



# AUSTRALIAN STRATEGIC MATERIALS LTD

(Awholly owned subsidiary of Alkane Resources Ltd)

ABN 51 091 489 511

## **Annual Review & Annual Rehabilitation Report**

**1 July 2018 – 30 June 2019**



Drone view looking northeast across the Toongi trachyte. A ray of sunlight shines on the test pit ore stockpile. Photo taken 20 August 2018





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**APPENDIX A** - Pink-tailed Worm-lizard Monitoring Report October 2018 - Area Environmental Consultants & Communication (AREA 2018); Vegetation Monitoring 2018 (AREA 2019)

**APPENDIX B** - Meteorological Data July 2018- June 2019

**APPENDIX C** - Water Monitoring Location Photographs 26 March 2019

**APPENDIX D** - Water Monitoring results 2016 -2019

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





## Definitions


Term	Definition
ASM	Australian Strategic Materials Ltd
AZL	Australian Zirconia Ltd
BOA	Biodiversity Offset Area
CaCO <sub>3</sub>	Calcium carbonate
CPVP	Conservation Property Vegetation Plan
CCC	Community Consultative Committee
DP	Dubbo Project (formerly known as DZP - Dubbo Zirconia Project)
DPE	Department of Planning & Environment
DRC	Dubbo Regional Council
DRG	Department of Resources and Geoscience
DSC	Dam Safety Committee
EEC	Endangered ecological community
EC	Electrical Conductivity
EPA	Environment Protection Authority
EP&A	<i>Environment Planning and Assessment Act 1979</i>
EPBC	<i>Environment Protection &amp; Biodiversity Conservation Act 1999</i>
ERML	Environmental Radiation Monitoring Location
EPL	Environment Protection Licence
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
Mining Act	<i>Mining Act 1992</i>
MOP	Mining Operations Plan
ML	Mining Lease
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 ( <i>Aprasia parapulchella</i> )
PVP	Property Vegetation Plan
RAP	Registered Aboriginal Party
REE	Rare Earth Elements
RMS	Roads and Maritime Services
ROM	Run of Mine
SEEC	Strategic Environmental and Engineering Consulting
TARP	Trigger action response plan
TEOM	Tapered Element Oscillating Microbalance
TIM	Total Insoluble Matter
TPC	Toongi Pastoral Company Pty Ltd
SEC	Salt Encapsulation Cell
SRSF	Solid Residue Storage Facility
TPC	Toongi Pastoral Company
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
<p>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.</p> <p>Note.</p> <p>a) 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.</p> <p>b) 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).</p>	
Name of authorised reporting officer	Michael Sutherland
Title of authorised reporting officer	General Manager NSW
Signature of authorised reporting officer	
Date	30 August 2019



## 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	Relevant 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: <ul style="list-style-type: none"> <li>potential for serious environmental consequences, but is unlikely to occur; or</li> <li>potential for moderate environmental consequences, but is likely to occur</li> </ul>
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> <li>potential for moderate environmental consequences, but is unlikely to occur; or</li> <li>potential for low environmental consequences, but is likely to occur</li> </ul>
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.**

ASM is a wholly owned subsidiary of Alkane Resources Ltd. The DP, approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015, comprises 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 is yet to be constructed 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.

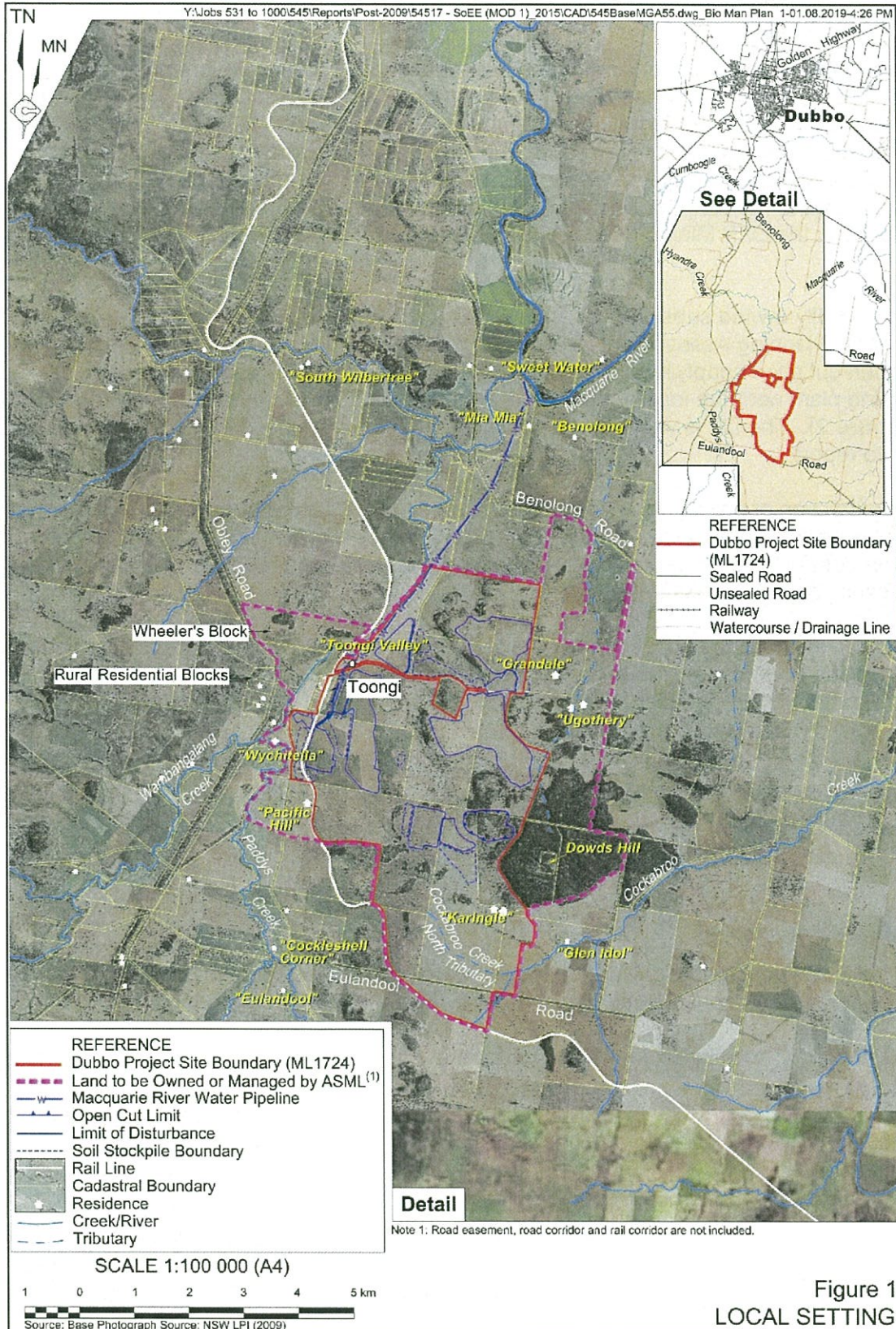
**Table 4. Dubbo Zirconia Project Key Contacts**

Key Contact	Position	Contact Details
Nic Earner	Managing Director	PO Box 4384, Victoria Park, WA 6979 Phone (08) 9227 5677
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 1  
 LOCAL SETTING**





Figure 2: Dubbo Project – Site Layout

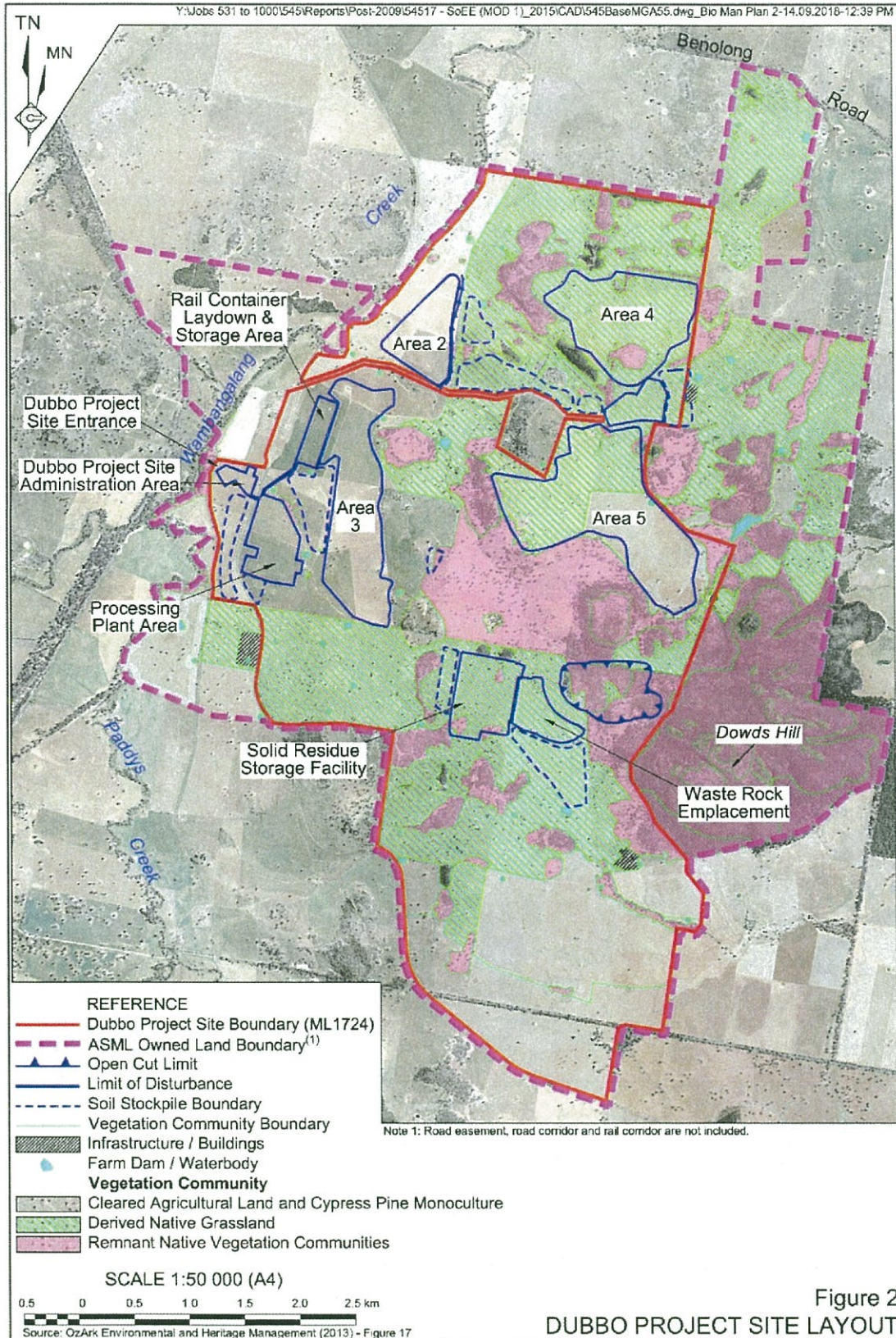
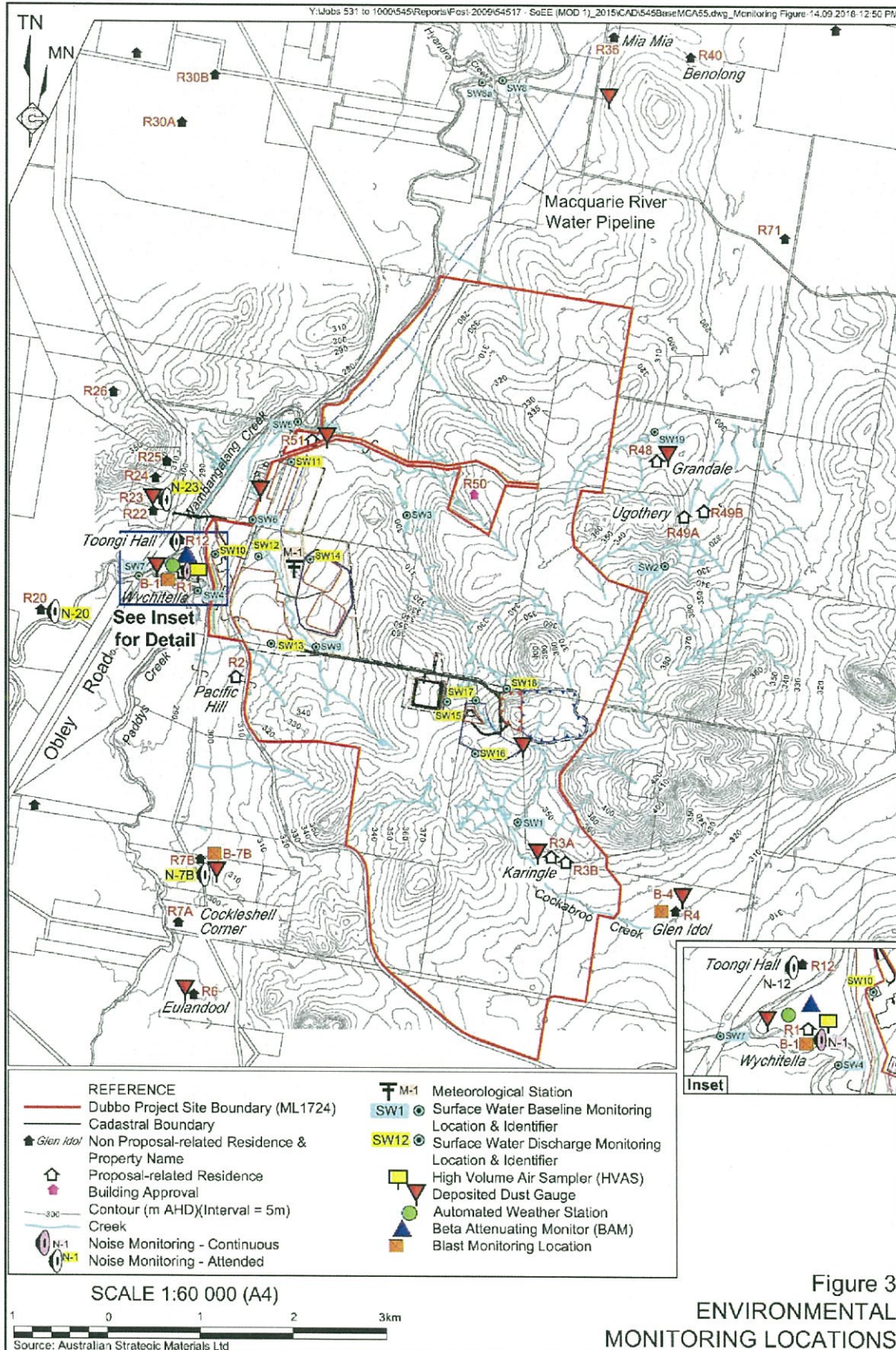


Figure 2  
DUBBO PROJECT SITE LAYOUT





**Figure 3: Dubbo Project – Environmental Monitoring Locations**

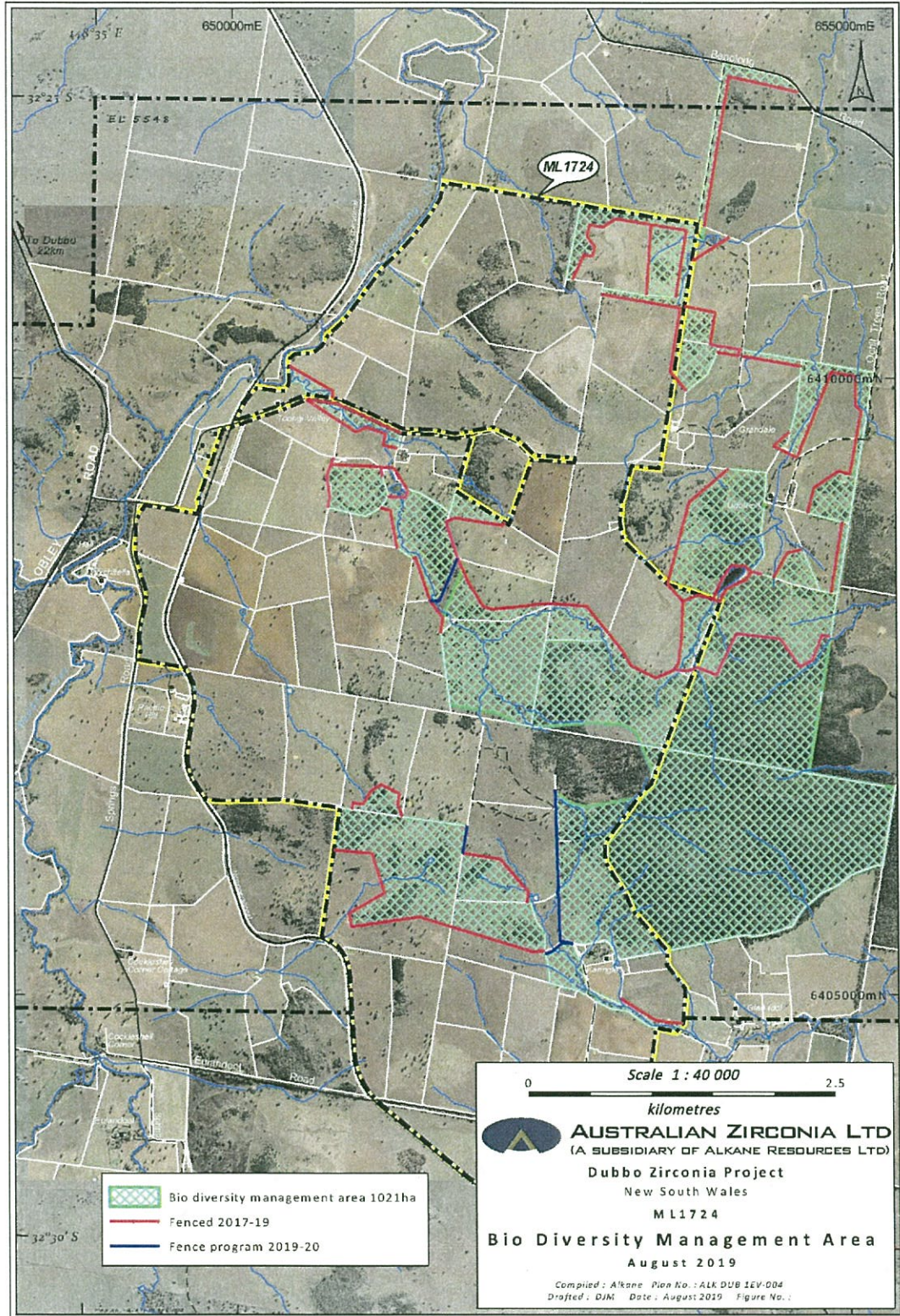


**Figure 3 ENVIRONMENTAL MONITORING LOCATIONS**





**Figure 4.: Biodiversity Management Area**







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

**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 2019. 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 acquired 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 Alkane staff.

Ecological monitoring continues to be undertaken by qualified professionals.

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

#### 3.3 Next reporting period

During the next reporting period, assuming project finance has been secured (1 July 2019 to 30 June 2020) 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 will be repaired/and or replaced in 2019-2020. See **Figure 4**.



#### 4 Actions required from previous Annual Review

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

**Table 6. Actions from review previous Annual Review**

<b>Actions Required from previous Annual Review</b>	<b>Requested by</b>	<b>Action taken by Operator</b>	<b>Section where discussed</b>
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 Alkane 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

[http://www.alkane.com.au/current\\_projects/dp-environment/management-plans](http://www.alkane.com.au/current_projects/dp-environment/management-plans)

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

**Table 7. Long term criteria for deposited dust**

<b>Pollutant</b>	<b>Averaging period</b>	<b>Maximum increase in deposited dust level</b>	<b>Maximum total deposited dust level</b>
c Deposited dust	Annual	b 2 g/m <sup>2</sup> /month	a 4 g/m <sup>2</sup> /month
<p><i>Notes to Table 7:</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources);</li> <li><input type="checkbox"/> b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);</li> <li><input type="checkbox"/> c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003:</li> </ul>			

Before construction commences a High Volume Sampler (HVS) for measuring Total Suspended Particulates (TSP) and PM<sub>10</sub> (particulate matter <10µm) will be installed in the at a location (WY1) between Wychitella homestead and the Toongi Hall.

