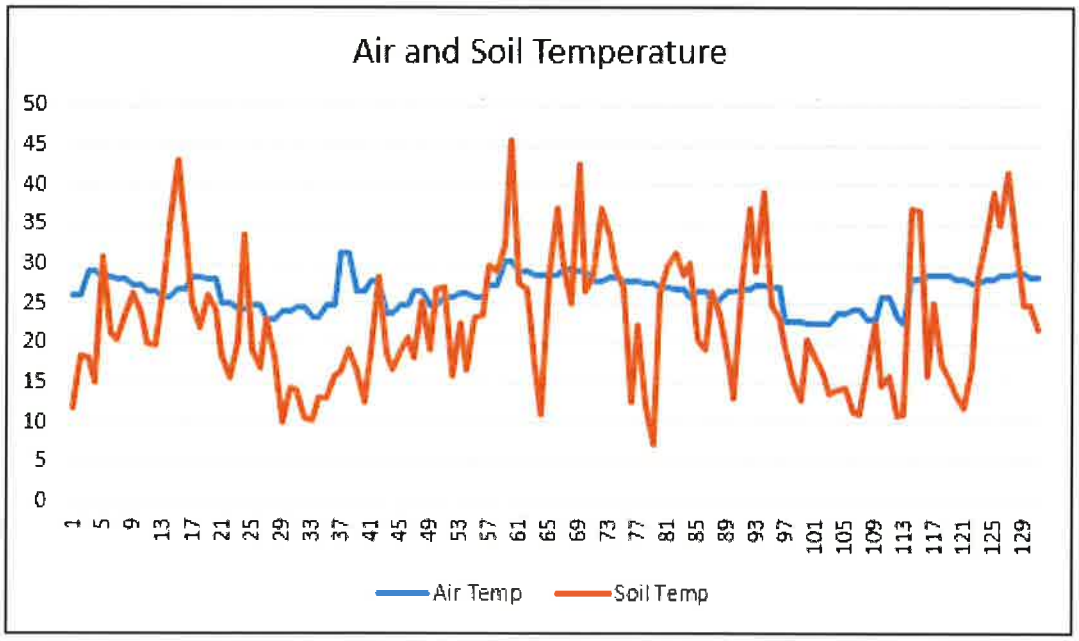
No further data was collected in this area. Soil type and underlying geology have previously been determined. Soil and geology data may be refined through investigation during future monitoring events to further ascertain more information in the link between these factors and PTWL habitat selection.

4.2 Soil Temperature

Air temperature was recorded at each tile set as well as the temperature on the surface of the soil, under each set of tiles.

Monitoring took place between 10am to 3pm when the ambient temperature was between 20°Celcius and 35°Celcius which increases likelihood of detection (P. Cameron pers comms.). Air temperature was relatively stable, however soil temperature beneath the tiles varied greatly from 7.3 to 45.6°Celcius, see Figure 4.1 below.

Figure 4-1: Air and soil temperature recorded at each tile location



This extreme variation in soil temperature indicates that the tiles may only provide short windows of habitat suitability for PTWL – they heat quicker and cool quicker than natural rock.

4.3 Moisture

Moisture was assessed by visual inspection only. The preceding month of this monitoring event, March 2020 received an above average monthly rainfall of 145mm, a total of which 21.8mm fell in the two days preceding 1st April 2020. Most of the tiles were damp underneath

when lifted, 15 out of a total 140 tile locations would have been considered wet. No frogs were detected (three Desert Tree Frogs *Litoria rubella* were detected in 2018).

4.4 Sun Exposure

The amount of sun on the tile/tile group at the time of checking was not recorded. Monitoring took place between 10am to 3pm when the ambient temperature was between 20°Celcius and 35°Celcius which increases likelihood of detection (P. Cameron pers comms.).

Sun exposure has an impact on soil temperature and moisture beneath the tiles, evident by the fact that tiles in the full sun recorded much higher soil temperatures than those in the shade.

5 Flora

Flora diversity and overall habitat is obviously improving due to livestock removal and fencing of DP boundaries. Natural regeneration has been exceptional, although a large number of trees have died since 2016 as the severe drought conditions prevailed until late Summer 2020.

The following photos taken by P. Cameron and M. Sutherland in April 2020 illustrate drought impacts and regeneration.

Regenerating Eucalypt on northern offset area Photo taken 1 April 2020

Swainsona monticola plants were prolific across the northern offset area 1 April 2020.

Extensive dieback of *Callitris* and *Allocasuarina sp.* 1 April 2020.

6 Fauna

6.1 Ants

Ants were present under 54 percent of tiles. Ant nests/burrows were located under 22 percent of tiles.

This is an increase from 2018 when ants were found under 34 percent of tiles. Previous years have seen ant level up to 94 percent (2014).

The increase in number ants under tiles since 2018 probably relates to the current reprieve from the drought and could indicate a 'boom' to come in following years.

An assessment of individual ant count was not conducted nor species identification.

6.2 Other invertebrates

Other invertebrates were recorded under 36 percent of the tiles. Majority of the time they occurred in conjunction with ants. Termites were the most common other invertebrate recorded. Spiders, wasps, beetles, centipedes, snails and crickets were also present.

6.3 Reptiles and other vertebrates

Other reptiles were found under nine percent of tiles. Mouse, snake and gecko poo was also found under a small number of tiles. No frogs were detected.

In 2018 reptiles were recorded under 18 percent of tiles, in 2016 it was 13 percent.

Ctenotus robustus or striped skink was discovered under 10 tiles. Other species were recorded were:

- *Egernia striolata*
- *Menetia greyii*
- *Underwoodisaurus milii.*

These species have all previously been recorded in the area and their presence on and under the tiles indicates the tiles have some value as artificial reptile habitat.

An echidna was also sighted at DP indicating strong ant populations.

7 Pink-tail Worm-lizard signs

No PTWL, or signs thereof, were found on 1 April 2020. Some naturally occurring rocks were opportunistically flipped during the event with no result.

During a vegetation survey of DP in November 2019 (early in the morning) AREA Principal Ecologist Phil Cameron sighted a PWTL individual under a naturally occurring rock outside the monitoring locations but within the southern extent of the BOA area.

8 Issues and Suggestions for future monitoring efforts

8.1 Climate considerations

The DP PTWL Management Plan (Ozark 2016) states the following:

The PTWL appears to mimic the same 'boom and bust' detection rates as seen in many western area species of fauna (P. Cameron, pers. comm.). This observation was supported by Gerry Swan (reptile expert) who also has experience with the species (pers. comm.). In favourable seasons, i.e. not long after inundating repetitive rains, 'many' (in context with the population) PTWL will be recorded with the recommended survey effort (P. Cameron pers. comm). This may be followed by subsequent hotter and dryer seasons when few or no PTWL recorded. Evidence available suggests this pattern follows a ten year cycle related to approximately 10 year interval high rainfall events (P. Cameron and Gerry Swan pers. comm).

The last 'boom' was recorded when targeted surveys were undertaken in 2012 and 2013 by Biosphere Environmental Consultants Pty Ltd (Biosphere) and 30 PTWLs (in total) were found in sites within a 5km radius of the DP impact footprint. All records were associated with natural rock.

Since then the area has been through a severe hot and dry 'bust' cycle and few PTWL have been detected. Improved conditioned experienced in the beginning of 2020 could indicate a 'boom' is imminent in the following years if the consistent rainfall persists. This would tie in with the hypothesised 10 year cycle.

8.2 Artificial habitat considerations

Previous research suggests that preferences for artificial reptile habitat may vary among species and between different designs. Reptiles appear to be highly selective when choosing retreat sites, evaluating multiple aspects of their habitat and making relatively subtle choices among avail-able retreat sites based on their structural and thermal features, the presence of conspecifics and/or competitors, and the perceived risk of predation (Thierry *et al.* 2019).

The temperature variation recorded under the artificial habitat tiles indicates that the tiles may only provide short windows of habitat suitability for PTWL – they heat quicker and cool quicker than natural rock. Tiles as artificial habitat for PTWL has previously been trialled in the ACT, which does not experience the same extreme high temperatures of the Dubbo region.

Since establishment of the roof tiles in 2013, an individual PTWL has only been recorded under an artificial habitat tile once at DP. This may indicate they do not like the tiles as a habitat option, although it may also be the cryptic nature of the species. This detection ratio is consistent with expected rates under natural rock (one success for every 300 rocks overturned).

Common sense suggests PTWL are always going to prefer natural habitat over artificial habitat where available, and there may be no suitable substitute to natural rock. As per the PTWL Plan of Management, prior to construction DP impact footprint, loose surface rocks suitable for PTWL habitat will be collected and moved to offset areas. In the meantime, the focus of management is on passive translocation though habitat quality improvement.

8.3 Native vegetation habitat

The DP PTWL Management Plan (Ozark 2016) states the following:

The overarching performance target is to increase the area of occupancy for PTWL by restoring native vegetation, connecting adjoining populations though rehabilitated corridors) and providing natural or artificial rock/tile habitat.
The quality of PTWL habitat in DP was assessed on the EPBC Offset Calculator as:

- *30ha of low condition habitat (quality score = 4/10).*
- *113.6ha of moderate condition habitat (quality score = 7/10).*
- *80.9ha of good condition habitat (quality score = 9/10).*

In practical terms the goal will be to achieve a quality score of 8 or higher in all PTWL HA's within 5 years.

Since conception of the PTWL Management Plan in 2016, the region has been through two significant events that would impact the quality of habitat within DP:

1. Exclusion if grazing and fencing of DP boundaries (positive)
2. An extreme drought (negative).

Habitat re-assessment in 2021 would be extremely valuable to how habitat quality is trending in relation to these two significant events.

9 Conclusions

The targeted survey for the PTWL occurred during ideal conditions in terms of temperature, season and proceeding rainfall. Other reptile species were observed during the course of the targeted survey, however, the PTWL was not recorded.

During a vegetation survey of DP in November 2019 (early in the morning) AREA Principal Ecologist Phil Cameron sighted a PWTL individual under a naturally occurring rock, so the species is definitely still present in the area but remains cryptic and difficult to detect.

Analysis of climate data from previous targeted surveys of low and high findings of the PTWL at the DP site suggest climatic conditions in the preceding years may contribute to detection success levels, and drought conditions prior to April 2020 monitoring may have impacted the lack of result.

Continued targeted surveys for this species is recommended. Given the current reprieve from drought conditions, future surveys may yield results.

