# Appendix 4

# SEPP 33 Risk Screening and Preliminary Hazard Analysis

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# A4.1 INTRODUCTION

In accordance with *State Environmental Planning Policy 33 – Hazardous and Offensive Development* (SEPP 33), consideration has been made as to whether the Project should be considered a hazardous or potentially hazardous industry using the risk screening method provided in the documents entitled *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines* (DoP (2011a) and *Risk Assessment – Hazardous Industry Planning Advisory Paper No 3* (DoP (2011b)). Assessment details for the final determination are provided in this appendix.

Industries or projects determined by the risk screening process to be hazardous or potentially hazardous would require the preparation of a Preliminary Hazard Analysis (PHA) in accordance with Clause 12 of SEPP 33. In the event that the project is deemed potentially hazardous under SEPP 33, only the preparation of the PHA is necessary and no further assessment is required.

The Hera Project has been determined potentially hazardous based on the storage and the transport of hazardous chemicals (see **Table 2.7**), and as such a risk screening has been undertaken for all hazardous chemicals that would be stored and transported to the site for use in ore processing activities.

# A4.2 RISK SCREENING

## A4.2.1 Hazardous Materials within the Project Site

Hazardous materials are defined within DoP (2011a) as substances falling within the classification of the *Australian Code for the Transportation of Dangerous Goods by Road and Rail* (*Dangerous Goods Code*) (Department of Infrastructure, Transport, Regional Development and Local Government, 2009). Based on this definition, the hazardous materials to be stored within the Project Site, their quantities and storage location are summarised in **Table A4.1**. Note that classes 1.4 – 1.6, 2.2, 7 and 9 are excluded from risk screening.

## A4.2.2 Transportation of Hazardous Materials

Information on the average number of vehicle movements for the transportation of hazardous material to and from the Project Site, the approximate load size of hazardous material being carried at any one time, and the SEPP 33 threshold limit in terms of the cumulative annual movements is presented in **Table A4.2**.

## A4.2.3 Risk Screening Results

The risk screening process, based on an evaluation of both the Dangerous Good Class/Packing Group of the material (**Table A4.1)** as well as the transportation of the hazardous material contingent of the load size and cumulative vehicle movements (**Table A4.2**) determined that a the Project is potentially hazardous, and a Preliminary Hazard Analysis (PHA) is required for the following hazardous chemicals:

- storage of solid potassium amyl xanthate;
- the transport and storage of 30% sodium cyanide solution; storage of solid lead nitrate; and
- storage of liquid hydrogen peroxide.

**Table A4.1**
**Hazardous Materials Storage within the Project Site**

| Material | Class/ Packing Group | Description | Storage Quantity | Storage Location | Distance to site boundary | Screening Threshold Limit[1] | Threshold Triggered |
|---|---|---|---|---|---|---|---|
| Potassium amyl xanthate (solid) | 4.2 PGII | Hygroscopic pellets | 10t (solid) | Processing Plant | NA | 1t | Yes |
| Potassium amyl xanthate (solution) | 8 PGIII | Solution | 2 400L of 30% solution | Processing Plant | NA | 50t | No |
| Sodium cyanide (30% solution) | 6.1 PGI | Solution delivered in Integrated Bulk Containers. Very toxic. | 20t | Processing Plant | NA | 2.5t | Yes |
| MIBC (methyl isobutyl carbinol) | 3 PGIII | Liquid, flammable | 3 000L (2.4t) | Processing Plant | >500m | 3m | No |
| Nitric acid | 8 PGII | Liquid | 2 000L (2.4t) | Processing Plant | NA | 25t | No |
| Sodium hydroxide (solution) | 8 PGIII | 50% w/w solution | 10 000L (16t) | Processing Plant | NA | 50t | No |
| Diesel fuel | 1 NA | Combustible liquids: flashpoint above 61°C but not exceeding 150°C | 200 000L | In bunded areas in the vicinity of the Workshop and Refuelling Station. | >500m | 10m | No |
| LPG | 2.1 | Extremely flammable gas, flash point $-104^{o}$C. | 7.5$m^3$ | Furnace room | NA | 10t or 16$m^3$ | No |
| Hydrogen peroxide | 5.1 PGII | 50% w/w solution | 20 000L (24 tonne)[2] | Processing Plant | NA | 5t | Yes |
| Lead nitrate | 5.1/6.1 PGII | Powder | 12t | Processing Plant | NA | 2.5t | Yes |
| Potassium nitrate | 5.1 PGIII | Powder | 1t | Processing Plant | NA | 5t | No |

Note 1: Screening threshold quantities obtained from Table 3 and for MIBC Figure 9 of (DoP, 2011a).
Note 2: Weight of 50% w/w of hydrogen peroxide solution was calculated based on a density of 1.20 g/mL.
NA = not applicable