Deposited dust is currently measured at 12 locations within and neighbouring the project site. Baseline deposited dust data collection recommenced on 29 November 2012.

Deposited dust gauges are changed over monthly and three sample sites have 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.

Five 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.

2018-2019 has seen numerous raised dust events due to statewide drought conditions. HVS sampling at Alkane's Tomingley Gold Operations provide supporting evidence of raised dust events.



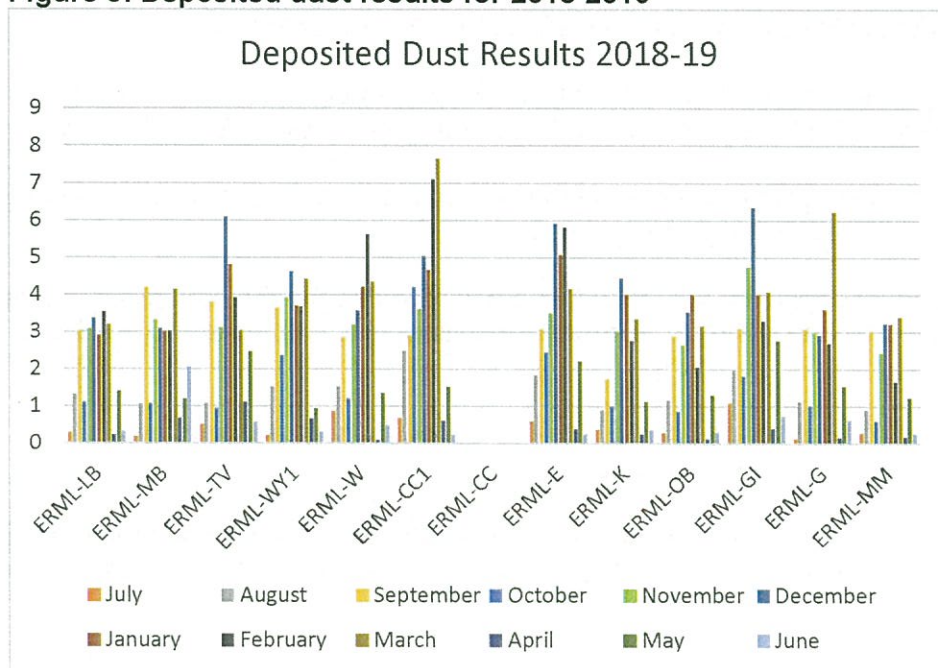


**Table 8. Deposited Dust Results**

Site ID	Site Name	Annual Dust Deposition Rates (g/m <sup>2</sup> .month)			
		2015-2016	2016-2017	2017-2018	2018-2019
		23/6/15 - 2/6/16	2/6/16 - 2/6/17	4/7/17 - 2/7/18	2/7/18 - 2/7/19
ERML-LB	Lifestyle Blocks	0.761	0.572	0.815	2.027
ERML-MB	Malcolm Bye's	1.820	1.613	0.719	2.270
ERML-TV	Toongi Valley	1.118	0.912	1.076	2.694
ERML-WY1	Wychitella Homestead		1.641	1.032	2.538
ERML-W	Wychitella	0.800	0.614	0.993	2.472
ERML-CC1	Cockleshell Corner Cottage		1.564	1.320	3.411
ERML-CC	Cockleshell Corner				
ERML-E	Eulandool	2.030	1.493	1.075	2.999
ERML-K	Karingle	0.658	1.514	0.862	1.99
ERML-OB	Ore Body	0.574	0.843	0.708	1.919
ERML-GI	Glen Idol	1.052	1.252	1.680	2.943
ERML-G	Grandale	4.669	2.667	1.178	2.223
ERML-MM	Mia Mia	3.524	0.911	0.713	1.753

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

**Figure 5: Deposited dust results for 2018-2019**







### 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 has continued as the drought conditions have extended beyond June 2019.

### 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 prior 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 Alkane 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.

See Appendix A for a letter report on vegetation plot monitoring (AREA 2019).

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

One PTWL survey was conducted on 16 October 2018 by one ecologist and three Alkane staff under ideal PTWL survey conditions (fine and warm conditions after 12.4mm of rain over the preceding week). See Appendix A for survey results. No PTWL were found during the survey. However, six species of reptiles and two frog species were found under the tiles. 18 of 100 tiles were providing habitat for reptiles (18%).

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





Extremely dry seasonal conditions in 2019 meant that a PTWL survey was not conducted in the autumn.

ASM settled on the last of the Dubbo Project property acquisitions 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.

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 during this reporting period.

The recently acquired 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.

Kangaroos, 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 replace some fencing (old with new) 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 vertebrate pest (pigs, foxes, cats and rabbits) 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 2019 which will likely provide baseline data on the effects of extreme drought on vegetation (ungrazed by livestock) that is being protected for its biodiversity value

### **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.

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

#### **5.3.1 Management Measures**

As recorded heritage sites are located away from site operational areas, and no new sites or items were identified during the reporting year, management of the existing sites mainly 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.

### 5.4 Meteorological Monitoring

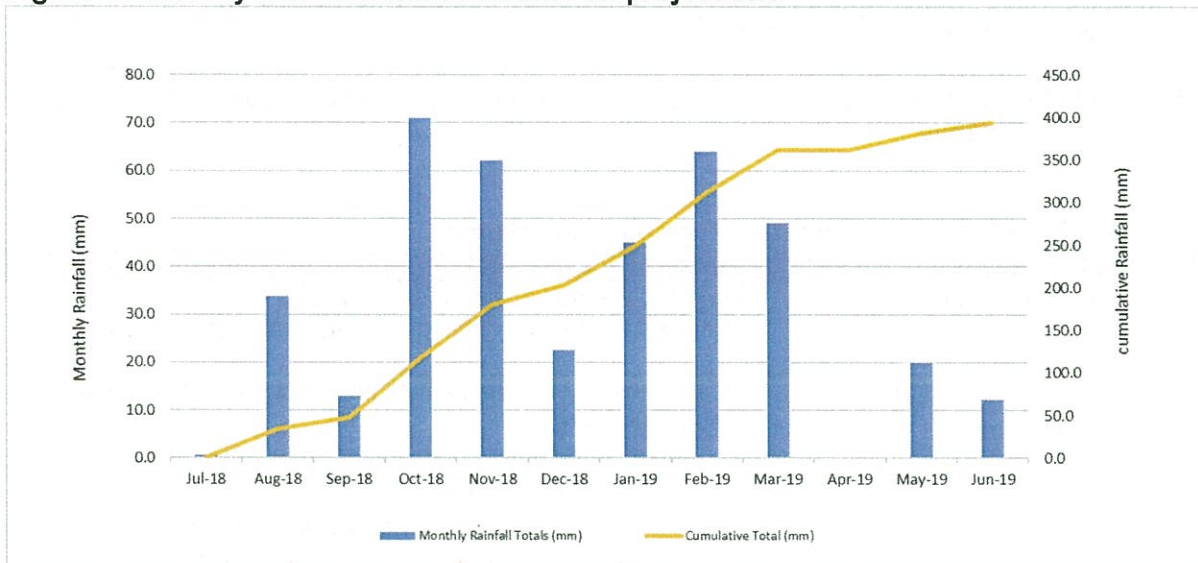
The met station at Wychitella has been operating since 2001.

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

Wind speed data represented in Wind Roses in Appendix B indicate that wind speed data is missing from the record since October 2018.

**Figure 6.** Wychitella monthly and cumulative rainfall to 30 June 2019. A total 393.4mm of rain fell over the reporting period which has seen prolonged drought conditions persist after 294.6mm fell in the preceeding period.

**Figure 6: Monthly and cumulative rainfall on project site**



#### 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.



## 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/rehydration of watercourse B.

Rainfall in this reporting period was so low that only one occasion provided a surface water sampling opportunity.

**Table 10. Water management performance measures**

<b>Feature</b>	<b>Performance Measure</b>
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: <ul style="list-style-type: none"> <li>• minimise the impact on watercourse water quality, hydrology and function;</li> <li>• minimise the impact on the habitat of aquatic species, populations or communities, consistent with the <i>Guidelines for fish habitat conservation and management – Chapter 4</i> (DPI 2013), or its latest version;</li> <li>• ensure pipelines across perennial watercourses are installed by directional drilling (under-boring) or attached to rail or road bridge crossings; and</li> <li>• be in accordance with NOW's <i>Guidelines for Controlled Activities on Waterfront Land</i> (2012), or the latest version(s).</li> </ul>
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	<p>Nil discharge from site. Design, construct and maintain:</p> <ul style="list-style-type: none"> <li>• in accordance with the recommendations of the NSW Dam Safety Committee;</li> <li>• to be stable over the long term and under all expected loading conditions;</li> <li>• in accordance with the standards set out in the <i>Environmental Guidelines – Management of Tailings Storage Facilities</i> (VIC DPI, 2006); and</li> <li>• to be lined with HDPE liners or equivalent that complies with a minimum permeability standard of <math>&lt; 1 \times 10^{-9}</math> m/s in accordance with the <i>NSW Environmental Guidelines for Solid Waste Landfills</i> (EPA, 1996), unless otherwise agreed with the EPA; and</li> <li>• to ensure the Solid Residue Storage Facility and Salt Encapsulation Cells are double-lined and include an adequate leak detection system.</li> </ul> <p>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.</p>
Waste Rock Emplacement	<p>Design, install and maintain the emplacement to encapsulate and prevent:</p> <ul style="list-style-type: none"> <li>• migration of potentially acid forming material, and saline and sodic material; and/or</li> <li>• manage long term saline groundwater seepage.</li> </ul>
Clean water diversion & storage infrastructure	<p>*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.</p>
Flood mitigation measures	<p>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.</p>
Sediment control structures	<p>Design, install and maintain erosion and sediment controls generally in accordance with <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries</i>.</p>
Chemical and hydrocarbon storage	<p>Chemical and hydrocarbon products to be stored in covered, impervious bunded areas in accordance with the relevant Australian Standards.</p>
Aquatic and riparian ecosystem	<p>Maintain or improve baseline channel stability.</p>



**Table 10. Water management performance measures**

<b>Feature</b>	<b>Performance Measure</b>
	Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and <i>Using the ANZECC Guidelines and Water Quality Objectives in NSW</i> 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**

<b>Water Licences</b>	<b>Water sharing plan, source and management zone (as applicable)</b>	<b>Entitlement (ML)</b>	<b>Active pumping</b>
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 <i>Aquifer</i>	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 be kept separate from existing 'clean' water discharges from the ephemeral drainage lines that drain the Toongi Pastoral Company 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 undisturbed 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

Owing to a lack of rain events, baseline surface water monitoring was carried out on one occasion only (26 March 2019) during the reporting period. There have only been diminishing flows in Paddys and Wambangalang Creeks since December 2017 through 2018 and 2019 as drought conditions prevail.

Sample results indicate increasing salinity levels in Wambangalang 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.





**Table 12. Stock and domestic 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

One bore on a neighbouring property was sampled during this round of monitoring to provide baseline data for the owner.

Seven geotech bores/piezometres (installed September 2014) were dipped for water levels on 7 September 2017, 11 September 2018 and 21 August 2019. 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	Reference Point (m above ground level)
C	13.06	Dry	Dry	Dry	Dry	N/A
S	15.72	Wet	10.73	12.86	14.42	0.75
W	15.27	Wet	15.24	15.26	Mud	0.7
E	14.95	Wet	Dry	Moist	Dry	0.9
Q	15.66	Wet	11.61	12.00	12.34	0.85
I	16.3	Dry	Dry	N/A	Dry	N/A
Y	11.6	Wet	8.93	9.45	9.8	0.9

## 6.7 Proposed Water Management Improvements

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

RW Corkery & Co will collate all the surface water quality data since the first groundwater bores were established for the EIS and provide the key elements graphically 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 Landuse

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.

Category	Objective		Target(s)
	Rehabilitation	BOA	
Ecosystem Development (Final Land Use)	Protect, enhance and extend areas of remnant native vegetation.		<ul style="list-style-type: none"> <li>Secure the BOA under PVP or equivalent mechanism.</li> </ul>
	Maintain habitats on the final landform which encourage colonisation by native flora and fauna with specific niche requirements.		<ul style="list-style-type: none"> <li>Species diversity and density of rehabilitated landforms equivalent to analogue sites established within the BOA.</li> </ul>
	Extend, improve, protect and link areas of remnant native vegetation.		<ul style="list-style-type: none"> <li>Secure the BOA under PVP or equivalent mechanism.</li> <li>Prepare and implement a Biodiversity Management Plan (BMP).</li> </ul>
	Retain areas on the DZP Site amenable to future agricultural or industrial activities.	-	<ul style="list-style-type: none"> <li>Agricultural productivity of land equivalent to pre-mining landforms.</li> </ul>
Post-Mining Land Use	Maximise positive and minimise adverse socio-economic outcomes following mine closure.	-	<ul style="list-style-type: none"> <li>Consult with the community and government agencies in relation to the post-mining land use.</li> <li>Rehabilitate the Mine in accordance with <b>Plan 4</b>, unless otherwise agreed.</li> </ul>

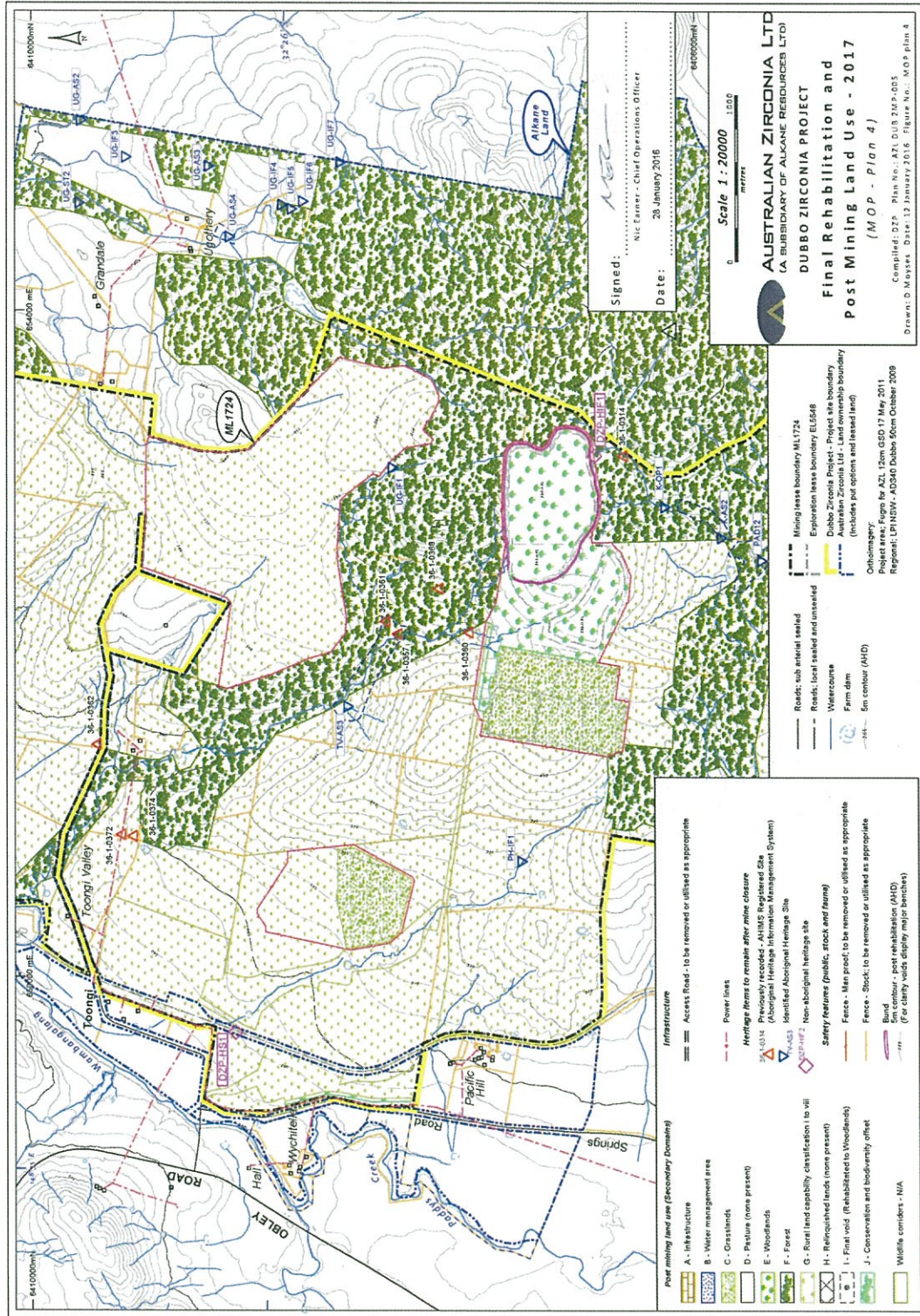




Category	Objective		Target(s)
	Rehabilitation	BOA	
	Provide rehabilitated woodland communities which adjoin the established Biodiversity Offset Area to maximise the wildlife corridors created within the local setting.	Undertake habitat augmentation to improve and promote corridors for fauna movement linking adjacent remnant woodland vegetation with the rehabilitation of the Mine.	<ul style="list-style-type: none"> <li>• Establish woodland vegetation over the landform equivalent to local analogues of that community.</li> <li>• Visual identification of wildlife corridors within the largely agricultural setting.</li> <li>• Conserve under a Conservation PVP 1021ha of remnant native vegetation in accordance with a Biodiversity Offset Strategy.</li> </ul>
	Integrate areas of biodiversity enhancement and conservation with agriculture.		<ul style="list-style-type: none"> <li>• Undertake agricultural activities on the Mine Site, including within the BOA in accordance with a PVP and BMP.</li> </ul>
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.		<ul style="list-style-type: none"> <li>• 50% within 5 years of final rehabilitation.</li> <li>• 100% within 10 years of final rehabilitation.</li> </ul>



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.



## 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 on the:

- 2 July 2018;
- 5 November 2018 (cancelled)
- 4 March 2018; and

No meeting was held in November 2018 as there was little progress with project offtake agreements and funding. Updates on the project from ASX announcements were emailed to the committee member.

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

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 Alkane Resources website ([www.alkane.com.au](http://www.alkane.com.au)).

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 community 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 conditions:

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 DPE 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 construction 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 2018-2019**

<b>Proposed Activities</b>	<b>Location</b>	<b>Proposed Completion Date</b>
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
Fencing and signage in accordance with the Biodiversity Offset Management Plan and PVP	Offset areas	30 May 2019
Design restoration works drainage line B in the BOA for stream bed rehabilitation	Biodiversity and rehabilitation areas	June 2019
Pink-tailed Worm Lizard Survey	PTWL Offset areas	Spring 2018 & Autumn 2019
Continue weed management and rubbish removal	Biodiversity offset areas	2018-2019



**APPENDIX A - Pink-tailed Worm-lizard Monitoring Report October 2018 - Area  
Environmental Consultants & Communication (AREA 2018);**

**Vegetation Monitoring 2018 – Letter report (AREA 2019)**







ABN:29 616 529 867

Advanced Regional Environmental Assessments (AREA)



**AUSTRALIAN STRATEGIC MATERIALS LTD**

(A wholly owned subsidiary of Alkane Resources Ltd)

ABN 51 091 489 511

# Pink-tailed Worm-lizard monitoring report

October 2018



AREA Environmental Consultants & Communication

(1) 6 Belmore Street Dubbo NSW 2830

(2) "Thieles Gate" (A Voluntary Conservation Area (79 Huonbrook Rd via Mullumbimby NSW 2482

Ph 0409 852 098

[phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)



ABN:29 616 529 867

Advanced Regional Environmental Assessments (AREA)

## 1 Introduction

---

Pink-tailed Worm-lizard (PTWL) and tile (artificial habitat) monitoring was carried out on 16 October 2018. The monitoring team included Phil Cameron (AREA Environmental Consultants & Communication), Mike Sutherland (Alkane Resources), Ken Robinson and Christian Munge.

