Tropicana Joint Venture

Tropicana Gold Mine (TGM)

Ministerial Statement No 839

Annual Compliance Assessment Report

24 September 2015 to 23 September 2016

20 December 2016

Document Reference: CAR20161220

Tropicana Gold Project, Annual Compliance Assessment Report

Ministerial Statement No. 839

CAR20161220

This report has been developed by AngloGold Ashanti Australia on behalf of the Tropicana Joint Venture.

Revision	Author	Reviewer	Date
Draft - for internal review	M. Stingemore	R. Lane	14 December 2016
Final – for review and release	M. Stingemore R. Lane	D. Gibbs	20 December 2016

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1 Introduction

The Tropicana Gold Mine (TGM) (the Project) is an open cut gold mine located approximately 330 kilometres (km) east northeast of Kalgoorlie on the western edge of the Great Victoria Desert (GVD) (Figure 1). The operation is a joint venture (Tropicana JV) between AngloGold Ashanti Australia (70% stakeholder and manager) and Independence Group (30% stakeholder).

The Project was approved under the *Environmental Protection Act 1986* (EP Act) in September 2010 and issued with Ministerial Statement No. 839 (MS839). Condition M4.6 of MS839 requires the preparation and submission of an annual compliance assessment report for the preceding 12 months.

This report has been prepared to meet Condition M4.6 and covers the period 24 September 2015 to 23 September 2016. The TGM Ministerial Statement audit compliance table updated for the 2016 reporting period is provided in Appendix 1.

The TGM is comprised of:

- Operational area - containing the open pits, waste landforms, stockpiles, tailings storage facility, processing plant, mine village, aerodrome and other supporting infrastructure.
- Infrastructure corridor - including an access road and communications corridor linking the operational area to existing communications and road networks of the Goldfields regions. This corridor is referred to as the Pinjin Corridor.
- Process water supply area – containing the process water supply borefield (PWSB).

This is the sixth Compliance Assessment Report (CAR) prepared by AngloGold Ashanti Australia (AGAA) on behalf of the Tropicana JV for the Project and has been prepared in accordance with the approved Compliance Assessment Plan (CAP) dated 13 December 2010 prepared and submitted to the Office of the EPA in 2010.

1.1 Approvals History

Subsequent to the issuance of MS839 in September 2010, the Tropicana JV has sought and gained approvals under section 45c of the EP Act to implement non-substantial changes to the original approved Project (Table 1).

Table 1: Non-substantial changes to MS839 Key Characteristics

Application	Date Approved	Element	Original Proposal	Approved Change to Proposal
Tailings Storage Facility Design – Two Cell vs. Single Cell. August 2012	19 November 2012	Tailings Storage Facility	Up to 7 mtpa; two-cell paddock tailings storage facility with possible in-pit TSF deposition. Maximum height of 372 mRL. Approximately 1330 m wide by 1850 m.	Up to 7 mtpa; single-cell paddock tailings storage facility with possible in-pit deposition. Maximum height of 372 mRL. Maximum 292ha footprint.
Water Supply Area Increased	17 December	Mining Rate	Up to 75 mtpa (ore and waste)	Removed as not a significant key characteristic relevant to the

Application	Date Approved	Element	Original Proposal	Approved Change to Proposal
Footprint and Abstraction Volume. September 2014	2014			environment.
		Stripping ratio	8:1	Removed as not a significant key characteristic relevant to the environment.
		Water Supply	Up to 7GL/year	Up to 9 GL/year
		Mine Access Road	Pinjin Option – 370 km (~210 km of road construction)	Pinjin Route – 370 km (~210 km of road construction.
		Communications	Fibre Optic or Microwave via either Pinjin or Tropicana Transline Corridor	Removed as not a significant key characteristic relevant to the environment.
		Main Power Supply	Onsite power station with an installed capacity of up to 40 Mw	Removed as regulated under Part V of the *Environmental Protection Act 1986*.
		Disturbance Area	Not more than 3,440 ha comprising: • Operational area – 2,570 ha • Water supply area – 200 ha • Infrastructure area – 670 ha	Not more than 3,540 ha comprising: • Operational area – 2,570 ha within 27,241 ha Operational Development Envelope. • Water supply area – 300 ha within 19,663 ha Water Supply Area Development Envelope. • Infrastructure areas – 670 ha within 4,269 ha Infrastructure Development Envelope.
		Figures	Figure 1 – Regional location of mine site Figure 2 – Proposal footprint and conceptual layout of key components	Figure 1 and 2 of Schedule 1 replaced by: Figure 1: Development Envelopes Table 2: Development Envelopes – Map Grid of Australia (MGA) Zone 51 Coordinates.

2 Current Status

Key activities undertaken during the reporting period included:

- Continuation of mining in the Tropicana, Havana and Boston Shaker Open Pits.
- Processing plant optimisation, including upgrades to conveyors and the Carbon-in-Leach circuit.
- Completion of the construction of the stage 4-5 Tailings Storage Facility (TSF) wall raise.
- Materials characterisation and erosion modelling to determine the optimum waste landform rehabilitation design. Characterisation and modelling studies were utilised to support a section 45c application submitted to the OEPA on 6 October 2016 to increase the height of waste landforms at TGM.

Table 2 provides an overview of the Project's key characteristics and current status while the updated disturbance footprint is shown in Figure 1, Figure 2 and Figure 3.

Table 2: Tropicana Gold Project Key Characteristics Table Status Report

Element	Description	Status / Comment
General		
Project Life	Approximately 15yr of mining; total project duration up to 25yr (including post closure monitoring)	Mining and Processing activities continued at a steady rate during the reporting period.
Mining and Processing		
Number of pits	Up to 4	3 current Open Pits (Tropicana, Havana and Boston Shaker)
Open pit void/s	Not more than 400 hectares	Current open pit area: 216.49 ha
Max. length of pit/s	6 kilometres (if pits combine)	Current max. open pit length: 3.24 km (Tropicana and Havana combined)
Max width of pit/s	1.5 kilometres	Current maximum width of Havana pit is approx. 700m
Overburden & waste	Not more than 800 million tonnes LOM	158.4 Mt of waste material mined
Waste landform	Not more than 1,200ha, max height 375mRL, slope with max angle 15°	Current Waste landform area: 510.42 ha Current max height: 374.5mRL
Water Supply	Up to 9 gigalitres per annum	4.8 GL in reporting period.
Dewatering Rate	1,000 to 5,000 kilolitres per day	295,712 kL total volume dewatered during reporting period. Average dewatering rate of 808 kL per day.
Infrastructure		
Mine access road	Pinjin Route – 370 km (~210km of road construction)	Pinjin Mine Access Road construction was completed during the 2012 reporting period.
Aerodrome	All weather strip 2.4km long	Aerodrome completed and commissioned. 2.1 km all weather strip.
Water Pipeline	Approximately 50 km in length from the borefield (located north northwest of Operational Area) to the process plant	Pipeline completed and commissioned. Pipeline length is approximately 42 km.
Tailings Storage Facility (TSF)	Up to 7 mtpa, single celled tailings storage facility with possible in pit deposition. Maximum height of 372 mRL. Maximum 292 ha footprint.	6.65 Mt of tailings disposed to the TSF during reporting period. Current TSF area: 290.27 ha Current TSF height: 352 mRL
Disturbance Areas		
Disturbance Area	Not more than 3,540ha comprising: • operational area – 2,570 ha within 27,241 ha Operational Development Envelope. • water supply area – 300 ha within 19,663 ha Water Supply Area Development Envelope. • Infrastructure areas – 670 ha within 4,269 ha Infrastructure Development Envelope.	Total current disturbance footprint: 3010.93 ha Operational Area: 2193.97 ha Water Supply Area: 195.67 ha Infrastructure Area: 621.29 ha Note – the Operational Development Envelope and the Infrastructure Development Area defined by Schedule 1 of MS839 overlap. To avoid duplication of

Element	Description	Status / Comment
		disturbance data, the Infrastructure Development Envelope has been cropped to outside the Operational Development Envelope for reporting purposes.

Note – Data recorded as at 30 September 2016

3 Compliance

The 2015-2106 reporting period represents the sixth reporting period for the TGM and the third full operating period for the TGM, with the processing plant commencing operation during September 2013.

During the 2016 reporting period the Tropicana JV was compliant with all ministerial conditions, with the exception of an administrative non-compliance associated with Condition 1.1 of MS839. A completed audit table providing further detail on compliance with conditions is included in Appendix 1.

The administrative non-compliance against Condition 1.1 of MS839 was identified during a review of the 'Disturbance Area' key characteristic of Schedule 1. The review found that the spatial extent of Infrastructure Development Envelope does not align completely with the *Mining Act 1978* tenure upon which the Pinjin Mine Access Road has been constructed. As a consequence, the southern-most 13 km of the Pinjin Mine Access Road is not consistently located within the Infrastructure Development Envelope. In addition, the spatial extent of the Infrastructure Development Envelope does not include communication towers located along the length of the Pinjin Mine Access Road and only partially includes borrow pits associated with the Access Road (the majority of which have now been rehabilitated). It is important to note that the reported Infrastructure disturbance area of 621.29 ha includes all disturbance associated with the Pinjin Mine Access Road is compliant with the 'Disturbance Area' key characteristic. Further to this, the construction of the Pinjin Mine Access Road and associated infrastructure has been completed in compliance with approved Mining Proposals under the *Mining Act 1978*. AGAA proposes to engage with the OEPA in 2017 to determine the most appropriate mechanism to rectify the spatial extent of the Infrastructure Development Envelope.

In accordance with the CAP, this CAR for the 2016 reporting period will be made publicly available once the Tropicana JV has received acknowledgement from the OEPA that the report has been accepted. A copy of the CAR 2016 will then be placed on the Tropicana JV website.

No changes have been made to the previously approved CAP during this reporting period (Condition 4.1 of MS839).

4 Environmental Monitoring

During the 2016 reporting period groundwater, surface water, vegetation condition and fauna monitoring programs were undertaken and the results from this monitoring analysed. Details of monitoring activities conducted throughout 2016 and further analysis on monitoring results is provided to the Department of Mines and Petroleum (DMP), Department of Environment Regulation (DER) and Department of Water (DoW) in separate annual reports.

Groundwater monitoring from the eight monitoring bores installed around the TSF and waste landform footprints (Figure 4) was undertaken throughout 2016. A summary of results from water samples taken are provided in Appendix 3. Results obtained from these monitoring bores were compared with trigger values which were established in 2014. Analysis of results indicates that changes in groundwater quality (baseline groundwater quality +/- 10%) has occurred at some monitoring bores. ENVMB001, located to the north of the TSF, has displayed results for multiple parameters that are above baseline water quality triggers values, including Electrical Conductivity (EC) and the identification of trace WAD Cyanide. Groundwater quality changes at ENVMB001 are influenced by the operation of the nearby TSF. Conversely, monitoring results for ENVMB004 have been recorded below the minimum trigger values for multiple parameters, including EC and Boron. Results recorded lower than the minimum trigger value are considered to be associated with natural fluctuations in groundwater quality and not associated with operational activities.

Localised changes in groundwater quality are not considered to have any detrimental impact to environmental values. The existing groundwater environment is typically saline to hypersaline and has no known beneficial users. No stygofauna were identified within the Operational Area during baseline surveys. Monitoring of vegetation condition in proximity to operational areas has not identified any impacts to vegetation health associated with changes in groundwater quality.

To mitigate any potential environmental impacts resulting from a rise in groundwater level, AGAA implemented a Seepage Mitigation Project in 2016. The recovery of seepage by this project also mitigates the environmental risks associated with any change in groundwater quality. This project involved:

- Increased frequency of groundwater monitoring of the Environmental Monitoring Bores from quarterly to monthly in January 2016.
- Hydrogeological investigations, including field exploration, to identify area of high potential to facilitate seepage recovery.
- Drilling of groundwater recovery bores at selected targets.
- Installation of a seepage recovery pipeline network to return recovered groundwater to the processing plant.
- Installation and commissioning of six seepage recovery pumps in October and November 2016.

- Installation of additional monitoring bores downstream from the TSF to provide improved understanding of the existing groundwater environment and any influence of the operation of the TSF on the groundwater regime.

Surface water monitoring sites have been established around the TSF and waste landforms (Figure 5) as required by M8.2. Due to the absence of continuous standing surface water, samples from these locations have only been obtained following rainfall events where there is surface water runoff (>20 mm rainfall in 24 hours). Results from surface water sampling locations are provided in Appendix 4.

Monitoring of vegetation condition and abundance is required on an annual basis across TGM in accordance with Condition 5-2 of MS839. A Vegetation Monitoring Strategy (VMS) was developed in 2011 to achieve the requirements of Condition 5-2. The VMS was designed using an integrated remote sensing (entire site) and targeted field assessment (local scale) approach to detect and quantify decline in vegetation condition that may result from any of the identified impacting processes. In 2015, health and cover indices were recorded using a combination of remote sensing and field assessment techniques.

The VMS establishes the vegetation monitoring triggers for the Project. Triggers relate to native vegetation cover and productivity, indicator species, clearing boundaries, weeds, and rehabilitation. The 2015 program involved an assessment of the survey findings against three of the Project triggers – Trigger 1 (25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites), Trigger 5 (Identification of a weed species in a site where it had not previously been recorded) and Trigger 6 (25% increase of weed species in abundance or cover relevant to reference site) as outlined in the VMS.

The 2015 monitoring program was undertaken by Eco Logical Australia Pty Ltd in October 2015 (Appendix 9). The 2015 monitoring program involved assessment of high resolution digital multi-spectral imagery and field survey verification at 112 quadrats (20m by 20m in size). Four additional vegetation monitoring locations (comprised of two new impact sites and two new reference sites) were established within the process supply borefield during the 2014 survey. The locations of the vegetation monitoring sites are shown in Figure 6.

Overall, the 2015 monitoring program found that no impact sites across the three core areas recorded required further investigation under Triggers 1, 5 and 6. Two sites had a decrease in overall foliar cover (%) which exceeded 25% deviation relative to their respective reference sites. These sites were impacted by a lightning initiated fire in 2012. Several other sites exceeded a 25% deviation in the comparisons of overall foliar cover (%) between 2015 to 2014 and 2015 to baseline. These sites had reduced cover due to natural processes, including fire and climatic influences. Most sites were showing no change in cover or had increasing cover (typically seen at sites experiencing post-fire regeneration), suggesting no impacts from the Project were occurring. This is further supported by the findings from the remote sensing component of the monitoring program.

Fauna monitoring conducted during the reporting period has included:

- Daily wildlife inspections at the Tailings Storage Facility (TSF).
- Fauna observations at the TSF by Donato Environmental Services to support the TGM Cyanide Code certification.
- Photographic monitoring of Mallee fowl mound (Plate 1 and Plate 2).
- Photographic monitoring of artificial water sources (Plate 3 to Plate 6).

A number of artificial water sources have been established around the TSF to provide an alternative water sources for wildlife and these are monitored via motion sensing cameras and periodically reviewed. Photographic monitoring has captured a number of fauna species utilising the artificial ponds including a variety of birds, marsupials, mammals and reptiles.

Priority flora species identified during flora and vegetation surveys at TGM, have been referenced and incorporated into the GIS database. Prior to any clearing being undertaken outside the Active Mining Area (AMA), an Environmental and Heritage Inspection Notification (EIN) is undertaken to determine whether the proposed disturbance will impact on any Priority flora or conservation significant habitats and if so, whether disturbance impacts can be mitigated. Typically the EIN process incorporates an initial desktop survey to determine known environmental values and avoidance areas within the proposed disturbance area. Following the desktop assessment, a field inspection is undertaken utilising a GPS to identify the following:

- Vegetation type
- Soil type
- Heritage considerations
- Environmental considerations
- Safety considerations.

During the 2016 reporting period a total of three EINs were completed within the TGM Development Envelopes (Appendix 6). The following environmental and heritage values were identified and entered in the Tropicana GIS database:

- *Olearia arida* (P4) was identified during the Long Island EIN
- *Olearia arida* (P4) and *Dicrastylis cundeeleensis* (P4) were identified during the PWSB Bore Maintenance EINs (19 Feb 2016; 2 March 2016).

5 Endorsement

This Report has been endorsed by:
Mr Duncan Gibbs
General Manager
Tropicana Gold Mine
AngloGold Ashanti Australia

I have reviewed this document and accept that the information provided is an accurate account of the activities undertaken during the current reporting period (24 September 2015 to 23 September 2016)

Date: 20 December 2016

Duncan Gibbs
General Manager
Tropicana Gold Mine
AngloGold Ashanti Australia

FIGURES

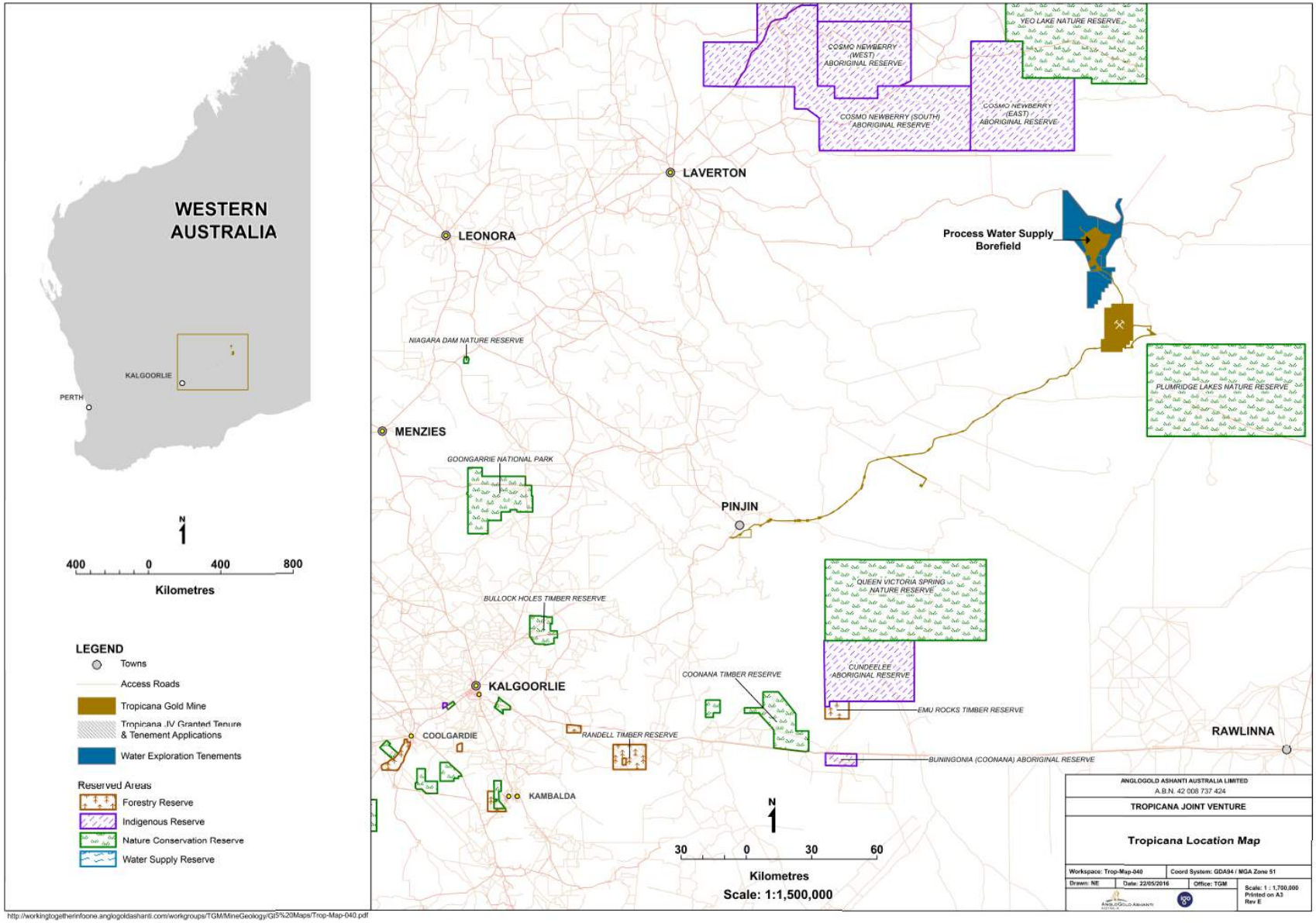

Figure 1: General Location of the Tropicana Gold Mine

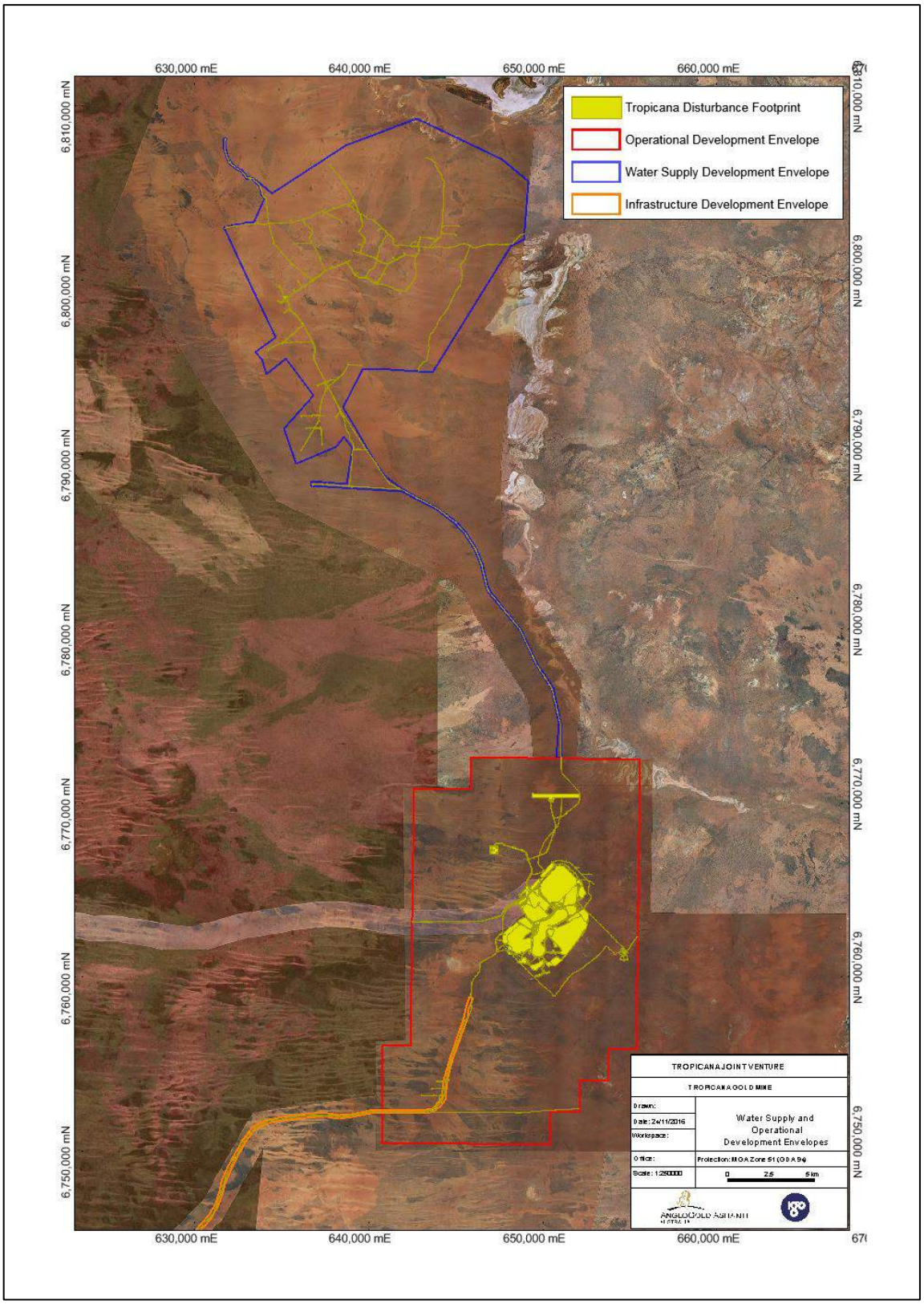

Figure 2: Water Supply and Operational Development Envelopes

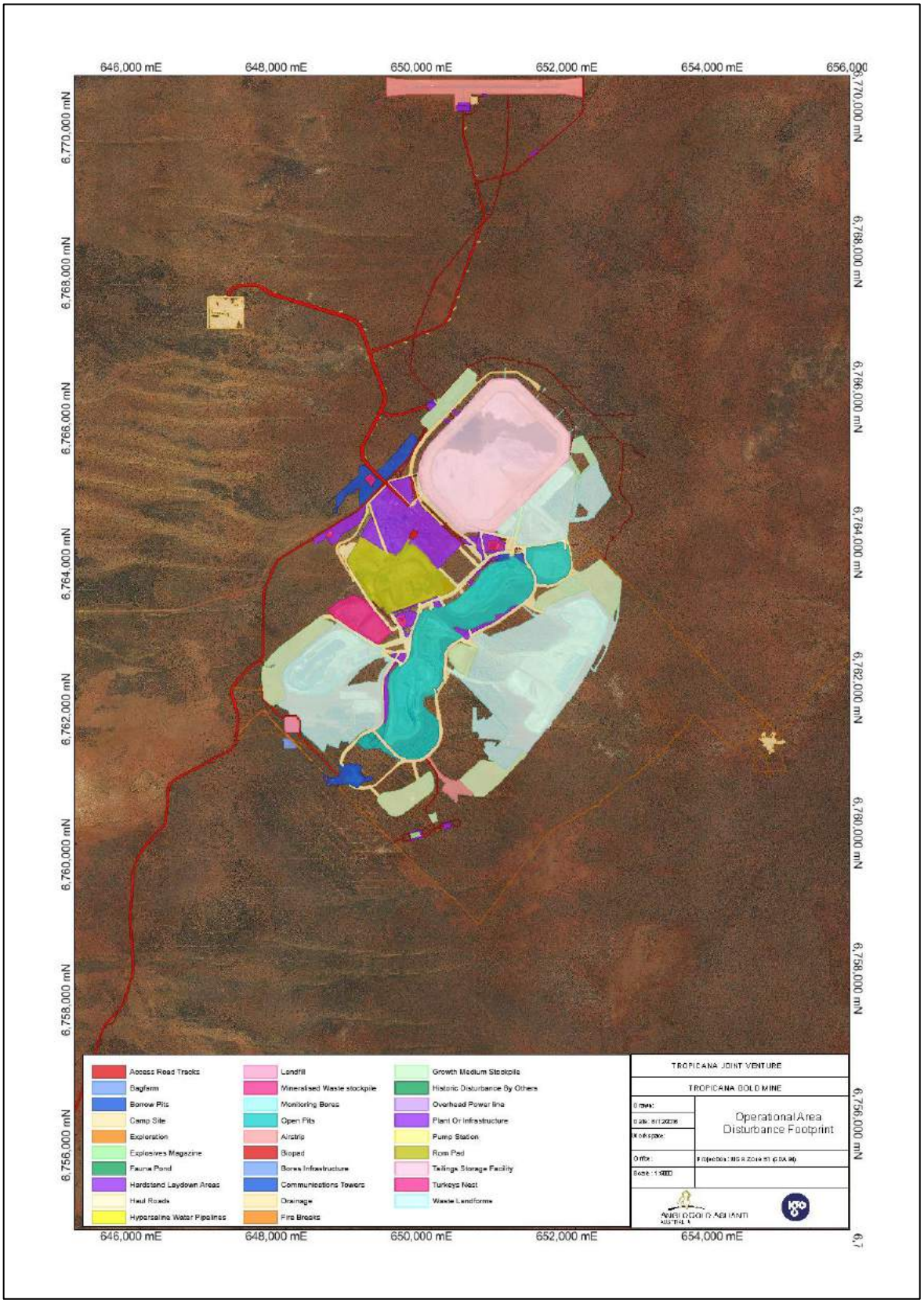

Figure 3: Operational Area Disturbance Footprint

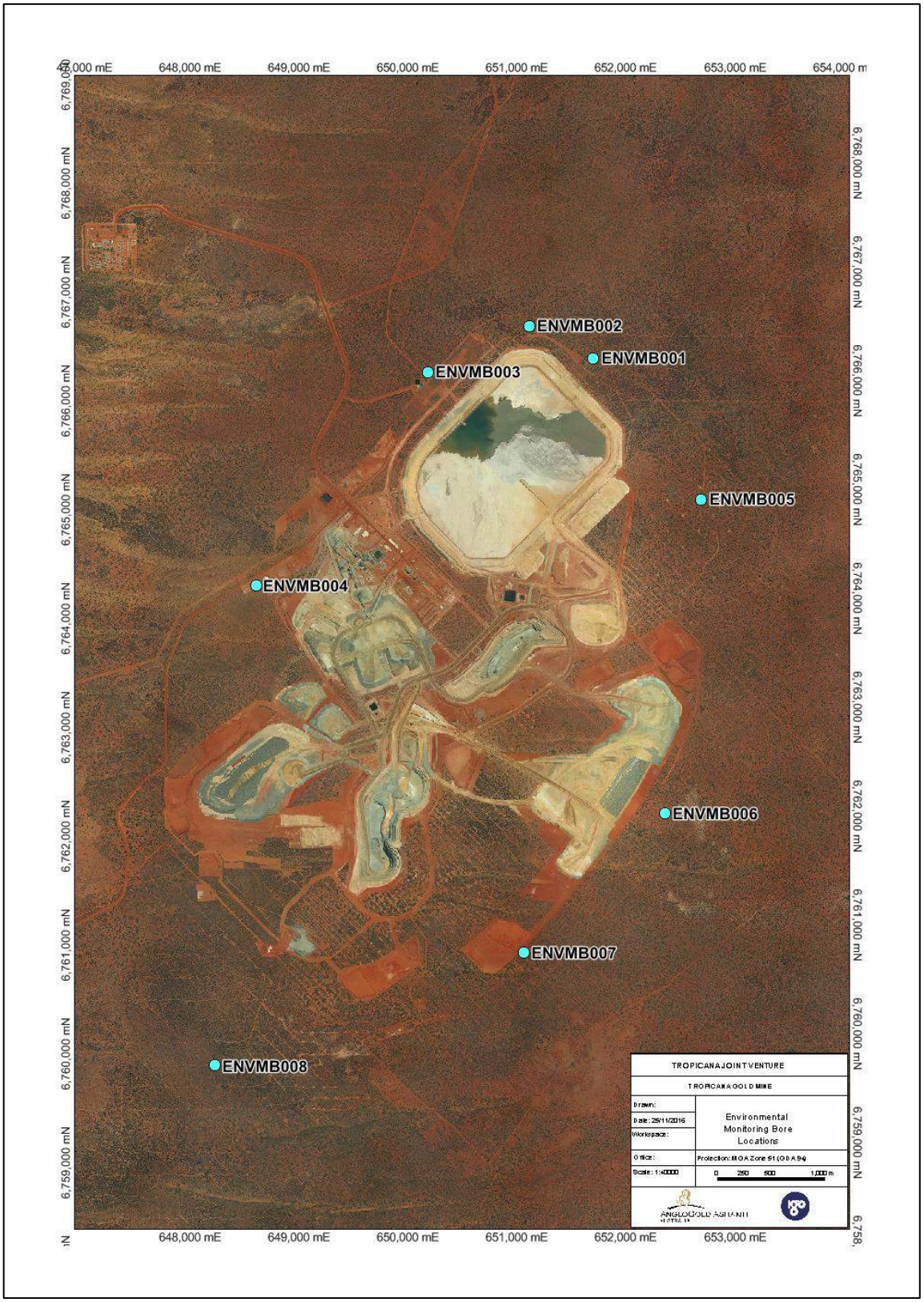

Figure 4: Ministerial Groundwater Monitoring Bore Locations

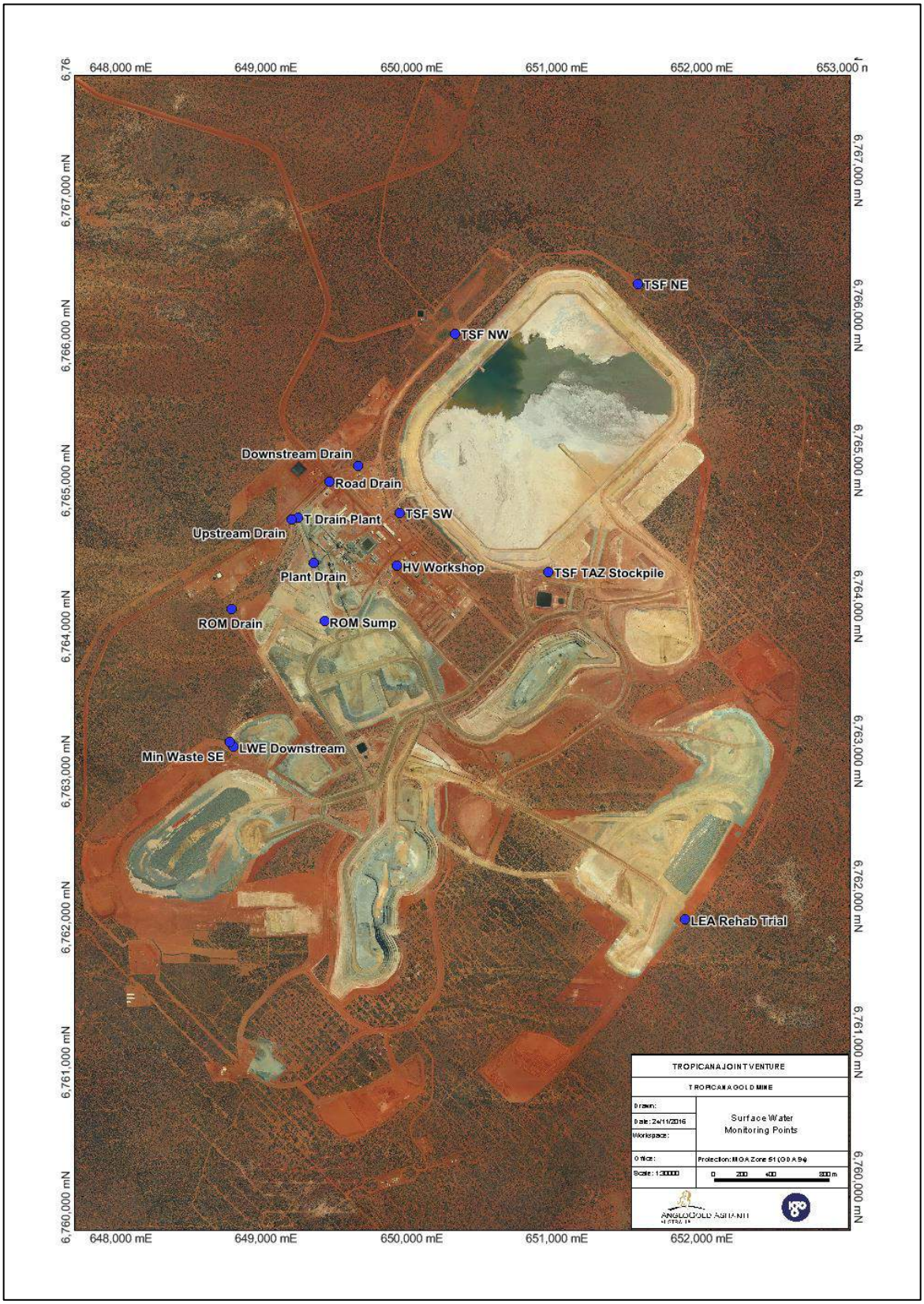

Figure 5: Surface Water Monitoring Locations

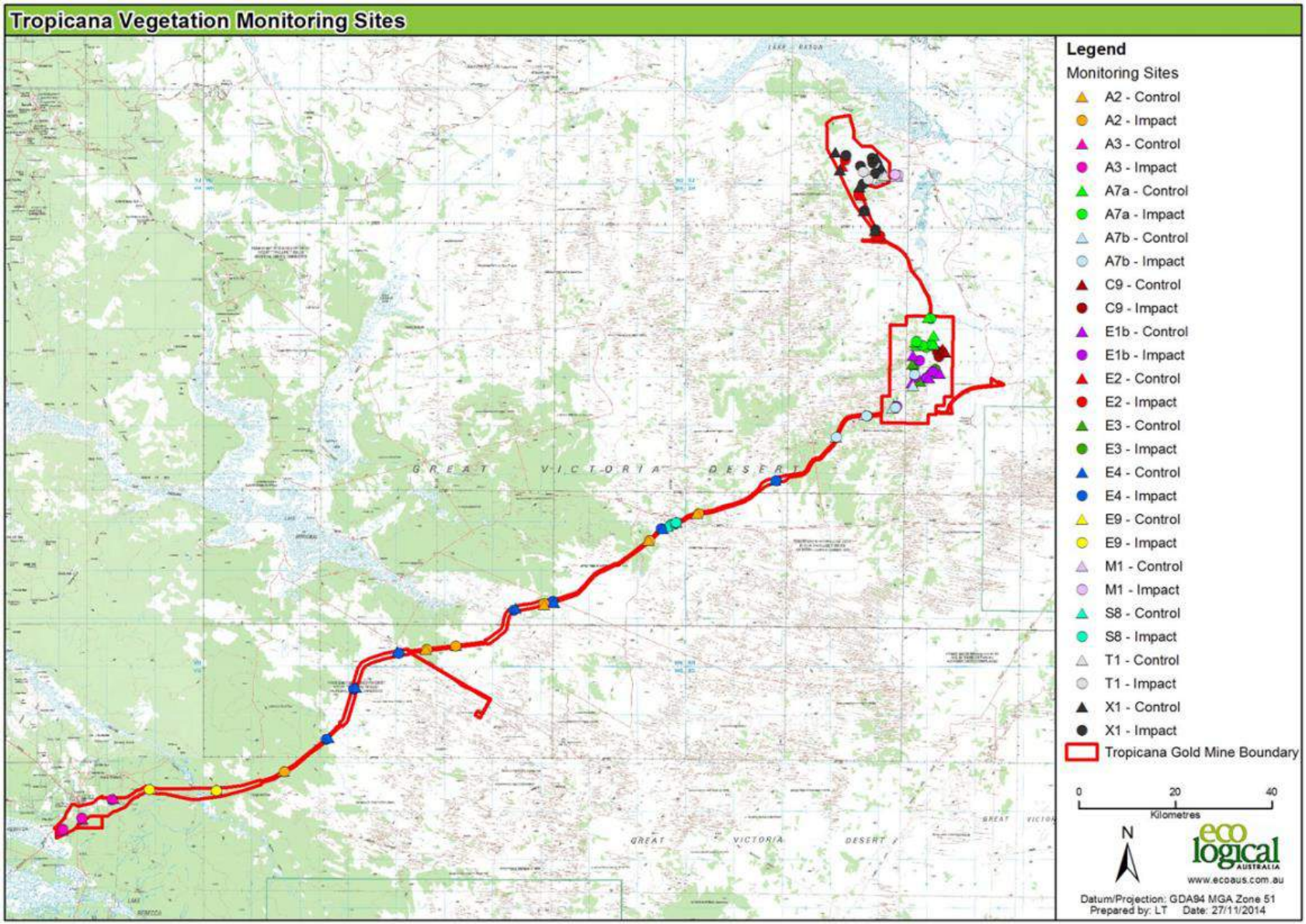

Figure 6: Vegetation condition monitoring quadrat locations (2015)

SITE PHOTOGRAPHS

Plate 1: Photographic monitoring of active Mallee fowl mound – February 2016

Plate 2: Photographic monitoring of active Mallee fowl mound – February 2016

Plate 3: Photo monitoring of TSF artificial water sources [TSF ART 2] – Wedge-Tailed Eagle (January 2016)

Plate 4: Photo monitoring of TSF artificial water sources [TSF ART 3] – Western Grey Kangaroo (January 2016)

Plate 5: Photo monitoring of TSF artificial water sources [TSF ART 4] – Dingoes (May 2016)

Plate 6: Photo monitoring of TSF artificial water sources [TSF ART 5] – Mulga Parrot (July 2016)

APPENDICES

Appendix 1 – Tropicana Gold Project Ministerial Statement No. 839 Audit Table

GOVERNMENT OF WESTERN AUSTRALIA

Office of the Environmental Protection Authority

AUDIT TABLE

Proposal Implementation Monitoring Section

PROJECT: Tropicana Gold Project, Shire of Menzies, Shire of Laverton and The City of Kalgoorlie-Boulder

Note:

- Phases that apply in this table = **Pre-Construction, Construction, Operation, Decommissioning, Overall (several phases)**
- This audit table is a summary and timetable of conditions and commitments applying to this project. Refer to the Minister's Statement for full detail/precise wording of individual elements.
- Code prefixes: M = Minister's condition; P = Proponent's commitment; A = Audit specification; N = Procedure.
- Any elements with status = "Audited by proponent only" are legally binding but are not required to be addressed specifically in compliance reports, if complied with.
- Acronyms list:- Minister for the Environment - Min for Env; Chief Executive Officer – CEO of the OEPA; Department of Environment – DoE (now DEC – Dept of Environment and Conservation); Evaluation Division - Part IV; Pollution Prevention Division - Part V; Waste Management Division - WMD; Department of Conservation and Land Management - CALM; Department of Minerals and Energy - DME; Environmental Protection Authority - EPA; Health Department of WA - HDWA; Water and Rivers Commission - WRC; Bush Fires Board - BFB.

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
839:M1.1	**Proposal Implementation**	The proponent shall implement the proposal as assessed by the Environmental Protection Authority and described in Schedule 1 of this statement subject to the condition and procedures of this statement.	As per Schedule 1, Statement 839	Compliance Report	Min for Env		Overall	Ongoing	Compliant (Administrative non-compliance)	Activities undertaken during the reporting period were compliant with Schedule 1 of the Ministerial Statement, with the exception of an administrative non-compliance associated with the 'Disturbance Areas' key characteristic of Table 1 (Refer to Section 3 of 2016 CAR).
839:M2.1	**Proponent Nomination and Contact Details**	The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.	Notify in writing a letter that provides details of the name and address of the new proponent	Letter applying for a transfer of proponent and a copy of the Statement endorsed by the proposed replacement proponent	Min for Env		Overall	On going	Not required at this stage	The nominated proponents for the Project did not change during the reporting period.
839:M2.2	**Proponent Nomination and Contact Details**	The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change	Notify in writing a letter that provides details of the name and address of the new proponent		CEO		Overall	Within 30 days of such change	Not required at this stage	There was no change to the contact name and or address of the nominated Proponent during the reporting period
839:M3.1	**Time Limit of Authorisation**	The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced	Notify in Writing	Letter of notification	CEO		Overall	Before the 23 September 2015	Completed	Assessed as 'Completed' by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). Mining Production commenced in July 2012 and Gold production commenced in September 2013.
839:M3.2	**Time Limit of Authorisation**	The proponent shall provide the Chief Executive Officer of the Office of the Environmental Protection Authority with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement	Notify in Writing	Letter of notification.	CEO		Overall	Before the 23 September 2015	Completed	Assessed as 'Completed' by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). Written notification was submitted to the OEPA on 12 March 2011 advising of the proposed commencement of works.
839:M4.1	**Compliance Reporting**	The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority	Correspondence with the OEPA Preparation of a Compliance Assessment Plan and an audit table in compliance with the requirements of the OEPA.	Approved Compliance Assessment Plan (CAP). A completed and approved Audit Table (this document). Compliance Report	CEO		Overall	Ongoing	Compliant	Compliance Assessment Plan was prepared and submitted on 13 Dec 2010. No updates have been made during the reporting period. Correspondence from General Manager OEPA on 14 February 2011 indicates OEPA is satisfied that the CAP addresses Condition M4.1
839:M4.2	**Compliance Reporting**	The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority, the compliance assessment plan required by condition 4-1 at least 6 months prior to the first compliance report required by condition 4-6, or prior to ground disturbing activity, whichever is sooner. The compliance assessment plan shall indicate: 1. the frequency of compliance reporting; 2. the approach and timing of compliance assessments; 3. the	The compliance assessment plan shall indicate: 1. the frequency of compliance reporting; 2. the approach and timing of compliance assessments; 3. the retention of compliance	Approved Compliance Assessment Plan Correspondence with OEPA	CEO		Pre-construction	By 24 June 2011 or prior to ground disturbing activities, whichever is sooner.	Completed	Assessed as 'Completed' by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). OEPA confirmed the Compliance Assessment Plan submitted on 13 December 2010 meets the requirements of M4.2 in a letter dated 14 February 2011 (A366869).

AUDIT TABLE

Proposal Implementation Monitoring Section
PROJECT: Tropicana Gold Project, Shire of Menzies, Shire of Laverton and The City of Kalgoorlie-Boulder

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
		retention of compliance assessments; 4. the method of reporting of potential non-compliances and corrective actions taken; 5. the table of contents of compliance reports; and 6. public availability of compliance reports.	assessments; 4. reporting of potential non-compliances and corrective actions taken; 5. the table of contents of compliance reports; and 6. public availability of compliance reports.							
839:M4.3	**Compliance Reporting**	The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.	As specified in CAP	Overview provided in Compliance Report	Min for Env		Overall	Compliance Report – Annually by 24 December	Compliant	Compliance Assessment Report prepared as per CAP and submitted prior to 24 December 2016 as required.
839:M4.4	**Compliance Reporting**	The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the Chief Executive Officer of the Office of the Environmental Protection Authority	Records and reports will be maintained in accordance with the Proponent's document management system requirements so that they can be retrieved if requested.	Availability at the request of the CEO	CEO		Overall	When requested by the CEO	Compliant	The CAP was submitted to the OEPA on 13 December 2010 and was approved by the OEPA on 14 February 2011. A CAR has been prepared annually since 2011. The 2016 CAR has been submitted prior to 24 December as required. All records and reports are maintained in the AGAA document management system.
839:M4.5	**Compliance Reporting**	The proponent shall advise the Chief Executive Officer of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known	Notify in writing	Correspondence to CEO of OEPA	CEO		Overall	Within 7 days of non-compliance being known	Compliant	No non-compliances, which were required to be reported to the OEPA in accordance with Condition 4.5, were observed during the reporting period. The administrative non-compliance to condition 1.1 was identified during the collation of this report and is submitted to the OEPA for consideration.
839:M4.6	**Compliance Reporting**	The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance assessment report. The compliance assessment report shall: 1. be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf; 2. include a statement as to whether the proponent has complied with the conditions; 3. identify all potential non-compliances and describe corrective and preventative actions taken; 4. be made publicly available in accordance with the approved compliance assessment plan; and 5. indicate any proposed changes to the compliance assessment plan required by condition 4-1.	In accordance with CAP	1. Endorsement in Compliance Report. 2. Compliance Report. 3. Uploaded on to proponent's website and copies sent to DEC Library and PIMB (OEPA).	CEO		Overall	The First CAR submitted due by 24 December 2011. Then annually by 24 December	Compliant	The 2016 CAR will be the sixth annual compliance assessment report prepared in accordance with the CAP and has been submitted prior to 24 December as required. Following acceptance of the 2016 CAR by the OEPA, the report will be made publicly available on the Tropicana JV website (www.tropicanajv.com.au).
839:M5.1	**Flora and Vegetation**	The proponent shall ensure that there is no loss of plants of Declared Rare Flora species due to construction or operational activities unless otherwise approved.	Implementation and internal audit of DRF management strategies in Section 13 of the Threatened Species and Community Management Strategy (TS&CMS). Implementation and internal audit of Environmental Monitoring Strategy Application for Licence to Take DRF (Regulation 17) where applicable	Species location records, design/location records and any incident reports/logs in monitoring report and summary in Compliance Report Approvals for license to take DRF	Min for Env		Overall	Ongoing	Compliant	There is currently no known Declared Rare Flora (DRF) species located within the TGM Project area. *Conospermum toddii* (Victoria Desert Smokebush) was identified within operational area and infrastructure corridor in the baseline surveys and was classified as DRF. Since the baseline surveys, the conservation status of *Conospermum toddii* has been reclassified and downgraded to Priority 4. The Threatened Species and Communities Management Strategy was updated during 2014. A number of species were removed to reflect changes in DRF and Priority Flora listings. The Department of Parks and Wildlife (DPaW) approved this version on the 30

AUDIT TABLE

Proposal Implementation Monitoring Section
PROJECT: Tropicana Gold Project, Shire of Menzies, Shire of Laverton and The City of Kalgoorlie-Boulder

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
										December 2014. Pre clearing inspections (Environmental Inspection Notifications – EINS) are routinely conducted by the sites Environmental Officers prior to any clearing activities (Appendix 6) and internal Ground Disturbance Permits (GDP) are issued for all ground disturbing activities. Examples of GDPs approved during the reporting period are provided in Appendix 8. Records of significant flora and fauna identified in the field are uploaded into the Project GIS.
839:M5.2	**Flora and Vegetation**	The proponent shall undertake monitoring of the condition and abundance of vegetation and flora at reference and potential impact sites in accordance with the "Tropicana Gold Project Environmental Monitoring Strategy, Version: 1.0, Author: B Bastow, Issue Date: 18 February 2010" or subsequent revisions approved by the Chief Executive Officer of the Office of the Environmental Protection Authority. This monitoring is to be carried out to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation	Implementation and internal audit of Environmental Monitoring Strategy Correspondence with OEPA (revisions) and DEC	Monitoring report included in Project Annual Environmental Report (AER) and summary in Compliance Report. Monitoring Records Maps and Photos Correspondence with OEPA (revisions) and DEC	CEO	DEC	Overall	Ongoing	Compliant	The annual vegetation monitoring program was conducted during October 2015. A brief overview of the report findings is provided in the 2016 CAR. A copy of the 2015 Vegetation Monitoring Report is provided as Appendix 9.
839:M5.3	**Flora and Vegetation**	Should the potential impact sites show a 25 per cent (or greater) decline in cover or productivity as compared to the reference sites, the proponent shall provide a report to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days of the decline being identified which 1). describes the decline; 2). provides information which allows determination of the likely root cause of the decline; and 3). if likely to be caused by activities undertaken in implementing the proposal, states the actions and associated timelines proposed to remediate the decline.	Internal audit of monitoring records and analysis of monitoring data Notify in writing	Monitoring Records Report outlining decline, potential causes and corrective actions taken Report to CEO of OEPA	CEO		Overall	Within 21 days of the decline being identified	Compliant	The annual vegetation monitoring was conducted during October 2015 (Appendix 9). Overall the 2015 monitoring program found no deterioration in vegetation condition associated with the project activities. A brief overview of the report findings is provided in Section 4 of the 2016 CAR.
839:M5.4	**Flora and Vegetation**	The proponent shall, on approval of the Chief Executive Officer of the Office of the Environmental Protection Authority, implement the actions identified in 5-3 (3) and continue to implement such actions until the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.	Implement the actions identified in 5-3 (3)	Correspondence with the OEPA	CEO		Overall	On approval of the CEO	Not required at this stage	No decline in vegetation condition associated with the TGM operational activities has been detected to date and no remedial actions have been required.
839:M5.5	**Flora and Vegetation**	The proponent shall make the Environmental Monitoring Strategy referred to in 5-2 publically available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority	1. In accordance with Proposal Implementation Monitoring Section – Fact Sheet 1 – Draft - Making Documents Publicly Available, unless otherwise instructed by the CEO; 2. Adherence to a condition in a Statement requiring public availability of documents must occur within 14 days of	Document available on website (and letter to CEO to confirm) Copy of Document to DEC Library and PIMB (OEPA)	CEO		Overall	Ongoing and within 14 days of submission and approval of any revisions	Compliant	The Environmental Monitoring strategy is available on the Tropicana JV website (www.tropicanajv.com.au/sustainability/document library)

AUDIT TABLE

Proposal Implementation Monitoring Section
PROJECT: Tropicana Gold Project, Shire of Menzies, Shire of Laverton and The City of Kalgoorlie-Boulder

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
			submission of the documents to the CEO; and 3. 14 days from the date of making documents publicly available, proponents shall provide evidence to the CEO to confirm that advertising or lodgement on website has been completed.							
839:M6.1	**Threatened Species**	The proponent shall implement the "Tropicana Gold Project Threatened Species and Communities Management Strategy, Version 2.0, Author: B Bastow, Issue Date: July 2009", or subsequent revisions approved by the Chief Executive Officer of the Office of the Environmental Protection Authority. The objective of this strategy is to minimise adverse impacts to conservation significant species and communities.	Implementation and internal audit of DRF management strategies in Section 13 of the Threatened Species and Community Management Strategy (TS&CMS). Internal Audit Correspondence with OEPA (revisions)	Monitoring report included in Project Annual Environmental Report (AER) and summary in Compliance Report. Electronic Species location records Design/location records Site inductions Maps and Photos	CEO		Overall	Ongoing	Compliant	The Threatened Species and Communities Management Strategy was updated during 2014. A number of species were removed to reflect changes in DRF and Priority Flora listings. The Department of Parks and Wildlife approved this version on the 30 December 2014. An internal compliance audit against the updated Threatened Species and Communities Management Strategy requirements has been conducted (Appendix 7). Pre clearing inspections (Environmental Inspection Notifications – EINs) are routinely conducted by the site Environmental Officers prior to any clearing activities (Appendix 6) and internal ground disturbance permits (GDP) are issued for all ground disturbing activities. Examples of GDPs approved during the reporting period are provided in Appendix 8. 'Avoidance' and 'Minimise Impact' areas are identified in the Projects GIS and are considered when planning future activities. Updating knowledge of threatened species in the area through additional surveys is ongoing as and when required. An example includes the monitoring survey for trapdoor spiders (Mygalomorphae) undertaken by Phoenix Environmental Services in December 2015.
839:M6.2	**Threatened Species**	The proponent shall review and revise the Tropicana Gold Project Threatened Species and Communities Management Strategy referred to in 6-1, in consultation with the Department of Environment and Conservation, every three years to ensure that the mitigation and management techniques remain valid and incorporate any relevant new research.	Formal review by specialist advisers and DEC	Correspondence with DEC Revised Strategy Research records	Min for Env	DEC	Overall	Review and revise every 3 years with the first review due **24 September 2013.**	Compliant	The Threatened Species and Communities Management Strategy was updated during 2014. A number of species were removed to reflect changes in DRF and Priority Flora listings. The Department of Parks and Wildlife (DPaW) approved this version on the 30 December 2014. The Threatened Species and Communities Management Strategy will be updated in 2017.

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Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
839:M6.3	**Threatened Species**	The proponent shall make the Tropicana Gold Project Threatened Species and Communities Management Strategy referred to in 6-1 publically available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.	1. In accordance with Proposal Implementation Monitoring Section – Fact Sheet 1 – Draft - Making Documents Publicly Available, unless otherwise instructed by the CEO; 2. Adherence to a condition in a Statement requiring public availability of documents must occur within 14 days of submission of the documents to the CEO; and 3. 14 days from the date of making documents publicly available, proponents shall provide evidence to the CEO to confirm that advertising or lodgement on website has been completed.	Document available on website (and letter to CEO to confirm) Copy of Document to DEC Library and PIMB (OEPA)	CEO		Overall	Ongoing and within 14 days of submission and approval of revision	Compliant	The updated Threatened Species and Communities Management Strategy is available on the Tropicana JV website (www.tropicanajv.com.au/sustainability).
839:M7.1	**Trapped Fauna**	The proponent shall ensure that open trenches associated with construction of the water pipeline and the communications link are cleared of trapped fauna by fauna-rescue personnel at least twice daily. Details of all fauna recovered shall be recorded. The first daily clearing shall take place no later than three hours after sunrise and shall be repeated between the hours of 3:00 pm and 6:00 pm. The open trenches shall also be cleared, and fauna details recorded, by fauna-rescue personnel no more than one hour prior to backfilling of trenches. Note: “fauna-rescue personnel” means an employee of the proponent whose responsibility it is to walk the open trench to recover and record fauna found within the trench.	Internal audit of trench inspection records and procedures	Trench Inspection Fauna Report Trench inspection records Backfilling records Fauna removal and relocation records Fauna injury/mortality records Correspondence with the DEC	Min for Env		Construction	Duration of pipeline construction Trench inspection fauna report will be submitted no later than 21 day from the cessation of construction	Completed	Assessed as ‘Completed’ by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). Trench inspection fauna report submitted to the OEPA in June 2013 following completion of the pipeline construction.
839:M7.2	**Trapped Fauna**	The fauna-rescue personnel shall be trained in the following, through a program that meets the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority: 1. fauna identification, capture and handling (including venomous snakes); 2. identification of tracks, scats, burrows and nests of conservation-significant species; 3. fauna vouchering (of deceased animals); 4. assessing injured fauna for suitability for release, rehabilitation or euthanasia; 5. familiarity with the ecology of the species which may be encountered in order to be able to appropriately translocate fauna encountered; and 6. performing euthanasia.	Training program approved by CEO of OEPA Internal audit of training records	Training Program records Correspondence with the OEPA	CEO		Construction	Program approved prior to the commencement of pipeline construction	Completed	Assessed as ‘Completed’ by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). A training program was developed in conjunction with Polytech West and was submitted to the OEPA on 6 February 2012.
839:M7.3	**Trapped Fauna**	Open trench lengths shall not exceed a length capable of being inspected and cleared by the fauna-clearing personnel within the required times as set out in condition 7-1.	Internal audit of inspection records Appropriate planning of pipeline construction	Trench Inspection Fauna Report Trench inspection records	Min for Env		Construction	During pipeline construction	Completed	Assessed as ‘Completed’ by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078).

