Tropicana Gold Project

Environmental Monitoring Strategy

1 OVERVIEW

The Environmental Monitoring Strategy contained within this document provides an overview of all environmental monitoring that will occur over the life of the Tropicana Gold Project (Project). The actual monitoring methods may change over the life of the Project as more appropriate technologies and methodologies become available. This Monitoring Strategy forms part of the Project's Integrated Management System that ensures the effective management of all health, safety, environment, community and operational issues associated with the Project.

The Integrated Management System (including this Monitoring Strategy) establishes the framework and standards that must be achieved for all activities associated with the Project. It includes the development and management of policies, management strategies, procedures and reporting requirements.

This document has been compiled with the assistance of 360 Environmental.

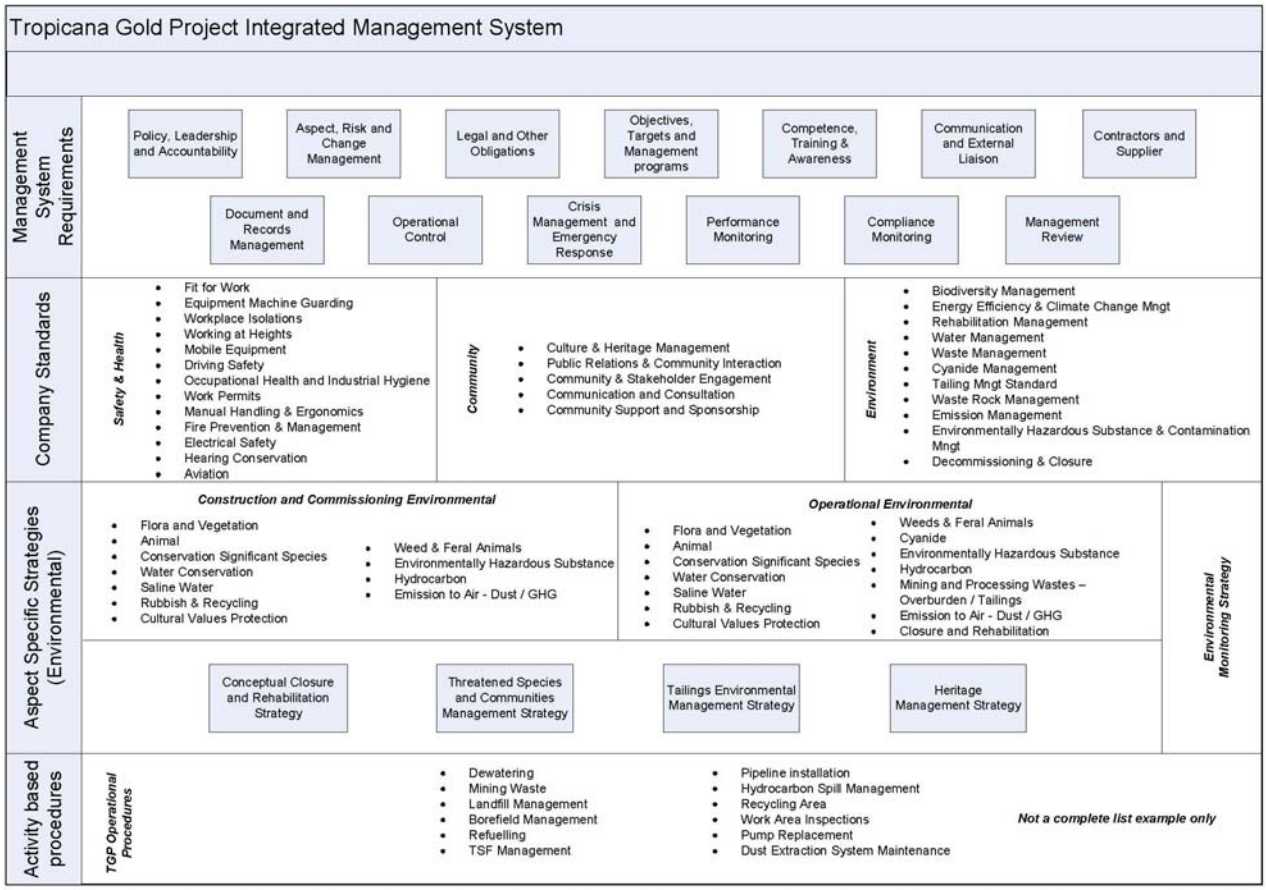

Figure 1 Tropicana Gold Project Integrated Management System

The Project's integrated Management System will operate on an adaptive management or continual improvement philosophy. The principle behind adaptive management is a structured, iterative process of optimal decision making in the face of uncertainty, with the aim of reducing uncertainty over time by monitoring the outcomes of the management strategy or by adopting procedures.

2 PURPOSE

The purpose of this document is to collate the key details of environmental monitoring programs, methods and action triggers associated with changes in key environmental values for the Project. Trigger values have been set for monitoring method to prompt investigation by the Joint Venture to determine whether the trigger has been exceeded due to activities related to the Project, or other factors (e.g. long dry-spell). In the event that investigation identifies that the Project is the cause, management will be altered to address the impact.

3 SCOPE

This Monitoring Strategy is applicable to all activities associated with the Project from construction through closure.

4 BACKGROUND

The Joint Venture's philosophy in the development of the Project has been to avoid impacts to threatened or conservation significant environmental values (e.g. Declared Rare Flora) in the first instance, and to minimise impacts where avoidance is not possible. In cases where a potentially significant impact to an important environmental value could not be avoided (e.g. Priority Flora situated beneath the Waste Material Landform (WML)) offsets have been proposed.