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Appendix A – Field Data

Area	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)
Ugothery North	1	652845	6407800	12.02		11.8		Y	Y	Y	
Ugothery North	1ABCD				26.1	18.5	Y	Y			
Ugothery North	2	652837	6407796			18.3		Y	Y	Y	
Ugothery North	2ABCD				29.1	15.2				Y	
Ugothery North	3	652829	6407792			30.9		Y	Y	Y	
Ugothery North	3ABCD				28.4	21.3		Y			
Ugothery North	4	652816	6407792			20.6					
Ugothery North	4ABCD				28.1	23.5					
Ugothery North	5	652809	6407780			26.4			Y	Y	*Ctenotus (basking)*
Ugothery North	5ABCD				27.3	23.9			Y	Y	
Ugothery North	6	652823	6407772			20					*Ctenotus*
Ugothery North	6ABCD				26.5	19.8		Y	Y		
Ugothery North	7	652830	6407773			27.2					
Ugothery North	7ABCD				25.8	34.9		Y	Y		
Ugothery North	8	652845	6407770			43.1				Y	
Ugothery North	8ABCD				26.9	33.4			Y		
Ugothery North	9	652845	6407778			25.1			Y	Y	
Ugothery North	9ABCD				28.4	21.9		Y	Y		*Ctenotus*
Ugothery North	10	652833	6407776			26				Y	
Ugothery North	10ABCD				28	24.4					*Ctenotus*
Ugothery East Lower	1	652929	6407563	10.50	25	18.4					*Menetia greyii*
Ugothery East Lower	1ABCD					15.7	Y	Y			
Ugothery East Lower	2	652912	6407571		24.4	20.1			Y		*Egernia striolata*
Ugothery East Lower	2ABCD					33.7	Y		Y		
Ugothery East Lower	3	652905	6407583		25				Y		
Ugothery East Lower	3ABCD										
Ugothery East Lower	4	652915	6407589			19.2			Y		Gecko poo
Ugothery East Lower	4ABCD				24.7	16.8				Y	
Ugothery East Lower	5	652929	6407583		23.1	23.1					
Ugothery East Lower	5ABCD					18.4					
Ugothery East Lower	6	652928	6407574		24.1	10.1	Y		Y		
Ugothery East Lower	6ABCD					14.4					
Ugothery East Lower	7	652935	6407562		24.5	14.1			Y	Y	
Ugothery East Lower	7ABCD					10.6					
Ugothery East Lower	8	652946	6407541		23.4	10.2					Gecko poo
Ugothery East Lower	8ABCD					13.1		Y	Y		
Ugothery East Lower	9	652947	6407575		24.7	13.1					
Ugothery East Lower	9ABCD					15.8			Y		
Ugothery East Lower	10	652943	6407585		31.4	16.5		Y		Y	
Ugothery East Lower	10ABCD					19.3		Y			

Area	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)
Ugothery East Upper	1	652836	6407637	11.31		16.6			Y	Y	
Ugothery East Upper	1ABCD				26.6	12.6	Y	Y	Y		
Ugothery East Upper	2	652841	6407649			18.8		Y	Y	Y	
Ugothery East Upper	2ABCD				27.8	28.4		Y	Y	Y	
Ugothery East Upper	3	652835	6407657			18.6			Y	Y	
Ugothery East Upper	3ABCD				23.8	16.6			Y	Y	
Ugothery East Upper	4	652846	6407659			18.9			Y	Y	
Ugothery East Upper	4ABCD				24.9	20.8			Y	Y	
Ugothery East Upper	5	652841	6407664			18.1			Y	Y	
Ugothery East Upper	5ABCD				26.7	25.3			Y	Y	*Ctenotus*
Ugothery East Upper	6	652818	6407649			19.1					*Ctenotus*
Ugothery East Upper	6ABCD				24.8	26.9			Y	Y	
Ugothery East Upper	7	652811	6407639			27.1					*Ctenotus*
Ugothery East Upper	7ABCD				25.9	15.8			Y	Y	
Ugothery East Upper	8	652811	6407663			22.4			Y	Y	
Ugothery East Upper	8ABCD				26.3	16.7					
Ugothery East Upper	9	652819	6407665			23.3		Y			
Ugothery East Upper	9ABCD				25.8	23.5		Y	Y	Y	
Ugothery East Upper	10	652803	6407676			29.8			Y		
Ugothery East Upper	10ABCD				27.3	29.1			Y	Y	
Grandale	1	653547	6410880	14.12	30.4	32.4		Y	Y		
Grandale	1ABCD					45.6					
Grandale	2	653541	6410870		29.2	27.6				Y	
Grandale	2ABCD					26.8					
Grandale	3	653549	6410852		28.6	16.8			Y		
Grandale	3ABCD					11.1					
Grandale	4	653541	6410831		28.7	28.7			Y		
Grandale	4ABCD					36.9			Y		
Grandale	5	653537	6410851		29.3	29.8			Y	Y	
Grandale	5ABCD					25					
Grandale	6	653525	6410856		29.1	42.7			Y	Y	
Grandale	6ABCD					26.7			Y		
Grandale	7	653518	6410846		27.9	28.6			Y		
Grandale	7ABCD					37.1			Y		
Grandale	8	653507	6410862		28.4	33.7			Y		
Grandale	8ABCD					29.3			Y	Y	
Grandale	9	653499	6410870		27.8	27.2			Y	Y	
Grandale	9ABCD					12.6			Y	Y	
Grandale	10	653504	6410848		27.8	22.3			Y	Y	
Grandale	10ABCD										

Area	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)
Ugothery Dowds Hill	1	653525	6406962	12.40	27.5	12.1	Y		Y	Y	
	1ABCD					7.3		Y			
Ugothery Dowds Hill	2	653544	6406972		27	26.3	Y	Y	Y	Y	
	2ABCD					29.8			Y		
Ugothery Dowds Hill	3	653561	6406985		26.8	31.3	Y		Y		
	3ABCD					28.6					*Ctenotus robustus*
Ugothery Dowds Hill	4	653575	6406991		25.7	30.1				Y	
	4ABCD										
Ugothery Dowds Hill	5	653589	6406998		26.6	20.6				Y	
	5ABCD					19.1			Y		
Ugothery Dowds Hill	6	653603	6407004		25.5	26.5			Y		*Ctenotus robustus*
	6ABCD					23.9			Y	Y	
Ugothery Dowds Hill	7	653618	6407007		26.6	18.4			Y	Y	
	7ABCD					13					
Ugothery Dowds Hill	8	653633	6407009		26.8	27.5			Y		
	8ABCD					37			Y	Y	
Ugothery Dowds Hill	9	653646	6407011		27.3	29.1			Y	Y	
	9ABCD					39.1					
Ugothery Dowds Hill	10	653660	6407011		27	24.8			Y		
	10ABCD					23.4					
Glen Idol	1	652877	6406944	10.06	22.8	19.4		Y			*Ctenotus robustus*
Glen Idol	1ABCD					15.3		Y			
Glen Idol	2	652903	6406954			12.9		Y			
Glen Idol	2ABCD										
Glen Idol	3	652896	6406929								
Glen Idol	3ABCD				22.4	20.5	Y				
Glen Idol	4	652888	6406885			18.2		Y			
Glen Idol	4ABCD				22.4	16.1	Y	Y			
Glen Idol	5	652909	6406873			13.6	Y	Y			
Glen Idol	5ABCD				23.8	14.2	Y	Y		Y	
Glen Idol	6	652923	6406847			14.3		Y			
Glen Idol	6ABCD				14.3	11.4		Y		Y	
Glen Idol	7	652946	6406871			11.1					
Glen Idol	7ABCD				23	16.8	Y	Y			
Glen Idol	8	652961	6406896			22.6					
Glen Idol	8ABCD				25.9	14.6		Y	Y		
Glen Idol	9	652953	6406846			15.9					
Glen Idol	9ABCD				23.4	10.7			Y		
Glen Idol	10	652998	6406853						Y		
Glen Idol	10ABCD				22.5	11.1			Y	Y	

Area	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Ant Nests / Burrows Present?	Ants present?	Other insects (Type / abundance)	Other reptiles (Sp / abundance)
Ugothery Dam Site	1	653894	6407990	13.05	28.2	37			Y	Y	
	1ABCD					36.7			Y		
Ugothery Dam Site	2	653931	6408018		28.5	16			Y		
	2ABCD					25.1			Y	Y	
Ugothery Dam Site	3	653963	6408042		28.5	17.3					
	3ABCD					15.4			Y		
Ugothery Dam Site	4	653964	6408060		27.8						
	4ABCD								Y		
Ugothery Dam Site	5	654014	6408118		28.1	13.6			Y	Y	
	5ABCD					11.8					
Ugothery Dam Site	6	653997	6408121		27.5	16.9	Y				snake poo
	6ABCD					28.3			Y	Y	
Ugothery Dam Site	7	653998	6408134		28	33.1			Y	Y	
	7ABCD					39.1	Y			Y	
Ugothery Dam Site	8	654014	6408123		28.6	34.9			Y	Y	
	8ABCD					41.7					
Ugothery Dam Site	9	654030	6408142		28.9	32.4			Y		
	9ABCD					24.8					
Ugothery Dam Site	10	654035	6408158		28.3	24.8			Y		
	10ABCD					21.7					

APPENDIX B - Meteorological Data July 2019- June 2020

Dubbo Project — **Rainfall 2020**

Date	Jul mm	Aug mm	Sep mm	Oct mm	Nov mm	Dec mm	Jan mm	Feb mm	Mar mm	Apr mm	May mm	Jun mm	Date
1	0.2					0.2						0.6	1
2						4.0		8.6		11.6	7.4	0.2	2
3					13.2				1.4	17.6	0.2	0.4	3
4									6.2	15.0	0.2		4
5					0.2			10.8	43.6		0.2		5
6			0.2				2.2		0.6	0.2		0.3	6
7	1.8		0.2				0.6	4.0					7
8	2.0							14.2			0.2		8
9	0.4	0.6						15.4		6.0	1.8		9
10	0.2	1.0						2.8		12.0			10
11		4.4		11.0				1.0		0.2			11
12		0.2		3.6				0.2			0.2		12
13		0.2		0.2				9.0				1.0	13
14									4.0			8.8	14
15											0.2	0.2	15
16							19.2	0.8					16
17			10.8	0.2			5.0					0.2	17
18		0.2									0.2		18
19							21.6						19
20											0.8		20
21			0.2								9.8	20.6	21
22			0.2									3.8	22
23							3.2					1.0	23
24					12.4							0.2	24
25					2.8		0.2		12.6				25
26				3.0			0.2	8.0		0.2			26
27										0.4			27
28											0.2		28
29										13.2			29
30									20.8	33.8	0.2		30
31													31
Totals	4.6	6.6	11.6	18.0	28.6	4.2	52.2	74.8	89.2	110.2	21.6	37.3	TOTAL
No.days	5	6	5	5	4	2	8	11	7	11	13	12	89
Cum. total	**4.6**	**11.2**	**22.8**	**40.8**	**69.4**	**73.6**	**125.8**	**200.6**	**289.8**	**400.0**	**421.6**	**458.9**	**458.9**