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Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
839:M7.4	**Trapped Fauna**	Ramps providing egress points and/or fauna refuges providing suitable shelter from the sun and predators for trapped fauna are to be placed in the trench at intervals not exceeding 50 meters.	Internal audit of inspection records and design drawings	Trench Inspection Fauna Report Trench inspection records Backfilling records Photographs	Min for Env		Construction	During pipeline construction	Completed	Assessed as 'Completed' by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). The requirement to install fauna egress ramps at approximately 50m intervals along pipeline trenches has been incorporated into the Threatened Species and Communities Management Strategy.
839:M7.5	**Trapped Fauna**	The proponent shall produce a report on fauna management within the water pipeline lateral easement and communication corridor at the completion of pipeline and communication link construction. The report shall include the following: 1. details of all fauna inspections; 2. the number of fauna cleared from trenches; 3. fauna mortalities; and 4. all actions taken. The report shall be provided to the Chief Executive Officer of the Office of the Environmental Protection Authority no later than 21 days after the completion of pipeline installation, and shall be made publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority	1. As per PIMB fact sheet 1 Making documents publicly available. Preparation of report as per criteria following finalisation of pipeline installation and submit to OEPA within 21 days. Report published in a manner approved by CEO of OEPA	Trench Inspection Fauna Report Document available on website (and letter to CEO to confirm) Copy of Document to DEC Library and PIMB (OEPA)	CEO		Overall	Trench inspection fauna report will be submitted no later than 21 days after the completion of pipeline installation	Completed	Assessed as 'Completed' by OEPA Desktop Verification Audit May 2014 (CA03-2013-0078). Construction of the borefield pipeline was completed during the 2013 reporting period and a fauna inspection report was developed and submitted as required by Condition M7.1.
839:M8.1	**Groundwater and Surface Water Quality**	The proponent shall ensure that run-off and/or seepage from the tailings storage facility and waste material landforms does not impact the quality of surface water or groundwater within or adjacent to the proposal area to exceed the trigger values for a slightly to moderately disturbed ecosystem provided for in Table 3.4.2 of Chapter 3 of the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates, taking into consideration natural background water quality	Internal audit of water monitoring results against table 3.4.2 of Chapter 3 of *Australian Water Quality Guidelines for Fresh and Marine Waters (2000)* as updated	Monitoring Report included in Project AER and summary included as part of the Compliance Report	Min for Env		Overall	Ongoing	Compliant	An internal audit of water monitoring results against the Australia Water Quality Guidelines for Fresh and Marine Waters (2000) was conducted in the 2014 CAR. The 2014 internal audit found that: • Tropicana baseline data naturally exceeds a number of Guideline trigger values and/or the Guideline trigger values are too low to be detected by the NATA accredited laboratory utilised by TGM for water analysis. • The Guidelines were developed for fresh and marine waters. The groundwater surrounding TGM does not align with either fresh or marine waters, with water quality ranging from saline to hypersaline. The 2014 Internal Audit established site specific triggers for groundwater quality based on baseline data. Groundwater monitoring bores around the TSF and waste landforms have been sampled throughout the reporting period. Review and analysis of the groundwater monitoring results identifies minor and localised variations to the baseline values however, there is no observed detrimental impact to the receiving environment. The detailed review is provided in Appendix 3. Opportunistic surface water monitoring has been conducted following rainfall events greater than 20 mm in 24 hours (Appendix 4).
839:M8.2	**Groundwater and Surface Water Quality**	The proponent shall monitor the quality of surface water and groundwater upstream and downstream of the tailings storage facility and waste material landforms to ensure that the requirements of condition 8-1 are met. This monitoring is to be carried out using methods consistent with	Implementation of Environmental Monitoring Strategy Internal audit of water	Monitoring report included in Project AER and Summary included in	CEO		Overall	Ongoing	Compliant	Groundwater monitoring bores around the TSF and waste landforms have been sampled throughout the reporting period (Appendix 3). Opportunistic surface water monitoring has been conducted following rainfall events greater

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Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
		Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Guidelines for Water Quality Monitoring and Reporting* (and its updates) and to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.	monitoring methodology against *Australian Guidelines for Water Quality Monitoring and Reporting* (2000) and its updates	Compliance Report						than 20 mm in 24 hours (Appendix 4). An internal audit of the monitoring methodology against the Australian Guidelines for Water Quality Monitoring and Reporting (2000) was undertaken (Appendix 5).
839:M8.3	**Groundwater and Surface Water Quality**	The proponent shall commence the water quality monitoring required by 8-2 before ground disturbing activities in order to collect baseline data	Implementation of Environmental Monitoring Strategy Internal audit of groundwater and surface water monitoring program	Monitoring report included in Project AER and Summary included in Compliance Report	CEO		Pre-construction	Before ground disturbing activities.	Compliant	Groundwater monitoring bores around the TSF and waste land-forms have been sampled throughout the reporting period (Appendix 3). Opportunistic surface water monitoring has been conducted following rainfall events greater than 20 mm in 24 hours (Appendix 4).
839:M8.4	**Groundwater and Surface Water Quality**	The proponent shall submit annually the results of monitoring required by condition 8-2 to the Chief Executive Officer of the Office of the Environmental Protection Authority	Written submission of results within the annual compliance reports	Correspondence with OEPA Monitoring report included in Project AER and Summary included in Compliance Report	CEO		Overall	Compliance Report – Annually by 24 December	Compliant	A summary of water monitoring results is provided in the 2016 CAR (Appendix 3 and Appendix 4). Results of the water quality monitoring activities are also provided to the Department of Mines and Petroleum (DMP) through the Annual Environmental Report (AER) in January each year.
839:M8.5	**Groundwater and Surface Water Quality**	In the event that monitoring required by condition 8-2 indicates that the requirements of condition 8-1 are not being met, the proponent shall: 1. report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days of the decline in water quality being identified; 2. provide evidence which allows determination of the root cause of the decline in water quality; and 3. if determined to be a result of activities undertaken in implementing the proposal, state the actions and associated timelines proposed to be taken to remediate the water quality.	Preparation of report as per criteria and submit to OEPA within 21 days. Internal review of monitoring results against criteria outlined in condition 8.1	Report outlining the water quality change, potential causes and corrective actions taken	CEO		Overall	No later than 21 days of the decline in water quality being identified.	Not required.	The requirements of condition 8.1 have been met. The 2014 Internal Audit of Groundwater Monitoring results established site specific triggers for groundwater quality based on baseline data. Groundwater monitoring bores around the TSF and waste landforms have been sampled throughout the reporting period. Review and analysis of the groundwater monitoring results identifies minor and localised variations to the baseline values however, there is no observed detrimental impact to the receiving environment. (Appendix 3).
839:M8.6	**Groundwater and Surface Water Quality**	The proponent shall, on approval of the Chief Executive Officer of the Office of the Environmental Protection Authority, implement the actions identified in 8-5 (3) and continue to implement such actions until the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.	Implement the actions identified in 8-5 (3)	Correspondence with OEPA	CEO		Overall	On approval of the CEO	Not Required	A summary of water monitoring results is provided in the 2016 CAR (Appendix 3 and Appendix 4).
839:M8.7	**Groundwater and Surface Water Quality**	The proponent shall make the monitoring reports required by condition 8-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority	1. In accordance with Proposal Implementation Monitoring Section – Fact Sheet 1 – Draft - Making Documents Publicly Available, unless otherwise instructed by the CEO; 2. Adherence to a condition in a Statement requiring public availability of documents must occur within 14 days of submission of the documents to the CEO;	Document available on website (and letter to CEO to confirm) Copy of Document to DEC Library and PIMB (OEPA)	CEO		Overall	Within 14 days of submission	Compliant	Following acceptance of the 2016 CAR by the OEPA, the report, including monitoring results contained in Appendix 3 and 4, will be made publicly available on the Tropicana JV website (www.tropicanajv.com.au)

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Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
			and 3. 14 days from the date of making documents publicly available, proponents shall provide evidence to the CEO to confirm that advertising or lodgement on website has been completed. In accordance with CAP							
839:M9.1	**Rehabilitation**	The proponent shall undertake progressive rehabilitation over the life of the proposal to achieve the following outcomes: 1. The waste material landforms and tailings storage facility shall be non-polluting and shall be constructed so that their stability, surface drainage, resistance to erosion and ability to support local native vegetation are similar to undisturbed natural analogue landforms as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority. 2. Waste material landforms, tailings storage facility and other areas disturbed through implementation of the proposal (excluding mine pits), shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed or plant material collected within the Great Victoria Desert Bioregions 1 and 2). 3. The percentage cover and species diversity of living self-sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority. 4. No new species of weeds (including both declared weeds and environmental weeds) shall establish in the area as a result of the implementation of the proposal. 5. The coverage of weeds (including both declared weeds and environmental weeds) within rehabilitated areas shall be no greater than the average of three reference sites on nearby land, with the reference sites to be chosen in consultation with the Department of Environment and Conservation. Note: The methodology for Ecosystem Function Analysis is set out in Tongway DJ and Hindley 2004 *Landscape Function Analysis – Procedures for Monitoring and Assessing Landscapes*, Commonwealth Scientific and Industrial Research Organisation Sustainable Ecosystems, Canberra.	Implementation of Operational Management Strategy, Tailings Environmental Management Strategy and Conceptual Closure and Rehabilitation Management Strategy (and approved future revisions) Internal audit of rehabilitation and closure activities and records Correspondence with OEPA and DEC on Monitoring Strategy Analysis of monitoring data	Rehabilitation Records Annual Mine Plan Map and photos of rehabilitation Rehabilitation Monitoring Records	CEO	DEC	Overall	Ongoing	Compliant	A total of 101.1 ha of rehabilitation has been completed to date. Due to active mining activities and operational usage, limited areas are currently available for progressive rehabilitation. An update on rehabilitation activities undertaken during the reporting period is provided in Appendix 2. The TGM Mine Closure Plan was prepared in accordance with the requirements of the 'Guidelines for Preparation of a Mine Closure Plan' (June 2011) and submitted to DMP in January 2013. An updated Mine Closure Plan will be submitted to DMP in January 2017. Materials characterisation and erosion modelling studies were undertaken in 2016 to determine the optimum rehabilitation design for waste landforms at TGM.
839:M9.2	**Rehabilitation**	Rehabilitation activities shall continue until such time as the requirements of condition 9-1 are met, and are demonstrated by inspections and reports to be met, for a minimum of five years following mine completion to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum	Activities will continue until the M9.1 requirements are met for a minimum of 5 years Seek advice from DMP following mine completion.	Rehabilitation records Rehabilitation Monitoring Records Correspondence with OEPA and DMP	CEO	DMP	Overall	Ongoing until the requirements of M9-1 are met for a minimum of 5 years	Compliant	TGM is in early stage of operations and final landforms are not yet available for rehabilitation to commence. Rehabilitation activities will be conducted progressively as and when areas become available.

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Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
839:M10.1	**Final Closure and Decommissioning Plan**	At least five years prior to mine completion, the proponent shall prepare and submit a Final Closure and Decommissioning Plan to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum	Preparation of a Final Closure and Decommissioning Plan in accordance with criteria.	Correspondence with OEPA approving the Plan	CEO	DMP	Overall	At least five years prior to mine completion	Not required at this stage	The TGM Mine Closure Plan was prepared in accordance with the requirements of the 'Guidelines for Preparation of a Mine Closure Plan' (June 2011) and submitted to DMP in January 2013. An updated Mine Closure Plan will be submitted to DMP in January 2017. TGM is in early stage of operations and has an expected mine life of 10-15 years. A final mine closure plan will be developed 5 years prior to mine completion as required.
839:M10.2	**Final Closure and Decommissioning Plan**	The Final Closure and Decommissioning Plan shall be prepared consistent with: 1. ANZMEC/MCA 2000, *Strategic Framework for Mine Closure Planning*; and 2. Department of Industry Tourism and Resources 2006 *Mine Closure and Completion* (Leading Practice Sustainable Development Program for the Mining Industry), Commonwealth Government, Canberra;	Preparation of a Final Closure and Decommissioning Plan in accordance with criteria.	Submit plan to CEO of OEPA and DMP Approval of Plan by OEPA.	CEO	DMP	Overall	At least five years prior to mine completion	Not required at this stage	The TGM Mine Closure Plan was prepared in accordance with the requirements of the 'Guidelines for Preparation of a Mine Closure Plan' (June 2011) and submitted to DMP in January 2013. An updated Mine Closure Plan will be submitted to DMP in January 2017. TGM is in early stage of operations and has an expected mine life of 10-15 years. A final mine closure plan will be developed 5 years prior to mine completion as required.
839:M10.3	**Final Closure and Decommissioning Plan**	The Final Closure and Decommissioning Plan shall provide detailed technical information on the following: 1. final closure of all areas disturbed through implementation of the proposal so that they are safe, stable and non-polluting; 2. decommissioning of all plant and equipment; 3. disposal of waste materials; 4. final rehabilitation of waste dumps; tailings storage facilities and other areas (outside the mine pit(s)); 5. Management and monitoring following mine completion; and 6.inventory of all contaminated sites and proposed management.	Preparation of a Final Closure and Decommissioning Plan in accordance with criteria.	Submit plan to CEO of OEPA and DMP. Approval of the plan by OEPA.	CEO	DMP	Overall	At least five years prior to mine completion	Not required at this stage	A mine closure plan was prepared in accordance with the requirements of the 'Guidelines for Preparation of a Mine Closure Plan' (June 2011) was submitted to DMP in January 2013. An updated Mine Closure Plan will be submitted to DMP in January 2017. TGM is in early stage of operations and has an expected mine life of 10-15 years. A final mine closure plan will be developed 5 years prior to mine completion as required.
839:M10.4	**Final Closure and Decommissioning Plan**	The proponent shall close, decommission and rehabilitate the proposal in accordance with the approved Final Closure and Decommissioning Plan	Implementation of the Final Closure and Decommissioning Plan Internal and external audits (as required) of the Final Closure and Decommissioning Plan	Closure, rehabilitation and Decommissioning activities detailed in the Project AER and summary included in Compliance Report	Min for Env		Overall	Ongoing	Not required at this stage	TGM is in early stage of operations and has an expected mine life of 10-15 years.

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PROJECT: Tropicana Gold Project, Shire of Menzies, Shire of Laverton and The City of Kalgoorlie-Boulder

Audit Code	Subject	Action	How	Evidence	Satisfy	Advice	Phase	When	Status 2016	Comment
839:M10.5	**Final Closure and Decommissioning Plan**	The proponent shall make the Final Closure and Decommissioning Plan required by conditions 10-1 and 10-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority	1. In accordance with Proposal Implementation Monitoring Section – Fact Sheet 1 – Draft - Making Documents Publicly Available, unless otherwise instructed by the CEO; 2. Adherence to a condition in a Statement requiring public availability of documents must occur within 14 days of submission of the documents to the CEO; and 3. 14 days from the date of making documents publicly available, proponents shall provide evidence to the CEO to confirm that advertising or lodgement on website has been completed.	Document available on website (and letter to CEO to confirm) Copy of Document to DEC Library and PIMB (OEPA)	CEO		Overall	Within 14 days of submission	Not required at this stage.	TGM is in early stage of operations and has an expected mine life of 10-15 years.

Appendix 2: Rehabilitation Summary

MEMORANDUM

Date: **7 November 2016**

To: Environment Team (Safety & Environment Department)

From: Matthew Stingemore

Subject: 2016 Rehabilitation Summary

1 Rehabilitation Activities

A total of 101.1 ha of rehabilitation has been completed for TGM.

Table 1: Summary of rehabilitation completed for TGM

Disturbance Category	Rehabilitation (ha)
Access Roads / Tracks	0.423
Borrow Pit	83.49
Camp Site	11.39
Turkeys Nest	5.79
TOTAL	**101.1**

1.1 Reporting Period

Due to ongoing active mining and operational activities, limited areas were available for progressive rehabilitation during the reporting period. Although limited on-ground rehabilitation activities were undertaken, key rehabilitation achievements completed during the reporting period included:

- Materials Characterisation.
- Erosion Modelling.
- Review and update of the TGM Mine Closure Plan.
- Review and update of the financial provisioning for mine closure.
- Seed collection around TGM. Collected seed is stored off site with an accredited seed collector in climate controlled facilities located in Mt Barker.

1.2 Previous Rehabilitation

During 2012-2013, borrow pits, turkeys nests and related infrastructure along the Pinjin Access Road corridor which was not required for future road maintenance activities were rehabilitated. Rehabilitation along the Access Road constitutes the majority of progressive rehabilitation completed for TGM to date.

Waste landform rehabilitation trials were commenced in 2015. Rehabilitation trials on LWE and LEA involved re-profiling waste landforms to 15 degrees and placement of growth medium up to one metre thick.

In 2015, seedling propagation by the Kalgoorlie Boulder Urban Landcare Group (KBULG) utilising seed collected around TGM were planted in work areas and around the village, rolled out to employees as an adopt a tree program.

2 Waste Landform Rehabilitation Design

During the reporting period, extensive work on materials characterisation and erosion modelling was undertaken to determine the TGM waste landform rehabilitation strategy. The strategy has been developed to create a safe, stable and functioning landform which is consistent with the surrounding landscape. The strategy identifies actions to increase the resilience of the slopes against erosion and sediment management and is cognisant of ensuring a buildable design utilising the existing mine fleet.

Based on the outcomes of material characterisation and erosion modelling, the key aspects of the waste landform rehabilitation strategy proposed to be implemented at TGM are:

- Batter and Berm
  A 20 m wide berm, backsloped at 5 degrees with the capacity to withstand a 1 in 100 year storm event will be incorporated into the landform slope profile. Erosion modelling demonstrated that a 10 m berm would have sufficient capacity to withstand a 1 in 100 year storm event – the adoption of a 20 m wide berm further reduces the risk of erosion potential on the waste landform slopes.

  The 20 m berm achieves a key aim of the rehabilitation strategy of demonstrating an achievable and buildable design based on the existing mining fleet. The 20 m berm provides for access by the existing mine fleet to the mid-slope of the batter profile, enabling progressive rehabilitation and cost-effective placement of rehabilitation materials.

- 15 degree slope profile
  The adoption of a final slope profile of 15^0 delivers waste landform slope profiles at comparable angles to local sand dunes. Erosion modelling shows that the Growth Medium Sand and Caprock materials are stable over slope angles approaching 22 degrees (or 40%). Implementation of a 15^0 slope profile provides additional erosion risk reduction for the waste landform design and supports the buildable rehabilitation design strategy.

- Cover Material
  To guard against wind erosion, it is proposed to use a 1 m layer of Growth Medium Sand (GMS):Caprock mixture at a ratio of 1:3 for the top section of each landform batter. The dominant Caprock will prevent wind erosion, particularly on the windward (eastern) side of landforms. Below the GMS/Caprock mixture will be a 1 m layer section of GMS incorporating available vegetative material (VMS), with available VMS preferentially placed on the prevailing wind side of the landform. The vegetative debris in the VSM will also guard against wind erosion whilst providing a medium to trap resources such as seed, water and organic matter. The bottom (and least susceptible) of the waste landform sections will be comprised of GMS. Therefore the entire surface area of batters will comprise cover material with high infiltration rates and the upper sections of each batter protected against wind erosion.

  The 20 m berms and top surface of the waste landforms will use Growth Medium Gravel (GMG) as the cover material. GMG has a high slit and clay faction resulting in a high water holding capacity and plant available water content which will support revegetation, providing a niche for deeper rooted vegetation to establish.

- Surface Water Management

  Erosion modelling clearly shows that GMS and Caprock yield negligible surface water run-off and sediment loss across all modelled landform designs. As a risk reduction strategy, waste landforms will have sediment run-off containment structures (e.g. toe-bunds and/or containment cells) constructed at the toe of slopes to prevent runoff and sediment being released directly to the environment.

  Cell bunds will be installed on the top of the waste landform and/or berms at strategic points where a post-construction survey pick-up indicates the potential for concentration of water flow.

  A substantial crestal bund will be established at the top of the waste landform (at least 2 m high and the width of a dump truck) to minimise the risk of the top surface contributing runoff to batters. The crestal bund will be thoroughly compacted and contiguous with the outer batter profile, having the same treatments applied to it as the batter profile.

  The upper section batters comprising the 1:3 mixture of GMS:Caprock will be contour ripped to assist in the erosion control through promoting infiltration and reducing the velocity of any runoff which may occur. The upper surface of the waste landform will also be ripped to reduce compaction, promote infiltration and trap resources (i.e. water, seed, organic matter) to promote revegetation.

- Revegetation

  Revegetation of waste landforms will be achieved by application of local provenance seed mixes tailored to the specific growth mediums applied to the landform. The application of a one metre cover layer seeks to provide a sufficient depth of growth medium to increase the amount of plant available water and reflects the typical depth of vegetation root zones in the arid area. Further research will be undertaken to assess and validate the optimal depth of cover for the growth mediums available.

  Baseline vegetation community studies indicate that the vegetation communities and flora species located within the TGM disturbance footprint. These vegetation communities were supported by the underlying growth medium/s which were / are stockpiled for use in rehabilitation. These vegetation communities and flora species will provide a guide as to the tailored seed mixes to be established for waste landform rehabilitation.

Further details on the waste landform rehabilitation strategy, materials characterisation and erosion modelling are contained in the 'Operational Area Waste Landform Section 45C – October 2016', application submitted to the OEPA in October 2016.

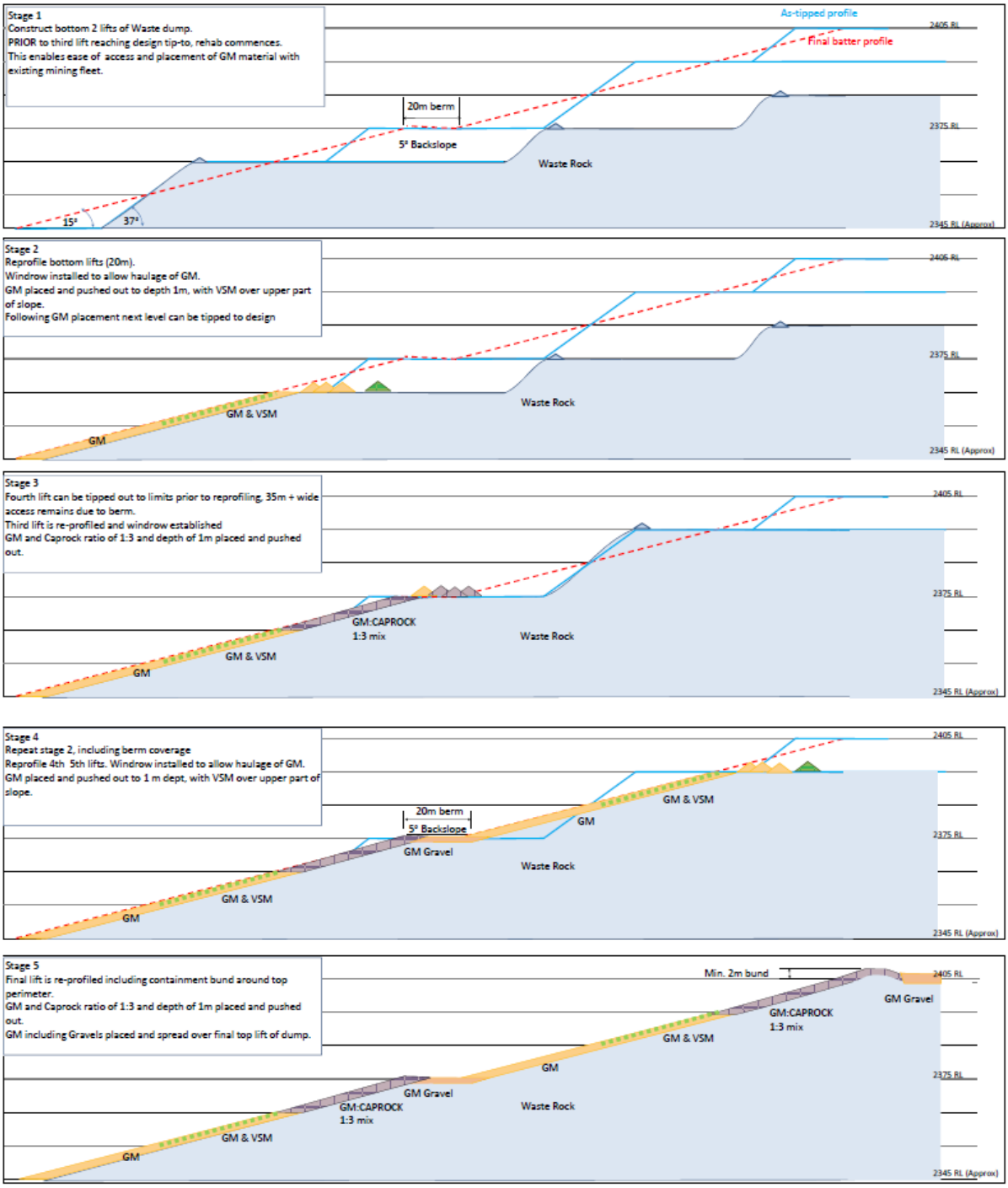


Figure 1: Evolution of waste landform rehabilitation from construction to completion.

3 Mine Closure Plan

An updated Mine Closure Plan (MCP) is due for submission to the Department of Mines and Petroleum (DMP) in January 2017, which will detail progress on rehabilitation undertaken.

The 2017 MCP will incorporate updated information on:

- Materials characterisation and erosion modelling.

- Waste Landform Rehabilitation Strategy.
- Post-mining Landuse.
- Stakeholder Engagement.
- Materials Balance.
- Knowledge gaps for each domain and or feature, and the risks associated with not having the information available. A list of research, investigations and trials required to close the knowledge gaps and the tasks prioritised based on the risk.

Appendix 3: Groundwater Monitoring

MEMORANDUM

Date: **14 December 2016**

To: Environment Team

From: Matt Stingemore

Subject: 2015/2016 Groundwater Monitoring Results

Tropicana Gold Mine Groundwater Trigger Values

Ministerial Statement 839 (MS839) Condition 8-1 requires that:
"The proponent shall ensure that run-off and/or seepage from the tailings storage facility and waste material landforms does not impact the quality of surface water or groundwater within or adjacent to the proposal area to exceed the trigger values for a slightly to moderately disturbed ecosystem provided for in Table 3.4.2 of Chapter 3 of the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates, taking into consideration natural background water quality".

In 2014 an internal review/audit by AGAA of the *Australian and New Zealand Environment Guidelines for Fresh and Marine Water Quality* (the Guidelines), specifically Tables 3.4.1 and Table 3.4.2, against results obtained from the Tropicana Gold Mine (TGM) environmental groundwater monitoring bores was undertaken. The review included the compilation of baseline monitoring data collected since the Environmental Monitoring Bores (ENVMB001 to ENVMB008) were installed (October 2013 – November 2014).

A review of the baseline data against the Guidelines trigger values for a slightly to moderately disturbed ecosystem (95% protection level) found that the Tropicana baseline data naturally exceeds a number of the Guidelines trigger values and/or the Guidelines trigger values are too low to be detected by the NATA accredited laboratory engaged by TGM for water analysis. For example, Aluminium has been consistently recorded across the environmental monitoring bores by the laboratory as <0.1 milligrams per litre (mg/L), while the guideline value is 0.055 mg/L. Furthermore, the Guidelines were developed specifically for fresh and marine waters. The groundwater surrounding the TGM does not align with either fresh or marine waters, with Tropicana water quality ranging from saline to hypersaline (TDS ranging from 9,000 mg/L to 42,000 mg/L).

The intent of the Guidelines is to specify biological, water and sediment quality guidelines for protecting a range of aquatic ecosystems from fresh water to marine. The Guidelines state that they are not sufficient in themselves to protect ecosystem integrity; and that they must be used in the context of the local environmental condition and other important environmental factors. The guidelines should be applied to maintain ecosystems and protect from degradation. In accordance with the Guidelines, site specific baselines values have been established for TGM based on ground water monitoring undertaken between October 2013 to November 2014, and site specific triggers have been developed to enable water quality changes to be identified. Triggers have been developed for each parameter to allow a 10% variation in baseline ground water quality monitoring, as per the TGM Environmental Monitoring Strategy and the Guidelines. Therefore, although the triggers presented in the Guidelines are not considered relevant for TGM, the intent of the Guidelines has been adopted

and implemented on site. The adopted triggers are consistent with MS839 Condition 8-1 as they "take into consideration natural background water quality".

2015/2016 Groundwater Quality Results

An internal review of the groundwater monitoring data for the reporting period (1 October 2015 to 30 September 2016) was undertaken for Environmental Monitoring Bores (ENVMB001 to ENVMB008) against the water quality trigger values (established in 2014). Throughout the reporting period, the Environmental Monitoring Bores were monitored monthly, with the exception of October and December 2015. The frequency of monitoring of the Environmental Monitoring Bores was increased to from quarterly to monthly in January 2016. A map of the Environmental Monitoring Bore locations is provided in Figure 1.

Figure 1: Environmental Monitoring Bore Locations (ENVMB001 – ENVMB008)

Results for pH (Figure 2) were relatively stable across the reporting period, with pH units ranging between 6.5 (ENVMB001) and 8.1 (ENVMB004). No trigger values were exceeded for pH monitoring results.

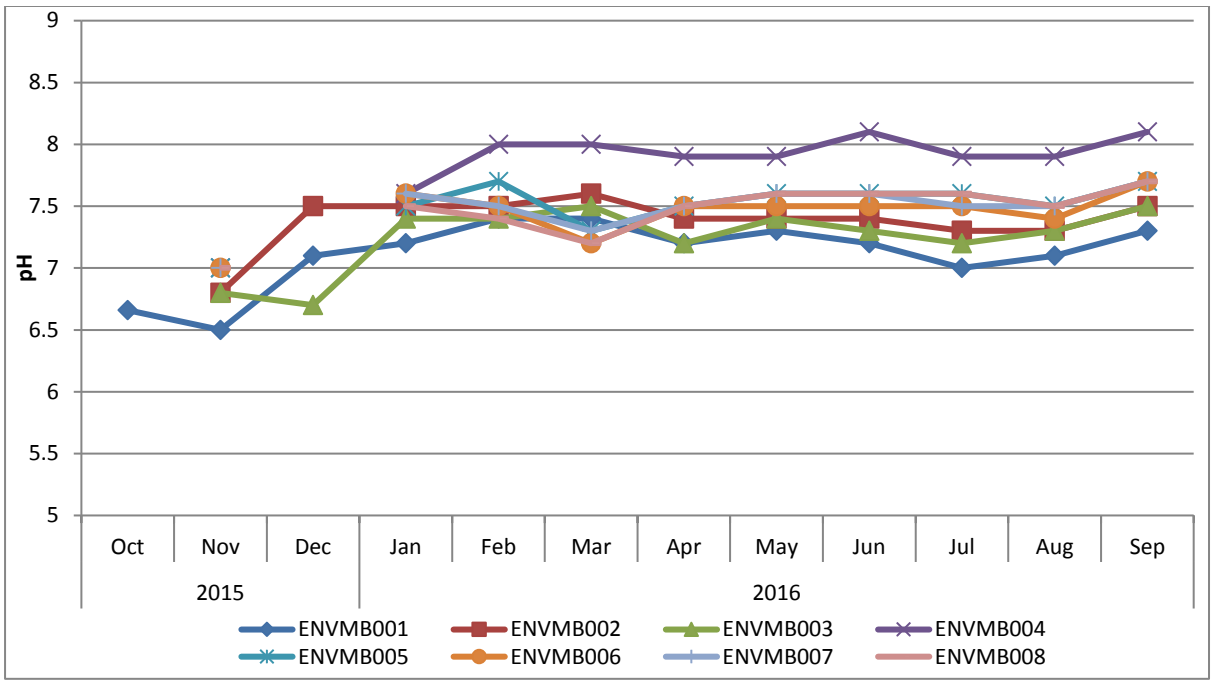


Figure 2: pH recorded in Environmental Monitoring Bores (Oct 2015 to Sept 2016)

Electrical Conductivity (EC) (Figure 3) varies between the monitoring bores, with ranges recorded during the reporting period between 4,600 µS/cm (recorded at ENVMB004) to 59,000 µS/cm (recorded at ENVMB001). The trigger value range for EC results (baseline ranges +/- 10%) is between 5,040 µS/cm and 54,670 µS/cm. During the reporting period, ENVMB01 exceeded the maximum EC trigger value in January, February, April, June, July and September 2016, with a maximum value of 59,000 µS/cm. This maximum EC value represents a 19% variation against baseline data. Monitoring results recorded for ENVMB004 during the reporting period in February, March and June 2016 were lower than the minimum EC trigger value. The lowest recorded value of 4600 µS/cm represents an 18% variation against baseline. The 18 – 19% variations at both the maximum and minimum EC trigger values suggests that a trigger value range of 10% variation against baseline may not account for natural variations in groundwater quality. It is recommended that the next review of the Environmental Monitoring Strategy re-evaluate the 10% variation against baseline groundwater quality trigger, particularly in the context of a saline to hypersaline groundwater environment.

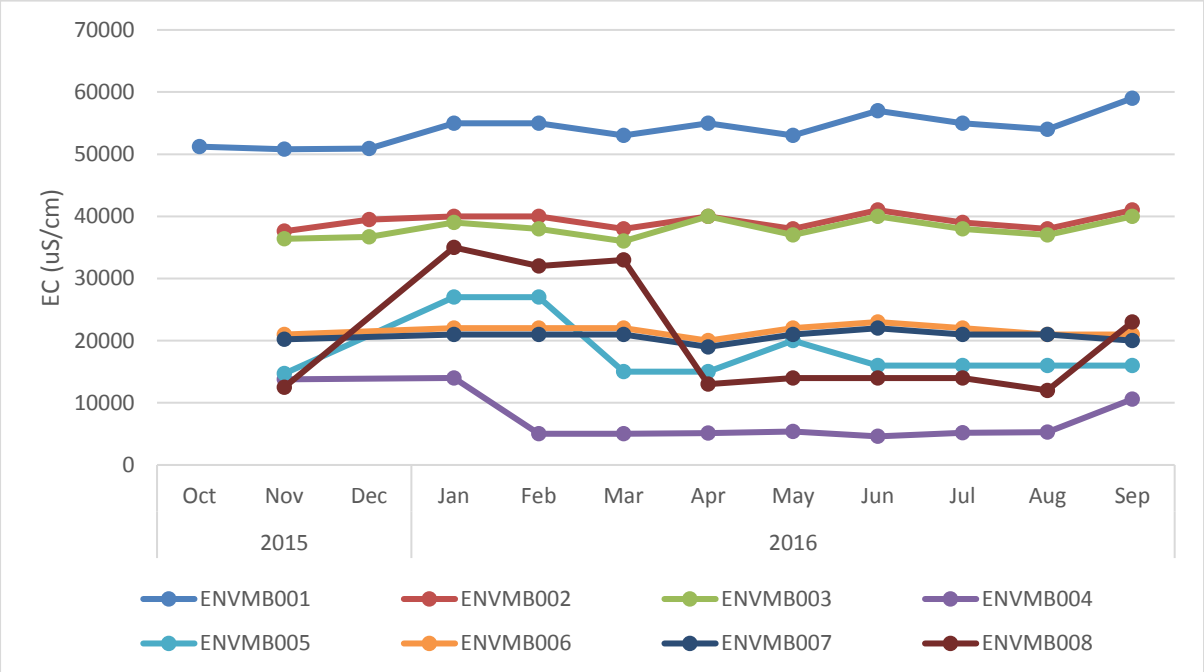


Figure 3: Electrical Conductivity recorded in the Environmental Monitoring Bores (Oct 2015 to Sept 2016)

Total Dissolved Solids (TDS) recorded at the Environmental Monitoring Bores during the reporting period ranged between 2,700 mg/L (recorded at ENVMB004) and 44,000 mg/L (recorded at ENVMB001) (Figure 4). The trigger value range for TDS results (baseline ranges +/- 10%) is between 2,943 and 45,210 mg/L. During the reporting period, results did not exceed the maximum trigger value range for TDS, however lower minimum TDS values were recorded at ENVMB004 in March, April and July 2016.

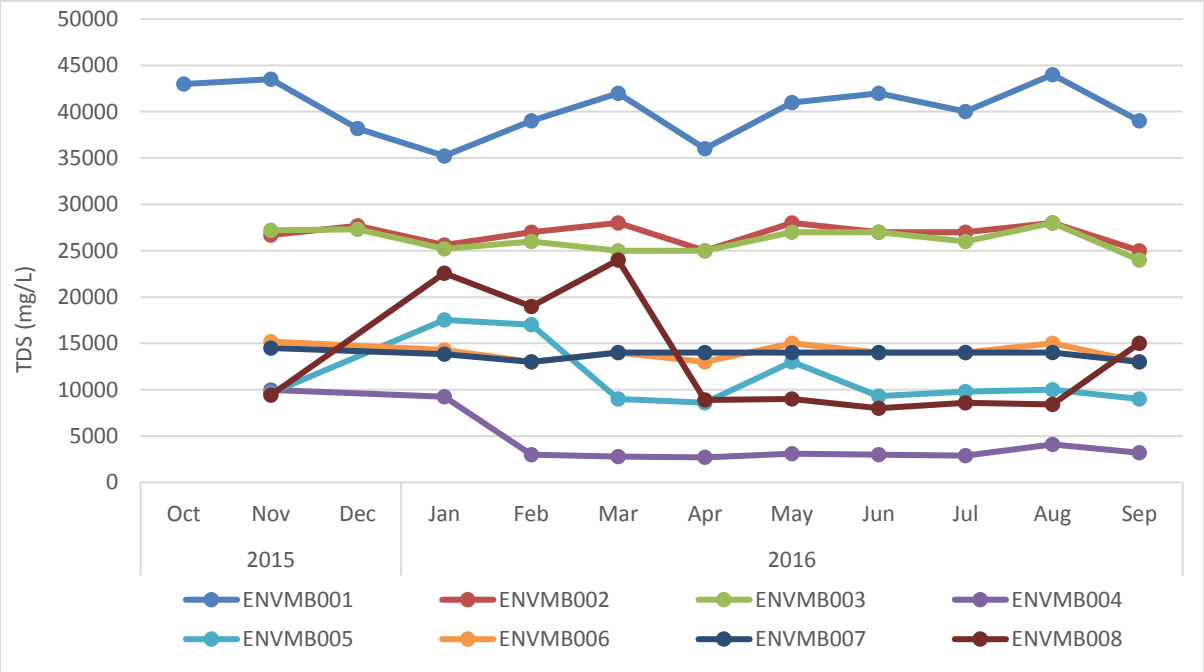


Figure 4: TDS recorded in the Environmental Monitoring Bores (Oct 2015 to Sep 2016)

Weak Acid Dissociable Cyanide (WAD CN) was detected at ENVMB001, ENVMB002 and ENVMB003 during the reporting period, with results recorded ranging between 0.005 mg/L WAD CN (recorded at ENVMB002) to 0.082 mg/L WAD CN (recorded at ENVMB001).

- WAD CN was detected in ENVMB001 in 10 out of 12 months during the reporting period.
- WAD CN was detected in ENVMB002 in December 2015 and July, August and September 2016.
- WAD CN was detected in ENVMB003 in August and September 2016.

All WAD CN results were well below the 0.5 mg/L limit which was previously contained within the Tropicana Gold Mine Prescribed Premise Licence L8676/2012/1 approved under the *Environmental Protection Act 1986*. The International Cyanide Management Code also establishes 0.5 mg/L WAD CN as the guidance value for environmental protection.

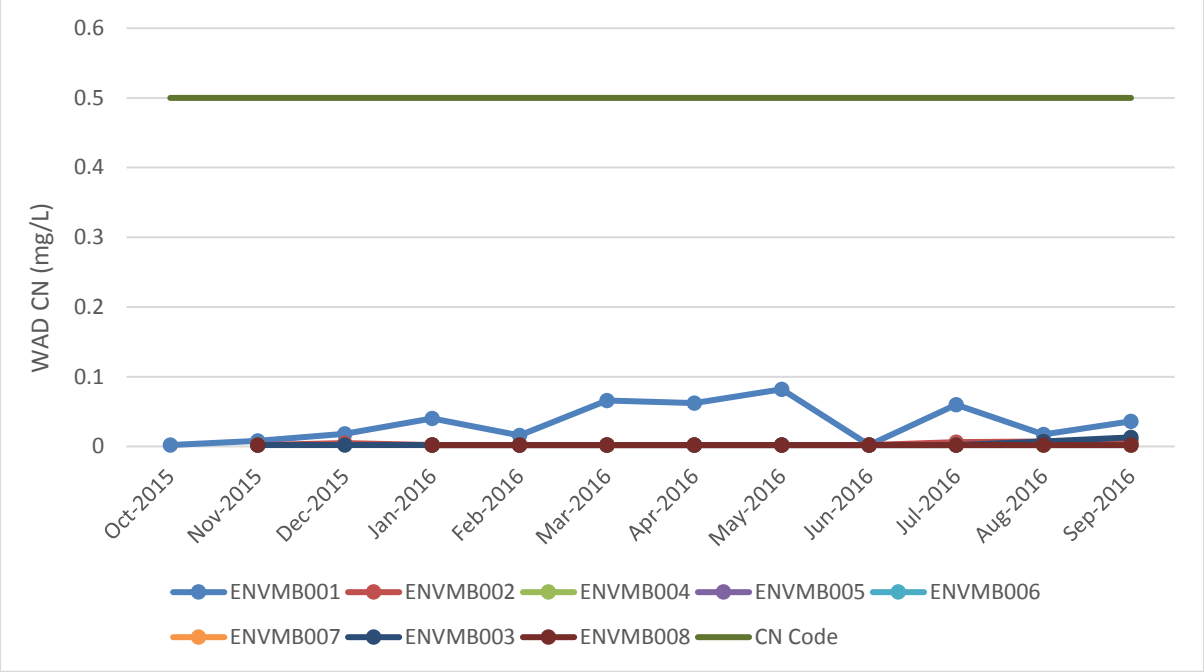


Figure 5: Environmental Monitoring Bores WAD Cyanide values (Oct 2015 to Sept 2016)

***Values recorded at below the minimum detectable limit of 0.004mg/L are represented as 0.002mg/L**

The triggers (minimum and maximum) for a 10% deviation from baseline values are outlined in Table 1 for each parameter. A comparison has been undertaken against the trigger values and the current ranges recorded in the environmental monitoring bores during the reporting period.

Table 1: Comparison of current groundwater quality data (reporting period October 2015 to September 2016) trigger value range (baseline +/- 10%)

Parameter	Trigger Range (Baseline +/- 10%)	Current Range (Reporting period)	Comments
Arsenic (mg/L)	< 0.001 – 0.55	<0.001 – 0.004	Current range within 10% deviation of baseline values.
Bicarbonate Alkalinity as HCO3 (mg/L)	135 – 682	140 – 700	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB005.
Boron (mg/L)	3.51 – 12.1	1.2 – 16	Current range exceeds 10% deviation of baseline values with a lower minimum and higher maximum values recorded. Maximum exceedances were recorded at ENVMB001 and values lower than the minimum range were recorded at ENVMB004 and ENVMB008.
Cadmium – Dissolved (mg/L)	<0.0001 – 0.0055	0.0001 – 0.0049	Current range within 10% deviation of baseline values.
Calcium – Dissolved (mg/L)	56.7 – 704	77 – 830	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB001 and ENVMB008.
Carbonate CO32 – as CaCO3 (mg/L)	<5	<5	Current range within 10% deviation of baseline values.
Chloride in water (mg/L)	2250 – 18700	1600 – 21000	Current range exceeds 10% deviation of baseline values with a lower minimum and higher maximum values recorded. Maximum exceedances were recorded at ENVMB001 and values lower than the minimum range were recorded at ENVMB004.
Cobalt – Dissolved (mg/L)	<0.001 – 0.0132	0.002 – 0.35	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB001.
Copper – Dissolved (mg/L)	<0.001 – 0.11	0.001 – 0.072	Current range within 10% deviation of baseline values.
Cyanide WAD (mg/L)	<0.004	<0.004 – 0.082	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB001, ENVMB002 and ENVMB003.
Electrical Conductivity (uS/cm)	5040 – 54670	4600 – 59000	Current range exceeds 10% deviation of baseline values with a lower minimum and higher maximum values recorded. Maximum exceedances were recorded at ENVMB001 and values lower than the minimum range were recorded at ENVMB004.
Hydroxide OH – as CaCO3 (mg/L)	<5	<5	Current range within 10% deviation of baseline values.
Iron – Dissolved (mg/L)	<0.02 – 1.98	0.052 – 5.5	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB002.
Lead – Dissolved (mg/L)	<0.001 – 0.33	0.024 – 0.46	Current range exceeds 10% deviation of baseline values with a higher maximum value recorded. Exceedances were recorded at ENVMB007.
Magnesium – Dissolved (mg/L)	117 – 2090	140 – 2400	Current range exceeds 10% deviation of baseline values with higher maximum values recorded. Exceedances were recorded at ENVMB001.
Manganese – Dissolved (mg/L)	<0.005 – 4.07	0.004 – 0.94	Current range exceeds 10% deviation of baseline values with a lower minimum value recorded. Lower than minimum values were recorded at ENVMB004.
Nickel – Dissolved (mg/L)	<0.001 – 0.022	0.001 – 0.028	Current range exceeds 10% deviation of baseline values with a higher maximum value recorded. Exceedances were recorded at ENVMB003.
Nitrate as NO3 (mg/L)	<10 – 176	0.2 – 170	Current range exceeds 10% deviation of baseline values with lower minimum values recorded. Lower than minimum values were recorded at ENVMB002, ENVMB006 and ENVMB007.
pH	5.85 – 8.8	6.5 – 8.1	Current range within 10% deviation of baseline values.

Parameter	Trigger Range (Baseline +/- 10%)	Current Range (Reporting period)	Comments
Potassium – Dissolved (mg/L)	51.3 – 924	57 – 950	Current range exceeds 10% deviation of baseline values with a higher maximum value recorded. Exceedances were recorded at ENVMB001.
Sodium – Dissolved (mg/L)	494.1 – 10670	510 – 11000	Current range exceeds 10% deviation of baseline values with a higher maximum value recorded. Exceedances were recorded at ENVMB001.
Sulphate in water (mg/L)	108 – 5170	48 – 5400	Current range exceeds 10% deviation of baseline values with a lower minimum and higher maximum values recorded. Maximum exceedances were recorded at ENVMB001 and values lower than the minimum range were recorded at ENVMB004.
Total Dissolved Solids (mg/L)	2943 – 45210	2700 – 44000	Current range exceeds 10% deviation of baseline values with lower minimum values recorded. Lower than minimum values were recorded at ENVMB004.
Zinc – Dissolved (mg/L)	<0.001 – 0.154	0.003 – 0.26	Current range exceeds 10% deviation of baseline values with a higher maximum value recorded. Exceedances were recorded at ENVMB008.

Across all Environmental Monitoring Bores, a higher value than the maximum trigger value was recorded for the following parameters for at least one monitoring event during the reporting period:

- Bicarbonate
- Boron
- Calcium
- Chloride
- Cobalt
- WAD Cyanide
- EC
- Iron
- Lead
- Magnesium
- Nickel
- Potassium
- Sodium
- Sulphate
- TDS

Across all Environmental Monitoring Bores, a lower value than the minimum trigger value was recorded for the following parameters for at least one monitoring event during the reporting period:

- Boron
- Chloride
- EC
- Manganese
- Nitrate
- Sulphate
- TDS

Review of the Environmental Monitoring Bore results indicates that ENVMB001 has exceeded the maximum trigger range at least once for ten water quality parameters. In contrast, results for monitoring at ENVMB004 show that a lower value than the minimum trigger value was recorded at least once for six water quality parameters (Appendix 1).

The laboratory monitoring results collected from the Environmental Monitoring Bores during the reporting period is presented in Appendix 1.

Environmental Management

The operation of the TSF has been observed to have had a localised impact to groundwater quality during the reporting period, in particularly at ENVMB001. Localised changes in groundwater quality are not considered to have had any detrimental impact to environmental values. The existing groundwater environment is typically saline to hypersaline and has no known beneficial users. Baseline surveys within the Operational Area did not identify any stygofauna. Monitoring of vegetation condition in proximity to operational areas has not identified any impacts to vegetation health associated with changes in groundwater quality.

To mitigate potentials impacts to environmental values, AGAA implemented a Seepage Mitigation Project in 2016. This project involved:

- Increased frequency of groundwater monitoring of the Environmental Monitoring Bores from quarterly to monthly in January 2016.
- Hydrogeological investigations, including field exploration, to identify areas of high potential to facilitate seepage recovery.
- Drilling of groundwater recovery bores at selected targets.
- Installation of a seepage recovery pipeline network to return recovered groundwater to the processing plant.
- Installation and commissioning of six seepage recovery pumps in October and November 2016.
- Installation of additional monitoring bores downstream from the TSF to provide improved understanding of the existing groundwater environment and any influence of the operation of the TSF on the groundwater regime.

AGAA will continue to monitor groundwater across the TGM and will implement additional mitigation actions as and when required to minimise the environmental impacts of the operation. The next review of the Environmental Monitoring Strategy will re-evaluate the 10% variation against baseline groundwater quality trigger, particularly in the context of a saline to hypersaline groundwater environment.

APPENDIX 1 GROUNDWATER MONITORING RESULTS

Values which exceed the maximum trigger value are highlighted red.

Values lower than the minimum trigger value are highlighted in green.

Groundwater Monitoring Results – ENVMB001

ENVMB001	10% Variation in Baseline Trigger		DATE											
Parameter	Min	Max	Oct-2015	Nov-2015	Dec-2015	Jan-2016	Feb-2016	Mar-2016	Apr-2016	May-2016	Jun-2016	Jul-2016	Aug-2016	Sep-2016
Arsenic - Dissolved (mg/L)	<0.001	0.55	0.002	0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	280	270	270	330	330	330	330	340	340	340	340	350
Boron - Dissolved (mg/L)	3.51	12.1	12	13	12	12	13	13	13	16	13	11	12	12
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0005	0.0004	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium - Dissolved (mg/L)	56.7	704	780	780	770	680	680	680	750	740	790	740	690	640
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<5	<5	<1				<1				<1
Chloride in water (mg/L)	2250	18700	20000	19000	19000	19000	20000	20000	20000	19000	21000	21000	20000	20000
Cobalt - Dissolved (mg/L)	<0.001	0.0132	0.12	0.17	0.13	0.18	0.19	0.23	0.29	0.35	0.25	0.24	0.27	0.28
Copper - Dissolved (mg/L)	<0.001	0.11	0.003	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanide WAD (mg/L)		<0.004	<0.004	0.008	0.018	0.04	0.016	0.066	0.062	0.082	<0.004	0.06	0.017	0.036
Electrical Conductivity (µS/cm)	5040	54670	51200	50800	50900	55000	55000	53000	55000	53000	57000	55000	54000	59000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5	<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	0.11	0.14	0.09	0.11	0.11	0.13	0.18	0.24	0.13	0.11	0.14	0.14
Lead - Dissolved (mg/L)	<0.001	0.33	<0.002	<0.002	<0.002	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Magnesium - Dissolved (mg/L)	117	2090	2200	2200	2100	2000	2000	2000	2100	2100	2400	2000	2000	2100
Manganese - Dissolved (mg/L)	<0.005	4.07	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

ENVMB001	10% Variation in Baseline Trigger		DATE											
Parameter	Min	Max	Oct-2015	Nov-2015	Dec-2015	Jan-2016	Feb-2016	Mar-2016	Apr-2016	May-2016	Jun-2016	Jul-2016	Aug-2016	Sep-2016
Nickel - Dissolved (mg/L)	<0.001	0.022	0.007	0.006	0.006	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrate as NO3 (mg/L)	<10	176	110	110	82	140	140	140	150	88	160	150	150	170
pH (pH units)	5.85	8.8	6.5	6.5	7.1	7.2	7.4	7.4	7.2	7.3	7.2	7	7.1	7.3
Potassium - Dissolved (mg/L)	51.3	924	950	940	950	820	800	770	920	770	770	680	820	680
Sodium - Dissolved (mg/L)	494.1	10670	10000	11000	10000	9600	10000	10000	10000	11000	11000	11000	11000	10000
Sulphate in water (mg/L)	108	5170	4900	4600	4800	4700	5400	4900	4900	4700	5000	5000	4700	4800
Total Dissolved Solids (mg/L)	2943	45210	43000	43500	38200	33000	39000	42000	36000	41000	42000	40000	44000	39000
Zinc - Dissolved (mg/L)	<0.001	0.154	<0.002	<0.002	<0.002	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Groundwater Monitoring Results – ENVMB002

ENVMB002	10% Variation in Baseline Trigger		DATE										
Parameter	**Min**	**Max**	**Nov-15**	**Dec-15**	**Jan-16**	**Feb-16**	**Mar-16**	**Apr-16**	**May-16**	**Jun-16**	**Jul-16**	**Aug-16**	**Sep-16**
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	270	280	320	330	320	310	330	320	330	320	330
Boron - Dissolved (mg/L)	3.51	12.1	8.6	8.6	8.1	8.8	9.6	9.4	8.1	9.4	8.5	8.7	8.7
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001
Calcium - Dissolved (mg/L)	56.7	704	530	610	470	470	510	530	520	550	520	490	440
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<5	<1				<1				<1
Chloride in water (mg/L)	2250	18700	13000	14000	13000	15000	14000	13000	13000	14000	15000	14000	14000
Cobalt - Dissolved (mg/L)	<0.001	0.0132	0.003	0.003	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Copper - Dissolved (mg/L)	<0.001	0.11	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Cyanide WAD (mg/L)		<0.004	<0.004	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.006	0.007	0.008
Electrical Conductivity (µS/cm)	5040	54670	37600	39500	40000	40000	38000	40000	38000	41000	39000	38000	41000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	4.2	2.4	<0.05	0.052	1.5	5.5	3.7	3.7	1.9	2.6	1.4
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Magnesium - Dissolved (mg/L)	117	2090	1500	1500	1300	1300	1400	1400	1300	1500	1300	1300	1300
Manganese - Dissolved (mg/L)	<0.005	4.07	0.8	0.86	0.76	0.78	0.81	0.94	0.76	0.75	0.63	0.78	0.72
Nickel - Dissolved (mg/L)	<0.001	0.022	0.008	0.008	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Nitrate as NO3 (mg/L)	<10	176	<10	<10	3.3	<0.2	0.3	0.3	0.2	0.2	<0.2	<0.2	0.6
pH (pH units)	5.85	8.8	6.8	7.5	7.5	7.5	7.6	7.4	7.4	7.4	7.3	7.3	7.5

ENVMB002	10% Variation in Baseline Trigger		DATE										
Parameter	**Min**	**Max**	**Nov-15**	**Dec-15**	**Jan-16**	**Feb-16**	**Mar-16**	**Apr-16**	**May-16**	**Jun-16**	**Jul-16**	**Aug-16**	**Sep-16**
Potassium - Dissolved (mg/L)	51.3	924	560	620	530	510	500	550	460	480	420	440	430
Sodium - Dissolved (mg/L)	494.1	10670	7600	7900	6700	7200	7300	7400	7500	7300	7300	7200	7100
Sulphate in water (mg/L)	108	5170	3300	3400	3400	3800	3400	3400	3400	3600	3600	3100	3200
Total Dissolved Solids (mg/L)	2943	45210	26700	27700	24000	27000	28000	25000	28000	27000	27000	28000	25000
Zinc - Dissolved (mg/L)	<0.001	0.154	<0.001	<0.001	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05

Groundwater Monitoring Results – ENVMB003

ENVMB003	10% Variation in Baseline Trigger		DATE										
Parameter	Min	Max	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	220	190	230	230	230	230	240	250	250	250	240
Boron - Dissolved (mg/L)	3.51	12.1	9.6	8.4	8.6	9.1	9.5	9.7	8.4	10	8.8	9.2	9.2
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0015	0.0016	0.0014	0.0012	0.0013	0.0014	<0.002	0.0014	0.0014	0.0014	0.0012
Calcium - Dissolved (mg/L)	56.7	704	470	420	360	350	360	390	380	430	400	370	340
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<5	<1				<1				<1
Chloride in water (mg/L)	2250	18700	13000	13000	13000	14000	13000	13000	13000	13000	14000	13000	12000
Cobalt - Dissolved (mg/L)	<0.001	0.0132	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Copper - Dissolved (mg/L)	<0.001	0.11	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007	0.013
Electrical Conductivity (µS/cm)	5040	54670	36400	36700	39000	38000	36000	40000	37000	40000	38000	37000	40000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Magnesium - Dissolved (mg/L)	117	2090	1400	1300	1200	1200	1200	1200	1200	1400	1200	1200	1200
Manganese - Dissolved (mg/L)	<0.005	4.07	0.098	0.015	0.02	0.016	0.032	0.028	0.038	0.048	0.034	0.046	0.048
Nickel - Dissolved (mg/L)	<0.001	0.022	0.028	0.02	0.023	0.022	0.024	0.025	0.02	0.021	0.021	0.023	0.022
Nitrate as NO3 (mg/L)	<10	176	49	50	62	58	53	58	56	64	60	56	60
pH (pH units)	5.85	8.8	6.8	6.7	7.4	7.4	7.5	7.2	7.4	7.3	7.2	7.3	7.5

Potassium - Dissolved (mg/L)	51.3	924	570	550	530	510	490	550	460	510	440	450	440
Sodium - Dissolved (mg/L)	494.1	10670	7600	7000	6900	7600	6800	7300	7500	7700	7200	7200	7000
Sulphate in water (mg/L)	108	5170	3400	3500	3700	3800	3300	3700	3500	3600	3600	3200	3400
Total Dissolved Solids (mg/L)	2943	45210	27200	27300	23000	26000	25000	25000	27000	27000	26000	28000	24000
Zinc - Dissolved (mg/L)	<0.001	0.154	0.035	<0.001	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05

Groundwater Monitoring Results – ENVMB004

ENVMB004	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	160	160	210	200	190	180	150	140	170	170
Boron - Dissolved (mg/L)	3.51	12.1	2.6	2.3	1.5	1.2	1.6	1.5	1.4	1.5	1.2	1.3
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0016	0.0014	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium - Dissolved (mg/L)	56.7	704	350	290	220	230	260	260	260	270	250	230
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<1	<1	<1		<1				<1
Chloride in water (mg/L)	2250	18700	4400	4500	1600	1600	1600	1700	1700	1600	1600	1700
Cobalt - Dissolved (mg/L)	<0.001	0.0132	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper - Dissolved (mg/L)	<0.001	0.11	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Electrical Conductivity (µS/cm)	5040	54670	13800	14000	5000	5000	5100	5400	4600	5200	5300	5300
Hydroxide OH- as CaCO3 (mg/L)		<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	<0.01	<0.025	<0.005	<0.005	0.062	<0.005	<0.005	<0.005	<0.005	<0.005
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	0.024	<0.001	<0.001	<0.001
Magnesium - Dissolved (mg/L)	117	2090	630	530	140	140	150	150	160	150	150	150
Manganese - Dissolved (mg/L)	<0.005	4.07	0.025	0.022	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel - Dissolved (mg/L)	<0.001	0.022	0.005	0.006	<0.001	<0.001	0.002	0.001	0.001	0.001	0.001	<0.001
Nitrate as NO3 (mg/L)	<10	176	37	46	62	70	62	60	68	63	62	65
pH (pH units)	5.85	8.8	7	7.6	8	8	7.9	7.9	8.1	7.9	7.9	8

ENVMB004	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Potassium - Dissolved (mg/L)	51.3	924	170	170	67	64	75	65	64	60	58	57
Sodium - Dissolved (mg/L)	494.1	10670	2000	1700	530	560	600	570	550	540	520	510
Sulphate in water (mg/L)	108	5170	800	850	62	57	53	50	53	49	48	55
Total Dissolved Solids (mg/L)	2943	45210	9980	8600	3000	2800	2700	3100	3000	2900	4100	3100
Zinc - Dissolved (mg/L)	<0.001	0.154	0.005	<0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Groundwater Monitoring Results – ENVMB005

ENVMB005	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	610	630	640	680	670	680	700	700	690	690
Boron - Dissolved (mg/L)	3.51	12.1	7.5	8.4	9	6.6	7.2	8.1	7	6.6	6.5	6.8
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium - Dissolved (mg/L)	56.7	704	86	180	170	78	80	130	87	87	84	77
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<1		<1		<1				<1
Chloride in water (mg/L)	2250	18700	4100	8300	8700	4200	4100	5800	4300	4500	4400	4100
Cobalt - Dissolved (mg/L)	<0.001	0.0132	<0.001	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper - Dissolved (mg/L)	<0.001	0.11	0.001	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Electrical Conductivity (µS/cm)	5040	54670	14700	27000	27000	15000	15000	20000	16000	16000	16000	16000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	<0.01	<0.05	<0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium - Dissolved (mg/L)	117	2090	260	570	550	240	220	390	260	230	250	250
Manganese - Dissolved (mg/L)	<0.005	4.07	0.006	0.072	0.077	0.02	0.025	0.11	0.006	0.01	0.015	0.009
Nickel - Dissolved (mg/L)	<0.001	0.022	0.001	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate as NO3 (mg/L)	<10	176	140	73	73	160	150	78	160	150	150	160
pH (pH units)	5.85	8.8	7	7.5	7.7	7.3	7.5	7.6	7.6	7.6	7.5	7.7

ENVMB005	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Potassium - Dissolved (mg/L)	51.3	924	180	320	270	180	190	220	180	160	160	170
Sodium - Dissolved (mg/L)	494.1	10670	3200	5200	5300	3100	3100	4300	3300	3000	3100	3200
Sulphate in water (mg/L)	108	5170	1200	2700	2600	1400	1300	2000	1400	1500	1400	1400
Total Dissolved Solids (mg/L)	2943	45210	9620	16000	17000	9000	8600	13000	9300	9800	10000	9000
Zinc - Dissolved (mg/L)	<0.001	0.154	<0.001	<0.05	<0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Groundwater Monitoring Results – ENVMB006

ENVMB006	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	430	510	520	490	480	500	500	500	510	500
Boron - Dissolved (mg/L)	3.51	12.1	5.5	4.7	5.1	5.9	5.3	5.3	5.5	5.1	5.1	5.2
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium - Dissolved (mg/L)	56.7	704	470	440	390	430	440	460	480	450	420	380
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<1	<1	<1		<1				<1
Chloride in water (mg/L)	2250	18700	6800	6900	6900	6800	6600	6700	6700	7600	6800	6900
Cobalt - Dissolved (mg/L)	<0.001	0.0132	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper - Dissolved (mg/L)	<0.001	0.11	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Electrical Conductivity (µS/cm)	5040	54670	21000	22000	22000	22000	20000	22000	23000	22000	21000	21000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	0.19	<0.025	<0.025	<0.025	0.51	<0.025	<0.025	<0.025	<0.025	<0.025
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium - Dissolved (mg/L)	117	2090	910	810	770	800	770	800	890	770	790	770
Manganese - Dissolved (mg/L)	<0.005	4.07	0.59	0.48	0.27	0.24	0.28	0.2	0.17	0.19	0.17	0.11
Nickel - Dissolved (mg/L)	<0.001	0.022	0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate as NO3 (mg/L)	<10	176	<10	12	7.8	11	8.6	8.8	9.9	8.3	8.6	12
pH (pH units)	5.85	8.8	7	7.6	7.5	7.2	7.5	7.5	7.5	7.5	7.4	7.7

ENVMB006	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Potassium - Dissolved (mg/L)	51.3	924	200	200	170	180	190	170	180	160	160	170
Sodium - Dissolved (mg/L)	494.1	10670	3700	3200	3600	3500	3500	3700	3700	3400	3500	3500
Sulphate in water (mg/L)	108	5170	2100	2200	2300	2200	2200	2200	2300	2400	2000	2000
Total Dissolved Solids (mg/L)	2943	45210	15200	13000	13000	14000	13000	15000	14000	14000	15000	13000
Zinc - Dissolved (mg/L)	<0.001	0.154	0.003	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Groundwater Monitoring Results – ENVMB007

ENVMB007	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	470	550	560	540	530	540	550	560	540	540
Boron - Dissolved (mg/L)	3.51	12.1	6	5.1	5.3	5.7	5.4	5.3	5.7	4.9	5.2	5.3
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium - Dissolved (mg/L)	56.7	704	470	440	380	420	440	460	480	460	420	380
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<1	<1	<1		<1				<1
Chloride in water (mg/L)	2250	18700	6600	6400	6600	6500	6300	6400	6500	7300	6400	6700
Cobalt - Dissolved (mg/L)	<0.001	0.0132	0.002	<0.005	0.012	<0.005	<0.005	0.005	0.005	<0.005	<0.005	<0.005
Copper - Dissolved (mg/L)	<0.001	0.11	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Electrical Conductivity (µS/cm)	5040	54670	20200	21000	21000	21000	19000	21000	22000	21000	21000	20000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	<0.01	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.46	<0.005	<0.005
Magnesium - Dissolved (mg/L)	117	2090	790	700	670	680	660	690	760	660	670	670
Manganese - Dissolved (mg/L)	<0.005	4.07	0.5	0.59	0.29	0.36	0.29	0.43	0.37	0.23	0.22	0.12
Nickel - Dissolved (mg/L)	<0.001	0.022	0.005	0.008	0.007	0.006	0.005	0.014	0.009	0.022	0.007	0.007
Nitrate as NO3 (mg/L)	<10	176	<10	10	6.9	6.3	4.6	5.1	4.1	12	5.4	9.4
pH (pH units)	5.85	8.8	7	7.6	7.5	7.3	7.5	7.6	7.6	7.5	7.5	7.7

ENVMB007	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Potassium - Dissolved (mg/L)	51.3	924	190	180	160	170	180	160	170	150	150	150
Sodium - Dissolved (mg/L)	494.1	10670	3700	3300	3700	3500	3600	3700	3800	3400	3400	3500
Sulphate in water (mg/L)	108	5170	2100	2100	2200	2100	2100	2100	2200	2300	2000	2000
Total Dissolved Solids (mg/L)	2943	45210	14500	13000	13000	14000	14000	14000	14000	14000	14000	13000
Zinc - Dissolved (mg/L)	<0.001	0.154	0.006	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Groundwater Monitoring Results – ENVMB008

ENVMB008	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Arsenic - Dissolved (mg/L)	<0.001	0.55	0.004	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bicarbonate Alkalinity as HCO3 (mg/L)	135	682	200	270	270	260	230	240	240	240	230	280
Boron - Dissolved (mg/L)	3.51	12.1	2.7	4.6	4.7	5	2.8	2.6	2.6	2.9	2.5	4
Cadmium - Dissolved (mg/L)	<0.0001	0.0055	0.0002	0.0044	0.004	0.0049	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium - Dissolved (mg/L)	56.7	704	420	830	710	750	400	390	390	470	350	540
Carbonate CO32- as CaCO3 (mg/L)		<5	<5	<1	<1	<1		<1				<1
Chloride in water (mg/L)	2250	18700	3800	12000	11000	11000	4100	3900	4000	4100	3600	8400
Cobalt - Dissolved (mg/L)	<0.001	0.0132	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper - Dissolved (mg/L)	<0.001	0.11	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cyanide WAD (mg/L)		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Electrical Conductivity (µS/cm)	5040	54670	12500	35000	32000	33000	13000	14000	14000	14000	12000	23000
Hydroxide OH- as CaCO3 (mg/L)		<5	<5									
Iron - Dissolved (mg/L)	<0.02	1.98	0.48	<0.05	<0.05	<0.05	0.056	<0.025	<0.025	<0.025	<0.025	<0.025
Lead - Dissolved (mg/L)	<0.001	0.33	<0.001	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium - Dissolved (mg/L)	117	2090	520	1700	1400	1600	530	510	540	660	460	1000
Manganese - Dissolved (mg/L)	<0.005	4.07	0.01	0.081	0.064	0.08	<0.005	<0.005	<0.005	<0.005	<0.005	0.006
Nickel - Dissolved (mg/L)	<0.001	0.022	0.002	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate as NO3 (mg/L)	<10	176	37	26	23	22	44	46	50	42	49	30
pH (pH units)	5.85	8.8	7	7.5	7.4	7.2	7.5	7.6	7.6	7.6	7.5	7.7

ENVMB008	10% Variation in Baseline Trigger		DATE									
Parameter	Min	Max	Nov-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
Potassium - Dissolved (mg/L)	51.3	924	110	240	210	210	110	87	86	95	80	140
Sodium - Dissolved (mg/L)	494.1	10670	1800	4900	4200	4700	2000	2000	1900	2500	1600	3400
Sulphate in water (mg/L)	108	5170	1200	3300	3100	3000	1400	1300	1400	1400	1200	2200
Total Dissolved Solids (mg/L)	2943	45210	9420	21000	19000	24000	8900	9000	8000	8600	8400	15000
Zinc - Dissolved (mg/L)	<0.001	0.154	0.26	<0.05	<0.05	<0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025

Appendix 4: Surface Water Monitoring

MEMORANDUM

Date: **17 November 2016**

To: Environment Team

From: Matthew Stingemore

Subject: 2015/2016 Surface Water Monitoring Results

Surface water quality monitoring is undertaken in accordance with the Tropicana Gold Mine Environmental Monitoring Strategy, with samples collected following rain events of over 20 millimetres (mm) in 24 hours or when surface water is observed in collection locations.

