ARGYLE

DIAMONDS

ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE ARGYLE UNDERGROUND PROJECT

GROUNDWATER MANAGEMENT PLAN

TABLE OF CONTENTS

This document forms part of the Environmental Protection Statement (AD#284204) under Ministerial Statement 711 (AD#283776) – it cannot be edited without prior approval from the Department of Environment

1. INTRODUCTION

1.1 PURPOSE

The primary aim of this Groundwater Management Plan is to provide guidance to manage groundwater during the Project and to comply with the Argyle Mine Water Management Plan (Metago, 2004c), Water and Rivers Commission GWL 74139 (4), Department of Environment [DoE] (2004a) Licence to Operate 4459/9: Condition S3 (a) and Argyle's Standard for Water Use and Quality Control (Argyle, 2004a). The Argyle Water Licence Operating Strategy for the Water and Rivers Commission (Metago, 2004a) commits to manage groundwater for both open cut operations and the Project:

- Groundwater abstraction will be limited to that necessary for safe and efficient mining;
- Maximum use will be made of dewatering discharge for mining and processing;
- Where dewatering operations are found to have detrimental impacts on adjacent springs or other environmental water requirements, supplementation of water to these effected areas/users will be considered; and
- Annual abstraction data will be reflected in the site water balance and reported in the Annual Environmental Report (AER) with groundwater quality data.

Management actions, which will ensure these objectives are met and personnel responsible for their implementation, are described in Table B1-1 Groundwater Management.

1.2 SCOPE

This Groundwater Management Plan identifies potential impacts of the Project and how these impacts may affect groundwater. It also defines actions to monitor and manage environmental impacts on groundwater during operations, decommissioning and closure.

1.3 AREA

Argyle mining lease and miscellaneous licences

2. DEFINITIONS

Groundwater	Water under the surface of the ground occupying pores, cavities, cracks and other voids. Groundwater in this Management Plan encapsulates dewatering and or depressurisation flows through water withdrawal from bores.

3. DETAILS

Two principal groundwater aquifer systems have been identified at the site:

- The alluvial-colluvial-weathered rock materials constituting the shallow regolith within the drainage catchments; and
- The underlying hard rock strata comprising a variable sequence of aquicludes (impermeable rocks), aquitards (poorly jointed rocks) and aquifers (well jointed strata).

The regional direction of groundwater flow is generally east to northeast towards Limestone and Smoke Creeks. Seasonally perched water table aquifers are sometimes found in alluvial areas, with the groundwater flow in these areas generally towards the local drainage lines. The depth to groundwater beneath the plains outside of the dewatering zone of influence is generally within 15 m of the ground surface.

Shallow aquifer storage within the Limestone Creek catchment has been extensively monitored; to assess changes in groundwater level and quality, through the installation of a network of strategically located groundwater bores. Monitoring indicates that groundwater levels may rise by five metres or more due to recharge during the first quarter of each year, slowly receding during the dry season.

The intergranular conductivity of the regional hard rocks at the mine site is negligible due to the age, origin and silicification of the strata. Groundwater storage and movement occurs almost entirely within a complex network of joints and fractures developed through regional stresses, faulting and related shearing.

Major faults have introduced a network of fractures although not all structures act as hydraulic conduits. The Gap Fault has been identified as the most transmissive structure by virtue of its extent and zone of hydraulic influence. Dewatering of the mine pit is facilitated via bores located within or near the fault zone and in-pit sumps. These bores currently pump a total of around 5.5ML /day which represents both deep aquifer seepage and shallow aquifer seepage from seasonal recharge. Groundwater levels have declined due to dewatering for open cut operations and will continue to do so during underground mining. These issues and associated management actions to minimise impacts to the environment are discussed in further detail below.

Water and Rivers Commission water allocation licence [GWL 74139(4)] permits Argyle to abstract 4,400 ML per year. This water is used for dust suppression, mineral ore processing, mining camp and rehabilitation. During 2003-2004, 3,770 ML of groundwater was abstracted during pit dewatering (Argyle, 2004b). Recharge to the groundwater occurs via incident rainfall and also possibly as leakage from Gap Dam via the Gap Fault.