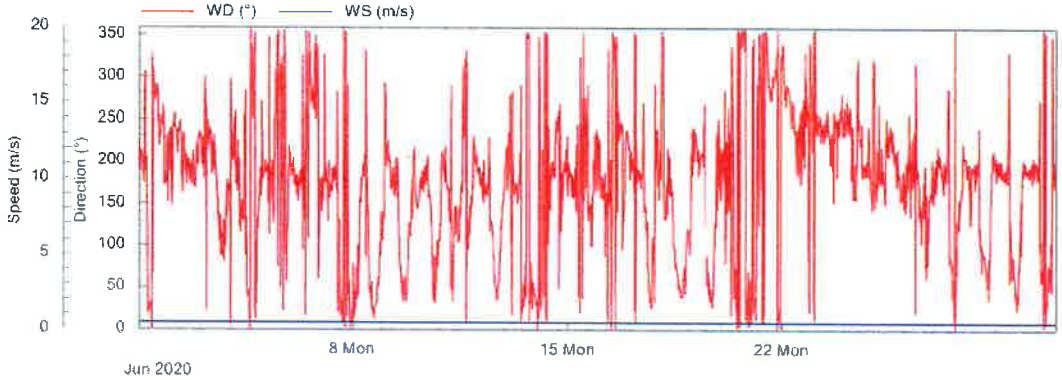
Bold data = cumulative total

0.2 readings may be dew

Raingauge situated at met station on Wychitella

WS/WD

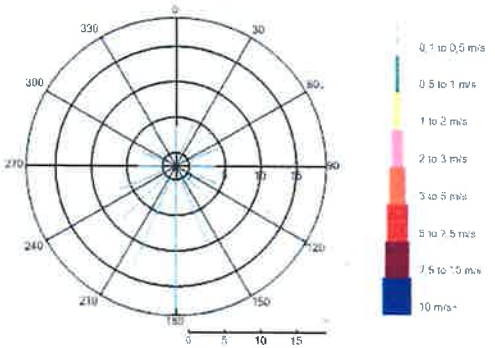
1/06/2020 midnight to 30/06/2020 23:59



Wind Rose

Wind Rose

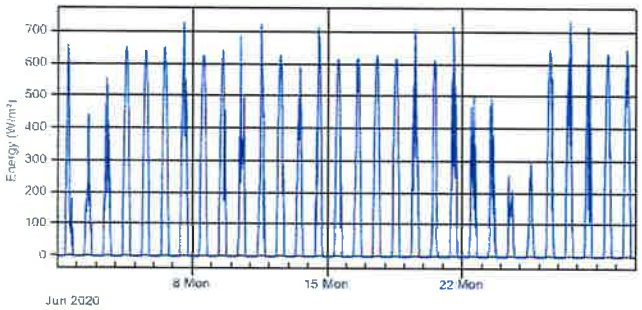
1/06/2020 midnight to 30/06/2020 23:59



0.0% calm
100.0% valid data present

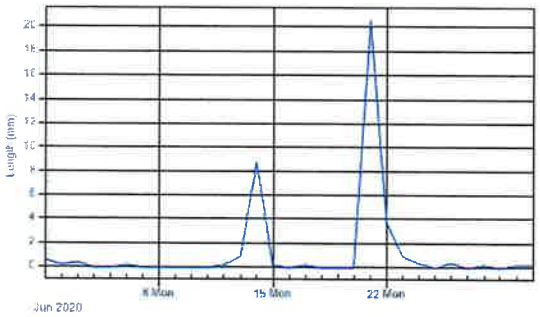
Solar Radiation

1/06/2020 midnight to 30/06/2020 23:59



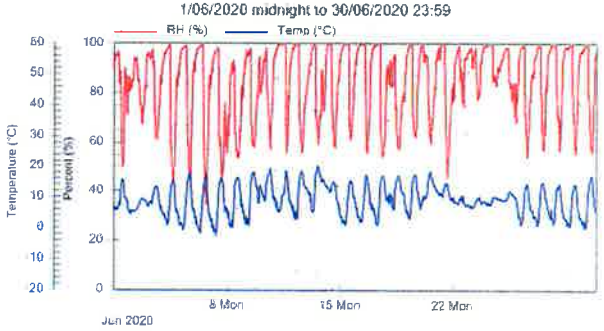
Rainfall

1/06/2020 midnight to 30/06/2020 23:59



RH/Temp

1/06/2020 midnight to 30/06/2020 23:59



WS/WD

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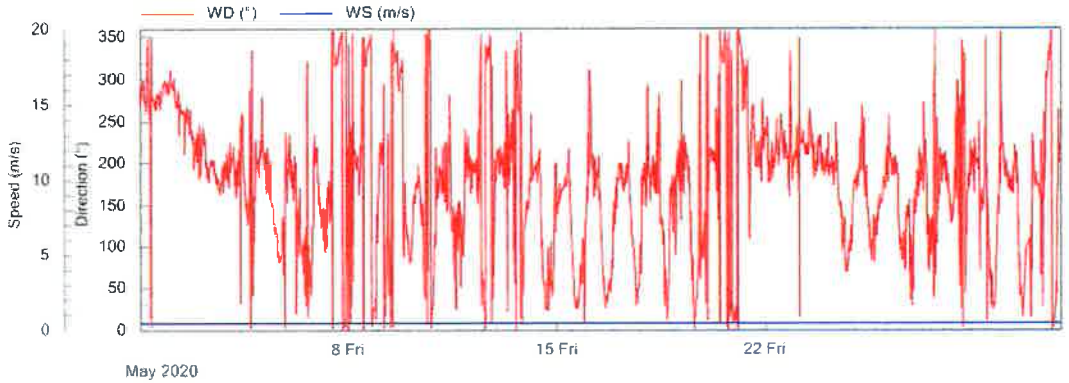
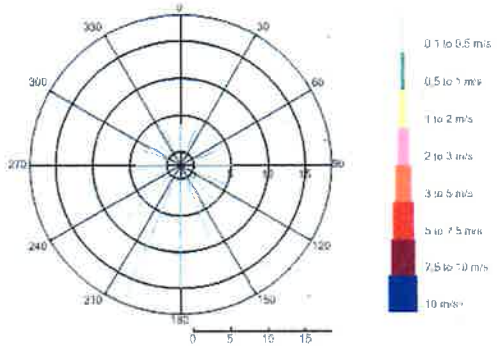


Wind Rose

Wind Rose

1/05/2020 midnight to 31/05/2020 23:59



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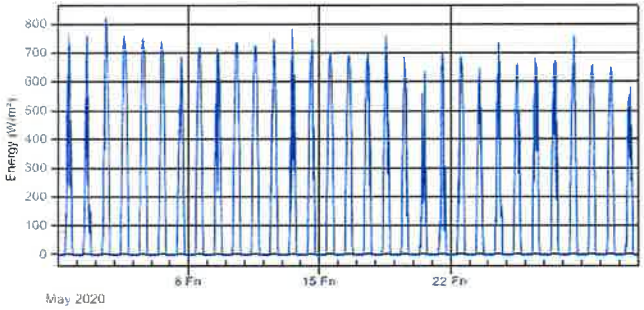
100.0% valid data present

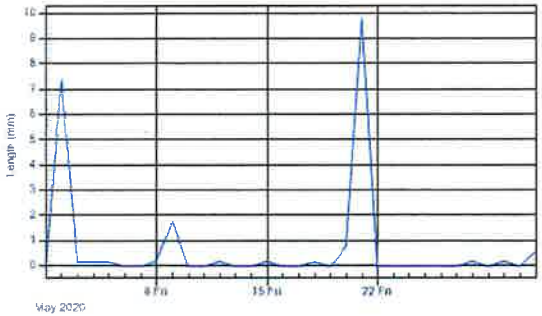
Solar Radiation

1/05/2020 midnight to 31/05/2020 23:59



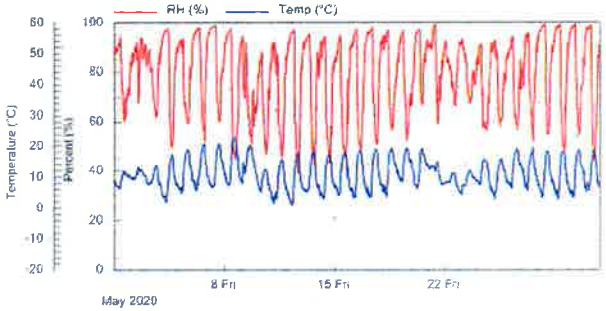
Rainfall

1/05/2020 midnight to 31/05/2020 23:59



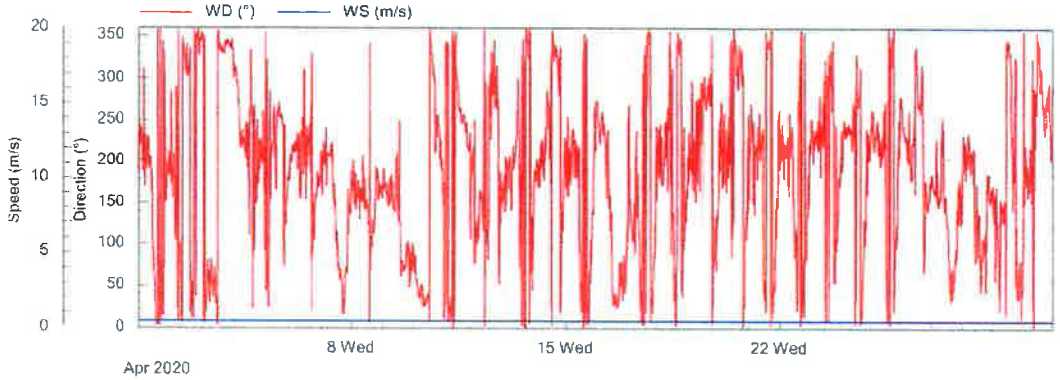
RH/Temp

1/05/2020 midnight to 31/05/2020 23:59



WS/WD

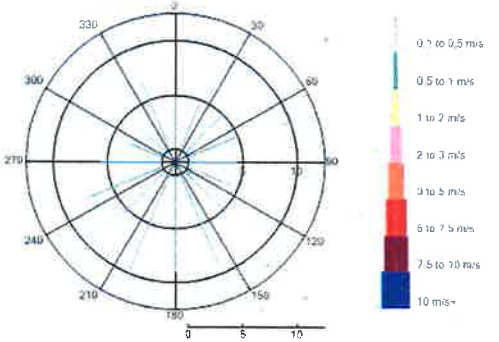
1/04/2020 01:00 to 30/04/2020 23:59



Wind Rose

Wind Rose

1/04/2020 01:00 to 30/04/2020 23:59



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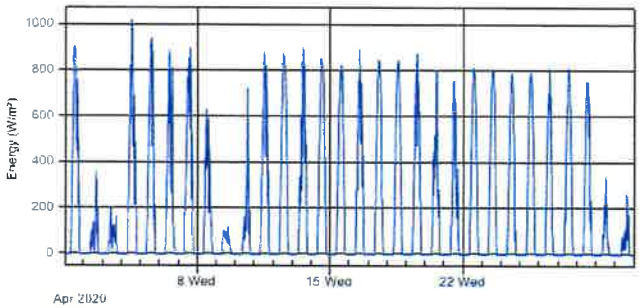
100.0% valid data present