Surface water sampling locations have been established in and around the operational area however no permanent surface water sites occur. Therefore surface water sampling is only able to be collected following large rainfall events. Additional surface water sample locations have been established progressively as the project has transitioned from construction to operational phases.

Event sampling was undertaken on six occasions during the reporting period following significant rainfall events:

9 November 2015	24 December 2015	18 January 2016
20 January 2016	1 February 2016	22 March 2016

The following locations were sampled:

Downstream Drain	Mineralised Waste South East	ROM Sump	TSF North West
Downstream LWE1	Plant Drain	T-Drain Plant	TSF South West
HV Workshop Lake MAH	Road Drain	TSF Drain End	TSF TAZ Stockpile
LEA Rehab Trial	ROM Drain	TSF North East	Upstream Drain

The locations of these sampling sites are shown in Figure 1.

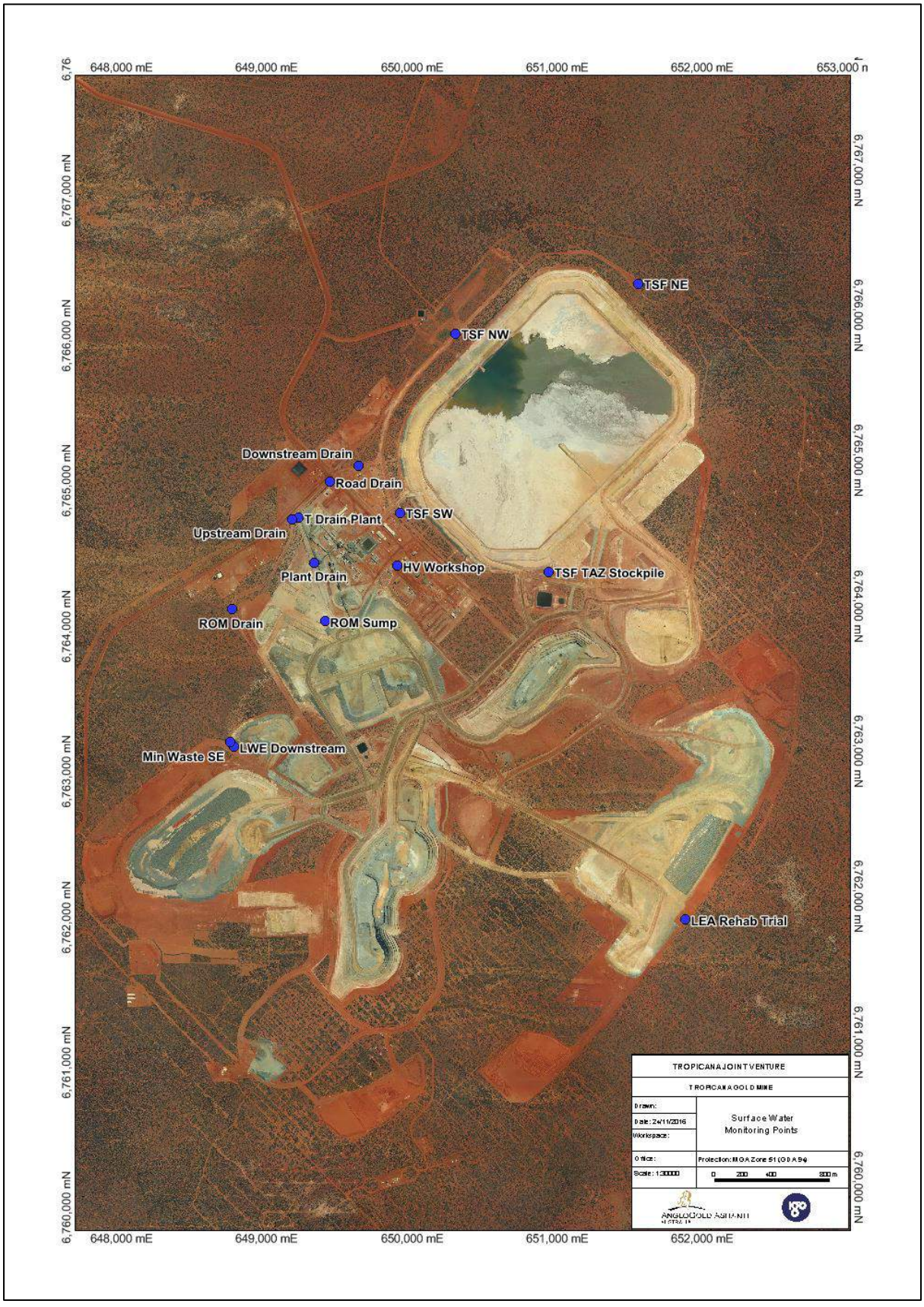


Figure 1: Surface Water Sampling Locations (March 2016)

Surface Water Monitoring Results

Results obtained from surface water sampling conducted during the reporting period are provided in Appendix 1 and discussed briefly below.

The pH of samples collected across the surface water sampling locations ranged between 6.8 and 8.3 pH units with levels typically ranging between 7 and 8 pH units (Figure 2).

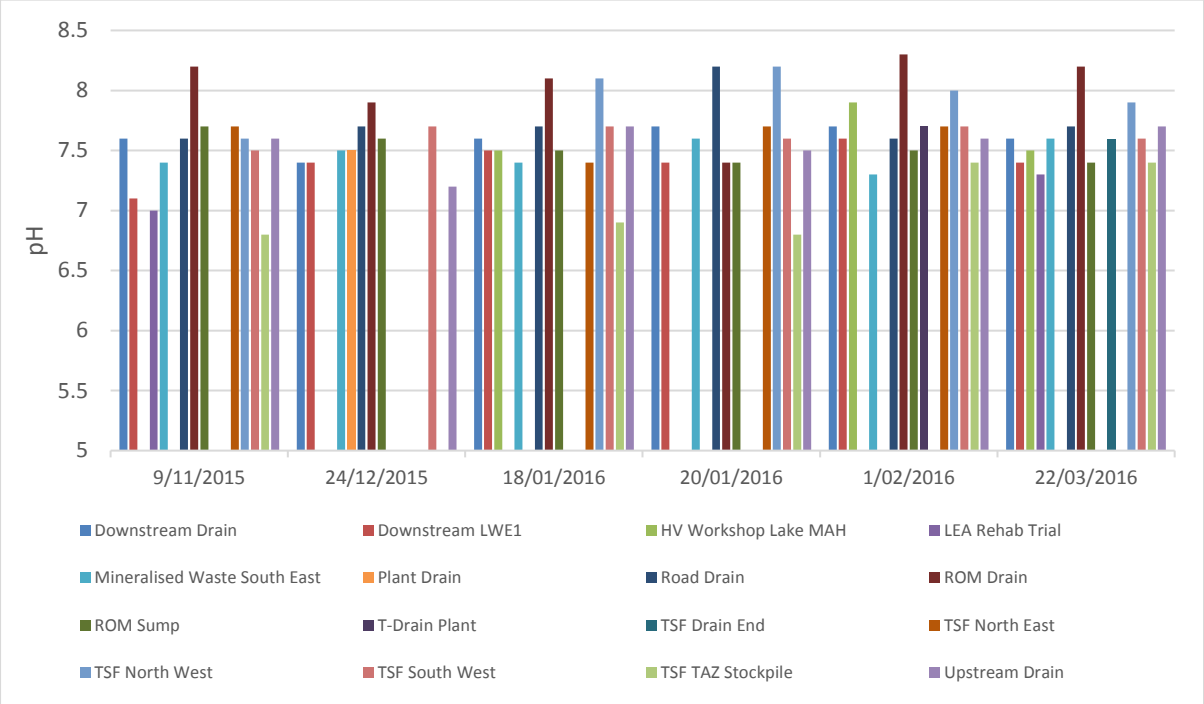


Figure 2: pH Recorded during Surface Water Monitoring (Oct 2015 to Sep 2016)

Electrical Conductivity (EC) recorded across the surface water sampling locations ranged between 55 µS/cm to 10,000 µS/cm and Total Dissolved Solids (TDS) values ranged from 57 mg/L to 6400 mg/L (Figure 3 and Figure 4). Higher EC and TDS results were recorded at the Mineralised Waste South East, Downstream LWE1 and the HV Workshop Lake MAH. These results are likely to be due to the use of hypersaline water for dust suppression on haul roads and active mining areas.

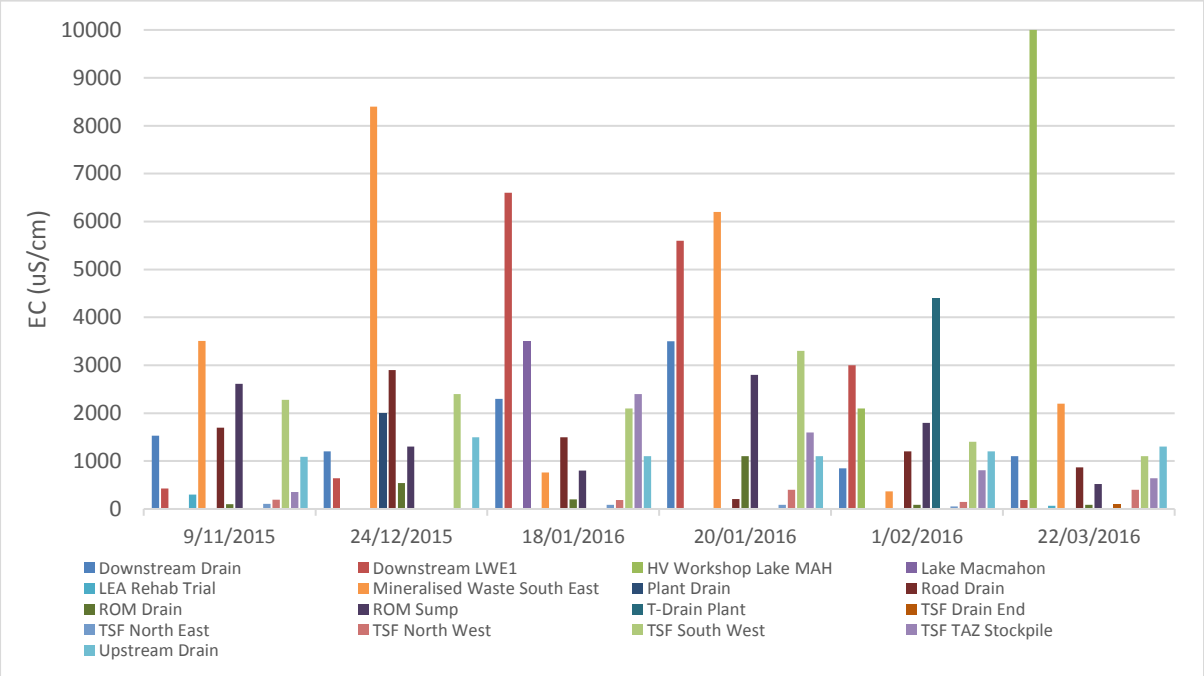


Figure 3: Electrical Conductivity Recorded during Surface Water Monitoring (Oct 2015 to Sept 2016)

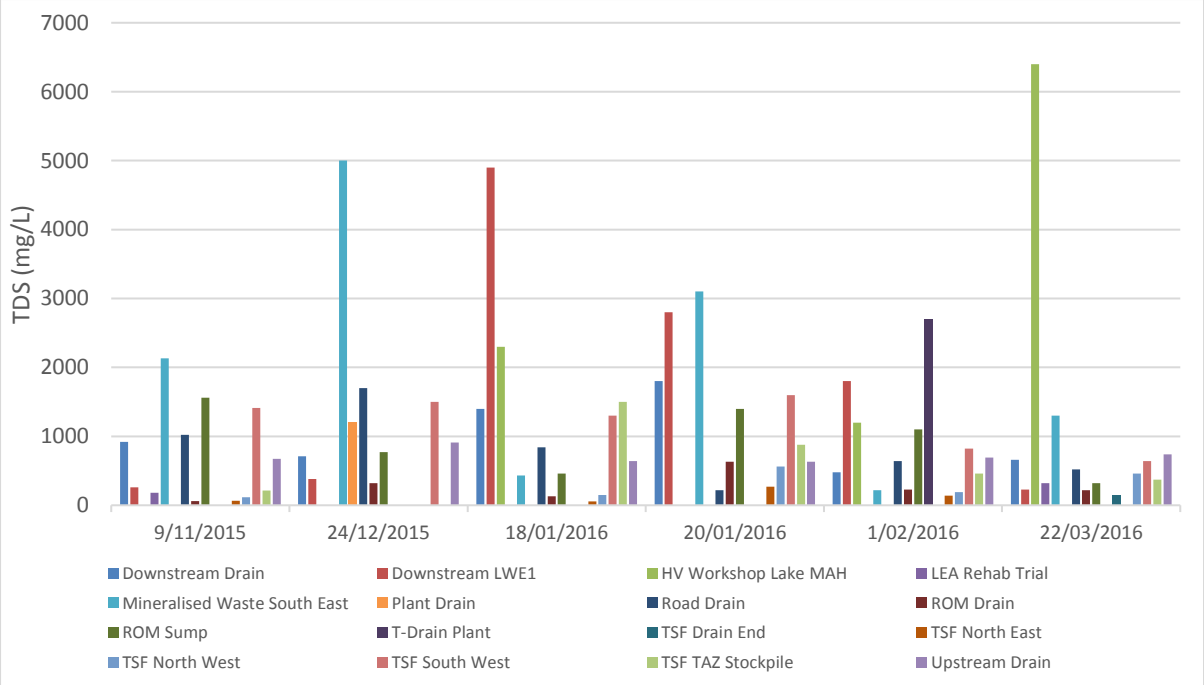


Figure 4: Total Dissolved Solids Recorded during Surface Water Monitoring (Oct 2015 to Sep 2016)

Appendix 1: Surface Water Results

Sampling Point	Date	Al - T	As - T	Bicarbonate Alkalinity	Ca - T	Carbonate Alkalinity	Cd - T	Cl	CN - T	Colour (True)	Cr - T	Cu - T	EC	Fe - T	Free Cyanide	Hardness	HCO_3	Hg - T	Hydroxide Alkalinity	Ionic Balance	Mg - T	Mn - T	Ni - T	NO3	OH	Oil & Grease (Grav.)	Pb - T	pH	K - T	SO4	Na - T	Sum of Ions	TDS	Total Alkalinity	TSS	Turbidity	WAD CN
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	HZU	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L
Downstream Drain	9/11/2015	0.15	<0.005		48		<0.001	410	<0.004	4	0.001	0.002	1530	0.21	<0.004	220	21	<0.00005		2.4	25	0.022	0.002	3.5	<5		<0.001	7.6	11	100	230		920	21	6	13	<0.004
	24/12/2015	2.5	0.002	25	44	<1	<0.001	280	0.005	6	0.007	0.014	1200	2.8	<0.004	170		<0.00005	<5	0	15	0.07	0.008	3.3		6	0.005	7.4	9.6	81	140	593	710		91	72	<0.004
	18/01/2016	1.3	<0.001	22	95	<1	<0.001	610	0.007	3	0.002	0.002	2300	0.52	<0.004	420		<0.00005	<5	1	44	0.023	0.001	4.3		<5	0.046	7.6	25	210	310	1310	1400	18	15	17	0.005
	20/01/2016	0.49	<0.001	24	110	<1	<0.001	740	0.006	4	0.002	0.002	3500	0.64	0.004	430		<0.00005	<5	1	40	0.021	0.001	4.3		<5	<0.001	7.7	21	240	410	1580	1800		24	30	0.004
	1/02/2016	1.8	<0.001	20	31	<1	<0.001	210	<0.004	3	0.003	0.002	850	1.5	<0.004	130		<0.00005	<5	-4	13	0.02	0.002	1.5		<5	0.001	7.7	8.3	68	95	440	480		51	45	<0.004
	22/03/2016	0.65	<0.001	19	37	<1	<0.001	280	0.007	2	0.003	0.002	1100	1.3	<0.004	160		<0.00005	<5	-1	16	0.031	0.001	1.7		<5	0.001	7.6	9.6	82	150	586	660		93	49	<0.004
Downstream LWE1	9/11/2015	1.5	<0.005		5.2		<0.001	98		5	0.005	0.003	431	2.3		34	9	<0.00005		0.04	5.1	0.069	0.002	2.4	<5		0.002	7.1	4.1	39	69		259	9	19	170	
	24/12/2015	2.7	0.001	16	18	<1	<0.001	140		5	0.008	0.004	640	4.2		76		<0.00005	<5	-2	7.6	0.064	0.003	1.5			0.003	7.4	6.1	52	80	322	380		70	230	
	18/01/2016	1.8	<0.005	24	250	<1	<0.005	2500		6	0.007	<0.005	6600	3.6		1300		<0.00005	<5	4	160	0.26	<0.005	21			<0.005	7.5	61	730	1500	5260	4900	20	100	160	
	20/01/2016	0.38	<0.001	16	130	<1	0.0001	1300		4	0.001	0.001	5600	0.53		650		<0.00005	<5	0	78	0.095	0.001	23			<0.001	7.4	39	380	690	2620	2800		7	18	
	1/02/2016	2	<0.001	28	82	<1	0.0001	790	<0.004	3	0.006	0.003	3000	2.8	<0.004	430		<0.00005	<5	1	55	0.065	0.004	20			0.002	7.6	28	260	450	1710	1800		210	180	<0.004
	22/03/2016	23	0.009	17	6.7	<1	<0.001	28		15	0.084	0.036	190	33		64		<0.00005	<5	26	11	0.43	0.049	1.1			0.037	7.4	11	28	30	131	230		1300	2000	
HV Workshop Lake MAH	1/02/2016	29	0.006	33	97	<1	0.0005	550	<0.004	2	0.12	0.046	2100	53	<0.004	420		<0.00005	<5	4	42	0.44	0.054	1.4		<5	0.041	7.9	25	180	290	1210	1200		1700	1700	<0.004
	22/03/2016	5	<0.005	25	260	<1	<0.005	3000	<0.004	6	0.013	0.005	10000	5.1	<0.004	1300		<0.00005	<5	-3	170	0.088	0.005	17		<5	0.014	7.5	69	610	1500	5660	6400		53	60	<0.004
	18/01/2016	1	<0.001	28	150	<1	0.0001	990	0.011	4	0.005	0.003	3500	1.9	0.007	590		<0.00005	<5	-2	49	0.036	0.002	3.8		<5	0.002	7.5	32	390	530	2170	2300	23	31	30	0.009
LEA Rehab Trial	9/11/2015	1234	<0.1		8.2		0.0026	43		18	0.64	0.25	300	2646		35	31	0.35		5.5	3.5	3468	0.41	4	<5		0.35	7	3.2	31	46		180	31	80000	91000	
	22/03/2016	86	0.007	15	17	<1	0.0004	6		200	0.29	0.17	66	130		210		<0.00005	<5	76	41	1.8	0.21	1			0.061	7.3	27	13	8.9	126	320		1900	1900	
Mineralised Waste South East	9/11/2015	1.6	<0.005		93		0.0001	960		4	0.006	0.003	3510	2.5		450	19	<0.00005		-0.56	54	0.081	0.003	9.5	<5		0.001	7.4	25	260	530		2130	19	110	110	
	24/12/2015	2.1	<0.005	21	220	<1	0.0015	2400		5	<0.005	<0.005	8400	1.3		1100		<0.00005	<5	-3	130	0.14	<0.005	20			<0.005	7.5	53	590	1300	4750	5000		34	45	
	18/01/2016	1.4	<0.001	15	19	<1	<0.001	190		5	0.005	0.002	760	2.2		95		<0.00005	<5	-4	11	0.074	0.002	2.6			0.002	7.4	6.7	61	100	407	430	12	24	77	
	20/01/2016	12	0.003	27	150	<1	0.0003	1400		4	0.048	0.02	6200	20		740		<0.00005	<5	-2	90	0.24	0.029	17			0.014	7.6	45	430	740	2920	3100		650	340	
	1/02/2016	4.1	0.002	12	7.7	<1	<0.001	71	<0.004	3	0.015	0.007	370	5.8	<0.004	43		<0.00005	<5	-1	5.8	0.084	0.009	1.3			0.006	7.3	5.6	58	54	213	220		250	350	<0.004
	22/03/2016	4.3	<0.001	22	66	<1	0.0001	520		2	0.005	0.002	2200	2.1		320		<0.00005	<5	2	37	0.047	0.002	14			0.002	7.6	20	190	300	1170	1300		90	88	
Plant Drain	24/12/2015	1.6	<0.001	27	59	<1	<0.001	520	0.005	3	0.005	0.004	2000	2.5	<0.004	220		<0.00005	<5	1	17	0.045	0.003	2.8		<5	0.004	7.5	15	130	310	1070	1200		67	95	<0.004
Road Drain	9/11/2015	2.6	<0.005		50		0.0001	470	<0.004	3	0.008	0.006	1700	4.3	<0.004	230	21	<0.00005		1.7	25	0.085	0.008	2.3	<5		0.005	7.6	11	110	270		1020	21	78	110	<0.004
	24/12/2015	0.79	<0.001	22	100	<1	0.0001	730	0.011	4	0.002	0.003	2900	1.1	<0.004	390		<0.00005	<5	3	33	0.059	0.003	3.4		<5	0.002	7.7	18	200	420	1530	1700		37	59	<0.004
	18/01/2016	0.74	<0.001	27	51	<1	<0.001	410	0.012	3	0.003	0.004	1500	1.2	0.006	220		<0.00005	<5	2	22	0.045	0.002	2.4		<5	0.002	7.7	15	91	220	836	840	22	33	39	0.007
	20/01/2016	26	0.003	55	24	<1	<0.001	32	<0.004	5	0.063	0.018	210	35	<0.004	90		0.000006	<5	9	7.2	0.16	0.023	1.5		<5	0.016	8.2	7.2	15	17	146	220		570	1900	<0.004

Sampling Point	Date	Al - T	As - T	Bicarbonate Alkalinity	Ca - T	Carbonate Alkalinity	Cd - T	Cl	CN - T	Colour (True)	Cr - T	Cu - T	EC	Fe - T	Free Cyanide	Hardness	HCO3	Hg - T	Hydroxide Alkalinity	Ionic Balance	Mg - T	Mn - T	Ni - T	NO3	OH	Oil & Grease (Grav.)	Pb - T	pH	K - T	SO4	Na - T	Sum of Ions	TDS	Total Alkalinity	TSS	Turbidity	WAD CN
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	HZU	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L
	1/02/2016	1	<0.001	20	37	<1	<0.001	300	0.054	3	0.003	0.003	1200	1.7	<0.004	150		<0.00005	<5	-5	15	0.037	0.002	1.3		<5	0.002	7.6	9.5	88	140	607	640		46	90	<0.004
	22/03/2016	0.88	<0.001	22	32	<1	<0.001	210	<0.004	1	0.004	0.002	870	1.6	<0.004	140		<0.00005	<5	-2	15	0.021	<0.001	1.9		<5	0.003	7.7	8.9	68	100	455	520		120	77	<0.004
ROM Drain	9/11/2015	15	<0.005		11		<0.001	8	<0.004	75	0.036	0.014	103	23	<0.004	35	41	<0.00005		-2.3	1.7	0.14	0.015	1.4	<5		0.013	8.2	2.2	4	6.9		62	41	56	1200	<0.004
	24/12/2015	1.2	<0.001	23	40	<1	<0.001	120	0.005	5	0.002	0.005	540	0.87	<0.004	130		<0.00005	<5	6	6.8	0.018	0.002	2.5		<5	0.001	7.9	5	40	57	290	320		15	62	<0.004
	18/01/2016	15	0.003	45	19	<1	<0.001	34	0.006	10	0.043	0.011	200	24	<0.004	67		<0.00005	<5	9	4.9	0.1	0.015	1.5		<5	0.011	8.1	5.1	10	19	130	130	37	330	1200	0.004
	20/01/2016	0.43	<0.001	21	42	<1	<0.001	270	0.008	3	0.002	0.001	1100	0.66	<0.004	160		<0.00005	<5	-5	15	0.024	0.001	2.2		<5	<0.001	7.4	9.7	89	130	571	630		12	25	0.005
	1/02/2016	17	0.002	47	14	<1	<0.001	4	<0.004	34	0.04	0.013	88	23	<0.004	50		<0.00005	<5	9	3.8	0.11	0.016	<0.2		<5	0.009	8.3	4.9	3	4.7	68	230		1000	1500	<0.004
	22/03/2016	15	0.002	40	11	<1	<0.001	7	<0.004	17	0.034	0.009	90	19	<0.004	41		<0.00005	<5	12	3.1	0.078	0.011	0.6		<5	0.008	8.2	4.1	3	6.1	68	220		290	640	<0.004
ROM Sump	9/11/2015	11	<0.005		79		0.0008	710	<0.004	<3	0.08	0.057	2610	26	<0.004	340	27	<0.00005		0.61	34	3472	0.061	2.2	<5		0.1	7.7	12	190	410		1560	27	760	1000	<0.004
	24/12/2015	0.88	<0.001	17	79	<1	<0.001	230	<0.004	<1	0.001	0.001	1300	0.34	<0.004	280		<0.00005	<5	1	20	0.011	<0.001	2.8		<5	0.001	7.6	14	240	140	741	770		16	21	<0.004
	18/01/2016	0.71	<0.001	18	34	<1	<0.001	180	0.009	<1	0.004	0.002	800	1.2	<0.004	140		<0.00005	<5	-3	14	0.025	0.002	2.5		<5	0.001	7.5	10	100	90	442	460	15	50	43	0.006
	20/01/2016	0.35	<0.001	14	79	<1	<0.001	590	0.005	<1	0.002	0.001	2800	0.53	<0.004	370		<0.00005	<5	0	42	0.024	0.001	6.3		<5	<0.001	7.4	19	240	320	1310	1400		34	32	<0.004
	1/02/2016	5.8	0.003	16	58	<1	0.0002	460	<0.004	<1	0.022	0.014	1800	8.3	<0.004	270		<0.00005	<5	-1	31	0.18	0.017	3.6		<5	0.009	7.5	16	180	250	1010	1100		390	280	<0.004
	22/03/2016	2.2	<0.001	14	28	<1	<0.001	95	<0.004	<1	0.003	0.001	520	0.61	<0.004	100		<0.00005	<5	-3	8.2	0.015	<0.001	1		<5	<0.001	7.4	6.5	84	51	285	320		110	100	<0.004
T-Drain Plant	1/02/2016	1.3	<0.001	31	130	<1	0.0007	1300	0.005	3	0.004	0.003	4400	2	0.004	720		<0.00005	<5	2	98	0.17	0.005	6.2		<5	0.002	7.7	44	320	720	2670	2700		160	96	0.005
TSF Drain End	22/03/2016	6.7	0.002	28	7.6	<1	<0.001	14	<0.004	29	0.015	0.006	95	9.6	<0.004	27		<0.00005	<5	5	1.9	0.087	0.005	1.7		<5	0.005	7.6	3.5	3	9.6	64	150		210	320	<0.004
TSF North East	9/11/2015	3.6	<0.005		6		<0.001	14	<0.004	81	0.008	0.005	106	6	<0.004	20	28	<0.00005		-1.2	1.2	0.1	0.003	1.4	<5		0.003	7.7	2.7	2	12		63.8	28	33	340	<0.004
	18/01/2016	13	0.002	16	4.7	<1	<0.001	16	<0.004	120	0.034	0.011	87	23	<0.004	20		<0.00005	<5	11	2.1	0.22	0.012	4.2		<5	0.009	7.4	3.9	2	12	58	57	13	91	510	<0.004
	20/01/2016	8.1	0.002	39	7.6	<1	<0.001	9	<0.004	120	0.018	0.008	89	12	<0.004	27		<0.00005	<5	2	1.9	0.12	0.007	1		<5	0.005	7.7	3.2	3	8.9	66	270		1500	550	<0.004
	1/02/2016	3.6	<0.001	17	4.3	<1	<0.001	7	<0.004	57	0.008	0.004	55	5.4	<0.004	15		<0.00005	<5	9	1.1	0.062	0.003	<0.2		<5	0.002	7.7	2.2	2	5.9	36	140		100	220	<0.004
TSF North West	9/11/2015	6.5	<0.005		14		<0.001	38	<0.004	34	0.013	0.008	192	10	<0.004	46	26	<0.00005		1.6	2.7	0.17	0.006	3.3	<5		0.006	7.6	3.2	4	17		115	26	<5	620	<0.004
	18/01/2016	39	0.006	44	9.9	<1	<0.001	31	0.005	73	0.076	0.031	190	41	<0.004	51		<0.00005	<5	-5	6.3	0.4	0.028	3.2		<5	0.018	8.1	8.5	12	29	118	150	36	320	1200	<0.004
	20/01/2016	27	0.005	55	14	<1	<0.001	71	<0.004	11	0.056	0.021	400	29	<0.004	75		<0.00005	<5	6	9.6	0.2	0.018	4.4		<5	0.011	8.2	14	41	57	257	560		980	1600	<0.004
	1/02/2016	6.6	0.002	36	7.4	<1	<0.001	24	0.007	28	0.014	0.007	150	8.1	<0.004	29		<0.00005	<5	3	2.6	0.095	0.006	1.9		<5	0.004	8	4.7	9	20	99	190		250	450	<0.004
	22/03/2016	17	0.004	35	8.7	<1	<0.001	72	<0.004	17	0.031	0.011	400	15	<0.004	58		<0.00005	<5	7	8.9	0.1	0.009	4.2		<5	0.01	7.9	12	43	60	238	460		940	1500	<0.004
TSF South West	9/11/2015	1.2	<0.005		77		<0.001	610	0.018	4	0.005	0.004	2280	2	<0.004	330	19	<0.00005		1.3	34	0.034	0.002	3.8	<5		0.002	7.5	16	170	340		1410	19	10	28	<0.004
	24/12/2015	1.4	<0.001	26	100	<1	<0.001	580	0.017	6	0.004	0.006	2400	1.8	0.012	400		<0.00005	<5	4	34	0.025	0.002	4.1		<5	0.002	7.7	20	230	340	1330	1500		44	81	0.013
	18/01/2016	0.35	<0.001	24	110	<1	<0.001	530	0.006	4	0.002	0.001	2100	0.5	0.005	430		<0.00005	<5	1	35	0.013	<0.001	3.9		<5	<0.001	7.7	25	270	280	1280	1300	20	22	31	0.005
	20/01/2016	1.7	<0.001	26	99	<1	<0.001	690	0.007	3	0.006	0.003	3300	2.6	0.004	400		<0.00005	<5	-1	37	0.032	0.003	3.9		<5	0.001	7.6	19	220	360	1450	1600		62	77	0.005
	1/02/2016	0.45	<0.0	20	56	<1	<0.0	350	<0.0	2	0.00	0.00	1400	0.75	<0.0	220		<0.00	<5	-5	20	0.00	0.00	1.5		<5	<0.0	7.7	12	130	160	757	820		43	36	<0.0

Sampling Point	Date	Al - T	As - T	Bicarbonate Alkalinity	Ca - T	Carbonate Alkalinity	Cd - T	Cl	CN - T	Colour (True)	Cr - T	Cu - T	EC	Fe - T	Free Cyanide	Hardness	HCO3	Hg - T	Hydroxide Alkalinity	Ionic Balance	Mg - T	Mn - T	Ni - T	NO3	OH	Oil & Grease (Grav.)	Pb - T	pH	K - T	SO4	Na - T	Sum of Ions	TDS	Total Alkalinity	TSS	Turbidity	WAD CN
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	HZU	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L
			01				001		04		2	1			04			005				9	2				01										04
	22/03/2016	1.4	<0.001	19	49	<1	<0.001	260	0.01	2	0.002	0.002	1100	0.61	0.009	200		<0.00005	<5	2	18	0.08	<0.01	2.4		<5	<0.01	7.6	11	99	130	584	640		11	17	0.01
TSF TAZ Stockpile	9/11/2015	2	<0.005		5.2		<0.001	81	<0.004	5	0.007	0.004	357	2	<0.004	28	7	<0.00005		-0.44	3.6	0.04	0.003	1.9	<5		0.007	6.8	5.4	35	56		214	7	91	580	<0.004
	18/01/2016	1.2	<0.001	6	120	<1	<0.001	600	0.012	2	<0.01	0.001	2400	0.14	0.005	440		<0.00005	<5	1	36	0.07	<0.01	2.1		<5	<0.01	6.9	26	320	340	1440	1500	<5	44	39	0.006
	20/01/2016	0.19	<0.001	<5	59	<1	<0.001	350	<0.004	2	<0.01	0.001	1600	0.25	<0.004	230		<0.00005	<5	-3	20	0.053	0.001	1.9		<5	<0.01	6.8	15	170	180	801	880		47	43	<0.004
	1/02/2016	1.2	<0.001	12	26	<1	<0.001	180	<0.004	3	0.004	0.002	810	1.6	<0.004	110		<0.00005	<5	-2	9.6	0.042	0.002	1.6		<5	0.002	7.4	9.6	90	110	439	460		73	130	<0.004
	22/03/2016	0.87	<0.001	13	14	<1	<0.001	160	<0.004	1	0.003	0.002	640	1.1	<0.004	58		<0.00005	<5	-4	5.8	0.022	<0.01	1.7		<5	0.002	7.4	8	48	91	338	370		33	82	<0.004
Upstream Drain	9/11/2015	2.2	<0.005		33		<0.001	270	<0.004	6	0.006	0.006	1090	3.2	<0.004	140	28	<0.00005		2.2	14	0.06	0.005	2.2	<5		0.005	7.6	11	80	170		676	28	440	430	<0.004
	24/12/2015	2.3	0.002	24	56	<1	<0.001	370	0.006	14	0.01	0.009	1500	2.4	<0.004	200		<0.00005	<5	0	15	0.11	0.005	2.8		<5	0.005	7.2	10	98	200	768	910		250	110	<0.004
	18/01/2016	1.8	<0.001	24	36	<1	<0.001	290	0.01	4	0.007	0.005	1100	3.1	0.004	150		<0.00005	<5	3	15	0.053	0.003	2.3		<5	0.004	7.7	12	69	170	616	640	20	44	110	0.009
	20/01/2016	3.1	0.001	24	42	<1	<0.001	280	<0.004	4	0.011	0.006	1100	5	<0.004	210		<0.00005	<5	10	25	0.067	0.006	2		<5	0.005	7.5	13	76	170	627	630		180	300	<0.004
	1/02/2016	7.1	0.002	22	30	<1	<0.001	320	<0.004	4	0.027	0.013	1200	12	<0.004	160		<0.00005	<5	-5	20	0.13	0.015	1.9		<5	0.01	7.6	11	89	120	645	690		270	350	<0.004
	22/03/2016	2.6	0.001	23	38	<1	<0.001	310	0.006	2	0.003	0.005	1300	4.2	<0.004	170		<0.00005	<5	-4	19	0.069	0.004	2		<5	0.005	7.7	13	100	150	650	740		84	160	<0.004

Appendix 5: Water Quality Monitoring Methodology - Internal Audit

MEMORANDUM

Date: **17 November 2016**

To: Environment Team (Safety & Environment Department)

From: Matthew Stingemore

Subject: Monitoring Strategy Internal Audit

Groundwater and Surface Water

An internal audit of the water quality monitoring methodology outlined in the TGM Monitoring Strategy was undertaken against the *Australian Guidelines for Water Quality Monitoring and Reporting* (2000) in November 2016. The audit covered seven key aspects including:

1. monitoring preparation;
2. contamination prevention;
3. sample collection;
4. quality control and quality assurance;
5. sample storage and transport;
6. record management; and
7. laboratory analysis.

Table 1 below provides the actions to be undertaken following the audit and a summary of the audit findings for each of the key aspects. The completed audit table is provided in Appendix 1.

Table 1: Audit actions to be undertaken

Action	Accountability	Due
Develop specific procedures / protocols for the calibration of the water quality meter, including methodology and frequency	Environmental Advisor	1-June-17
Formalise current protocols in place in the form of written procedures and work instructions which detail field sampling, transport and storage	Environmental Advisor	1-June-17
Develop specific procedures which specify the sample collection device, type of storage container, preservation procedures, type and numbers of quality control samples to be taken.	Environmental Advisor	1-June-17

Monitoring Preparation

Monitoring preparation overall is undertaken well, with clear areas for improvement. Although sampling protocols are in place, these protocols have not yet been documented as work instructions or procedures. It is the intention that these protocols will be formalised into procedures in the near future. A formal protocol and schedule is required to be developed for the water quality meter calibration. Monitoring Preparation achieved 50% compliance in the audit.

Contamination Prevention

Contamination prevention is currently a very high standard. An area for improvement is for sampling staff to utilise disposable gloves during sampling. The use of disposable gloves can be impractical for the nature of some the sampling work, so it will be considered where possible. Sampling is undertaken with care and with clean hands. Contamination prevention achieved 83% compliance in the audit.

Sample Collection

Sample collection is undertaken well, although it is recognised there is some room for improvement. The measurement of water levels and sampling of water which is representative of the aquifer is undertaken to a high standard. Sample collection achieved 92% compliance in the audit.

Quality Control and Quality Assurance

Quality Control and Quality Assurance (QAQC) requires further work to achieve the desired standard. Quality control and quality assurance achieved 50% compliance in the audit, compared with 0% in 2014.

Sample Storage and Transport

Sample storage and transport is undertaken to a very high standard. Every effort is made to align sampling with available transport, to ensure samples meet holding times, and are received by the laboratory appropriately. Sample storage and transport scored 100% in the audit.

Record Management

Records are currently maintained to a very high standard. Record management achieved 100% compliance in the audit.

Laboratory Analysis

Laboratory analysis covered aspects pertaining to the external laboratory. Some areas could be completed based on the laboratory's NATA accreditation; however more specific requirements were not incorporated into this audit, as they were outside the scope. Laboratory analysis scored 100% in the audit (not including audit components which were not applicable).

Appendix 1: Completed Audit Table

Audited by:	Matthew Stingemore	**Date of Audit:**	17/11/2016
Supervisor:	Rosemarie Lane		

1	Monitoring Preparation	Compliance (place x in applicable box)			Observations/Findings/Comments
		Yes	No	N/A	
1.1	Is there a record of the sampling site locations	X			Map available of the environmental monitoring bores and the surface water collection points (sampling locations).
1.2	Sampling device is calibrated prior to each monitoring event	X			Water sampling equipment is maintained as required.
1.3	Water quality parameter meter is calibrated prior to each monitoring event		X		Water quality parameter meter is calibrated infrequently.
1.4	Field staff have had sufficient training and experience to undertake the sampling	X			Field staff were trained in the use of the Grundfos groundwater sampling unit (pump).
1.5	All equipment and field instruments are kept clean and in good working order	X			Stored within an air-conditioned sea container, in storage containers, away from exposed sunlight and dust.
1.6	Sampling protocols and procedures in place for field sampling, transport and storage		X		Protocols in place, however this is not currently formalised within a documented procedure.
1.7	Procedures provide detailed descriptions for collecting, labelling, transporting and storing samples and the necessary ancillary field data.		X		Protocols in place, however this is not currently formalised within a documented procedure.
1.8	Specific procedures and protocols have been developed and specify the sample collection device, type of storage container, preservation procedures, type and numbers of quality control samples to be taken.		X		Protocols in place, however this is not currently formalised within a documented procedure. Although these requirements and details are not documented within a procedure, the field data sheet does include this information.
1.9	Exact locations of sampling sites and any sub sites are recorded in the sampling protocol.	X			Sampling locations including maps, map info files and gpx files of monitoring locations and the tracks to the monitoring locations.
1.10	Procedures are in place for handling, tracking and correcting data		X		Protocols in place, however this is not currently documented in a procedure.
		5	5	0	50%

		5	/	10	
2	**Contamination Prevention**	**Compliance (place x in applicable box)**			**Observations/Findings/Comments**
		Yes	**No**	**N/A**	
2.1	Field measurements are made on separate sub-samples of water (not in the laboratory samples)	X			Field measurements are taken using separate sub-samples of water.
2.2	Only sample containers supplied by the analytical laboratory are utilised	X			Containers supplied by SGS laboratory
2.3	The insides of containers do not come into contact with hands or objects	X			There is no direct contact with the insides of containers.
2.4	Sample containers are kept in a clear environment away from dust and dirt	X			Samples are stored in containers within a sea container.
2.5	Sampling staff use plastic disposable gloves when handling sample containers at every stage during sampling.		X		Disposable gloves are currently not utilised when handling sample containers.
2.6	Sampling equipment including containers, water quality parameter probes, pumps and bailers are rinsed with deionised water in between samples to prevent cross contamination.	X			Sampling jug is rinsed.
		5	1	0	
		5	/	6	83%
3	**Sample Collection**	**Compliance**			**Observations/Findings/Comments**
		Yes	**No**	**N/A**	
3.1	Samples are collected in the appropriate bottles for the analyte being tested	X			Yes the bottles required for each sampling event are detailed within the field record sheet.
3.2	The depth below ground level at which the sample is taken is always recorded	X			Standing Water Level meter is utilised to record this information.
3.3	Water levels are measured before prior to pumping	X			Water levels are always recorded prior to pumping.
3.4	Sampling device ensures representative sample of the aquifer is obtained (sample is derived from the aquifer itself and not from stagnant water in the bore).	X			The sampling devices, pumps three times the bore volume, and then once the field measurements stabilise (pH, TDS and EC), a sample is taken.
3.5	Sampling containers are clearly marked in a durable manner, enabling clear identification of all samples in the laboratory	X			Sample containers are clearly labelled.

3.6	Onsite analysis and field records are included in a report with the sample to the laboratory		X		Chain of Custody provided to the lab with the samples
3.7	Are field notes recorded on the field data sheet including weather conditions (wind speed, cloud cover and temperature) and water sample (odour, colour, floating material etc.)	X			Comments box allows for any unusual items to be noted, however does not specifically require comments on the weather or water sample.
3.8	All field records are documented before leaving a sampling location	X			All field records are documented before leaving a sampling location.
3.9	Observations or information on the conditions at the time of sampling that may assist in interpretation of the data are noted on the field record sheet or field notebook.	X			Unusual observations are noted
3.10	Field Sampling: Field record sheet includes field register of sample number, site, time, date, type/technique, technician, field data sheet	X			Field data sheet details this information.
3.11	Field data sheet describes the samples taken, the labels and details.	X			Field data sheet details this information.
3.12	The volume of sample collected is sufficient for the required analyses, including any repeat analyses.	X			Only containers provided by the laboratory are utilised.
3.13	A sampling report is prepared with the following information: - location (and name) of sampling site, with coordinates and any other relevant locational information - details of sampling point - date of sampling - method of sampling - time of sampling - name of sampler - general environmental and climatic conditions - nature of pre-treatment - preservation procedure - data gathered in the field - any information which may affect the results of the analysis.	X			This information is included in the field record sheet.
		12	1	0	
		12	/	13	92%

4	Quality Control and Quality Assurance	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
4.1	QAQC process has been implemented	X			QA/QC process has been implemented,

					although has not yet been detailed within a procedure.
4.2	Sample blanks are prepared to test for contamination from the field, containers, equipment and transport.		X		No QA/QC is currently integrated into the sampling program
4.3	Duplicate and replicate samples are taken as part of the sampling QA/QC	X			Duplicate samples are taken on every sampling day and a minimum of one duplicate for every 10 samples.
4.4	Protocols specify how sampling staff are to be trained to use sampling equipment		X		No QA/QC is currently integrated into the sampling program
		2	2	0	
		2	/	4	50%
5	**Sample storage and transport**	**Compliance**			**Observations/Findings/Comments**
		Yes	**No**	**N/A**	
5.1	Samples are delivered to the laboratory to meet the holding times (within 24 hours)	X			Sampling is undertaken with the aim to provide to the lab within 24 hours.
5.2	Samples are stored in an esky in the field and then refrigerated to cool to 4 degrees Celsius	X			Samples are always stored in an esky with ice bricks in the field and then refrigerated
5.3	Sample storage and transport Register of transport container number and sample numbers, date and time	X			Detailed within the Chain of Custody
		3	0	0	
		3	/	3	100%
6	**Record Management**	**Compliance**			**Observations/Findings/Comments**
		Yes	**No**	**N/A**	
6.1	Calibrations and preventative maintenance are recorded carefully	X			Service records of the pump are maintained.
6.2	All repairs to equipment and instruments are recorded as well as any incidents that could affect the reliability of the equipment.	X			Service records are available.
6.3	Laboratory results and data is backed up in case of system or file failure.	X			SharePoint system backs up laboratory data.
6.4	Chain of custody documentation in place	X			Chain of custody forms in place for each sampling event.
6.5	Chain of custody records maintained	X			Chain of custody records are maintained in hard copy and electronic.
		5	0	0	100%

		5	/	5	
7	**Laboratory Analysis**	**Compliance**			**Observations/Findings/Comments**
		Yes	**No**	**N/A**	
7.1	Analytical lab is NATA accredited			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.2	Laboratory Receipt of Samples: Laboratory register or transport container number and sample numbers, date and time			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.3	Laboratory storage of samples: Laboratory register of storage location, type, temperature, time and date			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.4	Sample Preparation: Analysis register of sample (laboratory number), pre-treatment, date, technician			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.5	Sample Analysis: Analysis register of instrument, calibration, technician, standard method, date, result			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.6	Analytes are clearly stated	X			Analytes are clearly stated on COCs
7.7	Appropriate analytical methods identified	X			NATA accredited laboratory
7.8	Analytical methods cover the range of concentrations expected	X			NATA accredited laboratory
7.9	Analytical methods detect the minimum concentration of interest	X			NATA accredited laboratory
7.10	Analytical methods have sufficient accuracy and precision	X			NATA accredited laboratory
7.11	Samples are processed within the samples storage life	X			NATA accredited laboratory
7.12	Laboratory has appropriate equipment to undertake the analytical method chosen	X			NATA accredited laboratory
7.13	Laboratory facilities are suitable for planned analyses	X			NATA accredited laboratory
7.14	Laboratory staff have the expertise, training and competence to undertake the planned analyses	X			NATA accredited laboratory

7.15	Laboratory has a data management system including: - track samples and data (chain of custody) - have written data entry protocols to ensure correct entry of data - enable associated data to be retrieved (e.g. nutrient concentration and flows to calculate nutrient loads) - have validation procedures to check accuracy of data - have appropriate storage and retrieval facilities to prevent loss of data and enable retrieval (for at least three years) based on current and expected information needs). - Procedures are in place to ensure information reaches the user			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
7.16	From documentation, the following information is available: - how the results were obtained? - samples unique identification - who the analyst was? - what test equipment was used? - the original observations and calculations? - how data transfers occur? - how standards were prepared? - the certified calibration solutions used, their stability and storage?			X	Not Applicable - associated with an offsite laboratory, which is outside the scope of the audit undertaken.
		9	0	7	
		9	/	9	100%
Audit Score		**41**	**/**	**50**	

82%

Actions to be added to In Control			
Ref	**Action**	**Accountability**	**Due Date**
	Develop specific procedures / protocols for the calibration of the water quality meter, including methodology and frequency	Environmental Advisor	1-June-17
	Formalise current protocols in place in the form of written procedures and work instructions which detail field sampling, transport and storage	Environmental Advisor	1-June-17
	Develop specific procedures which specify the sample collection device, type of storage container, preservation procedures, type and numbers of quality control samples to be taken.	Environmental Advisor	1-June-17

Appendix 6: Environmental and Heritage Inspection Notifications (EINs)

Environmental and Heritage Inspection Notification (EIN)

Proposal ID: 1550

Proposal of Work: Long Island – Rodney Berrell and Gemma Lee - Project Geologists

Release Date: Pre-release Inspection

Date of Inspection: 10/12/2015

Completed By: **Dylan Tucker –** Environmental Officer AGAA BFX
Hamish Sutton – Geological Technician

Summary Table for Drill Proposal

Safety considerations	**Prospect Location:** Tropicana Gold Mine **Camp location**: N/A serviced from Tropicana Gold Mine **Concurrent activities in the area**: Active Mining Area – Mining activities: HV's Dozers and Diggers **Dyno Nobel activities**: Coast Road and TFS Bypass Road users, **Nearest emergency points**: Tropicana Emergency Services **Other**: Be alert for exclusion zones during blasts/lightening alerts both in the pit and while drilling around the Dyno Nobel magazine. For mining compliance conditions see the Long Island drill program GDP.
Environmental considerations (see GPS File)	**Fauna values**: There were no identified threatened of priority fauna found in this inspection. **Flora values**: Priority 4 species *Olearia arida* were discovered and flagged on one of the northern lines of the program. See map for specifics. Operators avoid where possible large habitat trees with hollows that provide nesting habitat for many native bird species. **Buffers**: No buffers required. **Clearing method**: Bucket touch.
Heritage considerations (see GPS File)	**Heritage values**: There were no heritage sites identified in this inspection. **Buffers**: N/A

GPS File Name and Date:

41473

Environmental and Heritage Inspection Notification

Proposal of Work: PWSB Bore Maintenance

Release Date: Pre-release Inspection

Date of Inspection: 19th February 2016

Completed By: Dylan Asgill-Tucker - Environmental Officer & Jess Wilkinson Enviro Student

Findings:

An Environmental and Heritage inspection was conducted on the 9th of February 2016 to assess the clearing of corridors for the extraction of the down-hole bores for maintenance. This proposal is for the clearing of corridors shown in Figure 1. The proposed clearing will occur under the PWSB Phase 3 Mining Proposal (MP20141115). There are no recommended changes to the proposal of works. The table below summarises the proposed disturbance at each location and the relevant approvals.

PWSB Powerline Extension			
Clearing	**Tenement**	**Total Disturbance ha**	**Relevant Approvals**
MTPB039	L38/150	0.18 ha	MP 20141115
MTPB031	L38/150	0.18 ha	MP 20141115
MTPB058	L38/150	0.21 ha	MP 20141115
MTPB018	L38/150	0.22 ha	MP 20141115
MTPB071	L38/150	0.18 ha	MP 20141115
MTPB033	L38/150	0.15 ha	MP 20141115
MTPB035	L38/150	0.18 ha	MP 20141115
MTPB038	L38/150	0.21 ha	MP 20141115
MTPB041	L38/150	0.25 ha	MP 20141115
MTPB044	L38/150	0.18 ha	MP 20141115
MTPB048	L38/150	0.22 ha	MP 20141115
MTPB053	L38/150	0.18 ha	MP 20141115
MTPB059	L38/150	0.2 ha	MP 20141115
MTPB073	L38/150	0.16 ha	MP 20141115
MTPB067	L38/150	0.015 ha	MP 20141115
MTPB050	L38/150	0.19 ha	MP 20141115
Total		2.91 ha	

An initial desktop survey was conducted prior to field operations, to establish whether there are any environmental values and avoidance areas within the program clearing area. Field inspections were undertaken on foot and utilising a Panasonic tough-pad with GPS capabilities. Specific findings are presented below:

EIN - PWSB conducted January 2016	
Vegetation Type / Clearing Type	*Eucalyptus gongylocarpa* (marble gum) over *Triodia desertorum* or *T. basedowii* 50% Mulga woodland over spinifex – 50%
Clearing Width	All maintenance strips are 10m wide and clearly flagged by survey to prevent over clearing.
Soil Type	Sand/ sand over calcrete
Heritage Considerations	None discovered in desktop search or on ground EIN
Environmental Considerations	There were 2 species of priority flora identified in this EIN within the borefields operational area. *Olearia arida* and *Dicrastylis cundeeleensis*, these species are both priority 4. To ensure un-necessary impacts on these species operators must remain vigilant when clearing to prevent an over clearing incident.
Safety Considerations	The bore fields, in particular the Eastern areas are very remote. The following safety precautions shall be incorporated for the work at all sites: - Satellite phones - Mine radios (Ch7) - GPS - Check In/Out of the Borefields - Vehicle appropriate for the terrain and distance (fuel, equipment, spare tyres and tools). Please be aware of other users of the process water supply borefield access track. Speed limits must be adhered to at all times and please drive to the conditions. Vehicles travelling to and from the PWSB must remain on the dedicated track and not deviate over the buried main water pipeline regardless of road conditions. Please also be advised that there is significant fauna activity in these areas, especially at dawn and dusk so please take care when driving. Clearing around existing infrastructure like pipelines and electricity poles
Logistics	No mobile reception is available. Satellite phones may be required; Mine Ch7 does reach some areas of the bore fields however the Eastern areas may be out of signal.

Special Considerations:

Heritage Sites

A desktop review identified no archaeological, ethnographic or heritage sites within the proposed clearing areas. However there are sites of high ethnographic value within the region. Care should be taken when clearing and traveling in the area to ensure these sites are not disturbed. Always drive on gazetted tracks and report anything that could be significant to the Tropicana Sustainability team.

Threatened Flora Species

Dicrastylis cundeeleensis and *Olearia arida* were identified with the footprint of the bore maintenance clearing. These species of Priority 4 and should be avoided where ever possible.

Plate 1: *Olearia arida* found during this EIN

Plate 2: *Dicrastylis cundeeleensis*

Threatened Fauna Sites

No threatened fauna species were identified during the field inspection. Priority 4 fauna species *Ardeotis Australia* (Australian Bustard) is often observed in the PWSB area. Extreme care should be taken when driving within close proximity to prevent any interactions with this large ground dwelling species.

Plate 3: *Ardeotis australis* (Australian Bustard)

Care should be taken when conducting clearing and any sightings reported to the Sustainability Department.

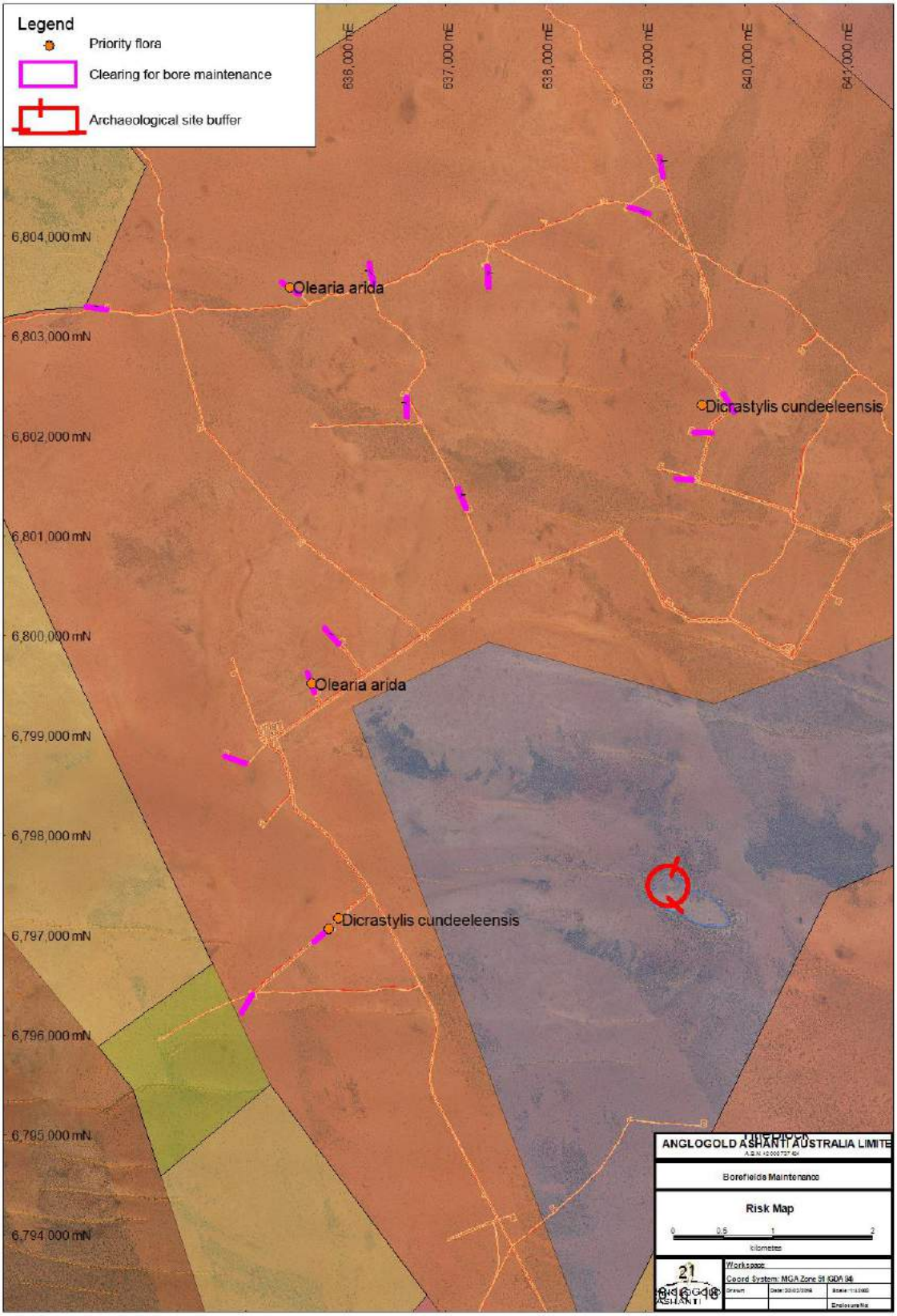


Figure 1 Risk map for the PSWB maintenance clearing

Summary of Proposed program:

The Long Island drill program will potentially see 86 RC/DDH holes with priorities ranging from 1-3, drilled at 100x100 meter spacing. BlueSpec Drilling will be the drilling contractor. The drill program is located within the Tropicana Active Mining Area (AMA). Resource Pad 2 will be used for this programme consisting of 0.059 Ha of clearing including 2 sumps. The EIN only covers holes that are to be drilled outside of mining's planned disturbance as outlined by the project geologist.

Recommendations – An environmental and heritage inspection was conducted for the Long Island drilling proposal 1550 on the (09/12/2015). The recommended movement of 1 hole (HSD067) is outlined in figure 3 purely from an operational perspective. The hole was planned on top of a crest and due to the steepness of the gradient it is recommended to move the hole to the base.

Special Considerations:

Safety:

- Be conscious of all AMA operations, movement of heavy vehicles etc. All personal conducting work on the drill proposal are required to be AMA inducted, hold the relevant AMA driving permit or be driven/escorted by an inducted person
- When in close proximity to the pit monitor blast locations, times and exclusion zones
- When working near the DYNO Noble magazine know the perimeter of the 1km exclusion zone during lightening alerts
- When working on haul roads ensure clear delineation around whole work area

Threatened Fauna:

There were no identified threatened or priority fauna found in this inspection.

Heritage:

There were no identified heritage sites in this inspection

Other Environmental Concerns:

Operators should avoid large habitat trees such as Casuarinas and Marble gums with a trunk diameter of greater than 30cm or where significant hollows are visible. These trees provide essential habitat to many of the bird species found within the area and are of particular environmental value.

Operational Considerations:

The southern area has tracks cleared throughout for multiple exploration programs, care should be taken to prevent over clearing as it could result in vast areas of open ground.

