

NORTHERN TERRITORY
DEPARTMENT OF RESOURCES

WATER MANAGEMENT PLAN (WMP)

Advisory note for sites identified by the Department

INSTRUCTIONS ON THE USE OF THIS DOCUMENT

1. A WMP is required annually for specific mine sites identified by the Department and authorised under the *Mining Management Act*.
2. The *Act* requires that Mining Management Plans are submitted for acceptance. These can only be considered for approval following the submission of an accepted WMP at a date agreed with the department.
3. This advisory note contains guidance and some examples of mine water management issues.
4. The commitments to continuous improvement outlined in the WMP should have a defined objective and completion date placed on them so that there is a measurable time frame.

THIS ADVISORY NOTE DEMONSTRATES THE MINIMUM REPORTING REQUIREMENTS FOR THE DEPARTMENT. IT SHOULD BE UTILISED BY OPERATORS AS A BASIS FOR THE DEVELOPMENT OF A PROJECT-SPECIFIC WATER MANAGEMENT PLAN (WMP) THAT INCORPORATES A PROGRAM OF CONTINUOUS IMPROVEMENT.

CONTENTS

Glossary and Abbreviations

1.0 Introduction

- 1.1 Purpose of the Water Management Plan**
- 1.2 Water Management Plan Objectives and Targets**
- 1.3 Term of this Water Management Plan**

2.0 Current Project Site Conditions

- 2.1 Climate**
- 2.2 Surface Water Catchments**
- 2.3 Groundwater Resources**

3.0 Water Management System

- 3.1 Water Use in Operations**
- 3.2 Water Management Infrastructure**
- 3.3 Water Balance**

4.0 Surface Water Management

- 4.1 Potential Contaminants**
- 4.2 Potential Impacts**
- 4.3 Surface Water Management Infrastructure Use**
- 4.4 Discharge**
- 4.5 Abstraction**
- 4.6 Contingency Planning and Mitigation Measures**

5.0 Groundwater Management

- 5.1 Potential Contaminants**
- 5.2 Potential Impacts**
- 5.3 Groundwater Management Infrastructure Use**
- 5.4 Abstraction**
- 5.5 Contingency Planning and Mitigation Measures**

6.0 Monitoring

- 6.1 Statutory and Operational Monitoring Program**
 - 6.1.1 Surface Water**
 - 6.1.2 Groundwater**
 - 6.1.3 Biological**
- 6.2 Quality Control/Sampling Methodology**



ADVISORY NOTE

WATER MANAGEMENT PLAN

AA7-023

Minerals and Energy

August 2008

- 6.3 Water Quality Trigger Values**
 - 6.3.1 Level of Protection**
 - 6.3.2 Surface Water**
 - 6.3.3 Groundwater**
 - 6.3.4 Application of Trigger Values and Incident Reporting**

7.0 Reporting

8.0 Strategic Planning

9.0 Changes Since The Last WMP

Figures

- 1.0 Location Plan**
- 2.0 Site Layout/Catchments/WMS Infrastructure (etc) Location Plan**
- 3.0 Surface Water Monitoring Program Site Location Plan**
- 4.0 Groundwater Monitoring Program Site Location Plan**
- 5.0 Biological Monitoring Program Site Location Plan**

Appendices

- 1.0 Surface Water Monitoring Program**
- 2.0 Groundwater Monitoring Program**
- 3.0 Biological Monitoring Program**

References

GLOSSARY AND ABBREVIATIONS

The Glossary and Abbreviations section follows the table of contents and should include all abbreviations and terms used in the WMP, such as:

- Units of measurement
- Chemical symbols
- Local, National and International abbreviations
- Explanation of terms

Some examples are listed below.

Units of measurement

µg/L	Micrograms per litre
°C	Degrees Celsius
ha	Hectares
pH	Measure of acidity (<7) or alkalinity (>7) of a (water) sample

Chemical Symbols

Al	Aluminium
CO ₂	Carbon dioxide
FeS ₂	Pyrite
NO _x	Oxides of nitrogen

Abbreviations

MOL	Maximum operating level
the Department	Department of Resources
RL	Reduced level (relative height (m) compared to Australian Height Datum)
WDL	Waste water discharge licence

Explanation of Terms

Berm	Horizontal strip or shelf built into an embankment or cut to break the continuity of the slope
Colloidal material	Finely divided solids that will not settle but which may be removed by coagulation
Tailings	Fine waste rock material arising from the processing operation

SECTION 1: INTRODUCTION

1.1 PURPOSE OF THE WATER MANAGEMENT PLAN

The Water Management Plan (WMP) outlines how environmental issues associated with surface and groundwater at a mine site will be managed through all aspects of current operations clearly set out in the context of the overall framework of life of mine development.

