E3 - Acid rock drainage prediction and control

Scope

This standard is applicable to all Rio Tinto business units and managed operations including, where applicable, admin/corporate offices and research facilities located off site. The requirements of this standard are to be followed by all operations that indicate existing or potential Acid Rock Drainage (ARD) conditions. The standard covers the management of sulphide-bearing materials and ARD through the complete mineral project development timeline from exploration through project development, approval and mining, changes in the orebody mineralogy and/or process conditions, through to closure and post-closure periods.

Intent: The intent of the standard is to ensure that ARD risks for Rio Tinto projects and operations are effectively identified through all phases of a business and managed to prevent or minimise adverse environmental impacts and to reduce long-term costs and liabilities. The standard applies to issues related to the potential release of sulphide oxidation products including the formation of acidic and/or saline soils and wastes, the release of low pH water or water with a neutral pH but elevated sulphate-dominated salinity or metals concentrations. The term ARD as used in this standard refers to the

potential environmental impacts that could result from the oxidation of sulphide minerals such as pyrite. The emphasis is on timely and thorough analysis of the risks, early identification and implementation of control (management) strategies and thorough integration of controls with mine planning and operational activities.

Other relevant documents:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Land use stewardship standard
- Mineral waste management standard
- Water use and quality control standard
- Closure standard
- Acid rock drainage prediction and control guidance note

Programme design

1 Planning

1.1 Identify and document the geological setting and the mineralogy of sulphide containing rocks, adjacent lithologies and unconsolidated sediments that will be disturbed or exposed in order to support ARD potential and prediction studies.

1.2 Assess the ARD potential of any new development as part of exploration, order of magnitude, pre-feasibility and feasibility studies, due-diligence reviews for acquisitions, and also for changes in process and/or mineralogy. Ensure that realistic

ARD management costs are estimated and included in project financial evaluations.

1.3 Undertake appropriate environmental baseline studies for ARD before the commencement of a development project or any significant expansions of existing operations.

1.4 Due diligence studies as part of potential project acquisitions must include an assessment of the project's current and potential ARD issues and liabilities.

1.5 Maintain an ARD prediction program for forecasting the short-term and long-term behaviour under local weathering conditions of sulphide-bearing materials such as:

a) The rocks and unconsolidated sediments exposed in open pits and underground mines;
b) Ore, waste rock, block cave rubble, acid sulphate soils and other materials that have been disturbed; and
c) Tailings, spent heap leach ore and other process wastes that have been generated.

1.6 Ensure the ARD prediction program reduces uncertainty about potential risk and liability to a level which permits a decision to be made to either reject the project or initiative, or to put in place effective mining and waste management strategies.

1.7 Ensure that recognised ARD experts are consulted for the initial assessment to determine whether there is an ARD issue at the site, design of the prediction program, the interpretation of its results, and the development of the management plan.

1.8 Develop an ARD management plan, commensurate with the ARD potential of mineral wastes and products and in line with the ARD prediction program, addressing as a minimum:

a) a summary assessment of the ARD setting, hazards and potential impacts;

b) the discharge limits and receiving environment objectives;

c) the ARD management strategy designed to meet the environmental objectives in a reliable and cost effective manner during operation and after closure;

d) the procedures and responsibilities for implementing the management strategy on an ongoing basis under actual field conditions;

e) ongoing ARD characterisation, monitoring and data collection requirements; and

f) contingency measures for response to unplanned conditions or unexpected impacts.

2 Implementation and operation

2.1 Implement the ARD management plan and make sure that it is integrated with mine and processing design, waste scheduling, closure planning, relevant operational procedures, and the business plan.

2.2 Maintain an inventory comprising quantities, location and representative characteristics of materials extracted from a mine or exposed to oxidation with respect to their abilities to generate or mitigate ARD.

2.3 Assign accountabilities at each affected operation for undertaking the ARD prediction program and for developing and implementing the ARD management plan.

2.4 Ensure that induction, general awareness and job specific training contains additional elements relating to ARD risks and how they are managed, where ARD is a significant issue for the operation. In such operations, the management team must have an appropriate knowledge of ARD prediction and control.

3 Performance management

3.1 Maintain a monitoring procedure appropriate to the potential ARD impacts, which, as a minimum, allows adequate early warning of unacceptable impacts, facilitates management

decisions, supports the ongoing prediction program and confirms assumptions used in the management plan.

3.2 Arrange for independent review of the ARD management plan at regular intervals (at least every four years, or more frequently when operational or environmental conditions so dictate). The review must be carried out by an ARD expert and produce an independent document attesting the status of the prediction program and control strategies in place and indicating any potential threats to the operation and the Rio Tinto Group.

4 Revision history

Version no.	**Effective date**	**Prepared by**	**Authorised by**	
1	June 2005	Adelino Taboada	ExCo	
Version no.	**Revision date**	**Revised by**	**Authorised by**	**Reason for change**
2	December 2008	Adrian van Tonder	Buce Kelley	Incorporation of suggested changes from operations and alignment with HSEQ management system.