To ensure that the proposed management strategies, and procedures are resulting in the expected outcomes (e.g. drains are competent and adequate to contain and divert surface water run-off adequately) the Joint Venture has proposed a series of monitoring actions, documented in the Public Environmental Review and supporting documentation.

This document brings together all monitoring commitments made in the Public Environmental Review and the supporting documentation and monitoring obligations associated with legislation and other approvals. It is envisaged that this document will be periodically updated (bi-annually) to ensure that monitoring regimes are appropriate.

5 LEGAL REQUIREMENTS AND OTHER CONSIDERATIONS

There are several acts, regulations and other requirements that should be considered during the life of the Project. The most significant documents are summarised below.

5.1 ENVIRONMENTAL PROTECTION ACT 1986 (AND SUPPORTING REGULATIONS)

The *Environmental Protection Act 1986* (EP Act) provides for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. The Project is subject to Part IV and V requirements under the EP Act which consider and manage environmental impacts such as clearing extent (Part IV) and pollution control (Part V) – among other things.

5.2 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance. The EPBC Act enables the Federal Government to join with the states and territories in providing a truly national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act focuses Federal Government interests on the protection of matters of national environmental significance, with the states and territories having responsibility for matters of state and local significance.

5.3 MINING ACT 1978

The *Mining Act 1978* is the key piece of legislation for all mineral exploration and mining activities in WA. The Act covers all aspects relating to obtaining prospecting licenses, exploration and mining leases, obtaining access to land for mineral activities, bonds and expenditure.

Conforming to Tenement Conditions, Mining Proposal and Program of Work requirements under this Act will be crucial for all phases of the Project.

5.4 WILDLIFE CONSERVATION ACT 1950

The *Wildlife Conservation Act 1950* (WC Act) is a key piece of legislation in the protection and conservation of all native flora, vegetation and fauna within WA. Under the Act, the Minister may declare any flora and fauna to be specifically listed as threatened, rare or extinct. These lists of specially protected species are regularly updated and published in the Government Gazette.

5.5 DANGEROUS GOODS AND SAFETY ACT 2004

The *Dangerous Goods and Safety Act 2004* relates to the safe storage, handling and transport of dangerous goods and related purposes. The Act indicates those activities and substances which

require licensing prior to use, storage or transport. The aim of the Act is to reduce or minimise risk from dangerous goods.