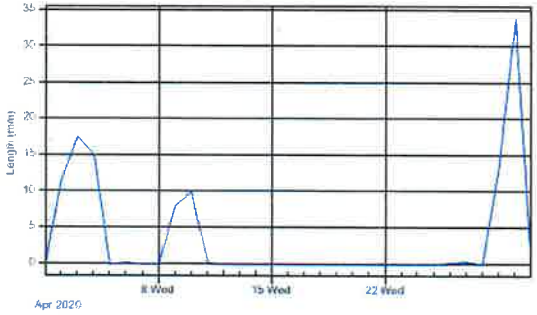
Solar Radiation

1/04/2020 01:00 to 30/04/2020 23:59



Rainfall

1/04/2020 01:00 to 30/04/2020 23:59



RH/Temp

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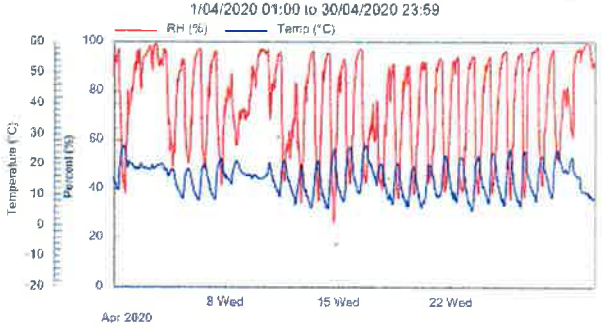
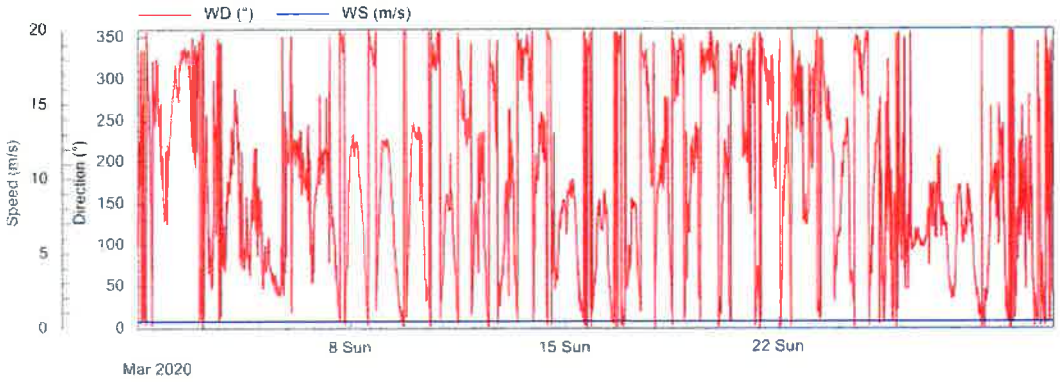


WS/WD

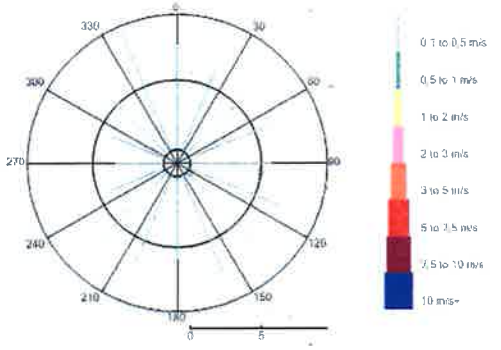
1/03/2020 01:00 to 31/03/2020 00:59



Wind Rose

Wind Rose

1/03/2020 01:00 to 31/03/2020 00:59



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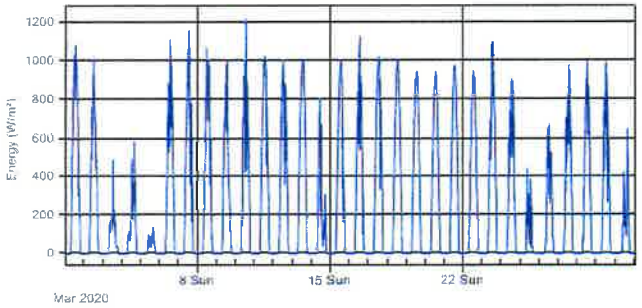
100.0% valid data present

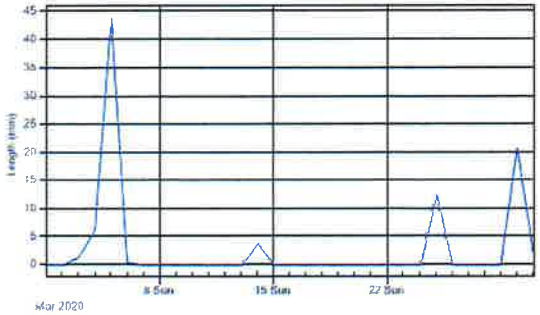
Solar Radiation

1/03/2020 01:00 to 31/03/2020 00:59



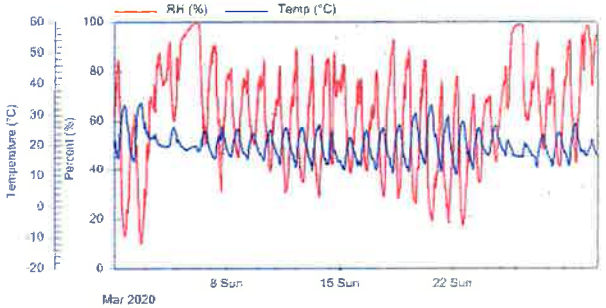
Rainfall

1/03/2020 01:00 to 31/03/2020 00:59



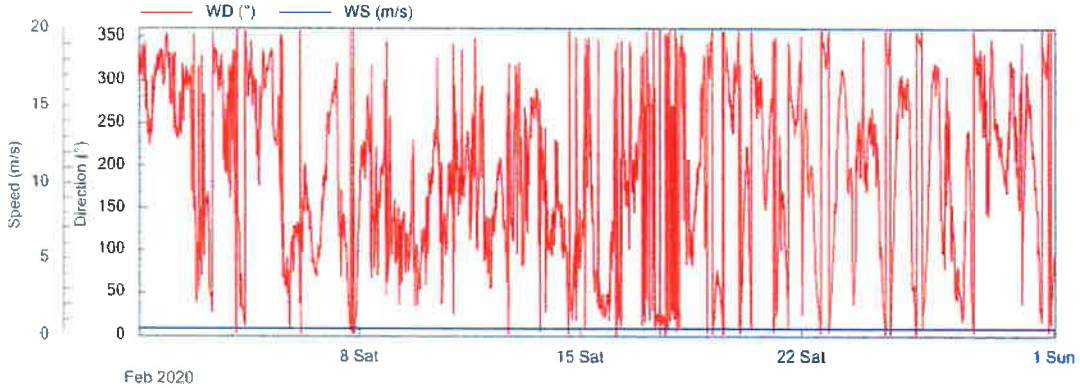
RH/Temp

1/03/2020 01:00 to 31/03/2020 00:59



WS/WD

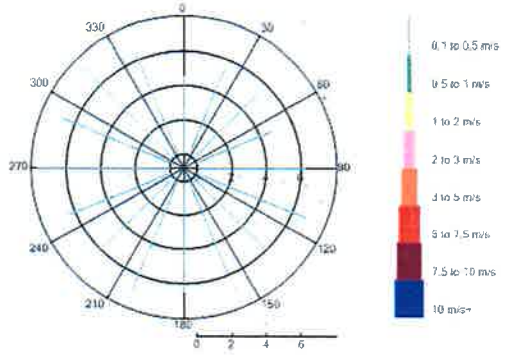
1/02/2020 01:00 to 1/03/2020 00:59



Wind Rose

Wind Rose

1/02/2020 01:00 to 1/03/2020 00:59



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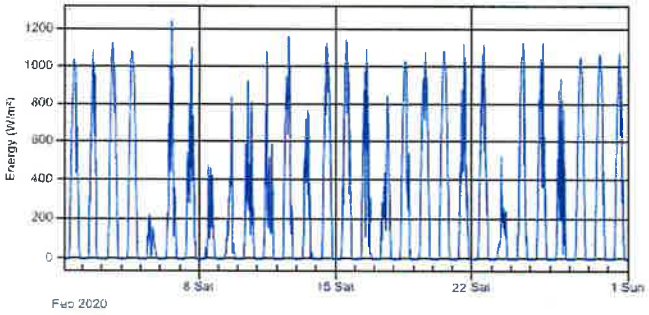
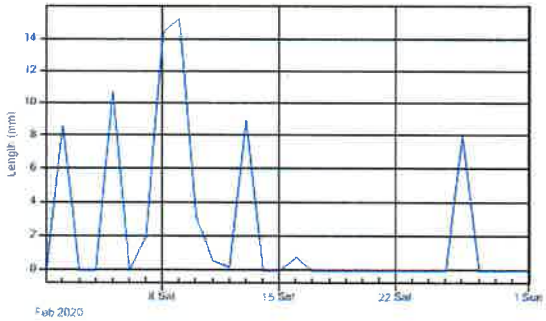
Solar Radiation