This monitoring program is underpinned by and implemented in accordance with the PTWL Plan of Management (Biosphere Environmental Consultants Pty Ltd May 2013). The proposed Dubbo Project will oversee the continued monitoring and management of the landscape, biodiversity and the PTWL. The application State Significant Development approval is currently with Department of Planning and Infrastructure.

Monitoring of the PTWL is scheduled to occur towards the end of spring and autumn each year. In autumn 2018 monitoring was not conducted due to unfavourable rainfall and temperatures, during the preceding spring and summer.

This October 2018 monitoring effort was timed to fall in the week following rainfall to increase the likelihood of collecting useful data.

This monitoring effort involved checking and data collection from five tile locations. These were Glen Idol, Ugothery East Lower, Ugothery Dowds Hill, Grandale and Mountain Offset.

Mountain Offset tiles have not previously been checked. Location data for Mountain Offset tile sets were collected however next survey, location data will need to be collected for tiles sets number two and number ten from this series as these were mistakenly not collected during this survey.

Tile numbers were repainted as required on the tile sets checked this survey.





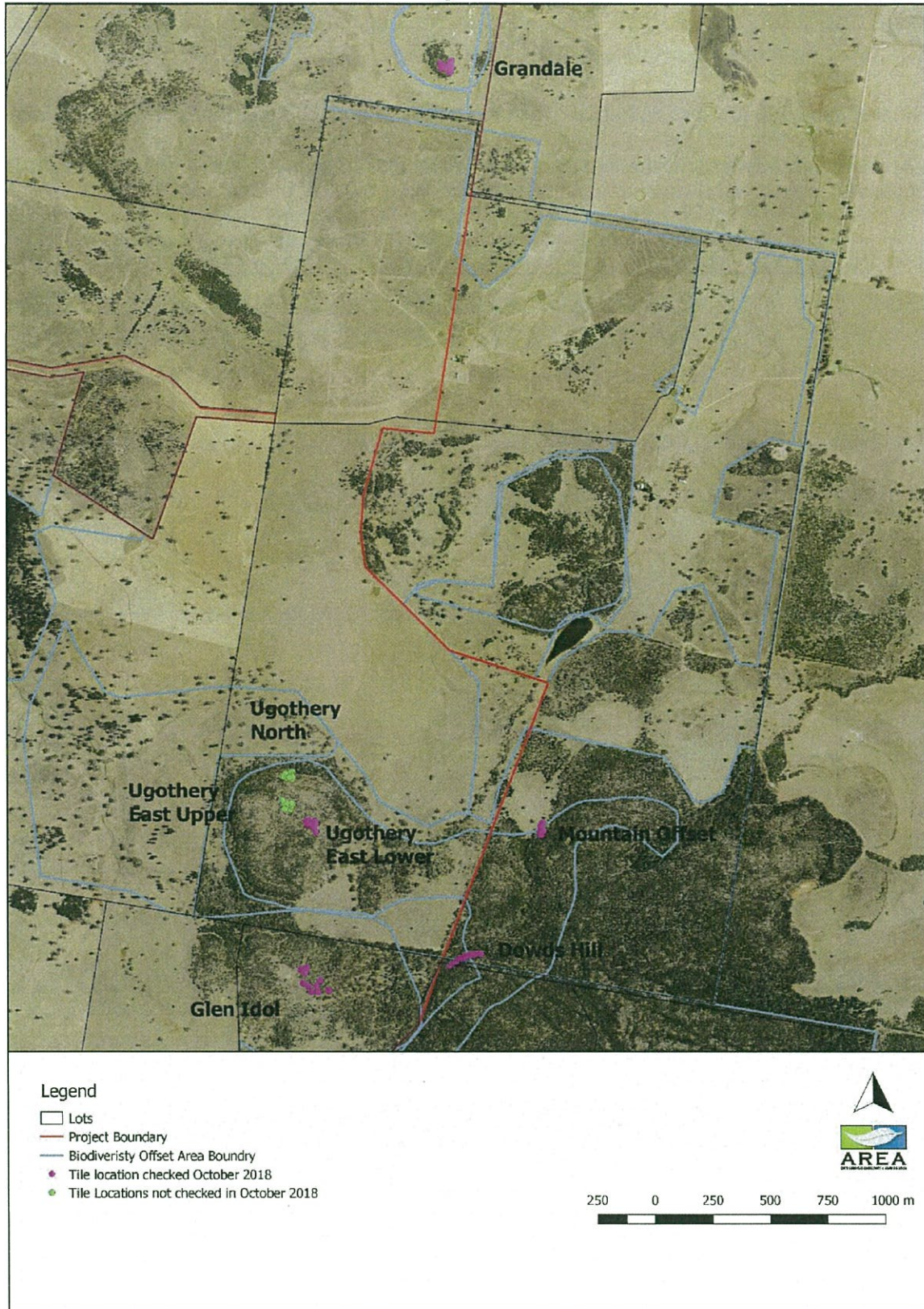


**AREA**

ABN:29 616 529 867

Advanced Regional Environmental Assessments (AREA)

Figure 1



AREA Environmental Consultants & Communication

(1) 6 Belmore Street Dubbo NSW 2830

(2) "Thieles Gate" (A Voluntary Conservation Area (79 Huonbrook Rd via Mullumbimby NSW 2482

Ph 0409 852 098

[phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)





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## 2 Weather conditions

### 2.1 Preceding weather conditions

Rainfall has been low for 2018; 2016 was the wettest year since 1994 (at Dubbo Airport) with a total of 916.4mm and the year to date rainfall for Dubbo (at Dubbo Airport) as 22 November 2018 is only 253.4mm. In the two and a half months leading up to the monitoring event it continued to be low, however several falls of rain in the first half of October (Figure 2).

Figure 2: Rainfall. August 2018 to October 2018 (Survey date was 7 October).

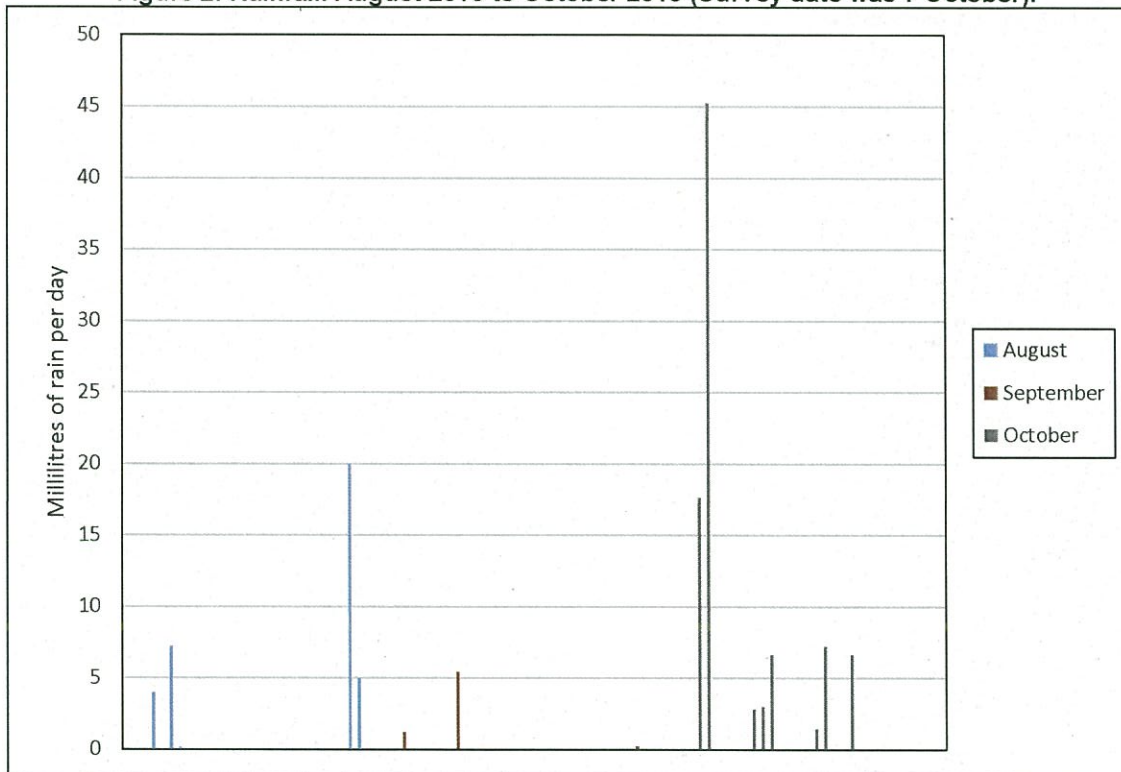


Table 1: Dubbo temperature data for spring 2013.8

(Elders Weather: <https://www.eldersweather.com.au/dailysummary.jsp?lt=site&lc=65070&dt=1>)

	August	September	October
<b>Daily maximum</b>	12.3 – 23.0	16.1 – 30.5	18.2 – 33.8
<b>Ave maximum</b>	18.3	22.8	26.5
<b>Overnight minimum</b>	-2.8 – 10.2	0.5 – 11.7	7.0 – 16.5
<b>Ave minimum</b>	7.2	6.4	12.0
Number of days with maximum within given temperature range	August	September	October
< 20	21	8	2
20 -25	10	13	7
25 – 30	0	8	18
30 – 35	0	1	4
35 - 40	0	0	0
> 40	0	0	0



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Ph 0409 852 098

[phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)





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## 2.2 Weather conditions on day of monitoring

Temperature on the day of the monitoring reached 29.5 degrees Celsius during the monitoring (monitoring data collection) and reached a maximum of 29.6 degrees Celsius for the day (at Dubbo Airport).

Air temperature was recorded at each tile set and is compared with soil temperature under each tile set in section 2.2.

## 3 Soil parameters

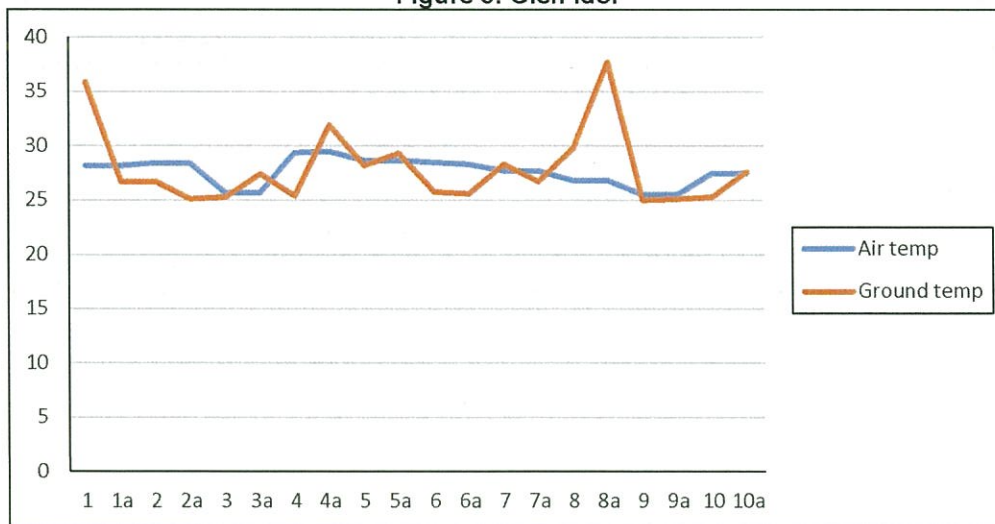
### 3.1 Soil type/ geology

No further data was collected in this area. Soil type and underlying geology were previously determined and reported in the Environmental Impact Assessment. Soil and geology data may be refined through further investigation during future monitoring events in order to draw a closer link between this parameter and PTWL habitat selection.

### 3.2 Soil temperature

Temperature was collected on the surface of the soil, under each set of tiles. Generally, the temperature under the tiles did not differ greatly from the air temperature. In fact, which temperature was higher of these two measurements was not consistent at any site although was almost so at Grandale, where air temperature was mostly higher than the soil temperature under the tile. Further, temperature under the tile seems less consistent from tile to tile than air temperature. This suggests that air temperature alone is not a reliable gauge for temperature under the tile and is likely to be influenced by direct sunlight on the tiles and soil moisture.

Figure 3: Glen Idol





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Figure 4: Ugothery East Lower

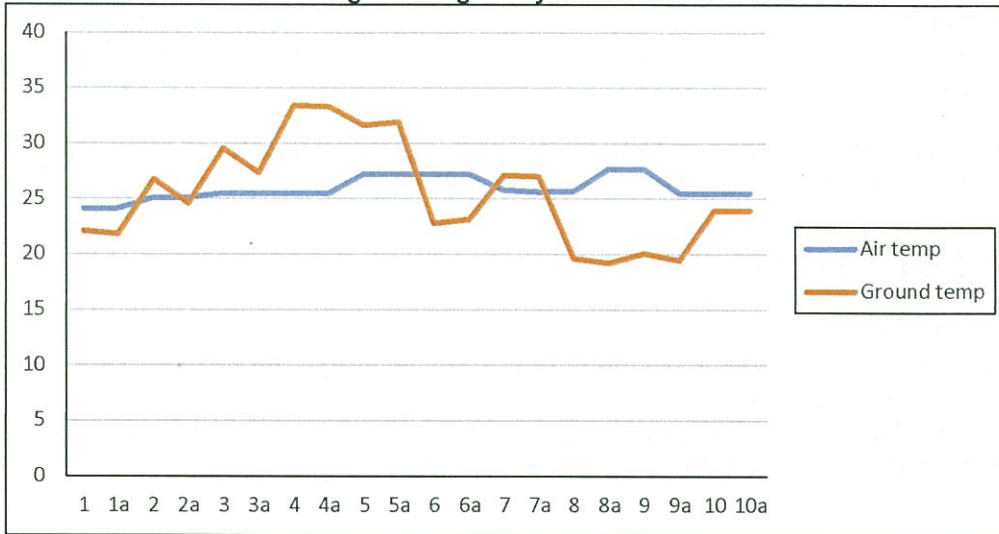


Figure 5: Ugothery Dowds Hill







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Figure 6: Grandale

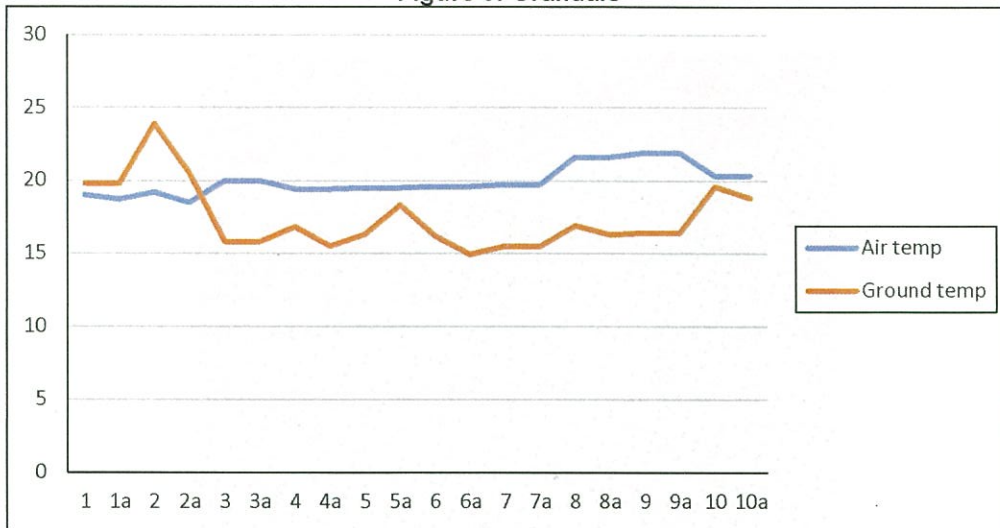
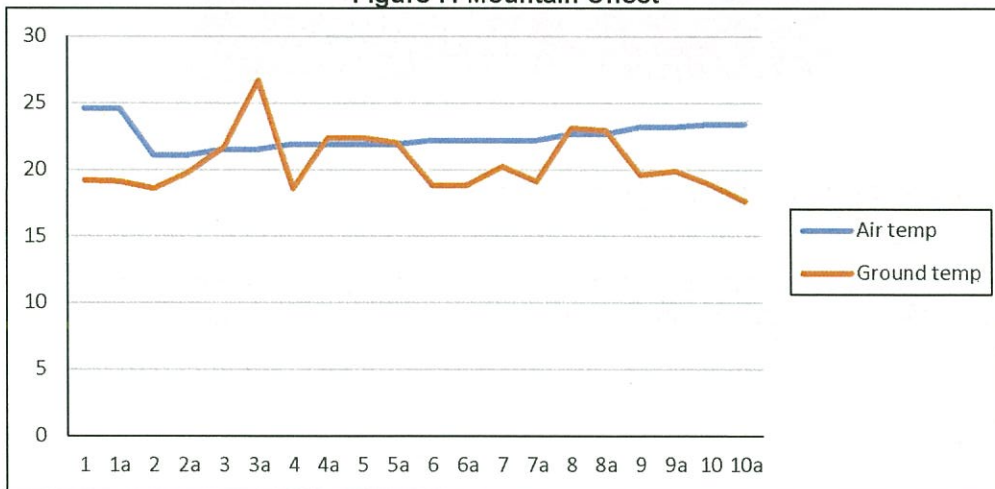


Figure 7: Mountain Offset



### 3.3 Soil depth

Depth of soil was not measured during this monitoring effort.

Soil depth data collected at a single point under the tile is unlikely to give a comprehensive understanding of soil depth beneath the tiles. Long term collection of this data however may give a general indication of soil depth at each site.

### 3.4 Moisture

Moisture was assessed by overall visual inspection only. 12.4mm of rain had fallen seven days prior to this monitoring effort. For 68 of 100 of the tile sets checked the soil was considered moist, and for 32 of 100 tile sets checked the soil was considered dry. Of the 32 with dry soil, 20 were from the same location.

Moisture content of the soil is further indicated by detection of three Desert Tree Frogs (*Litoria rubella*) beneath a tile.



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Plate 1



### 3.5 Soil pH

Soil pH was not measured this monitoring effort.

### 3.6 Sun exposure

The amount of sun on the tile/ tile group at the time of checking was not recorded during this monitoring effort. The monitoring on 16 October 2018 was concluded at approximately 12:15pm

## 4 Flora

---

In general, the flora of the area was less biodiverse due to the relatively harsh environmental conditions over the previous months to years.

It was noted that under one tile set at Grandale, and about three tiles at Urothery East Lower but to a much lesser extent, that seed burrs from Clover Burr (*Medicago polymorpha*) had been gathered and stored, presumably by ants or another invertebrate.



Plate 2



## 5 Fauna

### 5.1 Ants

An assessment of individual ant count under each tile was not conducted this monitoring effort. The monitoring team focused on counting number of ant species and number of burrows present under each tile set.

#### Ant Burrows

Burrow counts ranged from greater than ten on three occasions at Ugothery East Lower, to zero on 12 occasions across all locations. Frequency of each burrow count total are provided in Table 2. Most burrows were likely to be created by ants however to very large burrows were found, both associated with inch ants and were possibly burrows for other reptiles.