Groundwater monitoring has confirmed a steady fall in the water table around the pit during the course of open cut mine development. This distinct depressurisation extends westward along a fault on the West Ridge for more than two kilometres beyond the pit wall crest. Although there are only limited data on the shallow water table on the West Ridge, it is assumed that a shallow perched water table exists and provides recharge to the deeper strata. Groundwater levels will continue to decline during underground operations as dewatering continues, potentially affecting local and regional aquifer pressures and resulting in a loss of yield at springs and leakage of groundwater from shallow alluvial zones.

Diminished groundwater levels may impact on fauna and flora that are dependent directly or indirectly on the water table, particularly those in permanent water bodies such as aquatic organisms and wetland plants.

Groundwater level rises in areas not normally subjected to seasonal flooding may occur when drainage patterns are modified or groundwater mounding occurs underneath TSF's and WRDs. This may affect the dry land vegetation and fauna habitat, although wetland species are likely to colonise the area if inundation occurs over an extended period.

Groundwater may be contaminated by materials used in surface and underground mining, such as hydrocarbons, chemicals and nutrients from the manufacture of explosives. Of these, hydrocarbons, due to the volumes transported and stored on the Lease Area, pose the greatest risk. It is particularly important to manage hydrocarbons and other potential contaminants to minimise impacts to amphibians, aquatic fauna and the subterranean fauna assemblage.

A discussion of the aspects of the Project that may impact groundwater quality, levels and the management and monitoring of these impacts follow.

3.1 DEWATERING DISCHARGE

Dewatering rates required for underground mining to proceed are dependent on several factors including seepage and recharge from rainfall events. Abstraction rates will need to meet seepage, estimated at 4-10 ML per day as well as influx (attenuated percolation from the crater zone) from rainfall events ranging from an extra 15 ML per day for a one in one year event to 73 ML per day for a 1:100 year event. The dewatering discharge is expected to contain sediment and may also contain contaminants such as hydrocarbons. The discharge from the dewatering bores located in the open pit will continue to be directed to Gap Dam, whilst dewatering discharge from the underground mine sumps will, under normal operating conditions, be directed to the process water thickeners and then used as process water. The in-pit bores are expected to be obsolete within 2 years of the start of the Block Cave mine, after which dewatering operations will concentrate largely on the underground seepage (Metago, 2004b).

The average daily process plant water intake is around 20 ML/day therefore most of the dewatering base flow and a once per year storm flow event could be incorporated into the process (Metago, 2004b). Where the volume of dewatering discharge from the underground exceeds the capacity of the thickeners, it will be discharged to Jacko's Dam, or to RCP3 when constructed, for temporary storage prior to transfer to the process water circuit. Should water abstraction requirements exceed the capacity of the ponds and dams, the emergency contingency (eg: in excess of 1:100 rainfall event) will be to directly release water to the environment. It is predicted that excess dewatering is unlikely to occur for more than 10 days in the wettest of years. (Metago, 2004b) Any dewater discharged during these events is likely to be rapidly diluted as part of the generalised flooding across the site. RCP3,when constructed, will facilitate more efficient utilisation of dewatering discharge.

3.2 DEWATERING DRAWDOWN

Depressurisation of the groundwater levels as a result of dewatering is influenced by the permeability of the geological stratum. Drawdown is predicted to expand outward along the east and west ridge lines for distances of around 4 km and 7 km, respectively, beyond the pit crest at the completion of underground mining in 2024 (Figure B1.1). Expansion northward is predicted to extend only by about 2 km due to the presence of lower conductivity strata and the recharging effects of Gap Dam. Similarly the southward expansion is predicted to extend to around 1 km from the pit, reflecting the presence of impermeable granites and other plutonic rocks associated with the Lamboo Complex.

The loss of groundwater pressure within the hardrock strata has the potential to affect naturally occurring springs. Dewatering for the open cut pit has already depressurised the rock strata near Devil Devil Spring and the spring now ceases to flow early in the dry season. Supplementary water was supplied to the spring since 1992 but ceased in 2004 following the request of the Traditional Owner of that area. Devil Devil Spring is unlikely to recover to the pre-mining spring flow regime because the open cut final void will act as a groundwater sink, which will reduce the aquifer piezometric level and increase the hydraulic gradient, thus drawing groundwater flow away from the spring and into the final void. It is anticipated that flow into the spring will still occur from local perched aquifers during the wet season and early dry season, however at a reduced flow than was likely to occur in pre-mining conditions. A Management Plan for Devil Devil Spring has been prepared in conjunction with Traditional Owners and is a component of the Participation Agreement (Freehills, 2004), in which Traditional Owners provided their consent and support for past, present and future mining operations including the Project.