Source: YTC Resources Limited

**Table A4.2**
**Hazardous Material Transportation**

| Material | Class | Vehicle Movements per Year | | Approximate Load Size | Threshold Triggered |
|---|---|---|---|---|---|
| | | Project Average Number | Threshold Limit | | |
| Potassium amyl xanthate (solid) | 4.2 PGIII | 26[2] | >100 | 10t | No |
| Potassium amyl xanthate (solution) | 8 PGIII | 26[2] | >500 | 2 400L | No |
| Sodium cyanide (30% solution) | 6.1 PGI | 26[2] | all | 20 000L | Yes |
| MIBC (methyl isobutyl carbinol) | 3 PGIII | 26[2] | >1 000 | 3 000L (2.4t) | No |
| Nitric acid | 8 PGII | 26[2] | 500 | 1 000L (1.2t) | No |
| Sodium hydroxide (solution) | 8 PGII | 26[2] | >500 | 5 000L (8t) | No |
| Diesel fuel[1] | 1 | 284 | 1 000 | 25 000L | No |
| LPG | 2.1 | 26[2] | >500 | 7.5m[3] | No |
| Hydrogen peroxide | 5.1 PGII | 26[2] | >500 | 20 000L | No |
| Lead nitrate | 5.1/6.1 PGII | 52 | >500 | 10t | No |
| Potassium nitrate | 5.1 PGIII | 52 | >500 | 5t | No |

Source: YTC Resources Pty Limited
Note 1: Vehicle movements for diesel transportation based on fuel consumption rate of approximately 7.1ML/year.
Note 2: Delivery once a fortnight

## A4.3 PRELIMINARY HAZARD ANALYSIS METHODOLOGY

### A4.3.1 Introduction

This PHA has been conducted as part of the *Environmental Assessment* to evaluate the hazards associated with the storage and transport of the following chemicals in ore processing activities that have been identified during the risk screening process to trigger the respective SEPP33 threshold quantities, either for onsite storage of during transportation to the site.

- Solid potassium amyl xanthate is a Class 4.2 chemical used as a flotation reagent during ore processing and would be stored within the Project Site in quantities exceeding the screening threshold quantities nominated in DoP (2011a). As such a PHA is required to be prepared for the storage of solid potassium amyl xanthate.
- Sodium cyanide is a Class 6.1 chemical used in the recovery of gold from the ground ore and would be stored on the Project Site in quantities exceeding the threshold nominated in DoP (2011a). Transport of a Class 6.1 dangerous good in any quantity is also identified by DoP (2011a) as triggering a PHA. As such a PHA is required to be prepared for the transport and storage of the 30% sodium cyanide solution.

- Solid lead nitrate has been classified as Class 5.1/6.1 and is a chemical that would be used during ore processing and would be stored within the Project Site in quantities exceeding the screening threshold quantities nominated in DoP (2011a). As such a PHA is required to be prepared for the storage of solid lead nitrate.
- Hydrogen peroxide (50% w/w) has been classified as Class 5.1 and is a chemical that would be used as an oxidizing agent during ore processing and would be stored within the Project Site in quantities exceeding the screening threshold quantities nominated in DoP (2011a). As such a PHA is required to be prepared for the storage of solid lead nitrate.

Preparation of the PHA addresses the requirements of SEPP 33, and has been documented in general accordance with *Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis* (DoP (2011c)).

The PHA has been completed in accordance with the general principles of risk evaluation and assessment outlined in the NSW Department of Urban Affairs and Planning (DUAP) *Multi-Level Risk Assessment* (DUAP, 1999).

Assessed risks are compared to the qualitative risk assessment criteria developed in accordance with Australian Standard/New Zealand Standard (AS/NZS) 4360:2004 *Risk Management* (AS/NZS 4360:2004). Further, this PHA considers the qualitative criteria provided in *Hazardous Industry Planning Advisory Paper No. 3 – Risk Assessment* (DoP (2011d)).

### A4.3.2 Objectives and Scope

The objective of the PHA presented in this document are to:

- identify the risks posed by the use, storage and transport of the identified chemicals for the Project to personnel, property and the environment; and
- assess the identified risks using applicable qualitative criteria.

This assessment considers offsite risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions, ie. equipment failure, operator error and external events. The assessment does not consider risks to the employees or property of the Proponent.

This report should be read in conjunction with Section 4 of the *Environmental Assessment*.

### A4.3.2 Assessment Methodology

The assessment used the approach recommended by the NSW Department of Planning and described in the document entitled *Multi Level Risk Assessment Guidelines* and shown as a flowchart in **Figure A4.1**. These guidelines are intended to assist industry, consultants and the consent authorities to carry out and evaluate risk assessments at a level appropriate for the facility being assessed.