Table 2

Burrow count	Tally
0	12
1	26
2	15
3	10
4	14
5	10
6	5
7	1
8	4
9	0
10	0
>10	3

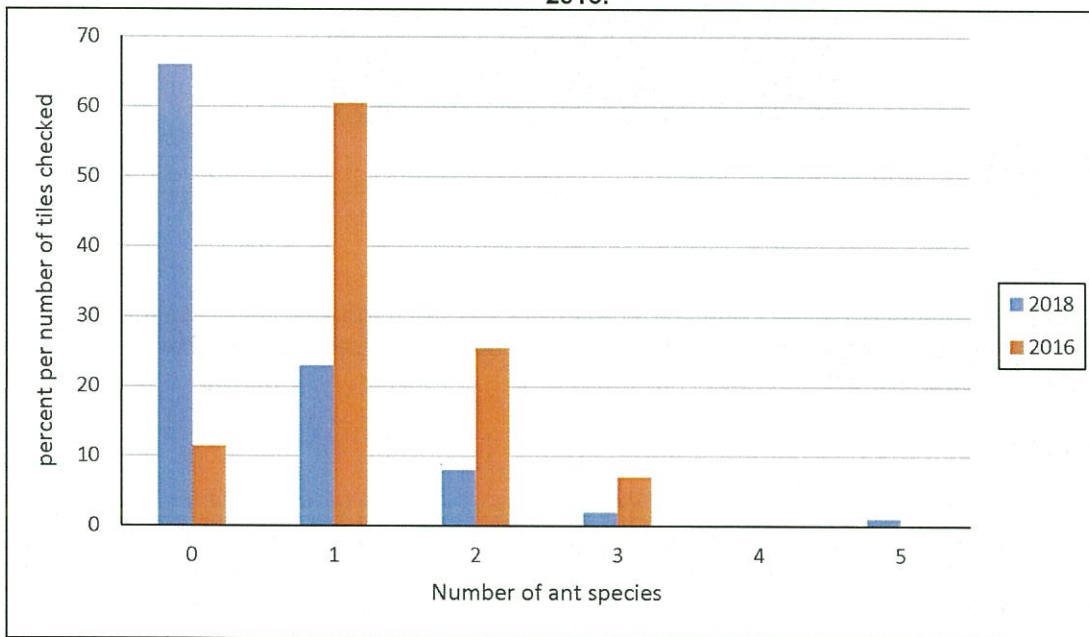


### Ant species

Ants were found under 34 of 100 tile sets, which is 34%. In 2014, ant activity was noted below 94% and in 2013 ant activity was noted under 83% of tiles.

During this survey effort ants were not collected nor were any species identified, however a count was taken of the number of different species seen under each tile set. The number of times each number of ant species counts for 2018 was compared to the same count for October 2016 (Figure 8). In 2016, most tiles (61%) revealed one species of ant, in 2018, most tiles (69%) revealed no ants. In 2018, 100 tile sets were checked and in 2016 114 tile sets were checked. This may be a result of the drought that has recently been gripping NSW.

Figure 8: Percentage of times each ant species count occurred, October 2018 versus October 2016.



Of the 34 tile sets which revealed ants, 14 were under single tiles, while 20 were under groups of tiles. While there were so few tiles used my ants during this monitoring, there is still, a perhaps not scientifically significant, benefit to a group of tiles.

Ant presence was recorded in all locations at reasonably consistent rates, under both single and groups of tiles, except for single tiles at Dowds Hill (Table 3). Ants were found under groups of tiles more frequently, however this is unlikely to be a significant difference.

Table 3

Tile location	Ants under single tiles	Ants under groups of tiles	Total
Ugothery East Lower	5	4	9
Grandale	4	3	7
Glen Idol	5	4	9
Dowds Hill	3	0	3
Mountain Offset	2	3	5
<b>Total</b>	<b>19</b>	<b>14</b>	





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## 5.2 Other invertebrates

Presence of other invertebrates under the tiles was noted:

- Spider activity was recorded under 28% of tiles (45% in 2016)
- Other invertebrates were found under 44% of the tiles (55% in 2016)
- Signs of other invertebrates were under one (1%) of the tiles.

## 5.3 Reptiles and other vertebrates.

The monitoring team felt like they saw other reptiles under the tiles than on previous monitoring occasions. A total of 18 of 100 tiles revealed reptiles (18%), and 2 of 100 tiles revealed frogs. A mouse nest was also noted under one tile set. When compared to monitoring results from 2016, the increase was minor – 15 of 114 tiles revealed reptiles (13%).

Summary of reptiles and other vertebrates under the tiles:

- *Morethia boulengeri* was discovered under seven tile sets, all of which were groups of tiles.
- *Ctenotus robustus* was discovered under five tiles, of which three were single tiles and two were groups of tiles.
- *Menetia greyii* was discovered under two sets of tiles, of which one was a group and one was a single tile.
- *Underwoodisaurus milii* was discovered under two sets of tiles, of which one was a group and one was a single tile. A skin of this species was found under a separate tile.
- Two frogs were discovered under groups of tiles, one was Desert Tree Frog (*Litoria rubella*) and the other was Peron's tree frog (*Litoria peronii*).
- One Red-naped Snake (*Furina diadema*) was found under a single tile.
- One skink was found under a group of tiles was unable to be identified before it escaped.

This is a total of 18 of 100, or 18% of tiles checked revealing a reptile (other than PTWL).

To continue the comparison with the 2016 monitoring, in October 2016 the monitoring revealed:

- *Morethia* – under six tile sets
- *Ctenotus* – under six tile sets
- *Menetia* – under two tile sets (one shared a tile space with a *Ctenotus*)
- Gecko – under one tile set
- *Ergonia* – under one tile set

This is a total of 15 of 114, or 13% of tiles checked revealing a reptile (other than PTWL).

No discernible difference exists in use of tiles by reptiles across the tile locations. Reptiles were found under groups of tiles more frequently (



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Table 4).



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(1) 6 Belmore Street Dubbo NSW 2830

(2) "Thieles Gate" (A Voluntary Conservation Area (79 Huonbrook Rd via Mullumbimby NSW 2482

Ph 0409 852 098

[phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)





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Table 4

Location	Reptiles found under tile groups	Reptiles found under single tiles	Total
Ugothery East Lower	3	1	4
Grandale	2	3	5
Glen Idol	3	0	3
Dowds Hill	2	1	3
Mountain Offset	2	1	3
<b>Total</b>	<b>12</b>	<b>6</b>	

Plate 3



## 6 PTWL signs

A possible PTWL skin was found under a grouped tile set at Mountain Offset. No PTWL were found. Some rocks were flipped during the assessment, and a potential sighting of one PTWL occurred on Glen Idol.

## 7 Habitat value assessment

Habitat monitoring was not conducted during this monitoring effort.

It was noted during this survey that many of natural rocks in a known PTWL area had been flipped over. The nature of this flipping was inconsistent with pig interest. It is suspected that some unauthorised PTWL search may have occurred over the previous several months.

## 8 Issues and suggestions for future monitoring efforts

Tiles in several locations had been turned over. Previous observations of tile disturbance have been attributed to pigs or other wildlife. On this occasion however, there were no other indications, such as broken tiles, foraging marks etc and so it is possible that the disturbance observed this year was a result of humans, perhaps looking for reptiles out of interest, or for illegal gain. Care should be taken regarding access to and security of the site, as well as considered distribution of tile locations and findings.



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Location data for Mountain Offset tile sets will need to be collected for tiles sets number two and number ten as these were mistakenly not collected during this survey.

## 9 Conclusions

---

The ant occupation of the tiles has decreased notably since October 2016. This drop may be attributable to the severe drought in the lead up to this monitoring effort. It is interesting to note however that the frequency of discovering reptiles had not decreased with percent occupation being slightly higher than 2016.

The impact of reduced ant populations may have a greater influence on the PTWL than the other reptile species observed because the PTWL has a more specific ant-based diet.

The tiles at Mountain Offset had not been checked before. Personal observations on the day suggested that the microclimate under the tiles was more advanced than the other tiles sets, however this did not equate to greater ant activity or greater reptile activity. Tiles at this location revealed the first snake under a tile set.

Rainfall in the coming months is expected to be close to normal, and so assessment of the tiles in spring 2019 may provide an interesting insight into the ability for ant populations to recover after harsh and enduring weather conditions.

## 10 References

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(1) 6 Belmore Street Dubbo NSW 2830

(2) "Thieles Gate" (A Voluntary Conservation Area (79 Huonbrook Rd via Mullumbimby NSW 2482

Ph 0409 852 098

[phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)





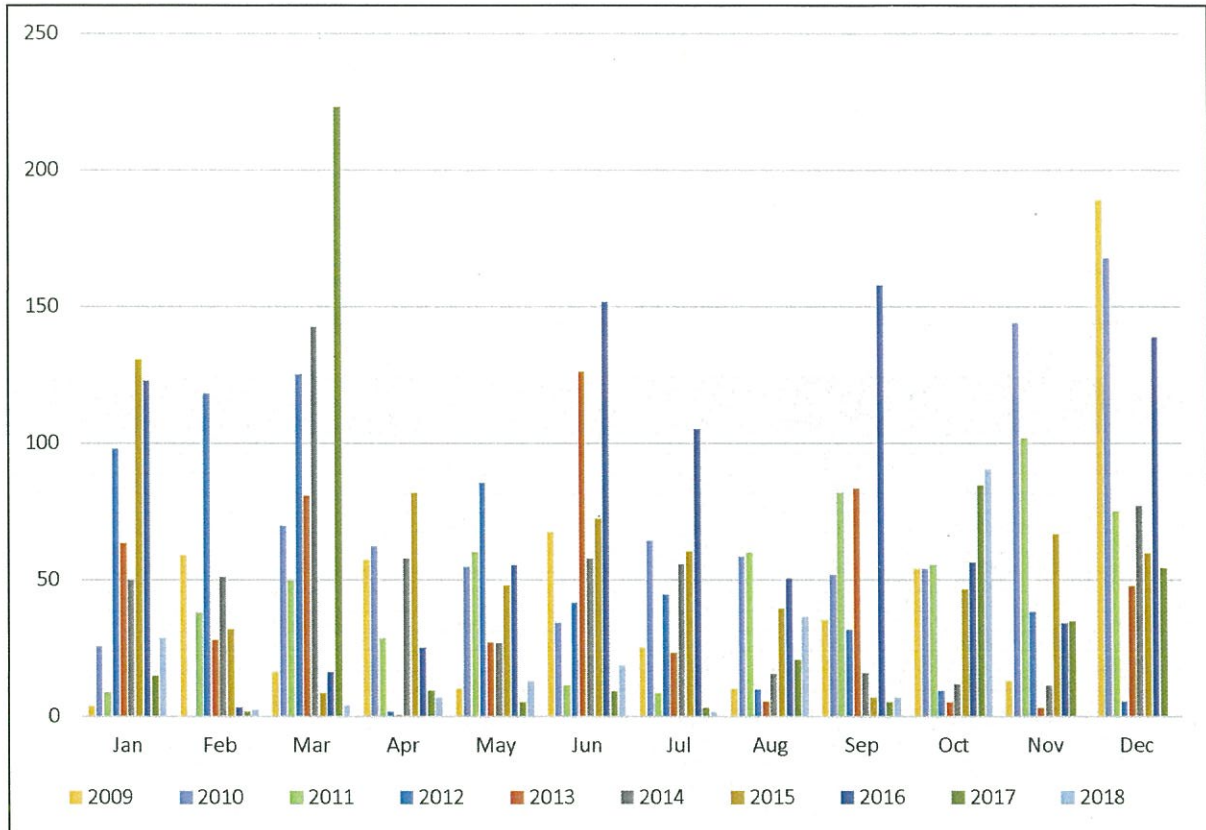
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## 11 Appendix A

Monthly rainfall data 2009 – 2018 as of 23 November 2018. Dubbo Airport weather station.





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## 12 Appendix B

Results from PTWL monitoring results, October 2018.

Location	Title No	GDA255 Easting	GDA255 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Number of Burrows Present	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	Comments
Glen Idol	1	652877	6406944	1215	28.2	35.9	Moist	1			
Glen Idol	1ABCD			1215	28.2	26.7	Moist	5	spider, snail, ants 1 sp		
Glen Idol	2	652903	6406954	1212	28.4	26.7	Moist	1	ants, spider, centipede		
Glen Idol	2ABCD			1212	28.4	25.1	Moist	4			
Glen Idol	3	652896	6406929	1210	25.7	25.3	Moist	6	ant x1, spider		
Glen Idol	3ABCD			1210	25.7	27.4	Moist	8			
Glen Idol	4	652888	6406885	1205	29.4	25.4	Moist	8			
Glen Idol	4ABCD			1205	29.5	31.9	Moist	0			
Glen Idol	5	652909	6406873	1203	28.7	28.2	Moist	3			turned over
Glen Idol	5ABCD			1203	28.7	29.3	Moist	1	ants, weevil	Morethia boulengeri	
Glen Idol	6	652923	6406847	1200	28.5	25.8	Moist	6			
Glen Idol	6ABCD			1200	28.3	25.6	Moist	3			
Glen Idol	7	652946	6406871	1158	27.7	28.3	Moist	1	beetle, termite, ants		
Glen Idol	7ABCD			1158	27.7	26.7	Moist	4	beetle, 2 ant, termites	Clonotus robustus	
Glen Idol	8	652961	6406896	1153	26.8	29.8	Moist	6	flying ant		
Glen Idol	8ABCD			1153	26.8	37.7	Moist	8	ant 1 sp, extensive burrows		
Glen Idol	9	652953	6406846	1152	25.5	25	Moist	0			
Glen Idol	9ABCD			1152	25.5	25.1	Moist	6	inch ants >100s	Menella greyii	
Glen Idol	10	652998	6406853	1150	27.5	25.3	Dry	1		Underwoodisaurus mill skin	
Glen Idol	10ABCD			1150	27.5	27.6	Dry	6	lots of burrows		



eha@theenvironmental.com.au

AREA Environmental Consultants & Communication  
 (1) 6 Belmore Street, Dubbo NSW 2830  
 (2) "Theles Gate" (A Voluntary Conservation Area) 79 Hootbrook Rd via Mullendumbly NSW 2452  
 Ph 0403 662 096





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Location	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Number of Burrows Present	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	Comments
Grandale	1	653547	6410890	810	19	19.8	Dry	2	Nil	Menetia greyii	
Grandale	1ABCD				18.7		Dry	2	Beetles		One broken tile
Grandale	2	653541	6410870	820	19.2	23.9	Dry	2	weevil		
Grandale	2ABCD			825	18.5	20.5	Dry	2	cockroach	Morethia bouliengeri	
Grandale	3	653549	6410852	826	20	15.8	Moist	3		Ctenotus robustus	
Grandale	3ABCD			827	20	15.8	Moist	5	cockroach		
Grandale	4	653541	6410831	828	19.4	16.8	Moist	2		Ctenotus robustus	
Grandale	4ABCD					15.5	Moist	2	Sugar ants		
Grandale	5	653537	6410851	829		16.3	Moist	3	small beetle, ant		
Grandale	5ABCD					18.3	Moist	5	Ants, 2 sp	centipede	
Grandale	6	653525	6410856			16.2	Moist	3	Ants, 1 sp		
Grandale	6ABCD			830		14.9	Moist	2	Ants, 2 sp		clover burr stored under tile
Grandale	7	653518	6410846	831	19.7	15.5	Moist	1	Ants, 2 sp		
Grandale	7ABCD				19.7	15.5	Moist	5	Ants, 2 sp, Red bug		
Grandale	8	653507	6410862		21.6	16.9	Moist	1			
Grandale	8ABCD				21.6	16.3	Moist	5		Desert tree frog	
Grandale	9	653499	6410870		21.9	16.4	Moist	1			
Grandale	9ABCD				21.9	16.4	Moist	3	Bogan moth cest		
Grandale	10	653504	6410848		20.3	19.6	Dry	0			
Grandale	10ABCD				20.3	18.8	Dry	0	weevil, red bug	Morethia bouliengeri	



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 (1) 6 Belmore Street, Dubbo NSW 2830  
 (2) "Theles Gate" (A Voluntary Conservation Area) 79 Hoonbrook Rd via Mullumbimby NSW 2482  
 Ph 0403 662 098



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Location	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Number of Burrows Present	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	Comments
Ugothery Dowds Hill	1	653525	6406962	950	23.4	19.9	Dry	1	weevil, spider		
Ugothery Dowds Hill	1ABCD			950	24.3	23.5	Dry	4	weevil, spider		
Ugothery Dowds Hill	2	653544	6406972	955	24.4	25.1	Dry	1			
Ugothery Dowds Hill	2ABCD			955	24.4	24.3	Moist	4	spider	mouse nest	
Ugothery Dowds Hill	3	653561	6406985	956	26.1	24.3	Moist	0		Ctenotus robustus	
Ugothery Dowds Hill	3ABCD				26.1	24.4	Moist	3	Ant, 2 sp, spider		
Ugothery Dowds Hill	4	653575	6406991	1000	24.4	24.4	Moist	1			large burrow
Ugothery Dowds Hill	4ABCD			1000	24.4	24.4	Moist	4	Ants 3 sp, termite		
Ugothery Dowds Hill	5	653589	6406998		24.7	21.5	Moist	1	Beetle, weevil		
Ugothery Dowds Hill	5ABCD				24.7	21.3	Moist	2	termite, spider		
Ugothery Dowds Hill	6	653603	6407004	1005	24.7	21.8	Moist	1	termite, spider		
Ugothery Dowds Hill	6ABCD			1005	24.5	20.9	Moist	4	termite, spider	Underwoodisaurus millii	
Ugothery Dowds Hill	7	653618	6407007	1010	23.6	18.6	Moist	1	termite, spider		
Ugothery Dowds Hill	7ABCD			1010	23.6	19.4	Moist	3	termite, spider		
Ugothery Dowds Hill	8	653633	6407009	1012	23.6	23.6	Moist	1	Slater, termite, spider		
Ugothery Dowds Hill	8ABCD			1012	23.6	23.1	Moist	2	Slater, termite, spider		
Ugothery Dowds Hill	9	653646	6407011	1015	23.1	24.6	Moist	1	Slater, termite, spider		
Ugothery Dowds Hill	9ABCD			1015	24.1	23.8	Moist	3	Slater, termite, spider	Morethia boulengeri	
Ugothery Dowds Hill	10	653660	6407011	1017	23.4	28.3	Dry	0			
Ugothery Dowds Hill	10ABCD			1017	25.4	24.3	Moist	4	spider, ant		



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AREA Environmental Consultants & Communication  
 (1) 6 Belmore Street, Dubbo NSW 2830  
 (2) "Thielers Gate" (A Voluntary Conservation Area) 79 Hootbrook Rd via Mullumbimby NSW 2462  
 Ph 0402 662 099





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Location	Title No	GDA255 Easting	GDA255 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Number of Burrows Present	Other Insects (Type / abundance)	Other reptiles (Sp / abundance)	Comments
Ugothery East Lower	1	652929	6407563	1030	24.1	22.1	Moist	1	Nil	Nil	
Ugothery East Lower	1ABCD			1030	24.1	21.8	Moist	4	cricket, spider	Nil	
Ugothery East Lower	2	652912	6407571	1033	25.1	26.8	Moist	>10	cricket, spider	Nil	
Ugothery East Lower	2ABCD			1033	25.1	24.6	Moist	>10	Ants, 1 sp, lots	Morethia boulengeri	Lots of ant burrows and significant large mouse burrow
Ugothery East Lower	3	652905	6407583	1035	25.5	29.5	Moist	1	Ants, 1 sp, lots	Nil	
Ugothery East Lower	3ABCD			1035	25.5	27.3	Moist	>10	Ants, 1 sp, lots	Desert Tree frog	
Ugothery East Lower	4	652915	6407589	1040	25.5	33.4	Moist	0	Nil	Nil	
Ugothery East Lower	4ABCD			1040	25.5	33.3	Moist	4	Spider, Ant 1 sp	Nil	
Ugothery East Lower	5	652929	6407583	1040	27.2	31.6	Moist	2	Ant, 1 sp	Nil	
Ugothery East Lower	5ABCD			1045	27.2	31.9	Moist	8	Spider, Ant 1 sp	Morethia boulengeri	
Ugothery East Lower	6	652928	6407574	1048	27.2	22.8	Moist	1	Spider	Nil	
Ugothery East Lower	6ABCD			1048	27.2	23.1	Moist	5	Spider, beetle, cockroach	Desert Tree Frog	
Ugothery East Lower	7	652935	6407562	1052	25.8	27.1	Moist	2	Nil	Nil	
Ugothery East Lower	7ABCD			1052	25.6	27	Moist	5	Spider, beetle, cockroach	Morethia boulengeri	
Ugothery East Lower	8	652946	6407541	1055	25.7	19.6	Moist	2	Crickel, beetle	Underwoodisaurus mlii	
Ugothery East Lower	8ABCD			1055	27.7	19.2	Moist	2	Nil	Nil	
Ugothery East Lower	9	652947	6407575	1053	27.7	20.1	Moist	4	Ant, 1 sp, centipede	Nil	
Ugothery East Lower	9ABCD			1058	25.5	19.4	Moist	1	Ant, 1 sp, centipede	Nil	
Ugothery East Lower	10	652943	6407585	1058	25.5	23.9	Moist	5	Ant, 1 sp, centipede	Nil	
Ugothery East Lower	10ABCD			1058	25.5	23.9	Moist	2	Nil	Nil	