1/02/2020 01:00 to 1/03/2020 00:59



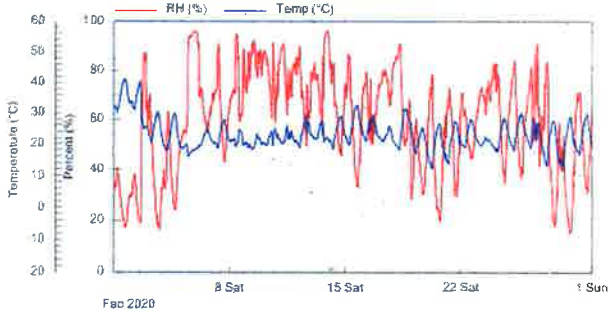
Rainfall

1/02/2020 01:00 to 1/03/2020 00:59



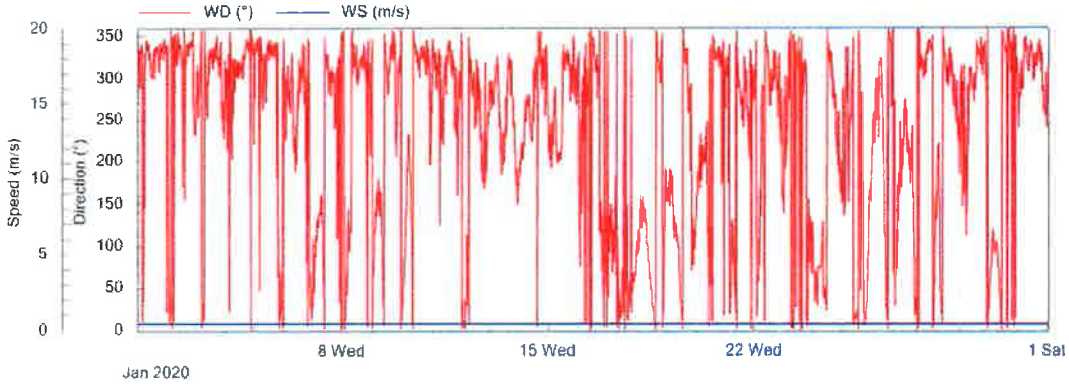
RH/Temp

1/02/2020 01:00 to 1/03/2020 00:59



WS/WD

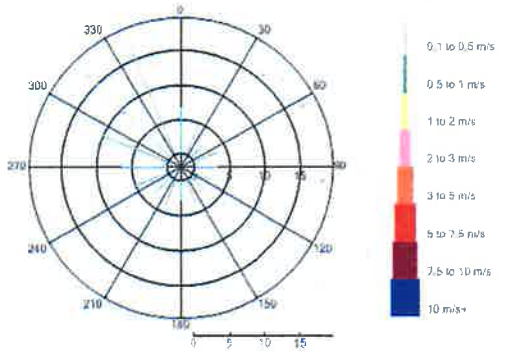
1/01/2020 01:00 to 1/02/2020 00:59



Wind Rose

Wind Rose

1/01/2020 01:00 to 1/02/2020 00:59



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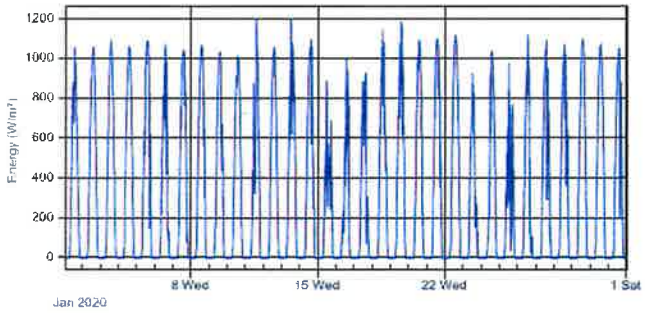
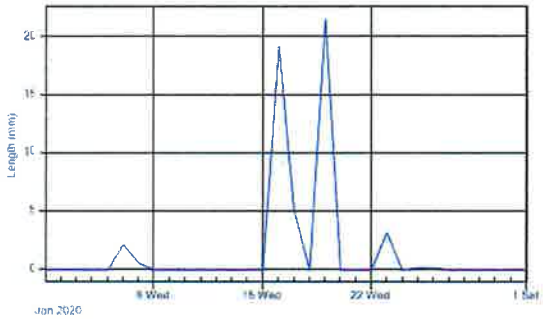
Solar Radiation

1/01/2020 01:00 to 1/02/2020 00:59



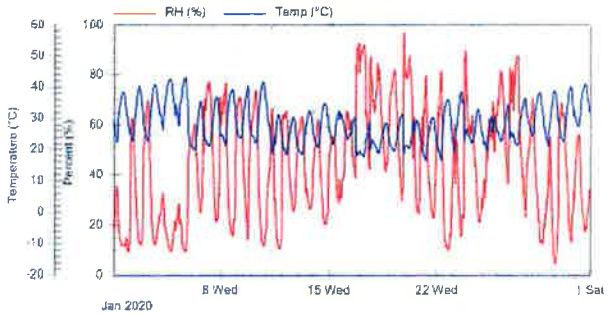
Rainfall

1/01/2020 01:00 to 1/02/2020 00:59



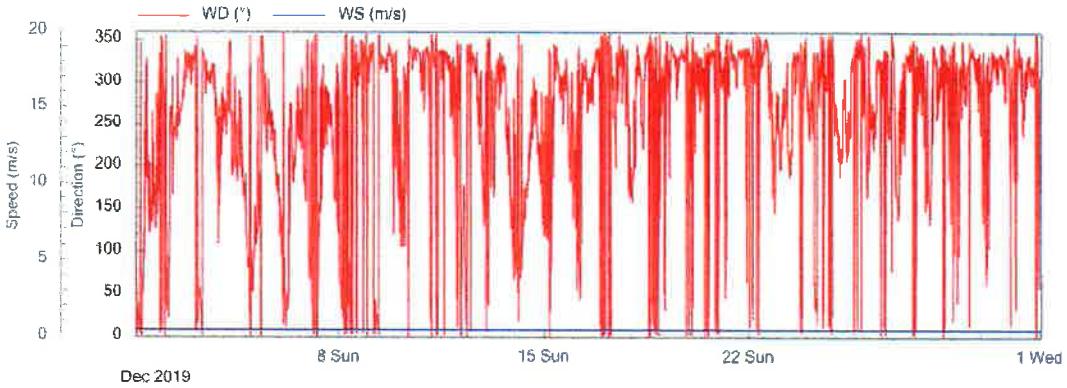
RH/Temp

1/01/2020 01:00 to 1/02/2020 00:59



WS/WD

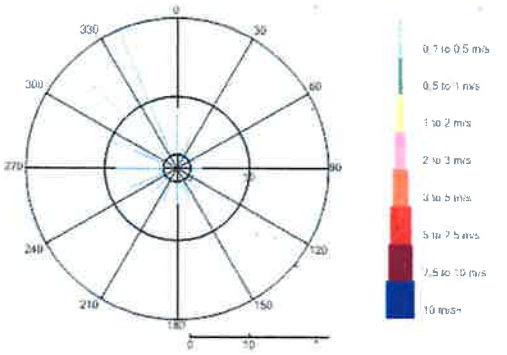
1/12/2019 01:00 to 1/01/2020 00:59



Wind Rose

Wind Rose

1/12/2019 01:00 to 1/01/2020 00:59



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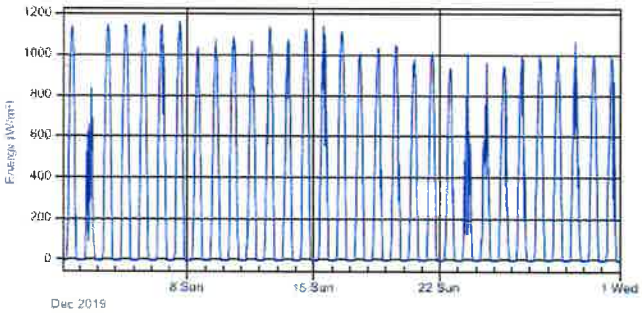
100.0% valid data present

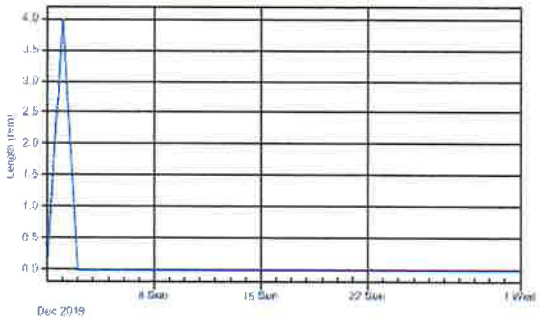
Solar Radiation

1/12/2019 01:00 to 1/01/2020 00:59



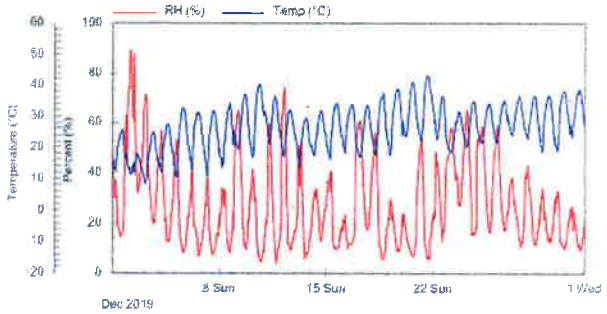
Rainfall

1/12/2019 01:00 to 1/01/2020 00:59



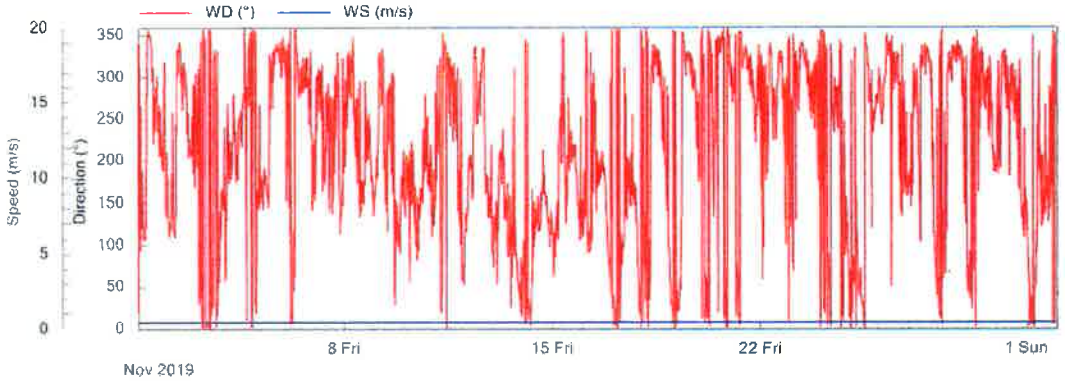
RH/Temp

1/12/2019 01:00 to 1/01/2020 00:59



WS/WD

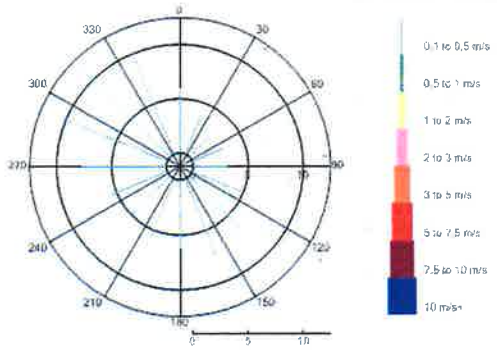
1/11/2019 01:00 to 2/12/2019 00:59



Wind Rose

Wind Rose

1/11/2019 01:00 to 2/12/2019 00:59



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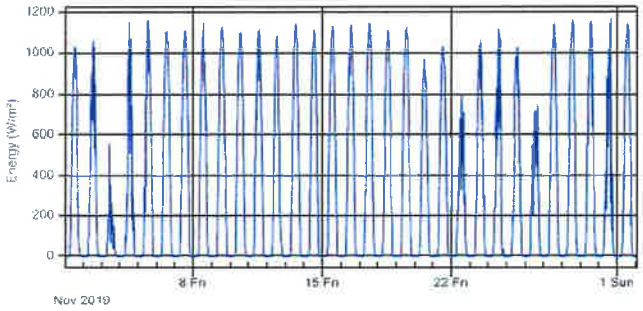
100.0% valid data present