Threatened Flora:
During the course of this inspection a population of *Olearia arida* (P4 species) were found and flagged with **Green** and **Pink** flagging. During the clearing of drill pads and the digging of sumps operators should remain vigilant not to destroy this population. A factsheet on *Olearia arida can be found: X:\GFX Environmental\Training-Equipment-Library\Factsheets\Flora*

Figure 1 *Olearia arida* P4 species in DP 1550

Threatened Flora Species	GPS Location Easting	GPS Location Northing
Olearia arida	651999	6763588

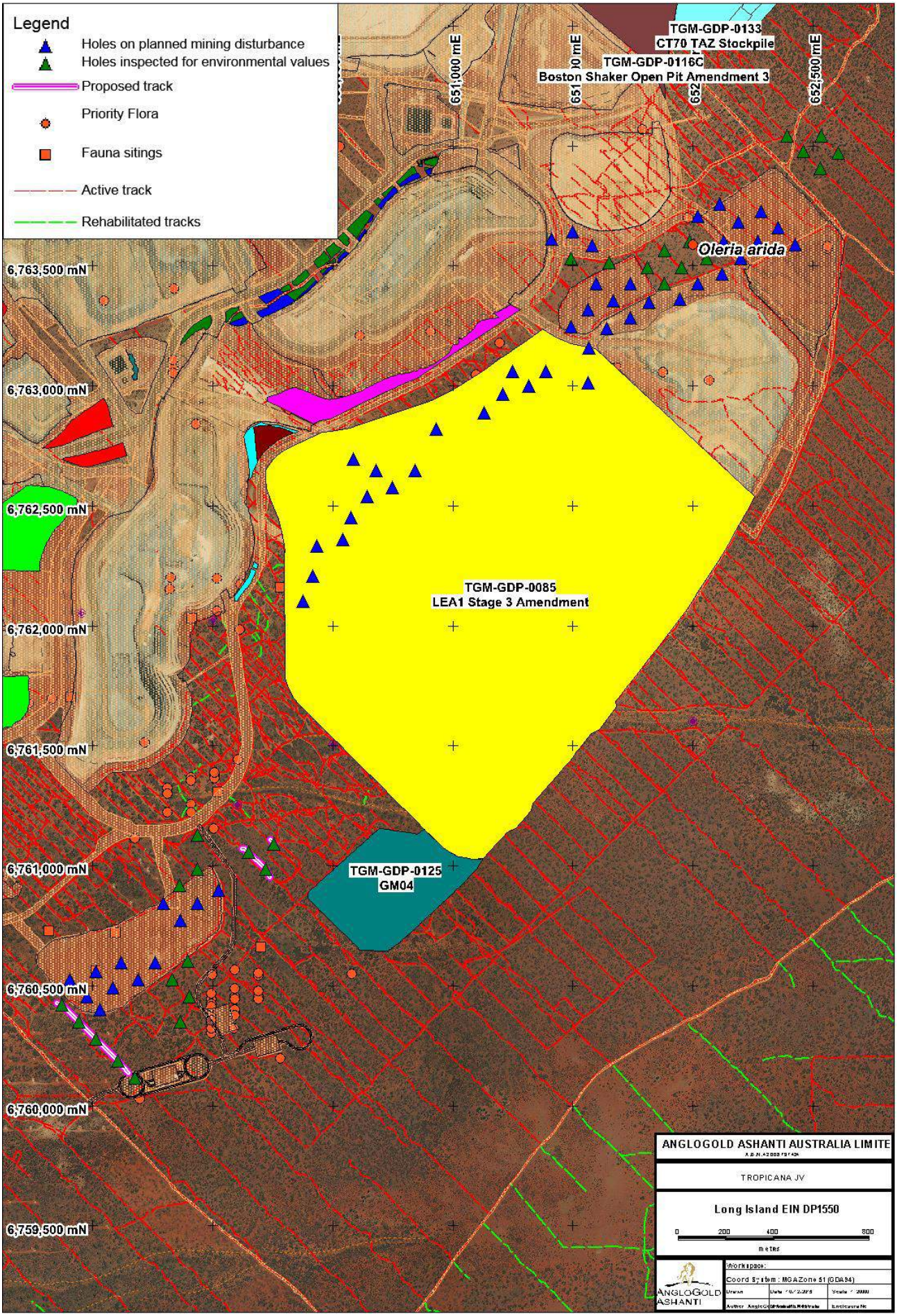


Figure 2: Long Island DP1550 holes inspected for Environmental values

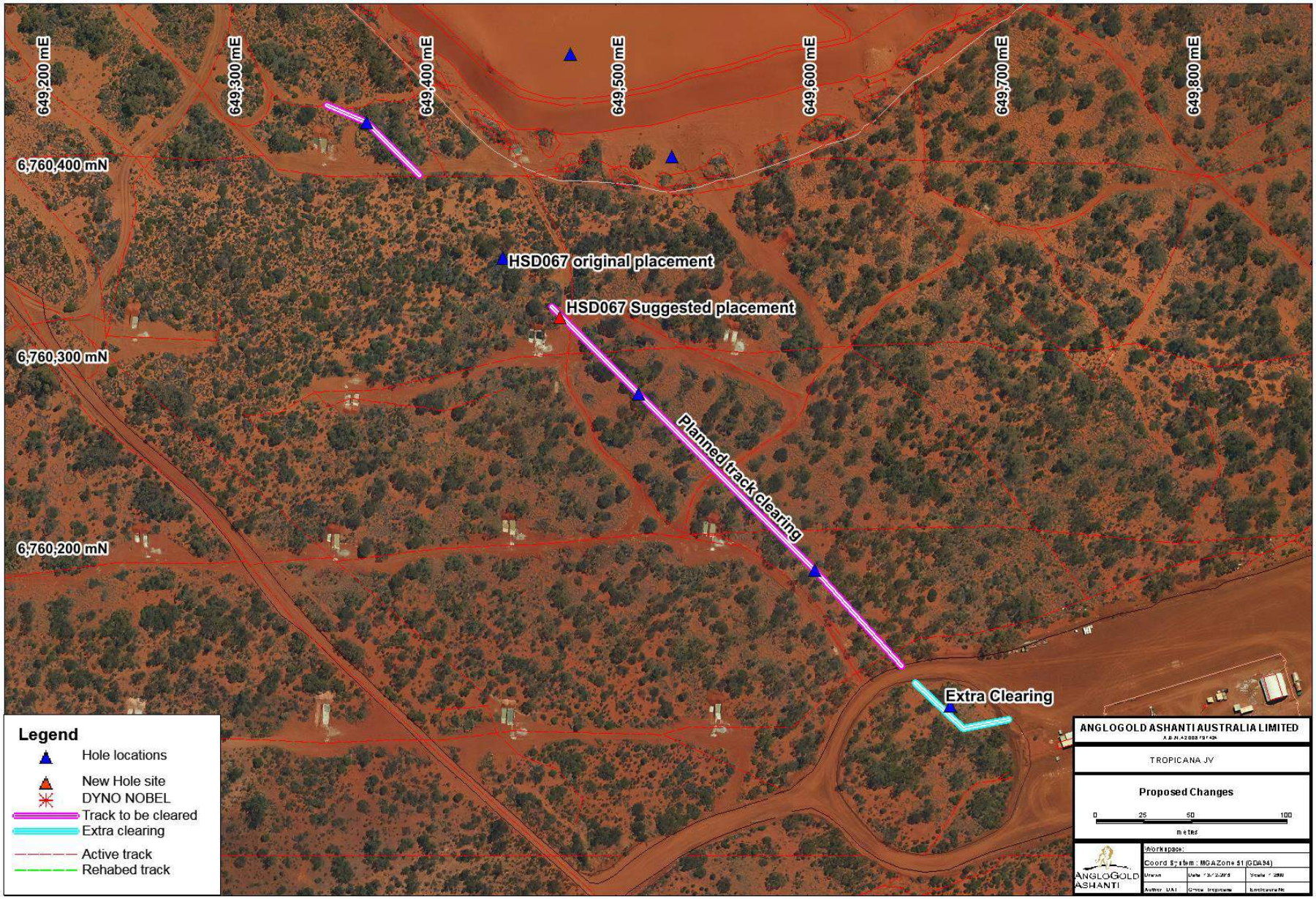


Figure 3: Suggested Changes – The movement of HSD067

Figure 4: Exclusion Zones for Dyno Nobel (1km) and 500m and 1000m rock fly zones

Environmental and Heritage Inspection Notification

Proposal of Work: PWSB Bore Maintenance

Release Date: Pre-release Inspection

Date of Inspection: 19th February 2016

Completed By: Dylan Asgill-Tucker - Environmental Officer & Jess Wilkinson Enviro Student

Findings:

An Environmental and Heritage inspection was conducted on the 9th of February 2016 to assess the clearing of corridors for the extraction of the down-hole bores for maintenance. This proposal is for the clearing of corridors shown in Figure 1. The proposed clearing will occur under the PWSB Phase 3 Mining Proposal (MP20141115). There are no recommended changes to the proposal of works. The table below summarises the proposed disturbance at each location and the relevant approvals.

PWSB Powerline Extension			
Clearing	**Tenement**	**Total Disturbance ha**	**Relevant Approvals**
MTPB039	L38/150	0.18 ha	MP 20141115
MTPB031	L38/150	0.18 ha	MP 20141115
MTPB058	L38/150	0.21 ha	MP 20141115
MTPB018	L38/150	0.22 ha	MP 20141115
MTPB071	L38/150	0.18 ha	MP 20141115
MTPB033	L38/150	0.15 ha	MP 20141115
MTPB035	L38/150	0.18 ha	MP 20141115
MTPB038	L38/150	0.21 ha	MP 20141115
MTPB041	L38/150	0.25 ha	MP 20141115
MTPB044	L38/150	0.18 ha	MP 20141115
MTPB048	L38/150	0.22 ha	MP 20141115
MTPB053	L38/150	0.18 ha	MP 20141115
MTPB059	L38/150	0.2 ha	MP 20141115
MTPB073	L38/150	0.16 ha	MP 20141115
MTPB067	L38/150	0.015 ha	MP 20141115
MTPB050	L38/150	0.19 ha	MP 20141115
Total		2.91 ha	

An initial desktop survey was conducted prior to field operations, to establish whether there are any environmental values and avoidance areas within the program clearing area. Field inspections were undertaken on foot and utilising a Panasonic tough-pad with GPS capabilities. Specific findings are presented below:

EIN - PWSB conducted January 2016	
Vegetation Type / Clearing Type	*Eucalyptus gongylocarpa* (marble gum) over *Triodia desertorum* or *T. basedowii* 50% Mulga woodland over spinifex – 50%
Clearing Width	All maintenance strips are 10m wide and clearly flagged by survey to prevent over clearing.
Soil Type	Sand/ sand over calcrete
Heritage Considerations	None discovered in desktop search or on ground EIN
Environmental Considerations	There were 2 species of priority flora identified in this EIN within the borefields operational area. *Olearia arida* and *Dicrastylis cundeeleensis*, these species are both priority 4. To ensure un-necessary impacts on these species operators must remain vigilant when clearing to prevent an over clearing incident.
Safety Considerations	The bore fields, in particular the Eastern areas are very remote. The following safety precautions shall be incorporated for the work at all sites: - Satellite phones - Mine radios (Ch7) - GPS - Check In/Out of the Borefields - Vehicle appropriate for the terrain and distance (fuel, equipment, spare tyres and tools). Please be aware of other users of the process water supply borefield access track. Speed limits must be adhered to at all times and please drive to the conditions. Vehicles travelling to and from the PWSB must remain on the dedicated track and not deviate over the buried main water pipeline regardless of road conditions. Please also be advised that there is significant fauna activity in these areas, especially at dawn and dusk so please take care when driving. Clearing around existing infrastructure like pipelines and electricity poles
Logistics	No mobile reception is available. Satellite phones may be required; Mine Ch7 does reach some areas of the bore fields however the Eastern areas may be out of signal.

Special Considerations:

Heritage Sites

A desktop review identified no archaeological, ethnographic or heritage sites within the proposed clearing areas. However there are sites of high ethnographic value within the region. Care should be taken when clearing and traveling in the area to ensure these sites are not disturbed. Always drive on gazetted tracks and report anything that could be significant to the Tropicana Sustainability team.

Threatened Flora Species

Dicrastylis cundeeleensis and *Olearia arida* were identified with the footprint of the bore maintenance clearing. These species of Priority 4 and should be avoided where ever possible.

Plate 1: *Olearia arida* found during this EIN

Plate 2: *Dicrastylis cundeeleensis*

Threatened Fauna Sites

No threatened fauna species were identified during the field inspection. Priority 4 fauna species *Ardeotis Australia* (Australian Bustard) is often observed in the PWSB area. Extreme care should be taken when driving within close proximity to prevent any interactions with this large ground dwelling species.

Plate 3: *Ardeotis australis* (Australian Bustard)

Care should be taken when conducting clearing and any sightings reported to the Sustainability Department.

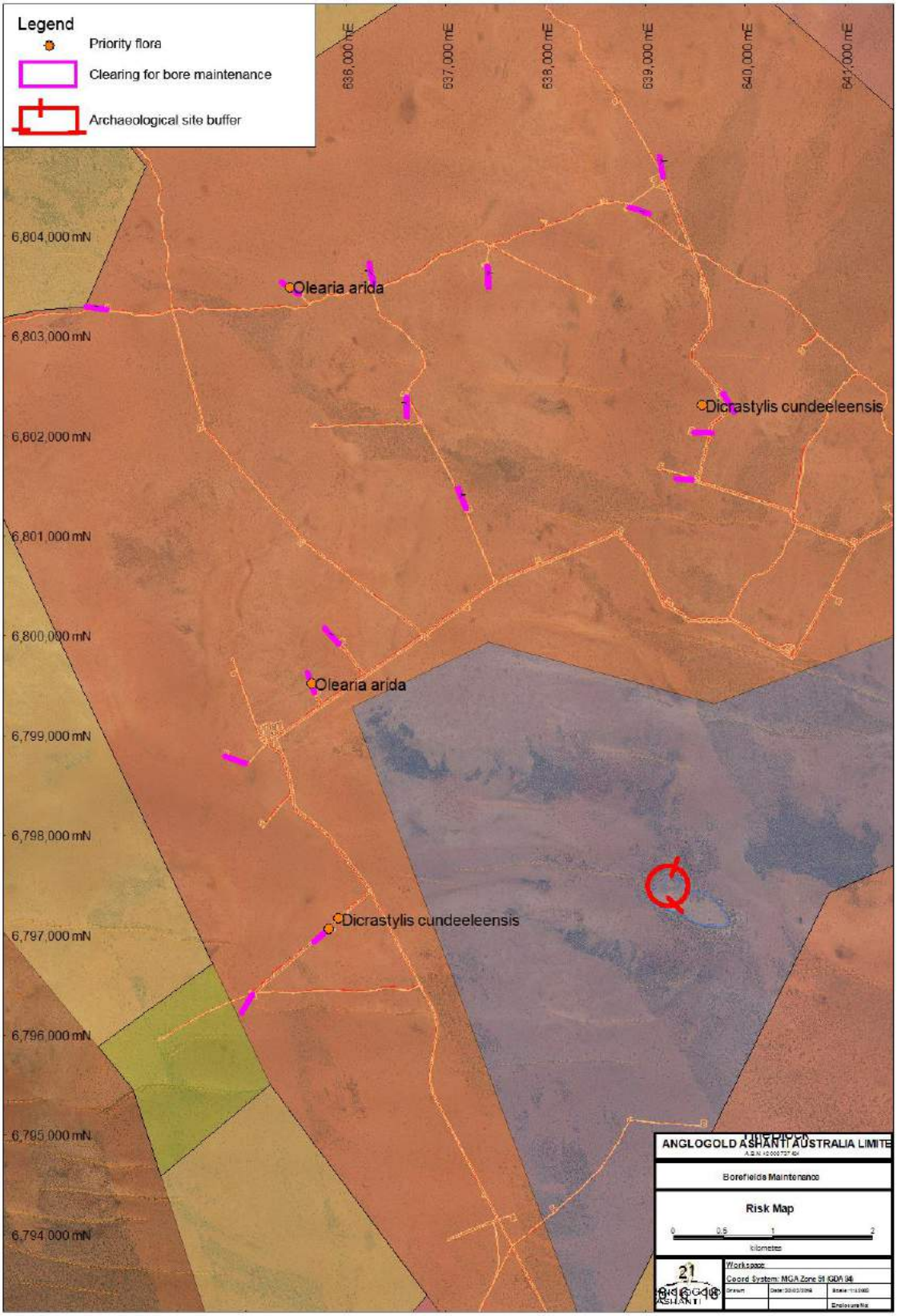


Figure 1 Risk map for the PSWB maintenance clearing

Environmental and Heritage Inspection Notification

Proposal of Work: PWSB Southern Bore Maintenance Stage 5

Release Date: 02/03/2016

Date of Inspection: 2nd March 2016

Completed By: Dylan Asgill-Tucker - Environmental Officer

Findings:

An Environmental and Heritage inspection was conducted on the 2nd of March 2016 to assess the clearing of corridors for the extraction of the down-hole bores for maintenance. This proposal is for the clearing of corridors shown in Figure 1. The proposed clearing will occur under the PWSB Phase 3 Mining Proposal (MP20141115). There are no recommended changes to the proposal of works. The table below summarises the proposed disturbance at each tenement.

Tenement	Bore ID	Total Clearing (ha)
L38/213	MTPB077	0.2 ha
L38/213	MTPB099	0.21 ha
L38/213	MTPB078	0.15 ha
L38/213	**TOTAL**	**0.6 ha**
L38/150	MTPB078	0.075 ha
L38/150	MTPB087	0.09 ha
L38/150	**TOTAL**	**0.17 ha**
L38/214	MTPB086	0.19 ha
L38/214	MTPB080	0.19 ha
L38/214	MTPB085	0.1 ha
L38/214	MTPB084	0.023 ha
L38/214	MTPB098	0.16 ha
L38/214	MTPB097	0.16 ha
L38/214	**TOTAL**	**0.83 ha**
TOTAL		**1.6 ha**

An initial desktop survey was conducted prior to field operations, to establish whether there are any environmental values and avoidance areas within the program clearing area. Field inspections were undertaken on foot and utilising a Panasonic tough-pad with GPS capabilities. Specific findings are presented below:

EIN - PWSB conducted January 2016	
Vegetation Type / Clearing Type	*Eucalyptus gongylocarpa* (marble gum) over *Triodia desertorum* or *T. basedowii* ~100%
Clearing Width	All maintenance strips are 10m wide and clearly flagged by survey to prevent over clearing.
Soil Type	Sand/ sand over calcrete
Heritage Considerations	None discovered in desktop search or on ground EIN within the footprint of disturbance.
Environmental Considerations	There were 2 species of priority flora identified in this EIN within the borefields operational area. *Olearia arida* and *Dicrastylis cundeeleensis*, these species are both priority 4. To ensure un-necessary impacts on these species operators must remain vigilant when clearing to prevent an over clearing incident.
Safety Considerations	The bore fields, in particular the Eastern areas are very remote. The following safety precautions shall be incorporated for the work at all sites: - Satellite phones - Mine radios (Ch7) - GPS - Check In/Out of the Borefields - Vehicle appropriate for the terrain and distance (fuel, equipment, spare tyres and tools). Please be aware of other users of the process water supply borefield access track. Speed limits must be adhered to at all times and please drive to the conditions. Vehicles travelling to and from the PWSB must remain on the dedicated track and not deviate over the buried main water pipeline regardless of road conditions. Please also be advised that there is significant fauna activity in these areas, especially at dawn and dusk so please take care when driving. Clearing around existing infrastructure like pipelines and electricity poles
Logistics	No mobile reception is available. Satellite phones may be required; Mine Ch7 does reach some areas of the bore fields however the Eastern areas may be out of signal.

Special Considerations:

Heritage Sites

A desktop review identified no archaeological, ethnographic or heritage sites within the proposed clearing areas. However there are sites of high ethnographic value within the region. Care should be taken when clearing and traveling in the area to ensure these sites are not disturbed. Always drive on gazetted tracks and report anything that could be significant to the Tropicana Sustainability team.

Threatened Flora Species

Dicrastylis cundeeleensis and *Olearia arida* were identified with the footprint of the bore maintenance clearing. These species of Priority 4 and should be avoided where ever possible.

Plate 1: *Olearia arida* found during this EIN

Plate 2: *Dicrastylis cundeeleensis*

Threatened Fauna Sites

No threatened fauna species were identified during the field inspection. Priority 4 fauna species *Ardeotis Australia* (Australian Bustard) is often observed in the PWSB area. Extreme care should be taken when driving within close proximity to prevent any interactions with this large ground dwelling species.

Plate 3: *Ardeotis australis* (Australian Bustard)

Care should be taken when conducting clearing and any sightings reported to the Sustainability Department.

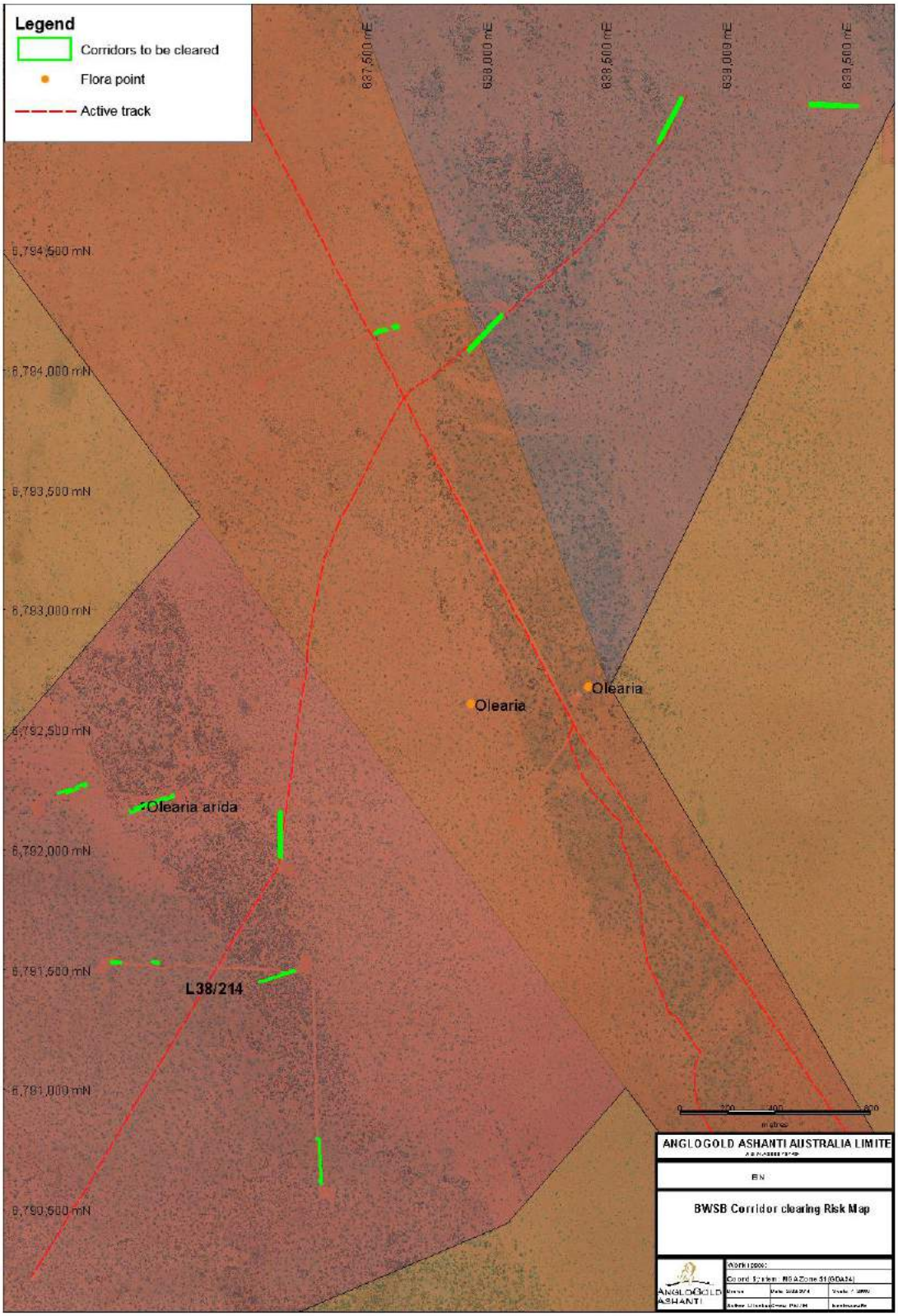


Figure 1 Risk map for the PSWB maintenance clearing

Appendix 7: Threatened Species and Communities Management Strategies – Internal Audit

ANGLOGOLD ASHANTI AUSTRALIA

TGM Threatened Species and Commmunities Management Strategy
Internal Audit - Environmental Compliance

Audit undertaken by:	Matthew Stingemore	**Date of Audit:**	17/11/2016
Supervisor:	Rosemarie Lane	**Communicated:**	

1	Clearing/ Earthworks	Compliance (place x in applicable box)			Observations/Findings/Comments
		Yes	No	N/A	
1.1	Disturbance to native vegetation is minimised with clearing confined to the minimum area practicable.	X			All clearing undertaken is approved through Ground Disturbance Permit (GDP) boundaries to minimise disturbance to native vegetation.
1.2	All areas requiring clearing are clearing delineated.	X			All clearing is clearly delineated within GDP application form.
1.3	Declared Rare Flora (DRF) within 50 m of disturbance areas are visibly demarcated.			X	During construction DRF were demarcated. Post the construction phase, known DRF in the Project area have been delisted.
1.4	All infrastructure (including the access roads) has/will been designed and located to avoid impacts on all known populations of DRF.	X			During construction DRF were demarcated. Post the construction phase, known DRF in the Project area have been delisted. Prior to clearing being undertaken, a GDP is required. The GDP requires specific details of the proposed disturbance. During the GDP assessment process, a desktop assessment is undertaken to determine if there will be any impacts to DRF and whether the proposed disturbance can be relocated to avoid the DRF. A site inspection (pre clearing inspection) may also be undertaken in areas outside the Project Development Envelopes to ensure disturbance to DRF is avoided.
1.5	Infrastructure areas have/will be designed and located to avoid known locations of Priority flora where reasonably practical.	X			Prior to clearing being undertaken, a GDP is required. The GDP requires specific details of the proposed disturbance. During the GDP assessment process, a desktop assessment is undertaken to determine if there will be any impacts to priority flora and whether the proposed disturbance can be relocated to avoid the priority flora. A site inspection (pre clearing inspection) may also be undertaken in areas outside the Project Development Envelopes to avoid disturbance to priority flora where practical.
1.6	Surface water diversion systems will be incorporated into the design of the Operational Area to minimise impacts to surface water flow.	X			Roads located on high points, culverts installed on site access roads to allow water to flow underneath the road to prevent interference with sheet flow.
1.7	The operational area layout has been designed to minimise impacts to surface water flow	X			Surface water diversions in place around site to intercept surface water and prevent offsite impacts. Waste Rock Landforms have been designed with a toe drain and collection point to prevent sedimentation down stream.
1.8	Infrastructure has been located to minimise fragmentation of important habitat	X			Environmental values were taken into consideration during project footprint design, minimising impacts to avoidance areas. For example, the TSF design was re-evaluated with the original TSF design comprised of valley fill utilising the nearby sand dunes as containment walls. The sand dunes however were subsequently recognised as significant habitat, and the TSF design was re-evaluated to prevent impact to the sand dunes.
1.9	Fire protocols have been implemented to reduce the risk of fire	X			Tropicana works activity with and regularly collaborates with the Department of Parks and Wildlife (DPaW) to determine suitable fire regimes and requirements for fuel reduction burns. The risks associated with fire are management in accordance with the AGAA Fire Management Plan.
1.10	Fire breaks have been established adjacent to high risk areas	X			Fire breaks located in the following locations: Village, Aerodrome, Waste Water Treatment Facility, Waste Management Facility, Explosives Magazine and Exploration camp. Firebreaks will be installed where appropriate if there is an imminent risk of fire.
1.11	No extensions to the pit or amendments have been undertaken without further troglobiotic surveys			X	No extensions or amendments to the pit has been undertaken beyond the current approval.

1.12	Disturbance to critical habitat has been avoided (sand dune systems suitable for Marsupial Moles, Sandhill Dunnarts and the Mulgara).	X			Environmental values were taken into consideration during project footprint design, minimising impacts to critical habitat. The Environmental and Heritage Inspection (EIN) and ground disturbance permitting (GDP) processes aim to minimise impacts to environmentally sensitive areas.
1.13	Disturbance to possible Malleefowl and Sandhill Dunnart habitats has been minimised where practicable (including areas of spinifex unburnt between eight and 38 years).	X			Infrastructure locations and project footprint has been placed to avoid and minimise disturbance to significant habitats including sand dunes and areas of unburnt spinifex.
1.14	Locations of critical threatened fauna habitat have been avoided (including Mallee fowl mounds, Bustard nests and sand dunes).	X			Infrastructure locations and project footprint has been placed to avoid and minimise disturbance to significant habitats including sand dunes and areas of unburnt spinifex.
1.15	Locations of Priority Ecological Communities (PEC) have been avoided where practicable.	X			Environmental values were taken into consideration during project footprint design, minimising impacts to PEC. The Environmental and Heritage Inspection (EIN) and ground disturbance permitting (GDP) processes aim to minimise impacts to environmentally sensitive areas through the identification of PEC locations in relation to proposed disturbances.
1.16	Removal of large mature habitat trees has been avoided (particularly Marble Gum) where reasonably practicable.	X			The project footprint was placed to avoid the removal of mature habitat trees. During clearing, large trees were marked and stockpiled seperately for use in rehabilitation.
1.17	Rehabilitation is undertaken as soon as is practicable.	X			Borrow pits along the access road have been rehabilitated. Ground Zero area has been rehabilitated. A rehabilitation plan will be developed for the mining area to enable and plan progressive rehabilitation of landforms.
1.18	Rehabilitation areas are monitored for presence of weeds			X	Currently limited rehabilitation areas in place. Following the commencement of progressive rehabilitation, a rehabilitation plan including monitoring for weeds will be implemented.
1.19	Information on current flora and fauna conservation status is maintained	X			The Threatened Species and Community Management Plan was updated to reflect changes in listings in 2014.
1.20	Site induction includes information on conservation significant flora, vegetation, fauna and habitat.	X			Site induction covers content on flora and fauna in the region. All employees are provided with access to a handbook which provides information on threatened species (flora and fauna) at TGM.
1.21	Open trenches are cleared and inspected for fauna at sunrise and sunset.			X	Construction of the Process Water Supply Borefield was completed in 2012/13.
1.22	Trenches do not exceed a length capable of being inspected by fauna clearing person.			X	Construction of the Process Water Supply Borefield was completed in 2012/13. Trenches inspected were of a length appropriate that the fauna clearing person could get to the trenches within the required timeframes (three hours after sunrise and three hours after sunset).
1.23	Fauna refuges and/or egress ramps are placed in the trench at 50 m intervals			X	Construction of the Process Water Supply Borefield was completed in 2012/13.
1.24	Report on fauna management following trenching activities has been produced.			X	Trench inspection fauna report submitted to the OEPA in June 2013.
		17	0	7	
		17	/	17	100%

2	Environmentally Hazardous Substances	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
2.1	The placement of storage, re-fuelling, handling and disposal facilities avoids critical habitat	X			The project footprint was placed to avoid critical habitat
2.2	All pipelines are buried or bunded, have leak detection systems and automatic cut off systems	X			Pipelines are buried or bunded. For those pipelines that do not have leak detection system in place (Low environmental risk eg. pit dewatering), visual inspections are undertaken.
2.3	The pipeline corridor to the Minigwal borefield avoids threatened or conservation significant species	X			Designed to avoid critical habitat - minimise impact zones.
2.4	Hydrocarbons and chemicals are stored as per site procedures and Australian Standard 1940	X			Facility inspections and audits are undertaken regularly to ensure hydrocarbons and chemicals are stored appropriately.
2.5	Dangerous Goods licensing covers all hazardous materials on site	X			Tropicana Gold Mine currently holds Dangerous Goods Licence # DGS020989. Chemical request process ensure that the Dangerous Goods Licence is considered prior to the chemical being approved for use on site.
2.6	Evidence of appropriate spill containment at refuelling bays and bulk storage facilities	X			Spill kits are located at refuelling bays and at bulk storage facilities
2.7	Evidence of implementation of Emergency Response Procedures for hydrocarbon spills	X			ERT Action Sheet 6 - Diesel Spill
2.8	Evidence of spill kit and emergency response training records for relevant staff.	X			Spill training is delivered as part of the TGM General Induction and provdes information on spill kits with a specific question in the assessment. The ERT are trained to a higher level and these modules are part of a National Certification. Records are held by ERT.
		8	0	0	
		8	/	8	100%

3	General Waste	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
3.1	Housekeeping and strict waste management practices	X			Waste management practices are in place, although further education of the workforce may be required.
3.2	All domestic waste is disposed within the licensed waste management facility	X			Yes - the Waste Management Facility is contained on the prescribed premises license
3.3	All domestic rubbish bins have lids	X			Yes - wheelie bins with lids are utilised for domestic waste.
3.4	Waste stations are labelled for the appropriate segregation of waste (e.g. recyclables, general waste, hydrocarbon waste)	X			Yes - waste streams are managed by dedicated colour coded bins
3.5	Putrescible and inert waste is disposed of and covered within the licensed waste management facility.	X			Yes - the landfill is regularly maintained and contains putrescible and inert waste only.
		5	0	0	
		5	/	5	100%

4	Tailings	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
4.1	The TSF design contains any potentially contaminated runoff, preventing uncontrolled discharge.	X			The TSF design allows for an operational freeboard of 500mm. The completion of the Stage 4-5 TSF Wall Lift provides for a current freeboard of approximately 5m.
4.2	WAD CN levels in free water on the TSF do not exceed 50 mg/L			X	TGM has undertaken baseline and causal studies to determine the risk to wildlife of WAD CN levels greater than 50mg/L when the salinty is greater than 50,000 mg/L. The studies confirmed that hypersalinity is an effective mechanism to afford wildlife protection and this managment strategy has been peer reviewed and submitted to the International Cyanide Management Code (ICMC) as a subset of the certification documention. As such, this audit criteria is no longer applicable and will be removed as part of the 2017 review.
4.3	Compliance with the International Cyanide Management Code			X	Cyanide Code Certification is scheduled for March 2017.
4.4	Animal access is restricted	X			Animal access around the TSF is managed by a combination of fencing, steep sided landform precluding fauna movements and mining activities. Freshwater fauna ponds have been placed in locations outside of the TSF and these have been found to attract fauna to these ponds preferentially away from the TSF.
4.5	The TSF Management Strategy has been implemented	X			Tailings Storage Facility Operating Manual implemented to privde TGM personnel with information to operate the TSF in line with design parameters.

4.6	TSF design limits seepage through the installation of a basin liner, seepage recovery system and water recovery.	X			Seepage Recovery System installed. Compacted clay liner and HDPE liner underlying the decant. (300 mm liner).
4.7	Operation of TSF limits volume of water stored on the TSF at any one time (through re-use)	X			Decant water is returned to the Process Plant
		5	0	2	
		5	/	5	100%

5	Dust	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
5.1	Evidence of implementation of the CEMS and OEMS	X			Dust suppression - including water carts and dust monitoring program in place
5.4	Disturbance is minimised and progressive rehabilitation undertaken to reduce the potential for dust generation from cleared areas.	X			Disturbance is undertaken progressively to minimise dust generation. Progressive rehabilitation will be undertaken.
5.6	Road speeds are limited to reduce dust generation.	X			The road speeds on site do not exceed 60 km/hr., the access road permits speed up to 80 km/ hr. All employees are required to drive to the conditions.
5.5	Growth medium stripping and clearing activities are undertaken in appropriate weather conditions	X			Yes growth medium is stripped in dry conditions only.
5.6	Dust suppression techniques are implemented.	X			Dust suppression, including water carts and conveyor sprinklers / sprayers are utilised to reduce dust generated onsite.
		5	0	0	
		5	/	5	100%

6	Noise/ Vibration	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
6.1	Noise levels acceptable	X			Compliant with Noise Regulations.
6.2	Vibration associated with blasting is being controlled	X			Vibration is localised to the Active Mining Area
		2	0	0	
		2	/	2	100%

7	Water Sources/ Storage	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
7.1	Water storage areas are fenced	X			Twin turkeys, Kamikaze Turkeys nest, WWTP ponds and Process Water Ponds are fenced with lockable gates
7.2	Fauna egress and/or nets have been incorporated into permanent water storage sites	X			Scramble mats and or nets are installed. The majority ponds have a textured HDPE liner.
7.3	Evidence of fauna deterrent methods	X			Fencing in place, egress and artificial water ponds in place to preferrentially attract fauna to these ponds in lieu of the TSF.
		3	0	0	
		3	/	3	100%

8	Erosion/ Sedimentation	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
8.1	Routine inspections of erosion and sediment control structures	X			Inspection of site diversions and drains and sediment traps on landforms is undertaken in conjunction with surface water monitoring post significant rainfall events.
8.2	Evidence of stormwater drains within the operational area.	X			Large diversion drain around site
8.3	Installation of an effective diversion system to separate clean and dirty water	X			Large diversion drain around site.
8.4	Evidence of dust control measures	X			Dust suppression measures in place - water carts, sprinklers on stockpiles
		4	0	0	
		4	/	4	100%

9	Terrestrial Ecosystems - Fire Regimes	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
9.1	Flammable liquids are stored appropriately	X			Flammable Liquids are stored as per Dangerous Goods License requirements.
9.2	Fire protocols have been implemented to reduce the risk of fire	X			Tropicana works activity with and regularly collaborates with the Department of Parks & Wilflife (DPaW). Fire activity is monitored by the Emergency Response Team.
9.3	Fire breaks have been established adjacent to high risk areas	X			Fire breaks located in the following locations: Village, Explosives Magazine, Aerodrome, Waste Water Treatment Facility, Waste Management Facility and Exploration Camp. Considering installing additional firebreaks - determining where these may be required. Firebreaks will be installed if there is an imminent risk of fire.
9.4	Designated smoking areas and provision of appropriate cigarette disposal.	X			Designated smoking areas established on site. Cigarette Butt disposal pockets available to all employees on site.
9.5	Collaboration with regulators to reduce the risk of fires	X			Tropicana works activity with and regularly collaborates with the Department of Parks & Wilflife (DPaW).
		5	0	0	
		5	/	5	100%

10	Terrestrial Ecosystems - Invasive Flora	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
10.1	Invasive flora management procedures have been implemented	X			Vehicle Hygiene Certificate process has been successfully implemented. Targeted inspections of high risk areas post rainfall events.
10.2	Strict Vehicle hygiene practices implemented	X			All new vehicles/ equipment mobilised to site, require a notification form which provides details of the last service, location utilised and last clean. Upon arrival to site, the Environment team will inspect all equipment in order to grant approval for use.
10.3	Inductions and training promote awareness of weeds	X			Induction includes content on weeds and the strict vehicle mobilisation protocols. Toolbox topics and training materials target potential species.
10.4	Inspections are undertaken to record invasive flora infestation or changes in invasive flora.	X			Targeted inspections of high risk areas post rainfall events.
10.5	All soil brought to site is certified weed free.	X			No soil brought to site. Washed white sand was brought in once for the Volleyball court in the Village.
10.6	Control and treatment measures for weeds are developed in consultation with DPaW where appropriate			X	In the case a significant weed was introduced on site, DPaW would be consulted regarding management, control measures and treatment programs
10.7	Clean seed and local seed only to be harvested for use in rehabilitation	X			Seed is harvested, cleaned and stored by a reputable company. Seed is only collected within a close range of TGM.
		6	0	1	
		6	/	6	100%

11	Terrestrial Ecosystems - Invasive Fauna	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
11.1	No pets on site	X			TGM is a FIFO operation and no pets are allowed on flights/site.
11.2	Putrescible waste is disposed of in the licensed waste management facility	X			Waste landfill is managed and utilised in accordance with the PPL conditions and requirements.
11.3	Water storage facilities are Fenced	X			The shallow freshwater fauna ponds outside the TSF (designed and strategically placed to attract fauna to the ponds over the TSF) have motion sensor camers to monitor faun activity
11.4	Stormwater management around site minimises ponding	X			Any surface water ponding observed post significant rainfall event is assessed and management actions taken as required.
11.5	Taps are maintained to prevent leaks	X			Planned maintenance, inspections and work requests for all pipelines, fixtures and fittings.
		5	0	0	
		5	/	5	100%

12	Terrestrial Ecosystems - Traffic	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
12.1	Speed limits consider interaction with and impacts to threatened fauna	X			Signed speed limits (80kph Site Access Road, 60kph Site Roads). Site awareness on driving to conditions, dawn and dusk.
12.2	Infrastructure corridors have avoided bisecting critical habitats	X			Environmental values were taken into consideration during project footprint design, minimising impacts to critical habitats
12.3	Evidence of signs present in areas of threatened fauna habitat along roadsides		X		Signs have not been installed.
12.4	No evidence of unauthorised off road driving	X			Aerial survey, survey and reconciliation against approved ground disturbance activities is undertaken to verify there is no unauthorised off road driving.
		3	1	0	
		3	/	4	75%

13	Terrestrial Ecosystems - Increase Use of Region Nature Reserves	Compliance			Observations/Findings/Comments
		Yes	No	N/A	
13.1	Restrict vehicle movement and unauthorised use of the mine access road.	X			DIDO forms required to drive to site - requiring GM approval. No Unauthorised Acess signage installed at the start of and at various access points to the road.
		1	0	0	
		1	/	1	100%

Audit Score	**69**	**/**	**69**
			100%

Actions to be added to In Control			
Ref	**Action**	**Accountability**	**Due Date**
12.3	Identify locations along roadsides where threatened fauna habitat occurs and assess the requirements for signs.	Environment Team	31-Mar-17

Sign off

Role/Name	**Name**	**Signature**	**Date**
Senior Environmental Advisor	Matthew Stingemore		17/11/2016
Environmental Superintendent:	Rosemarie Lane		**14/12/2016**

Appendix 8: Ground Disturbance Permits (GDPs)

ANGLOGOLD ASHANTI AUSTRALIA

TGM Ground Disturbance Form
Havana South Resource Development TGM-GDP-0142

Independence Group

Prior to completing a Ground Disturbance Permit the requestor shall verify that proposed activities are within approved boundaries using GIS Disturbance System and/or discussion with Sustainability Department.

Part A – Application Details (Applicant to complete Parts A, B and submit with a related Survey Request (where applicable) and spatial file to TGM Sustainability via TGMSustainabilitydata@anglogoldashanti.com.au for Part C onward)				
Date of Application: **18/02/2016**		Date/s of Proposed Disturbance: **August 2016**		
Expected Clearing Completion Date: **June 2016**				
Type of Activity	*Maintenance* (e.g. pruning, re-clearing of existing cleared area) ☐	*Mining /Waste Landform* (including: pits, borrow area, growth medium stockpiles) ☐	*Infrastructure* (including: pipeline/ building/ power line/ turkey's nest, accommodation, Workshop) ☐	*Access* (including: haul road, access roads) ☐
	Other (e.g. drainage,) ☒ *(Please specify:* **Clearing for Drilling Activities**			*Emergency* (e.g. fire break) ☐
Request Completed By:	Name: **Hannah Edwards**	Department: **TGM Mine Geology**	Signature: 	
Activity to be Conducted by:	Department/Contractor: **TGM Mine Geology**			
Activity to be Supervised by:	Name: **Hannah Edwards/other Mine Geologists**	Department/Contractor: **TGM Mine Geology**	Signature: 	

Part B – Scope of Ground Disturbance (applicant to complete)				
Location of the activities and purpose *(Description of proposed activities and location - tenement No.s. Attach a map showing location with coordinates. If space provided is not enough attach details as a separate document)* *Has consideration been given to using existing disturbed area?*	**Havana South Resource Development Drilling: 25 x 25m infill drilling. Drilling activities impact the Havana South pit area (design hs_v3-7), on the south-western flank of HA01. All holes are within the AMA and PER Boundaries.** **Total disturbance proposed is 2.3898Ha, comprised of the following:** **Pads (Resource Pad designed #1): Total 82 holes for 0.0193 Ha per pad (including 1 sump per pad) for a total of 1.5826 Ha.** **Tracks (4 metres wide): 2.018 km for 0.8072 Ha.** **Areas around Cape Crushing (Borrow Pit 9) may require flat topping – this will be conducted with mining.** **Please see attached risk map.** **Tracks and disturbance on dunes has been kept to a minimum. Where possible, existing tracks are to be used. Tracks for areas of planned or existing landforms have not been taken into account.**			
Are there any buried services or overhead powerline corridors within proximity of the proposed ground disturbance?	YES ☒ NO ☐ If Yes, refer to the Survey and/ or Electrical Department for additional permits.			
Describe the disturbance method	Drive Over ☐	Raised Blade ☐	Bucket Touch ☒	Full Clear >3cm ☐

ANGLOGOLD ASHANTI AUSTRALIA

TGM Ground Disturbance Form
Havana South Resource Development TGM-GDP-0142

Independence Group

Does this disturbance require any excavation greater than 150 mm or within proximity of overhead power corridor?	YES ☒ **Drill Sumps** If Yes – consult survey and/ or electrical department and complete relevant approvals (i.e. Excavation and Penetration Permit)	NO ☐
Area of disturbance	Attach plan with coordinates and/or spatial file of disturbance area – coordinates and spatial data to be in MGA94, Zone 51 or TGM Mine Grid **See attached risk map** L _____ m x W _____ m = _____ ha	
Is the disturbance within proximity of any 'Avoidance Areas' / Heritage Site / Threatened Flora / Fauna locations? *If yes state distance from and type*	YES ☐ Type Distance from (m)	NO ☒
If yes above describe management measures for 'Avoidance Areas" (if not enough room, please attach as a separate document)		
Growth medium collection details	YES ☒ NO ☐ If no, provide a reason: If yes, what depth 100mm/300mm, other, document: **Vegetation and soil stockpiled adjacent to drill pad as part of SWP for exploration drill pad clearing. See attached drill pad layout.** Stockpile location: **Along the edge of sumps and on the edges of the drill pad. See attached drill pad plan.**	
Vegetation collection details	YES ☒ NO ☐ If no, provide a reason: **All vegetation cleared is collected in rehabilitation piles.** Vegetation Types Large trees / Scrub – Shrubs / Mixed, document: Stockpile location: **A long edge of drill pad. See attached drill pad layout plan.**	

Part C- External Approval Assessment - assess proposed activities against actual disturbance and pending activities using the GIS Ground Disturbance Management System

(When completed Sustainability Dept to submit to Survey with Survey Request and associated spatial file)

Is proposed activity (type and area) within the approval limits?	YES ☒ NO ☐ *(If no discuss amendments with applicant to alter clearing area or reject if new external approval is required)* If Yes which one/s: PER ☐ Mining Proposal ☒ Approval id/s: **MP20141224**	

Part D-Flagging, Delineation and Survey (TGM Survey to complete and return to Sustainability Dept with plan and DXF of points set out in field via TGMSustainabilitydata@anglogoldashanti.com.au)

Has the disturbance boundary been clearly delineated in the field?	YES ☐ NO ☐ Date:	Name: Signature:
	Disturbance delineation activities that have been undertaken are: Flagging ☐ Pegging ☐ Other *(please specify)* ☐ _____	

Part E –Assessment and Approval (Sustainability Dept to complete and return to Applicant)

Area Inspection	Area Inspection Completed: YES ☒ NO ☐, Date inspected:			
	Clearing boundary in place	YES ☒	NO ☐	
	Significant Environmental Values avoided	YES ☒	NO ☐	
	Pre clearing photo's taken	YES ☐	NO ☒	

ANGLOGOLD ASHANTI AUSTRALIA

TGM Ground Disturbance Form
Havana South Resource Development TGM-GDP-0142

Independence Group

Clearing Permit Reference	Enter clearing permit into GIS Clearing Management System if approval being granted. **PERMIT REFERENCE NUMBER - TGM-GDP-0142** **PERMIT EXPIRY 31st August 2016**

Approval Granted:	**Approval Not Granted:**
Date: 20 February 2016 Name: Dylan Asgill-Tucker Environmental Officer Signature:  *Sustainability Manager or delegate authorised to sign*	Date_____ Name_____ Signature_____ *Sustainability Manager or delegate authorised to sign*

Approval Comments or Conditions	This Ground Disturbance Permit (GDP) is approved in accordance with the following conditions: 1. This GDP authorises the drilling of **82 holes** and the clearing of up to **2.3898 ha** of which **1.5826 ha** is for drill pads and **0.8072 ha** is for tracks (4m wide) on M39/1096 for the resource development drill program in Havana South. 2. Consult survey and/ or electrical department and complete relevant approvals (i.e. Excavation and Penetration Permit) for digging sumps/working under power lines. 3. Any movement of material for drill pad preparation in the old Cape Crushing (Borrow Pit 9) area must be discussed with mining prior to commencement. 4. Any dust suppression required must use low salinity Kamikaze water. 5. Drill water and spoil is to be contained within sumps. Sumps will be backfilled and scarified upon completion of the programme. 6. Growth medium is to be recovered to a minimum depth of 300 mm and stockpiled within the GDP Boundary. 7. The proposed ground disturbance must be surveyed and flagged in the field prior to commencing clearing. A pick-up of the area which has been surveyed and flagged is to be submitted to tgmsustainabilitydata@anglogoldashanti.com.au 8. To prevent damage to infrastructure in the area survey must mark out any pipelines and delineate them from the drill pads and sumps prior to clearing. 9. If there are any significant changes to any holes or tracks they will need to be resubmitted to the sustainability team for approval 10. A survey pick-up of the drill locations and post drilling is to be submitted to: TGMSustainabilityData@AngloGoldAshanti.com 11. Only necessary clearing is to be undertaken within the boundary of the GDP. 12. Disturbance of large trees (diameter greater than 300 mm) shall be minimised where possible. Where impacts to large trees cannot be avoided they must be selectively harvested and stockpiled for later rehabilitation. 13. Any hydrocarbon spills are to be cleaned up immediately. Contaminated soils can be disposed of within the bioremediation facility. Please contact the Environment Department prior to disposing of contaminated soils. 14. Minimise disturbance by utilising existing tracks wherever practicable. 15. Ensure all rubbish is removed at the conclusion of drilling each hole. A copy of this permit must be provided to the operator undertaking this work, and the Supervisor of the work, and be in the vehicle at the time the work is occurring.

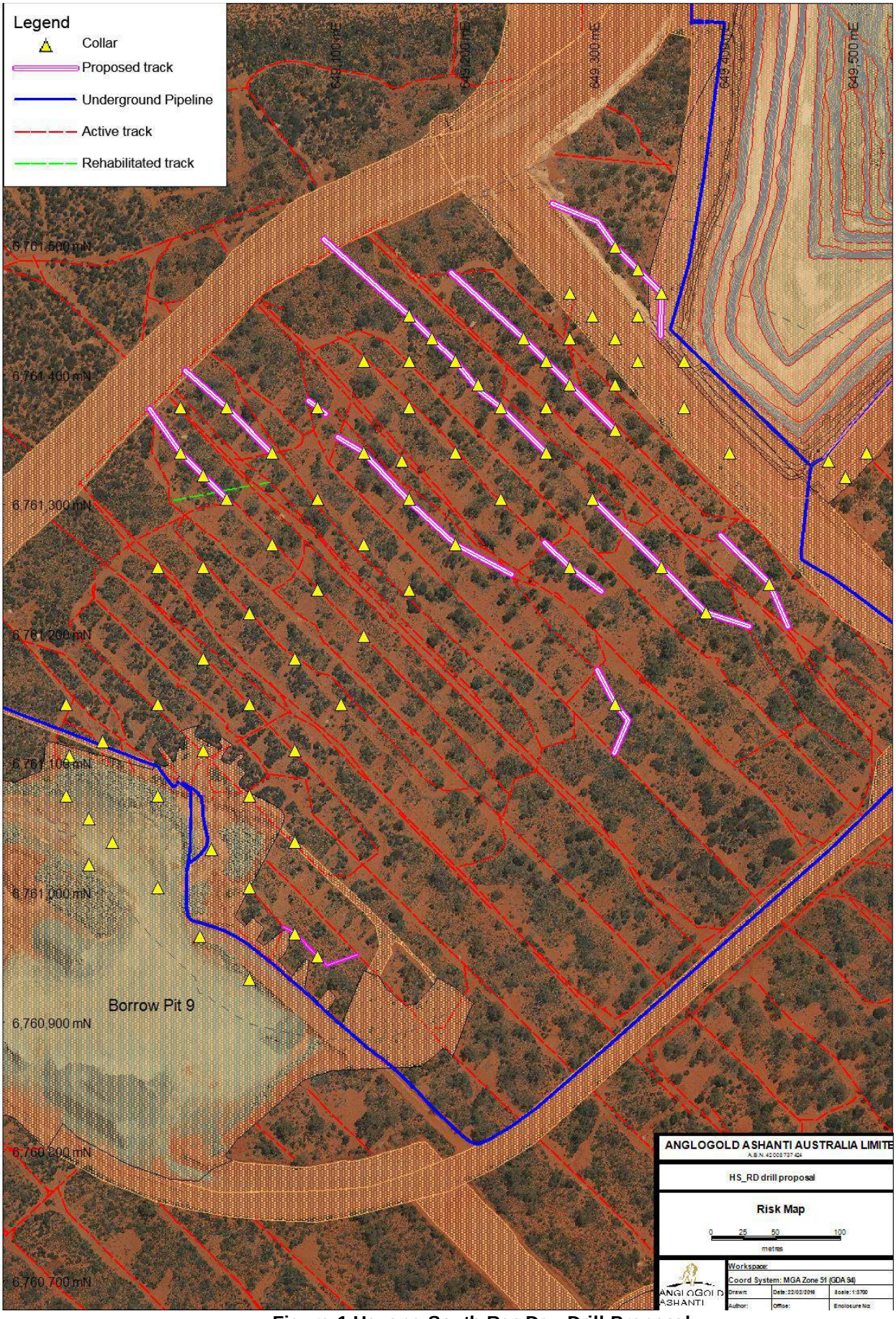


Figure 1 Havana South Res Dev Drill Proposal

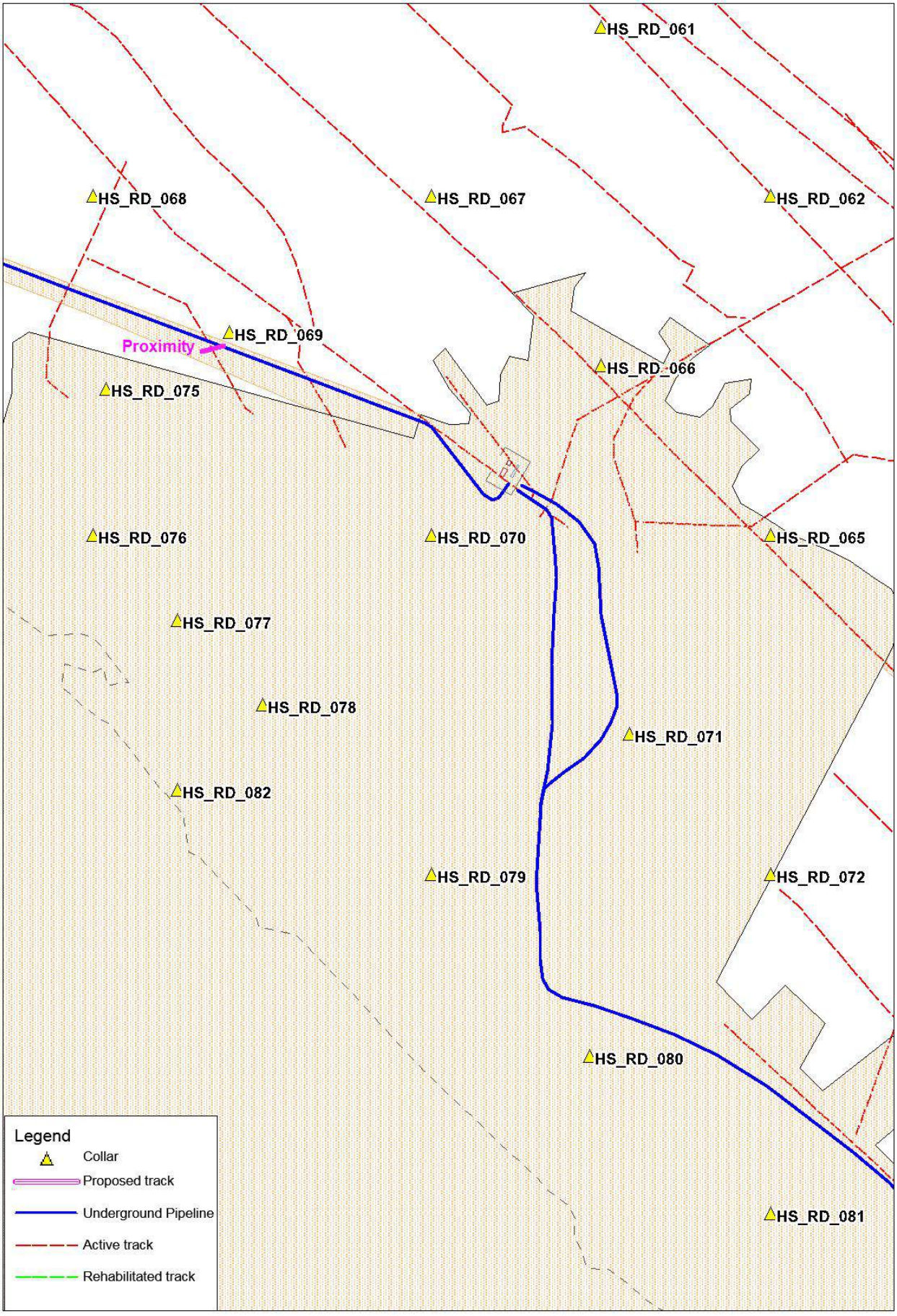


Figure 2 Close Proximity between pipeline and Collars

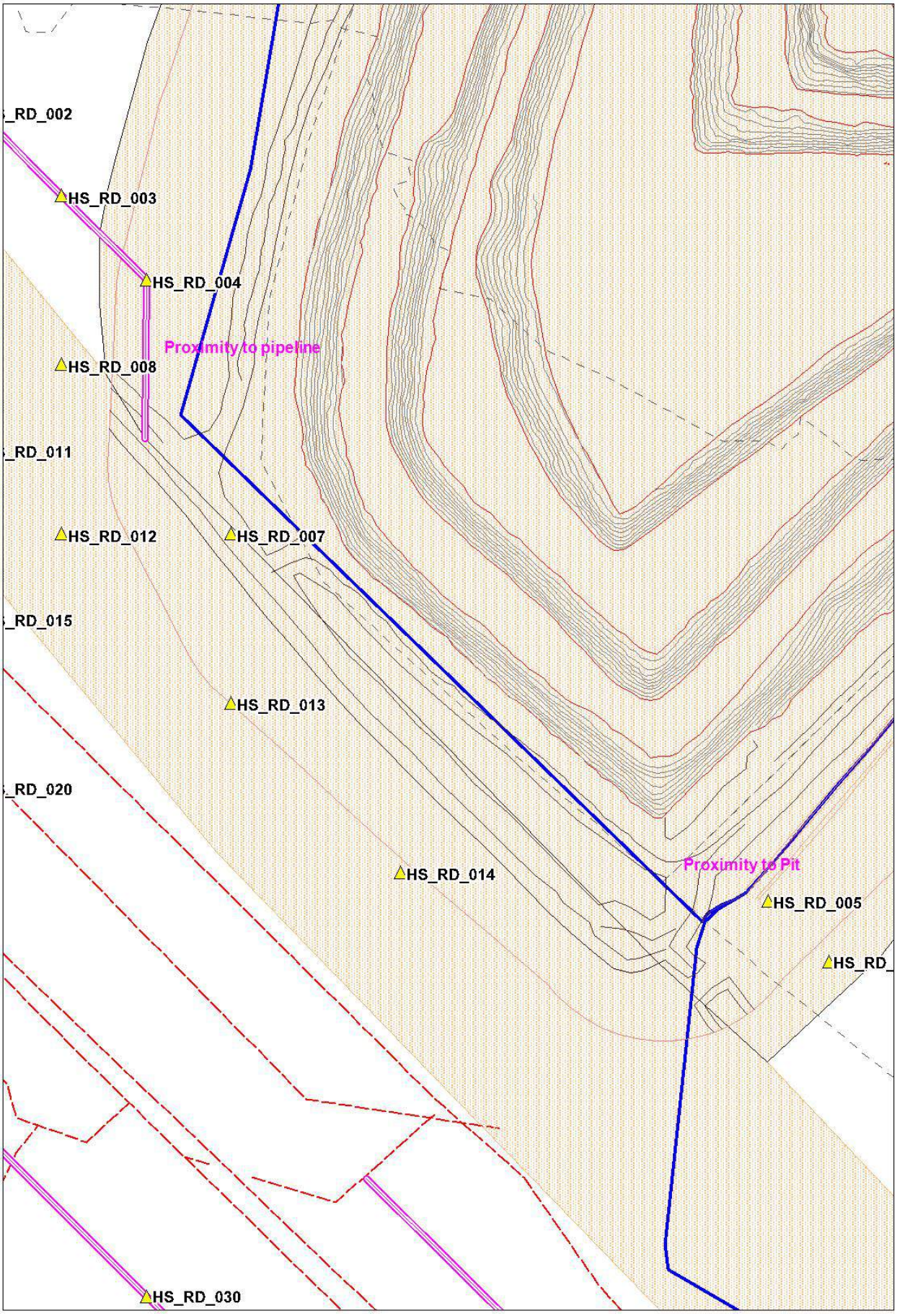
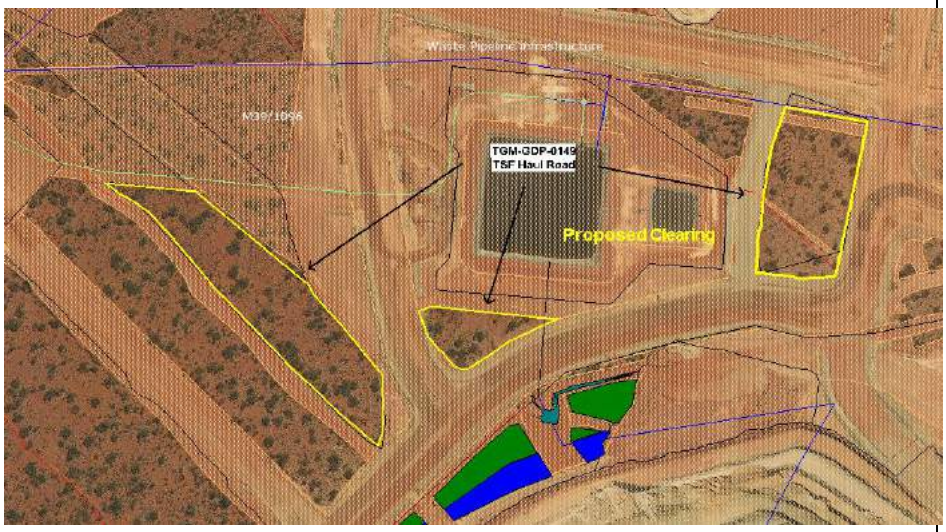


Figure 3 Collars in proximity to pit and pipe line

TGM-GDP-0149B TSF Haul Road

Prior to completing a Ground Disturbance Permit the requestor shall verify that proposed activities are within approved boundaries using GIS Disturbance System and/or discussion with Sustainability Department.