The WMP is designed to support the approval process for Mining Management Plans (MMP) by resolving issues relating to water in a consistent framework. The WMP will effectively become part of the MMP and should facilitate the granting of approval.

The WMP addresses the requirements of the legislation for the mine site authorisation and (water) waste discharge licences. It will detail the relevant legislation, codes of practice, standards and guidelines applicable to the mining operation.

The WMP also outlines how performance against the objectives and requirements of this plan will be measured, monitored and reported.

1.2 WATER MANAGEMENT PLAN OBJECTIVES AND TARGETS

The operator shall outline the objectives and targets for managing water related impacts on the environment, including natural groundwater and surface waters, resulting from the mining operation.

1.3 TERM OF THIS WATER MANAGEMENT PLAN

WMPs are valid for a 12 month period. WMPs are required to be submitted 3 months prior to the MMP. The WMP timeframe will be the same period as that covered by the up-coming MMP (i.e. a 12 month retrospective reporting of activities and a further 12 month operational plan). They are to be updated annually and will remain valid until a subsequent plan is accepted.

The WMP will also be reviewed from time to time as a result of changes to mine planning or in response to incidents and investigations, or whenever significant changes are required.

All reviews and amendments to the plan should be done in consultation with the relevant authorities.

SECTION 2: CURRENT PROJECT SITE CONDITIONS

2.1 CLIMATE

Brief description of regional and site specific information.

This information may be presented as a graph or table of climate data.

It may include:

- Summary data of rainfall (annual, monthly variability), evaporation, temperatures (annual, monthly average - maximum, minimum) and wind speed
- Information from on-site monitoring during operational phase of project
- Reference to any reports/studies undertaken (i.e. quantified estimates/measurements of climatic factors).

2.2 SURFACE WATER CATCHMENTS

Detailed information to include:

- Surface water flows onto, on and out of the mining tenure area that may be impacted by the mining operation, including relevant watershed information
- Any present uses or users of surface water
- Reference to any reports/studies undertaken (i.e. baseline measurements or monitoring)
- Catchment assessment of the current site with a contour map outlining the surface catchment areas and their respective surface areas.

2.3 GROUNDWATER RESOURCES

Detailed information to include:

- Groundwater occurrence locally (mine site) and regionally
- Any present uses or users of groundwater in the general area, including local communities.
- Reference to any reports/studies undertaken (i.e. baseline measurements or monitoring).

SECTION 3: WATER MANAGEMENT SYSTEM

3.1 WATER USE IN OPERATIONS

This section must summarise all types of water uses and water generation within mine site operations which may potentially impact on the surrounding environment. (e.g. process water sourced from production bores/pond water, potable water from production bores, water treatment plant permeate, discharges to surface ponds/water courses etc).

3.2 WATER MANAGEMENT INFRASTRUCTURE

This section must detail the types, numbers and storage capacity (where applicable) of water management infrastructure. This includes, but is not limited to:

- Dams
- Bores
- Natural Water Bodies
- Pumps
- Pipelines
- Open Channels
- Open Cut Pits
- Evaporation Basins
- Sediment Basins
- Wetlands
- Chemical Treatment
- Waste Water Treatment Plant
- Water Storages

3.3 WATER BALANCE

Include detailed information on water balance within the water management system and its management across the whole mine site. The water balance must take into account inputs (e.g. rainfall, surface flows), outputs (e.g. evaporation, evapotranspiration, controlled/uncontrolled discharges, use in production etc.), interactions between surface and ground water, surface area of stores at various water levels and total catchment surface area per store / pit/ dam.