Several substances used in the processing of gold, and in the general running and up keep of the Project will require management under this Act and its associated regulations. For example:

- Explosives used for drill and blast in the mine; and,
- Hydrocarbons (e.g. diesel fuel).

The Project will need to ensure certain activities and substances that require licensing are identified. Places where dangerous goods are stored or handled or transported must also be licensed under this Act.

5.6 Contaminated Sites Act 2003

The *Contaminated Sites Act 2003* provides for the identification, recording, management and remediation of contaminated sites. A site is considered contaminated if it has 'a substance present … at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value'.

Various facilities and activities associated with different stages of the life of the Project have the potential to generate a contaminated site under this Act. The Joint Venture will appropriately manage its obligations under the act, particularly in regard to:

- Bulk hydrocarbon storage;
- Waste rock dumps and low-grade ore stockpiles; and,
- The tailings storage facility.

5.7 Rights in Water and Irrigation Act 1914

The *Rights in Water and Irrigation Act 1914* provides for the planning, regulation, management, protection and allocation of water resources in Western Australia. The objectives of the legislation include providing for the management, sustainable use and development of water resources to meet the needs of current and future users, and for the protection of their ecosystems and the environment in which water resources are situated.

The Act provides for the permanent transfer of a licence or water entitlement (ie, part of a licence), and also temporary transfer (called agreements with licensees).

5.8 National Greenhouse Emissions Reporting Act 2004

The *National Greenhouse Emissions Reporting Act 2004* (NGER Act) is the National Emissions Data reporting framework that establishes for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production, from 1 July 2008.

The NGER Reporting Guidelines document outlines the steps corporations need to take when determining their registration and reporting obligations. The reporting guidelines also outline the principles of the NGER Act, for corporations needing to report.

5.9 National Pollutant Inventory

The National Pollutant Inventory (NPI) provides the community, industry and government with information regarding substance emissions in Australia. The NPI is tracking pollution across Australia, and ensuring that the community has access to information about the emission and transfer of toxic substances which may affect them locally.

The desired environmental outcomes of the NPI program are to:

- maintain and improve air and water quality
- minimise environmental impacts associated with hazardous waste, and
- improve the sustainable use of resources.

5.10 Other Requirements And Considerations

5.10.1 Cyanide Code

The Code is a voluntary, industry-based program for the gold mining companies that promotes:

- Responsible management of cyanide used in gold mining;
- Enhanced the protection of human health; and,
- Reduction of the potential for environmental impacts.

AngloGold is a signatory of the Code; therefore the Joint Venture will comply with the Code for the Project.

5.10.2 Department of Environment and Conservation Priority List

Species or communities recognised under the Department of Environment and Conservation (DEC) Priority scheme. If a species does not meet the criteria for listing as Threatened Fauna or Declared Rare Flora under the WC Act (e.g. due to lack of information) and is poorly known and/or conservation dependent, it may be classified as a Priority Species at the discretion of the DEC. Priority species are not provided any extra protection to other native species in Western Australia. The listing of a species or a community as a Priority indicates that activities that may impact them are in need of special consideration. A similar program exists for Priority Ecological Communities

5.10.3 EPA Position Statement 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection

The Environmental Protection Authority (EPA) regards biological diversity as a key environmental factor and has an objective to ensure that biodiversity is protected. Position Statement 3 discusses the principles which the EPA will use when assessing proposals which may impact on biodiversity values.

5.10.4 International Council on Mining and Metals Sustainable Development Principle

The International Council on Mining & Metals (ICMM) is an industry group that addresses key priorities and emerging issues within the sector. The ICMM has implemented 10 principles to measure their performance relating to sustainable development in the mining and minerals. Of importance:

Principle 7: Contribute to conservation of biodiversity and integrated approaches to land use planning:

- respect legally designated protected areas;
- disseminate scientific data on and promote practices and experiences in biodiversity assessment and management; and,
- support the development and implementation of scientifically sound, inclusive and transparent procedures for integrated approaches to land use planning, biodiversity, conservation and mining.