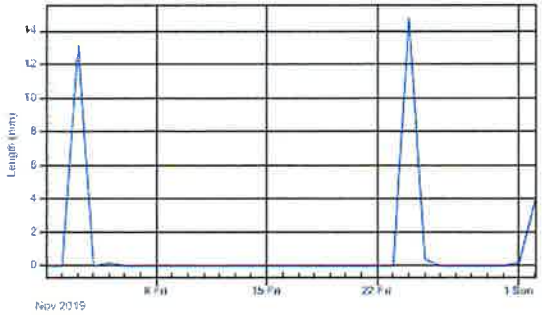
Solar Radiation

1/11/2019 01:00 to 2/12/2019 00:59



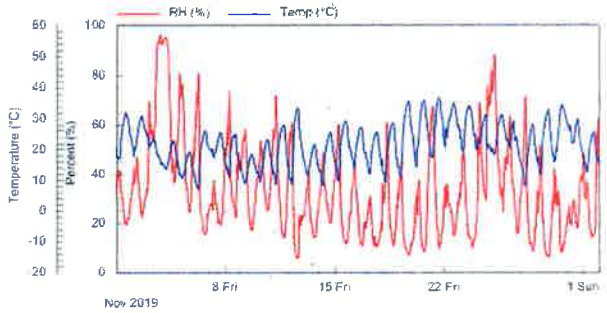
Rainfall

1/11/2019 01:00 to 2/12/2019 00:59



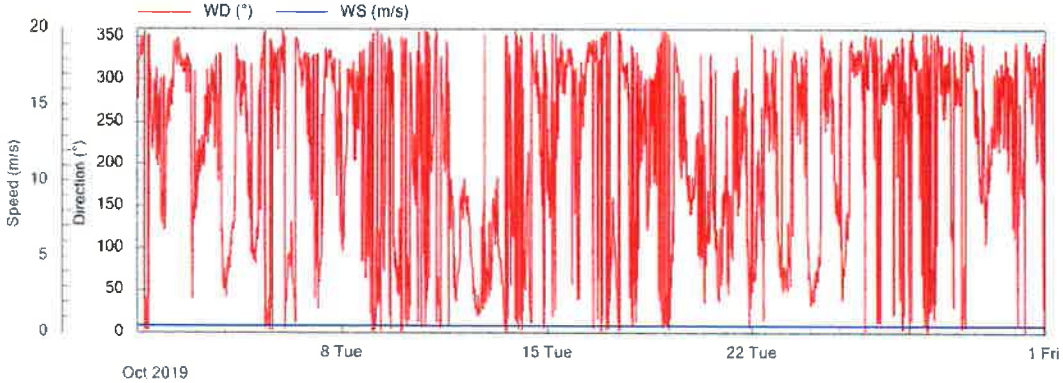
RH/Temp

1/11/2019 01:00 to 2/12/2019 00:59



WS/WD

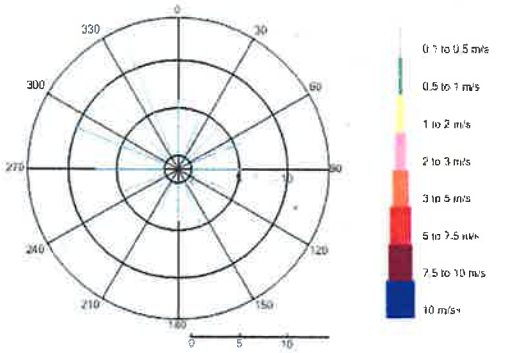
1/10/2019 midnight to 1/11/2019 00:59



Wind Rose

Wind Rose

1/10/2019 midnight to 1/11/2019 00:59



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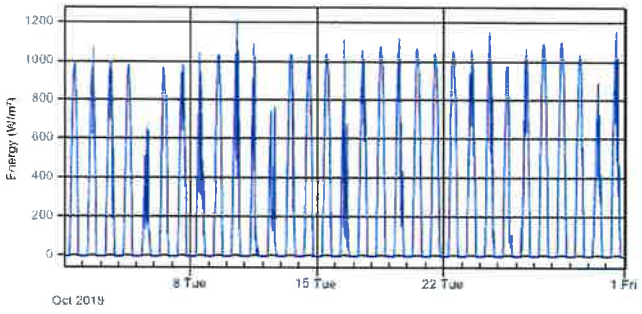
100.0% valid data present

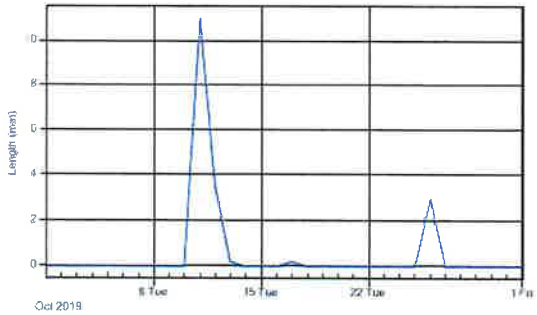
Solar Radiation

1/10/2019 midnight to 1/11/2019 00:59



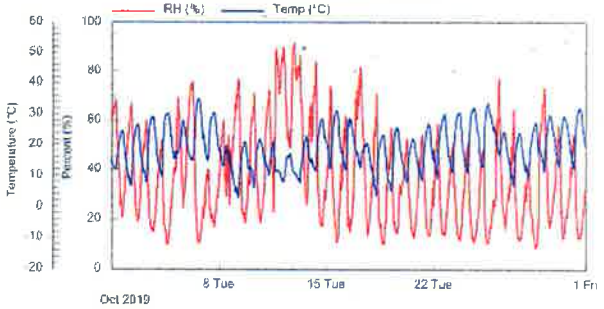
Rainfall

1/10/2019 midnight to 1/11/2019 00:59



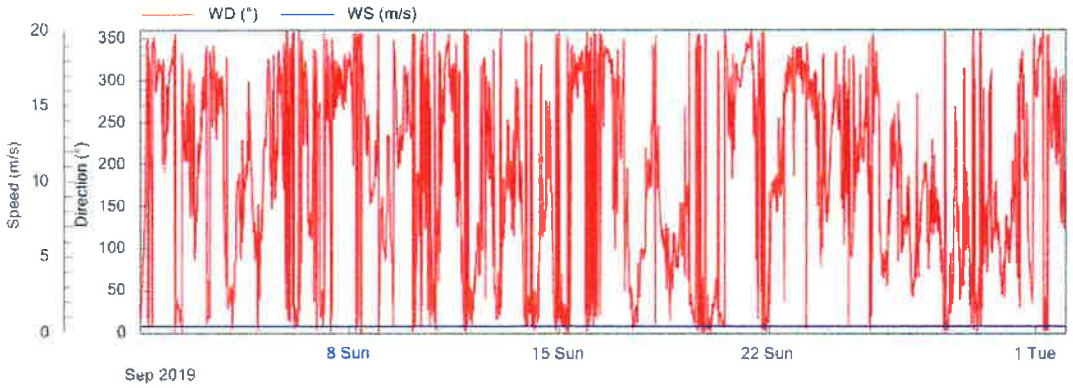
RH/Temp

1/10/2019 midnight to 1/11/2019 00:59



WS/WD

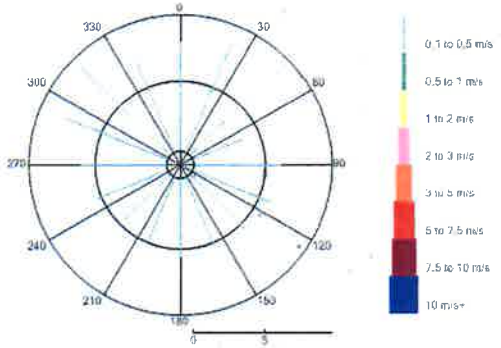
1/09/2019 midnight to 1/10/2019 23:59



Wind Rose

Wind Rose

1/09/2019 midnight to 1/10/2019 23:59



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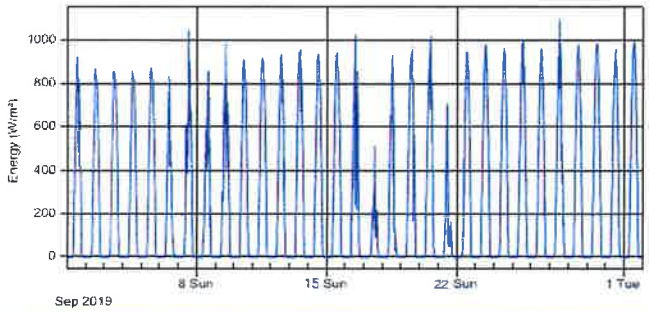
100.0% valid data present