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AREA Environmental Consultants & Communication  
 (1) 5 Blenheim Street, Dubbo NSW 2830  
 (2) "Theles Gate" (A Voluntary Conservation Area) 79 Hoorbrook Rd via Mullumbimby NSW 2452  
 Ph 0403 662 098



ABN:29 616 629 867  
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Location	Tile No	GDAz55 Easting	GDAz55 Northing	Time	Air Temp	Soil Temp	Soil Moisture	Number of Burrows Present	Other insects (Type / abundance)	Other reptiles (Sp / abundance)	Comments
Mountain Offset	1	653932	6407578	920	24.6	19.2	Dry	2	silverfish		
Mountain Offset	1ABCD			920	24.6	19.1	Dry	4		possible PTWL skin	
Mountain Offset	2	N/A	N/A	920	21.1	18.6	Dry	1	scorpion		
Mountain Offset	2ABCD			920	21.1	19.8	Dry	4	cockroach	Ctenotus robustus	
Mountain Offset	3	653924	6407565	925	21.5	21.7	Dry	1	silverfish	Furina diadema (Red-naped snake)	large burrow - sugar ants
Mountain Offset	3ABCD			925	21.5	26.7	Dry	5	5 sp ant		
Mountain Offset	4	653936	6407543	927	21.9	18.6	Dry	1	2 beetle 2 ant		
Mountain Offset	4ABCD			927	21.9	22.4	Dry	5	2 beetles		
Mountain Offset	5	653935	6407539	930	21.9	22.4	Dry	1	3 sp ant		
Mountain Offset	5ABCD			930	21.9	22	Dry	3	beetle silverfish		
Mountain Offset	6	653931	6407539	930	22.2	18.8	Dry	0	beetle silverfish, 1sp		
Mountain Offset	6ABCD			930	22.2	18.8	Dry	0	1 sp		
Mountain Offset	7	653926	6407527	932	22.2	20.2	Dry	0			
Mountain Offset	7ABCD			932	22.2	19.1	Dry	0	spider		lots of leaf litter
Mountain Offset	8	653922	6407540	935	22.7	23.1	Dry	1			
Mountain Offset	8ABCD			935	22.7	22.9	Dry	4	2 ants 1ater termite spider		
Mountain Offset	9	653920	6407536	937	23.2	19.6	Dry	0	2 sp spider trap door		
Mountain Offset	9ABCD			937	23.2	19.9	Dry	4	3 sp beetles	skink	
Mountain Offset	10	N/A	N/A	940	23.4	18.9	Dry	1			
Mountain Offset	10ABCD			940	23.4	17.6	Dry	7	spider cockroach		



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 (1) 6 Bellmore Street, Dubbo NSW 2830  
 (2) "Thielers Gate" (A Voluntary Conservation Area) 75 Huestbrook Rd via Mullumbimby NSW 2442  
 Ph 0403 862 096



- ✓ Environmental impact assessment and approvals
- ✓ Preliminary environmental assessment (PEA)
- ✓ Review of environmental factors (REF) and Minor Work REF (MWREF)
- ✓ Ecology and heritage assessments
- ✓ Biobanking and biodiversity assessment method (BAM) assessments and offsetting
- ✓ Plans of Management
- ✓ Aboriginal community engagement and cultural walkovers
- ✓ Stakeholder and community engagement
- ✓ Peer review / project briefs / budgeting assistance
- ✓ Landscape design and architecture



29 June 2019

**Purpose of this document:**

**Project name:**

**Tender No**

**Legislative framework**

**Provided to**

<b>Vegetation monitoring 2018</b>
<b>Australian Strategic Metals Project (Dubbo)</b>
N/A
A requirement of the Biodiversity Management Plan
Michael Sutherland General Manager NSW <b>Australian Strategic Metals Ltd</b> Level 2, 21 Church Street, Dubbo, NSW 2830 Phone: 02 6882 2866 Fax: 02 6882 9282 Mobile: 0427 691 733 Email: msutherland@alkane.com.au

**Details of vegetation monitoring:**

Need	<ol style="list-style-type: none"> <li>1. The western region is affected by a severe drought. While there is a requirement for vegetation monitoring in the Biodiversity Management Plan the use of these results to date are negligible.</li> <li>2. Phillip Cameron has been assessing the property since project inception and being a Dubbo resident has a robust understanding of the status of the region's flora.</li> <li>3. After a review of the medium and long term weather forecasts it is recommended to reschedule this year monitoring to spring 2019 then in summer 2019 / 2020 preferably after inundating rain.</li> <li>4. The aim of this action is to capture the values of the vegetation plots in their worst possible state (due to drought) and then to identify what flora species will colonise the vacant habitat.</li> <li>5. The above action will inform us on likely species to recolonise disturbed areas during and after construction. These data will inform many aspects of the Biodiversity Management Plan including weed management and natural unassisted recruitment.</li> </ol>
Recommendation	<ol style="list-style-type: none"> <li>6. Reschedule the 2018 monitoring</li> <li>7. Convert each existing monitoring site into a Biodiversity Assessment Method Plot and run the results annually through the Biodiversity Assessment Method Calculator to monitor changes in the vegetation integrity scores over time.</li> </ol>





**The AREAs contact person:**

Name:	Phillip Cameron (PJC)
Position:	Director and Principal Consultant
Mobile no:	0409 852 098
e-mail address:	phil@areaenvironmental.com.au

**Conclusion**

Thank you for the opportunity to provide this advice. If you have any questions, please feel free to contact me.

Regards



**Phil Cameron**

Principal Consultant

CEnvP, NSW Biodiversity Assessment Method (BAAS17082) & Biobanking (0117) accredited

**AREA Environmental Consultants & Communication**

P 0409 852 098

E [phil@areaenvironmental.com.au](mailto:phil@areaenvironmental.com.au)

a) 6 Belmore Street Dubbo NSW 2830

b) "Thieles Gate" (Type 2 Conservation Agreement Area) 79 Huonbrook Rd Mullumbimby NSW 2842

We acknowledge Traditional Owners and Custodians and their ancestors



APPENDIX B - Meteorological Data July 2018- June 2019





Dubbo Project		Rainfall 2018-2019											
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			1.6									0.2	1
2				12.8			0.6						2
3		3.0		0.2			2.4				11.6	1.8	3
4				29.2							0.2	0.8	4
5			7.2	7.0			3.4	28.4					5
6		8.0			0.6								6
7			1.6	12.0			0.2	35.0					7
8								0.6					8
9												0.2	9
10				17.6			4.4				5.2		10
11				0.4		8.2					0.4		11
12						5.4							12
13						4.2					0.2	4.6	13
14						4.8						0.2	14
15												0.2	15
16													16
17				11.4			2.8		10.8			0.2	17
18													18
19													19
20				5.4	20.8		6.4					0.2	20
21							4.0						21
22									15.6				22
23			2.4										23
24			0.2										24
25		5.0							18.2				25
26		14.0									1.2		26
27											0.2		27
28					15.8								28
29	0.6							2.6			0.8	0.2	29
30								1.8			0.2	3.6	30
31		3.8											31
Totals	0.6	33.8	13.0	71.0	62.2	22.6	45.0	64.0	49.0	0.0	20.0	12.2	TOTAL
No. days	1	5	5	6	6	4	9	3	5	0	9	11	64
<b>Cum. tot</b>	<b>0.6</b>	<b>34.4</b>	<b>47.4</b>	<b>118.4</b>	<b>180.6</b>	<b>203.2</b>	<b>248.2</b>	<b>312.2</b>	<b>361.2</b>	<b>361.2</b>	<b>381.2</b>	<b>393.4</b>	<b>393.4</b>

Bold data = cumulative total

0.2 readings may be dew

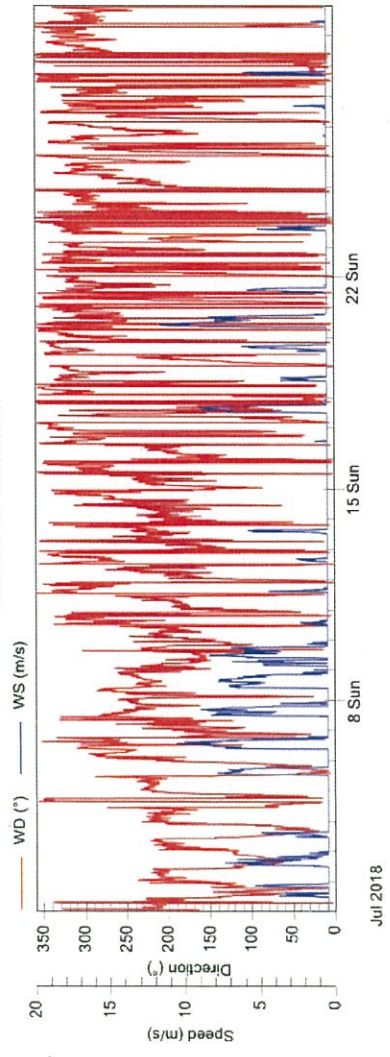
Raingauge situated at met station on Wychitella