Wesley Spring is located around 3.5 km to the southwest of the underground mine, and more than one kilometre from the predicted drawdown zone. It appears to be sustained though the damming of groundwater runoff behind a prominent quartz ridge and thus is less likely to be impacted by lowered groundwater levels. Monitoring to-date provides no evidence of any lowering of groundwater levels (Argyle, 2004b). Management actions to monitor and minimise environmental impacts from the Project are outlined in B17 Wesley Springs Management.

Groundwater abstraction and thus dewatering will be restricted to that required for safe and effective mining within the licenced allocations. Where impacts on springs, creek lines and/or vegetation are detected, ameliorative actions will be discussed with Traditional Owners and regulatory authorities to develop case-by-case management measures. Dewatering for the Project will impact on the in-pit dewatering bores and significantly reduce bore yields and thus pumping to Gap Dam from 3.6 GL/year to 0.3 GL/year when block caving commences (Metago, 2004d). The loss of inpit bores PW5 and 6 will also mean that the process water pond will be the sole source of water supply to the primary crusher tank, eliminating the current wastage of water through spillage to upper Gap Creek (Metago, 2004dc).

The habitat of subterranean fauna may be directly impacted by water abstraction, however extensive surveys have been carried out and further studies are scheduled to ascertain their distributions. The aim is to locate outlying populations to ensure that no species becomes extinct as a consequence of dewatering should the Project proceed. The Western Australian Museum (2004) has suggested that only one taxon, identified as Kimberleybathynella n.gen ADM sp.nov. may be directly affected by the dewatering and that this species also occurs in a separate drainage channel outside of the predicted dewatering drawdown area.

Groundwater levels will recover to some degree following the cessation of mining. Preliminary storage calculations indicate that a period of more than 150 years will be required to achieve an equilibrium state where groundwater seepage and rainfall runoff are balanced by evaporative losses. The recovered groundwater levels are predicted to be around 30 m AHD, this is higher than the current base of the open cut pit floor but below the levels observed in low lying areas to the south. Thus it will act as a groundwater sink in the long term.

3.2.1 Surface Drainage

Dewatering drawdown is likely to have already had an impact on minor creek lines on the elevated ridges and first order tributaries of Limestone and Smoke Creeks, within 500 m of the open cut pit. Drawdown may increase vertical seepage, which in turn would increase rates of recharge to the regolith and reduce the surface water base flow following the wet season. However, the vegetation in these upland creek lines is unlikely to be directly dependent on permanent water although ephemeral pools further downstream may be affected.

3.3 RISING GROUNDWATER LEVELS

Groundwater levels may rise in areas where drainage has been modified and/or the hydraulic head has increased such as in the TSF or underneath the WRD. Where rising groundwater has inundated dry land, measures will be considered to restore the hydrological balance. Toe drains and bores may be utilised to intercept water or dewater the affected areas. Vegetation transects may be established in areas potentially affected by rising groundwater levels.

3.3.1 Monitoring

There are more than 112 groundwater-monitoring bores at 80 sites on the Lease Area located as shown on Figure B1-2. Additional bores were installed in 2003 to provide groundwater baseline data specifically for the Project, including two bores in close proximity to Devil Devil Spring, six bores near Wesley Spring and three bores located to the west along the Matsu Range. The following additional groundwater bores (Figure B1-2) will be constructed to expand the monitoring programme for the Project:

- West Ridge;
- Matsu Valley;
- Wesley Spring Creek;

- South of the Southern WRD;
- Near the proposed new TSF; and
- Lissadel.

Groundwater quality monitoring is conducted by bailing rather than pumping otherwise it is in accordance with the Government of WA (2000) guidelines. Groundwater quality is generally good with both the Revolver Creek and Carr Boyd aquifers containing fresh water. Groundwater levels are currently monitored and water sampled for the suite of parameters. Monitoring will continue until agreed closure criteria have been met. Where observations indicate that groundwater levels are rising or falling, additional monitoring piezometers, bores, and or vegetation monitoring transects will be considered. In 2003-4 seventeen new automatic instruments were installed to monitor stream flow, water quality, weather and groundwater (Argyle, 2004b). Vegetation monitoring will continue at Wesley Springs and will be considered for areas, which may be affected, by either dewatering drawdown or inundation.