6 SUMMARY OF MONITORING PROGRAMS

6.1 PHYSICAL FACTORS

6.1.1 Groundwater

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Groundwater characteristics	PER, Tailings EMS	Monitor bores in the TSF embankment downstream of the embankment.	Assess TSF seepage.	Monitor water level.	Monthly	25% deviation of modelled.	DMP DEC	Annually
				Monitor water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		
	PER	Monitor groundwater levels, quantity and quality (including groundwater and recharge monitoring against modelling) in the Minigwal Trough.	Assess impacts to Minigwal Trough and to assess pressure changes over the life of the Project.	Monitor Minigwal Trough bores for water level and abstraction rate.	Monthly	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	DoW EPA	Annually
				Monitor Minigwal Trough bores for water quality.	Quarterly	10% variation of baseline groundwater quality monitoring.		
	PER	Monitor post closure recovery of the aquifer for a period of up to 10 years or until it recovers to more than 80% of its capacity or until another user takes control of the borefield.	Assess recovery of Minigwal Trough after the cessation of operations.	Monitor water level and abstraction rate in all production bores.	Monitor at monthly intervals during the first year of recovery, then at quarterly intervals until year three (3), then annually until year 10, or the site is returned to the state (whichever comes first).	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	EPA	Annually
	PER	Monitor the drawdown effect over the life of the Project to determine if the operations are affecting the local groundwater supply beyond what was modelled.	Assess impacts of dewatering on groundwater levels. Indicator for impact to subterranean fauna, vegetation, flora and terrestrial fauna habitat. Assess accuracy of predicted recharge during operations.	Monitor mining area bores for water level and abstraction rate (inside and outside the operational footprint).	Quarterly	25% deviation of modelled recharge and drawdown. 25% of initial pressure.	DoW EPA	Annually

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
				Monitor mining area bores for water quality.	Quarterly	10% variation of baseline groundwater quality monitoring.		
				Compare realtime data against projected modelling or field tests data.	Annually			
	PER	Monitor bores installed across site to determine if the operation is affecting the local groundwater supply.	Assess impacts on groundwater from surface water run-off from the landforms and/or the site internal drainage system.	Monitor mining area bores for water level and abstraction rate (inside and outside the operational footprint).	Monthly	25% deviation of modelled. 25% of initial pressure.	DoW DEC	Annually
				Monitor mining area bores for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		
	PER, CEMS, OEMS	Monitor potential pollution/ groundwater quality adjacent to the pit, processing area, TSF and production bores and surrounding undisturbed areas (e.g. downstream of mining area).	Assess impacts to groundwater quality from mine operations.	Monitor mining area bores for water quality (inside and outside the disturbance area).	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.	DoW DEC	Annually
	PER	Monitor superficial aquifers to identify drawdown impacts.	Assess impact on non-target aquifers (if present).	Monitor bores in superficial aquifer(s) for water level and pressure.	Monthly	25% deviation of modelled. 25% of initial pressure.	DoW EPA	Annually
				Monitor bores in superficial aquifer(s) for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly.	10% variation of baseline groundwater quality monitoring.		

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
	PER, OEMS, CEMS	Groundwater remains uncontaminated after operations.	Assess groundwater contamination occurring after operations cease (during rehabilitation and closure).	Monitor observation bores at the mining area for water quality.	Standard parameters such as pH and electrical conductivity will be monitored monthly. A more comprehensive suite of water quality parameters will be monitored Quarterly. during the first year of recovery. After that, the full suite will be monitored at six monthly intervals until year three (3), then annually until year 10 (or until the site is returned to the state).	10% variation of baseline groundwater quality monitoring	EPA	Annually
Groundwater usage	CEMS, OEMS	Monitor groundwater abstraction volumes (flow meter readings).	Record groundwater abstraction volumes.	Flow meter readings.	Monthly		DoW	Annually
Soil moisture	PER	Monitor sand dunes adjacent to the dewatering operation for water retention levels.	Assess dewatering impacts on sand dune water retention levels.	Monitor sand dune sites for moisture levels in the immediate vicinity of the mining area.	At least annually for the first five years of the Project.	25% variation from monitoring sites.	EPA DEC	Annually
Drinking water quality	Submission	Monitor drinking water from source to end user.	To ensure a drinking water of adequate quality is available for the workforce.	As appropriate to the analyte being investigated (e.g. pH is measured with a pH meter, microbiological monitoring requires laboratory techniques).	Thermotolerant coliforms, amoeba, free chlorine will be monitored monthly Dissolved oxygen, hardness, pH, TDS (and other parameters) will be monitored six-monthly. Other sampling requirements as described in DoH document "*Small Community Model Assessable Sampling Grid*"	Result is out of specification	DoH	According to DoH document: "*Systems Compliance And Routine Reporting Requirements For Minesites And Exploration Camps*"