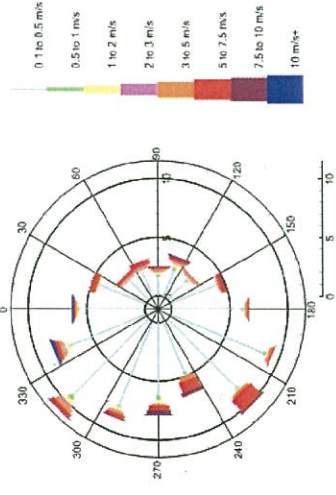
### WS/WD

1/07/2018 to 30/07/2018

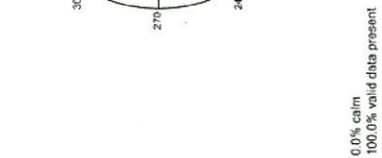


### Wind Rose

1/07/2018 to 30/07/2018

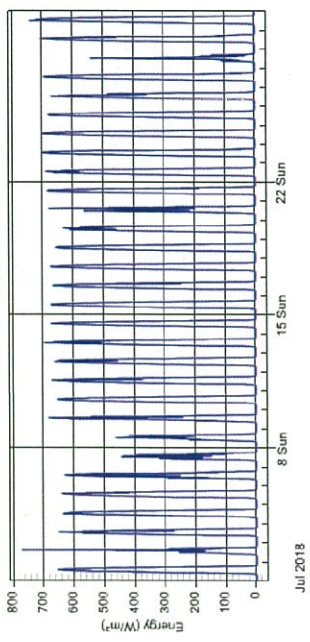


### Wind Rose



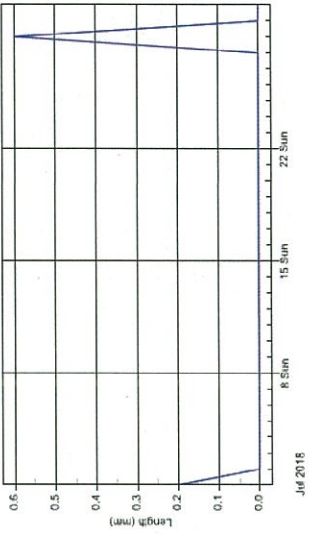
### Solar Radiation

1/07/2018 to 30/07/2018



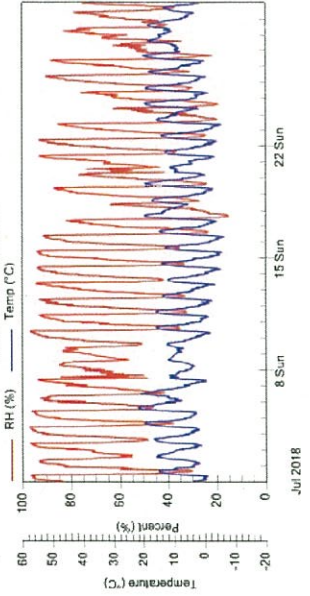
### Rainfall

1/07/2018 to 30/07/2018



### RH/Temp

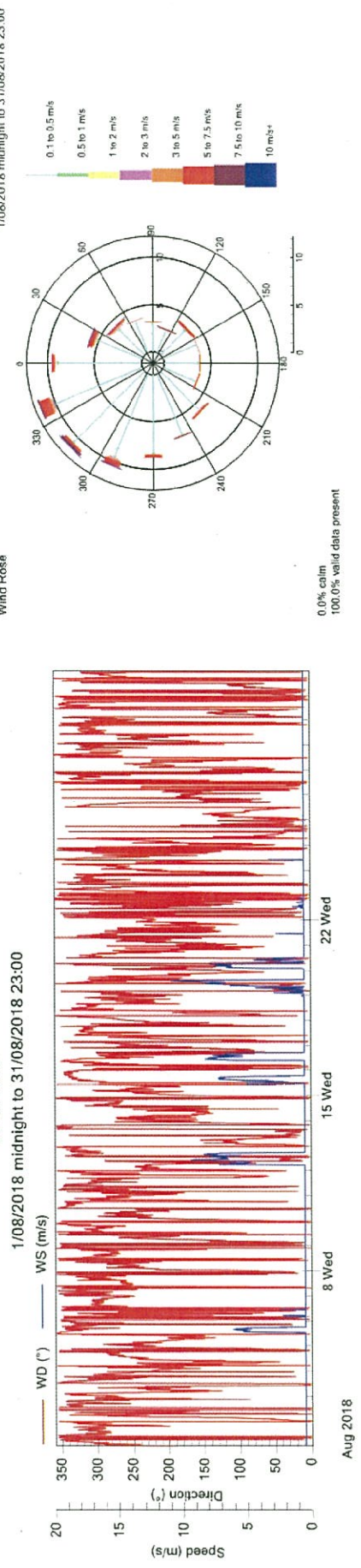
1/07/2018 to 30/07/2018



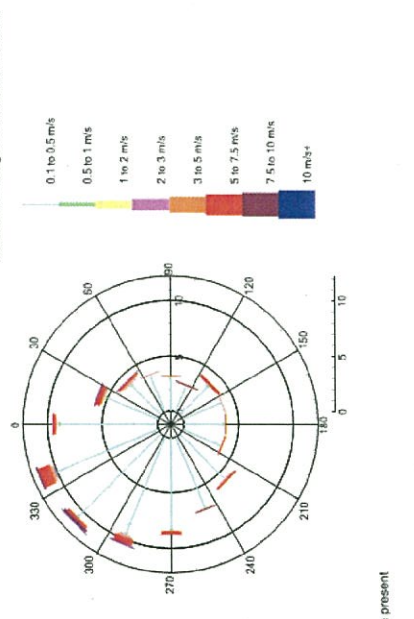




### WS/WD



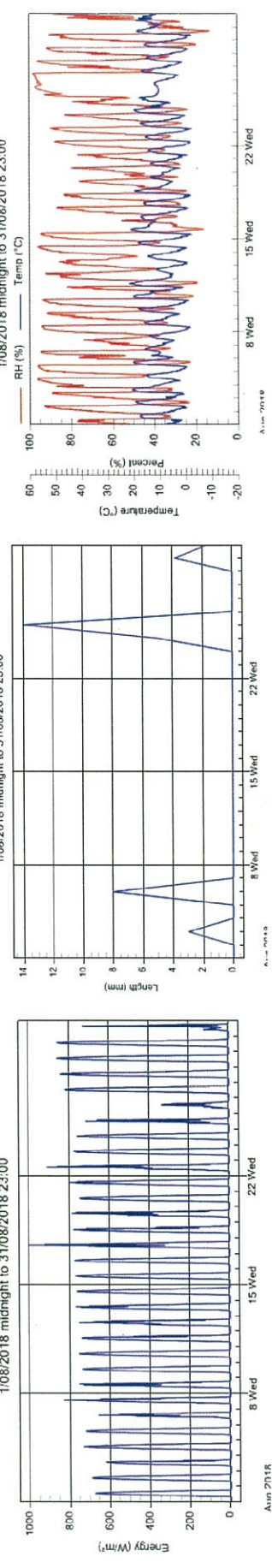
### Wind Rose



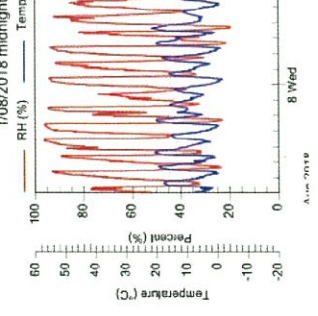
### Wind Rose



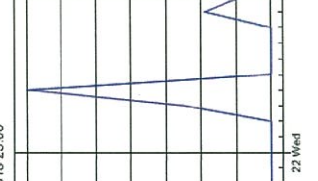
### Solar Radiation



### Rainfall

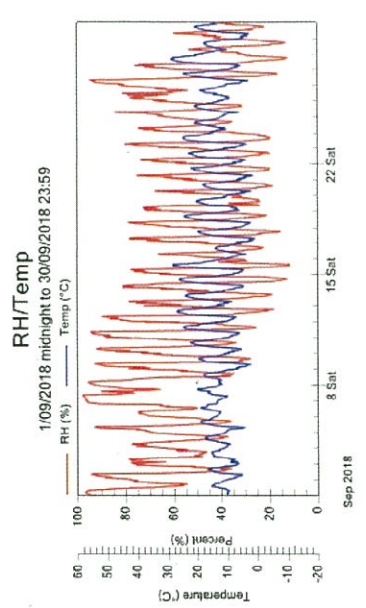
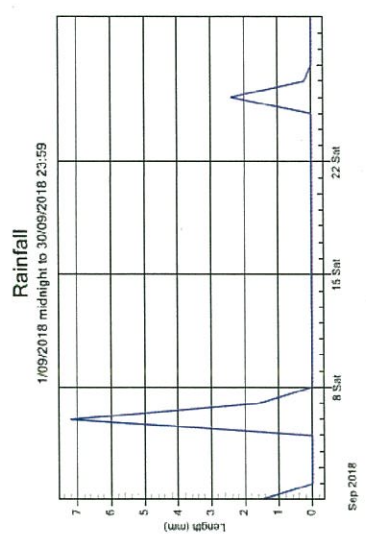
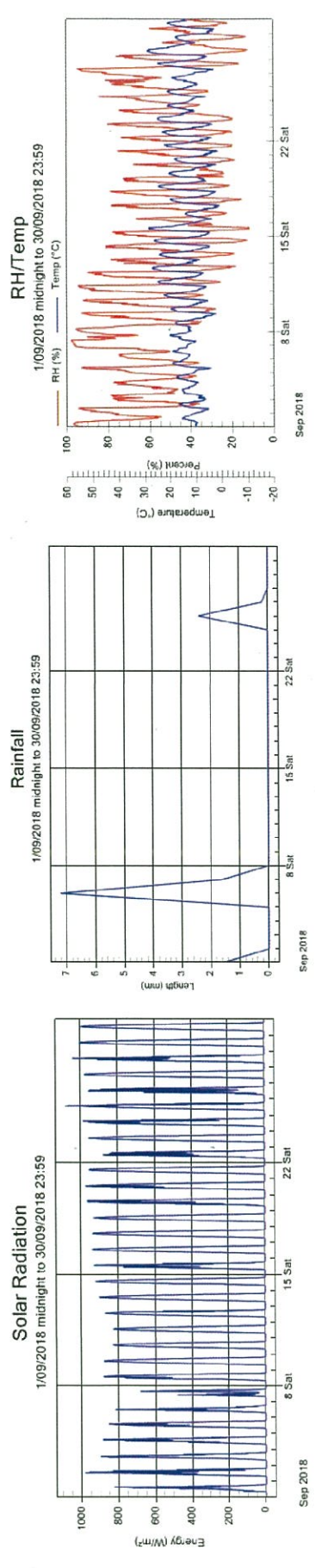
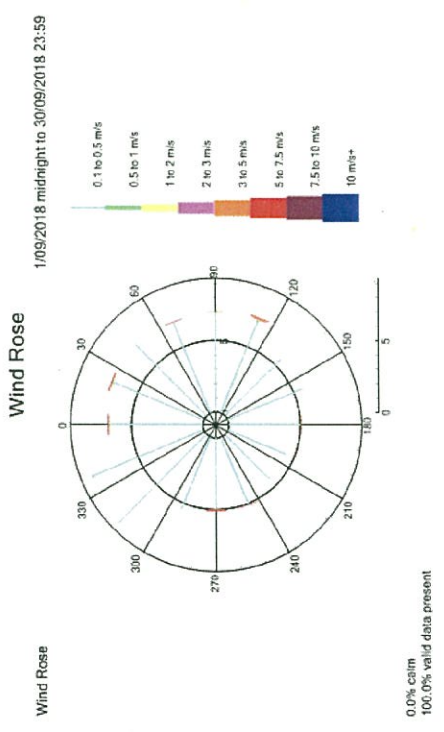
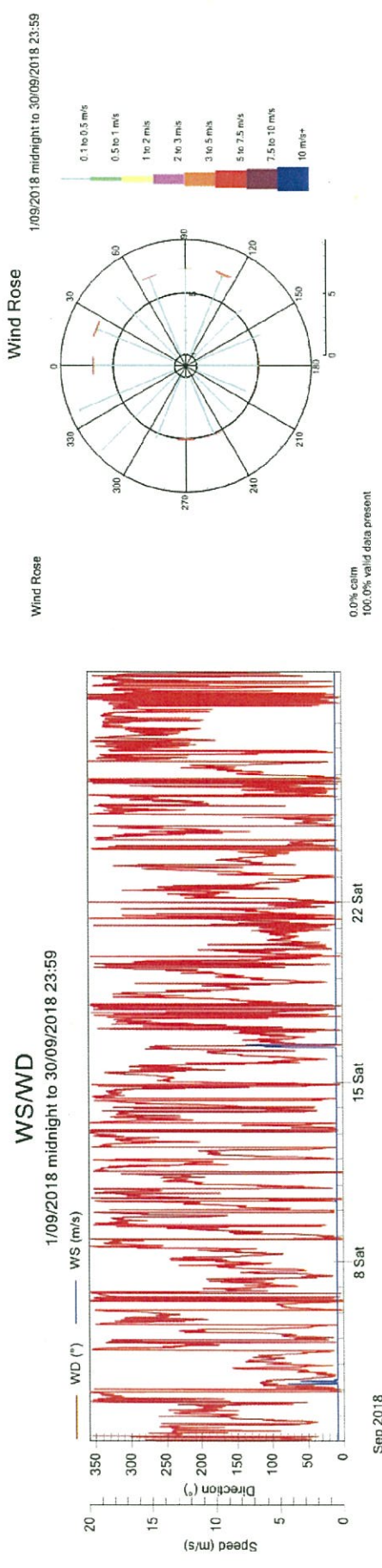


### RH/Temp





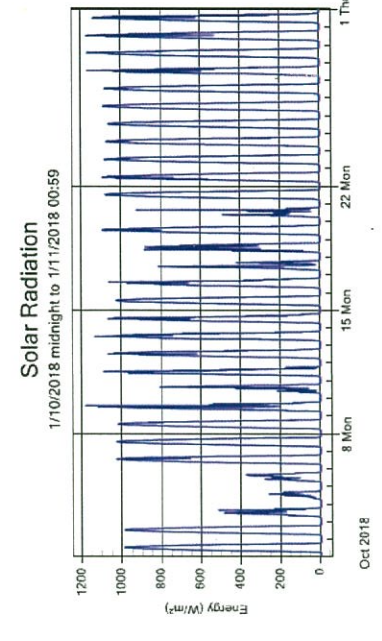
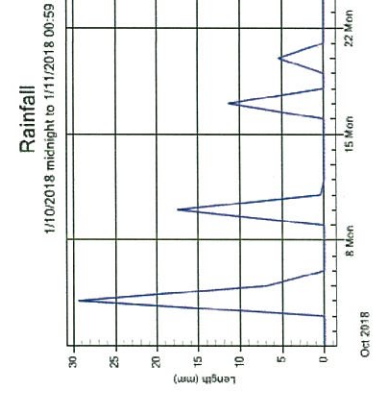
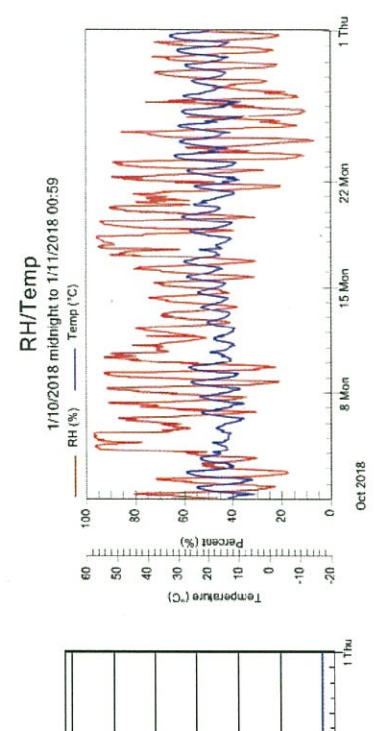
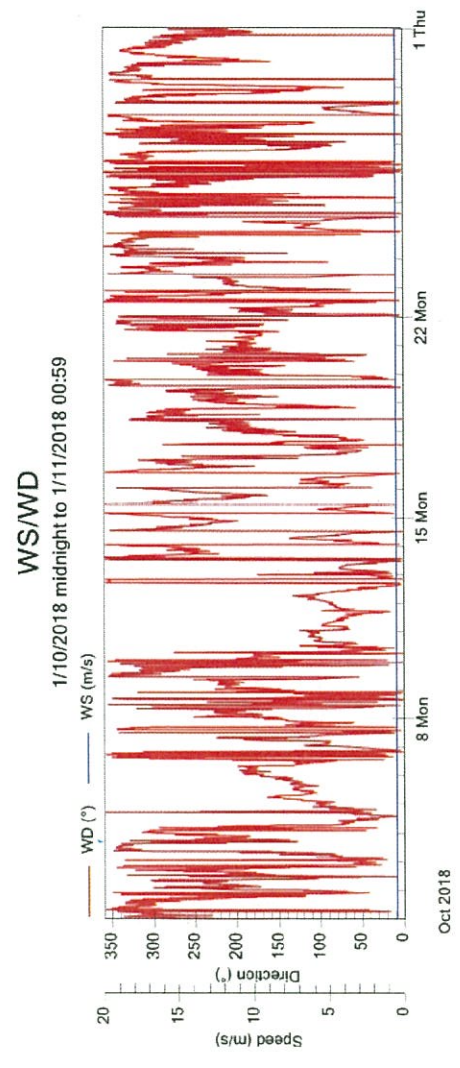
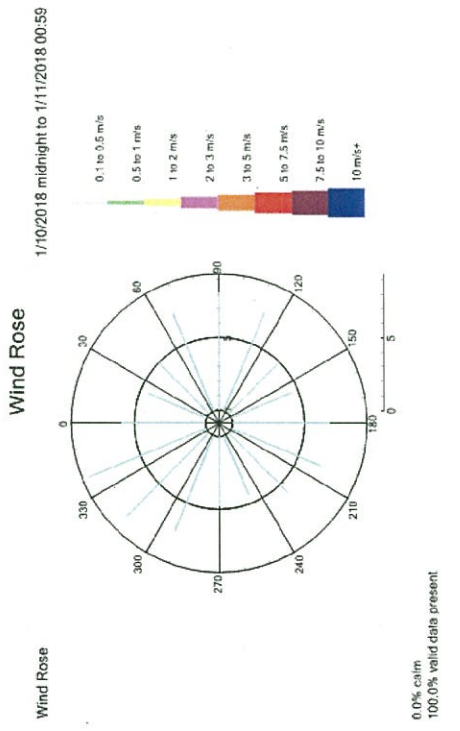