Monitoring of basic water quality parameters (pH and electrical conductivity) in the shallow bedrock zone has been conducted regularly at selected monitoring bores. Full ionic testing is carried out on an annual basis. Groundwater typically has a low Total Dissolved Solids (TDS) with a range from 500 to 1500 milligrams per litre (mg/L), which reflects an active recharge and flushing regime within a generally inert rock matrix. Sodium-magnesium bicarbonates tend to dominate the water chemistry. Dewatering discharge from underground operations is anticipated to be good quality, although the water may be turbid and contaminated with hydrocarbons and other underground mining materials (Metago, 2004d). Based on existing bore data it is expected to be near neutral to slightly alkaline, with elevated levels of sulphate, iron, magnesium and calcium (ibid).

The underground mine will act as a groundwater sink and may induce flows from other strata that may affect water quality. Hydrochemical characteristics of the regional groundwater suggest that dissolution and other processes are not likely to significantly change the TDS in the regional aquifers. It is therefore unlikely that any measurable change in groundwater quality will be observed. Localised changes in the shallow regolith system may occur as a consequence of historical disturbance to groundwater.

The subterranean fauna monitoring program will continue as detailed in Subterranean Fauna Management Plan.

4. RESPONSIBLE PEOPLE

The following people are responsible for actions to manage groundwater at Argyle:

4.1 SUPERINTENDENT ENVIRONMENT

The Superintendent Environment is responsible for identifying potential sources of contamination, volumes of groundwater abstracted, and monitoring water quality, levels and subterranean fauna. The Superintendent Environment is also responsible for monitoring the zone of dewatering influence in relation to model predictions, maintaining groundwater data, reporting data in the AER and notifying the DoE and DoIR of licence non-compliances.

4.2 CULTURAL HERITAGE MANAGEMENT OFFICER

The Cultural Heritage Management Officer will consult with Traditional Owners, document their concerns and provide feedback on groundwater levels, quality and issues as they arise. The Environmental Advisor is also responsible for groundwater quality and level monitoring and maintaining a groundwater database.

4.3 TAILINGS AND WATER ENGINEER

The Tailings and Water Engineer (TWE) will monitor volumes of dewatering discharge and ensure that it is utilised for processing and directed to storage facilities as appropriate with the exception of extreme flood conditions when it may be discharged to the environment. The TWE will ensure any groundwater non-compliances or incidents are reported and that groundwater abstraction is maintained within the licensed allocation.

4.4 SUPERINTENDENT PROCESS ASSURANCE

The Superintendent Process Assurance will ensure that the Water Licence Operating Strategy and Groundwater Management Plan are reviewed every three years or when significant operating changes occur (in consultation with the Environment Section).

This document forms part of the Environmental Protection Statement (AD#284204) under Ministerial Statement 711 (AD#283776) – it cannot be edited without prior approval from the Department of Environment

5. RELATED DOCUMENTS

Management and Operational Plans

- Metago (2004c) Mine Water Management Plan
- Metago (2004a) Water Operating Strategy for Water and Rivers Commission

Procedures and Work Instructions

- Metago (2004a) Environmental Water Monitoring Handbook
- Argyle (2003b) Procedure for Working In and Around Rivers
- Argyle (2003c) Procedure for Working in Remote Areas
- Argyle (2003d) Water Monitoring Procedure
- Argyle (2003e) Work Instruction for Collecting Groundwater Samples
- Argyle (2003f) Work Instruction for Collecting Surface Water Samples
- Argyle (2003g) Work Instruction for Conductivity Meter Calibration
- Argyle (2003h) Work Instruction for pH Meter Calibration
- Argyle (2003i) Work Instruction for Soil and Water Sample Dispatch
- Argyle (2003j) Work Instruction for Monitoring Groundwater Levels
- Argyle (2003k) Procedure for Calibration of Flow Meters

Groundwater research references and other background documents are listed in Part C References of the Environmental Protection Statement (EPS).

6. RECORDS MANAGEMENT

As subsequent revisions of this document are carried out, previous versions are retained within DM5 for records management purposes in accordance with the **Management of Controlled Documents Procedure #AD-226750**.