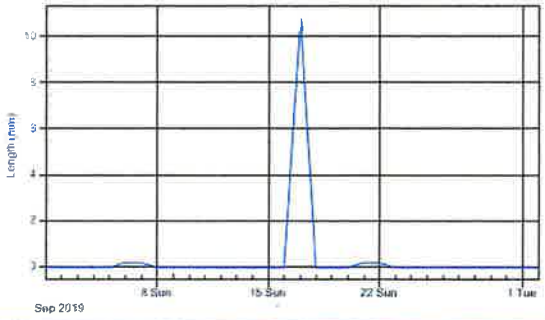
Solar Radiation

1/09/2019 midnight to 1/10/2019 23:59



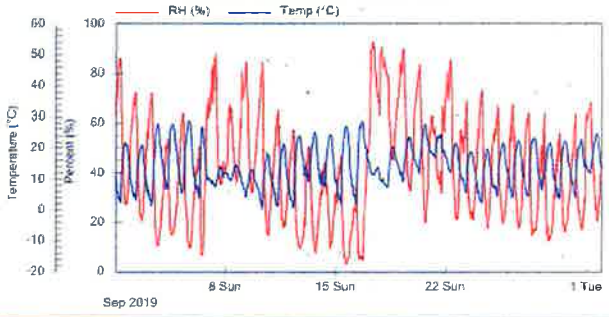
Rainfall

1/09/2019 midnight to 1/10/2019 23:59



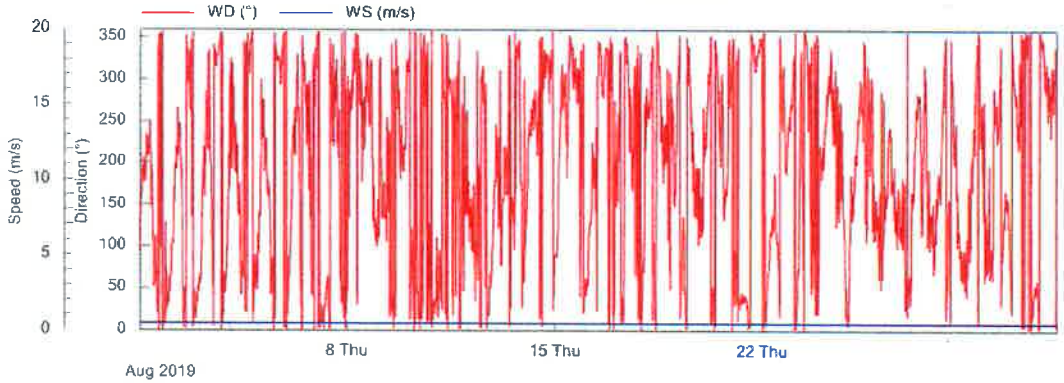
RH/Temp

1/09/2019 midnight to 1/10/2019 23:59



WS/WD

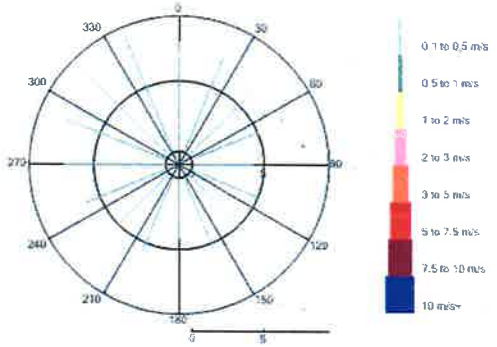
1/08/2019 midnight to 31/08/2019 23:59



Wind Rose

Wind Rose

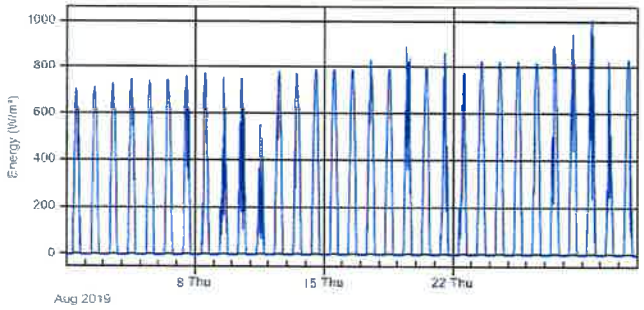
1/08/2019 midnight to 31/08/2019 23:59



0.0% calm
100.0% valid data present

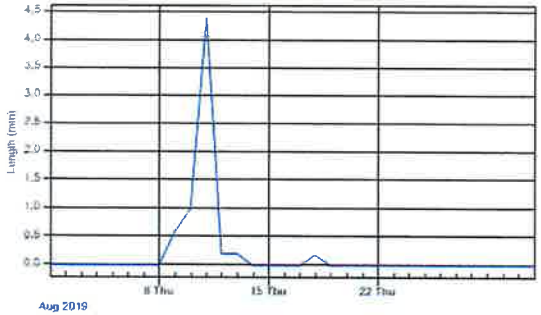
Solar Radiation

1/08/2019 midnight to 31/08/2019 23:59



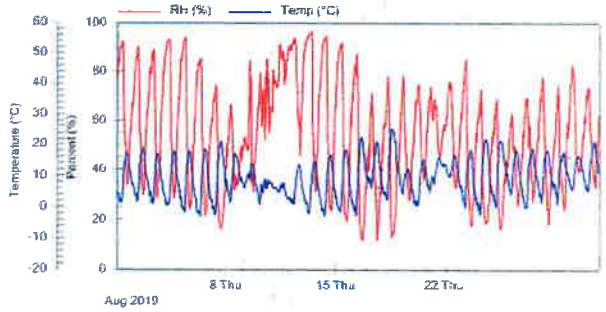
Rainfall

1/08/2019 midnight to 31/08/2019 23:59



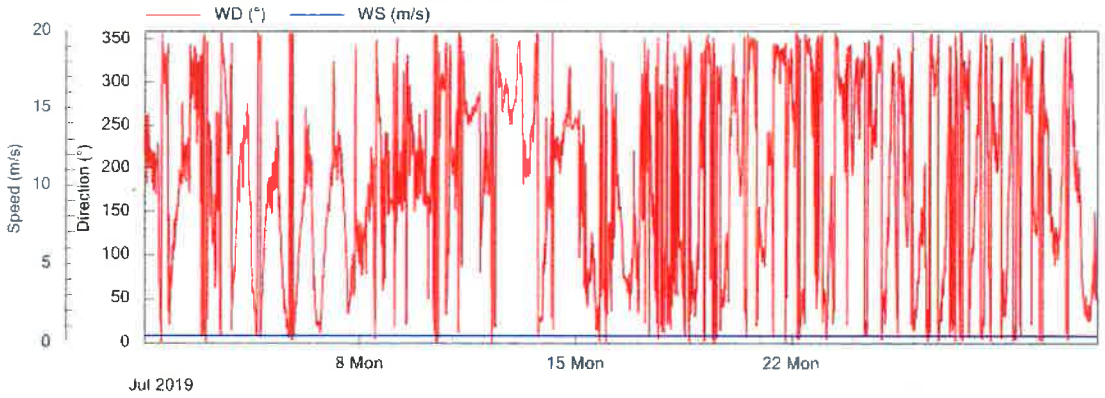
RH/Temp

1/08/2019 midnight to 31/08/2019 23:59



WS/WD

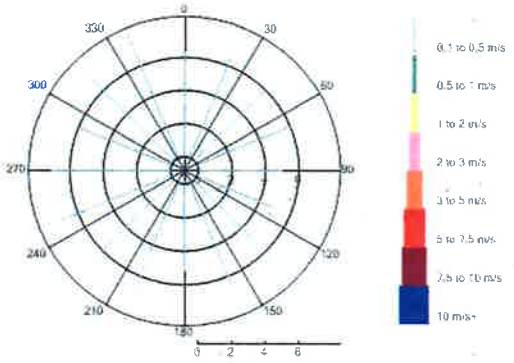
1/07/2019 midnight to 31/07/2019 23:59



Wind Rose

Wind Rose

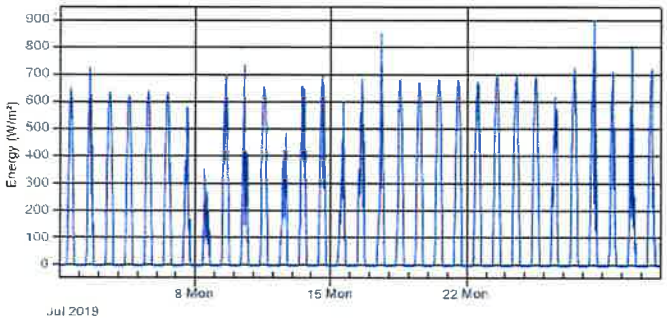
1/07/2019 midnight to 31/07/2019 23:59



0.0% calm
100.0% valid data present

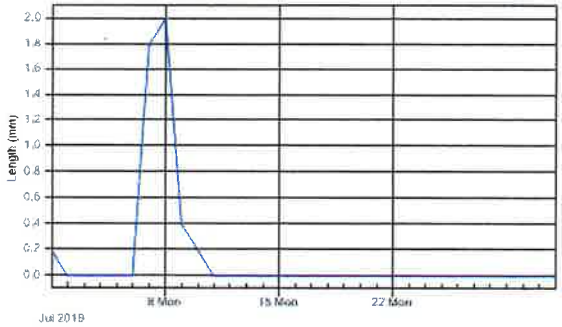
Solar Radiation

1/07/2019 midnight to 31/07/2019 23:59



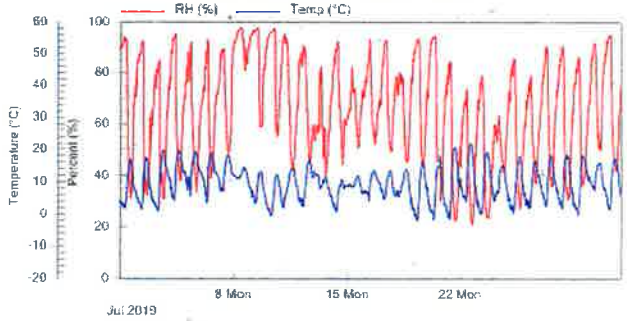
Rainfall

1/07/2019 midnight to 31/07/2019 23:59



RH/Temp

1/07/2019 midnight to 31/07/2019 23:59



APPENDIX C - Water Monitoring Location Photographs 10 February 2020

Dubbo Project Surface Water Sampling 10 February 2020 (first flows since 26 March 2019).

SW007-Wambangalang Creek sampled 10 February 2020.

SW003 on watercourse B sampled 10 February 2020

SW005- Wambangalang Creek downstream of railway bridge. Sampled 10 February 2020.

SW001 north arm of Cockabroo Creek draining the orebody. Sampled 10 February 2020.

SW004-Paddy's Creek, Wychitella. Normal sample site dry but flowing under sand 26 March 2019.

SW004b - Paddy's Creek sampled 25m downstream of usual location. Flowing under sand 26 March 2019. (results reported by ALS as SW004).

APPENDIX D - Water Monitoring results 2016 -2020

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2004791**	Page	: 1 of 4
Client	: **AUSTRALIAN STRATEGIC MATERIALS**	Laboratory	: Environmental Division Sydney
Contact	: MR MIKE SUTHERLAND	Contact	: Customer Services ES
Address	: PO Box 910 DUBBO NSW 2830	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: ----	Date Samples Received	: 12-Feb-2020 14:14
Order number	: ----	Date Analysis Commenced	: 12-Feb-2020
C-O-C number	: ----	Issue Date	: 19-Feb-2020 19:44
Sampler	: MDS & EPW		
Site	: ----		
Quote number	: SY/363/16		
No. of samples received	: 5		
No. of samples analysed	: 5		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

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.