0.0% calm  
100.0% valid data present





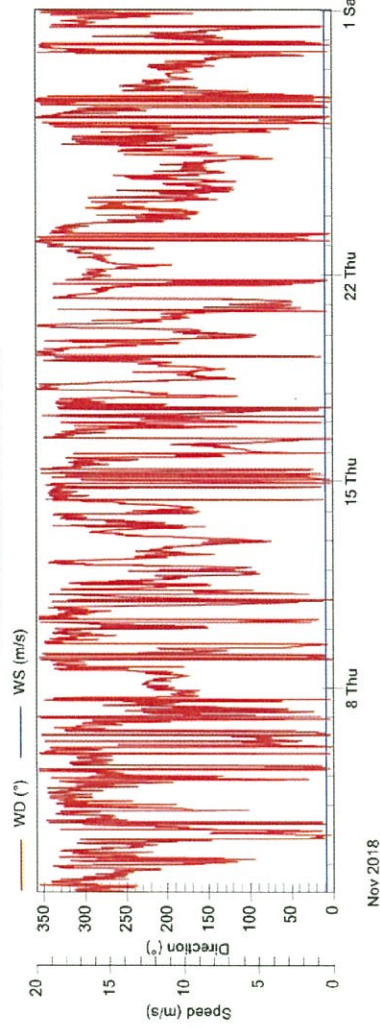






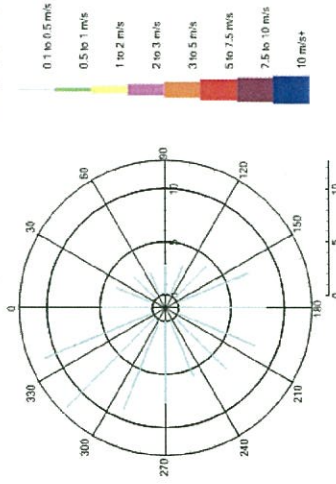
### WS/WD

1/11/2018 01:00 to 1/12/2018 00:59



### Wind Rose

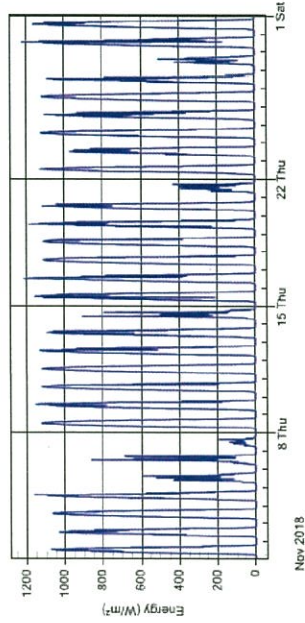
1/11/2018 01:00 to 1/12/2018 00:59



0.0% calm  
100.0% valid data present

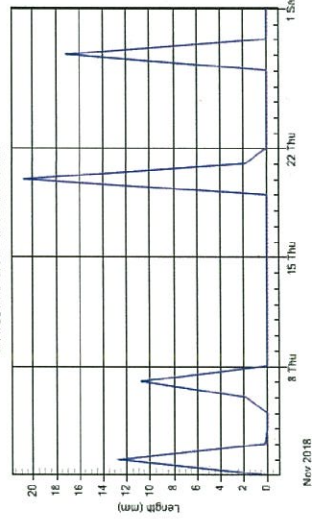
### Solar Radiation

1/11/2018 01:00 to 1/12/2018 00:59



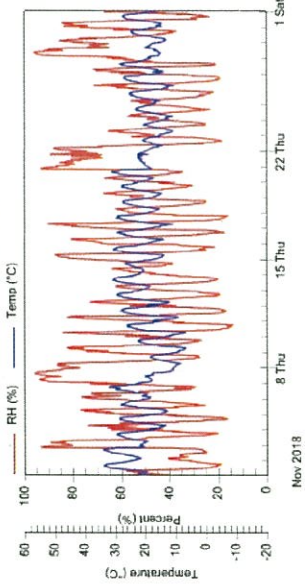
### Rainfall

1/11/2018 01:00 to 1/12/2018 00:59



### RH/Temp

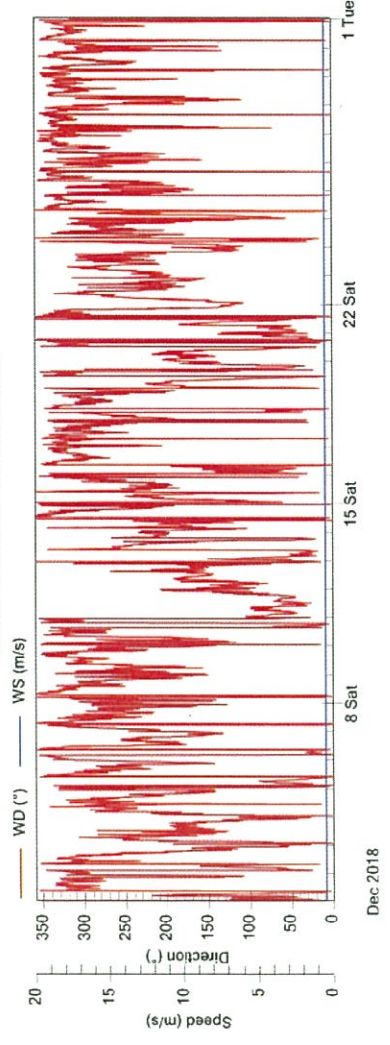
1/11/2018 01:00 to 1/12/2018 00:59





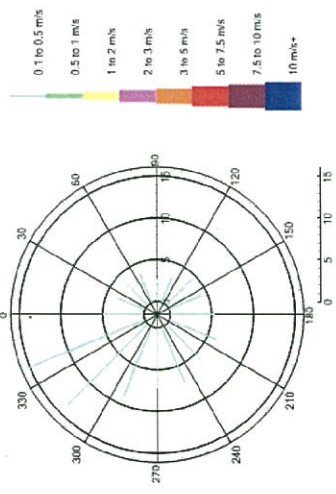
### WS/WD

1/12/2018 01:00 to 1/01/2019 00:59



### Wind Rose

1/12/2018 01:00 to 1/01/2019 00:59

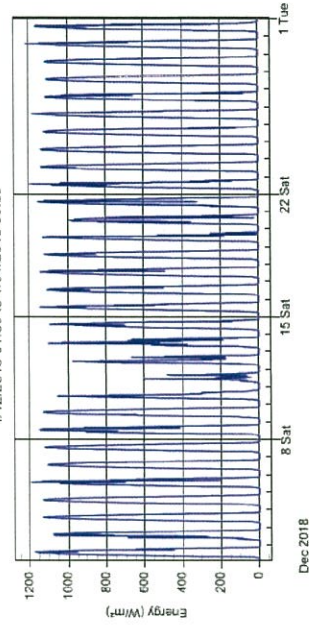


### Wind Rose

0.0% calm  
100.0% valid data present

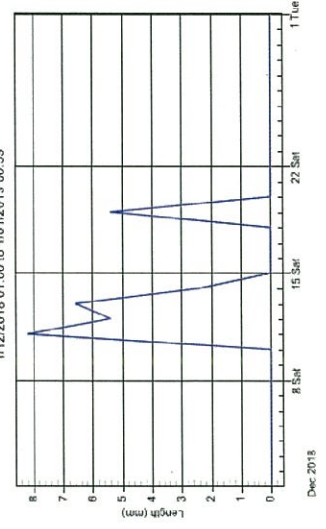
### Solar Radiation

1/12/2018 01:00 to 1/01/2019 00:59



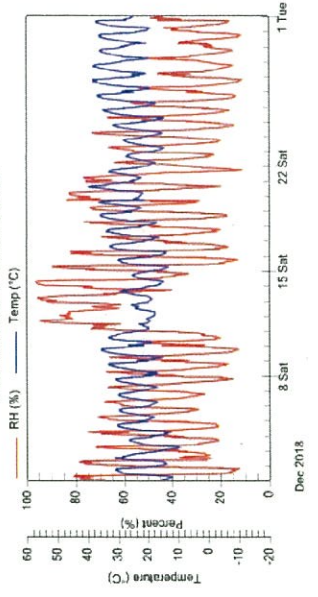
### Rainfall

1/12/2018 01:00 to 1/01/2019 00:59



### RH/Temp

1/12/2018 01:00 to 1/01/2019 00:59

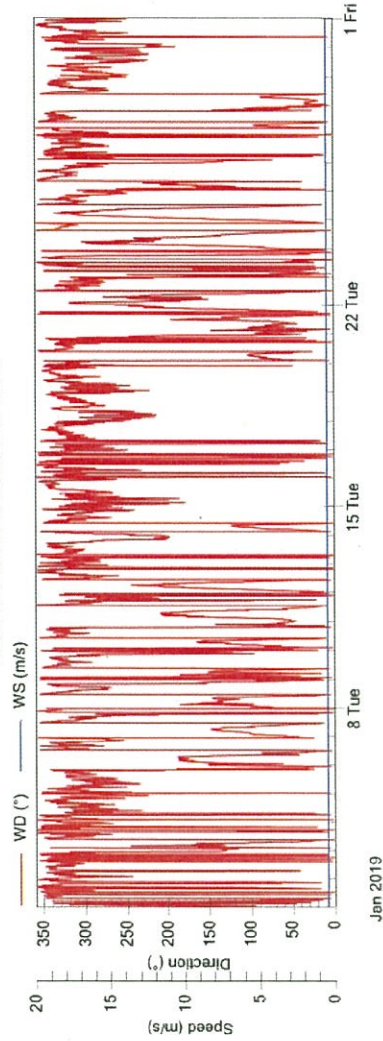






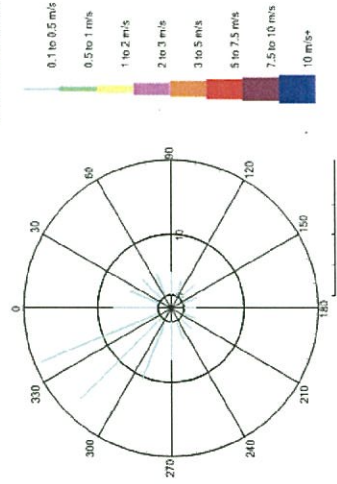
# WSWD

1/01/2019 01:00 to 1/02/2019 00:59



# Wind Rose

1/01/2019 01:00 to 1/02/2019 00:59

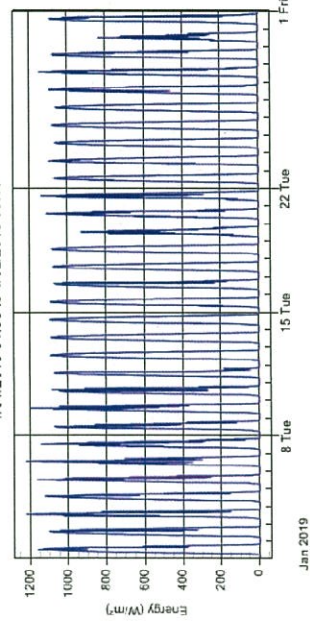


# Wind Rose

0.0% catm  
100.0% valid data present

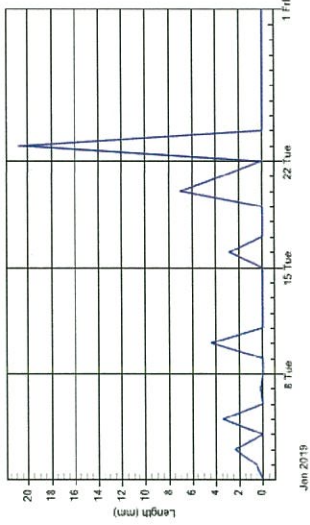
# Solar Radiation

1/01/2019 01:00 to 1/02/2019 00:59



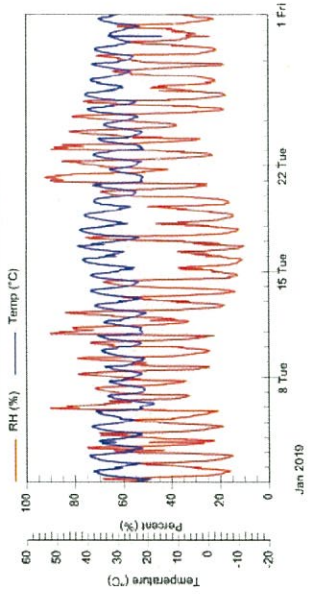
# Rainfall

1/01/2019 01:00 to 1/02/2019 00:59



# RH/Temp

1/01/2019 01:00 to 1/02/2019 00:59

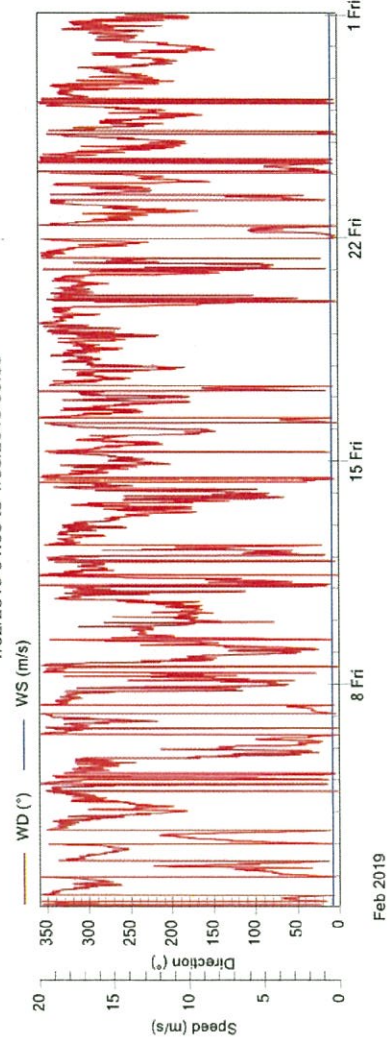






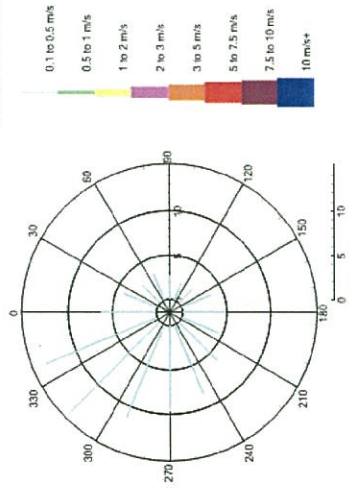
### WS/WD

1/02/2019 01:00 to 1/03/2019 00:59



### Wind Rose

1/02/2019 01:00 to 1/03/2019 00:59

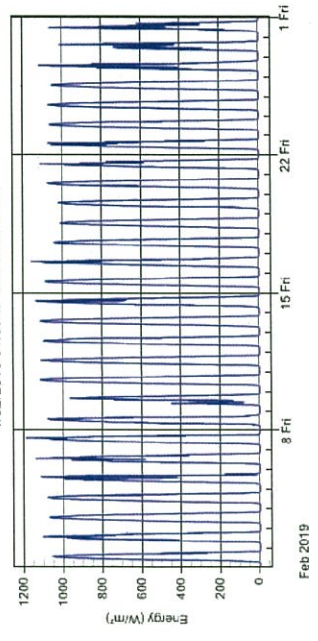


0.0% calm  
100.0% valid data present

### Wind Rose

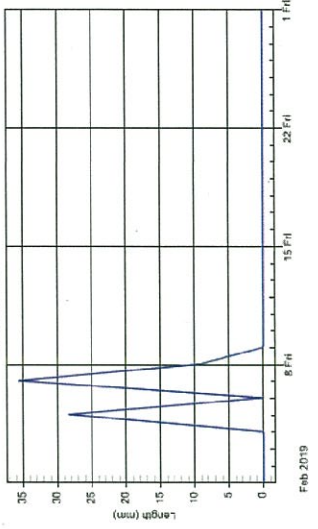
### Solar Radiation

1/02/2019 01:00 to 1/03/2019 00:59



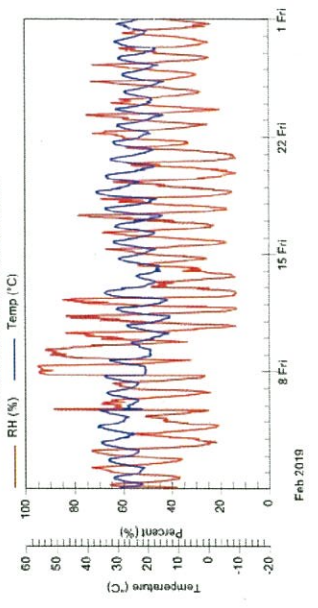
### Rainfall

1/02/2019 01:00 to 1/03/2019 00:59

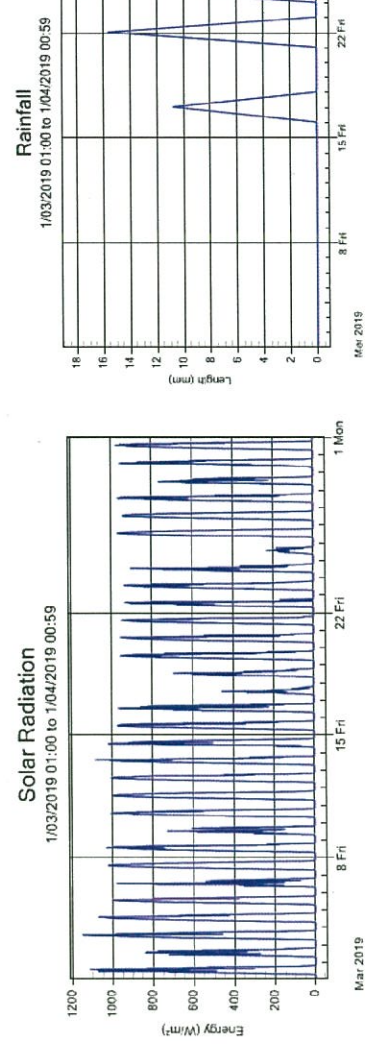
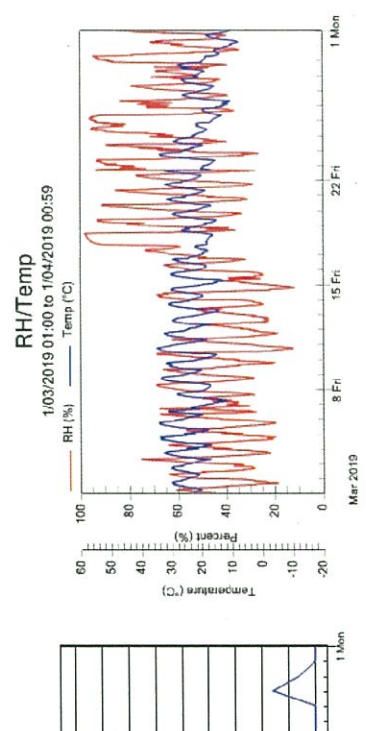
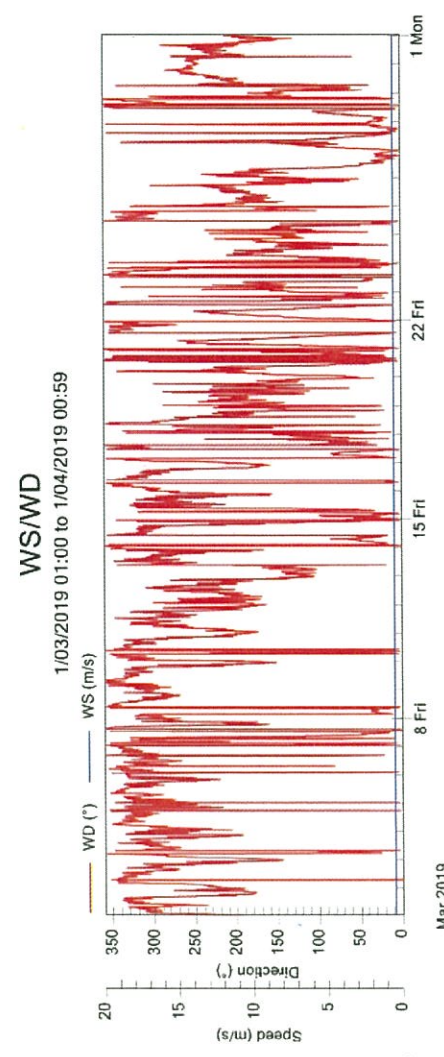
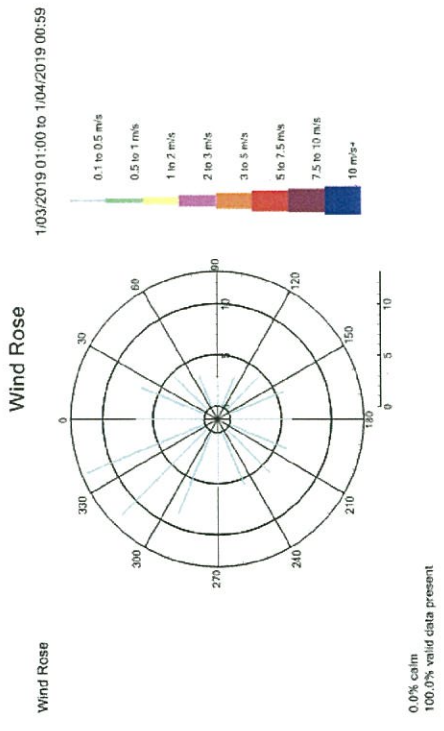


### RH/Temp

1/02/2019 01:00 to 1/03/2019 00:59

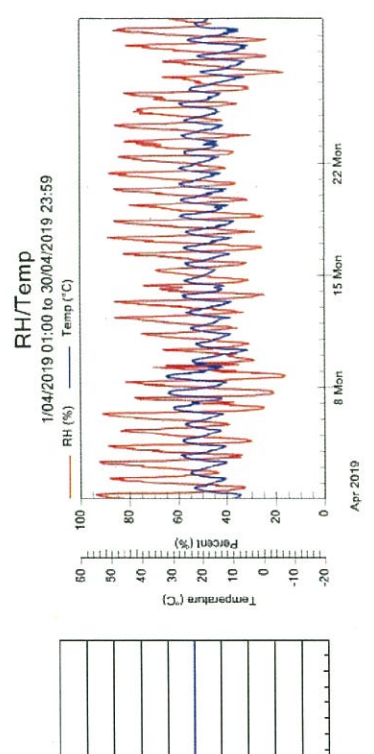
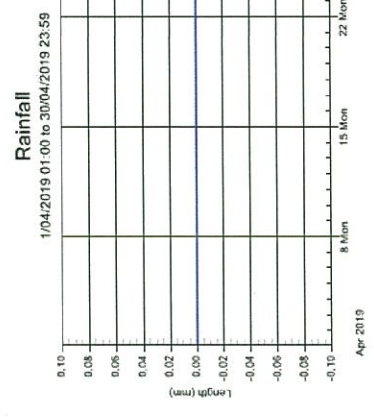
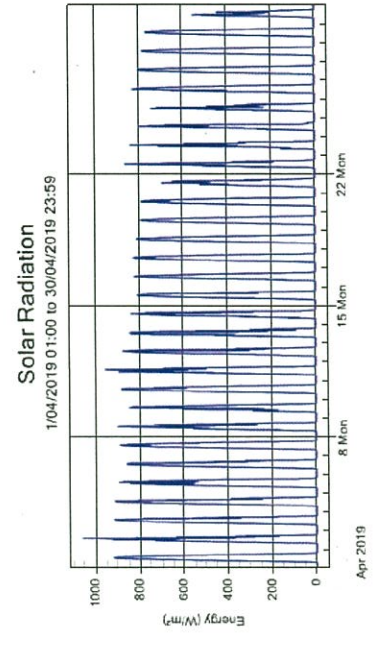
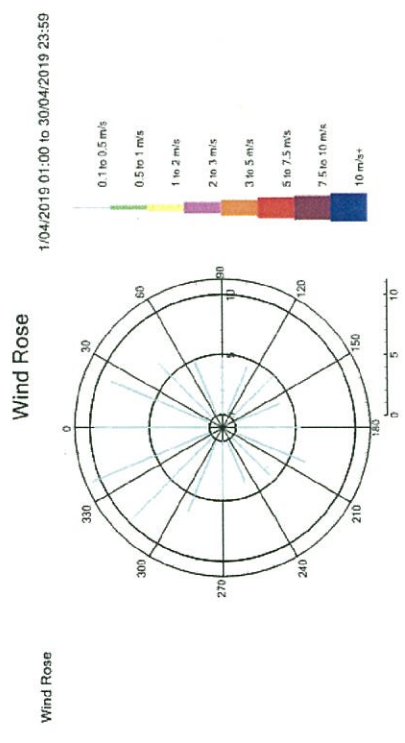
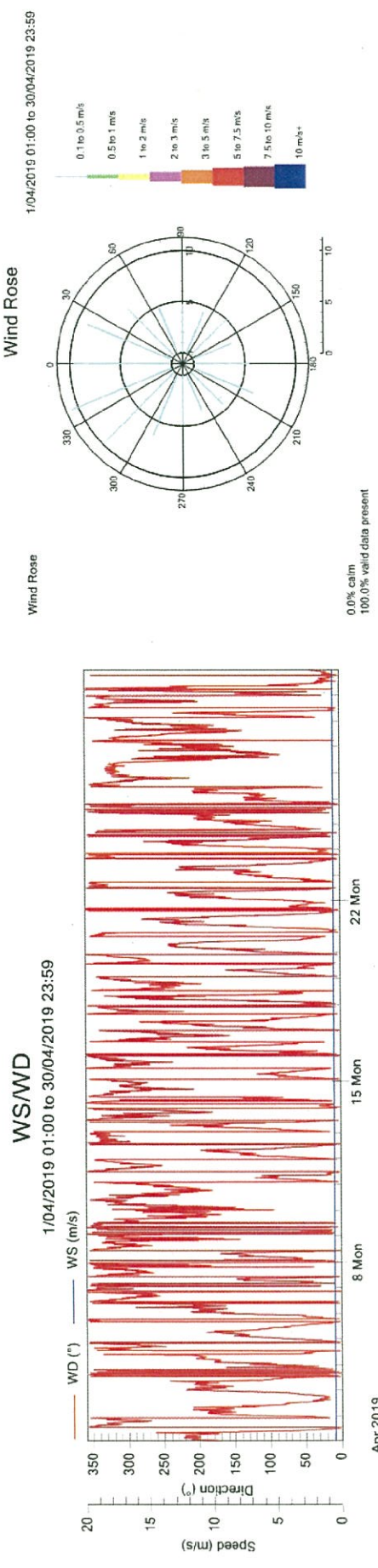








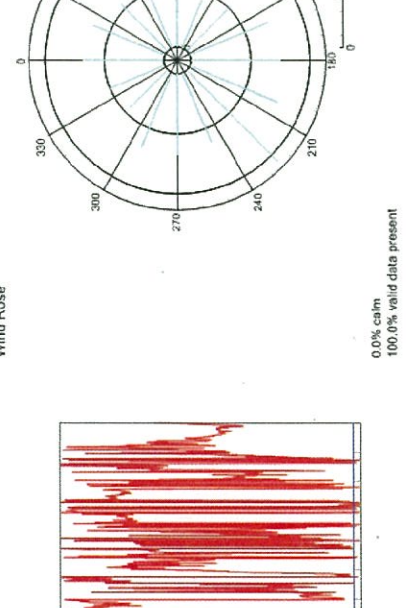




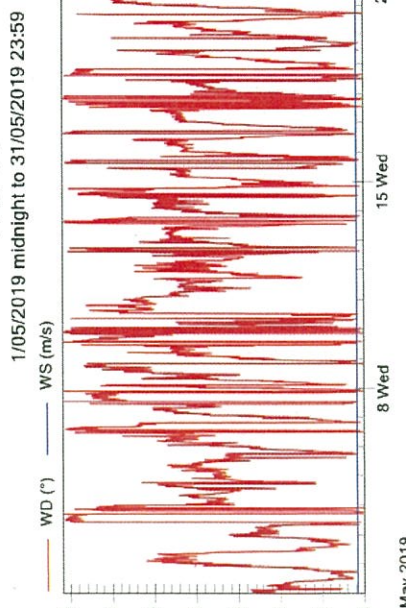




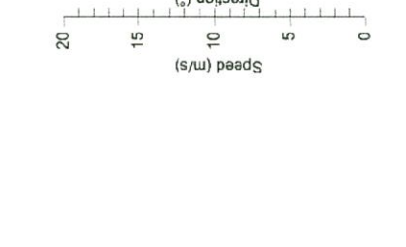
### WS/WD



### Wind Rose

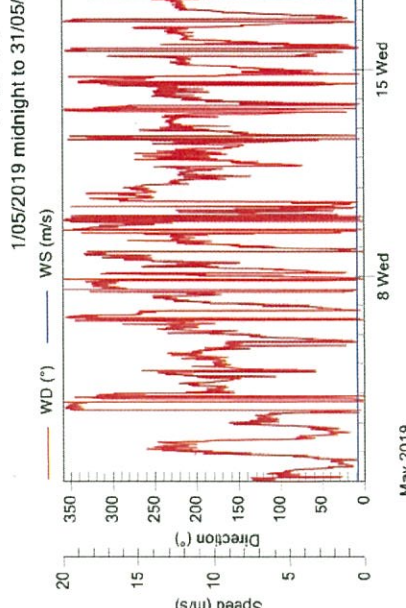


### Wind Rose



0.0% calm  
100.0% valid data present

### WS/WD



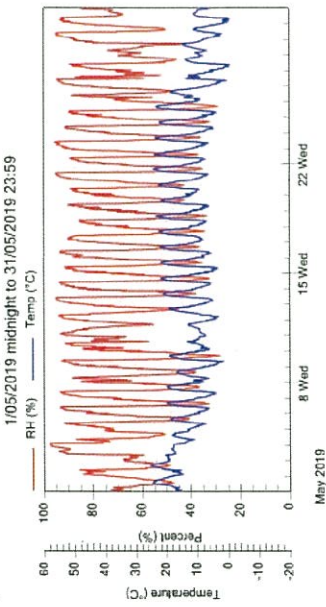
### WS/WD



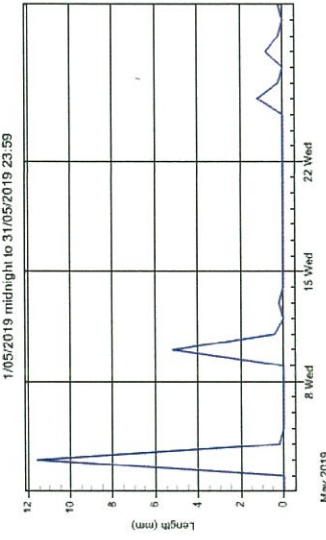
### WS/WD



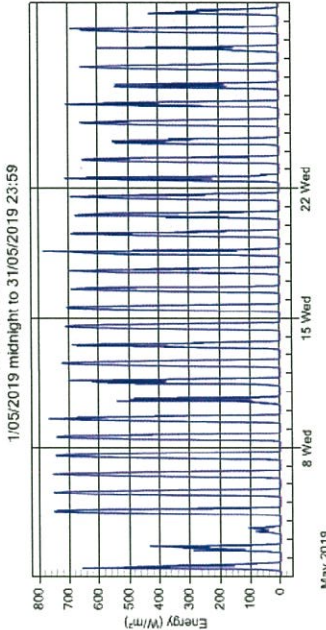
### RH/Temp



### Rainfall



### Solar Radiation



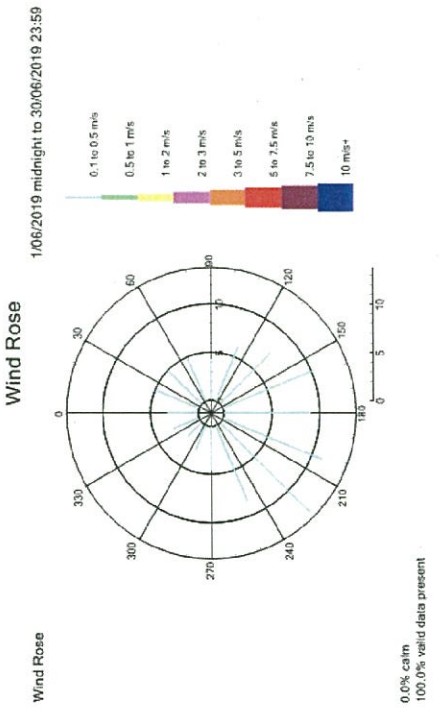
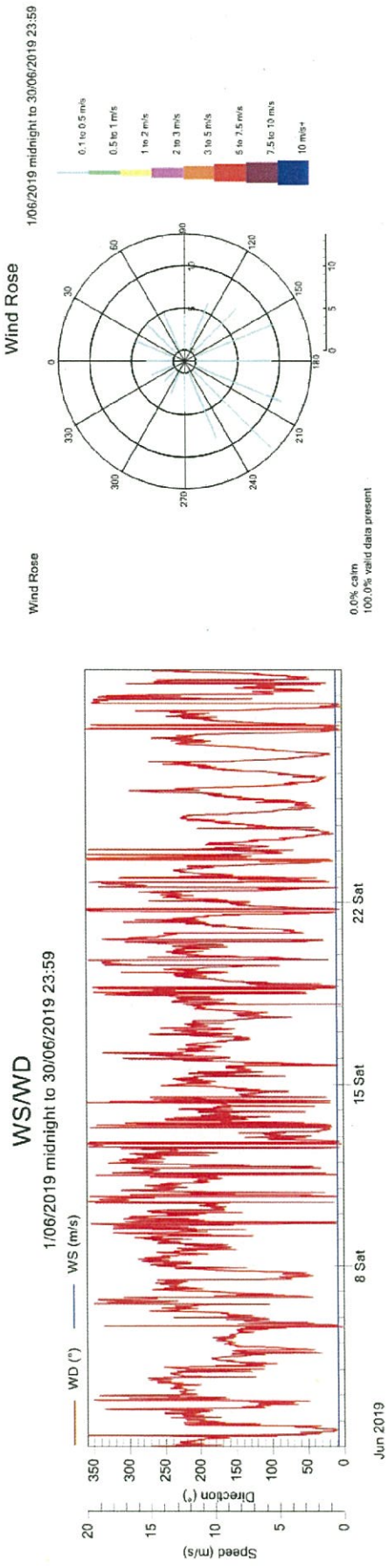
### Solar Radiation