Part A – Application Details (Applicant to complete Parts A, B and submit with a related Survey Request (where applicable) and spatial file to TGM Sustainability via TGMSustainabilitydata@angogoldashanti.com.au for Part C onward)				
Date of Application: **22/04/2016**		Date/s of Proposed Disturbance: **24/02/2016**		
Expected Clearing Completion Date: **22/06/2016**				
Type of Activity	*Maintenance* (e.g. pruning, re-clearing of existing cleared area) ☐	*Mining /Waste Landform* (including: pits, borrow area, growth medium stockpiles) ☐	*Infrastructure* (including: pipeline/ building/ power line/ turkey's nest, accommodation, Workshop) ☐	*Access* (including: haul road, access roads) ☒
	Other (e.g. drainage,) ☐ *(Please specify:*			*Emergency* (e.g. fire break) ☐
Request Completed By:	Name: **Michael Wells**	Department: **Mining**	Signature:	
Activity to be Conducted by:	Department/Contractor: **Macmahon**			
Activity to be Supervised by:	Name: **Jason Vos**	Department/Contractor: **Mining**	Signature:	

Part B – Scope of Ground Disturbance (applicant to complete)				
Location of the activities and purpose *(Description of proposed activities and location - tenement No.s. Attach a map showing location with coordinates. If space provided is not enough attach details as a separate document)* *Has consideration been given to using existing disturbed area?*	**South of TSF for Haul Road (see figures below).** 			
Are there any buried services or overhead powerline corridors within proximity of the proposed ground disturbance?	YES ☒ NO ☐ If Yes, refer to the Survey and/ or Electrical Department for additional permits.			
Describe the disturbance method	Drive Over ☐	Raised Blade ☐	Bucket Touch ☐	Full Clear >3cm☒
Does this disturbance require any excavation greater than 150 mm or within proximity of overhead power corridor?	YES ☒ If Yes – consult survey and/ or electrical department and complete relevant approvals (i.e. Excavation and Penetration Permit)		NO ☐	

Area of disturbance	Attach plan with coordinates and/or spatial file of disturbance area – coordinates and spatial data to be in MGA94, Zone 51 or TGM Mine Grid L _____ m x W _____ m = **2.834 ha**		
Is the disturbance within proximity of any 'Avoidance Areas' / Heritage Site / Threatened Flora / Fauna locations? *If yes state distance from and type*	YES ☐		NO ☒
	Type		
	Distance from (m)		
If yes above describe management measures for 'Avoidance Areas" (if not enough room, please attach as a separate document)	**NA**		
Growth medium collection details	YES ☒	NO ☐	
	If no, provide a reason:		
	If yes, what depth 100mm/300mm, other, document: **300 mm**		
	Stockpile location: **GM21**		
Vegetation collection details	YES ☒	NO ☐	
	If no, provide a reason:		
	Vegetation Types Large trees / Scrub – Shrubs / Mixed, document: **Mixed**		
	Stockpile location:**GM21**		

Part C- External Approval Assessment - assess proposed activities against actual disturbance and pending activities using the GIS Ground Disturbance Management System

(When completed Sustainability Dept to submit to Survey with Survey Request and associated spatial file)

Is proposed activity (type and area) within the approval limits?	YES ☒ NO ☐ *(If no discuss amendments with applicant to alter clearing area or reject if new external approval is required)* If Yes which one/s: PER ☐ Mining Proposal ☒ Approval id/s: **MP20141224**	

Part D-Flagging, Delineation and Survey (TGM Survey to complete and return to Sustainability Dept with plan and DXF of points set out in field via TGMSustainabilitydata@anglogoldashanti.com.au)

Has the disturbance boundary been clearly delineated in the field?	YES ☐ NO ☒ Date:	Name: Signature:
	Disturbance delineation activities that have been undertaken are: Flagging ☐ Pegging ☐ ☒ **Area surrounded by Clearing** ☒ **Mine Star**	

Part E –Assessment and Approval (Sustainability Dept to complete and return to Applicant)

Area Inspection	Area Inspection Completed: YES ☐ NO ☒, Date inspected:			
	Clearing boundary in place	YES ☐	NO ☒	
	Significant Environmental Values avoided	YES ☒	NO ☐	
	Pre clearing photo's taken	YES ☐	NO ☒	
Clearing Permit Reference	Enter clearing permit into GIS Clearing Management System if approval being granted. **PERMIT REFERENCE NUMBER:** **TGM-GDP-0149** **PERMIT EXPIRY:** **30 July 2016**			

	Approval Not Granted:

Approval Granted: Date: **23 April 2016** Name: **Dylan Asgill-Tucker** Signature:  *Sustainability Manager or delegate authorised to sign*	Date_____ Name_____Signature_____ *Sustainability Manager or delegate authorised to sign*
Approval Comments or Conditions	This Ground Disturbance Permit has been authorised in accordance with the following conditions: 1. This GDP authorises up to **2.834 ha** for the purposes of haul road on **M39/1096.** 2. This GDP boundary is bound by existing cleared areas, however only necessary clearing is to be undertaken. 3. Care shall be taken to not cut into buried groundwater pipelines during clearing activities. 4. If pipelines are required to be moved, ensure the line is drained first to reduce the risk of any hypersaline water spills. 5. The operator shall be provided a copy of the mine star files outlining the areas of disturbance as well as any avoidance areas such as buried services including the water pipeline on the edge of the eastern polygon. 6. This GDP shall not commence until a Supplementary Clearing Authorisation Form has been compiled and a work package has been developed and approved. 7. Growth medium is to be recovered to a depth of at least 300 mm and direct returned to any available rehabilitation areas or stockpiled within existing stockpiles. 8. Trees with a trunk diameter greater than 300 mm must be selectively harvested and stockpiled for use in rehabilitation. 9. A survey pick up of the **cleared area** must be undertaken 10. This GDP Permit must be signed by the GDP requestor and supervisor acknowledging they have read and understand all of the conditions outlined in this GDP. 11. Ensure the requirements of this GDP are clearly communicated to the operator undertaking the clearing**.**
GDP Requestor Review of Conditions	Date_____ Name_____ Signature

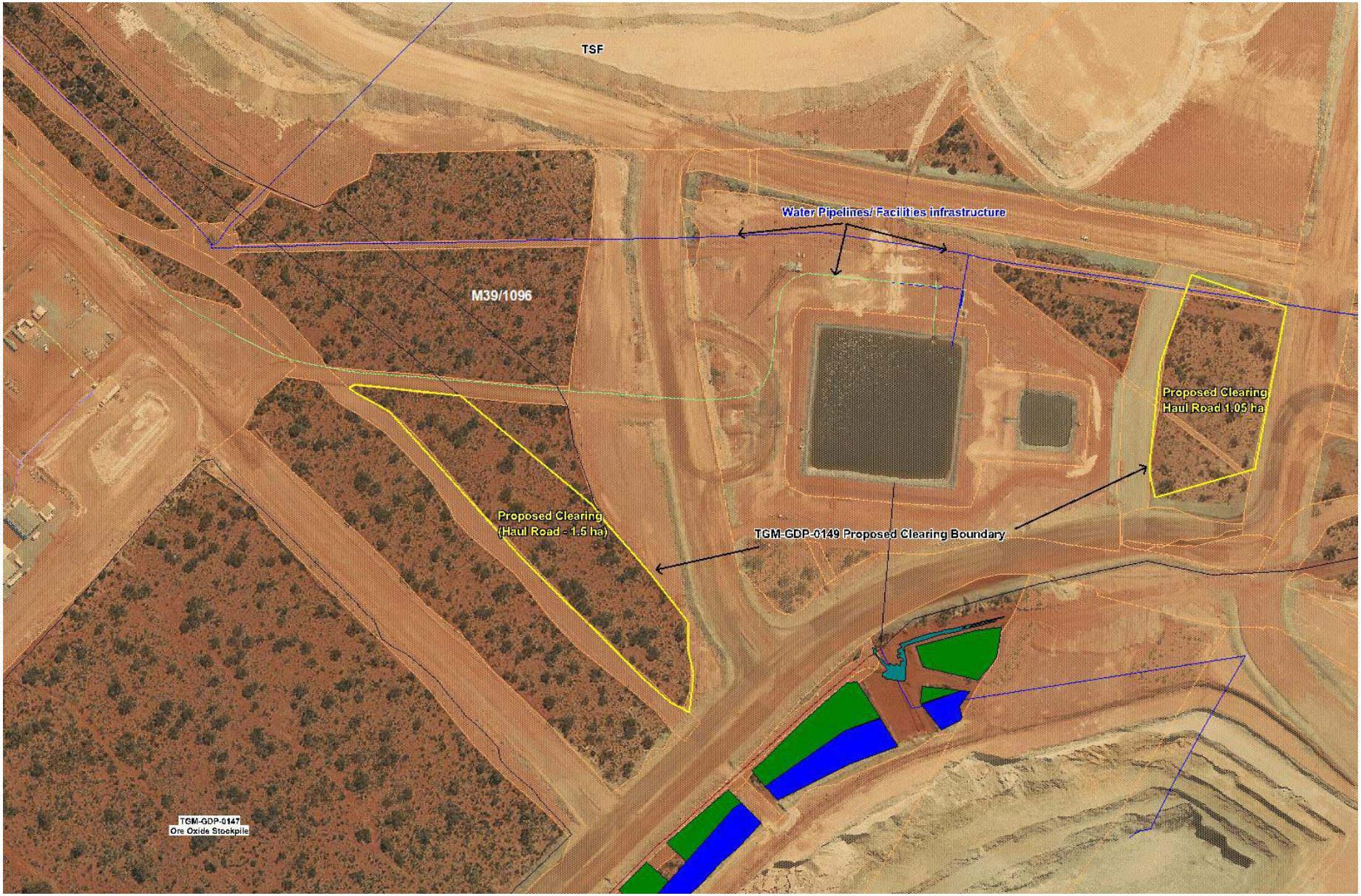
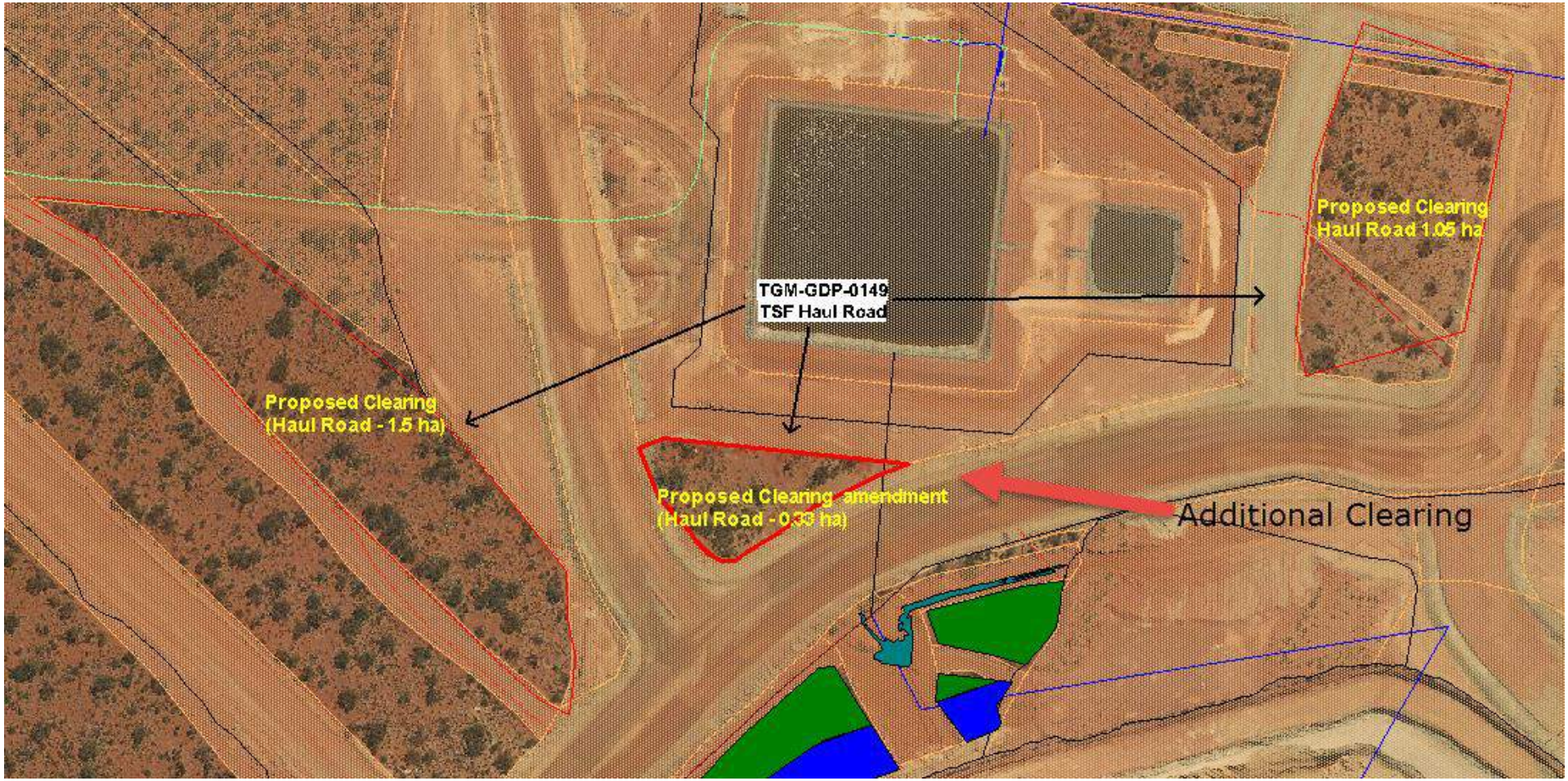


Figure 1: TGM-GDP-0145 Proposed Boundary


Proposed Clearing
Haul Road 1.05 ha
TGM-GDP-0149
TSF Haul Road
Proposed Clearing
(Haul Road - 1.5 ha)
Proposed Clearing amendment
(Haul Road - 0.33 ha)
Additional Clearing

Figure

TGM-GDP-0154 Havana 03 Open Pit

Prior to completing a Ground Disturbance Permit the requestor shall verify that proposed activities are within approved boundaries using GIS Disturbance System and/or discussion with Sustainability Department.

Part A – Application Details (Applicant to complete Parts A, B and submit with a related Survey Request (where applicable) and spatial file to TGM Sustainability via TGMSustainabilitydata@anglogoldashanti.com.au for Part C onward)				
Date of Application: **10/06/2016**		Date/s of Proposed Disturbance:**16/06/2016**		
Expected Clearing Completion Date: **31/12/2016**				
Type of Activity	*Maintenance* (e.g. pruning, re-clearing of existing cleared area) ☐	***Mining /Waste Landform*** **(including: pits, borrow area, growth medium stockpiles)** ☒	*Infrastructure* (including: pipeline/ building/ power line/ turkey's nest, accommodation, Workshop) ☐	*Access* (including: haul road, access roads) ☐
	Other (e.g. drainage,) ☐ *(Please specify:*			*Emergency* (e.g. fire break) ☐
Request Completed By:	Name: **David Pawlovich**	Department: **Mining**	Signature:	
Activity to be Conducted by:	Department/Contractor: **Macmahon**			
Activity to be Supervised by:	Name: **Colin Bald**	Department/Contractor: **Mining**	Signature:	

Part B – Scope of Ground Disturbance (applicant to complete)	
Location of the activities and purpose *(Description of proposed activities and location - tenement No.s. Attach a map showing location with coordinates. If space provided is not enough attach details as a separate document)* *Has consideration been given to using existing disturbed area?*	**Havana 03 Open Pit** Clearing required for the Havana 03 open pit. Mining will use a D10 Dozer to push VSM up to a minimum depth of 300mm into piles that will be moved to GM06 for stockpiling or direct placed for landform rehab.  **Figure 1: Footprint of Proposed HA03 Open Pit**

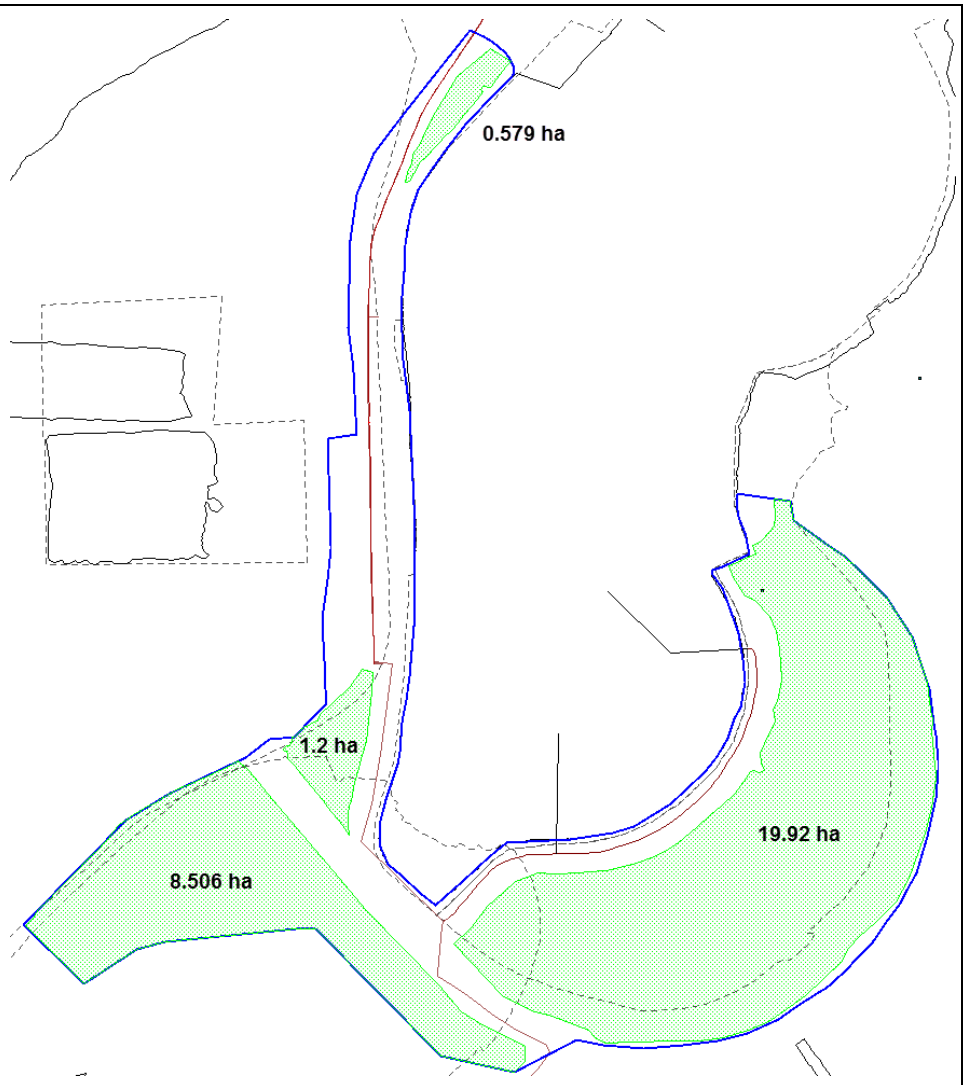


Figure 2: Vegetation Clearing shown in green

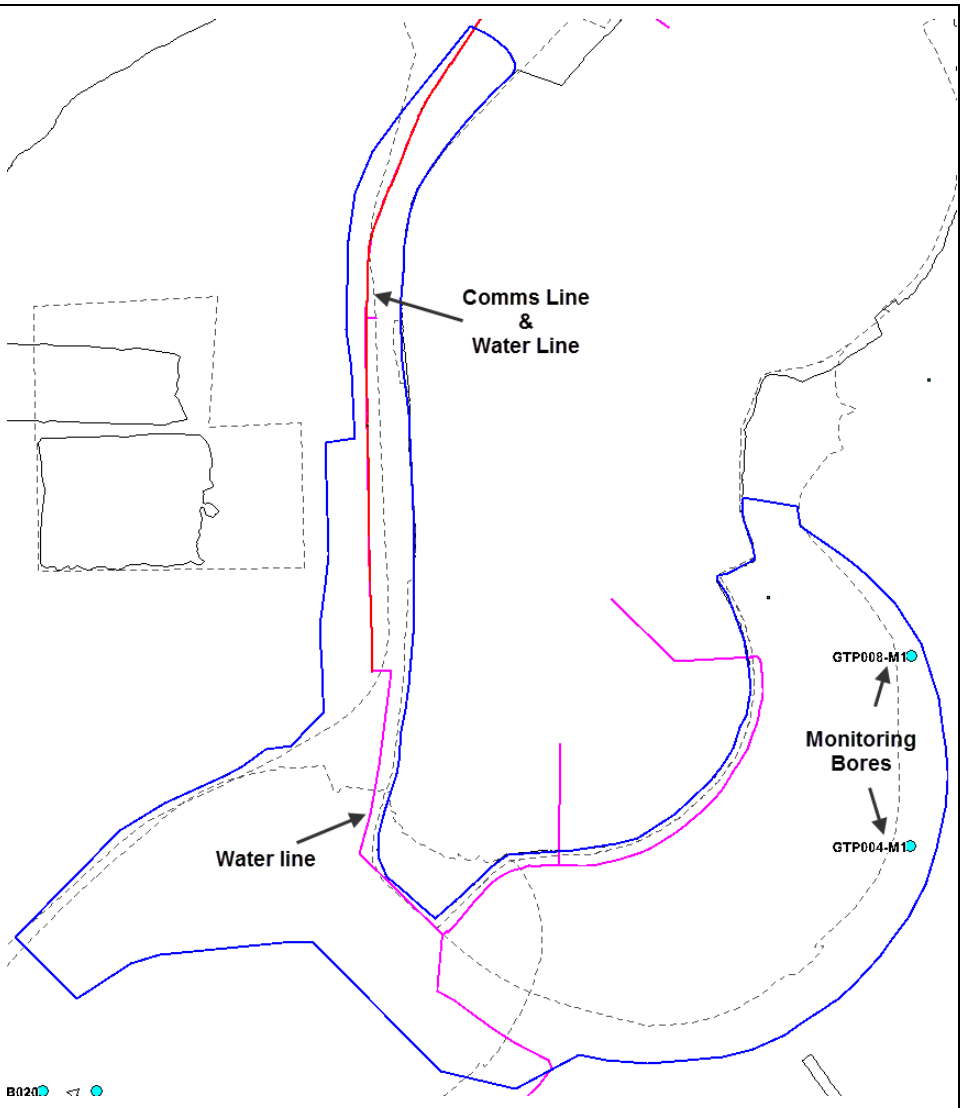


Figure 3: Infrastructure within proposed clearing boundry

Are there any buried services or overhead powerline corridors within proximity of the proposed ground disturbance?	YES ☒ (**Shown in Figure 3**) If Yes, refer to the Survey and/ or Electrical Department for additional permits.		NO ☐	
Describe the disturbance method	Drive Over ☐	Raised Blade ☐	Bucket Touch ☐	Full Clear >3cm☒
Does this disturbance require any excavation greater than 150 mm or within proximity of overhead power corridor?	YES ☒ If Yes – consult survey and/ or electrical department and complete relevant approvals (i.e. Excavation and Penetration Permit)		NO ☐	
Area of disturbance	Attach plan with coordinates and/or spatial file of disturbance area – coordinates and spatial data to be in MGA94, Zone 51 or TGM Mine Grid L _____ m x W _____ m = **30.205 ha**			
Is the disturbance within proximity of any 'Avoidance Areas' / Heritage Site / Threatened Flora / Fauna locations? *If yes state distance from and type*	YES ☐		NO ☒	
	Type			
	Distance from (m) NA			

If yes above describe management measures for 'Avoidance Areas" (if not enough room, please attach as a separate document)	
Growth medium collection details	YES ☒ NO ☐
	If no, provide a reason:
	If yes, what depth 100mm/300mm, other, document: 300mm –**Variable Depth- Mine GM to hard surface for drill floor.**
	Stockpile location: **GM06/GM02**
Vegetation collection details	YES ☒ NO ☐
	If no, provide a reason:
	Vegetation Types **Large trees** / **Scrub** – Shrubs / Mixed, document:
	Stockpile location: **GM06/GM02**

Part C- External Approval Assessment - assess proposed activities against actual disturbance and pending activities using the GIS Ground Disturbance Management System

(When completed Sustainability Dept to submit to Survey with Survey Request and associated spatial file)

Is proposed activity (type and area) within the approval limits?	YES ☒ NO ☐ *(If no discuss amendments with applicant to alter clearing area or reject if new external approval is required)* If Yes which one/s: PER ☐ Mining Proposal ☒ Approval id/s: **MP20141224**

Part D-Flagging, Delineation and Survey (TGM Survey to complete and return to Sustainability Dept with plan and DXF of points set out in field via TGMSustainabilitydata@anglogoldashanti.com.au)

Has the disturbance boundary been clearly delineated in the field?	YES ☐ NO ☐ Date:	Name: Signature:
	Disturbance delineation activities that have been undertaken are: Flagging ☐ Pegging ☐ Other *(please specify)* ☐_____ Minestar ☒ Area surrounded by existing disturbance ☐	

Part E –Assessment and Approval (Sustainability Dept to complete and return to Applicant)

Area Inspection	Area Inspection Completed: YES ☒ NO ☐, Date inspected: **11/06/2016 (Desktop)**
	Clearing boundary in place YES ☐ NO ☒
	Significant Environmental Values avoided YES ☒ NO ☐
	Pre clearing photos taken YES ☐ NO ☒
Clearing Permit Reference	Enter clearing permit into GIS Clearing Management System if approval being granted. **PERMIT REFERENCE NUMBER: TGM-GDP-0154** **PERMIT EXPIRY: 31/12/2016**

Approval Granted:	**Approval Not Granted:**
Date: 13/06/2016	Date_____
Name: Jesse Ober	Name_____ Signature_____
Signature: 	*Sustainability Manager or delegate authorised to sign*
Sustainability Manager or delegate authorised to sign	

Approval Comments or Conditions	This GDP has been approved in accordance with the following conditions: 1. This GDP authorises clearing of up to **30.205 ha** for the Havana 03 Open Pit on **M39/1096**. 2. This GDP must be surveyed and flagged in the field prior to commencing this clearing. A pickup of the area which has been surveyed and flagged is to be submitted to: TGMSustainabilityData@AngloGoldAshanti.com.au 3. It is the responsibility for Mining to submit Land Use Change Requests for any design changes which result in changes to the underlying land use. See **Figure 5** for areas that are affected by this GDP. 4. This GDP shall not commence until a Supplementary Clearing Authorisation Form has been compiled and a work package has been developed and approved. 5. A copy of the approved clearing package must be provided to the operator undertaking the work and the Supervisor of the work and be in the vehicle at the time the work is occurring. The TGM Environment team may undertake inspections during clearing activities to ensure a copy of the Permit is available. 6. Growth medium is to be recovered to **the depth of hard surface for drill floor** and returned to any available rehabilitation areas or stockpiled within existing GM stockpiles. 7. Trees with a trunk diameter greater than 300 mm must be selectively harvested and stockpiled for use in rehabilitation. 8. Care shall be taken when undertaking maintenance works to ensure there are no hydrocarbon or hypersaline water spills. All spills must be reported to the TGM Environment Team immediately. 9. Any spills are to be cleaned up immediately. Contaminated hydrocarbon soils can be disposed of within the bioremediation facility. Please contact the Environment Team prior to disposal. 10. Section 'D' must be completed and signed by the surveyor completing the survey and a copy email sent back to the Environment team (ASAP). 11. The clearing must be surveyed on completion and provided to the Environment Team and TGM CADGIS. 12. This GDP does not provide authorisation for any additional permits that may be required (such as excavation and penetration permit) see **Figure 3**. 13. Monitoring bores identified in **Figure 3** need to be decommissioned, see Hydrogeology for details 14. This GDP Permit must be signed by the GDP requestor and supervisor acknowledging they have read and understand all of the conditions outlined in this GDP.
GDP Requestor Review of Conditions	Date: Name: Signature:

Figure 4: Overview of Havana 03 Open Pit

Figure 5: Changes to Current Land Use Allocations

Appendix 9: Vegetation Monitoring Report

Tropicana Gold Mine

Vegetation Monitoring Program – 2015 Survey

Prepared for
Tropicana Joint Venture

14 January 2016

DOCUMENT TRACKING

Item	Detail
Project Name	Tropicana Gold Mine 2015 Vegetation Monitoring Program
Project Number	15PER_1767
Project Manager	Joel Collins Phone: 08 9227 1070 Office address: Suite 1 & 2, 49 Ord Street, West Perth WA 6005
Prepared by	Sarah Dalgleish
Reviewed by	Joel Collins, Mark Vile
Approved by	Joel Collins
Status	FINAL
Version Number	2
Last saved on	14 January 2016
Cover photo	Vegetation at Tropicana © Eco Logical Australia 2015

This report should be cited as 'Eco Logical Australia 2015. *Tropicana Gold Mine Vegetation Monitoring Program – 2015 Survey*. Prepared for Tropicana Joint Venture.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Tropicana Joint Venture.

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Abbreviations

Abbreviation	Description
AGAA	AngloGold Ashanti Australia
BOM	Bureau of Meteorology
CEO	Chief Executive Officer
DMSI	Digital multispectral imagery
ELA	Eco Logical Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EP Act	*Environmental Protection Act 1986*
GVD	Great Victorian Desert
IBRA	Interim Biogeographic Regionalisation of Australia
JV	Joint Venture
OEPA	Office of the Environmental Protection Authority
PWSB	Process Water Supply Borefield
SAVI	Soil Adjusted Vegetation Indices
The Project	Tropicana Gold Mine
VMP	Vegetation Monitoring Program
WA	Western Australia

Definitions

Term	Description
Canopy vigour	Canopy vigour in terms of remote sensing is the determination and monitoring of vegetation condition using remote methods such as satellite photography to detect changes in canopy cover and therefore canopy vigour
Indicator species	An indicator species is a plant species that can signal a change in the biological condition of an ecosystem and therefore used as a surrogate for providing early warning of potential negative change to biodiversity values
Vegetation Monitoring Trigger	Triggers relate to native vegetation cover and productivity, indicator species, clearing boundaries, weeds, and rehabilitation as described in Vegetation Monitoring Program

Executive summary

Condition 5-2 of Ministerial Statement 839 for the Tropicana Gold Mine (The Project) specifies that:

'*The proponent shall undertake monitoring of the condition and abundance of vegetation and flora at reference and potential impact sites in accordance with the 'Tropicana Gold Project Environmental Monitoring Strategy, Version 1.0, Author: B Bastow, Issue Date: 18 February 2010' or subsequent revisions approved by the EPA CEO. This monitoring is to be carried out to the requirements of the EPA CEO on advice of the DEC*'.

The Environmental Monitoring Strategy referred to by Condition 5-2 provides an overview of all environmental monitoring to be undertaken over the life of the Project, and includes information on environmental monitoring triggers. From this overarching Environmental Monitoring Strategy, a Vegetation Monitoring Strategy (VMS) was prepared to specifically detail the annual vegetation monitoring approach to meet the requirements of Condition 5-2, and outline the triggers and actions required if triggers were reached or exceeded. Eco Logical Australia was commissioned to prepare and undertake a Vegetation Monitoring Program in accordance with the approach described in the VMS. The Vegetation Monitoring Program was prepared in 2011, with a survey (Year 1) also conducted in 2011. The first monitoring survey (Year 2) was undertaken in 2012.

This document reports the results from the Vegetation Monitoring Program 2015 (Year 5). The document also evaluates results against three of the vegetation monitoring triggers, triggers1, 5 and 6 to determine whether the trigger values have been exceeded and requires further investigation into the potential cause. Trigger 1 is a 25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites. Monitoring Triggers 5-6 refer to the presence, distribution, abundance and density/cover of invasive flora. Data was also collected to facilitate assessment of Trigger 2 which relates to indicator species.

Most sites were showing no change in cover or had increasing cover (typically seen at sites experiencing post-fire regeneration), suggesting no impacts from the Project are occurring. This was further supported by the findings from the remote sensing component of the Vegetation Monitoring Program.

Two sites showed a decrease in overall foliar cover (%) which exceeded 25% deviation relative to their respective reference sites between 2015 and baseline, however these sites were impacted by a fire in 2012 which accounts for the deviation. Several other sites exceeded 25% deviation in the comparisons of overall foliar cover (%) between 2015 – 2014 and 2015 – baseline. These sites displayed a reduction in cover due to natural processes, including fire and climatic influences.

The remote sensing analysis did not detect any changes in vegetation that were directly attributable as an impact from the Project. Changes detected included approved mine infrastructure development, changes in canopy vigour, increases in groundcover along some road sections, bare ground and drainage lines, and fluctuations in the water levels of water bodies associated with the mine. Changes as a result of recent fires were also detected.

1 Introduction

This document describes data collection and analysis for the Tropicana Gold Mine (the Project) Vegetation Monitoring Program (VMP) for 2015 (Year 5 of the VMP), and examines changes that have occurred between 2014 and 2015 and between 2015 and baseline data. The VMP uses an integrated remote sensing and field assessment approach, and is being implemented to quantitatively monitor changes and potential impacts to vegetation, if any, that may be related to the Project.

Environmental monitoring triggers, including those relating to vegetation, were established in the Tropicana Gold Project Environmental Monitoring Strategy (AngloGold Ashanti Australia [AGAA] 2010). This document also evaluates whether these vegetation monitoring triggers have been exceeded.

The first survey for the VMP was conducted in 2011 to determine the species composition, health and cover of selected vegetation communities. From 2012 to 2015, health and cover attributes were again recorded, both remotely-sensed and ground-based, to compare with previous results. Additional data was also collected in 2015 to define indicator species within each monitoring site.

1.1 Tropicana Gold Project

1.1.1 Background

The Project is an approved and operational open pit gold mining and processing operation. Mining activities commenced in July 2012, with processing commencing in the second half of 2013. The Project is located approximately 330 km east-north-east of Kalgoorlie and 200 km east of Laverton, on the western edge of the Great Victoria Desert (GVD) in Western Australia (WA)

The Project comprises three core areas:

- An Operational Area containing open pits, waste landforms, stockpiles, tailings storage facility, processing plant, village, aerodrome and other supporting infrastructure
- An infrastructure corridor (the Pinjin Infrastructure Corridor) including an access road and communications corridor linking the Operational Area to existing communications and road networks in Kalgoorlie
- Process Water Supply Borefield (PWSB) in the Minigwal Trough to provide water for the Project.

The Project is a joint venture between AGAA (70% stakeholder and manager) and Independence Group NL (30% stakeholder), collectively known as the Tropicana Joint Venture (JV).

1.1.2 Study area

The Project is located primarily within the Great Victoria Desert (GVD) region of the Interim Biogeographic Regionalisation of Australia (IBRA) classification system (Department of Environment 2013). A small section of the western part of the Pinjin Infrastructure Corridor is situated within the Murchison IBRA region.

1.1.3 Climate

The climate of the Project area can be described as arid, generally receiving less than 250 mm of rainfall occurring sporadically throughout the year (Beard 1990). At the Tropicana Gold Mine (years 2007-2015) mean minimum temperatures recorded range between 3.2 ºC in July and 18.7 ºC in

January whereas mean maximum temperatures range between 19.4 ºC in June to 36.1 ºC in January (AGAA climate data 2015; **Figure 2**).

In the year preceding the 2015 survey (November 2014 to October 2015) rainfall received at Tropicana Gold Mine was below average with the area receiving a total of 236.2 mm compared to the long term average (2007-2015) of 257.8 mm for the same period (AGAA climate data 2015). However, rainfall in the three months preceding the survey (July to September) was average, with the area receiving a total of 36 mm of rainfall compared to the long term average of 35.9 mm for this period (AGAA climate data 2015; **Figure 2**).

By comparison, rainfall received at Laverton Aero weather station (site number 12305; years 1994-2016), which is approximately 200 kilometres west of the Project, totalled 29.4 mm in the three months preceding the survey (July to September) which was below the long term average of 33.4 mm for this area (Bureau of Meteorology [BOM] 2016; **Figure 3**).

A more detailed overview of the existing environment and regional climate and weather is provided in the 2011 report (Eco Logical Australia [ELA] 2011).

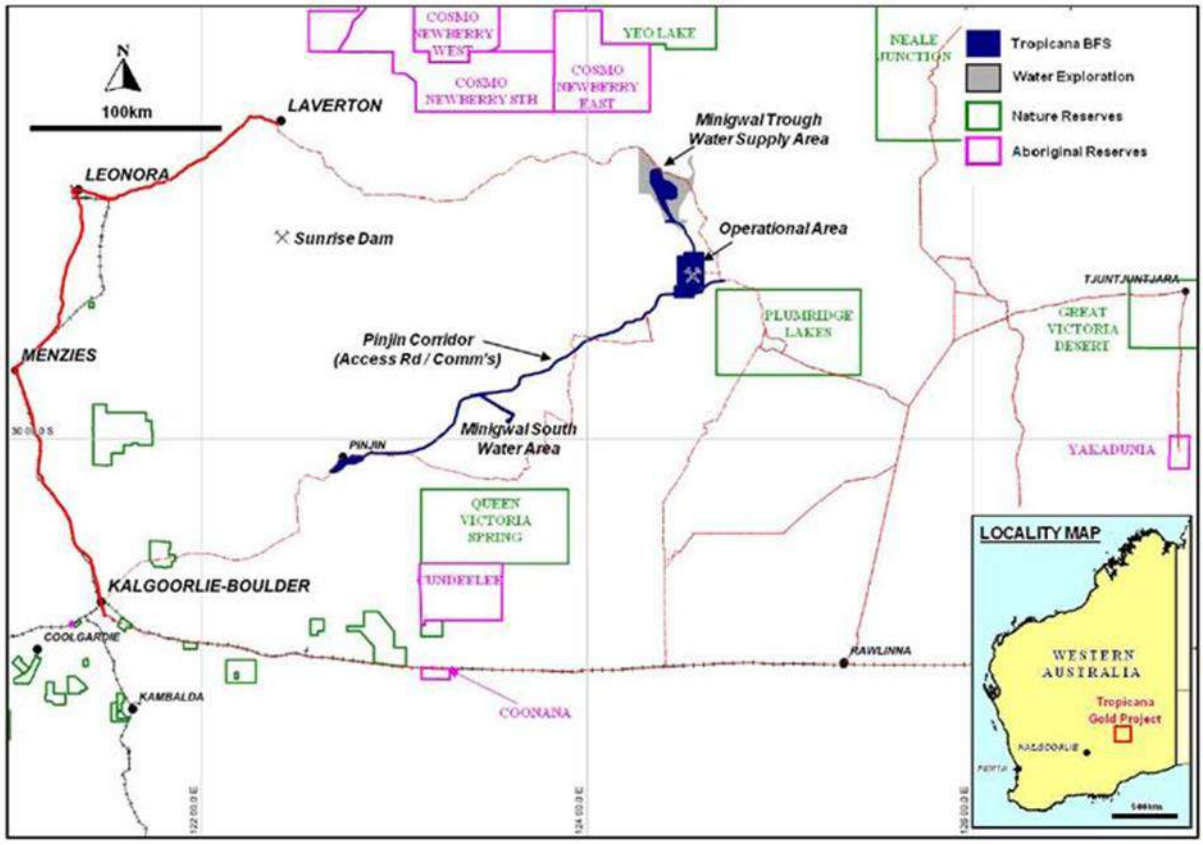


Figure 1: Location of the Tropicana Gold Project, showing locations of the Operational Area, Water Supply Borefield, and Infrastructure Corridor

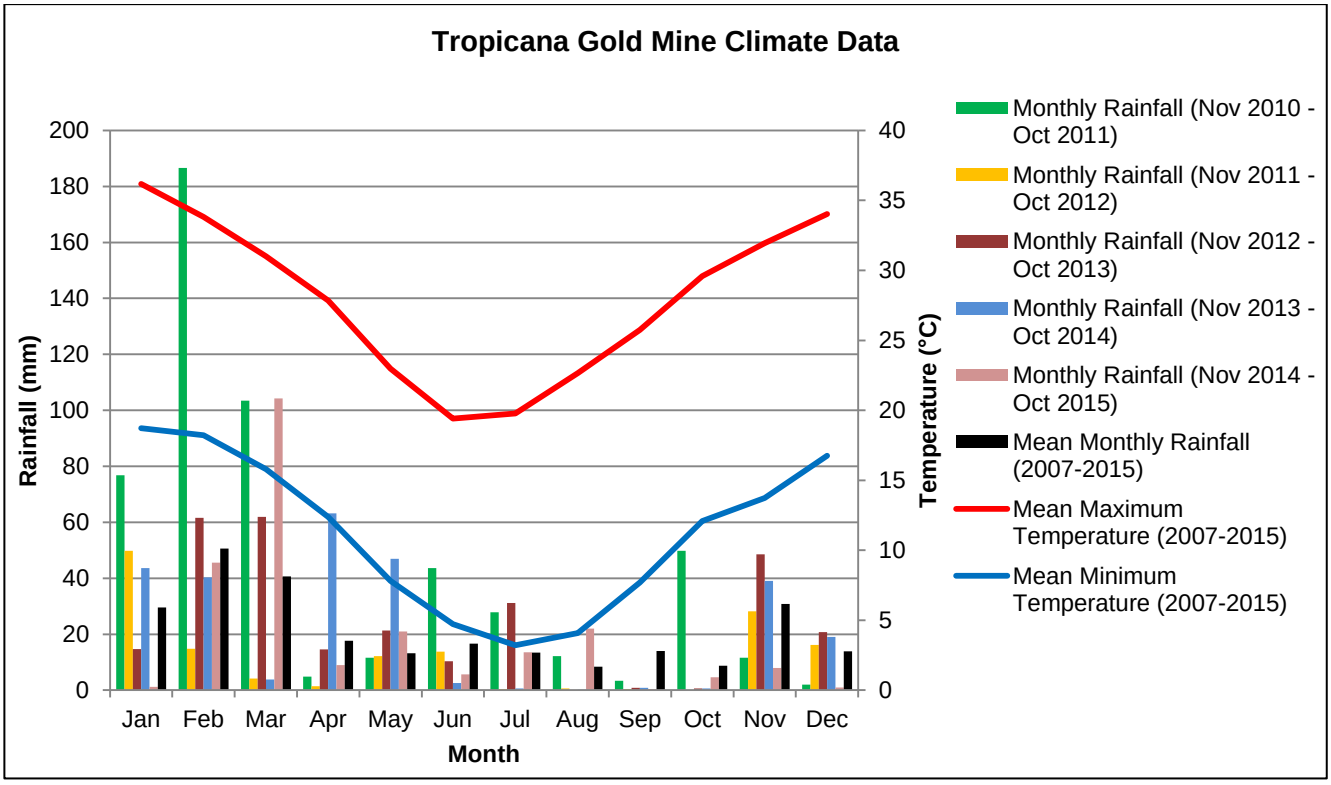


Figure 2: Long–term climate graph and rainfall for the current and previous monitoring years for Tropicana Gold Mine (AGAA data 2015)

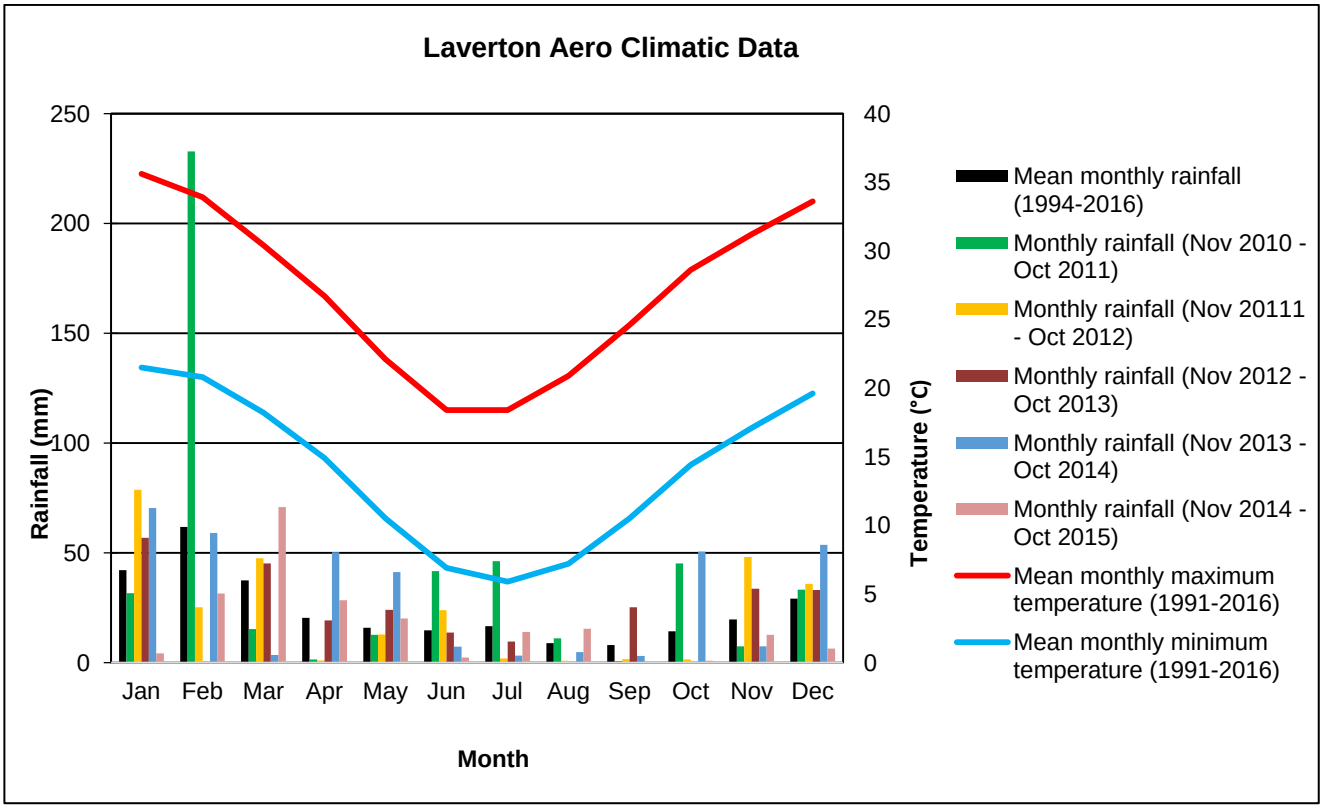


Figure 3: Long–term climate graph and rainfall for the current and previous monitoring years for Laverton Aero weather station (number 12305; BoM 2016)

1.1.4 Ministerial approval and conditions

An environmental impact assessment to meet both State and Federal requirements was completed in 2009 with WA approval (Ministerial Statement 839) under the State *Environmental Protection Act 1986* (EP Act) being obtained in September 2010 and approval under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) obtained in December 2010.

Condition 5-2 of Ministerial Statement 839 for the Project specified that:

'The proponent shall undertake monitoring of the condition and abundance of vegetation and flora at reference and potential impact sites in accordance with the 'Tropicana Gold Project Environmental Monitoring Strategy, Version 1.0, Author: B Bastow, Issue Date: 18 February 2010' or subsequent revisions approved by the EPA CEO. This monitoring is to be carried out to the requirements of the EPA CEO on advice of the DEC' (Minister for Environment; Youth 2010).

The aim of this document is to meet the requirements of this condition.

1.2 Purpose of the Vegetation Monitoring Program

The VMP is being undertaken in part to assist in assessing environmental performance of the Project (acknowledging this is not the only tool being used to measure environmental performance) and to also specifically meet Condition 5-2 of Statement 839.

The Environmental Monitoring Strategy referred to by Condition 5-2 provides an overview of environmental monitoring to be undertaken over the life of the Project (AGAA 2010). The monitoring requirements, purposes, methods and frequencies from this Strategy that are applicable to vegetation are provided in the Vegetation Monitoring Strategy document (ELA and Tropicana JV 2011).

1.2.1 Potential impacts

Operational activities may lead to vegetation decline/impact in areas adjacent to the active Project areas if not appropriately managed. Potential impacts from operational activities associated with vegetation include (both direct and indirect):

- Clearing native vegetation
- Reduced sheet flow (water starving) down slope of infrastructure affecting sheet flow dependent communities
- Concentrated water flow through diversion infrastructure, with potential to cause erosion and subsequent deposition
- Runoff concentration and channel formation
- Potential for dust deposition from vehicle movements, crushing, stockpiles and cleared areas to affect fringing vegetation
- Escape of saline water to fringing vegetation due to inadequate management of activities associated with dust suppression
- Introduction and increased germination and cover of non-native (weed) species
- Compaction from off-road vehicles
- Introduction and spread of plant pathogens
- Non-adherence to clearing boundaries or delineated driving areas
- Clearing related erosion and sediment deposition
- Saline water release from infrastructure
- Drawdown of the water table
- Vehicle and other mechanical damage to vegetation

- Release of contaminated water from facilities such as the tailings storage facility (TSF) and waste landforms.

The VMP was designed using an integrated remote sensing (entire site) and targeted field assessment (local scale) approach to quantitatively determine whether there is any decline in vegetation condition that may result from any of the identified impacting processes.

1.2.2 Vegetation monitoring triggers

The Projects Vegetation Monitoring Strategy outlines the vegetation monitoring triggers for the Project. Triggers relate to native vegetation cover and productivity, indicator species, clearing boundaries, weeds, and rehabilitation, and are outlined in **Table 1**. This report addresses results obtained in relation to triggers 1, 2, 5 and 6.

Table 1: Vegetation monitoring triggers for the Project (extract from Tropicana Gold Project Vegetation Monitoring Strategy; ELA and Tropicana JV 2011)

Parameter	Monitoring requirement	Trigger
Vegetation and flora condition	Monitoring vegetation and flora adjacent to the Project and road corridor to identify indirect impacts e.g. dust (includes internal and Mine Access Road)	1. 25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites 2. 25% deviation of indicator species within monitoring (impact) sites relative to reference sites
Vegetation and flora condition	Monitor Project footprint boundaries	3. Clearing beyond boundary and/or clearing in the absence of marked boundary 4. Actual clearing beyond expected extent (GIS)
Presence, distribution, abundance and density/cover of invasive flora	Assessment of weeds present including: species, their distribution, abundance and density/cover of weeds	5. Identification of a weed species in a site where it had not previously been recorded 6. 25% increase of weed species in abundance or cover relevant to reference site
Presence, distribution, abundance and density/cover of invasive flora	Monitor weed presence within the project area and on roadsides	7. Identification of a weed species in a site where it had not previously been recorded
Rehabilitation	Monitor vegetation establishment in rehabilitated areas Following rehabilitation, areas will be monitored and treated for invasive flora invasion, if necessary	8. N/A 9. Weed identified in rehabilitation

2 Methods

2.1 Remote sensing data and analysis

2.1.1 Data capture and assessment

High resolution digital multispectral imagery (DMSI), with four bands (Blue, Green, Red and Near Infrared) was captured by Outline Imagery from 30th September to 20th October 2015. Images were resampled to a pixel resolution of 1 m. The 2015 imagery was compared to similar imagery captured between 18 and 21 September 2014. The footprint of data capture is outlined in **Figure 4**. **Appendix A** provides the DMSI visual assessment outputs.

Each image was assessed for quality using visualisation of each image band, band ratios and band histograms. Image quality in terms of cloud effects, dust effects or incorrect offset and gains were assessed and recorded.

2.1.2 Data processing

All images were processed to create Soil Adjusted Vegetation Indices (SAVI) images (Equation 1).

Equation 1: SAVI = ((NIR-Red)/(NIR+Red+L))*(1+L)

NIR = Near Infrared Band, R = Red Band, L = the soil cover adjustment factor (set to 0.8 in all cases). The value of 0.8 was used due to the large amount of bare soil within the images. By using this value the aim was to reduce the effect that the soils has on the analysis.

The corresponding SAVI images for each mosaic section were processed to create change detection images between the time periods. The images were analysed to detect year to year change by subtracting each Previous (2014) image from each Current (2015) (Equation 2).

Equation 2: ΔSAVI = Current(SAVI) – Previous(SAVI)

Each of the change detection images were divided into a colour spectrum using a piecewise contrast stretch to help define the areas of change (Redder colours = loss, Bluer colours = gain and Light Green = little or no change).

All image processing and assessment was carried out using ENVI 5.0 image processing software.

2.1.3 Data assessment

A set of standard tiles was created over the entire project footprint at a scale of approximately 1:20,000 (ELA 2011). Each tile was designed to be 6,000 m by 3,200 m with approximately 100 m of overlap between adjoining tiles to facilitate on-screen assessment and ensure coverage of the entire area. A total of 86 tiles were created. Each tile was given a unique label to facilitate rapid identification and future comparison. This network of tiles forms the basis for detailed systematic evaluation of change in vegetation communities for ongoing monitoring. Additional tiles will be developed to facilitate analysis within the expanded image capture area.

Each change image was displayed on the screen at high resolution using the tile layout. The image zoomed in to a viewing scale of 1:5,000 or higher. In addition to the change image the true colour images for 2014 and 2015 were compared and assessed to identify areas of ‘significant change’ in vegetation. Areas of ‘significant change’ in vegetation cover were documented using a GIS polygon and a table recording system. A minimum mapping unit of 40 m x 40 m (1600 m2) was used.

To determine a ‘significant change’ each change image was inspected on-screen using the tile layout. A contrast stretch was applied to the image to highlight areas of potentially significant change, being areas where the change in the SAVI index differed by more than 1 standard deviation from the average change between years. This enabled differentiation between possible mine impacts and broad seasonal variability between years. Areas of significant change greater than approximately 40 m x 40 m (1600 m2) were further evaluated against true colour images for 2014 and 2015 and tagged if an association with mining operations was suspected.

All derived images and polygons were stored as jpg files and shapefiles using the tile labelling file system to enable ease of display and further analysis.

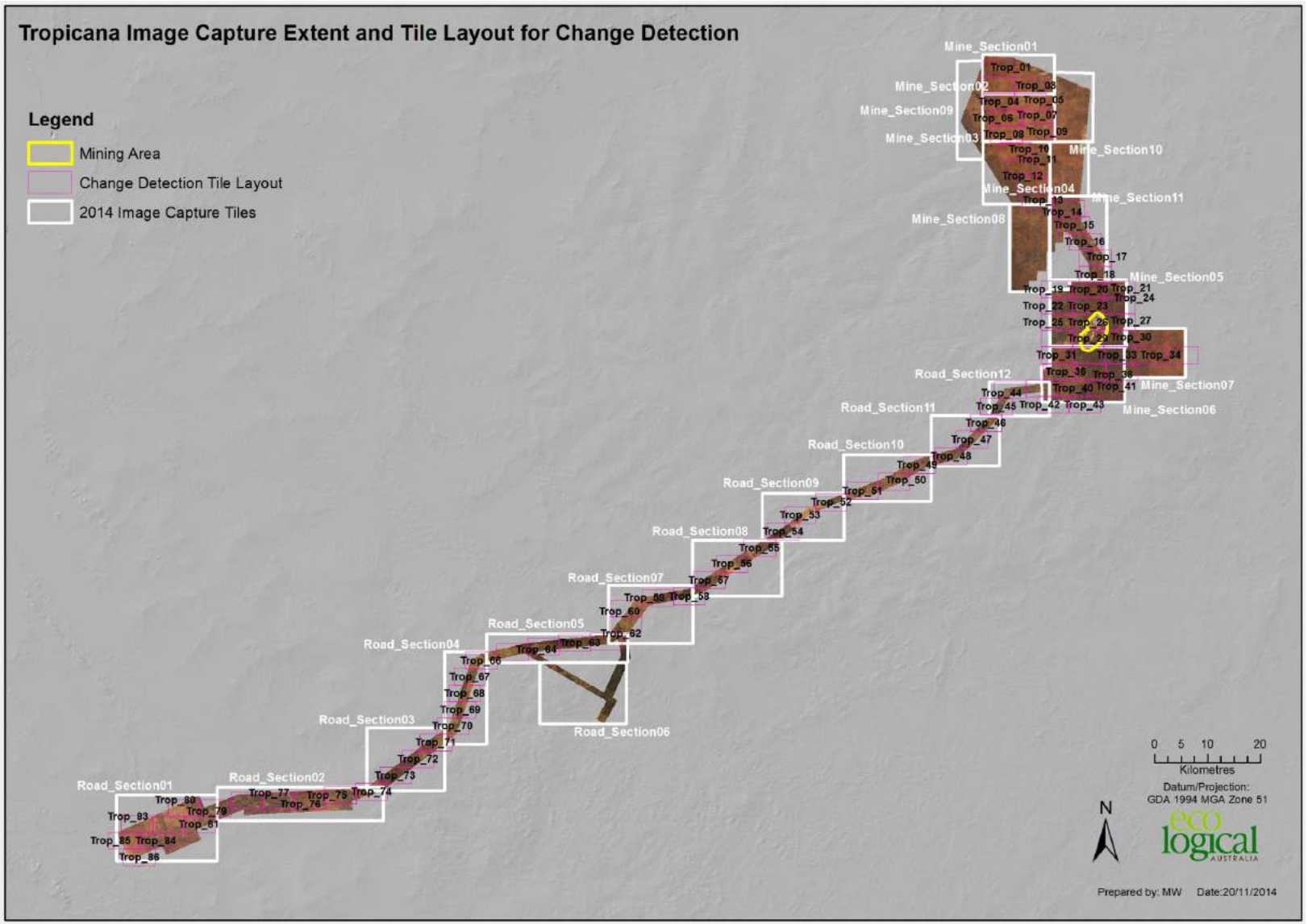


Figure 4: Image capture extent and tile layout for change detection

2.2 Floristic survey and vegetation condition assessment

The 2015 survey was undertaken from 15 to 19 October 2015 by Joel Collins and Sarah Dalgleish of ELA and by AGAA employees (acting as field assistants).

2.2.1 Survey design

A total of 112 quadrats located within 14 representative vegetation communities consisting of 55 reference and 57 impact sites were surveyed during the 2015 survey. This included the 106 quadrats (20 × 20 m) originally established in 2011 (consisting of 53 reference and 53 impact sites) along with two new impact sites established in 2012 and two new impact and reference sites established in 2014.

For the purposes of this report the sites have been grouped into the three core areas (Operational Area, Infrastructure Corridor and PWSB) listed by vegetation community. Each reference and impact sites have then been paired together. The vegetation communities selected for monitoring and their representative sites (grouped in pairs) are listed in **Table 2**. The locations of the quadrats in each core area are shown in **Figure 5**. Quadrat names, location coordinates and attributes are presented in **Appendix B**. More detailed maps of the quadrat locations in each core area are provided in **Appendix C**.

Table 2: Vegetation communities included in the Project Vegetation Monitoring Program and associated sites

Vegetation code (from ELA 2011)	Description of floristics	Sites		Number of sites
		Impact	Reference	
Operational Area				
A7a	*Acacia aneura* woodlands over grasses+/- *Triodia basedowii*	A7a-5	A7a-6	10
		A7a-10	A7a-9	
		A7a-8	A7a-7	
		A7a-1	A7a-4	
		A7a-2	A7a-3	
A7b	Open to moderately dense *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata*/ *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii*	A7b-2	A7b-1	4
		A7b-4	A7b-3	
C9	Open to moderately dense *Casuarina pauper* woodland over open mixed shrubs and scattered soft grasses and/or *Triodia scariosa*	C9-1	C9-3	4
		C9-2	C9-4	
E1b	Open *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii*	E1b-1	E1b-2	10
		E1b-8	E1b-7	
		E1b-3	E1b-4	
		E1b-5	E1b-6	
		E1b-10	E1b-9	
E3	Occasional *Eucalyptus gongylocarpa* over mixed upper stratum over *Daviesia grahamii*/*Pityrodia loricata*/*Chrysocephalum puteale* low shrubland over sparse to open *Triodia desertorum* or *T. basedowii and Lomandra leucocephala* subsp. *robusta*	E3-1	E3-2	6
		E3-3	E3-4	
		E3-5	E3-6	
Subtotal		17	17	34
Pinjin Infrastructure Corridor				
A2	Low Woodland to Tall Shrubland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* with *Acacia aneura* var. *argentea* over *Eremophila* spp., *Aluta maisonneuvei* subsp. *auriculata* and *Prostanthera* spp. This community occurs on orange sandy loam	A2-6	A2-5	12
		A2-1	A2-7	
		A2-9	A2-8	
		A2-2	A2-10	
		A2-3	A2-11	
		A2-4	A2-12	
A3	Low Open Woodland to Tall Open Shrubland of *Acacia*	A3-2	A3-1	6

Vegetation code (from ELA 2011)	Description of floristics	Sites		Number of sites
		Impact	Reference	
	ayersiana and *Acacia aneura* var. *aneura* over *Acacia* spp. and mixed shrubs. This community occurs on orange sandy loams	A3-4	A3-3	
		A3-5	A3-6	
A7b	Open to moderately dense *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata*/ *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii*	A7b-6	A7b-5	4 + 1 new in 2012
		A7b-7	A7b-8	
		A7b-9^		
E4	Low Woodland to Low Open Woodland of *Eucalyptus gongylocarpa* with *Callitris preissii* and *Eucalyptus* spp. over mixed shrubs over *Triodia* spp. This community occurs on orange, red-orange, yellow-orange and yellow sandy loams on mixed topographies	E4-3	E4-4	14
		E4-5	E4-6	
		E4-2	E4-1	
		E4-7	E4-8	
		E4-9	E4-10	
		E4-11	E4-12	
		E4-14	E4-13	
E9	Low Open Woodland of *Eucalyptus concinna* with *Eucalyptus* spp. over *Eremophila scoparia*, *Acacia hemiteles*, *Acacia colletioides*, *Scaevola spinescens* and *Eremophila caperata* over *Triodia scariosa*. This community occurs on orange sandy loams on flats	E9-2	E9-1	4
		E9-6	E9-5	
S8	Low Shrubland of *Acacia desertorum* var. *desertorum* with *Grevillea juncifolia*, low Myrtaceous shrubs and mixed low shrubs with occasional emergent *Eucalyptus youngiana* and *Eucalyptus* spp. This community occurs on pale orange sandy loams on flats	S8-2	S8-6	6 + 1 new in 2012
		S8-3	S8-1	
		S8-4	S8-5	
		S8-7^		
Subtotal		23 + 2 new in 2012	23	46 + 2 new in 2012
Water Supply Borefield				
E2	*Eucalyptus gongylocarpa* over mixed *Acacia* over mixed moderately open to moderately dense shrubs over *Triodia basedowii*	E2-5	E2-6	6
		E2-1	E2-4	
		E2-2	E2-3	
T1	Open to moderately open mixed shrubs over *Triodia basedowii*	T1-3	T1-1	4
		T1-4	T1-2	
X1	Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa*/ *E. youngiana* over mixed open shrubs and *Triodia basedowii*	X1-1	X1-2	16
		X1-15	X1-16	
		X1-11	X1-12	

Vegetation code (from ELA 2011)	Description of floristics	Sites		Number of sites
		Impact	Reference	
		X1-13	X1-14	
		X1-9	X1-10	
		X1-7	X1-8	
		X1-4	X1-6	
		X1-3	X1-5	
M1	Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii*.	M1-3*	M1-4*	4 new in 2014
		M1-1*	M1-2*	
Subtotal		13 + 2 new in 2014	13 + 2 new in 2014	26 + 4 new in 2014
TOTAL		53 + 2 new in 2012 + 2 new in 2014	53 + 2 new in 2014	106 + 2 new in 2012 + 4 new in 2014*

^ Site established in 2012, * Site established in 2014

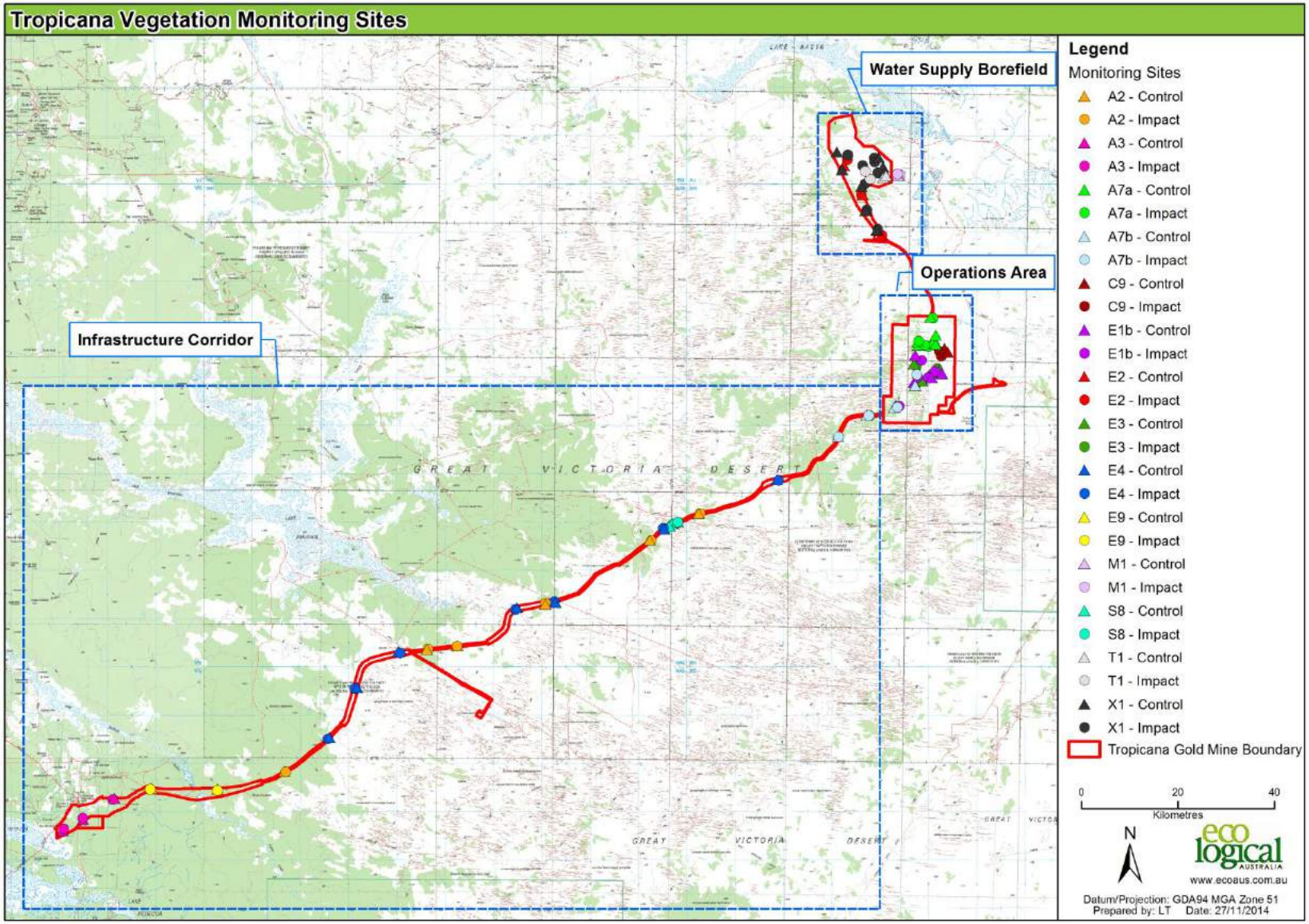


Figure 5: Field quadrat locations

2.2.2 Survey data collection

Vegetation condition

The following attributes were collected in each of the 112 sites (106 original quadrats from 2011, two additional quadrats established in 2012, and four additional quadrats established in 2014):

- Overall % foliar cover (estimate)
- % foliar cover based on vegetation strata (e.g. overstorey, midstorey, understorey)
- % bare soil
- Foliar condition for the quadrat, measured using two qualitative scales:
  - Browning scale of Green (healthy), Yellow (senescent), or Brown (dead or dying foliage)
  - Leaf loss scale (1 through to 5 with 1 indicating denuded branches and 5 indicating a full canopy of leaves)
- Disturbance (location and dimensions of tracks etc, marked on a map of the quadrat)
- Depth of erosion rills or gullies, or depth and dimensions of sediment deposition
- Other observations (e.g. recent fire occurrence, storm damage, weeds, pest or pathogen attack).