6.1.2 Surface Water

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Surface water quality	PER	Monitor run-off (waste landforms) in the collection point following significant rain events.	To determine if management strategies are working.	Monitor surface water quality in collection points.	Following rain events of over 20mm in 24 hr or when surface water is observed in collection ponds.	TBD	DMP EPA	Annually
	PER	Monitor pit water quality post operations	To assess water quality of pit water post rehab and closure.	Monitoring of pit water post rehab and closure.	Six monthly intervals until year three (3), then annually until the site is returned to the State.	Statistically significant deleterious change in pH and/ or metal content (other than salinity).	DMP EPA	Annually

6.1.3 Air Quality (Dust, Gaseous Emissions)

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Dust	CEMS	Monitor dust emission from construction in areas at high risk of dust.	Assess dust levels and compliance with environmental and health guidelines.	Dust monitoring stations.	Monitor dust emission from construction in dusty area Monthly	Dust levels above 1000mg/m^3, measured over 15 minutes, according to Dust Guidelines (DEP 1996).	EPA DEC	Annually
	OEMS	Monitor dust emissions at environmentally sensitive areas (Dunes west of plant).	Assess dust generation from internal traffic at Dunes west of plant.	Dust monitoring stations.	Quarterly	as above	EPA DEC	Annually
	OEMS	Monitor ambient dust level at the village.	Assess dust generation from internal traffic at the village.	Dust monitoring stations.	Quarterly	Dust levels above 1000 mg/m^3,	EPA DMP	Annually
GHG production	PER	Monitor emissions, as required under NGERS reporting and EEO participation.	To ensure compliance.	GHG calculation/estimation.	Annually	NA	DCC	Annually
	PER	Monitor the effectiveness of greenhouse gas emissions controls.	To track and assess GHG production.	Reconciliation between actual and expected emissions.	Annually	Higher than expected GHG emissions		

6.1.4 Soil Quality and Landform

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
TSF embankment stability	PER	Monitor TSF survey pins to check embankment movements.	Assess TSF embankment stability	GPS monitoring of survey pins.	Annually	TBD	DMP	Annually
	PER - Tailings EMS	Monitor pore water pressures at various key locations within the TSF embankment.	To ensure that stability is not compromised.	Stand pipe peizometers phreatic surface	Monthly	TBD	DMP	
Erosion	PER	Monitoring and remediation program during construction.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Weekly and following rain event over 20mm in 24hr	NA trigger covered under surface water (above)	EPA	Annually
	PER	Monitoring and remediation program during operation.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Monthly and following rain event over 20mm in 24hr			
	PER	Monitoring and remediation program post operation.	Prevent sedimentation and ensure stability.	Regular visual inspection.	Monitor at Quarterly intervals during the first year of recovery, then at six monthly intervals until year three (3), then annually until the site is returned to the State			
Landform stability	PER	Monitor the ongoing stability of the pit(s), tailings storage and waste landforms during rehab and closure.	Assess landform stability during rehabilitation and closure.	Regular visual inspection of general embankment integrity will be used as a qualitative check for stability.	Monthly	No specific environmental trigger as stability is covered under OSH	DMP EPA	Annually
				Survey monitoring using a combination of survey pins and monitor prisms.		TBD		
Soil volumes	CEMS	Soil volumes will be monitored.	To ensure the volume available meet rehabilitation requirements.	Visual assessment of stockpiles to qualitatively assess volumes remaining.	Periodic	NA	NA	NA
				Reconciliation of available vs required	Annually	Negative reconciliation	DMP EPA	Annually

6.1.5 Noise and Vibration

This will be monitored under the OSH monitoring strategy.