7. APPENDICES

7.1 TABLE B-1: GROUNDWATER MANAGEMENT

Action	Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.1.1	Impact of disposal of dewatering discharge on environment.	To maximise re use of dewatering discharge water and to minimise impacts to the environment	Under normal conditions direct underground dewatering discharge to the process water thickeners (<20 ML/day). During rainfall events pump excess dewatering discharge to Jacko's Dam or RCP3 when constructed, for storage and transfer to process water circuit. In extreme rainfall events discharge excess water to the environment via constructed spillways.	Ongoing	TWE. Superintendent Production Assurance	Complete pipeline works and pumping stations from underground to process plant, Jacko's Dam and RCP3.	Project Dewatering Procedure. (Metago, 2004b) Environmental Water Monitoring Handbook (Metago, 2004b)
B.1.2			Construct a concrete and rock lined spillway for discharge during flood events when RCP3 is constructed.	During construction of RCP3.	TWE Superintendent Production Assurance	Locate a suitable dewatering discharge point on Gap Creek.	RCP3 Design report (Metago, 2005a).
B.1.3	Zone of drawdown influence due to dewatering.	Ensure that measured groundwater levels reflect the predicted zone of influence and if not that management actions are implemented.	Review water abstraction and hydrological data to assess the accuracy of the predicted zone of influence. Revise drawdown model and if zone of influence exceeds the predicted area or is likely.	Every six months. As required	Superintendent Environment Manager Production Processing Superintendent Environment	Dewatering zone of influence is within the predicted area.	Nil

Action	Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.1.4	Impact of altered groundwater levels.	To determine and minimise the impacts of changed groundwater levels.	1. Continue to monitor groundwater levels: • 23 bores at Wesley Spring and nearby to Devil Devil Spring; • AK1 Pit dewatering bores & sump (PW 2-5 & 7, AK1MPQ); • AK1 in-pit piezometers (PZ 21,24,27,42,44,45,46,47,48, 49, 50); • Matsu Valley borefield production bores (P/2/4/5, DD1, DD2); and • Regional environmental bores (8, 9, 13, 21, 27, 48, 57. 59, CND1, CND3). 2. Establish or upgrade bores and monitor groundwater levels: • West Ridge; • Matsu Valley P/2/4/5 (fit telemetry); • Wesley Spring Creek; • South of the Southern WRD; and • Near the proposed new TSF and at Lissadel. 3. Enter groundwater level data into a database 4. Report groundwater monitoring findings and analyses in AER.	Continuous (Automatic) Monthly Monthly Annual Annual Establish during the first 12 months after commencemen t of the Project. Monitor Monthly Annually	Superintendent Environment Superintendent Environment	Groundwater level data are collected. Data are verified, entered into database for analyses and reported. Groundwater level data are collected. Construction of new bores is completed. Baseline data for groundwater levels in new bores are collected within three months of commencement of underground mining Data are verified, entered into database for analyses and reported.	S5.2.2 Monitoring Procedures (Metago, 2004b) S7.2 Water Balance Model; S9 Commitments (Metago, 2004b) S5.2.2 Monitoring Procedures (Metago, 2004b) S7.2 Water Balance Model; S9 Commitments (Metago, 2004b)

Action	Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.1.5 Also see Table B9.1	Impacts of dewatering drawdown on subterranean fauna.	To ensure that subterranean fauna species are not made extinct by the Project.	Monitor subterranean species in: • Existing bores; • New bores constructed downstream of Pin Smoke Creek in the vicinity of alluvial blocks or C6; and • In additional pastoral and other regional bores. Report subterranean fauna data and analyses to Government in the AER.	Annual Within 12 months of commencement of the Project. Biennial Annual	Superintendent Environment	Subterranean fauna sampling as per programme Sampling bores are constructed. Data and analyses are reported.	New Procedure for Monitoring Subterranean Fauna (see Subterranean MP)
B.1.6		Ensure the drawdown area is as predicted.	Review potential impacts on subterranean fauna if zone of influence is different to that predicted.	As required	Superintendent Environment	Dewatering zone of influence is within the predicted range.	Nil
B.1.7	Impacts of altered groundwater levels on vegetation at Wesley Spring.	To determine and minimise the impact of altered groundwater levels on vegetation.	Continue vegetation monitoring at Wesley Springs. (See Wesley Spring Management Plan.)	Annual	Superintendent Environment	Monitoring completed. Vegetation transects established.	B17 Wesley Spring Management.
B.1.8	Impacts of altered groundwater levels on vegetation	To determine and minimise the impact of altered groundwater levels on vegetation.	Establish baseline vegetation monitoring transects within the drawdown zone, downstream of the proposed new TSF and at additional sites considered likely to be affected by changing groundwater levels. Monitor vegetation at these transects. Report vegetation data and analyses to Government in the AER	Baseline and annually Annually Annually	Superintendent Environment	Vegetation transects established. Monitoring programme developed. Reported in AER.	Nil