Indicator species selection

- An additional component of the 2015 monitoring program was to determine suitable indicator species at each site. The following methodology was applied for the selection of suitable indicator species:
  - Prior to the 2015 field survey, potentially suitable indicator species were pre-selected on the following basis:
    - species is widespread through the study area and dominant within each vegetation community;
    - species is present through time (e.g. ephemerals were excluded); and
    - species is present in impact site and its respective paired reference site.
  - During the field survey, the suitability of pre-selected indicator species was assessed. If a pre-selected species was found to be unsuitable, an alternative species was selected based on the above parameters.
- At each site, data was collected for each suitable indicator species on its abundance (number of individuals and % cover). This data will allow trends to be determined over successive monitoring years (e.g. rapid declines will be detected earlier for management considerations to be determined).

Photographic data

Photographic monitoring of each of the quadrats involved the following steps:

- A panoramic photograph was taken with the camera held at chest height directly above the northwest corner peg. A photo board, consisting of a sheet of paper on a clipboard with the site name and date written on it was placed approximately 5 m in front of the northwest corner peg to be visible in the photograph. A measuring pole was erected at the centre peg to a height of at least 2 m. Photographs were taken with two digital cameras (Sony DSC-HX50V) set on panorama. Note that for the 2011 and 2012 photographs, a canon PowerShot SX30 IS digital camera with a focal length of 4.3 mm was used.
- The panoramic photos started due east, and swept east to south, ending due south. As follows:

- due east along the quadrat boundary;
- southeast (towards the centre peg); and
- due south along the quadrat boundary.

2.2.3 Assessment of vegetation condition attributes

For the purposes of conducting an assessment of potential change in vegetation condition the sites have been grouped into the three core areas (Operational Area, Infrastructure Corridor and Water Supply Borefield) listed by vegetation community. Each of the reference and impact sites have then been paired together to allow for comparisons to be made.

Vegetation condition data was assessed to determine if any changes have occurred between 2014 and 2015 to assess if any patterns are emerging of a decreasing trend in vegetation condition. To determine if any changes have occurred between 2015 and the baseline data an assessment was undertaken against vegetation monitoring Trigger 1 (see section 2.3).

The assessment focussed on the following vegetation condition attributes:

- Comparisons of the percentage covers (overall) of each paired site, listed by each vegetation community in the three core areas
- Comparisons of measures of foliar condition
- Other observations, including erosion and weeds.

2.3 Evaluation of data against vegetation monitoring triggers

Assessments of data were undertaken against vegetation monitoring Trigger 1 (25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites), as outlined in the Environmental Monitoring Strategy (AGAA 2010) and reproduced in the Vegetation Monitoring Strategy (ELA and Tropicana JV 2011) (**Table 1**), were undertaken. Other assessments against monitoring Triggers 5-6 were also undertaken. Monitoring Triggers 5-6 refer to the presence, distribution, abundance and density/cover of invasive flora. Trigger 5 is defined as “Identification of a weed species in a site where it had not previously been recorded” and Trigger 6 is defined as “25% increase of weed species in abundance or cover relevant to reference site”. As part of the 2015 survey, indicator species were defined for Trigger 2 for the first time, to be assessed in subsequent years monitoring. Other assessments against Triggers 3-4 relating to clearing boundaries, Trigger 7 relating to monitoring weeds and Trigger 8-9 relating to weeds in rehabilitation areas were not undertaken as these do not directly relate to data collected as part of the VMP.

Assessments for Trigger 1 were conducted through comparisons of overall foliar cover.

In order to clearly show whether a deviation in cover greater than 25% has occurred the results have been colour-coded by ‘flags’ with green indicating impact sites within 25% investigation threshold, blue indicating impact sites that have an increase in cover which exceeds the 25% threshold and red indicating impact sites that have a decrease in cover which exceeds the 25% threshold, as shown in **Table 3** below.

Table 3: Colour-coded flags indicating deviation in cover for impact sites

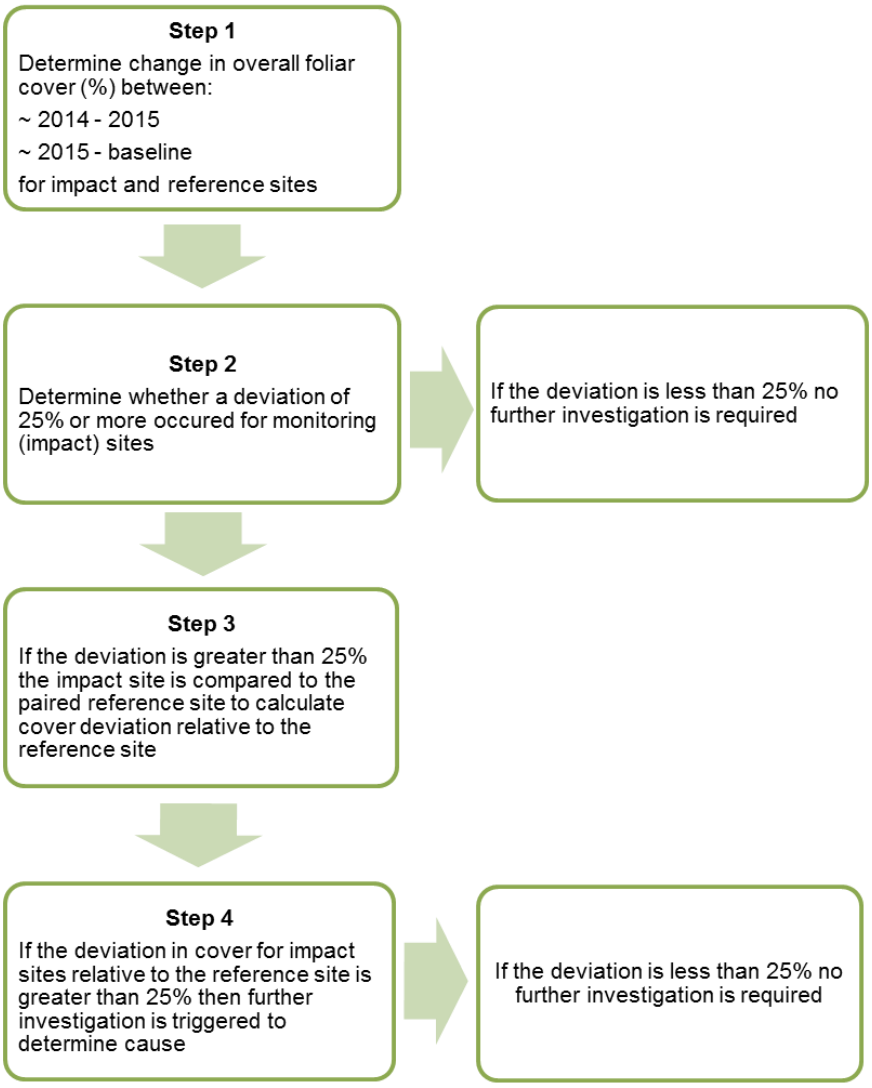
Flag	Definition
Green	Impact site/s within 25% threshold, no further investigation required
Blue	Impact site/s with an increase in cover which is at or exceeding the 25% threshold, further investigation required relative to the paired reference site

Flag	Definition
Red	Impact site/s with a decrease in cover which is at or exceeding the 25% threshold, further investigation required relative to the paired reference site

Comparisons of overall foliar cover were made between 2014 to 2015 data and the 2015 data was compared against the baseline. For analysis of previous data, the baseline was considered to be data collected in 2011 when the Project was initially established in Year 1. For the 2015 survey, a baseline dataset comprising the mean overall foliar cover (%) for years 2011, 2012 and 2013 was used in the analysis. This was considered more appropriate as it captures the year to year variability of the study area as a result of climatic influences, which provides a more robust baseline given the five year duration of monitoring to date.

Further assessments were then undertaken to determine whether a deviation in cover of 25% occurred for monitoring (impact) sites. If a deviation occurred that was greater than 25%, the impact site was then compared to the paired reference sites to calculate the change in cover for the impact site relative to the reference site. If impact sites showed a decreasing deviation in cover greater than 25% relative to the reference site further investigation was triggered. If impact sites showed an increasing deviation in cover greater than 25% relative to the reference site no further investigation was deemed to be required as this represents a positive trend in vegetation condition. This process is outlined in the flow diagram presented in **Table 4**.

Table 4: Flow diagram showing steps to investigate deviation in cover for Trigger 1



3 Results

3.1 Remote sensing

Comparison and assessment of SAVI imagery from 2015 and 2014 for changes showed some areas of change relating clearly to mine infrastructure development (e.g. roads, borrow pits, airstrip, operational areas etc.) and fire. However, no areas of secondary (targeted) impacts from the Project were identified.

Generalised patterns of changes found in the imagery were due to:

- Image to image mis-registration (image registration was with a 3 m allowable error, resulting in some areas of expected pixel misalignment)
- Changes in shadow due to variation in sun angle due to time of image capture in the day and changes in season
- Changes in canopy vigour, particularly in areas with higher levels of foliar cover. Canopy extent changed little throughout the image area; however minor increases in SAVI potentially reflected variation in vegetative vigour. This varied both within and between tiles with a general trend of lower plant canopy vigour potentially occurring near the northern limits of the capture area
- Increase in groundcover along some road sections, areas of bare ground and drainage lines
- Fluctuations in the water level of water bodies between years, showing either a dense area of increase (drying), or decrease (wetting).

Tile by tile comparison is included in **Appendix D** pictures of all tiles (colour 2014, colour 2015 and change 2014-2015) are supplied in the attached data disc. The location of each tile is shown in **Figure 4**.

3.2 Floristic survey and vegetation condition assessment

The results of the vegetation condition assessment are provided for the three core areas (Operational Area, Infrastructure Corridor and Water Supply Borefield) listed by vegetation community. The raw data sheets completed during the 2015 survey are provided in **Appendix E**.

3.2.1 Operations Area

Foliar cover, condition and other attributes

The foliar cover (%) data for the 2015 survey mostly remained consistent with the 2014 data for the Operations Area with minimal or no changes recorded. Three sites (A7a-2, A7a-5 and C9-1) each had a slight reduction (no more than a 10% difference) in overall foliar cover when compared to 2014 results. Furthermore three sites (A7a-2, E3-1 and E1b-3) had slightly reduced overstorey cover, three sites (A7a-8, E3-1 and C9-1) had reduced midstorey cover and four sites (A7a-1, A7a-8, A7b-4 and C9-2) had reduced understorey cover compared to 2014 results. The reduced cover difference at each of these sites for each stratum was no greater than 10%.

Comparison between the impact sites and their paired reference sites indicated a similar trend was occurring for both sites. It was noted during the survey that slight changes in cover at these sites was a result of natural processes including termite activity and senescence of older vegetation, and not as a result of the Project activities. For sites with a reduction in understorey cover, it was noted that annual species had died off. Analysis of results across all years indicates no impact sites within the Operations Area show a trend of decreasing overall foliar cover. The raw data for foliar cover between 2011 and 2015 is presented in **Appendix F**.

The raw data for foliar condition (browning scale and leaf loss scale) indicated that the foliar condition for the overstorey and midstorey was mostly recorded as green (healthy) for the 2015 survey. The understorey was mostly recorded as green (healthy) to yellow (senescent), with brown (dead or dying) recorded at one site, A7a-1. The brown foliar condition recorded at site A7a-1 was due to annual species die off. The leaf loss scale recorded in 2015 for the overstorey and midstorey was mostly 4 to 5, with 5 indicating a full canopy of leaves. Occasionally 3 was recorded in the overstorey and midstorey. In the understorey, leaf loss scale of 4 and 3 was mostly recorded, however, this was not considered significant as it represents the typical variation in response to climatic influences (e.g. annual species die off, *Triodia* spp. dying back in drier times). The raw data for foliar condition (browning scale and leaf loss scale) is presented in **Appendix G**.

No signs of erosion or deposition were recorded in any quadrats during the 2015 survey. No weed species were recorded in any quadrats during the 2015 survey in the Operations Area, which is consistent with the previous surveys between 2011 and 2014. As no weed species were recorded in any quadrats during the 2015 survey in the Operations Area Trigger 5 and Trigger 6 do not require further investigation.

Evaluation of data against vegetation monitoring triggers

Comparisons of overall foliar cover (%) were made for the impact sites between 2015 to 2014 data and the 2015 data was compared against the baseline (comprising mean overall foliar cover for 2011, 2012 and 2013). **Table 5** presents the overall foliar cover deviation values for the two comparisons with the colour-coded flags (as described in Section 2.3). It also shows the difference between impact sites relative to the reference site (for impact sites that had an overall foliar cover deviation of more than 25%).

There were three impact sites (A7a-10, A7a-2 and A7a-8) that had an increase or decrease in overall foliar cover by more than 25% for the 2015 - baseline comparison. Three sites (A7a-10, A7a-2 and A7a-1) also had an increase or decrease in overall foliar cover by more than 25% for the 2015 - 2014 comparison.

Site A7a-2 had a decrease in overall foliar cover by 25% or more for both the 2015 – baseline and 2015 – 2014 comparisons. The corresponding paired reference site (A7a-3) also showed the same result of a negative deviation for both comparisons. It was evident during the field survey that both of these sites experience prominent termite activity. The spinifex at site A7a-2 was also dying back, which is part of the lifecycle of this species in drier conditions; this also contributed to reduction in cover. A comparison with photo monitoring indicates no mining related disturbances are occurring at this site (**Figure 6**). Furthermore, when the deviation of A7a-2 is compared to the deviation for A7a-3, the deviation was no more than 25%, for comparisons between both 2015 – baseline and 2015 – 2014. There was therefore no requirement to undertake further investigation under Trigger 1.

A7a-10 and A7a-8 had an increase in overall foliar cover which exceeded 25% for the comparison between 2015 - baseline. Sites A7a-10 and A7a-1 had an increase which exceeded 25% for the comparison of 2015 - 2014 results. When these impact sites were compared to the paired reference site, the difference was greater than 25% for A7a-8 and A7a-10. As these sites show an increase in overall foliar cover, there was no requirement to investigate further under Trigger 1.

Table 5: Overall foliar cover deviation (%) for impact sites in the Operations Area

Site	Site type	% deviation of 2015 relative to baseline^	Difference between % deviation of impact relative to reference quadrats for 2015 – baseline^	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
A7a-5	Impact	3	n/a	-7	n/a
A7a-6	Reference	50		25	
A7a-10	Impact	41	5	33	25
A7a-9	Reference	36		9	
A7a-8	Impact	29	67	20	n/a
A7a-7	Reference	-38		-33	
A7a-1	Impact	15	n/a	25	15
A7a-4	Reference	10		10	
A7a-2	Impact	-38	-5	-25	18
A7a-3	Reference	-33		-43	
C9-1	Impact	-10	n/a	-14	n/a
C9-3	Reference	-27		-38	
C9-2	Impact	20	n/a	0	n/a
C9-4	Reference	6		0	

Site	Site type	% deviation of 2015 relative to baseline^	Difference between % deviation of impact relative to reference quadrats for 2015 – baseline^	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
E1b-1	Impact	-2	n/a	0	n/a
E1b-2	Reference	41		33	
E3-1	Impact	17	n/a	0	n/a
E3-2	Reference	11		-7	
E1b-8	Impact	14	n/a	14	n/a
E1b-7	Reference	11		0	
A7b-2	Impact	4	n/a	0	n/a
A7b-1	Reference	10		0	
E3-3	Impact	4	n/a	0	n/a
E3-4	Reference	3		13	
A7b-4	Impact	0	n/a	0	n/a
A7b-3	Reference	-9		0	
E1b-3	Impact	19	n/a	0	n/a
E1b-4	Reference	11		0	
E1b-5	Impact	-3	n/a	20	n/a
E1b-6	Reference	14		0	
E1b-10	Impact	19	n/a	0	n/a
E1b-9	Reference	31		17	
E3-5	Impact	4	n/a	0	n/a
E3-6	Reference	14		0	

^Baseline was derived from mean overall foliar cover (%) for 2011, 2012, 2013, n/a = not applicable as the deviation is less than 25% no further investigation is required

Figure 6: Photo taken at site A7a-2 during the 2015 October survey (there are no mining related impacts occurring at this site)

3.2.2 Infrastructure Corridor

Foliar cover, condition and other attributes

The foliar cover (%) data for the 2015 survey mostly remained consistent with the 2014 data for the Infrastructure Corridor with minimal or no changes recorded. Three sites (S8-7, A2-1 and A7b-6) each had a slight reduction (no more than a 5% difference) in overall foliar cover when compared to 2014 results. Five sites (E9-2, E4-3, E4-5, A2-3 and A7b-6) had slightly reduced overstorey cover, two sites (A2-1 and A2-4) had reduced midstorey cover and three sites (E4-5, A2-3 and A2-9) had reduced understorey cover compared to 2014 results. The reduced cover difference at each of these sites for each stratum was no greater than 15%. Dust coating of vegetation was observed at sites S8-7 and A7b-6 however there was no sign of this affecting vegetation health. The slight decline of vegetation at these sites appears to be due to the effects of a past fire and senescence of older vegetation. The reduction in understorey cover in site A2-9 was due to change in vegetation as it matures after fire; shrubs previously in the understorey have naturally thinned out and moved into the midstorey. All remaining sites had vegetation decline due to senescence of old vegetation, collapse of vegetation impacted by past fire and/or annual species die off. Analysis of results across all years indicates no impact sites within the Infrastructure Corridor show a trend of decreasing overall foliar cover. The raw data for foliar cover for 2011-2015 is presented in **Appendix H**.

The raw data for foliar condition (browning scale and leaf loss scale) had a similar result seen in the Operations Area. The foliar condition for the overstorey and midstorey was mostly recorded as green (healthy) with occasional yellow (senescent) for the 2015 survey. The understorey was mostly recorded from green (healthy) to yellow (senescent), with one brown (dead or dying) recorded from sites S8-4. Site S8-4 has been partially cleared (with approval) and is currently is a state of regeneration. The brown rating was assigned as some shrubs were dying, as revegetation is adapting to altered site conditions (e.g. soil disturbance). Overall within this site however, the regenerating vegetation was healthy and recruitment was adequate (**Figure 7**).

The leaf loss scale for 2015 recorded mostly 4 to 5, with 5 indicating a full canopy of leaves. On occasion, a score of 3 was recorded. For some sites this was due to the effects of fire in the past which has killed some vegetation (though leaves were retained in places and have died, this was particularly seen with Acacias). Similarly to the Operations Area, other sites where a leaf loss scale of 3 or 4 was recorded are showing typical response to climatic conditions at the time of the survey (e.g. annual species dying off). As the lower leaf loss scales recorded for some sites are due to natural processes, they do not require further investigation. The raw data for foliar condition (browning scale and leaf loss scale) is presented in **Appendix I**.

No signs of erosion or deposition were recorded in any quadrats during the 2015 survey. No weed species were recorded in any quadrats during the 2015 survey in the Infrastructure Corridor, and therefore Trigger 5 and Trigger 6 were not exceeded. However, **Salvia verbenaca* (Wild Sage) was recorded approximately 50 m from the boundary of A3-4 on the southern end of the road. Given this weed was recorded in the same location in 2014 it is recommended that it is monitored and managed to prevent its spread along the infrastructure corridor towards the operational area.

Evaluation of data against vegetation monitoring triggers

Comparisons of overall foliar cover (%) were made for the impact sites between 2015 and 2014 data and the 2015 data was compared against the baseline (comprising mean overall foliar cover (%) for 2011, 2012 and 2013). **Table 6** presents the overall foliar cover deviation values for the two comparisons with the colour-coded flags (as described in Section 2.3). It also shows the difference

between impact sites relative to the reference site for impact sites that had an overall foliar cover (deviation of more than 25%) between 2015 and 2014 data and 2015 data compared against the baseline.

A comparison between 2015 and the baseline dataset identified seven impact sites (A2-6, E4-11, S8-2, S8-3, S8-7, E4-14 and A7b-7) that had an overall foliar cover deviation of 25% or more. Sites E4-11, S8-2, S8-3 and S8-7 all showed a decrease in overall foliar cover. These sites are all experiencing post-fire regeneration (**Figure 8**). The paired reference sites were also burnt and are at a similar post-fire regeneration phase as the impact sites. The paired reference sites show the same trend in overall foliar cover decline as the impact sites. Comparisons between the deviation of these impact sites with their respective reference site show the deviation is no more than 25%, therefore, there was no requirement to further investigate under Trigger 1. The impact site A2-6 also had a deviation greater than 25% relative to its reference site A2-5, however as this was an increase in cover, no further investigations are required for this impact site under Trigger 1. The deviation for sites E4-14 and A7b-7 relative to their paired reference site was no more than 25%, therefore these sites do not require further investigation under Trigger 1.

The 2015 to 2014 comparison identified five sites (E9-2, A2-6, S8-4, E4-14 and A7b-7) that had an overall foliar cover deviation of 25% or more. Relative to their respective reference sites, these impact sites either did not exceed 25% deviation, or where they did they show an increase in vegetation cover and therefore do not require further investigations under Trigger 1.

Table 6: Overall foliar cover deviation (%) for impact sites in the Infrastructure Corridor sites

Site	Site type	% deviation of 2015 relative to baseline*	Difference between % deviation of impact relative to reference quadrats for 2015 - baseline*	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
A3-2	Impact	-18	n/a	0	n/a
A3-1	Reference	-20		0	
A3-4	Impact	11	n/a	0	n/a
A3-3	Reference	17		17	
A3-5	Impact	6	n/a	0	n/a
A3-6	Reference	-3		0	
E9-6	Impact	0	n/a	14	n/a
E9-5	Reference	-8		0	
E9-2	Impact	4	n/a	29	-11
E9-1	Reference	30		40	
A2-6	Impact	38	45	33	33
A2-5	Reference	-6		0	
E4-3	Impact	14	n/a	0	n/a
E4-4	Reference	20		-20	

Site	Site type	% deviation of 2015 relative to baseline*	Difference between % deviation of impact relative to reference quadrats for 2015 - baseline*	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
E4-5	Impact	5	n/a	0	n/a
E4-6	Reference	-18		-25	
E4-2	Impact	17	n/a	0	n/a
E4-1	Reference	-9		0	
A2-1	Impact	14	n/a	-11	n/a
A2-7	Reference	0		-43	
A2-9	Impact	18	n/a	10	n/a
A2-8	Reference	66		-6	
E4-7	Impact	0	n/a	0	n/a
E4-8	Reference	20		0	
A2-2	Impact	3	n/a	0	n/a
A2-10	Reference	-4		0	
E4-9	Impact	-10	n/a	0	n/a
E4-10	Reference	-5		0	
A2-3	Impact	13	n/a	0	n/a
A2-11	Reference	0		0	
E4-11	Impact	-44	-1	0	n/a
E4-12	Reference	-42		25	
S8-2	Impact	-49	-12	20	n/a
S8-6	Reference	-36		17	
S8-3	Impact	-40	14	9	n/a
S8-1	Reference	-54		0	
S8-4	Impact	-4	n/a	33	45
S8-7	Impact	-40	9	-6	n/a
S8-5	Reference	-49		-12	
A2-4	Impact	15	n/a	0	n/a
A2-12	Reference	28		-5	
E4-14	Impact	29	-17	33	12
E4-13	Reference	45		21	
A7b-6	Impact	4	n/a	-11	n/a

Site	Site type	% deviation of 2015 relative to baseline*	Difference between % deviation of impact relative to reference quadrats for 2015 - baseline*	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
A7b-5	Reference	-23		-20	
A7b-7	Impact	25	20	100	108
A7b-9	Impact	5	n/a	0	n/a
A7b-8	Reference	-8	n/a	-8	

* S8-7 and A7b-9 were established in 2012 due to approved mining activities resulting in sites S8-4 and A7b-7 being disturbed. The paired reference sites remain the same.

n/a = not applicable as the deviation is less than 25% no further investigation is required

^Baseline was derived from mean overall foliar cover (%) for 2011, 2012, 2013

2014

2015

Figure 7: Recruitment of vegetation following pre-approved clearing at Site S8-4

2014

2015

Figure 8: Photographs of post-fire regeneration at site S8-2 in 2014 and 2015

3.2.3 Process Water Supply Borefield

Floristic survey, foliar cover, condition and other attributes

The foliar cover (%) data for the 2015 survey mostly remained consistent with the 2014 data for the PWSB with minimal or no changes recorded. Three sites (X1-4, X1-7 and T1-4) recorded a slight reduction (no more than a 10% difference) in overall foliar cover when compared to 2014 results. No sites recorded a significant difference (greater than 10%) in overstorey and midstorey cover compared to 2014 results. Five sites (E2-1, X1-4, X1-7, X1-11 and T1-4) recorded a slightly reduced understorey cover compared to 2014 results; however this was no more than a 10% difference. Comparison between the impact sites and their paired reference sites indicates a similar trend was occurring at both sites with a slight decline in understorey cover. This is owed to annual grass die off that had previously been burnt in 2012. It is typical of post-fire regeneration to thin out as it matures, this can be particularly pronounced in the understorey as shrubs and trees grow into upper strata. Furthermore, some fire dependent species have reduced in cover since the 2012 fire, such as fire ephemerals and other short-lived species. This is a natural process post-fire as these species rapidly reproduce and decline in cover and return to the soil-seed bank. Analysis of results across all years indicates that no impact sites within the Water Supply Borefield show a trend of decreasing overall foliar cover. The raw data for foliar cover between 2011 and 2015 is presented in **Appendix J**.

The raw data for foliar condition (browning scale and leaf loss scale) indicated that the foliar condition for the overstorey and midstorey, where present (these layers were sometimes absent in burnt sites), was green (healthy) for the 2015 survey. The understorey was mostly recorded as green (healthy) with occasional yellow (senescent) due to annual species die off. The leaf loss scale recorded in 2015 for the overstorey, midstorey and understorey was mostly 4 to 5, with 5 indicating a full canopy of leaves. The leaf loss scale recorded during the 2015 survey was not considered significant. The raw data for foliar condition (browning scale and leaf loss scale) is presented in **Appendix K**.

It was noted during the survey that there were soil piles in the southwest corner of site E2-1, which was from pre-approved clearing undertaken for a pipeline. No other signs of erosion or deposition were recorded during the 2015 survey. No weed species were recorded in any quadrats during the 2015 survey in the PWSB, which is consistent with the previous surveys from 2011 to2014. Given no weed species were recorded in the PWSB Trigger 5 and Trigger 6 do not require further investigation.

Evaluation of data against vegetation monitoring triggers

Comparisons of overall foliar cover (%) were made for the impact sites between 2015 and2014 data and the 2015 data was compared against the baseline (comprising mean overall foliar cover for 2011, 2012 and 2013). **Table 7** presents the overall foliar cover deviation values for the two comparisons with the colour-coded flags (as described in Section 2.3). It also shows the difference between impact sites relative to the reference sites, for impact sites that had an overall foliar cover deviation of more than 25%.

A comparison between 2015 and baseline data identified eight impact sites (E2-5, X1-1, E2-1, X1-15, X1-11, X1-13, X1-9 and X1-7) that showed a decrease in overall foliar cover by more than 25%. When these impact sites were compared to the paired reference site there were two impact sites (X1-9 and X1-11) that had a negative difference of -33% and -59% respectively relative to the paired reference site. These impact sites were subjected to a fire in 2012 and continue to regenerate with increasing cover recorded over each subsequent year showing that the vegetation is recovering (**Figure 9**). It was noted that many of the individual plants have survived and had grown in size (such as *Grevillea* sp, *Acacia* sp, *Hakea* sp), which was confirmed through comparing of the photographic monitoring. As the

decrease in cover has been previously determined to be a result of a previous fire there was no requirement to further investigate under Trigger 1. Site X1-1 had an increase in cover more than 25% relative to its reference site (A2-5). Furthermore, the deviation of overall foliar cover for impact site T1-4 exceeded 25% compared to the baseline and also exceeded 25% relative to its paired reference site. As sites X1-1 and T1-4 showed an increase in cover relative to their paired reference sites they do not require further investigations under Trigger 1.

There were no sites that had a decrease in overall foliar cover of more than 25% for the 2015 to2014 comparison. Six impact sites (X1-1, E2-1, X1-15, X1-9, M1-2 and M1-3) had an overall increase in cover of more than 25% in the 2015 to 2014 comparison. Of these, sites X1-1, E2-1 and X1-9 had a difference in deviation for overall foliar cover of greater than 25% when compared to their respective reference sites. However, given the deviation was an increase in cover, no further investigations were required under Trigger 1.

Table 7: Overall foliar cover deviation (%) for impact sites in the Water Supply Borefield

Site	Site type	% deviation of 2015 relative to baseline*	Difference between % deviation of impact relative to reference quadrats for 2015 - baseline*	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
E2-5	Impact	-48	-10	11	n/a
E2-6	Reference	-38		33	
X1-1	Impact	-40	35	25	25
X1-2	Reference	-75		0	
E2-1	Impact	-29	13	67	67
E2-4	Reference	-42		0	
E2-2	Impact	3	n/a	0	n/a
E2-3	Reference	-13		20	
X1-15	Impact	-33	21	100	13
X1-16	Reference	-54		88	
X1-11	Impact	-33	-33	0	n/a
X1-12	Reference	0		0	
T1-3	Impact	3	n/a	0	n/a
T1-1	Reference	49		-29	
T1-4	Impact	39	30	-10	n/a
T1-2	Reference	9		-11	
X1-13	Impact	-31	-8	0	n/a
X1-14	Reference	-22		25	
X1-9	Impact	-38	-59	25	39

Site	Site type	% deviation of 2015 relative to baseline*	Difference between % deviation of impact relative to reference quadrats for 2015 - baseline*	% deviation of 2015 sites relative to 2014 sites	Difference between % deviation of impact relative to reference quadrats for 2015 - 2014
X1-10	Reference	22		-14	
X1-7	Impact	-25	24	-29	21
X1-8	Reference	-49		-50	
X1-4	Impact	0	n/a	-22	n/a
X1-6	Reference	68		0	
X1-3	Impact	-23	n/a	0	n/a
X1-5	Reference	-32		0	
M1-1	Impact	n/a	n/a	29	-21
M1-2	Reference	n/a		50	
M1-3	Impact	n/a	n/a	25	-6
M1-4	Reference	n/a		31	

^Baseline was derived from mean overall foliar cover (%) for 2011, 2012, 2013

n/a = not applicable as the deviation if less than 25% no further investigation is required

2014

2015

Figure 9: An example of healthy post-fire recruitment at a site (Site X1-11) burnt in 2012

3.3 Indicator species

During the 2015 survey, species were selected to be used as appropriate indicators in assessing against Trigger 2. Trigger 2 is described as "25% deviation of indicator species within monitoring (impact) sites relative to reference sites". A single indicator species was selected for each paired site. Species selected for the sites within each of the core areas along with density / cover values for each species are presented in **Appendix L**. As this is the first year identifying indicator species, the information collected will be used as baseline data against which future year's assessments will be compared.

3.4 Photographic monitoring

Photographs for each quadrat are presented for the 2011 through to 2015 surveys in **Appendix M**. Photographs for 2015 include those taken in April at six months following the 2014 survey along with photographs taken in October, during the 2015 monitoring survey.

The photographic monitoring supports the findings of the vegetation condition assessment, showing no sign of non-approved or indirect impacts from the Project are occurring. The photographs also demonstrated that overall foliar covers remained stable between the years 2014 and 2015.

4 Discussion

4.1 Remote sensing

Remote sensing detected changes between 2014 and 2015 resulting from approved additional mine infrastructure development (e.g. roads, borrow pits, airstrip, operational areas), changes in canopy vigour, increases in groundcover along some road sections, bare ground and drainage lines, and fluctuations in the water levels of water bodies associated with the mine. The remote sensing analysis detected large areas of vegetation change, which are likely to be the result of fire (in the vicinity of Road Section 6 and Road Sections 11 and 12) and an area of vegetation change which is likely to represent a fire break (**Figure 10** to **Figure 12**). The analysis did not detect any changes in vegetation that were directly or indirectly attributable as an impact from the Project and therefore there is no requirement for further investigation for any of the vegetation monitoring triggers. Furthermore, no significant change was detected within any of the field monitoring sites. The results of the remote sensing analysis were consistent with field survey results and confirm the process as a sensitive and robust tool for quantitatively measuring change.

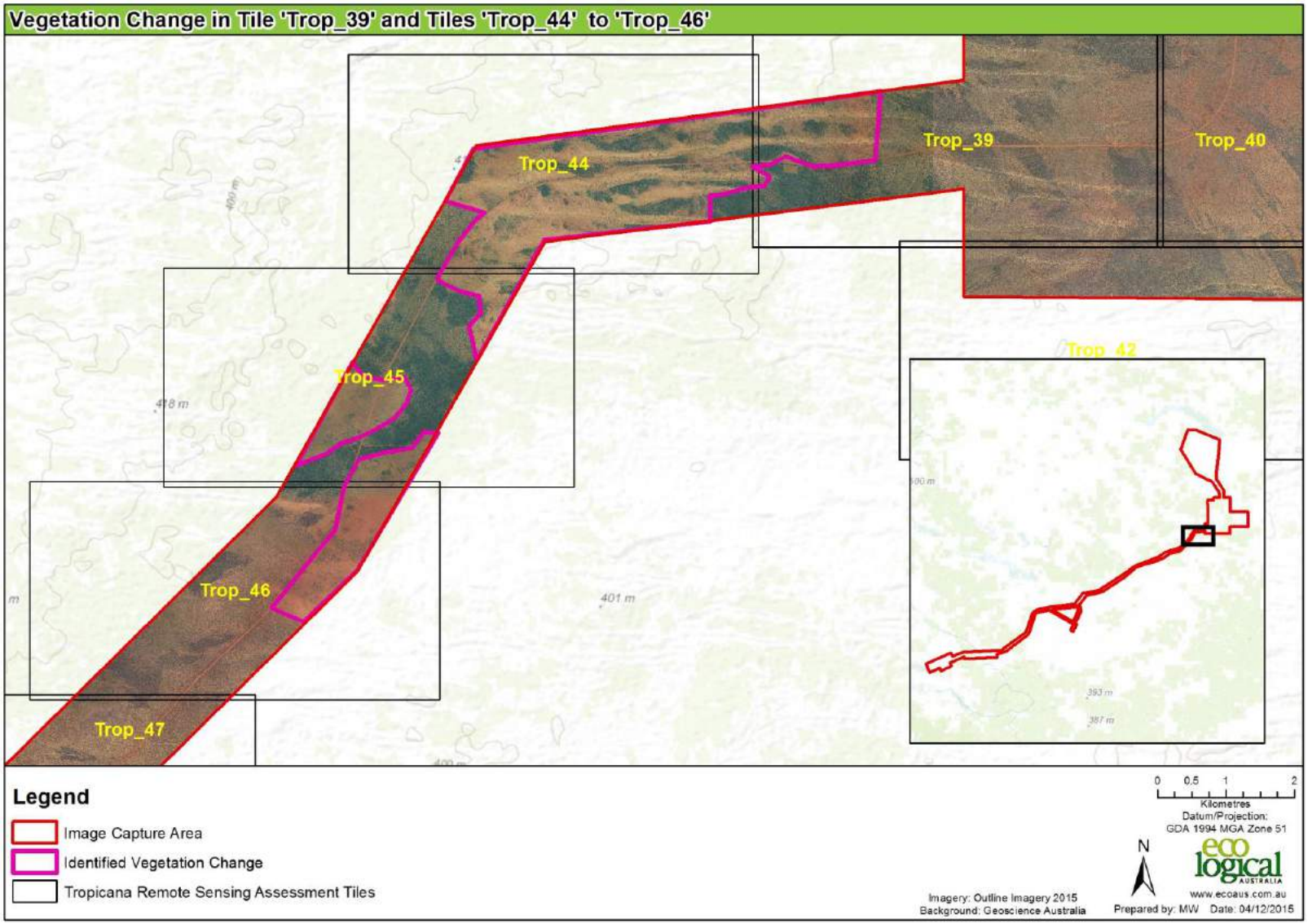


Figure 10: Identified vegetation change from fire impact in Tiles 39 and 44-46 (Road sections 11 and 12)

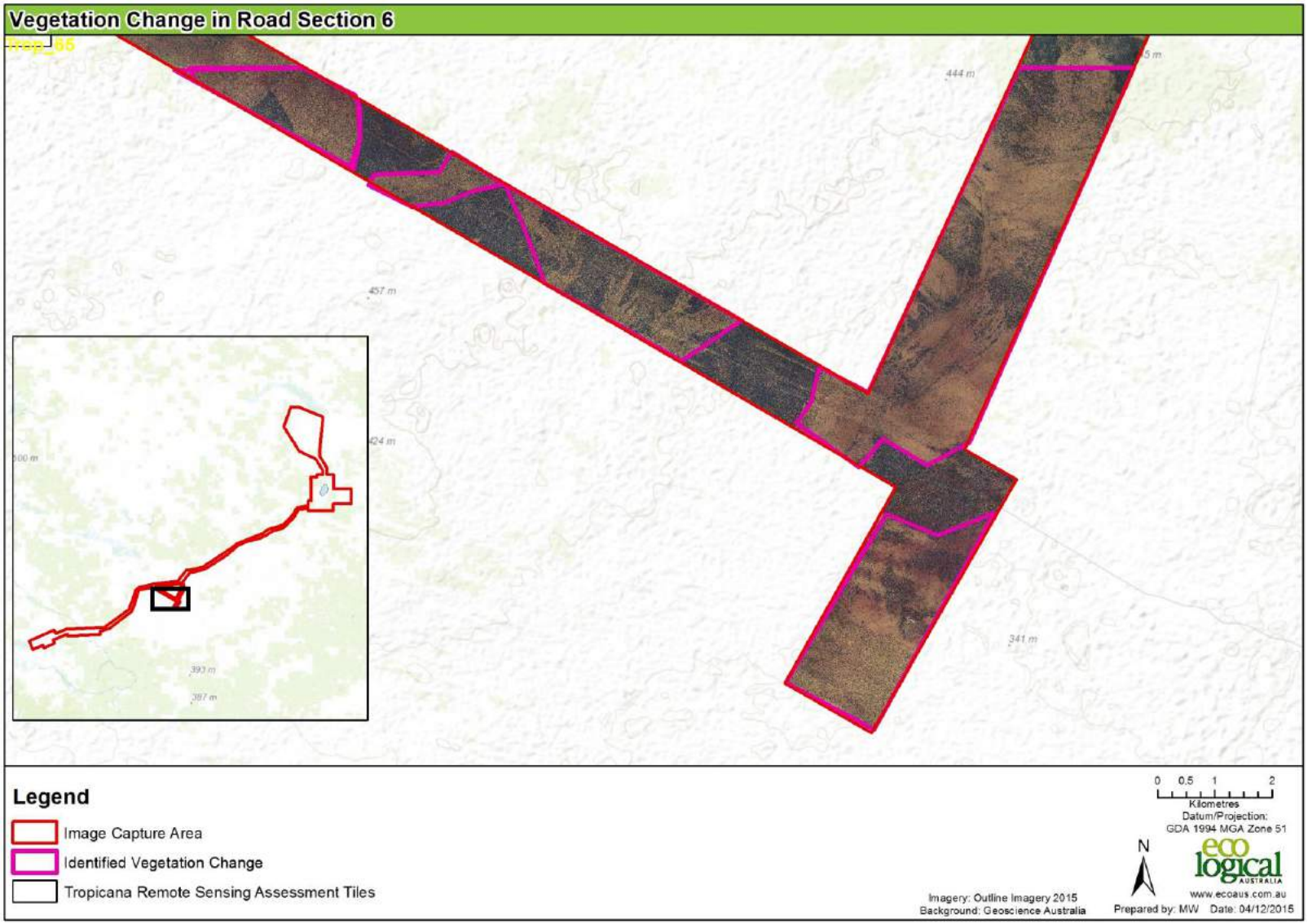


Figure 11: Identified vegetation change from fire in Road Section 6

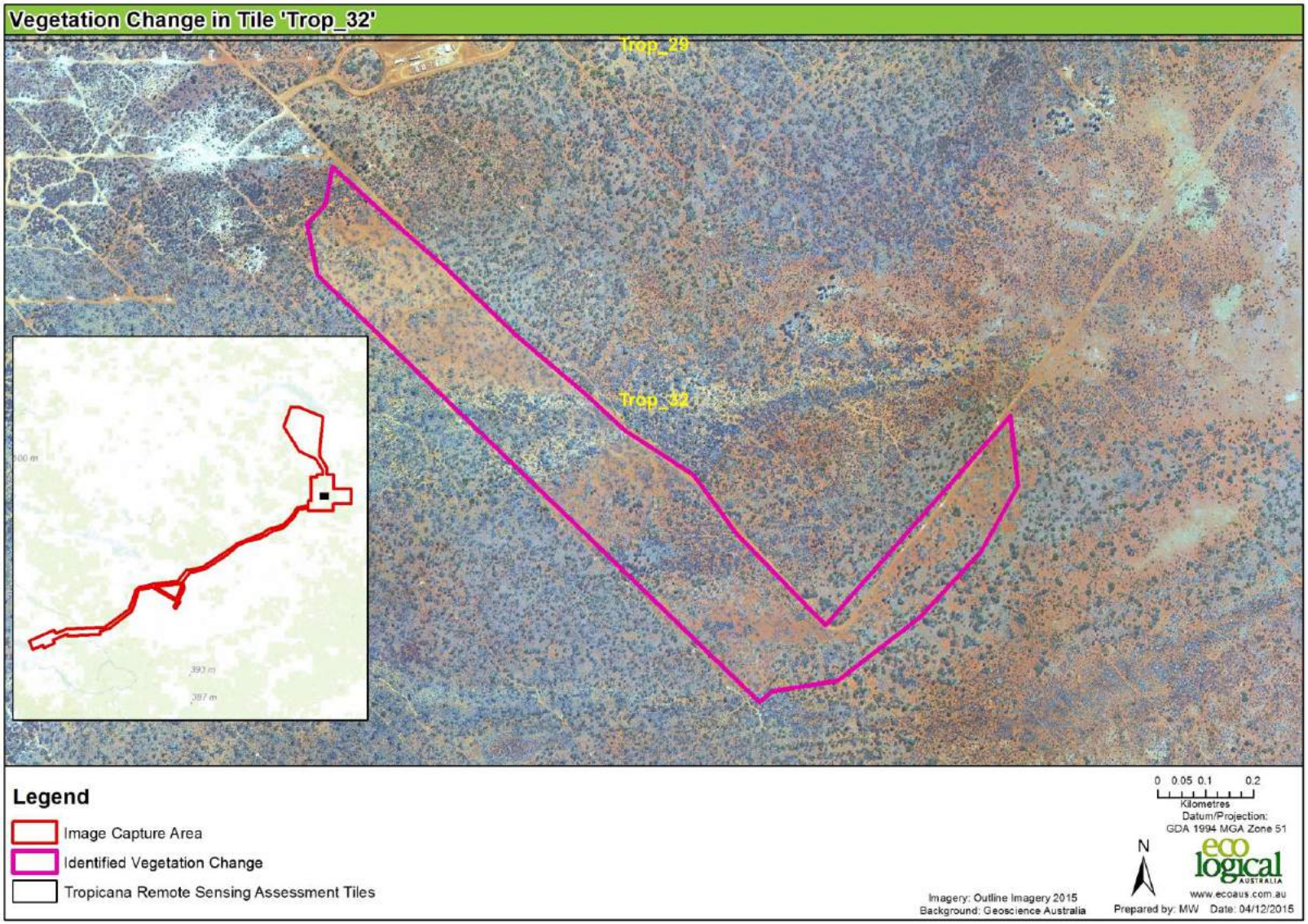


Figure 12: Identified vegetation change in Tile 'Trop_32' (Mine Section 5)

4.2 Operations Area

The results of the vegetation cover assessment of the sites in the Operations Area indicated that the percentage foliar cover remained stable during the 2015 to 2014 assessment, with minimal or no changes recorded. To determine if any changes have occurred between 2015 and the baseline data an assessment was undertaken against vegetation monitoring Trigger 1.

The small changes that were detected were due to natural processes, particularly termites, senescence of older vegetation and climatic influences (e.g. annual species dying off and *Triodia* spp. dying back which is part of its lifecycle in drier times). No trends indicating an ongoing decline in vegetation cover were observed in the operations area.

Similarly, the foliar condition (browning scale and leaf loss scale) results indicated vegetation in the upper storey and midstorey to be healthy. While foliar condition in the understorey shows evidence of some vegetation yellowing, this is due to a large presence of annual species dying off and *Triodia* spp. in some sites (where dying off is a natural part of its lifecycle). Foliar cover and condition results indicates that no impacts, such as roadside dust, are occurring from the Project. This is further supported by the findings from the remote sensing. No signs of erosion or deposition were recorded in any quadrats during the 2015 survey.

The comparison of impact sites and paired reference sites showed no overall foliar cover deviation decrease of more than 25% for the 2015-2014 and 2015-baseline comparisons. As a result, further investigation of Trigger 1 was not required.

No weed species were recorded in any quadrats in the Operations Area, and therefore Trigger 5 and Trigger 6 do not require further investigation. While no weed species were recorded, it is recommended that weed hygiene measures are continually maintained to prevent the spread of weeds, such as **Salvia verbenaca* (Wild Sage), which was recorded along the Infrastructure Corridor (outside of the monitoring quadrats).

4.3 Infrastructure Corridor

The results of the vegetation cover assessment of the sites in the Infrastructure Corridor found that the foliar covers remained stable during the 2015 to 2014 assessment, with minimal or no changes recorded. To determine if any changes have occurred between 2015 and the baseline data an assessment was undertaken against vegetation monitoring Trigger 1. Small decreases observed were attributed to the effects of a past fire, and annual species die off, and senescence of older vegetation.

The foliar condition (browning scale and leaf loss scale) was similar to the results from the Operations Area, indicating the vegetation is maintaining good health with typical responses to climatic conditions (e.g. annual species drying off). No signs of erosion or deposition were recorded in any quadrats during the 2015 survey. Some sites did have dust coated vegetation, however this did not appear to be affecting vegetation cover or condition.

Several impact sites (A2-6, E4-11, S8-2, S8-3, S8-7, E4-14 and A7b-7) had a decrease in overall foliar cover which exceeded 25% deviation for the 2015-baseline comparison. These sites have all been burnt and are currently experiencing post-fire regeneration. Comparisons between the deviation of these impact sites with their respective reference site show the deviation is no more than 25%, or were an increase in cover of more than 25%, therefore no further investigation was required under Trigger 1.

Although no weed species were recorded within any quadrats, **Salvia verbenaca* (Wild Sage) is still present at the southern end of the Infrastructure Corridor (as noted in the 2014 survey). As **Salvia*

verbenaca was not recorded within any sites Trigger 5 and Trigger 6 were not exceeded. However, it is recommended that this weed species is monitored and managed to prevent its spread along the infrastructure corridor towards the mine areas.

4.4 Water Supply Borefield

The results of the vegetation cover assessment of the sites in the PWSB show the foliar cover for the 2015 survey remained relatively consistent with the 2014 results. Small changes that were observed were mostly attributed to annual species die off or were a result of post fire regeneration where the vegetation was maturing and structural changes occurred (e.g. Shrubs previously in the understorey are now recorded as cover in the midstorey).

The foliar condition results also indicated the vegetation is healthy in the Water Supply Borefield, with the only yellowing or dying vegetation recorded in the understorey due to the annual species reaching the end of the growing season and senescing after setting seed.

Soil piles were present near site E2-1 that were determined to be from a nearby approved pipeline construction. This was not observed to be affecting vegetation cover or foliar condition, nor was any erosion present.

Two sites (X1-9 and X1-11) had a decrease in deviation of overall foliar cover which exceeded 25% relative to their paired reference sites. This was detected in the comparison between 2015 and the baseline results. These sites were burnt in 2012 and were currently experiencing post-fire regeneration. The vegetation cover at these sites has been increasing each subsequent year of the monitoring program since the fire. As the vegetation cover decline is due to a fire and is successfully regenerating, no further investigation was required under Trigger 1.

As no weed species were recorded in any quadrats during the 2015 survey, Trigger 5 and Trigger 6 did not require further investigation. While no weed species were recorded it is recommended that weed hygiene measures are continually maintained to prevent the spread of weeds, such as **Salvia verbenaca* (Wild Sage).

4.5 Summary and recommendations

Overall no impact sites in any of the three core areas require further investigation under Triggers 1, 5 and 6.

Two sites had a decrease in overall foliar cover (%) which exceeded 25% deviation relative to their respective reference sites. These sites were impacted by a fire in 2012. Several other sites exceeded a 25% deviation in the comparisons of overall foliar cover (%) between 2015 to 2014 and 2015 to baseline. These sites had reduced cover due to natural processes, including fire and climatic influences. Most sites were showing no change in cover or had increasing cover (typically seen at sites experiencing post-fire regeneration), suggesting no impacts from the Project were occurring. This is further supported by the findings from the remote sensing component of the VMP.

The following recommendations are provided for consideration for future monitoring:

- If expansion of the PWSB occurs, consider establishing additional monitoring sites, to detect any impacts in these areas
- Strict vehicle and equipment weed hygiene measures are continually adhered to prevent the spread of weeds, such as *Salvia verbenaca (Wild Sage).

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Eco Logical Australia (ELA). 2011. *Tropicana Gold Project: Vegetation Monitoring Program – 2011 Baseline Survey*. Prepared for Tropicana Joint Venture.

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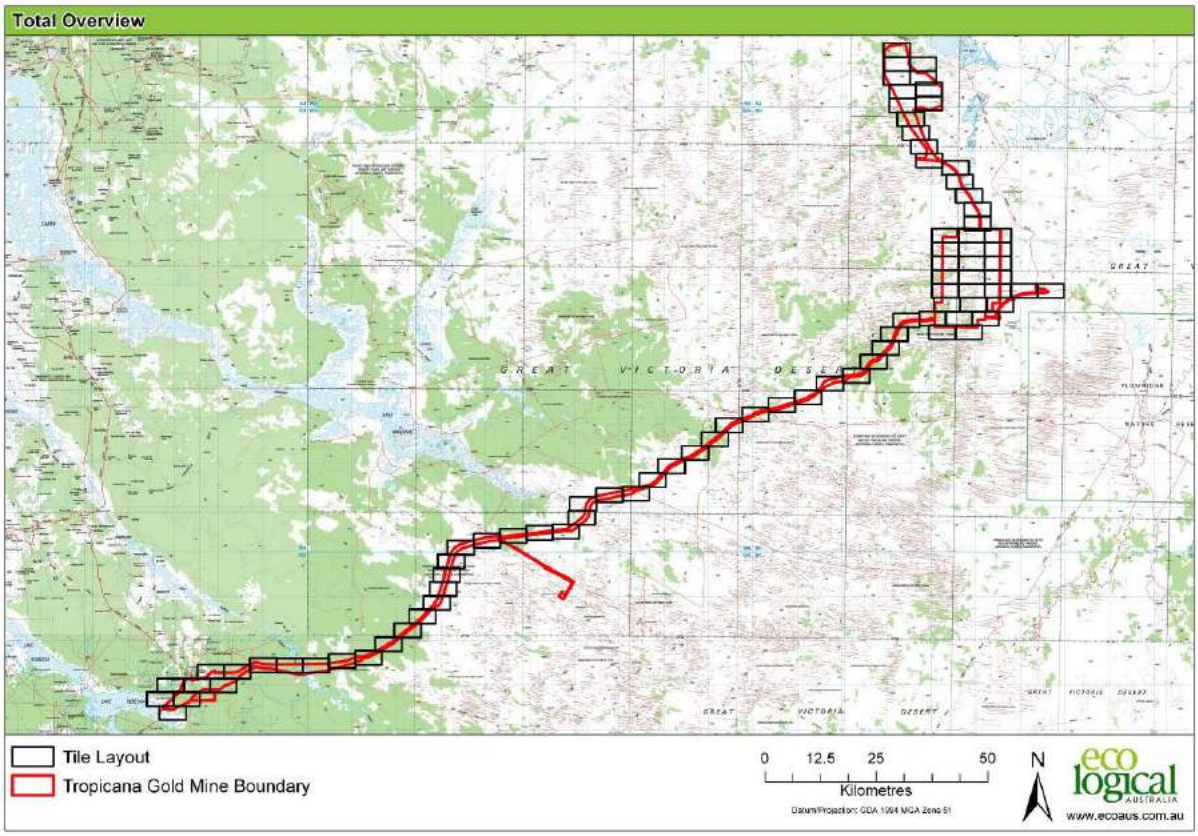
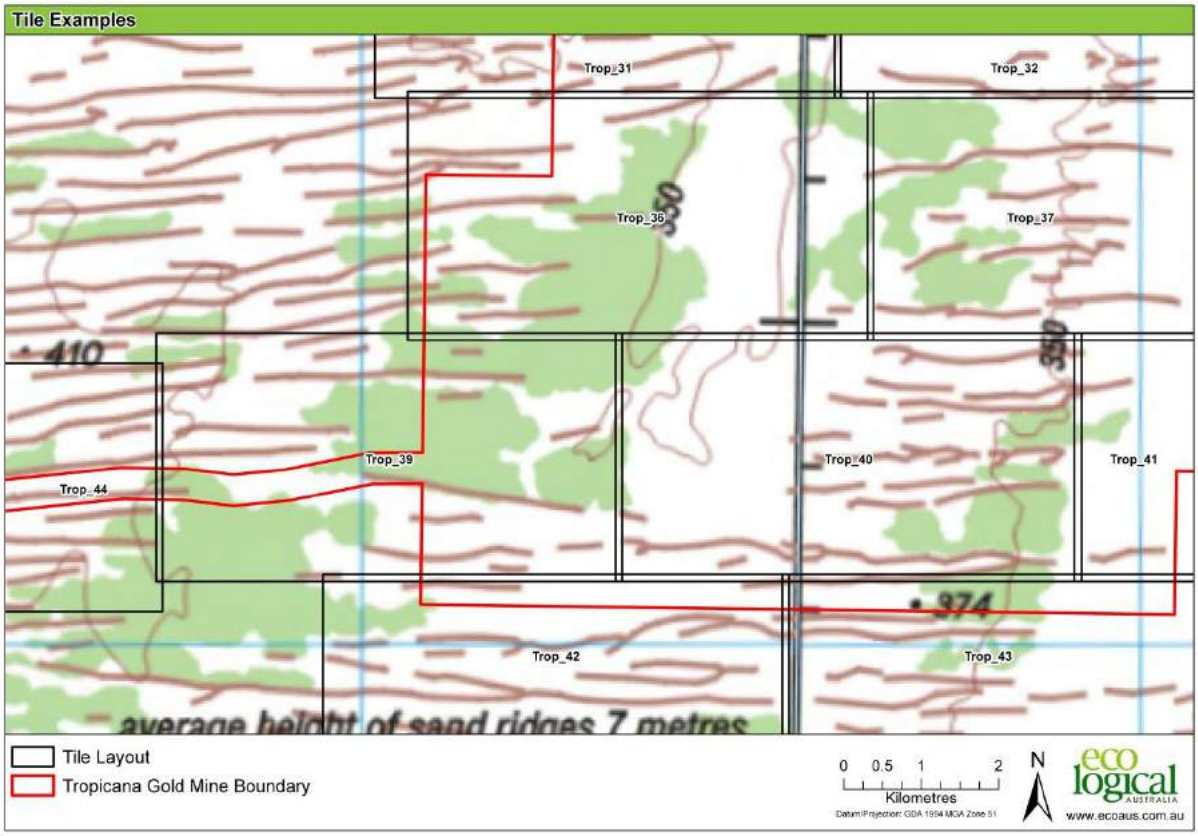
Appendix A : DMSI visual assessment outputs

Pictures of the remotely sensed data for 2014, 2015 and the SAVI change detection are provided on disk. Data are separated into image tiles for ease of comparison.



The tile layout and a zoomed section of the tile layout are provided below.