ADVISORY NOTE WATER MANAGEMENT PLAN

AA7-023

Minerals and Energy

August 2008

Completion of a balance sheet, as follows:

WATER SOURCE ACCOUNT

	Volume ML/yr				Total in storage
	Input	Diversion	Operational use	Output	
Surface					
Ground					
Sea					
Third-party					
TOTAL					

WATER STATE ACCOUNT

	Volume ML/yr				Total in storage
	Input	Diversion	Operational use	Output	
Raw					
Worked					
Treated					
TOTAL					

Efficiency %	
Re-use	
Recycled	

ML	
Store capacity	
Inventory	

Operational Risks	E.g. Pit #A	E.g. Tailings dam	
Time to fill (yr)			
Time to empty (yr)			

Raw water: captured surface, ground sea or third party water

Worked water: process water, drainage from wash down areas etc. Re-use of stored worked water is critical in establishing efficiency for a site.

Treated water: raw and/or worked water which is treated to improve its water quality prior to its intended use. Treatment can range from settling ponds to neutralising plants etc

Diverted water: includes water from dewatering and reinjection of aquifers, collection of clean run-off, off-site run-off and flows in watercourses. Diverted water does not connect with site stores

Third party water: water supplied by an entity external to the site, e.g. potable water mains.

Inputs: rainfall, run-off, surface storages, water bodies, aquifers, third party water

Outputs: seepage, evaporation, discharge to the environment

Operational use: processing uses, dust suppression

This water accounting balance sheet is derived from the draft *Water Accounting in the Minerals Industry & Possible WADC Pilot Project* by the Sustainable Minerals Institute and Minerals Council of Australia.

SECTION 4: SURFACE WATER MANAGEMENT

4.1 POTENTIAL CONTAMINANTS

Detail the potential sources and composition of surface water contamination, management measures and risk categories for each.

4.2 POTENTIAL IMPACTS

List the potential impacts on surface waters on/near the site from mining operations.

4.3 SURFACE WATER MANAGEMENT INFRASTRUCTURE

Detail the infrastructure involved in the management of surface water impacts and how they are used.

4.4 DISCHARGE

In this section detail the following information:

- Management of surplus water
- Discharge management history
- Discharge locations
- Potential impacts
- Potential/actual volumes
- Discharge water quality
- Waste Discharge Licence requirements (if applicable).

4.5 ABSTRACTION

Intended abstraction sources and quantities. The actual measured quantity should be reported against these estimates on an annual basis.

4.6 CONTINGENCY PLANNING AND MITIGATION MEASURES

Summarise the measures to manage and mitigate the potential impacts on surface waters (e.g. above average rainfall events).

SECTION 5: GROUNDWATER MANAGEMENT

5.1 POTENTIAL CONTAMINANTS

Detail the potential groundwater contaminants, management measures and risk categories for each.

5.2 POTENTIAL IMPACTS

List the potential impacts on groundwater resources in/near the site from mining operations.

5.3 GROUNDWATER MANAGEMENT INFRASTRUCTURE

Detail the infrastructure involved in the management of groundwater in order to prevent environmental impact or manage water and how it is used.

Examples of this may include but are not limited to:

- Groundwater recovery bores;
- Infrastructure and pumps etc relating to dewatering activities
- Injection bores;
- Barrier technologies;
- Engineered structures to manage potential impacts relating to seepage (e.g. seepage limiting layers, drainage, under drains);
- Material characteristic changes that will affect groundwater quality.

5.4 ABSTRACTION

Intended abstraction sources and quantities, including dewatering systems (if applicable). The actual measured quantity should be reported against these estimates on an annual basis.

5.5 CONTINGENCY PLANNING AND MITIGATION MEASURES

Summarise the measures to manage and mitigate the potential impacts on groundwater resources.

SECTION 6: MONITORING

6.1 STATUTORY AND NON-STATUTORY MONITORING PROGRAMS

The water quality monitoring program includes statutory and operational monitoring of surface water and groundwater and it may also include biological water quality monitoring (e.g. macroinvertebrate/fisheries data).

Statutory sites are monitored in accordance with the Wastewater Discharge Licence (WDL), minesite Authorisation and/or the MMP.

Operational monitoring is undertaken to:

- Provide early warning capability by identifying environmental change particularly those resulting from project development activities
- Validate modelling (actual vs. predicted)
- Contribute to reviews of environmental management procedures.