6.2 BIOLOGICAL/ BIODIVERSITY VALUES

6.2.1 Flora and Vegetation

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To Stakeholder	Reporting Frequency
Vegetation and flora condition	PER, OEMS, CEMS	Monitor vegetation and flora adjacent to the Project and road corridor to identify indirect impacts e.g. dust (both internal and Mine Access Road).	To quantitatively determine level of decline/impact for flora and vegetation within a predetermined buffer area.	Remote sensing, photopoints and physical flora and vegetation survey including indicator species[1] within monitoring sites of potentially impacted areas outside of the Project footprint (within a 200 m buffer of the Operational Area footprint and a 100 m buffer of the Mine Access Road and Water Supply Area infrastructure) as well as reference sites that are not subject to Project impacts.	Annually with additional photo monitoring – Quarterly during construction and six monthly during operations.	25% deviation in cover or productivity within monitoring (impact) sites relative to reference sites. 25% deviation of indicator species of impact against reference sites.	DEC Project NGOs	Annually
	CEMS, OEMS	Monitor Project footprint boundaries	To ensure clearing boundaries are clearly marked and that there are no breaches in boundaries (e.g. unauthorised clearing, off road driving).	Visual inspection of clearing boundaries.	Fortnightly check during construction. Annually during operation.	Clearing beyond boundary and/or clearing in the absence of a marked boundary.	DEC DMP	Annually
				Reconciliation between satellite (or other) imagery and project GIS data.	Annually	Actual clearing beyond expected extent (GIS).		
Presence, distribution, abundance and density/cover of invasive flora	PER, CEMS, OEMS	Assessment of weeds present including: species, their distribution, abundance and density/cover of weeds.	Monitor the introduction of weeds to determine if weed treatment is required.	Visual inspection for weeds at known locations in and around the Project footprint and at high risk areas (e.g. the airport and rest stops on Mine Access Road). Annual vegetation monitoring sites will include the collection of weed data (if present in monitoring sites).	Annually and six weeks after significant rainfall events (>20mm)	Identification of a weed species in a site where it had not previously been recorded. 25 % increase of weed species in abundance or cover relevant to reference site.	DEC DMP	Annually

[1] Indicator species

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To Stakeholder	Reporting Frequency
	CEMS, OEMS	Monitor weed presence within the Project area and on roadsides.	To ensure weeds do not spread from known locations and high risk areas.	Visual inspection for weeds at known locations in and around the Project footprint and at high risk areas. Satellite or 'similar' imagery will be utilised.	6-weeks after rain greater than 20 mm	Identification of a weed species in a site where it had not previously been recorded.	DEC DMP	Annually
Hygiene compliance	OEMS	Monitor weed hygiene compliance.	To ensure that weed hygiene measures are being adhered to.	Random check of compliance by subcontractor.	As required.	Identified non-compliance		
Rehabilitation	CEMS, OEMS	Monitor vegetation establishment in rehabilitated areas.	To identify the attainment of successful rehabilitation stages.	Combination of remote sensing and visual assessments will be used to assess factors such as soil condition, vegetation stability and establishment appropriate to the establishment of rehabilitation.	Annually	NA	DMP EPA / DEC Project NGOs	Annually
Rehabilitation	PER, CEMS, OEMS	Following rehabilitation, areas will be monitored and treated for invasive flora invasion, if necessary.	To assess the occurrence of invasive flora in rehabilitated areas.	Visual inspection for weeds in rehabilitated areas.	Annually	Weed identified in rehab.	DEC DMP	Annually
Closure	PER	Compliance with Closure Criteria.	To track progress with meeting closure criteria and ensuring Project compliance with environmental requirements.	Administrative	Biennially (post-operations)	Failure to meet identified milestones in closure and rehab management strategy.	Closure	