Action	Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.1.9	Impact of mining activities on groundwater quality	To maintain GW quality.	Identify potential sources of groundwater contamination.	Within 3 months of commencement of the Project.	Superintendent Environment	Groundwater quality data are recorded.	Environmental Water Monitoring Handbook (Metago, 2004b).
B.1.10	Impact of mining activities on groundwater quality	To maintain GW quality.	Monitor groundwater quality (EC, pH, BMI, HM, TPH and N where appropriate): • Key underground sumps1; • Rising main(s) 1; • Regional environmental bores (8, 9, 13, 21, 27, 48, 57, 58, 59, CND1, CND3) 2; • Sewage Lagoon (23, 24, 50, 51, 52) 2; • Devil Devil Spring (P, P, PW2, DD1s/d, DD2s/d) 2; • Wesley Spring (W, W, W, W, W, W, 57, 59)2 ; and New and upgraded bores (above). • Enter groundwater data into a database and report to Government in the AER	1Monthly for first six months then quarterly 2Annually Ongoing Annually	Superintendent Environment	Groundwater quality data are recorded and reported in AER.	Environmental Water Monitoring Handbook (Metago, 2004b).
B.1.11	Compliance with licence conditions.	To ensure any groundwater incidents or non-compliance are reported to Government.	Notify DoE of any Licence to Operate non-compliances. Report all groundwater incidents to Government via the AER.	As required Annually	Superintendent Environment Tailings and Water Engineer		Commitment S2.3 Water Use (Metago, 2004b)
B.1.12		To ensure that dewatering abstraction does not exceed licenced volumes.	Monitor flow rates of abstraction pumps and provide data to the Environment Section.	Monthly	Superintendent Production Process	Measure and document flow rates.	Operating Strategy Commitments (Metago 2004b): S9

Action	Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.1.13			Review monthly abstraction data so that the yearly abstraction does not exceed the licensed allocation.	Monthly	TWE	Maintain abstraction within licenced allocation.	Operating Strategy Commitments (Metago 2004b): S9
B.1.14	Compliance with licence conditions.	To ensure that dewatering abstraction does not exceed licenced volumes.	Collate, analyse data and report groundwater quality, abstraction rates and impact on aquifer in AER.	Annually	Superintendent Environment	Report abstraction values in AER.	Operating Strategy Commitments (Metago 2004b): S9
B.1.15		To ensure that the Water Operating Strategy and Management Plans are maintained.	Review and revise the Water Licence Operating Strategy and Groundwater MP to incorporate changes to allocation, water management and/or monitoring and reporting requirements.	Every three years or when significant changes occur.	Superintendent Production Process	Water Operating Strategy and Groundwater Management Plan reviewed.	S3 Administrative Requirements (Metago, 2004b).
B.1.16	Consultation with Traditional Owners and other stakeholders in relation to groundwater matters at the site.	Successful consultation with relevant stakeholders	Consult Traditional Owners (through the Relationship Committee) and other stakeholders to provide feedback on groundwater levels and quality; vegetation and fauna, and potential impacts on Aboriginal heritage sites. Document stakeholder concerns and implement management actions where appropriate. Make groundwater monitoring data and reports available to stakeholders. Where adverse impacts occur determine ameliorative actions with stakeholders and implement.	Quarterly Quarterly Bi-annually As required	Cultural Heritage Management Officer Environmental Advisor	Stakeholder meetings are held and documented. Stakeholder opinions are incorporated into reviews of Operating Strategy and Management Plans.	S6 Water Use (Metago, 2004b) Management Plan 8 – Devil Devil Springs S5 Argyle Participation Agreement (Freehills, 2004)

BMI = Basic and Major Ions: EC, TDS, pH, Hardness, Na, K, Ca, Mg, Cl, Alk (CaCO3), SO4, CO3, HCO3, Si, F, Fe, Mn, A
N = Nutrients: NO2, NO3, NH4 (free), Total N, PO4, Total P, Chlorophyll, BOD
HM = Heavy Metals: Zn, Cu, Ni, Pb, Cd, Cr, As, Hg
TPH = Hydrocarbons