6.1.1 SURFACE WATER

Provide the following information:

- An overview of the surface water monitoring program
- Maps showing locations of statutory and operational monitoring sites are to be provided
- Current Monitoring Program (including site, sample type, frequency parameters measured).

6.1.2 GROUNDWATER

Provide the following information:

- An overview of the groundwater monitoring program
- Maps showing locations of statutory and operational monitoring sites are to be provided. Also include recovery bores on site
- Current Monitoring Program (including site, sample type, frequency, parameters measured).

6.1.3 BIOLOGICAL

Provide the following information:

- An overview of the biological monitoring program
- Maps showing locations of statutory and operational monitoring sites are to be provided
- Sample Monitoring Program (including site, sample type, frequency).

6.2 QUALITY CONTROL

Provide an overview of the quality control procedures for:

- Sample collection and dispatch
- Calibration of field instruments
- Sample analysis
- Standards preparation
- Data storage and verification.

6.3 WATER QUALITY TRIGGER VALUES

Trigger values are levels or concentrations of water quality parameters that are designed to protect aquatic ecosystems. Trigger values should be determined in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC 2000). The 'ANZECC' guidelines provide default trigger values for various physical and chemical stressors.

However, these values may or may not be appropriate for a specific mine site location, as background levels of some stressors may exceed the default trigger values. For this reason, the guidelines promote a site-specific approach to developing trigger values that utilise background (e.g. unimpacted adjacent catchment, pre-mining and/or upstream) water quality data and biological-effects data (e.g. toxicity testing).

6.3.1 LEVEL OF PROTECTION

Detail the level of protection as derived from past and current land uses, declared Beneficial Uses, sites of conservation status and ANZECC guidelines. As discussed in the ANZECC guidelines, the level of protection should be determined in consultation with relevant stakeholders (e.g. downstream land owners).

6.3.2 SURFACE WATER

Water quality trigger values for all parameters measured at surface water sites are to be provided. It may be appropriate to define several trigger values for a given parameter with increasing levels of management response, such as 'Focus', 'Action' and 'Upper Limit' values.

6.3.3 GROUNDWATER

Water quality trigger values for all parameters measured at groundwater sites are to be provided. The ANZECC guidelines do not provide trigger values for groundwater ecosystem protection but do provide livestock drinking values. However, trigger values should be based on surrounding and/or future land use for the area and consider the connectivity between ground and surface water ecosystems. For example, more stringent trigger values would be required in a situation where it is likely that groundwater has a strong connectivity with local surface waters.

6.3.4 APPLICATION OF TRIGGER VALUES & INCIDENT REPORTING

Provide an outline of the responses to results outside trigger value levels, the corrective actions/investigations and the reporting requirements.

SECTION 7: REPORTING

7.0 REPORTING

An annual water quality report is to be included, which contains (at a minimum):

- Water quality data and interpretation of this data (i.e. comparison to triggers)
 - Identification of any issues (e.g. degrading water quality in a specific site/area)
 - Potential causes of issues
- Details of any incidents potentially affecting water quality
- Details of actions taken to address any water quality issues
- Commitments to specific areas for improvement in the next reporting period.

A list of water quality reporting requirements for wastewater discharge licence purposes (e.g. bi-monthly reporting due dates, annual report due date etc).

Raw data for water quality monitoring is to be forwarded to the Department on a quarterly basis or as agreed with the Department Mine Evaluations Team.

SECTION 8: STRATEGIC PLANNING

8.0 STRATEGIC PLANNING

Factors for consideration:

- Brief history of Water Management System (WMS) development and current status
- Outline of short term objectives, priority actions and initiatives aligning with the period of the plan
- Summary of proposed works to the WMS and timelines for the report period.

SECTION 9: CHANGES SINCE LAST WMP

9.0 CHANGES SINCE LAST WMP

Detail/include a table listing all changes since the last WMP:

- To the current WMP document
- Water management system
- Monitoring programs.

REFERENCES

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality
http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality

Water Management Best Practice Guidance for Mining published by the Commonwealth Government
<http://www.ret.gov.au/General/Resources-SM/Pages/BestPracticeEnvironmentalManagementinMiningWaterManagement.aspx>