6.2.2 Fauna

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Fauna health, injury, mortality	PER, Tailing EMS	Monitor use of TSF by fauna (particularly birds).	To ensure contaminants from the TSF are not impacting native fauna and to prevent entrapment/ death at the TSF.	Visual inspections of fauna utilising the TSF.	Daily	Death of a conservation significant species.		
	PER	Monitor presence of fauna (particularly birds) at potentially contaminated and potable water ponds	To prevent fauna entrapment/death in ponds and to ensure contaminants are not impacting native fauna.	Visual inspections of fauna utilising ponds in the mining area.	Daily	as above		
	CEMS	Inspections of trenches during construction and other high risk areas to identify and release entrapped fauna.	To prevent fauna entrapment/death in trenches.	Visual inspection of trenches while trenches are open. Records will be kept of all fauna removed and any deaths	Twice-daily or more frequently if the weather requires	as above	EPA DEC	Annually
Threatened fauna population	Appendix 4I of the Project's Response to Submissions. (Joe Benshemesh report)	Monitor impacts to Marsupial Moles	To assess whether Project operations (including clearing, pit excavation, noise, and vibration) has impacted the local Marsupial Mole population.	Monitoring technique and criteria to be developed in consultation with Joe Benshemesh and other relevant statutory authorities.	Biennially	to be developed	DEC DEWHA Project NGOs	Annually
Fauna habitat	Submissions	To monitor the known habitat of *Aganippe* sp. 4 and presumed habitat of *Kwonkan* sp. 2.	To provide information on the indirect impacts from mine activities on SRE invertebrate fauna and to ensure the species are not subject to indirect impacts beyond the mine's footprint.	Monitoring of fixed sites of known habitat of *Aganippe* sp. 4 and presumed habitat of *Kwonkan* sp. 2 will include: • Census of all mygalomorph burrows present • New burrows to be flagged. • Monitoring of *Aganippe* sp. 4 and *Kwonkan* sp. 2 habitat will be undertaken in conjunction and accordance with the monitoring methods for vegetation and flora (section 6.2.1)..	Annually	No net decline beyond than 25% of reference sites over a three year period.	DEC	Annually
Introduced fauna	CEMS	Monitor the abundance of invasive fauna populations.	Monitor the introduction/ spread of fauna to determine if fauna control is required.	Visual inspections of village and mine for evidence of feral animals, observations to be recorded in the Project's feral animal register.	Quarterly.	Increase in observations quarter to quarter.	DEC	Annually

6.3 INFRASTRUCTURE

Parameter	Source	Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
pH	PER	The pH in the CIL circuit will be monitored and a slow acting control loop will control quicklime addition based on the ball mill feed rate and the measured pH.	To assess CIL performance and lime dosing rate.	Automatic.	Realtime/daily.	Design specification.		
Integrity	PER	Monitor pipelines.	To prevent saline water leakage.	Leak detection system.	Realtime	Greater than 25% between two points.		
Asset and track location	CEMS, OEMS	Tracked infrastructure / facility location via Geographic Information System (GIS) and satellite (or other) imagery.	Identify whether infrastructure is in correct location	Reconcile database against satellite imagery or aerial photography.	Annually	Infrastructure not located as expected.		
Roads, internal and external	CEMS, OEMS	Monitor roads for obvious signs of unauthorised off-road driving.	To ensure roads are maintained and clearly marked.	Periodic drive-by inspections.	Monthly	Signs of unauthorised off-road driving.		
				Reconcile against satellite imagery or aerial photography.	Annually			
Sewage infrastructure	CEMS, OEMS	Monitor the integrity of the sewage system.	To ensure sufficient capacity and appropriate maintenance is occurring	Dependant on system selected.	Dependant on system selected.	System failure. Trigger to be determined at works approval.		
Pipeline containment systems	OEMS	Inspect and monitor pipeline containment systems.	To ensure containment systems are properly maintained.	Visual inspections of bunds and surface pipes.	Monthly	Bund contains water or other debris or pipe perforation.		
				Leak detection system for buried pipes.	Real time.	Greater than 25% between two points.		
Weak acid dissociable cyanide	Tailing EMS	Monitor decant/ bleed water on the TSF for levels of Weak Acid Dissociable Cyanide (WAD cyanide; a form of cyanide that can be environmentally harmful once dissociated).	To ensure that wildlife are protected and the ICM Code is complied with (by keeping the WAD cyanide to below 50 mg/L).	Water samples collected at the TSF and analysed for WADCN.	Weekly	WAD cyanide detected in decant/ bleed water above 50 mg/L	DEC	Annually
Facility integrity and compliance	Tailing EMS	Inspect the TSF to ensure tailings capture.	Avoid uncontrolled release of tailings.	Visual inspection.	Daily	Evidence of tailings on road. Less than 300mm freeboard.		
	OEMS	Inspections of fauna egress at all lined ponds (mining area and Water Supply Area).	To prevent fauna entrapment/death in ponds.	Visual inspection of egress mats/ ramps.	Weekly	Faulty egress		
Facility integrity	CEMS	Audited and inspected landfill and recycling facilities.	To ensure landfill and recycling facilities are properly maintained.	Regular inspection.	Landfill - Weekly Recycling - Monthly	Excessive exposure of tip face. Presence of introduced fauna. Lack of recycling capacity or incorrect sort of recyclables.		
				Regular audit.	Landfill - Annual Recycling - Annual	Audit non-conformance	DEC	Annually