Tile layout



Zoomed section of the tile layout

Appendix B : Quadrat locations and details

Site name	Latitude	Longitude	Treatment	Vegetation community
Operations Area				
A7A-1	-29.22353	124.54416	Impact	*Acacia aneura* woodlands over grasses +/- *Triodia basedowii*
A7A-4	-29.20206	124.55977	Reference	
A7A-2	-29.22067	124.55582	Impact	
A7A-3	-29.21881	124.55957	Reference	
A7A-5	-29.17022	124.55268	Impact	
A7A-6	-29.1686	124.54745	Reference	
A7A-8	-29.22079	124.53609	Impact	
A7A-7	-29.22108	124.52236	Reference	
A7A-10	-29.21327	124.5229	Impact	
A7A-9	-29.21453	124.52184	Reference	
E3-1	-29.26139	124.51906	Impact	Occasional *Eucalyptus gongylocarpa* over mixed upper stratum over *Daviesia grahamii/Pityrodia loricata/Chrysocephalum puteale* low shrubland over sparse to open *Triodia desertorum* or *T. basedowii* and *Lomandra leucocephala* subsp. *robusta*
E3-2	-29.25589	124.51441	Reference	
E3-3	-29.26533	124.56357	Impact	
E3-4	-29.26552	124.56877	Reference	
E3-5	-29.27398	124.55448	Impact	
E3-6	-29.2877	124.53194	Reference	
E1B-1	-29.24937	124.53009	Impact	Open *Eucalyptus youngiana* and sparse *Callitris preissii* over mixed shrubs over open to moderately dense *Triodia basedowii*
E1B-2	-29.23972	124.51599	Reference	
E1B-3	-29.27014	124.55874	Impact	
E1B-4	-29.27303	124.5738	Reference	
E1B-5	-29.28137	124.54474	Impact	
E1B-6	-29.28119	124.55158	Reference	
E1B-8	-29.2807	124.52136	Impact	
E1B-7	-29.29069	124.51486	Reference	
E1B-10	-29.33537	124.48317	Impact	
E1B-9	-29.33378	124.47629	Reference	
A7B-2	-29.27574	124.51965	Impact	Open to moderately dense *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata* / *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii*
A7B-1	-29.29621	124.51709	Reference	
A7B-4	-29.33791	124.47997	Impact	
A7B-3	-29.33805	124.47349	Reference	

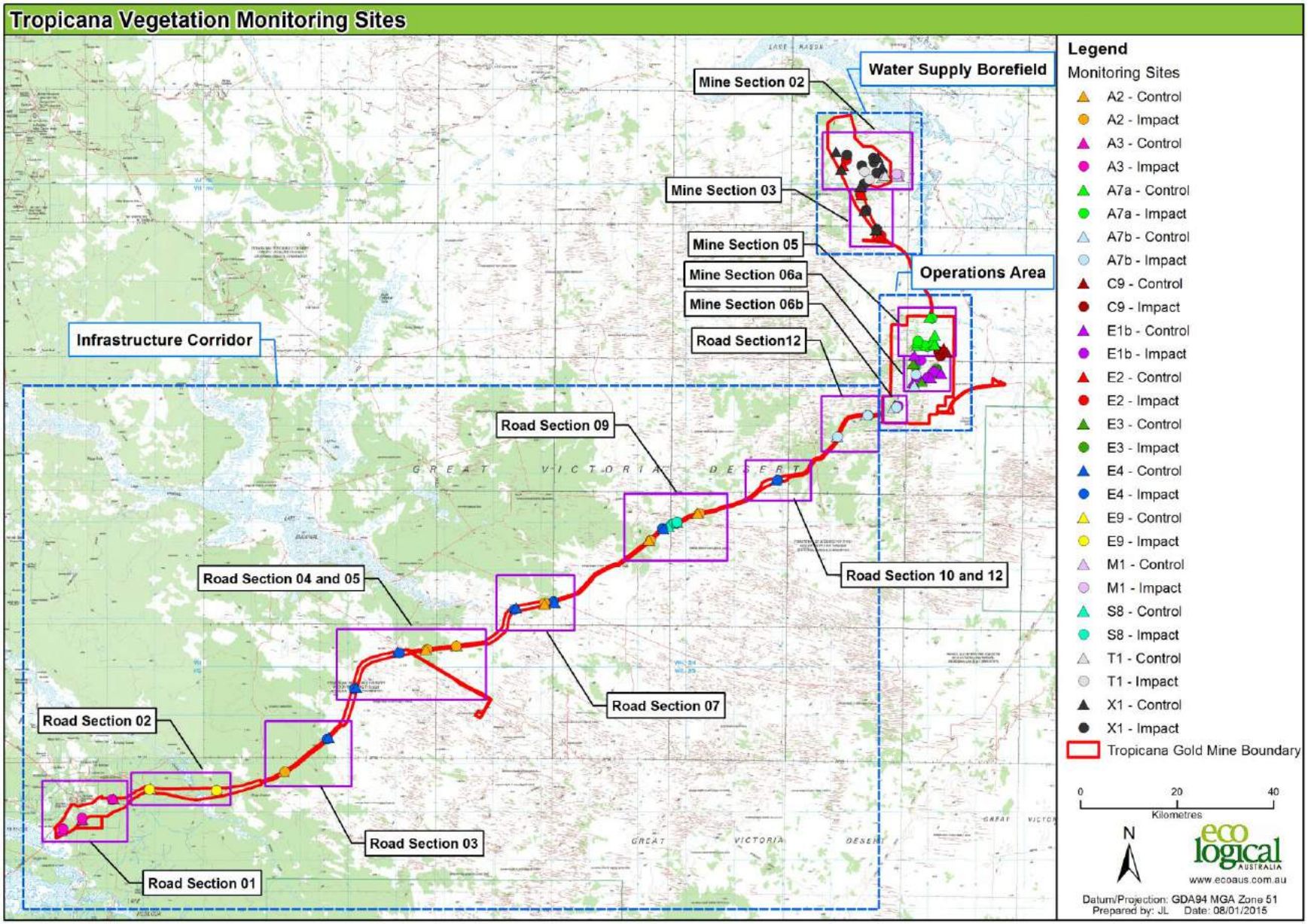
Site name	Latitude	Longitude	Treatment	Vegetation community
C9-1	-29.232	124.56774	Impact	Open to moderately dense *Casuarina pauper* woodland over open mixed shrubs and scattered soft grasses and/or *Triodia scariosa*
C9-3	-29.22669	124.57865	Reference	
C9-2	-29.24138	124.57154	Impact	
C9-4	-29.2331	124.58527	Reference	
Infrastructure Corridor				
E9-2	-30.06177	123.02964	Impact	Low Open Woodland of *Eucalyptus concinna* with *Eucalyptus spp*. over *Eremophila scoparia*, *Acacia hemiteles, Acacia colletioides, Scaevola spinescens* and *Eremophila caperata* over *Triodia scariosa*. This community occurs on orange sandy loams on flats.
E9-1	-30.05935	123.03026	Reference	
E9-6	-30.05983	122.88569	Impact	
E9-5	-30.05797	122.88797	Reference	
A3-2	-30.13366	122.69965	Impact	Low Open Woodland to Tall Open Shrubland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Acacia spp*. and mixed shrubs. This community occurs on orange sandy loams
A3-1	-30.13646	122.69748	Reference	
A3-4	-30.1135	122.74053	Impact	
A3-3	-30.11531	122.74101	Reference	
A3-5	-30.07888	122.80564	Impact	
A3-6	-30.07624	122.80871	Reference	
S8-3	-29.5601	124.00667	Impact	Low Shrubland of *Acacia desertorum* var. *desertorum* with *Grevillea juncifolia*, low Myrtaceous shrubs and mixed low shrubs with occasional emergent *Eucalyptus youngiana* and *Eucalyptus spp.* This community occurs on pale orange sandy loams on flats
S8-1	-29.55902	124.00424	Reference	
S8-2	-29.56185	124.00079	Impact	
S8-6	-29.56442	123.99559	Reference	
S8-4	-29.55795	124.01273	Impact	
S8-7	-29.5567	124.01356	Impact	
S8-5	-29.55566	124.01362	Reference	
E4-2	-29.80427	123.42075	Impact	Low Woodland to Low Open Woodland of *Eucalyptus gongylocarpa* with *Callitris preissii* and *Eucalyptus spp*. over mixed shrubs over *Triodia spp*. This community occurs on orange, red-orange, yellow-orange and yellow sandy loams on mixed topographies
E4-1	-29.80187	123.41777	Reference	
E4-3	-29.96562	123.26614	Impact	
E4-4	-29.96245	123.27089	Reference	
E4-5	-29.87154	123.32471	Impact	
E4-6	-29.86894	123.32907	Reference	
E4-7	-29.72284	123.66718	Impact	
E4-8	-29.71848	123.67104	Reference	
E4-9	-29.70646	123.75116	Impact	

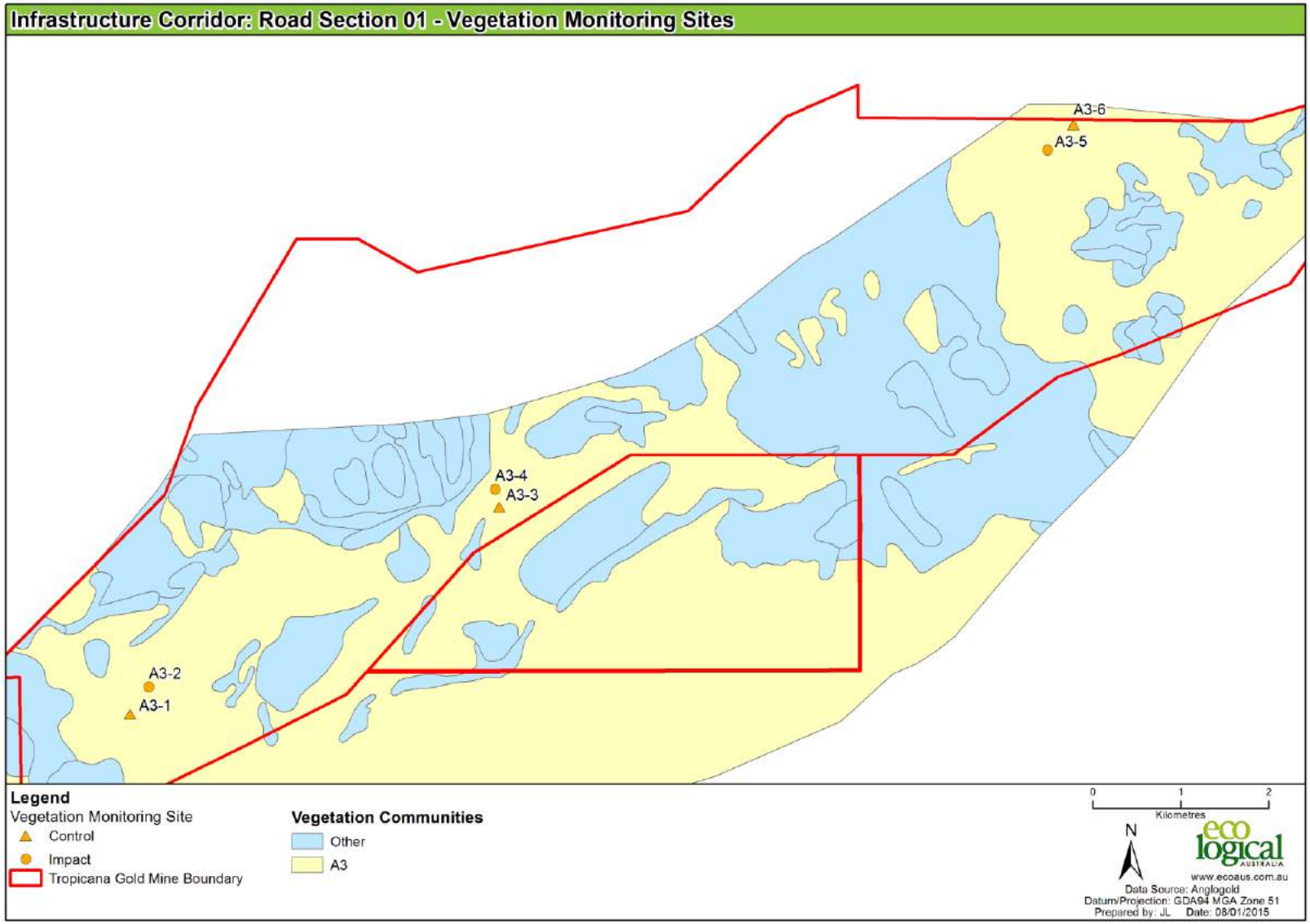
Site name	Latitude	Longitude	Treatment	Vegetation community
E4-10	-29.70804	123.75318	Reference	
E4-11	-29.56846	123.98227	Impact	
E4-12	-29.56914	123.98532	Reference	
E4-14	-29.47713	124.22742	Impact	
E4-13	-29.47554	124.22452	Reference	
A2-1	-29.7975	123.4812	Impact	Low Woodland to Tall Shrubland of *Acacia ayersiana* and *Acacia aneura* var. *aneura* with *Acacia aneura* var. *argentea* over *Eremophila spp*., *Aluta maisonneuvei* subsp. *auriculata* and *Prostanthera spp*. This community occurs on orange sandy loam
A2-7	-29.79695	123.4785	Reference	
A2-2	-29.70986	123.7316	Impact	
A2-10	-29.71198	123.7317	Reference	
A2-3	-29.59098	123.95703	Impact	
A2-11	-29.59075	123.9545	Reference	
A2-4	-29.54005	124.06123	Impact	
A2-12	-29.53954	124.05796	Reference	
A2-6	-30.02674	123.17591	Impact	
A2-5	-30.02572	123.17397	Reference	
A2-9	-29.79106	123.54354	Impact	
A2-8	-29.78967	123.54379	Reference	
A7B-6	-29.39442	124.35442	Impact	Open to moderately dense *Acacia aneura* over *Aluta maisonneuvei* subsp. *auriculata* / *Acacia ramulosa* var. *ramulosa* over *Eremophila forrestii* subsp. *forrestii* over *Triodia basedowii*
A7B-5	-29.39369	124.35364	Reference	
A7B-7	-29.35357	124.41985	Impact	
A7B-9	-29.35352	124.41888	Impact	
A7B-8	-29.35167	124.4156	Reference	
Water Supply Borefield				
E2-1	-28.94181	124.39672	Impact	*Eucalyptus gongylocarpa* over mixed *Acacia* spp. over mixed moderately open to moderately dense shrubs over *Triodia basedowii*
E2-4	-28.94109	124.40065	Reference	
E2-2	-28.87624	124.36713	Impact	
E2-3	-28.88708	124.35986	Reference	
E2-5	-29.01685	124.44234	Impact	
E2-6	-29.01686	124.43948	Reference	
X1-1	-29.00525	124.43319	Impact	Mixed Eucalypt woodlands dominated by *Eucalyptus gongylocarpa/ E. youngiana* over mixed open shrubs
X1-2	-29.00674	124.43163	Reference	

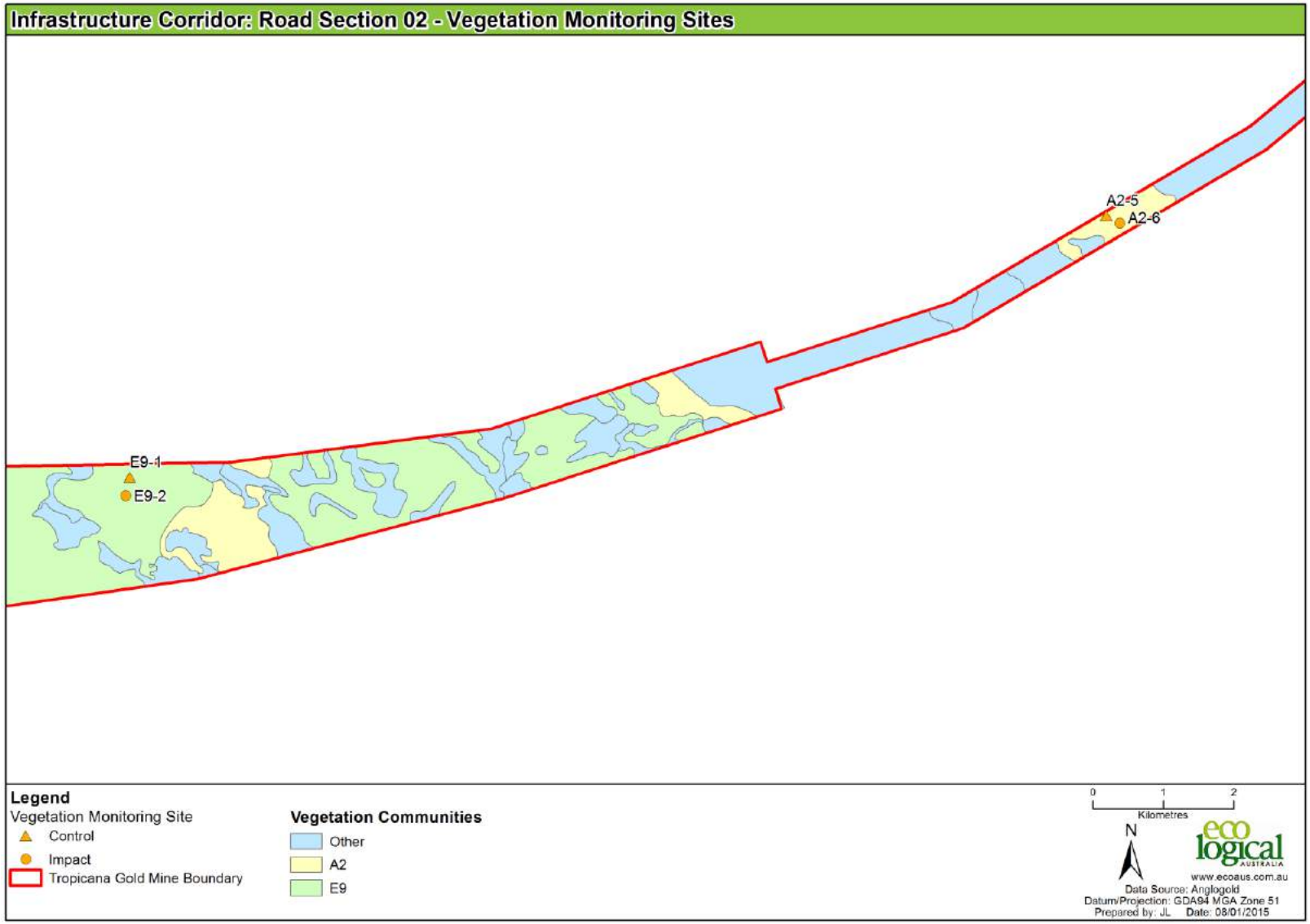
Site name	Latitude	Longitude	Treatment	Vegetation community
X1-3	-28.87242	124.42353	Impact	and *Triodia basedowi*i
X1-5	-28.87106	124.43335	Reference	
X1-4	-28.88026	124.42482	Impact	
X1-6	-28.8887	124.44297	Reference	
X1-7	-28.90014	124.43136	Impact	
X1-8	-28.89963	124.44631	Reference	
X1-9	-28.86753	124.36771	Impact	
X1-10	-28.86117	124.34488	Reference	
X1-11	-28.92043	124.40539	Impact	
X1-12	-28.92559	124.39786	Reference	
X1-13	-28.88746	124.39931	Impact	
X1-14	-28.89446	124.35574	Reference	
X1-15	-28.97024	124.40909	Impact	
X1-16	-28.97075	124.40729	Reference	
M1-1	-28.9017	124.4733	Impact	Moderately dense to dense *Acacia aneura* woodland over isolated shrubs over scattered *Triodia basedowii*.
M1-2	-28.9054	124.4746	Reference	
M1-3	-28.9029	124.479	Impact	
M1-4	-28.9054	124.4782	Reference	
T1-3	-28.91204	124.41596	Impact	Open to moderately open mixed shrubs over *Triodia basedowii*
T1-1	-28.9089	124.44324	Reference	
T1-4	-28.89736	124.40519	Impact	
T1-2	-28.90475	124.44995	Reference	

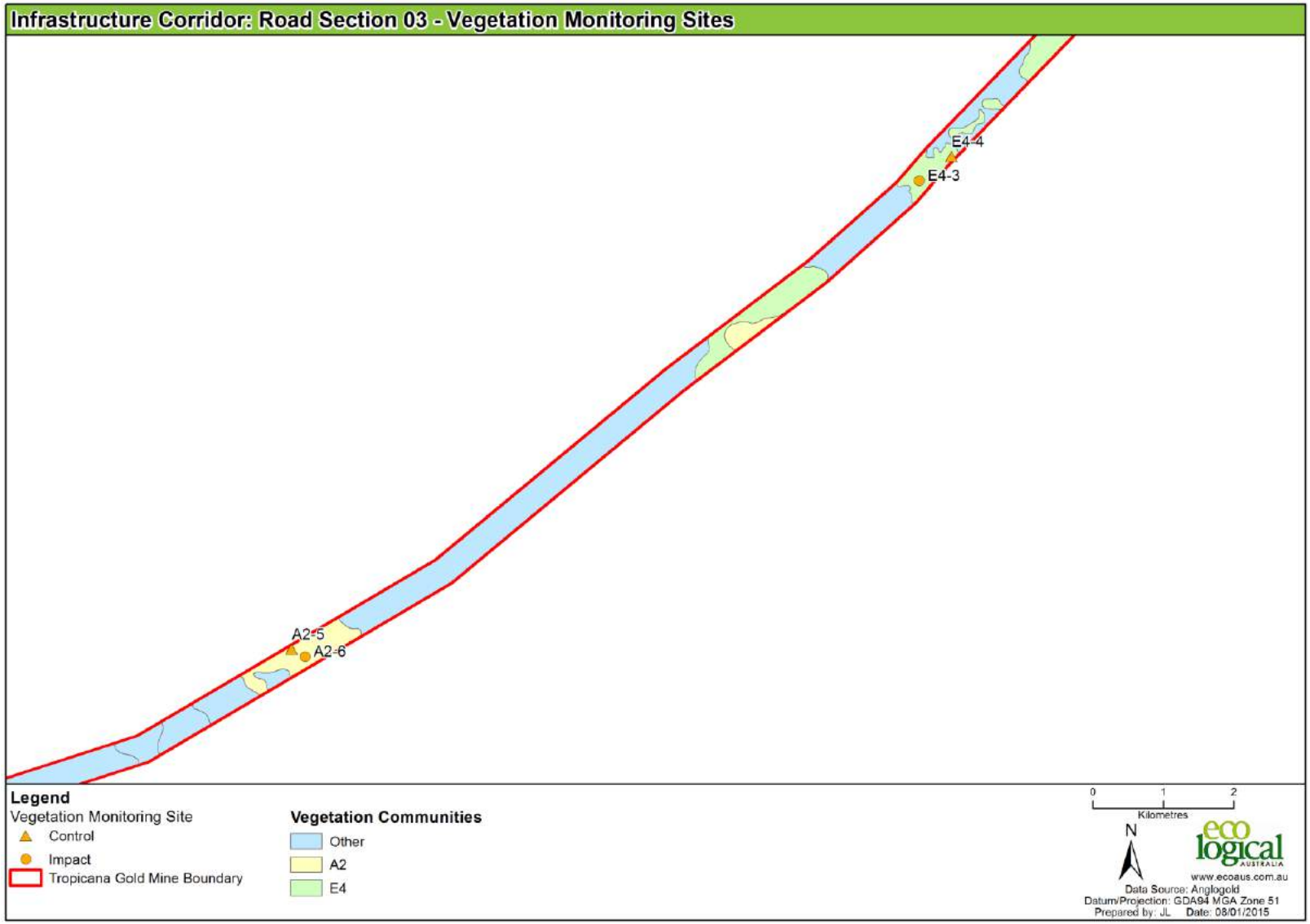
Appendix C : Quadrat location maps

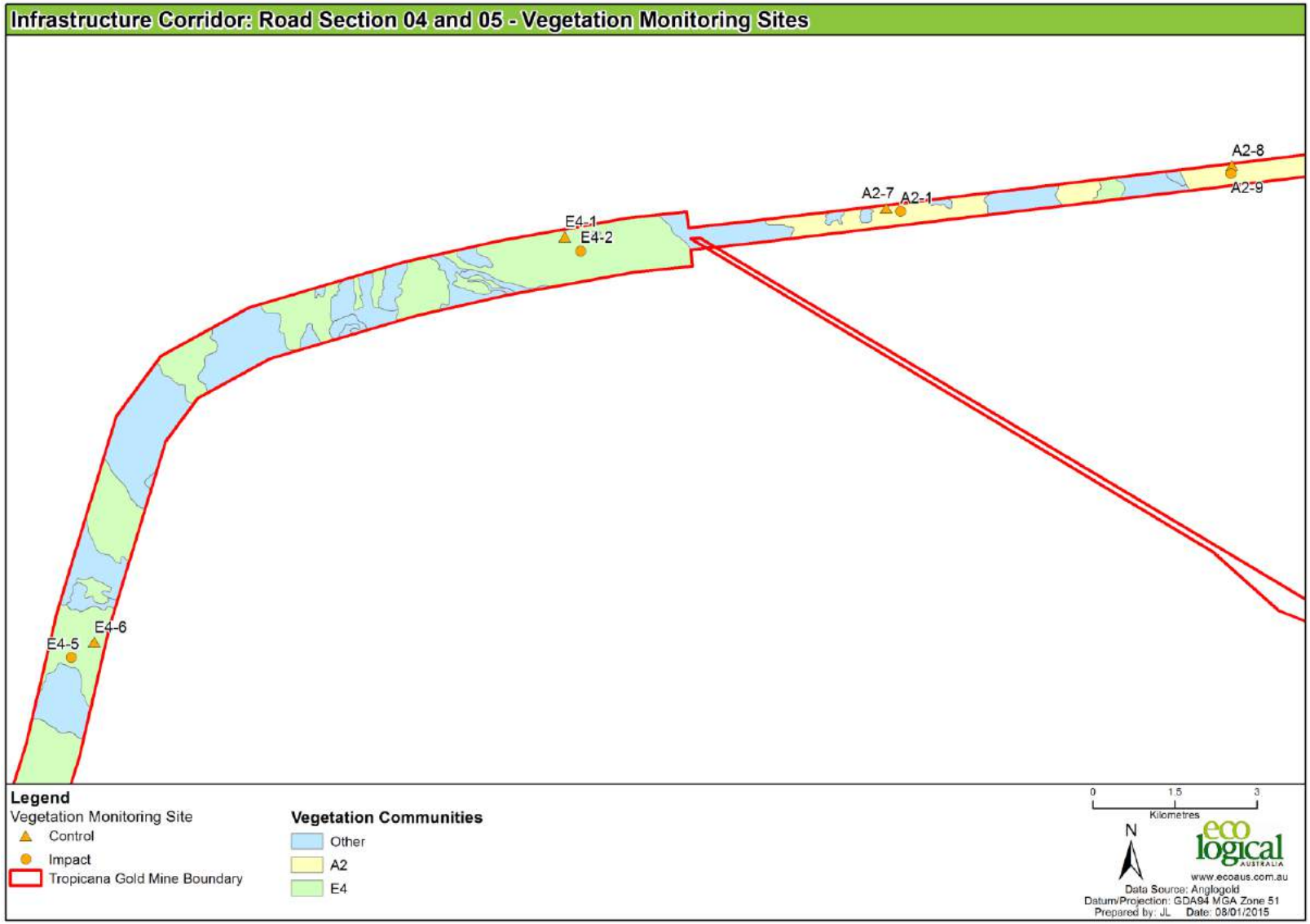
Separate maps are provided in the following pages. The first index map indicates the locations of the close-up maps.

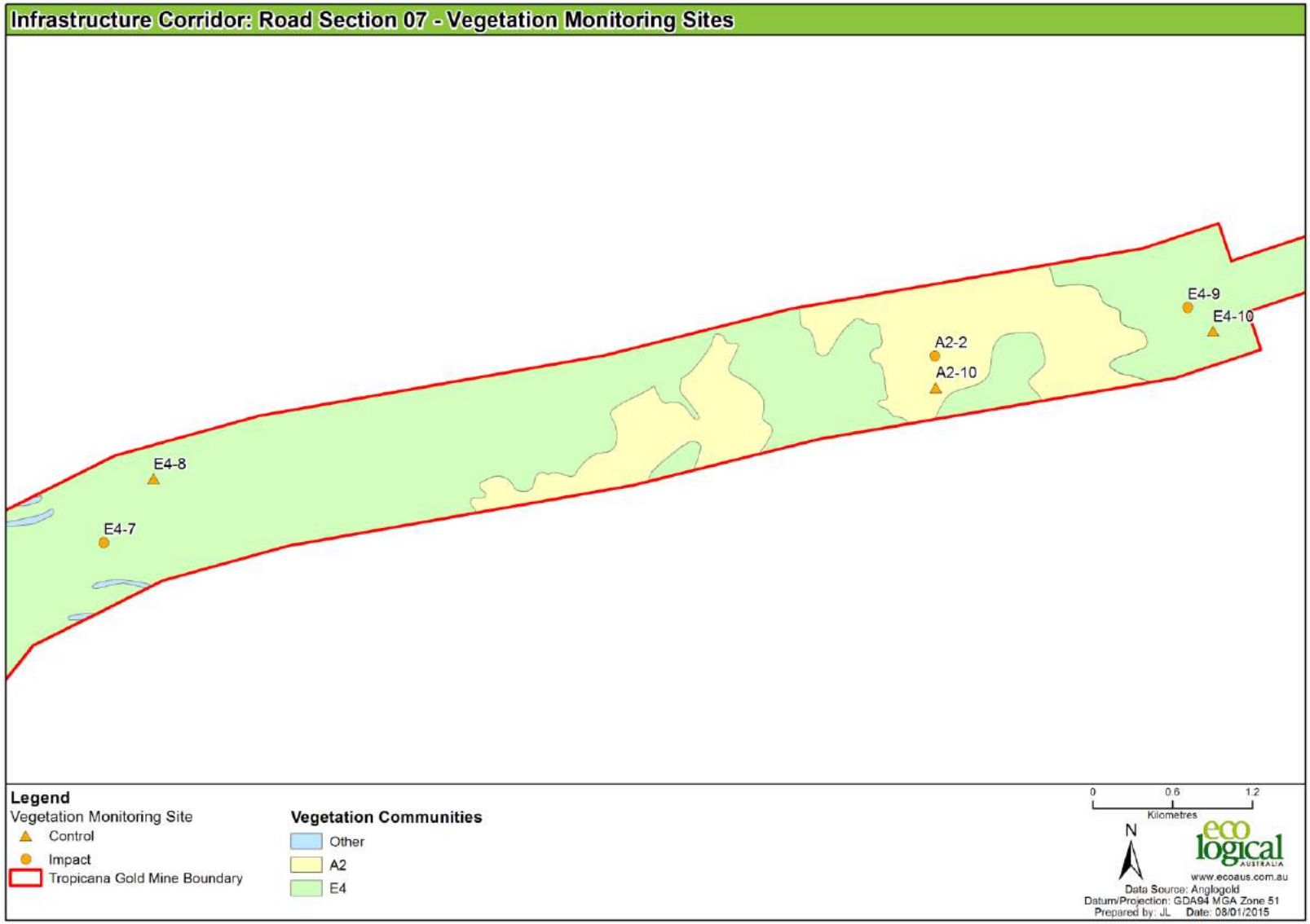


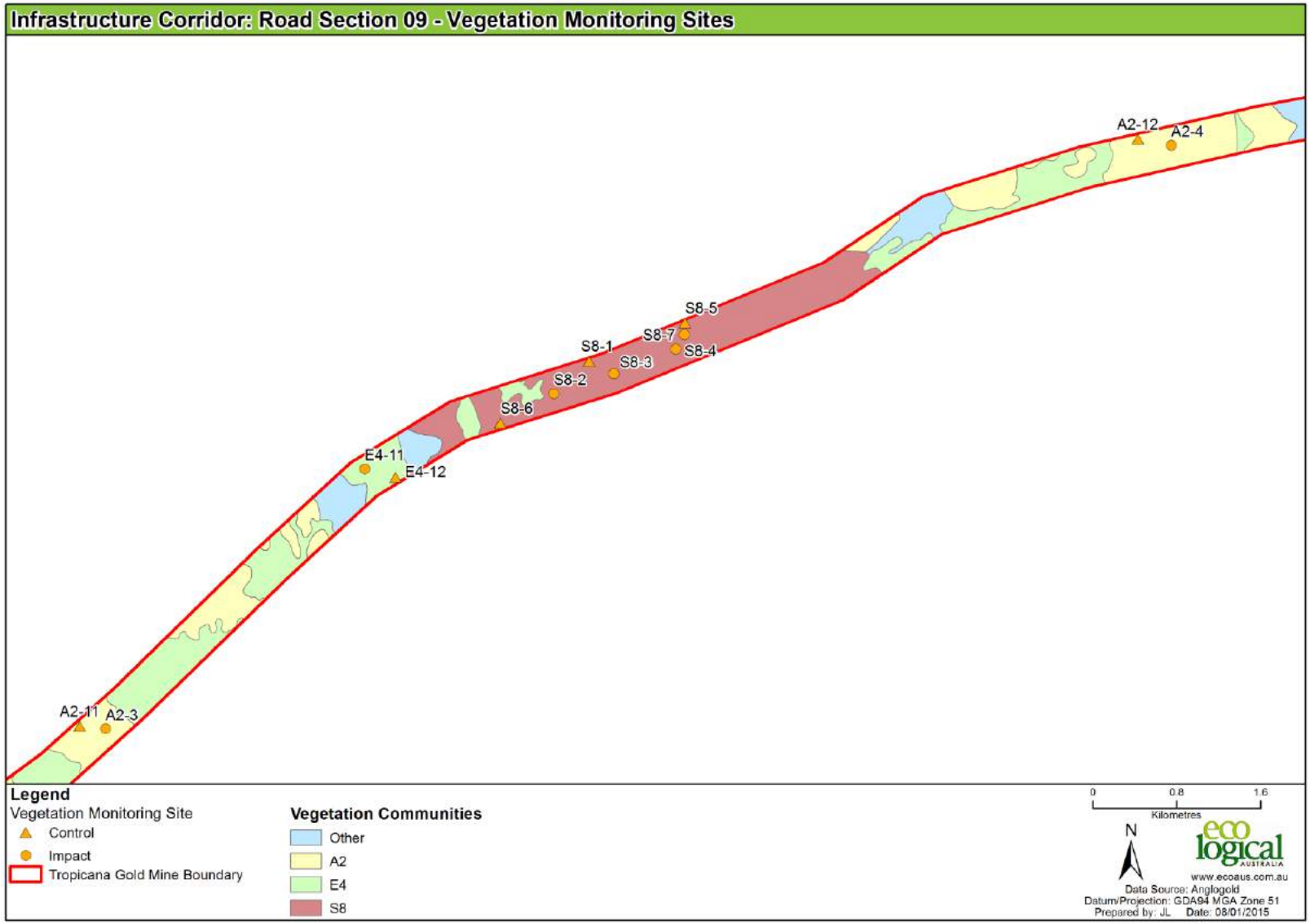


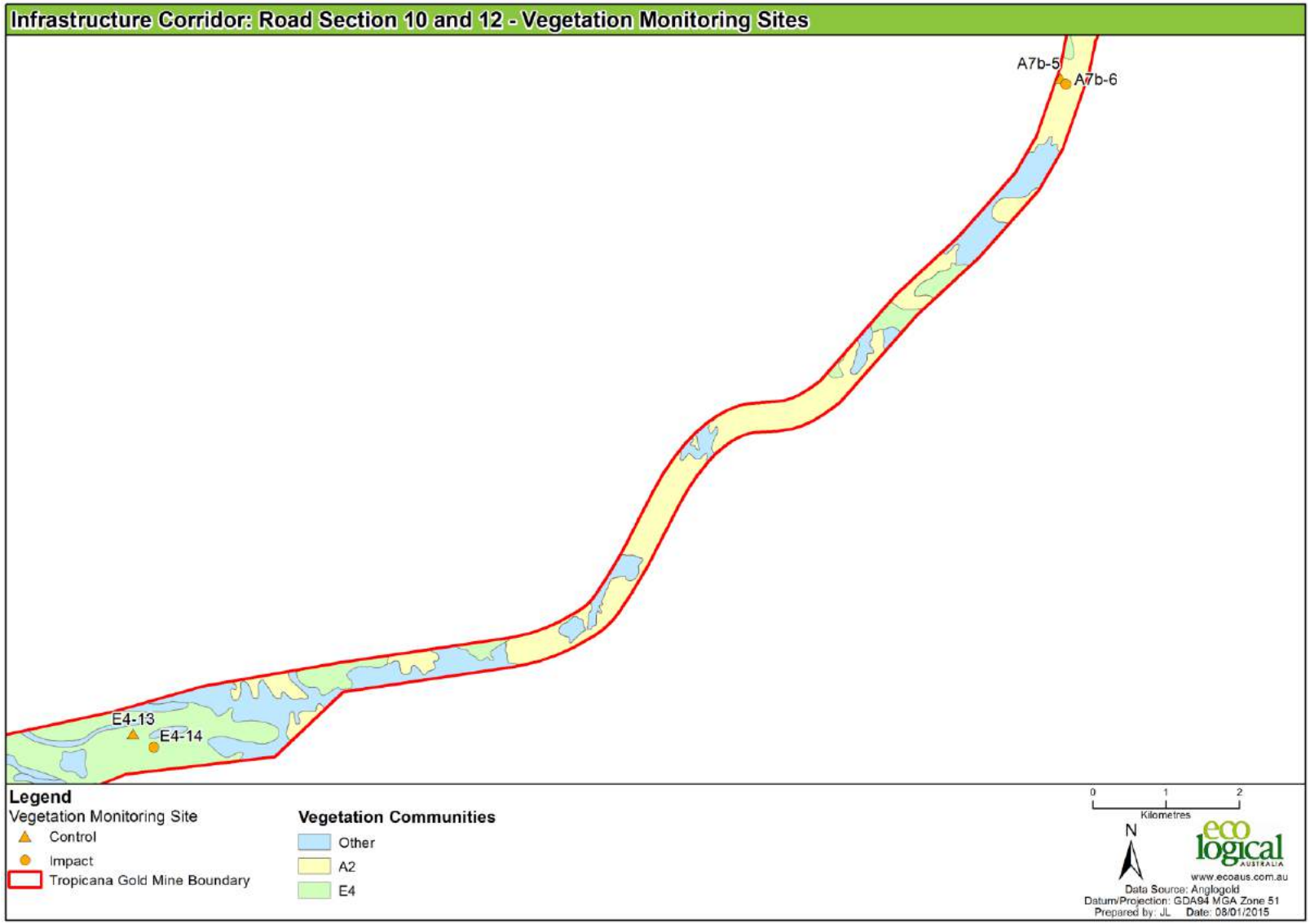


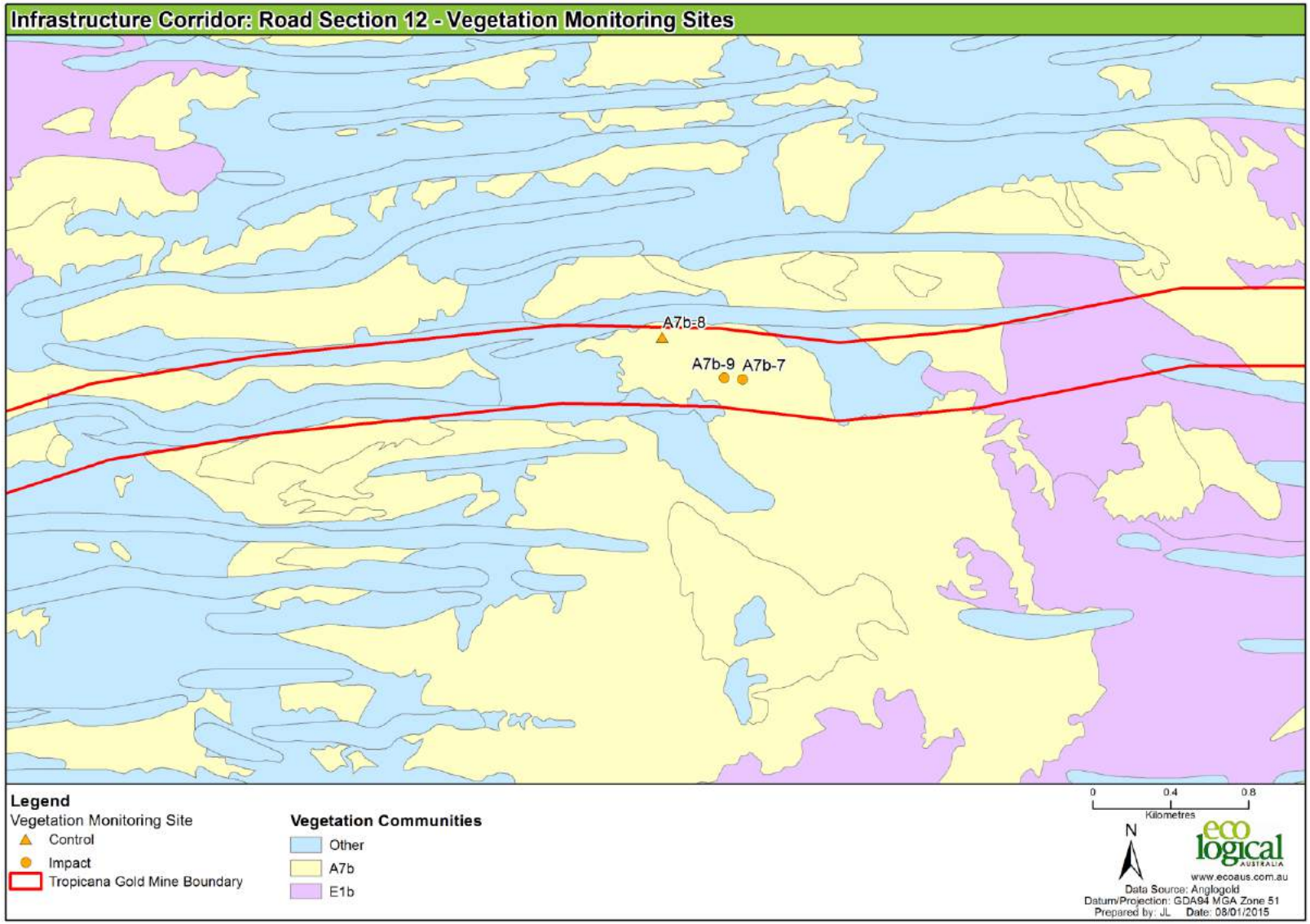


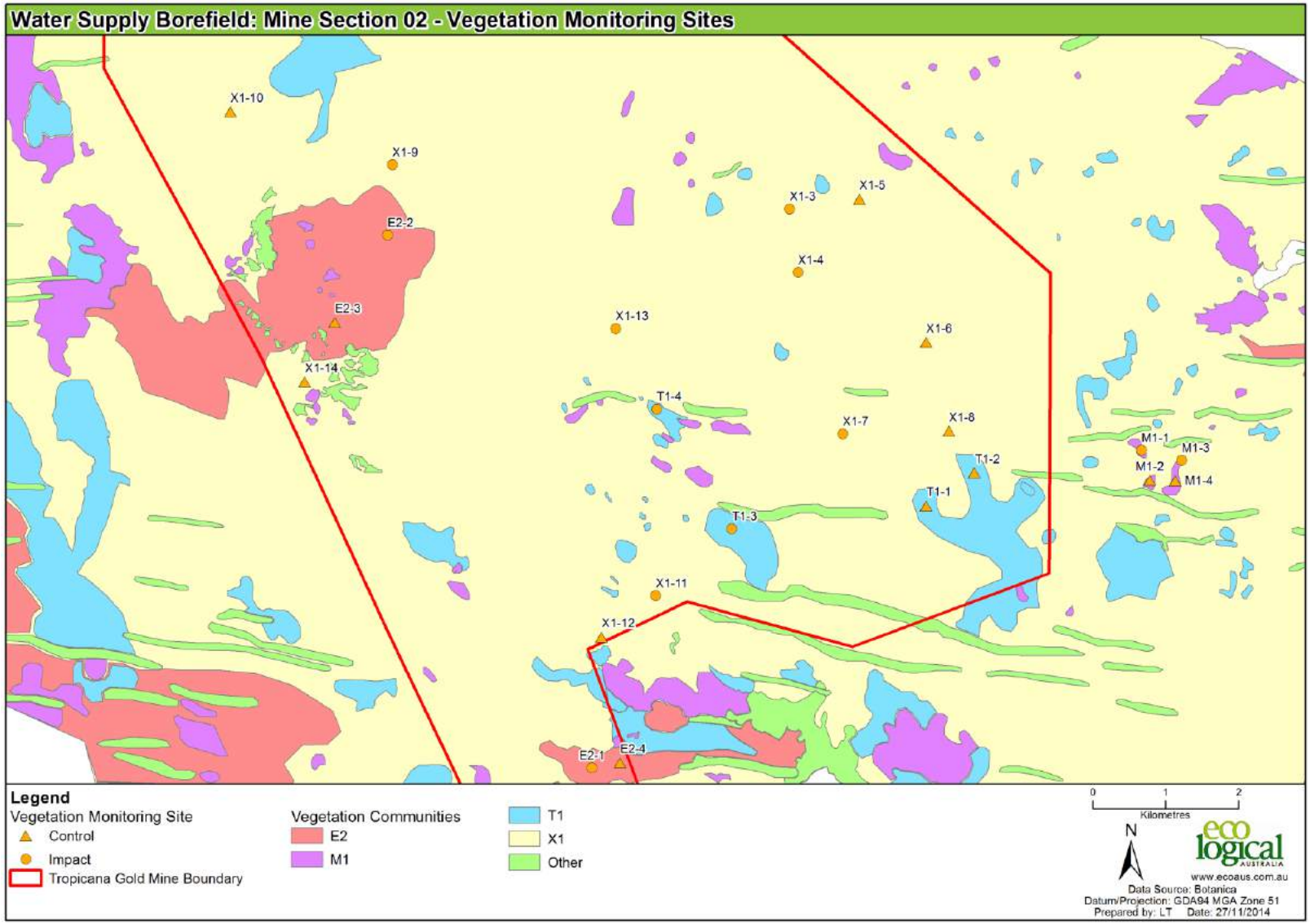


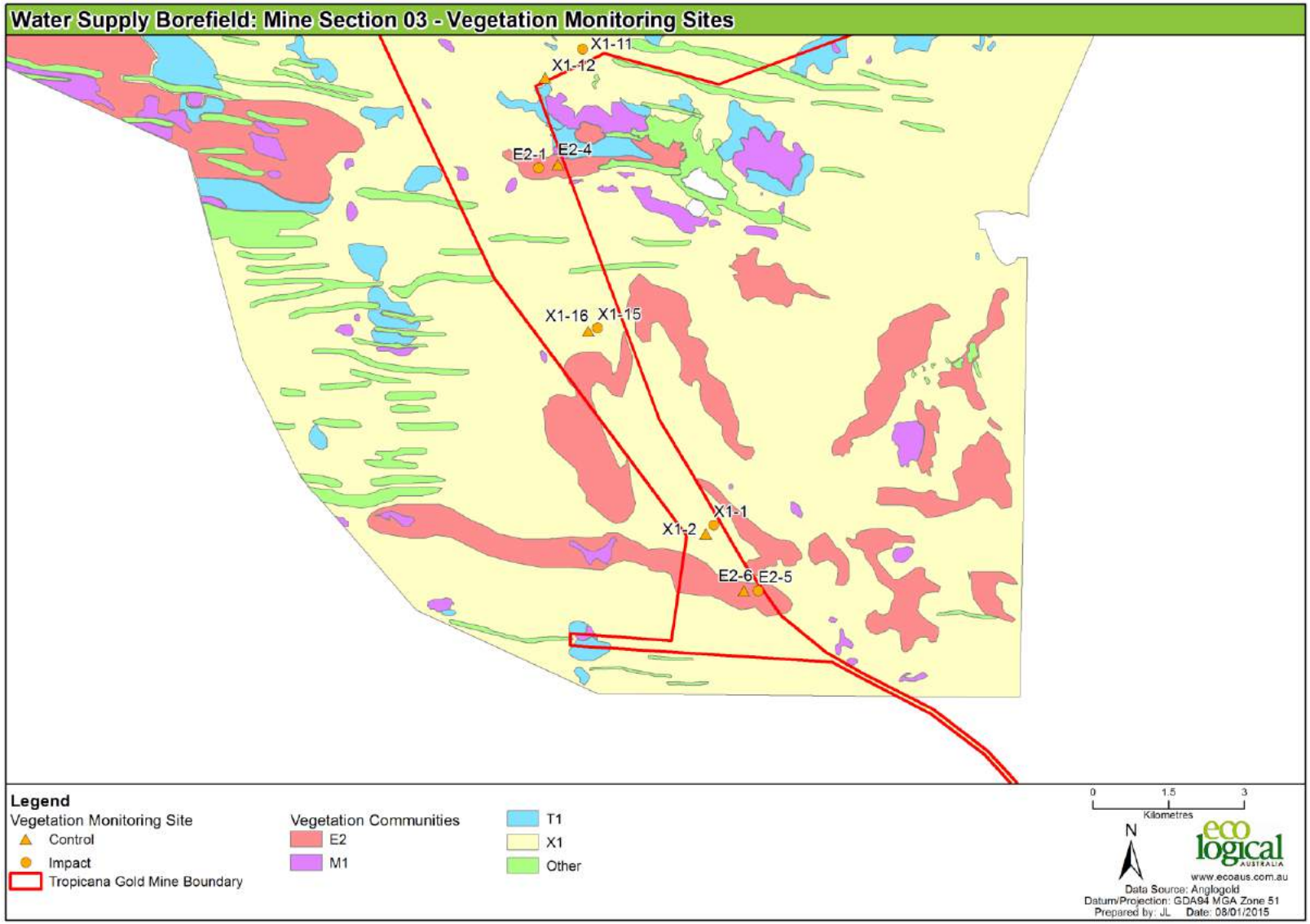


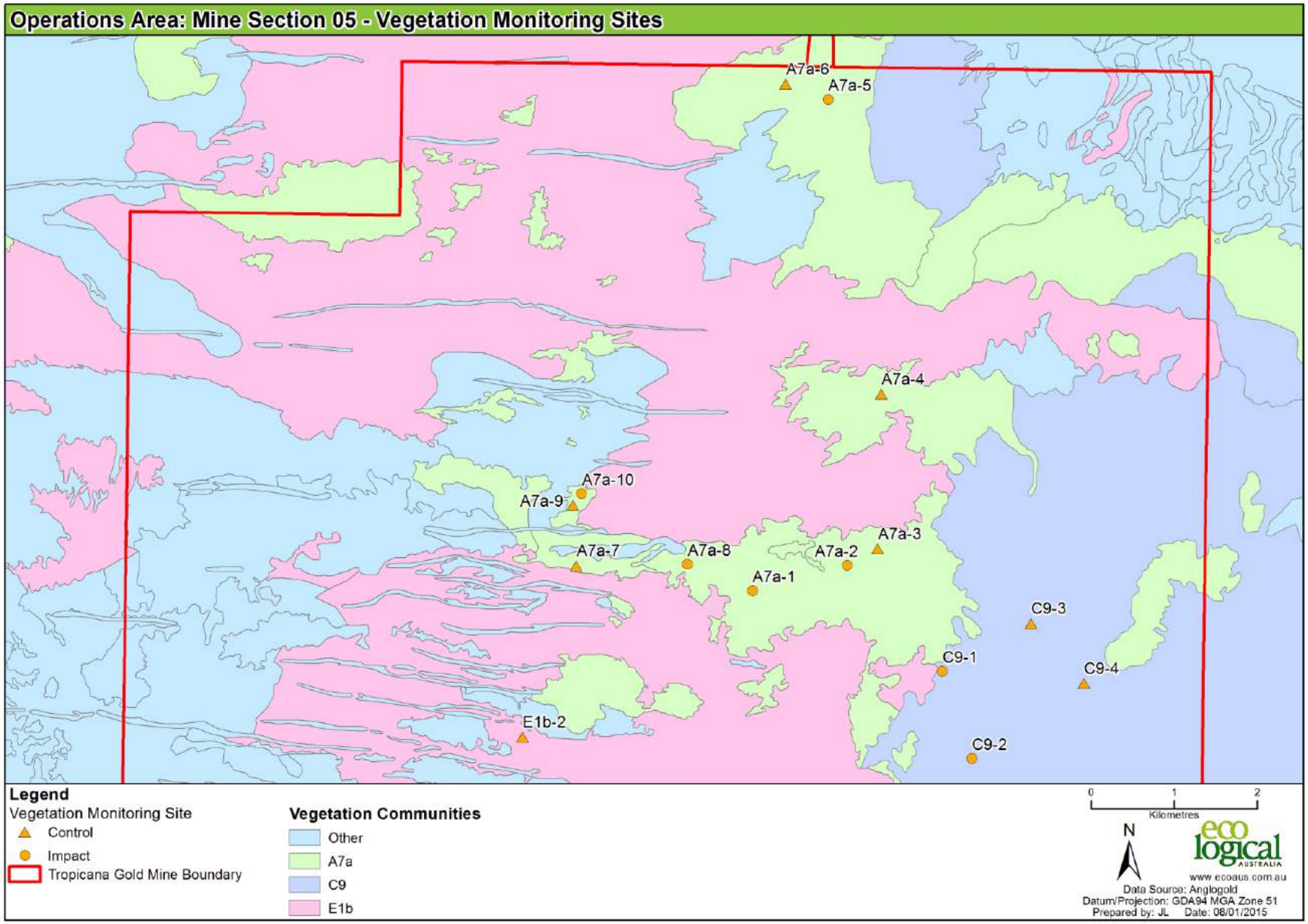


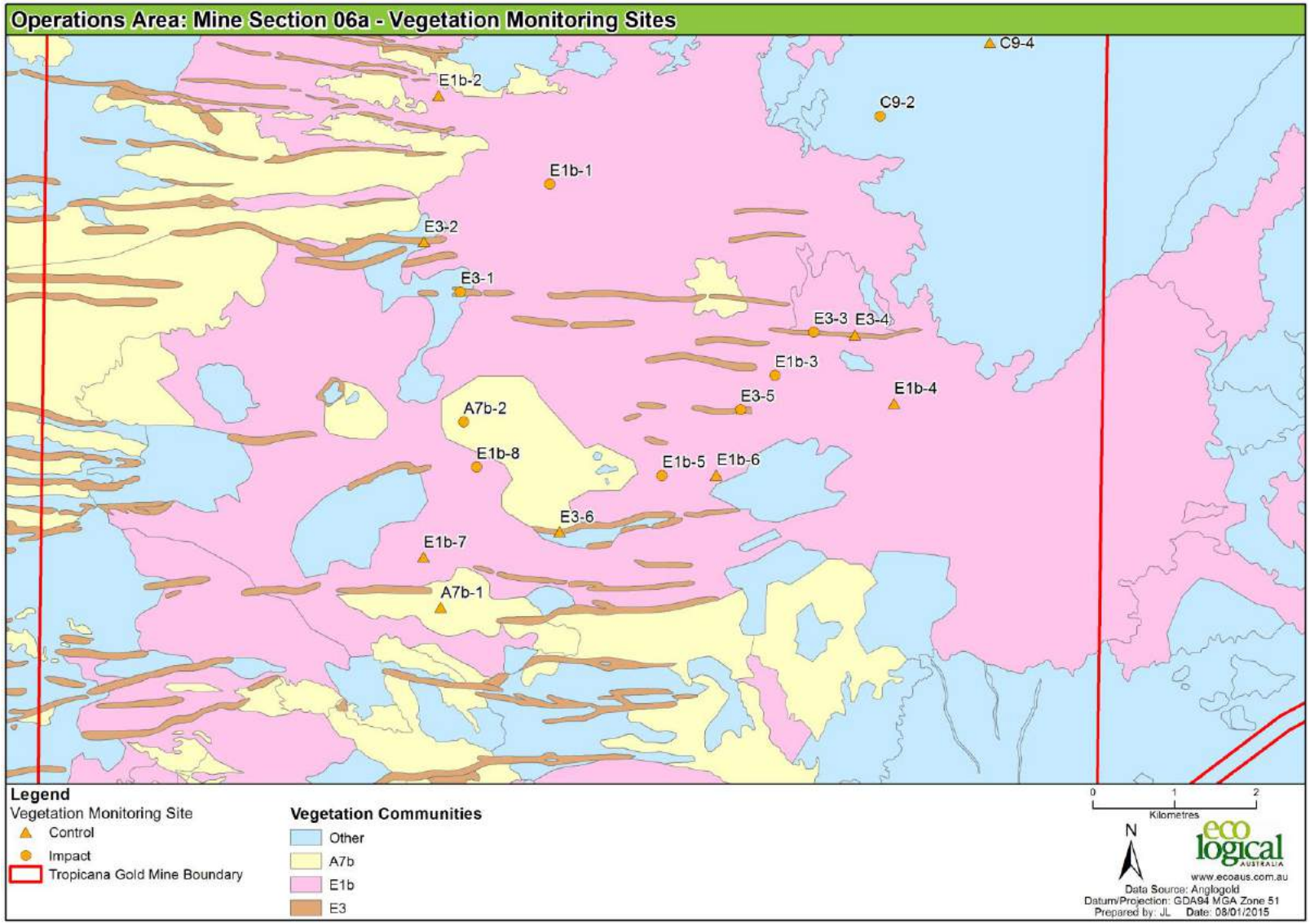


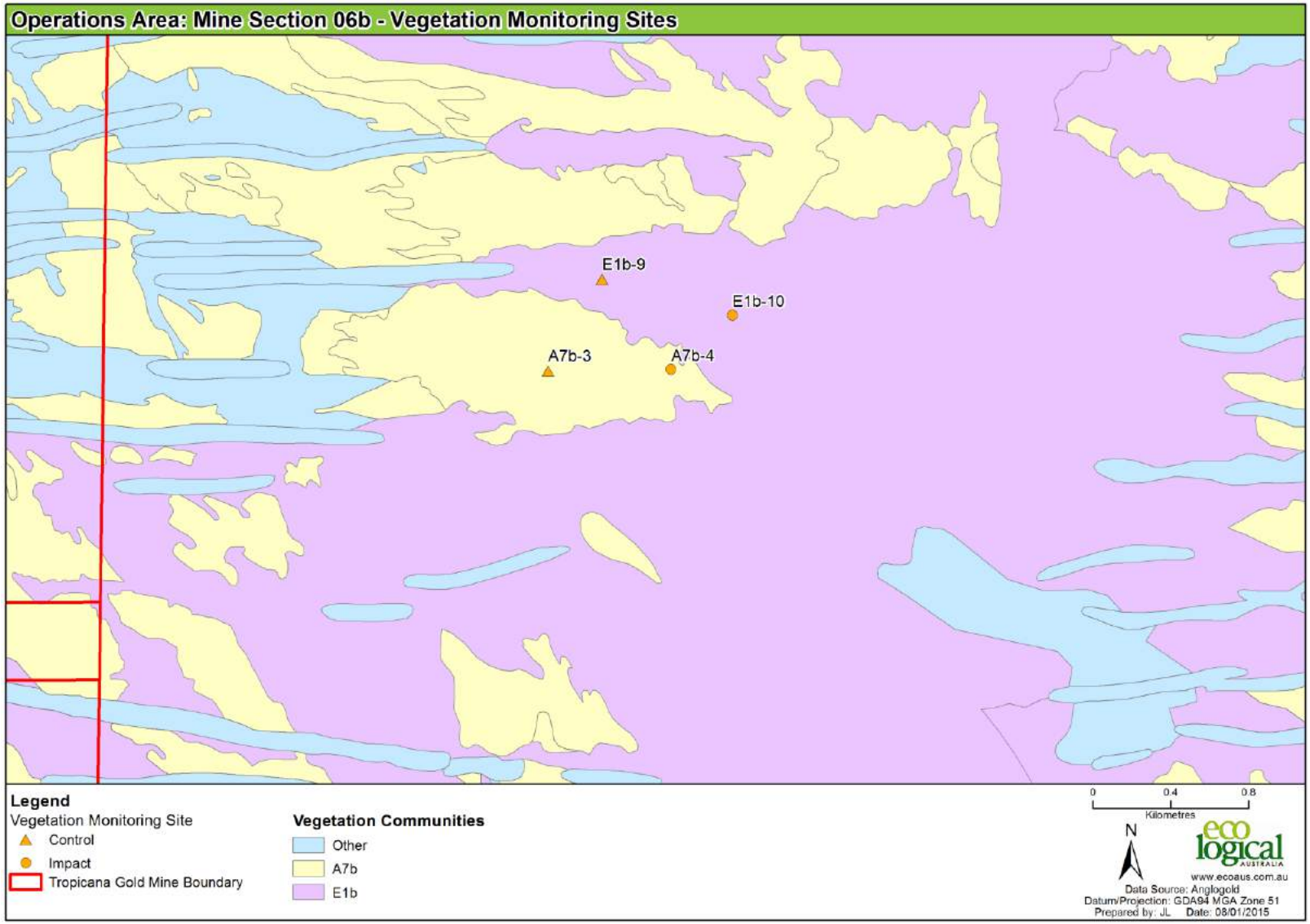












Appendix D : Remote sensing tile comparisons

Tile Number*	Comment	Area
Trop_01	No significant change from mining development.	Water Supply Borefield
Trop_02	No significant change from mining development.	Water Supply Borefield
Trop_03	No significant change from mining development. Overall a minor decrease in canopy vigour and an increase in groundcover on bare ground and drainage lines. Minor decrease in greenness of shrubs/groundcover within some patches in the south. No significant change at monitoring sites.	Water Supply Borefield
Trop_04	Minor decrease in canopy greenness throughout the tile. Slight increase in groundcover or shrubs within bare ground and drainage lines. Increased groundcover particularly evident within one patch in the centre of the tile, likely from runoff from a vehicle track. No significant change at monitoring sites.	Water Supply Borefield
Trop_05	Minor decrease in canopy greenness across the image tile. Minor increases in groundcover or shrub greenness along drainage lines in the centre-western portion of the tile. Overall increase in groundcover on bare ground, although shrub/groundcover greenness has decreased in some patches in the south. No significant change at monitoring sites.	Water Supply Borefield
Trop_06	No significant change from mining development.	Water Supply Borefield
Trop_07	No significant change from mining development. Minor decrease in canopy greenness throughout the tile. Increase in groundcover or shrubs within bare ground and drainage lines. No significant change at monitoring sites.	Water Supply Borefield
Trop_08	No significant change from mining development.	Water Supply Borefield
Trop_09	Loss of a couple of individual trees due to track widening/extension and maintenance of water supply pipe.	Water Supply Borefield
Trop_10	No significant change from mining development.	Water Supply Borefield
Trop_11	No significant change from mining development.	Water Supply Borefield
Trop_12	No significant change from mining development.	Water Supply Borefield
Trop_13	No significant change from mining development.	Water Supply Borefield
Trop_14	No significant change from mining development.	Water Supply Borefield
Trop_15	No significant change from mining development.	Water Supply Borefield

Tile Number*	Comment	Area
Trop_16	No significant change from mining development.	Water Supply Borefield
Trop_17	No significant change from mining development.	Water Supply Borefield
Trop_18	No significant change from mining development.	Water Supply Borefield
Trop_19	No significant change from mining development.	Operational Area
Trop_20	No significant change from mining development.	Operational Area
Trop_21	No significant change from mining development.	Operational Area
Trop_22	No significant change from mining development.	Operational Area
Trop_23	No significant change from mining development.	Operational Area
Trop_24	No significant change from mining development.	Operational Area
Trop_25	No significant change from mining development.	Operational Area
Trop_26	Pre-approved cleared areas associated with expansion of mine and access infrastructure. Increased vehicle tracks in west of tile. No secondary vegetation impacts adjacent to mine.	Operational Area
Trop_27	Pre-approved small cleared areas associated with new vehicle tracks and temporary infrastructure.	Operational Area
Trop_28	No significant change from mining development.	Operational Area
Trop_29	Pre-approved cleared areas associated with expansion of mining infrastructure.	Operational Area
Trop_30	No significant change from mining development.	Operational Area
Trop_31	No significant change from mining development.	Operational Area
Trop_32	Vegetation loss alongside access track - possible firebreak. Several new tracks in area as well. These activities are within existing approval area.	Operational Area
Trop_33	No significant change from mining development.	Operational Area