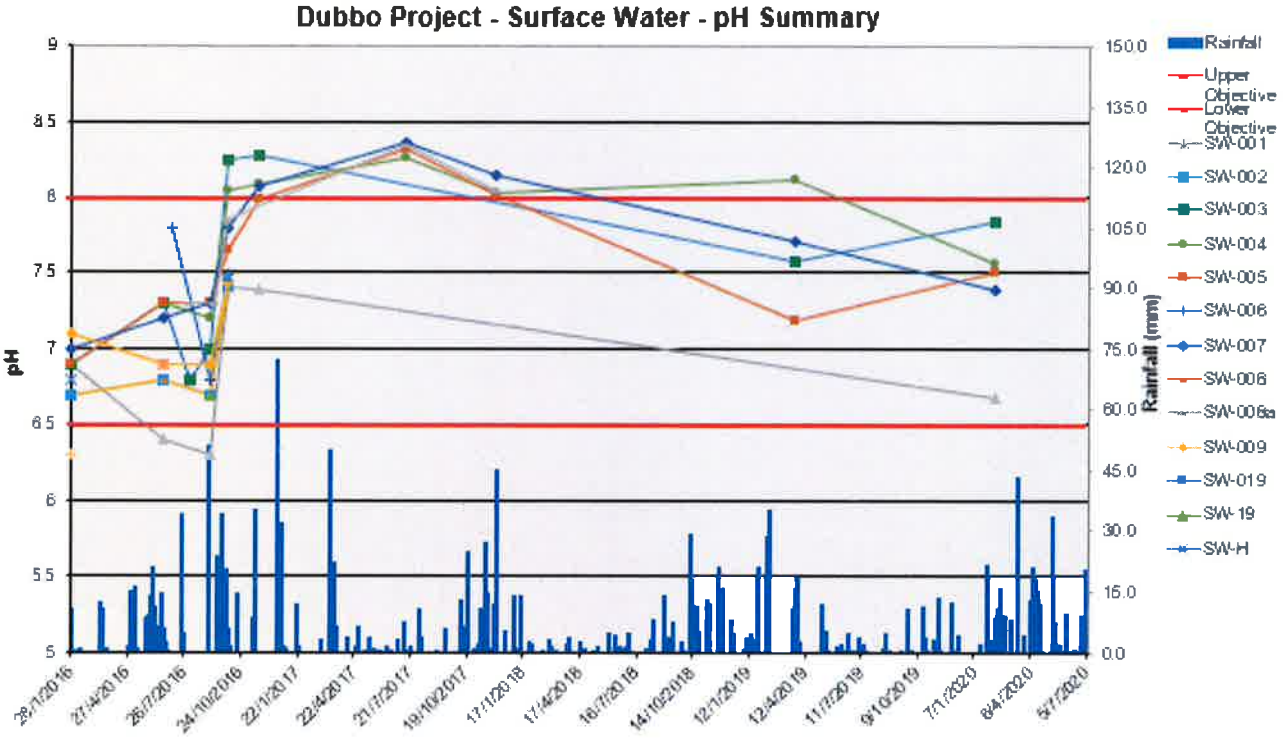
- TDS by method EA-015 may bias high for various samples due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

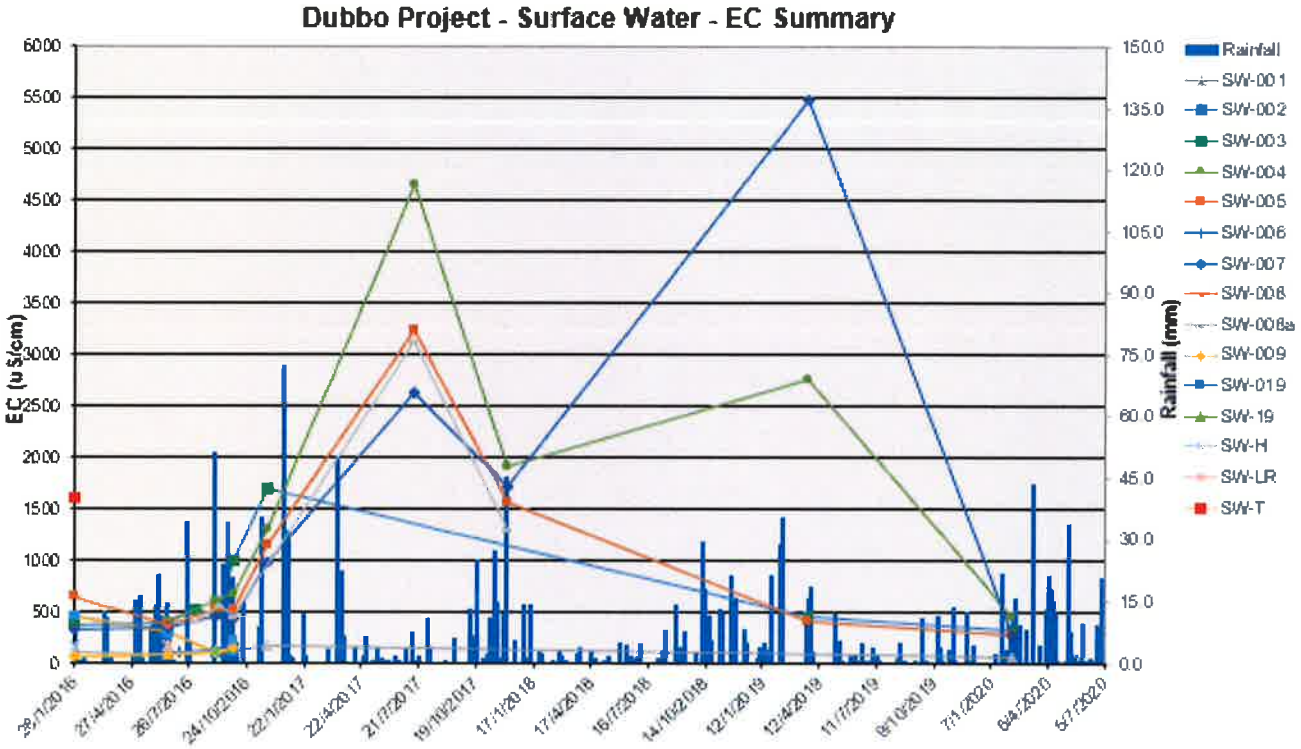
Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	SW-003	SW-004 Patty CK @ Wych	SW-005	SW-007	SW1 (Karingle NE)
			Client sampling date / time	10-Feb-2020 11:36	10-Feb-2020 11:07	10-Feb-2020 11:23	10-Feb-2020 11:00	10-Feb-2020 11:53
Compound	CAS Number	LOR	Unit	ES2004791-001	ES2004791-002	ES2004791-003	ES2004791-004	ES2004791-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.84	7.57	7.50	7.39	6.68
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	327	441	264	273	53
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	219	366	355	255	145
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	60	162	150	70	60
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	23	21	12	11	2
Magnesium	7439-95-4	1	mg/L	11	12	7	7	1
Sodium	7440-23-5	1	mg/L	20	37	22	27	3
Potassium	7440-09-7	1	mg/L	10	10	7	7	5
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	1.56	8.97	11.9	7.87	4.34
Arsenic	7440-38-2	0.001	mg/L	0.003	0.003	0.006	0.003	0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	0.004	0.013	0.019	0.012	0.009
Copper	7440-50-8	0.001	mg/L	0.002	0.014	0.016	0.013	0.004
Nickel	7440-02-0	0.001	mg/L	0.012	0.007	0.012	0.008	0.007
Lead	7439-92-1	0.001	mg/L	<0.001	0.005	0.008	0.004	0.003
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	0.008	0.028	0.039	0.028	0.034
Manganese	7439-96-5	0.001	mg/L	1.41	0.209	0.316	0.278	0.116
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	0.002	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Iron	7439-89-6	0.05	mg/L	3.85	10.2	14.2	9.01	3.21
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.27	0.21	0.26	0.26
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.09	0.07	0.06	0.06

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW-003	SW-004 Patty CK @ Wych	SW-005	SW-007	SW1 (Karingle NE)
				Client sampling date / time	10-Feb-2020 11:36	10-Feb-2020 11:07	10-Feb-2020 11:23	10-Feb-2020 11:00	10-Feb-2020 11:53
Compound	CAS Number	LOR	Unit		ES2004791-001	ES2004791-002	ES2004791-003	ES2004791-004	ES2004791-005
					Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	0.53	0.63	0.44	2.22
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	0.62	0.70	0.50	2.28
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.6	2.2	2.3	1.8	1.5
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		2.6	2.8	3.0	2.3	3.8
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.29	0.55	0.62	0.51	0.20
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	<5	<5	<5	<5
EP025: Oxygen - Dissolved (DO)									
Dissolved Oxygen	----	0.1	mg/L		8.2	8.4	8.5	8.5	8.9


Dubbo Project - Surface Water - pH Summary
pH
Rainfall (mm)
Rainfall
Upper Objective
Lower Objective
SW-001
SW-002
SW-003
SW-004
SW-005
SW-006
SW-007
SW-008
SW-008a
SW-009
SW-019
SW-19
SW-H


Dubbo Project - Surface Water - EC Summary
EC (u S/cm)
Rainfall (mm)
Rainfall
SW-001
SW-002
SW-003
SW-004
SW-005
SW-006
SW-007
SW-008
SW-008a
SW-009
SW-019
SW-19
SW-H
SW-LR
SW-T

APPENDIX E – Correspondence between Department of Planning Industry & Environment and Australian Strategic Materials Ltd

Planning, Industry & Environment

Mr Michael Sutherland
Australian Strategic Materials Ltd
PO Box 4384
Victoria Park WA 6979

Our ref: DOC19/797359

By email: MSutherland@alkane.com.au

12 September 2019

Dear Mr Sutherland

ML1724, Mining Act 1992, Australian Strategic Materials Ltd, Annual Rehabilitation Report

We refer to your Annual Rehabilitation Report (ARR) received by the NSW Department of Planning, Industry and Environment – Resources Regulator (the Department) on 2 September 2019 (Department Reference: RR19/230627).

NOTICE OF SATISFACTORY ARR

Pursuant to Condition 3 of ML1724, the above-mentioned ARR is to the satisfaction of the Minister for Resources.

It is the responsibility of the Authorisation Holder to ensure that all operations are consistent with relevant Project Approval or Development Consent requirements and that all necessary approvals and consents from the relevant Government Departments or Local Council are obtained to permit the operations.

DEFINITIONS

In this letter, words have the meaning given to those terms in the *Mining Act 1992*, unless otherwise specified below.

Annual Rehabilitation Report means the document named "Annual Review & Annual Rehabilitation Report 1 July 2018 – 30 June 2019" prepared by Australian Strategic Materials Pty Ltd and dated 30 August 2019 and covering the period from 1 July 2018 to 30 June 2019.

Department means the NSW Department of Planning, Industry and Environment – Resources Regulator.

If you have any questions about this letter, please contact Chloe Bigg directly on (02) 6360 9514.

Yours sincerely,

Christine Fawcett
Manager Environmental Operations
Resources Regulator
NSW Department of Planning, Industry and Environment

Signed under delegation from the Minister for Resources.