Further information on the management and monitoring requirements can be found in the Tailings Environmental Management Strategy (Appendix-3G of the PER). A summary is provided in Appendix 1 of this document.

6.4 WASTE

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Recyclable material volumes	CEMS, OEMS	Record volumes of recyclable material leaving site.	To track recyclable material leaving site.	Tracking system.	Monthly or as required	NA		
Controlled Waste volumes	CEMS, OEMS	Record volume of Controlled Waste leaving site.	To track Controlled Waste leaving site.	Tracking system.	As removed	NA		

6.5 MANAGEMENT SYSTEM

Parameter		Monitoring Requirement	Purpose	Monitoring Method	Monitoring Frequency	Trigger	Reporting To	Reporting Frequency
Management system	CEMS, OEMS	Monitor spills through the site incident tracking system and follow-up inspections	To track incidents and follow-up actions.	Tracking system.	Monthly			

APPENDIX 1: ADDITIONAL MONITORING REQUIREMENTS FOR THE TSF

Area	Monitoring Requirement	Frequency
Section 1:	**Short Term Operation Monitoring**	
Tailings	Pipeline integrity	Daily
	Visual check of tailings level versus embankment crest	Daily
	Visual check of water level versus embankment crest	Daily
	Off-take location	Daily
	Blockage of discharge	Daily
	Check integrity of geomembrane lining	Daily
	Discharge of free cyanide	Real-time
Decant	Ingress of tailings into decant tower	Daily
	Location of decant pond	Daily
	WAD CN concentration	Weekly
Section 2:	**Compliance Monitoring**	
Embankment	Embankment integrity	Daily
	Seepage from embankments	Daily
	Access ramps	Daily
	Piezometer water level	Weekly
	Decant / supernatant water analysis	
	- Regular	Monthly
	- Comprehensive	Quarterly
	Water level and volume	Monthly
	Tailings level	Monthly
	Survey pins	Quarterly
	General inspection by suitably qualified engineer	Annually
Monitoring bores	Water level	Monthly
	Water quality	Quarterly
Section 3:		
Tailings	Tailings solids (tonnes)	Daily
	Water in tailings (tonnes or m^3)	Daily
	Average tailings flow (m^3/s)	Daily
	Freeboard monitoring survey	
	- Regular	Monthly
	- Comprehensive	Quarterly
	Outflow from decant, underdrainage	Daily
	Outflow from external seepage interception system	Daily
	Water return to plant	Daily
Return Water	Silt removal	Once every 6 months or more frequently if required
Climate	Precipitation	
	Evaporation	Daily
	Maximum - minimum temperatures	Daily
	Wind direction and speed	Daily
		Daily