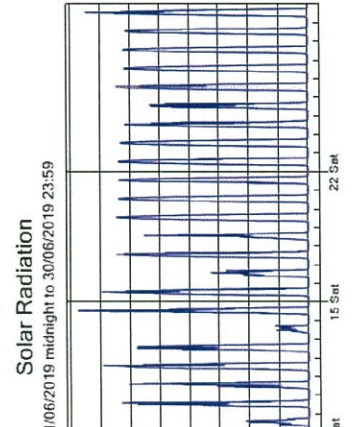
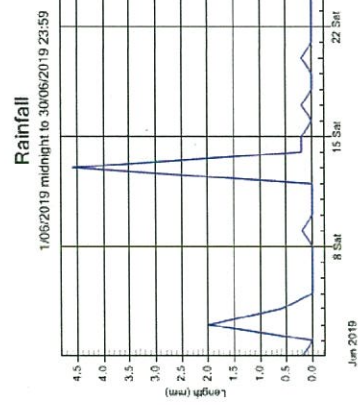
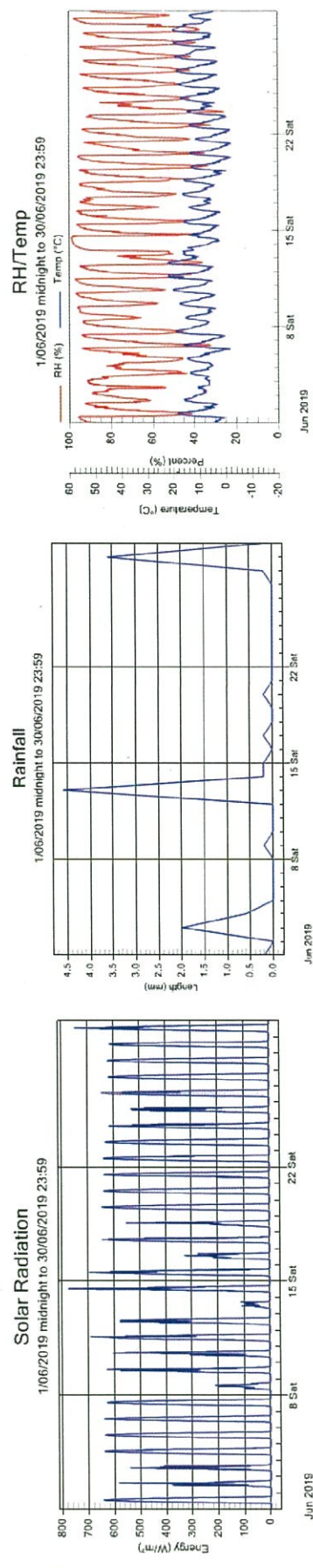
### Solar Radiation







0.0% calm  
100.0% valid data present





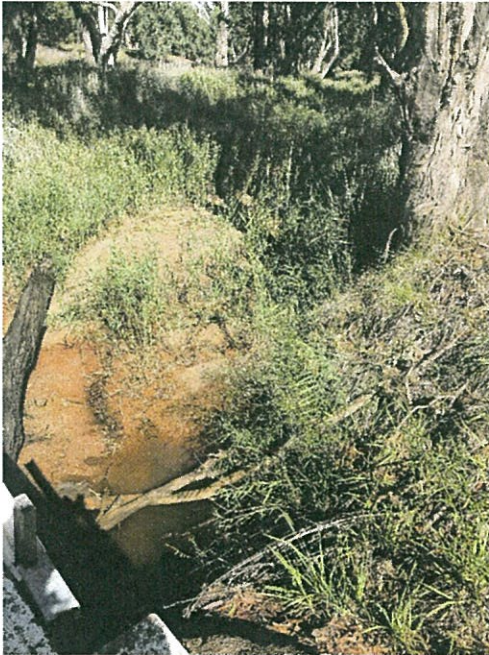


APPENDIX C - Water Monitoring Location Photographs 26 March 2019

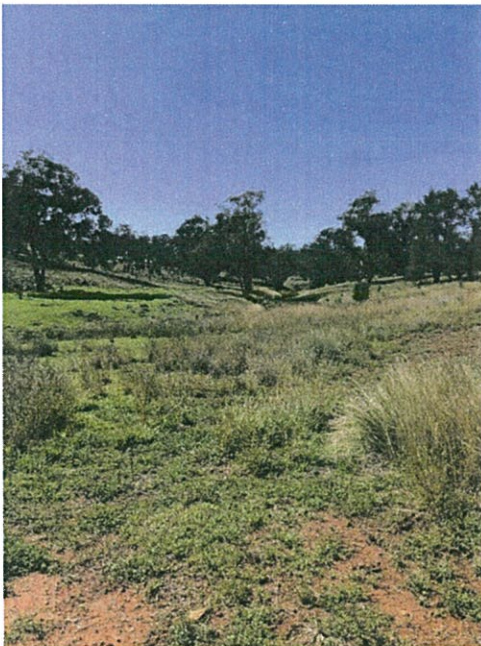




**Dubbo Project Surface Water Sampling 26 March 2019 after 25mm of rainfall overnight.**



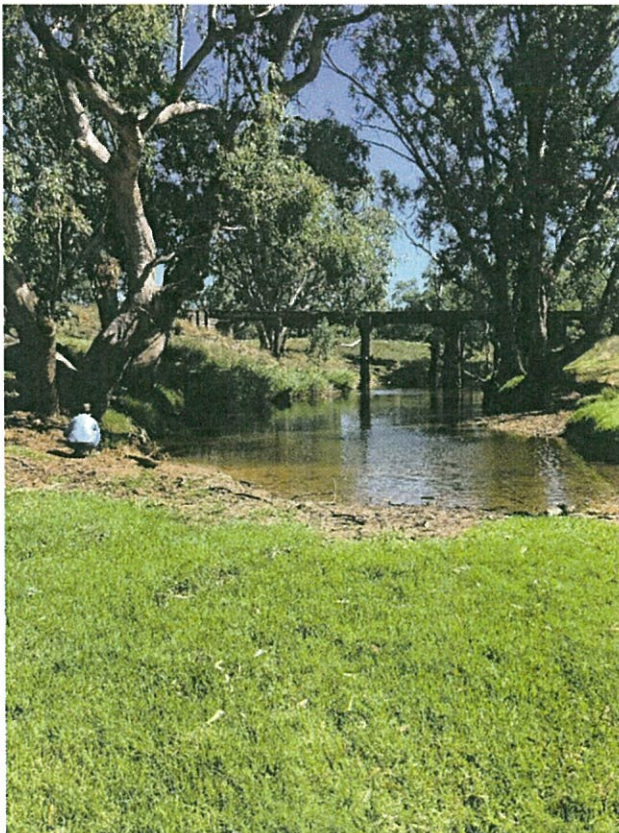
SW007-Wambangalang Creek sampled 26 March 2019.



Watercourse B - 1000m upstream of SW003 looking southeast. Photo taken 26 March 2019.

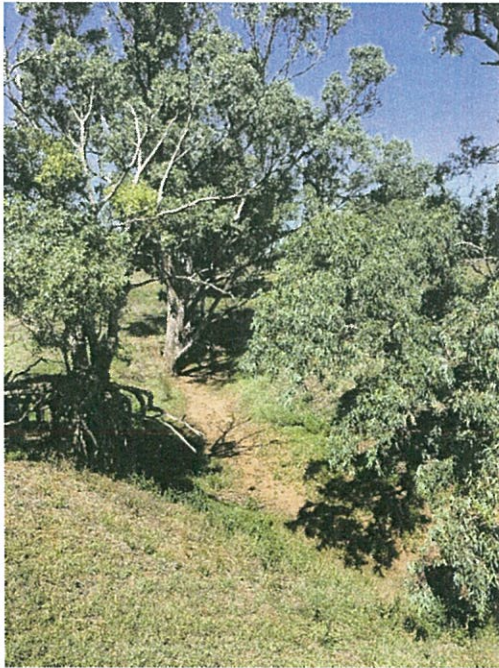


SW003-Watercourse B Toongi Valley sampled 26 March 2019.



SW005- Wambangalang Creek under sand flow. Sampled 26 March 2019.





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 -2019







**ALS Environmental**

**CERTIFICATE OF ANALYSIS**

Work Order : **ES1909295**      Page : 1 of 4  
 Client : **AUSTRALIAN STRATEGIC MATERIALS**      Laboratory : **Environmental Division Sydney**  
 Contact : **MR MIKE SUTHERLAND**      Contact : **Customer Services ES**  
 Address : **PO Box 910**      Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**  
           **DUBBO NSW 2830**  
 Telephone : **---**      Telephone : **+61-2-8784 8555**  
 Project : **DUBBO ZIRCONIA PROJECT**      Date Samples Received : **27-Mar-2019 08:30**  
 Order number : **---**      Date Analysis Commenced : **27-Mar-2019**  
 C-O-C number : **---**      Issue Date : **01-Apr-2019 13:56**  
 Sampler : **MDS**  
 Site : **---**  
 Quote number : **SY/363/16**  
 No. of samples received : **4**  
 No. of samples analysed : **4**



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
Dian Dao		Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



Page : 2 of 4  
Work Order : ES1909295  
Client : AUSTRALIAN STRATEGIC MATERIALS  
Project : DUBBO ZIRCONIA PROJECT

### 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

∅ = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- 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**

Compound	CAS Number	Client sample ID		Unit	LOR	Client sampling date / time	SW-003		SW-004		SW-005		SW-007		
		Result	Result				Result	Result	Result	Result	Result	Result			
EA005P: pH by PC Titrator	----	0.01	pH Unit	7.58	8.11	7.18	7.71	26-Mar-2019 11:34	26-Mar-2019 12:05	26-Mar-2019 11:50	26-Mar-2019 10:45	ES1909295-001	ES1909295-002	ES1909295-003	ES1909295-004
EA010P: Conductivity by PC Titrator	----	1	µS/cm	448	2750	407	5490								
EA015: Total Dissolved Solids dried at 180 ± 5 °C	----	10	mg/L	308	1560	330	3240								
EA025: Total Suspended Solids dried at 104 ± 2°C	----	5	mg/L	16	8	11	20								
<b>ED093F: Dissolved Major Cations</b>															
Calcium	7440-70-2	1	mg/L	28	54	20	145								
Magnesium	7439-95-4	1	mg/L	18	104	13	158								
Sodium	7440-23-5	1	mg/L	31	378	43	818								
Potassium	7440-09-7	1	mg/L	11	10	9	6								
<b>EG020T: Total Metals by ICP-MS</b>															
Aluminium	7429-90-5	0.01	mg/L	0.32	0.80	0.53	0.22								
Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.002	0.002								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001								
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001								
Copper	7440-50-8	0.001	mg/L	0.002	0.004	<0.001	<0.001								
Nickel	7440-02-0	0.001	mg/L	0.006	0.003	0.003	0.002								
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001								
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01								
Zinc	7440-66-6	0.005	mg/L	0.006	<0.005	<0.005	<0.005								
Manganese	7439-96-5	0.001	mg/L	0.530	0.462	0.239	2.46								
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001								
Uranium	7440-61-1	0.001	mg/L	<0.001	<0.001	0.004	0.010								
Boron	7440-42-8	0.05	mg/L	0.06	<0.05	0.08	0.06								
Iron	7439-89-6	0.05	mg/L	1.35	0.92	0.52	2.02								
<b>EG035T: Total Recoverable Mercury by FIMS</b>															
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001								
<b>EK055G: Ammonia as N by Discrete Analyser</b>															
Ammonia as N	7664-41-7	0.01	mg/L	0.02	<0.01	<0.01	0.39								
<b>EK057G: Nitrite as N by Discrete Analyser</b>															
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	0.03								
<b>EK058G: Nitrate as N by Discrete Analyser</b>															





**Analytical Results**

Compound	CAS Number	LOR	Unit	Client sample ID			
				Client sampling date / time	SW-003	SW-004	SW-005
Sub-Matrix: WATER (Matrix: WATER)				26-Mar-2019 11:34	26-Mar-2019 12:05	26-Mar-2019 11:50	26-Mar-2019 10:45
				ES1909295-001	ES1909295-002	ES1909295-003	ES1909295-004
				Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser - Continued							
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	0.17
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Nitrite + Nitrate as N		0.01	mg/L	<0.01	<0.01	<0.01	0.20
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Total Kjeldahl Nitrogen as N		0.1	mg/L	1.7	1.6	1.1	1.8
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser							
Total Nitrogen as N		0.1	mg/L	1.7	1.6	1.1	2.0
EK067G: Total Phosphorus as P by Discrete Analyser							
Total Phosphorus as P		0.01	mg/L	0.18	0.39	0.08	0.16
EP020: Oil and Grease (O&G)							
Oil & Grease		5	mg/L	<5	<5	<5	<5
EP025: Oxygen - Dissolved (DO)							
Dissolved Oxygen		0.1	mg/L	5.3	6.8	4.0	7.0







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





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

Our ref: DOC18/898163

By email: [MSutherland@alkane.com.au](mailto:MSutherland@alkane.com.au)

22 November 2018

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 and Environment – Resources Regulator (the Department) on 21/09/2018 (Department Reference: DOC18/738226).

**NOTICE OF SATISFACTORY AEMR**

Pursuant to Condition 4 of Mining Authorisation Number ML1724, the above-mentioned ARR is to the satisfaction of the Minister for Resources for the NSW Department of Planning and Environment.

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 2017 – 30 June 2018” prepared by Australian Strategic Materials Ltd and dated 20 September 2018, and covering the period from 1 July 2017 to 30 June 2018.

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



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

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Fawcett', with a stylized flourish at the end.

Christine Fawcett  
Manager Environmental Operations – Central/West  
Resources Regulator  
NSW Department of Planning and Environment  
Signed under delegation from the Minister for Resources.

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Contact: Chris Schultz  
Phone: 02 4224 9478  
Fax: 02 4224 9470  
Email: [chris.schultz@planning.nsw.gov.au](mailto:chris.schultz@planning.nsw.gov.au)

Mr Michael Sutherland  
General Manager  
Australian Strategic Materials Ltd  
Level 2  
21 Church Street  
Dubbo NSW 2830

Email: [msutherland@alkane.com.au](mailto:msutherland@alkane.com.au)

Dear Mr Sutherland

### **Dubbo Project (SSD-5251) Annual Review**

Reference is made to the Annual Review for the Dubbo Project for the period 1 July 2017 to 30 June 2018, submitted to the Department on 21 September 2017 as required under Condition 4 of Schedule 5 of SSD-5251 (the consent).

The Department has reviewed the Annual Review and considers it to generally satisfy the requirement of the consent in relation to the Annual Review. Please note that approval of this Annual Review is not endorsement of the compliance status of the project.

It is requested that the following corrections are made to the Annual Review prior to upload to the website:

- (i) correct the mining lease number shown in the inset in Figure 1 (it currently references ML1659);
- (ii) correct the reference to Appendix C in Section 6.3.2 (should be Appendix D);
- (iii) reference Appendix C – Water Monitoring Location Photographs 6 December 2017 in the text; and
- (iv) either include the surface water monitoring results from 2016 in Appendix D or correct the text that indicates that they are provided in Appendix D.

It is requested that in future Annual Reviews that:

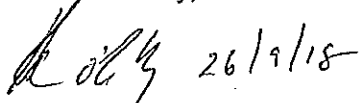
- (a) the biodiversity offset area is shown on a relevant plan; and
- (b) surface water and groundwater monitoring data are provided graphically to show trends.

In accordance with Condition 11 of Schedule 5 of the consent, the Applicant is required to make a copy on the documents listed by this condition publicly available on the company website and ensure that these documents are up-to-date. It is noted that environmental monitoring results for September 2016 are provided on the website however there are no 2017 or 2018 results.

It is requested that the Annual Review is uploaded within one month of the date of this letter. Environmental monitoring results for September 2016 should either be removed, or 2017/2018 results provided.

Should you need to discuss the above, please contact Chris Schultz as per the details provided.

Yours sincerely,



Katrina O'Reilly  
**Team Leader Compliance**  
as nominee of the Secretary





## Planning & Environment

**Resource Assessments**

Contact: Stephen Shoesmith  
Phone: (02) 9274 6164  
Email: [stephen.shoesmith@planning.nsw.gov.au](mailto:stephen.shoesmith@planning.nsw.gov.au)

Mr Alex Irwin  
Senior Environmental Consultant  
Dubbo Zirconia

Via Email to: [alex@rwcorkery.com](mailto:alex@rwcorkery.com)

Dear Mr Alex Irwin

### **Dubbo Zirconia Project (SSD\_5251) Approval – Traffic Management Plan**

I refer to your submission seeking the Secretary's review and approval of the Construction Traffic Management Plan (TMP) for Dubbo Zirconia Project (SSD\_5251).

The Department has reviewed the revised version of the TMP (Revision 2.2), and is satisfied that it addresses the requirements of Condition 44, in Schedule 3 of Development Consent SSD\_5251.

Accordingly, the Secretary approves the revised Construction Traffic Management Plan. Please ensure that a copy of the approved plan is placed on your website as soon as possible.

It is noted that the NSW Roads and Maritime Services (RMS) made several rounds of detailed comments related to road safety and fatigue management. The Department recommends Dubbo Zirconia Project consider RMS comments in implementing the mine safety management system.

Please ensure RMS, Council and the Dubbo Zoo are consulted with, for the Operations Traffic Management Plan.

If you require further information, please contact Stephen Shoesmith on (02) 9274 6164 or by email to [stephen.shoesmith@planning.nsw.gov.au](mailto:stephen.shoesmith@planning.nsw.gov.au).

Yours sincerely

Clay Preshaw  
**Director**  
**Resource and Energy Assessments**  
as nominee of the Secretary

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