Tile Number*	Comment	Area
Trop_34	No significant change from mining development.	Operational Area
Trop_35	No significant change from mining development.	Operational Area
Trop_36	No significant change from mining development.	Operational Area
Trop_37	Minor reduction in canopy and groundcover from new vehicle tracks	Operational Area
Trop_38	No significant change from mining development.	Operational Area
Trop_39	Vegetation loss within apparent fire scar. Field observations confirmed fire scar and natural recruitment occurring.	Infrastructure Corridor
Trop_40	No significant change from mining development.	Operational Area
Trop_41	No significant change from mining development.	Operational Area
Trop_42	No significant change from mining development.	Operational Area
Trop_43	No significant change from mining development.	Operational Area
Trop_44	Vegetation loss within apparent fire scar. Field observations confirmed fire scar and natural recruitment occurring.	Infrastructure Corridor
Trop_45	Vegetation loss within apparent fire scar. Field observations confirmed fire scar and natural recruitment occurring.	Infrastructure Corridor
Trop_46	Vegetation loss within apparent fire scar. Field observations confirmed fire scar and natural recruitment occurring.	Infrastructure Corridor
Trop_47	No significant change from mining development.	Infrastructure Corridor
Trop_48	No significant change from mining development.	Infrastructure Corridor
Trop_49	No significant change from mining development.	Infrastructure Corridor
Trop_50	No significant change from mining development.	Infrastructure Corridor
Trop_51	No significant change from mining development.	Infrastructure Corridor
Trop_52	No significant change from mining development.	Infrastructure Corridor
Trop_53	No significant change from mining development.	Infrastructure Corridor
Trop_54	No significant change from mining development.	Infrastructure Corridor

Tile Number*	Comment	Area
Trop_55	No significant change from mining development. Individual plants cleared for road drainage ditch within existing approval area.	Infrastructure Corridor
Trop_56	No significant change from mining development.	Infrastructure Corridor
Trop_57	No significant change from mining development.	Infrastructure Corridor
Trop_58	No significant change from mining development.	Infrastructure Corridor
Trop_59	No significant change from mining development.	Infrastructure Corridor
Trop_60	No significant change from mining development.	Infrastructure Corridor
Trop_61	No significant change from mining development.	Infrastructure Corridor
Trop_62	No significant change from mining development.	Infrastructure Corridor
Trop_63	No significant change from mining development.	Infrastructure Corridor
Trop_64	No significant change from mining development.	Infrastructure Corridor
Trop_65	No significant change from mining development.	Infrastructure Corridor
Trop_66	No significant change from mining development.	Infrastructure Corridor
Trop_67	No significant change from mining development.	Infrastructure Corridor
Trop_68	No significant change from mining development.	Infrastructure Corridor
Trop_69	No significant change from mining development.	Infrastructure Corridor
Trop_70	No significant change from mining development.	Infrastructure Corridor
Trop_71	No significant change from mining development.	Infrastructure Corridor
Trop_72	No significant change from mining development.	Infrastructure Corridor
Trop_73	No significant change from mining development.	Infrastructure Corridor
Trop_74	No significant change from mining development.	Infrastructure Corridor
Trop_75	No significant change from mining development.	Infrastructure Corridor
Trop_76	No significant change from mining development.	Infrastructure Corridor

Tile Number*	Comment	Area
Trop_77	No significant change from mining development.	Infrastructure Corridor
Trop_78	No significant change from mining development.	Infrastructure Corridor
Trop_79	No significant change from mining development.	Infrastructure Corridor
Trop_80	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor
Trop_81	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor
Trop_82	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor
Trop_83	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor
Trop_84	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor
Trop_85	Increase in canopy cover and greenness along drainage lines.	Infrastructure Corridor

Appendix E : Field data sheets

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
A2-1	5820	60	40	5	15	25	Green	Green	Green	4	5	5	nil	nil	Dead branches and trees from fire though all looks healthy	
A2-10	1842	25	75	15	10	50	Green	Green	Green	5	5	4	nil	nil	nil	
A2-11	1852	45	50	50	2	0.5	Green	Yellow	Yellow	5	3	3	nil	nil	Sparse ground layer	Acacia senescence
A2-12	5856	65	35	0.5	3	30	Green	Green	Green	5	5	4	nil	nil	Old fire, now regenerating looks healthy, some dead shrubs from fire, grasses haven't come back very well remnants of bases but not resprouting	
A2-2	1840	45	50	n/a	20	30	n/a	Green	Yellow	n/a	5	5	nil	nil	nil	
A2-3	1850	25	75	70	5	1	Green	Green	Yellow	5	4	3	nil	nil	Dust near the track but minimal in quadrat	
A2-4	5853	50	50	n/a	15	45	n/a	Green	Green	n/a	5	5	nil	nil	hot fire in past has killed eucs and other shrubs, is regenerating well though,	WPT is inaccurate, actual nw corner is 70m north of current wpt
A2-5	5803	45	50	20	35	20	Green	Green	Yellow	5	4	3	nil	nil	Leaf loss from senescence, Triodia dying back	Many very old fallen branches and trees, appears to be from

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
																termites
A2-6	5800	40	60	35	15	20	Green	Green	Yellow	4	4	3	nil	nil	leaf loss from senescence and old fire, Triodia dying back	
A2-7	5823	80	20	5	20	3	Green	Green	Green	5	5	4	nil	nil	Good condition, regenerating from past fire, many burnt dead shrubs	
A2-8	1833	15	80	n/a	40	40	n/a	Green	Yellow	n/a	5	4	nil	nil	nil	Provided a % for the mid storey this year
A2-9	1831	40	55	n/a	30	25	n/a	Green	Yellow	n/a	5	4	nil	nil	nil	Provided a % for the mid storey this year
A3-1	1796	60	40	n/a	30	10	n/a	Green	Green	n/a	5	3	nil	nil	Cattle grazing	
A3-2	1799	70	30	n/a	15	20	n/a	Green	Green	n/a	5	4		nil	Cattle	
A3-3	1811	65	35	20	10	10	Green	Green	Green	5	5	4	nil	nil	Cattle, no weeds	
A3-4	1806	60	35	25	4	15	Green	Green	Green	5	5	4	nil	nil	Cattle, no weeds	
A3-5	1813	35	60	55	20	5	Green	Green	Yellow	5	5	4	nil	nil	nil	
A3-6	1815	45	55	35	20	5	Green	Green	Green	5	5	4	nil	nil	nil	
A7a-1	5779	75	25	3	20	2	Green	Green	Brown	5	4	3	nil	nil	Rabbits, camel evidence in area	Annuals dying off

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
A7a-10	5875	50	40	25	15	1	Green	Green	Green	4	4	4	nil	nil	Many long dead trees and shrubs, some senescence in older trees and shrubs, rabbit evidence	
A7a-2	5775	70	30	25	n/a	25	Green	n/a	Yellow	5	n/a	3	nil	nil	Spinifex dying off, goanna diggings termite activity	No midstorey
A7a-3	5768	80	20	15	5	20	Green	Green	Yellow	4	4	4	nil	nil	Termites, many old dead acacias probably from old fire	Spinifex dying off from ?drought
A7a-4	5877	45	55	10	20	45	Green	Green	Green	5	4	4	nil	nil	Heavy camel activity in area	Senescence in older plants, Triodia dying back, fire in past killed several shrubs and trees
A7a-5	5879	35	65	35	15	40	Green	Green	Green	5	4	4	nil	nil	Older trees and shrubs senescence, Camels have damaged some shrubs	
A7a-6	5919	50	50	20	30	10	Green	Green	Yellow	4	4	4	nil	nil	Old foliage senescence, grasses and small shrubs dying off, some shrubs damaged by	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
															camels	
A7a-7	5787	70	30	15	20	10	Green	Green	Yellow	4	4	4	nil	nil	Termite and goanna activity, camel and rabbit evidence	Some senescence in shrubs, annuals dying off, drought like conditions
A7a-8	5783	40	60	30	25	5	Green	Green	Yellow	3	4	4	nil	nil	Some leaves/branches dying on Acacia appears to be senescence or from old fire some annuals dying off	Termite activity, old dead fallen branches from Acacia
A7a-9	5869	75	25	10	10	5	Green	Yellow	Yellow	4	4	3	nil	nil	Many long dead trees and shrubs appears to be due to fire, evidence of rabbits	
A7b-1	1874	30	55	n/a	35	25	n/a	Green	Yellow	n/a	5	4	nil	nil	nil	
A7b-2	1791	35	40	35	1	15	Green	Green	Yellow	5	5	4	nil	nil	nil	
A7b-3	1868	60	35	20	20	2	Green	Yellow	Yellow	5	5	4	nil	nil	nil	
A7b-4	1866	80	25	15	1	10	Green	Yellow	Yellow	5	4	4	nil	nil	Some grazing	
A7b-5	5844	60	40	30	10	5	Brown	Yellow	Green	3	2	4	nil	nil	Upper and midstorey defoliated and dead from fire	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
A7b-6	5836	60	40	25	15	20	Yellow	Green	Yellow	3	4	4	nil	nil	Fire has killed some trees and shrubs though lots of annuals flowering but finishing off now and dying back	Vegetation is coated in dust from road doesn't appear to be affecting condition
A7b-7	5826	85	20	n/a	n/a	20	n/a	n/a	Green	n/a	n/a	5	nil	nil	No upper or middle storey, all regeneration in gravel pit	
A7b-8	5833	40	60	55	10	2	Green	Green	Yellow	4	3	3	nil	nil	Senescence of lower branches of shrubs, typical of this vegetation	
A7b-9	5829	50	50	10	40	5	Green	Green	Yellow	4	4	3	nil	nil	Some senescence of lower branches, understorey annuals dying off	
C9-1	5766	70	30	10	25	2	Green	Green	Yellow	5	4	4	nil	nil	Some senescence or fire killed shrubs	
C9-2	5763	40	60	15	45	10	Green	Yellow	Yellow	5	4	4	nil	nil	Drought condtions, some dead shrubs from old fire	Drill line in close proximity
C9-3	5760	60	40	30	25	5	Green	Green	Yellow	4	4	3	nil	nil	Drought or old fire, some dead Acacias likely from old fire	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
C9-4	5758	70	30	1	30	0.5	Green	Yellow	Yellow	4	3	3	nil	nil	Drought, many shrubs missing leaves, no disturbance or erosion	
E1b-1	5921	30	70	n/a	55	60	n/a	Green	Green	n/a	4	4	nil	nil	Senescence of older growth both Acacias and Triodia	
E1b-10	1870	45	55	2	15	40	Green	Green	Yellow	4	5	3	nil	nil	nil	
E1b-2	5923	60	40	n/a	15	30	n/a	Green	Green	n/a	5	4	nil	nil	A lot of animal tracks including camels	Fire in past, some shrub senescence but otherwise healthy
E1b-3	1774	25	75	5	15	60	Green	Green	Yellow	4	4	5	nil	nil	nil	
E1b-4	1768	60	35	10	15	25	Green	Green	Green	5	4	5	nil	nil	nil	
E1b-5	1780	35	60	5	25	35	Green	Green	Yellow	5	5	4	nil	nil	nil	
E1b-6	1778	20	70	10	40	30	Green	Green	Yellow	5	5	4	nil	nil	nil	
E1b-7	1876	45	50	30	25	1	Green	Green	Yellow	5	5	4	nil	nil	Old vehicle track, not recently used	
E1b-8	1786	35	40	15	25	5	Green	Green	Green	5	5	5	nil	nil	nil	
E1b-9	1872	60	35	4	30	3	Green	Green	Yellow	5	5	4	nil	nil	nil	
E2-1	1898	80	20	n/a	20	2	n/a	Green	Yellow	n/a	5	4	nil	nil	Pipeline clearing, soil piles in the sw corner	New marker required

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
															photo 1900	
E2-2	1929	45	50	15	25	20	Green	Green	Yellow	5	5	4	nil	nil	nil	
E2-3	1927	70	30	10	2	25	Green	Green	Yellow	4	5	5	nil	nil	nil	
E2-4	1903	70	30	n/a	15	15	n/a	Green	Yellow	n/a	5	4	nil	nil	nil	
E2-5	1884	80	20	n/a	15	10	n/a	Green	Yellow	n/a	5	5	nil	nil	nil	
E2-6	1882	85	20	n/a	15	5	n/a	Green	Green	n/a	5	5	nil	nil	nil	
E3-1	1878	50	45	10	1	45	Green	Yellow	Yellow	5	3	4	nil	nil	Animal tracks, no effects recorded	
E3-2	1880	30	70	2	5	65	Green	Green	Green	5	5	5	nil	nil	nil	
E3-3	1772	40	40	n/a	35	5	n/a	Green	Yellow	n/a	5	4	nil	nil	Camel tracks	
E3-4	1770	55	45	5	25	15	Green	Green	Yellow	5	4	4	nil	nil	nil	
E3-5	1776	60	40	5	20	15	Green	Green	Yellow	5	5	4	nil	nil	Camel tracks	
E3-6	1782	25	70	1	1	70	Green	Green	Green	5	5	4	nil	nil	nil	
E4-1	1830	60	35	1	30	5	Green	Green	Yellow	5	5	4	nil	nil	nil	
E4-10	1848	30	65	5	25	45	Green	Green	Yellow	4	5	4	nil	nil	nil	
E4-11	1853	70	30	1	5	30	Green	Green	Yellow	5	4	4	nil	nil	Patchy burn 2.5 yrs ago	
E4-12	1856	75	25	n/a	2	25	n/a	Green	Yellow	n/a	5	4	nil	nil	nil	
E4-13	5850	25	75	5	3	70	Green	Green	Green	5	5	4	nil	nil	Triodia old growth dying	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
															off	
E4-14	5848	40	60	20	20	50	Green	Green	Yellow	5	5	4	nil	nil	Dead shrubs (and resprouters), from old fire otherwise vegetation looks fine, doesn't seem to have dust issues even though it's adjacent to road, Triodia dying back looks like due to age	
E4-2	1829	35	45	5	35	10	Green	Green	Yellow	5	5	4	nil	nil	nil	
E4-3	5808	60	40	20	10	20	Green	Green	Green	5	5	4	nil	nil	Some senescence, old growth dying off	
E4-4	5811	60	40	25	15	25	Green	Green	Green	5	5	4	nil	nil	Some small shrubs dead, burnt in past but is now regenerating	
E4-5	5814	25	75	20	5	60	Green	Green	Green	4	5	4	nil	nil	nil	
E4-6	5817	40	60	20	3	50	Green	Green	Green	4	5	4	nil	nil	Burnt maybe in last 5 yrs, regenerating good, some senescence of old growth, dead branches from fire and maybe drought affected	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
E4-7	1835	60	35	5	2	35	Green	Green	Green	5	4	4	nil	nil	nil	
E4-8	1837	60	40		10	35		Yellow	Yellow		4	4	nil	nil	nil	
E4-9	1844	40	60	5	20	50	Yellow	Green	Yellow	4	5	4	nil	nil	nil	
E9-1	5797	65	35	0.5	25	5	Green	Green	Yellow	4	4	4	nil	nil	Some leaf loss from senescence or drought, annuals have died off	
E9-2	5791	50	45	10	30	2	Green	Green	Yellow	4	5	3	nil	nil	Very old dead shrubs from fire, termite activity	Annuals dying off, some senescence in old Acacias, rabbit evidence
E9-5	1827	35	60	20	15	40	Green	Green	Green	5	5	4	nil	nil	nil	
E9-6	1824	60	40	15	15	20	Green	Green	Green	5	5	4	nil	nil	nil	
M1-1	5897	55	45			45			Yellow			4	nil	nil	Grasses dried off and dying back, older ones senescence, fire within approximately past 2yrs	
M1-2	5895	85	10		4	10		Green	Green		5	4	nil	nil	Some grasses drying off, burnt in past 2 or so years no over storey, recruiting well though	
M1-3	5891	50	50			50			Green			4	nil	nil	Some smaller grasses have died off, fire in last	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
															couple years	
M1-4	5888	40	55		5	50		Green	Yellow		5	4	nil	nil	Grasses dying off (annuals)	Recent fire
S8-1	1862	70	30	2		30	Green		Yellow	4		4	nil	nil	nil	
S8-2	1860	70	30		2	30		Green	Yellow		5	4	nil	nil	Post fire 2.5 years	
S8-3	1864	65	35		2	35		Green	Yellow		5	4	nil	nil	nil	
S8-4	5865	60	40		10	30		Green	Brown		5	4	nil	nil	Some vegetation coated in dust though doesn't seem to be affecting health	Has been impacted by fire and is regenerating
S8-5	5858	70	30		5	30		Green	Green		5	4	nil	nil	No over storey, all burnt within last approximately last 3 yrs now regenerating , regenerating eucs counted as midstorey	
S8-6	1857	65	35			35			Yellow			5	nil	nil	Post fire 2.5 years	
S8-7	5861	70	30		2	30		Green	Green		5	5	nil	nil	Fire in past vegetation seems to be regenerating well, some dust coating from adjacent road though	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
															doesn't seem to be impacting vegetation health, some small plants appear to be drought stressed	
T1-1	5899	40	60		2	60		Green	Yellow		5	4	nil	nil	Grasses dying off	Burnt about 2 yrs ago
T1-2	5901	60	40		3	40		Green	Green		5	4	nil	nil	Some grasses dying off, fire in past	
T1-3	1910	60	35		5	30		Green	Green		5	5	nil	nil	nil	
T1-4	1913	50	45		5	40		Green	Green		5	5	nil	nil	nil	
X1-1	1887	75	25	5	25	3	Green	Green	Yellow	5	5	5	nil	nil	nil	
X1-10	1934	50	60		30	45		Green	Yellow		5	4	nil	nil	nil	
X1-11	1908	70	30		25	5		Green	Yellow		4	4	nil	nil	nil	
X1-12	1905	65	35		4	35		Green	Yellow		5	4	nil	nil	nil	
X1-13	1915	75	25		2	25		Green	Yellow		5	4	nil	nil	nil	
X1-14	1925	65	35		1	35		Green	Green		5	5	nil	nil	nil	
X1-15	1893	80	20		20	2		Green	Yellow		5	4	nil	nil	nil	
X1-16	1894	85	15		15	2		Green	Yellow		5	5	nil	nil	nil	
X1-2	1891	90	10	1	5	4	Green	Green	Green	5	5	5	nil	nil	nil	

Plot	Photos	Cover - Bare soil	Cover - overall	Cover - over	Cover - mid	Cover - under	Foliar cond - Browning - Over	Foliar cond - Browning - Mid	Foliar cond - Browning - Under	Foliar cond - Leaf loss - Over	Foliar cond - Leaf loss - Mid	Foliar cond - Leaf loss - Under	Deposition (depth cm, area if >4m2	Erosion (Depth, Width, Length cm)	Observations	Other notes
X1-3	5915	50	45		5	40		Green	Green		4	4	nil	nil	Some annual grasses dying off, fire in the past	
X1-4	5909	65	35		3	35		Green	Green		5	4	nil	nil	Grasses dying off	
X1-5	5917	45	55		25	30		Green	Yellow		4	4	nil	nil	Regenerating after fairly recent fire, regrowth looks healthy, some grasses have dried off	
X1-6	5907	30	70		25	50		Green	Yellow		5	4	nil	nil	Old Triodia growth dying off, old fire	
X1-7	5905	75	25	3	5	20	Green	Green	Green	4	5	4	nil	nil	Some grasses dying off and old foliage, recent fire all regrowth	
X1-8	5903	80	20		5	20		Green	Green		5	4	nil	nil	Burnt within past few years, all regenerating, some grasses drying off	
X1-9	1931	75	25		2	25		Green	Green		5	5	nil	nil	nil	

Appendix F : Raw foliar cover data for Operations Area

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
A7A-1	25	20	20	20	25	3	2	2	2	3	20	20	20	20	20	10	5	2	3	2	85	80	80	80	75	I	A7A
A7A-4	30	60	60	50	55	6	5	5	5	10	8	10	10	10	20	30	50	55	45	45	65	30	30	35	45	R	
A7A-2	35	55	55	40	30	25	20	20	35	25	n/a	5	2	n/a	n/a	20	30	65	20	25	70	50	65	60	70	I	
A7A-3	20	35	35	35	20	15	10	10	15	15	2	2	2	2	5	10	20	25	20	20	80	40	40	55	80	R	
A7A-5	45	75	70	70	65	25	25	30	35	35	7	10	10	15	15	25	30	30	35	40	50	20	25	20	35	I	
A7A-6	20	40	40	40	50	8	10	10	20	20	15	25	25	25	30	5	15	15	10	10	85	40	55	55	50	R	
A7A-8	40	50	50	50	60	17	30	30	30	30	15	25	25	30	25	30	20	10	8	5	60	45	45	40	40	I	
A7A-7	55	45	45	45	30	20	10	20	20	15	10	25	20	20	20	30	10	15	15	10	70	40	45	45	70	R	
A7A-10	20	35	30	30	40	15	15	20	20	25	5	10	10	10	15	2	2	1	1	1	90	85	80	80	50	I	
A7A-9	15	20	20	23	25	7	2	10	10	10	5	10	5	5	10	10	10	15	10	5	90	85	85	85	75	R	
E3-1	30	40	45	45	45	7	17	17	15	10	3	4	3	2	1	25	40	45	45	45	70	50	45	45	50	I	E3
E3-2	35	80	75	75	70	4	2	2	2	2	5	4	5	5	5	30	75	70	70	65	60	25	25	25	30	R	
E3-3	35	40	40	40	40	n/a	n/a	n/a	n/a	n/a	30	35	35	35	35	20	5	5	5	5	65	35	35	35	40	I	
E3-4	40	45	46	40	45	20	6	6	6	5	25	25	25	25	25	10	15	15	15	15	70	30	35	35	55	R	
E3-5	25	50	40	40	40	5	3	3	3	5	20	20	20	20	20	10	15	15	15	15	80	60	60	60	60	I	
E3-6	35	75	75	70	70	4	3	3	2	1	5	2	2	2	1	35	70	70	70	70	70	25	25	25	25	R	
E1B-1	75	70	70	70	70	n/a	n/a	n/a	n/a	n/a	60	50	50	50	55	60	50	45	45	60	55	40	40	30	30	I	E1
E1B-2	20	35	30	30	40	n/a	n/a	n/a	n/a	n/a	5	20	15	15	15	15	25	20	20	30	85	55	60	60	60	R	
E1B-3	45	70	74	75	75	10	7	7	8	5	10	5	10	12	15	30	60	60	60	60	60	30	30	30	25	I	
E1B-4	25	35	35	35	35	20	10	10	10	10	6	15	15	15	15	20	25	25	25	25	85	45	45	45	60	R	
E1B-5	65	70	50	50	60	15	5	5	5	5	15	10	10	15	25	15	35	35	35	35	30	40	40	40	35	I	
E1B-6	50	65	70	70	70	10	5	5	10	10	30	20	25	40	40	10	50	50	30	30	50	25	20	20	20	R	
E1B-8	25	45	35	35	40	15	10	10	10	15	15	20	20	22	25	15	5	5	5	5	75	35	35	35	35	I	

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E1B-7	35	50	50	50	50	25	30	30	30	30	20	25	25	25	25	5	5	2	1	1	70	35	40	40	45	R	
E1B-10	30	55	54	55	55	5	2	2	2	2	7	15	15	15	15	25	40	40	40	40	70	45	45	45	45	I	
E1B-9	20	30	30	30	35	4	2	2	2	4	20	20	20	25	30	5	10	8	5	3	85	60	60	60	60	R	
A7B-2	35	40	40	40	40	20	35	35	35	35	10	1	1	1	1	15	15	15	15	15	70	25	25	25	35	I	A7B
A7B-1	35	60	55	55	55	n/a	n/a	n/a	n/a	n/a	30	30	30	35	35	30	30	25	25	25	55	30	30	30	30	R	
A7B-4	25	25	25	25	25	15	15	15	15	15	15	1	1	1	1	5	12	12	12	10	80	80	80	80	80	I	
A7B-3	35	45	35	35	35	25	25	25	25	20	20	15	15	15	20	10	2	2	2	2	70	60	60	60	60	R	
C9-1	30	35	35	35	30	15	8	8	8	10	20	30	30	30	25	5	2	2	1	2	85	60	65	75	70	I	C9
C9-3	35	65	65	65	40	25	30	30	35	30	25	30	30	30	25	5	15	15	10	5	65	30	35	30	60	R	
C9-2	30	60	60	60	60	7	15	15	15	15	25	30	30	40	45	15	10	15	15	10	85	35	40	30	40	I	
C9-4	20	35	30	30	30	7	3	3	1	1	20	15	30	30	30	5	20	3	2	0.5	80	60	70	70	70	R	

^ I = Impact site, R = Reference site

Appendix G : Raw foliar condition data for Operations Area

Site name	Browning scale*															Leaf loss**															Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
A7A-1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	3	5	4	5	5	5	5	3	5	5	4	5	3	3	3	3	I	A7a
A7A-4	1	1	1	1	1	1	1	1	1	1	2	2	2	3	1	5	4	5	5	5	5	4	5	5	4	4	3	3	2	4	R	
A7A-2	1	1	1	1	1	1	1	1	n/a	n/a	1	2	2	2	2	5	5	5	5	5	5	4	4	n/a	n/a	5	3	3	3	3	I	
A7A-3	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	4	5	4	5	5	5	5	4	5	3	3	4	4	R	
A7A-5	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	4	4	5	5	5	4	4	5	4	4	3	3	4	4	I	
A7A-6	1	1	1	1	1	1	2	1	1	1	1	2	2	2	2	5	4	4	5	4	5	3	4	5	4	4	3	3	3	4	R	
A7A-8	1	1	1	1	1	1	2	1	1	1	1	2	2	2	2	5	3	3	5	3	5	3	4	5	4	5	4	3	4	4	I	
A7A-7	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	4	4	4	5	4	5	4	4	5	3	3	3	4	R	
A7A-10	1	1	1	1	1	1	1	1	2	1	1	1	2	2	1	5	5	4	4	4	5	4	5	4	4	5	3	3	4	4	I	
A7A-9	1	1	1	1	1	1	1	1	1	2	1	2	2	3	2	4	3	4	4	4	4	3	4	5	4	4	3	3	3	3	R	
E3-1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	2	5	4	5	5	5	5	4	4	4	3	4	3	3	4	4	I	E3
E3-2	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	4	5	5	5	5	4	5	5	5	5	4	4	4	5	R	
E3-3	1	n/a	n/a	n/a	n/a	1	2	1	1	1	1	2	1	1	2	5	n/a	n/a	n/a	n/a	5	3	4	4	5	5	4	4	5	4	I	
E3-4	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	5	4	4	4	5	5	4	5	4	4	4	3	5	4	4	R	
E3-5	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	5	5	5	5	5	4	5	5	5	5	3	3	3	4	I	
E3-6	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	5	5	5	5	5	5	5	5	5	5	5	4	4	5	4	R	
E1B-1	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	1	4	n/a	n/a	n/a	n/a	5	4	4	4	4	5	3	3	3	4	I	E1b
E1B-2	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	1	5	n/a	n/a	n/a	n/a	5	5	5	5	5	5	4	3	4	4	R	
E1B-3	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	4	5	4	5	4	4	4	4	4	4	4	4	5	I	
E1B-4	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	5	5	4	5	5	4	4	4	5	4	4	2	3	4	5	R	
E1B-5	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	5	5	5	5	4	5	5	5	4	3	3	3	4	I	
E1B-6	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	5	5	5	5	4	5	5	5	5	4	4	3	4	R	
E1B-8	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	4	4	5	5	5	5	5	5	5	5	4	4	5	5	I	

Site name	Browning scale*															Leaf loss**															Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E1B-7	1	1	1	1	1	1	2	1	2	1	1	2	2	2	2	5	4	4	5	5	5	4	3	3	5	4	2	4	4	4	R	
E1B-10	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	5	5	5	4	5	5	5	5	5	5	4	4	4	3	I	
E1B-9	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	5	5	5	5	5	5	4	4	5	5	5	4	3	4	4	R	
A7B-2	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	5	3	3	4	5	5	4	5	5	5	5	2	2	3	4	I	
A7B-1	n/a	n/a	n/a	n/a	n/a	1	1	1	1	1	2	2	1	1	2	n/a	n/a	n/a	n/a	n/a	5	5	5	4	5	4	4	4	4	4	R	A7 b
A7B-4	1	1	1	1	1	1	3	2	2	2	1	2	2	1	2	5	4	3	4	5	5	3	3	4	4	5	4	4	4	4	I	
A7B-3	1	1	1	1	1	1	1	1	2	2	1	2	2	2	2	5	4	4	5	5	5	4	4	5	5	4	3	4	4	4	R	
C9-1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	2	5	4	5	5	5	4	4	5	5	4	4	3	4	5	4	I	
C9-3	1	1	1	1	1	1	2	1	1	1	1	2	2	3	2	5	4	4	4	4	4	3	4	5	4	4	3	3	4	3	R	C9
C9-2	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	5	5	5	5	5	4	4	4	4	4	3	4	3	3	4	I	
C9-4	1	1	1	1	1	1	3	2	2	2	1	2	2	2	2	5	3	5	5	4	4	3	3	3	3	4	3	3	4	3	R	

* Browning Scale 1 = Green (Healthy), 2 = Yellow (Senescent), 3 = Brown (Dead or dying foliage), ** Leaf loss scale (1 through to 5 with 1 indicating denuded branches and 5 indicating a full canopy of leaves), ^ I = Impact site, R = Reference site

Appendix H Raw foliar cover data for Infrastructure Corridor

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E9-2	45	45	40	35	45	10	20	20	15	10	30	25	25	30	30	5	2	1	1	2	50	60	65	55	50	I	E9
E9-1	30	25	26	25	35	1	1	1	n/a	0.5	25	25	25	25	25	10	2	1	1	5	70	80	76	70	65	R	
E9-6	50	35	35	35	40	20	15	15	15	15	15	10	10	10	15	20	20	20	20	20	50	70	65	65	60	I	
E9-5	70	65	60	60	60	35	10	15	20	20	20	15	15	15	15	40	40	40	40	40	30	45	35	35	35	R	
A3-2	50	30	30	30	30	n/a	n/a	10	n/a	n/a	10	10	2	15	15	50	20	20	20	20	40	70	70	70	70	I	A3
A3-1	75	35	40	40	40	n/a	n/a	n/a	n/a	n/a	40	25	30	30	30	20	10	10	10	10	25	65	60	60	60	R	
A3-4	25	35	35	35	35	15	25	25	25	25	5	2	2	2	4	5	15	15	15	15	80	50	50	55	60	I	
A3-3	30	30	30	30	35	20	20	20	20	20	15	8	10	10	10	5	10	10	8	10	70	60	60	65	65	R	
A3-5	70	45	55	60	60	40	30	55	55	55	55	15	15	15	20	20	5	5	5	5	30	35	35	35	35	I	
A3-6	60	55	55	55	55	20	35	35	35	35	40	20	20	20	20	50	5	5	5	5	25	40	40	40	45	R	
S8-3	80	60	35	32	35	4	5	n/a	n/a	n/a	30	15	2	2	2	75	50	35	30	35	20	35	65	68	65	I	S8
S8-1	85	80	30	30	30	5	5	2	2	2	35	10	n/a	1	n/a	75	75	30	30	30	15	15	70	70	70	R	
S8-2	85	75	15	25	30	4	4	n/a	n/a	n/a	30	4	n/a	2	2	75	75	15	25	30	15	20	85	75	70	I	
S8-6	85	60	20	30	35	35	n/a	n/a	n/a	n/a	n/a	30	n/a	n/a	n/a	80	55	20	30	35	15	40	80	70	65	R	
S8-4	65	30	30	30	40	1	1	n/a	n/a	n/a	7	10	10	10	10	50	25	25	25	30	40	75	75	70	60	I	
S8-7	n/a	70	30	32	30	n/a	n/a	n/a	n/a	n/a	n/a	3	n/a	2	2	n/a	65	30	30	30	n/a	35	70	70	70	I	
S8-5	60	80	35	34	30	n/a	3	n/a	n/a	n/a	50	60	n/a	4	5	55	40	35	30	30	35	20	65	65	70	R	
E4-2	50	30	35	45	45	2	n/a	n/a	5	5	20	7	7	30	35	40	25	30	10	10	50	75	65	30	35	I	E4
E4-1	60	25	30	35	35	1	0.5	n/a	1	1	1	4	2	30	30	60	25	28	5	5	40	80	70	60	60	R	
E4-3	30	40	35	40	40	5	n/a	25	25	20	n/a	25	8	10	10	25	20	10	15	20	70	70	65	60	60	I	
E4-4	30	35	35	50	40	3	15	15	15	25	5	2	2	20	15	30	30	30	40	25	60	70	70	55	60	R	
E4-5	75	70	70	75	75	5	25	25	25	20	1	1	1	1	5	75	50	50	65	60	25	25	35	20	25	I	
E4-6	80	65	75	80	60	15	25	3	5	20	7	2	2	5	3	80	50	70	80	50	20	35	25	15	40	R	
E4-7	45	30	30	35	35	5	2	3	3	5	40	3	2	2	2	10	30	30	35	35	35	65	65	60	60	I	
E4-8	40	30	30	40	40	n/a	1	1	1	n/a	30	4	4	5	10	20	25	25	35	35	60	70	70	60	60	R	
E4-9	80	60	60	60	60	5	3	3	5	5	30	20	20	20	20	80	50	50	50	50	10	45	45	40	40	I	
E4-10	80	60	65	65	65	4	7	7	7	5	5	20	25	25	25	75	40	45	45	45	20	35	30	30	30	R	
E4-11	80	55	25	30	30	1	2	2	1	1	40	7	5	5	5	80	45	20	25	30	20	50	75	70	70	I	

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E4-12	75	45	10	20	25	10	4	n/a	n/a	n/a	90	20	n/a	2	2	70	20	10	20	25	25	60	90	80	75	R	
E4-14	60	40	40	45	60	15	20	20	20	20	8	4	4	4	20	50	40	40	40	50	40	60	50	50	40	I	
E4-13	35	60	60	62	75	2	4	4	4	5	2	2	2	2	3	30	60	60	60	70	70	35	35	35	25	R	
A2-1	40	35	30	45	40	5	5	5	5	5	40	7	7	30	15	5	25	20	10	25	55	75	65	40	60	I	A2
A2-7	15	20	25	35	20	5	7	8	5	5	10	1	1	1	20	5	20	22	30	3	80	90	75	65	80	R	
A2-2	55	45	45	50	50	n/a	n/a	n/a	n/a	n/a	50	35	35	20	20	10	10	10	30	30	40	60	60	45	45	I	
A2-10	95	70	70	75	75	10	10	15	15	15	95	25	10	10	10	5	35	45	50	50	5	35	30	25	25	R	
A2-3	50	75	75	75	75	40	75	75	75	70	10	7	7	5	5	5	3	2	1	1	30	20	20	25	25	I	
A2-11	50	50	50	50	50	35	50	50	50	50	20	5	5	5	2	5	2	1	1	0.5	40	65	65	45	45	R	
A2-4	40	40	50	50	50	n/a	n/a	n/a	n/a	n/a	10	15	20	20	15	30	25	40	40	45	65	65	50	50	50	I	
A2-12	17	30	35	37	35	2	5	5	2	0.5	4	2	2	2	3	13	30	35	35	30	75	70	65	60	65	R	
A2-6	50	40	40	45	60	30	30	30	35	35	50	10	10	10	15	20	10	10	10	20	40	45	35	35	40	I	
A2-5	60	50	50	50	50	20	20	20	20	20	60	25	25	30	35	20	15	15	10	20	30	45	40	35	45	R	
A2-9	85	25	30	50	55	n/a	0.3	n/a	n/a	n/a	30	n/a	n/a	n/a	30	60	25	30	50	25	25	85	70	40	40	I	
A2-8	80	25	40	85	80	n/a	n/a	n/a	n/a	n/a	75	2	2	2	40	60	25	40	85	40	25	85	60	15	15	R	
A7B-6	25	45	45	45	40	13	30	35	40	25	5	7	7	10	15	7	15	15	15	20	60	40	40	40	60	I	A7B
A7B-5	70	40	45	50	40	40	35	35	40	30	20	15	15	15	10	50	20	20	15	5	25	30	30	30	60	R	
A7B-7	30	n/a	2	10	20	15	n/a	n/a	n/a	n/a	30	n/a	n/a	n/a	n/a	15	n/a	2	10	20	70	100	98	90	85	I	
A7B-9	n/a	50	45	50	50	n/a	8	8	10	10	n/a	40	35	40	40	n/a	5	5	4	5	n/a	50	50	45	50	I	
A7B-8	70	65	60	65	60	60	55	55	55	55	35	8	10	10	10	7	4	4	2	2	40	30	35	35	40	R	

^ I = Impact site, R = Reference site

Appendix I : Raw foliar condition data for Infrastructure Corridor

Site name	Browning scale*															Leaf loss**															Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E9-2	1	1	2	1	1	1	1	2	1	1	1	3	2	2	2	5	4	4	4	4	4	4	4	5	5	4	2	3	4	3	I	E9
E9-1	1	1	2	n/a	1	1	1	2	2	1	1	2	2	2	2	5	4	4	n/a	4	5	4	4	5	4	4	3	3	4	4	R	
E9-6	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	5	4	4	5	5	4	4	4	4	5	3	3	4	4	4	I	
E9-5	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	4	4	4	5	5	4	4	4	5	5	4	3	4	4	4	R	
A3-2	n/a	n/a	1	n/a	n/a	1	1	1	1	1	2	3	2	2	1	n/a	n/a	5	n/a	5	4	4	5	4	4	3	3	4	3	n/a	I	A3
A3-1	n/a	n/a	n/a	n/a	n/a	1	1	2	1	1	2	3	2	2	1	n/a	n/a	n/a	n/a	n/a	4	4	3	4	5	3	3	2	3	3	R	
A3-4	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	5	4	4	5	5	5	4	4	4	5	3	3	3	3	4	I	
A3-3	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	4	4	5	5	5	4	4	4	5	3	3	3	3	4	R	
A3-5	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	4	4	4	5	5	4	4	4	4	5	3	4	3	3	4	I	
A3-6	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	4	4	4	4	5	4	4	4	5	5	3	4	3	3	4	R	
S8-3	1	1	n/a	n/a	n/a	1	1	2	1	1	2	2	1	2	2	5	4	n/a	n/a	n/a	4	4	5	5	5	3	4	4	5	4	I	S8
S8-1	1	1	1	1	1	1	1	n/a	1	n/a	2	2	1	2	2	3	4	4	4	4	5	4	n/a	4	n/a	3	4	5	5	4	R	
S8-2	1	1	n/a	n/a	n/a	1	1	n/a	1	1	1	2	1	2	2	4	4	n/a	n/a	n/a	4	4	n/a	5	5	4	4	5	5	4	I	
S8-6	n/a	n/a	n/a	n/a	n/a	1	1	n/a	n/a	n/a	2	2	1	2	2	n/a	n/a	n/a	n/a	n/a	4	4	n/a	n/a	n/a	4	3	5	5	5	R	
S8-4	1	1	n/a	n/a	n/a	1	1	2	1	1	1	2	2	1	3	5	5	n/a	n/a	n/a	5	4	3	5	5	4	3	4	4	4	I	
S8-7	n/a	n/a	n/a	n/a	n/a	n/a	1	3	1	1	n/a	2	1	2	1	n/a	n/a	n/a	n/a	n/a	n/a	4	1	5	5	n/a	3	5	5	5	I	
S8-5	1	1	n/a	n/a	n/a	1	1	2	1	1	1	2	1	2	1	4	5	n/a	n/a	n/a	5	4	3	4	5	5	4	5	4	4	R	
E4-2	1	n/a	n/a	1	1	1	1	2	1	1	1	1	2	2	2	4	n/a	n/a	5	5	4	5	4	5	5	4	5	3	4	4	I	E4
E4-1	2	1	1	1	1	1	1	2	1	1	1	1	2	2	2	3	4	4	4	5	4	5	4	5	5	4	4	3	5	4	R	
E4-3	1	n/a	1	1	1	1	1	1	1	1	1	1	2	2	1	5	n/a	5	5	5	4	4	4	4	5	4	4	4	4	4	I	
E4-4	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	5	4	5	4	5	4	4	4	5	5	4	4	4	5	4	R	
E4-5	1	1	1	2	1	1	1	1	1	1	2	2	2	2	1	4	4	4	4	4	4	5	5	4	5	3	4	4	3	4	I	
E4-6	1	1	1	1	1	1	1	1	1	1	2	2	2	2	1	4	5	5	5	4	4	5	5	5	5	3	4	4	4	4	R	

Site name	Browning scale*															Leaf loss**															Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E4-7	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	5	5	5	5	4	5	5	4	4	4	4	4	4	4	I	
E4-8	1	1	1	1	n/a	1	1	1	2	2	1	1	2	2	2	5	5	5	5	n/a	5	5	5	4	4	4	4	4	4	4	R	
E4-9	1	1	1	1	2	1	1	1	1	1	2	2	2	2	2	4	2	2	4	4	4	4	4	5	5	3	4	4	4	4	I	
E4-10	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	4	5	3	3	4	4	4	5	5	5	3	4	4	4	4	R	
E4-11	1	1	1	1	1	1	1	2	1	1	1	2	2	2	2	5	4	3	5	5	4	4	3	3	4	4	4	4	4	4	I	
E4-12	1	1	n/a	n/a	n/a	1	1	n/a	1	1	2	2	1	2	2	4	4	n/a	n/a	n/a	4	4	n/a	4	5	3	4	3	5	4	R	
E4-14	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	4	4	4	5	5	4	4	4	5	5	4	4	4	4	4	I	
E4-13	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	5	4	4	5	5	5	4	4	4	5	4	4	3	4	4	R	
A2-1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	5	4	4	4	4	5	5	5	5	5	5	4	4	5	5	I	
A2-7	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1	5	4	4	4	5	5	4	4	5	5	4	5	5	5	4	R	
A2-2	1	n/a	n/a	n/a	n/a	1	3	1	1	1	1	1	1	2	2	5	n/a	n/a	n/a	n/a	5	4	4	4	5	5	4	4	4	5	I	
A2-10	1	1	1	1	1	1	2	1	1	1	1	2	2	2	1	5	4	4	5	5	5	4	4	5	5	5	4	4	5	4	R	
A2-3	1	1	1	1	1	1	2	1	2	1	1	2	2	2	2	4	3	3	4	5	4	2	3	4	4	4	3	2	3	3	I	
A2-11	1	1	2	1	1	1	1	1	1	2	1	1	2	2	2	5	4	4	5	5	5	4	4	5	3	5	4	3	4	3	R	A2
A2-4	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	1	2	1	1	5	n/a	n/a	n/a	n/a	5	4	5	5	5	5	4	3	5	5	I	
A2-12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	4	5	5	5	5	4	5	5	5	5	4	4	5	4	R	
A2-6	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	I	
A2-5	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	5	4	4	4	5	4	4	4	3	4	3	3	3	3	3	R	
A2-9	n/a	1	n/a	n/a	n/a	1	n/a	n/a	n/a	1	1	1	2	2	2	n/a	3	n/a	n/a	n/a	5	n/a	n/a	n/a	5	4	4	3	4	4	I	
A2-8	1	n/a	n/a	n/a	n/a	1	1	2	1	1	1	2	2	2	2	5	n/a	n/a	n/a	n/a	5	4	4	5	5	4	3	3	4	4	R	
A7B-6	1	1	2	1	2	1	1	2	1	1	3	2	2	2	2	5	4	4	4	3	5	4	4	5	4	3	2	3	3	4	I	A7b
A7B-5	1	1	2	1	3	1	1	1	2	2	3	2	2	2	1	4	3	4	3	3	4	4	4	4	2	2	2	3	3	4	R	

Site name	Browning scale*															Leaf loss**														Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
A7B-7	1	n/a	n/a	n/a	n/a	1	n/a	n/a	n/a	n/a	1	n/a	1	1	1	5	n/a	n/a	n/a	n/a	5	n/a	n/a	n/a	n/a	3	n/a	5	5	5	I	
A7B-9	n/a	1	1	1	1	n/a	1	2	1	1	n/a	1	2	2	2	n/a	4	4	4	4	n/a	4	4	5	4	n/a	3	4	4	3	I	
A7B-8	1	1	1	1	1	1	1	2	2	1	1	2	2	2	2	5	4	4	5	4	4	4	3	4	3	4	3	4	4	3	R	

* Browning Scale 1 = Green (Healthy), 2 = Yellow (Senescent), 3 = Brown (Dead or dying foliage), ** Leaf loss scale (1 through to 5 with 1 indicating denuded branches and 5 indicating a full canopy of leaves), ^ I = Impact site, R = Reference site

Appendix J : Raw foliar cover data for Water Supply Borefield

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E2-1	35	40	10	12	20	n/a	n/a	n/a	n/a	n/a	5	2	5	2	20	35	40	5	10	2	65	65	90	85	80	I	E2
E2-4	60	70	25	30	30	4	n/a	n/a	n/a	n/a	5	20	10	10	15	30	60	15	20	15	50	30	75	70	70	R	
E2-2	40	55	50	50	50	20	10	10	15	15	40	20	20	25	25	40	25	25	20	20	60	50	48	45	45	I	
E2-3	45	50	9	25	30	11	15	3	5	10	10	5	1	1	2	35	30	5	20	25	55	70	80	75	70	R	
E2-5	40	60	15	18	20	n/a	1	n/a	n/a	n/a	35	25	n/a	10	15	15	50	15	8	10	65	45	85	82	80	I	
E2-6	35	55	6	15	20	5	4	n/a	n/a	n/a	5	3	n/a	10	15	30	50	6	5	5	70	50	94	85	85	R	
X1-1	40	70	15	20	25	10	10	5	5	5	25	15	n/a	15	25	35	60	12	3	3	50	35	85	70	75	I	X1
X1-2	75	40	4	10	10	3	2	n/a	1	1	10	6	n/a	5	5	25	40	4	4	4	70	65	95	90	90	R	
X1-3	75	50	50	45	45	n/a	n/a	n/a	n/a	n/a	2	4	2	5	5	75	45	15	40	40	25	55	88	50	50	I	
X1-5	50	50	25	55	55	3	2	n/a	n/a	n/a	10	5	n/a	25	25	40	45	25	30	30	40	55	73	45	45	R	
X1-4	35	50	20	45	35	8	7	n/a	n/a	n/a	8	6	1	5	3	25	40	20	45	35	70	60	80	55	65	I	
X1-6	35	45	45	70	70	n/a	n/a	n/a	n/a	n/a	5	5	5	25	25	25	45	45	55	50	70	50	50	35	30	R	
X1-7	50	40	10	35	25	3	7	5	5	3	5	7	1	5	5	40	25	7	25	20	35	70	88	65	75	I	
X1-8	50	55	12	40	20	5	5	1	2	n/a	25	6	1	2	5	20	50	10	35	20	50	55	87	60	80	R	
X1-9	50	60	10	20	25	5	2	n/a	n/a	n/a	15	15	2	2	2	30	50	8	20	25	60	45	88	80	75	I	
X1-10	40	55	53	70	60	n/a	n/a	n/a	n/a	n/a	14	25	20	30	30	27	50	45	50	45	65	45	45	50	50	R	
X1-11	65	60	10	30	30	4	5	n/a	n/a	n/a	12	6	5	20	25	30	55	5	15	5	35	45	90	65	70	I	
X1-12	35	45	25	35	35	15	5	n/a	n/a	n/a	5	2	1	1	4	25	40	25	35	35	75	55	75	65	65	R	
X1-13	35	65	8	25	25	n/a	n/a	n/a	n/a	n/a	7	3	3	2	2	25	65	5	25	25	60	65	92	70	75	I	
X1-14	70	55	10	28	35	2	3	n/a	n/a	n/a	25	15	3	3	1	45	40	7	25	35	30	55	90	75	65	R	
X1-15	35	50	4	10	20	10	3	n/a	n/a	n/a	30	5	2	8	20	5	45	2	2	2	60	60	96	90	80	I	
X1-16	40	55	3	8	15	3	n/a	n/a	n/a	n/a	35	1	1	4	15	10	55	3	4	2	60	50	96	92	85	R	
M1-1	n/a	n/a	n/a	35	45	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1	n/a	n/a	n/a	n/a	35	45	n/a	n/a	n/a	65	55	I	M1

Site name	Cover (%)																				Bare soil (%)					Site type^	Vegetation community
	Overall					Overstorey					Midstorey					Understorey											
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
M1-2	n/a	n/a	n/a	10	15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2	4	n/a	n/a	n/a	8	10	n/a	n/a	n/a	85	85	R	
M1-3	n/a	n/a	n/a	40	50	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	40	50	n/a	n/a	n/a	60	50	I	
M1-4	n/a	n/a	n/a	42	55	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2	5	n/a	n/a	n/a	40	50	n/a	n/a	n/a	70	40	R	
T1-3	30	45	27	35	35	1	1	n/a	n/a	n/a	25	7	2	5	5	20	40	25	30	30	70	65	71	55	60	I	T1
T1-1	45	60	16	85	60	10	5	n/a	n/a	n/a	10	15	1	1	2	30	40	15	80	60	60	40	82	15	40	R	
T1-4	45	40	12	50	45	n/a	n/a	n/a	n/a	n/a	35	20	2	1	5	10	20	12	50	40	60	65	86	45	50	I	
T1-2	40	45	25	45	40	2	1	n/a	n/a	n/a	3	6	2	2	3	40	40	25	45	40	60	60	75	55	60	R	

^ I = Impact site, R = Reference site

Appendix K : Raw foliar condition data for Water Supply Borefield

Site name	Browning scale*															Leaf loss**														Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
E2-1	n/a	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	2	n/a	n/a	n/a	n/a	n/a	4	4	4	5	5	4	3	4	4	4	I	
E2-4	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	2	5	n/a	n/a	n/a	n/a	5	5	5	5	5	5	4	5	4	4	R	
E2-2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	4	4	4	5	5	4	4	4	5	5	3	3	3	3	4	I	
E2-3	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	5	5	3	5	4	4	5	5	5	5	4	3	5	4	5	R	E2
E2-5	1	1	n/a	n/a	n/a	1	1	n/a	1	1	1	2	1	2	2	5	5	n/a	n/a	n/a	5	5	n/a	4	5	5	4	4	3	5	I	
E2-6	1	1	n/a	n/a	n/a	1	1	n/a	1	1	1	2	1	2	1	5	4	n/a	n/a	n/a	5	4	n/a	5	5	5	2	5	4	5	R	
X1-1	1	1	2	1	1	1	1	n/a	1	1	1	2	1	2	2	5	4	4	3	5	5	4	n/a	4	5	5	4	4	4	5	I	
X1-2	1	1	1	1	1	1	1	n/a	1	1	1	2	2	2	1	5	4	5	4	5	5	4	n/a	5	5	5	4	4	4	5	R	
X1-3	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	1	4	n/a	n/a	n/a	n/a	4	5	5	5	4	4	4	4	4	4	I	
X1-5	1	1	n/a	n/a	n/a	1	1	n/a	1	1	1	2	1	2	2	4	4	n/a	n/a	n/a	4	4	n/a	5	4	4	4	5	4	4	R	
X1-4	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	1	5	4	n/a	n/a	n/a	5	4	5	5	5	5	4	4	3	4	I	
X1-6	n/a	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	2	n/a	n/a	n/a	n/a	n/a	5	4	4	5	5	5	4	3	4	4	R	
X1-7	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	5	4	4	5	4	4	4	4	5	5	4	3	5	3	4	I	
X1-8	1	1	1	1	n/a	1	1	1	1	1	1	2	1	2	1	4	4	5	5	n/a	4	4	4	5	5	4	3	5	3	4	R	
X1-9	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	1	4	5	n/a	n/a	n/a	5	5	5	5	5	5	4	4	4	5	I	X1
X1-10	n/a	n/a	n/a	n/a	n/a	1	1	1	2	1	1	2	2	2	2	n/a	n/a	n/a	n/a	n/a	5	5	4	5	5	4	4	3	4	4	R	
X1-11	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	2	4	4	n/a	n/a	n/a	4	4	5	5	4	4	4	5	4	4	I	
X1-12	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	2	5	4	n/a	n/a	n/a	5	4	5	5	5	4	3	5	4	4	R	
X1-13	n/a	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	1	2	2	n/a	n/a	n/a	n/a	n/a	5	4	5	5	5	5	4	5	4	4	I	
X1-14	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	3	1	4	3	n/a	n/a	n/a	4	4	5	5	5	4	4	4	4	5	R	
X1-15	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	2	5	4	n/a	n/a	n/a	5	4	3	4	5	5	4	3	4	4	I	
X1-16	1	n/a	n/a	n/a	n/a	1	1	1	1	1	1	2	2	2	2	5	n/a	n/a	n/a	n/a	5	4	5	5	5	5	3	3	4	5	R	

Site name	Browning scale*															Leaf loss**														Site type^	Vegetation community
	Overstorey					Midstorey					Understorey					Overstorey					Midstorey					Understorey						
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015		
M1-1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2	n/a	n/a	n/a	n/a	2	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4	n/a	n/a	n/a	n/a	4	4	I	M1
M1-2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	1	n/a	n/a	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	5	n/a	n/a	n/a	4	4	R	
M1-3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3	4	I	
M1-4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	1	n/a	n/a	n/a	2	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5	5	n/a	n/a	n/a	5	4	R	
T1-3	1	1	n/a	n/a	n/a	1	1	1	1	1	1	1	2	2	1	5	4	n/a	n/a	n/a	5	4	3	4	5	4	4	3	4	5	I	T1
T1-1	1	1	n/a	n/a	n/a	1	1	3	1	1	2	2	1	2	2	5	4	n/a	n/a	n/a	5	4	1	5	5	5	3	5	4	4	R	
T1-4	n/a	n/a	n/a	n/a	n/a	1	1	1	2	1	1	2	1	2	1	n/a	n/a	n/a	n/a	n/a	5	4	5	3	5	4	3	5	3	5	I	
T1-2	1	1	n/a	n/a	n/a	1	1	1	1	1	1	2	1	3	1	5	4	n/a	n/a	n/a	5	4	5	5	5	5	3	5	3	4	R	

* Browning Scale 1 = Green (Healthy), 2 = Yellow (Senescent), 3 = Brown (Dead or dying foliage), ** Leaf loss scale (1 through to 5 with 1 indicating denuded branches and 5 indicating a full canopy of leaves), ^ I = Impact site, R = Reference site

Appendix L : Indicator species

Site	Site type	Indicator species	Cover (%)	No. plants
Operations Area				
A7a-5	Impact	*Senna artemisioides* subsp. *filifolia*	1	2
A7a-6	Reference	*Senna artemisioides* subsp. *filifolia*	3	10 to 20
A7a-10	Impact	*Dodonaea rigida*	0.5	5
A7a-9	Reference	*Dodonaea rigida*	3	5 to 10
A7a-8	Impact	*Triodia basedowii*	1	10 to 20
A7a-7	Reference	*Triodia basedowii*	1	30 to 40
A7a-1	Impact	*Ptilotus obovatus*	1	30 to 40
A7a-4	Reference	*Ptilotus obovatus*	1	10 to 20
A7a-2	Impact	*Triodia basedowii*	25	400 to 500
A7a-3	Reference	*Triodia basedowii*	20	500 to 1000
C9-1	Impact	*Senna artemisioides* subsp. *filifolia*	5	30 to 40
C9-3	Reference	*Senna artemisioides* subsp. *filifolia*	15	30 to 40
C9-2	Impact	*Ptilotus obovatus*	0.5	10 to 20
C9-4	Reference	*Ptilotus obovatus*	1	40 to 50
E1b-1	Impact	*Triodia basedowii*	60	400 to 500
E1b-2	Reference	*Triodia basedowii*	5	20 to 30
E3-1	Impact	*Triodia desertorum*	45	400 to 500
E3-2	Reference	*Triodia desertorum*	60	500 to 1000
E1b-8	Impact	*Triodia basedowii*	3	30 to 40
E1b-7	Reference	*Triodia basedowii*	0.1	5 to 10
A7b-2	Impact	*Acacia aneura*	30	5 to 10
A7b-1	Reference	*Acacia aneura*	30	50 to 100
E3-3	Impact	*Anthotroche pannosa*	1	5 to 10
E3-4	Reference	*Anthotroche pannosa*	0.1	2
A7b-4	Impact	*Triodia basedowii*	10	50 to 100
A7b-3	Reference	*Triodia basedowii*	2	5 to 10
E1b-3	Impact	*Triodia basedowii*	60	200 to 300
E1b-4	Reference	*Triodia basedowii*	25	200 to 300
E1b-5	Impact	*Triodia basedowii*	35	400 to 500
E1b-6	Reference	*Triodia basedowii*	25	200 to 300
E1b-10	Impact	*Triodia basedowii*	40	400 to 500
E1b-9	Reference	*Triodia basedowii*	3	5 to 10
E3-5	Impact	*Anthotroche pannosa*	4	20 to 30
E3-6	Reference	*Anthotroche pannosa*	1	5 to 10

Site	Site type	Indicator species	Cover (%)	No. plants
Infrastructure Corridor				
A3-2	Impact	*Eremophila clarkei*	1	5 to 10
A3-1	Reference	*Eremophila clarkei*	1	5 to 10
A3-4	Impact	*Acacia tetragonophylla*	2	4
A3-3	Reference	*Acacia tetragonophylla*	2	3
A3-5	Impact	*Dodonaea lobulata*	10	10 to 20
A3-6	Reference	*Dodonaea lobulata*	15	50 to 100
E9-6	Impact	*Triodia scariosa*	20	100 to 200
E9-5	Reference	*Triodia scariosa*	35	300 to 400
E9-2	Impact	*Acacia aneura*	10	10 to 20
E9-1	Reference	*Acacia aneura*	15	5 to 10
A2-6	Impact	*Triodia scariosa*	20	50 to 100
A2-5	Reference	*Triodia scariosa*	20	100 to 200
E4-3	Impact	*Leptosema chambersii*	3	100 to 200
E4-4	Reference	*Leptosema chambersii*	1	50 to 100
E4-5	Impact	*Callitris preissii*	1	5 to 10
E4-6	Reference	*Callitris preissii*	0.25	5 to 10
E4-2	Impact	*Allocasuarina spinosissima*	25	400 to 500
E4-1	Reference	*Allocasuarina spinosissima*	2	5 to 10
A2-1	Impact	*Triodia desertorum*	5	50 to 100
A2-7	Reference	*Triodia desertorum*	1	40 to 50
A2-9	Impact	*Allocasuarina spinosissima*	25	400 to 500
A2-8	Reference	*Allocasuarina spinosissima*	35	400 to 500
E4-7	Impact	*Triodia desertorum*	25	50 to 100
E4-8	Reference	*Triodia desertorum*	10	50 to 100
A2-2	Impact	*Aluta maisonneuvei* subsp. *auriculata*	25	300 to 400
A2-10	Reference	*Aluta maisonneuvei* subsp. *auriculata*	25	500 to 1000
E4-9	Impact	*Triodia rigidissima*	50	500 to 1000
E4-10	Reference	*Triodia rigidissima*	45	500 to 1000
A2-3	Impact	*Acacia aneura*	70	10 to 20
A2-11	Reference	*Acacia aneura*	25	30 to 40
E4-11	Impact	*Triodia rigidissima*	20	50 to 100
E4-12	Reference	*Triodia rigidissima*	5	50 to 100
S8-2	Impact	*Leptosema chambersii*	2	40 to 50
S8-6	Reference	*Leptosema chambersii*	15	500 to 1000

Site	Site type	Indicator species	Cover (%)	No. plants
S8-3	Impact	*Triodia rigidissima*	2	100 to 200
S8-1	Reference	*Triodia rigidissima*	5	400 to 500
S8-4	Impact	*Chrysitrix distigmatosa*	1	400 to 500
S8-7	Impact	*Chrysitrix distigmatosa*	2	500 to 1000
S8-5	Reference	*Chrysitrix distigmatosa*	5	500 to 1000
A2-4	Impact	*Aluta maisonneuvei* subsp. *auriculata*	25	100 to 200
A2-12	Reference	*Aluta maisonneuvei* subsp. *auriculata*	25	100 to 200
E4-14	Impact	*Triodia rigidissima*	50	400 to 500
E4-13	Reference	*Triodia rigidissima*	50	500 to 1000
A7b-6	Impact	*Aluta maisonneuvei* subsp. *auriculata*	3	5 to 10
A7b-5	Reference	*Aluta maisonneuvei* subsp. *auriculata*	5	5 to 10
A7b-7	Impact	*Aluta maisonneuvei* subsp. *auriculata*	3	100 to 200
A7b-9	Impact	*Aluta maisonneuvei* subsp. *auriculata*	20	50 to 100
A7b-8	Reference	*Aluta maisonneuvei* subsp. *auriculata*	5	30 to 40
Water Supply Borefield				
E2-5	Impact	*Triodia basedowii*	4	400 to 500
E2-6	Reference	*Triodia basedowii*	2	200 to 300
X1-1	Impact	*Triodia basedowii*	3	200 to 300
X1-2	Reference	*Triodia basedowii*	3	400 to 500
E2-1	Impact	*Triodia basedowii*	1	30 to 40
E2-4	Reference	*Triodia basedowii*	1	40 to 50
E2-2	Impact	*Eucalyptus gongylocarpa*	15	2
E2-3	Reference	*Eucalyptus gongylocarpa*	10	1
X1-15	Impact	*Triodia basedowii*	1	40 to 50
X1-16	Reference	*Triodia basedowii*	1	30 to 40
X1-11	Impact	*Keraudrenia velutina* subsp. *Velutina*	1	30 to 40
X1-12	Reference	*Keraudrenia velutina* subsp. *velutina*	20	500 to 1000
T1-3	Impact	*Keraudrenia velutina* subsp. *velutina*	10	50 to 100
T1-1	Reference	*Keraudrenia velutina* subsp. *velutina*	5	50 to 100
T1-4	Impact	*Keraudrenia velutina* subsp. *velutina*	2	10 to 20
T1-2	Reference	*Keraudrenia velutina* subsp. *velutina*	10	50 to 100
M1-3	Impact	*Keraudrenia velutina* subsp. *velutina*	40	100 to 200
M1-4	Reference	*Keraudrenia velutina* subsp. *velutina*	40	100 to 200
M1-1	Impact	*Triodia basedowii*	5	100 to 200
M1-2	Reference	*Triodia basedowii*	2	10 to 20

Site	Site type	Indicator species	Cover (%)	No. plants
X1-13	Impact	*Keraudrenia velutina* subsp. *velutina*	5	100 to 200
X1-14	Reference	*Keraudrenia velutina* subsp. *velutina*	10	400 to 500
X1-9	Impact	*Triodia basedowii*	10	100 to 200
X1-10	Reference	*Triodia basedowii*	45	500 to 1000
X1-7	Impact	*Triodia basedowii*	5	50 to 100
X1-8	Reference	*Triodia basedowii*	0.25	10 to 20
X1-4	Impact	*Triodia basedowii*	1	100 to 200
X1-6	Reference	*Triodia basedowii*	50	500 to 1000
X1-3	Impact	*Keraudrenia velutina* subsp. *velutina*	0.5	10 to 20
X1-5	Reference	*Keraudrenia velutina* subsp. *velutina*	0.75	10 to 20

Appendix M : Monitoring site photos

Photos are provided electronically

ecological AUSTRALIA

ISO 14001 Environmental Management

AS/NZS 4801:2001 Occupational Health and Safety Management

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