The assessment approach considered the Hera Project in context of its location and its technical and safety management control. The three levels of assessment, depending on the outcome of the preliminary screening are as follows.

- **Level 1** – **Qualitative Analysis**, primarily based on the hazard identification techniques and qualitative risk assessment of consequences, frequency and risk;

- **Level 2** – **Partially Quantitative Analysis**, using hazard identification and the focused quantification of key potential offsite risks; and
- **Level 3** – **Quantitative Risk Analysis (QRA)**, based on the full detailed quantification of risks, consistent with *Hazardous Industry Planning Advisory paper No.6 – Guidelines for Hazard Analysis*.

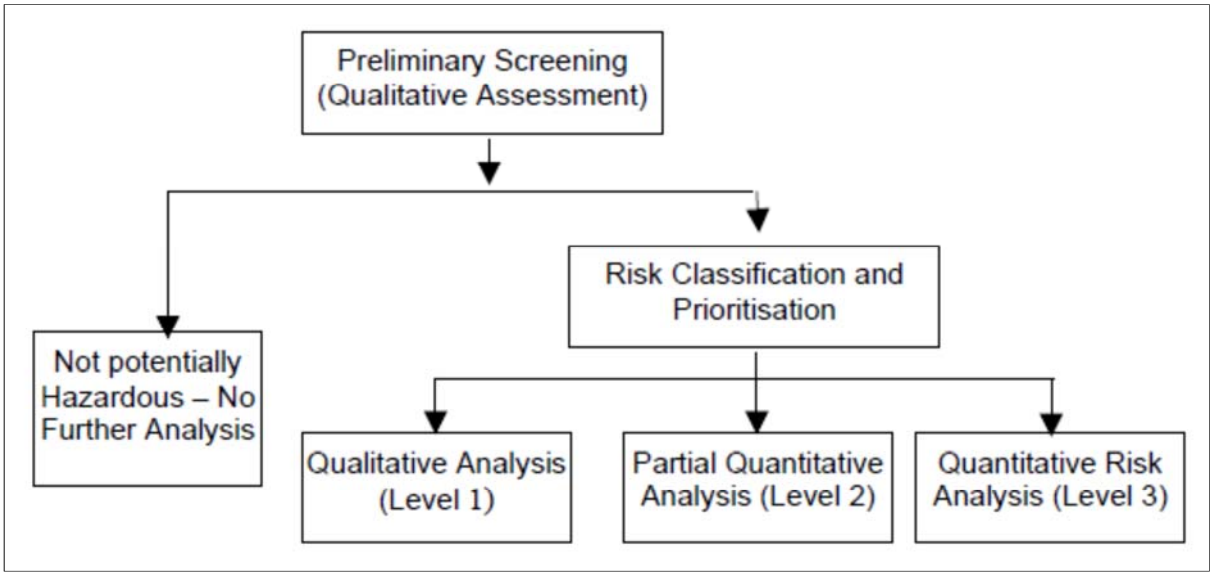


**Figure A4.1**
**Multi-Level Risk Assessment Process**

A qualitative analysis has been implemented for the preparation of the PHA due to the relatively low quantities of the dangerous goods to be used, stored and transported to and from the Project Site, the well understood management practices for these materials and the relatively non-sensitive surrounding land uses.

The qualitative analysis methodology employed was as follows:

i) Identification of the hazards associated with the use, storage and transport of sodium cyanide.

ii) Examination of the maximum reasonable consequence[1] of identified events.

iii) Qualitative estimation of the likelihood of events.

iv) Proposal of risk treatment measures.

v) Qualitative assessment of risks to the environment, members of the public and their property arising from atypical and abnormal events and compare these to applicable qualitative criteria.

vi) Recommendation of further risk treatment measures if considered warranted.

vii) Qualitative determination of the residual risk assuming the implementation of the risk treatment measures.

[1] Definition of Maximum Reasonable Consequence. The worst-case consequence that could reasonably be expected, given the scenario and based upon the experience of the workshop participants.

### A4.3.3 Risk Management Process

The PHA presented in this document have been undertaken in general accordance with the risk management process described in *Risk Management Standard* (AS/NZS 4360:2004), which provides a generic guide for managing risk. The risk management process is shown schematically on **Figure A4.2** and includes the following components.

- Establishment of the risk assessment context – Section A3.3.4.
- Identification of risks – Section A3.3.5.
- Analysis, evaluation and treatment of risks – Section A3.3.6 and **Table A4.6**.

### A4.3.4 Qualitative Measures of Consequence, Likelihood and Risk Ranking Table

Descriptors for the qualitative risk assessment at the various levels of consequence of a particular event, and the likelihood (or probability) of such an event occurring are presented in **Tables A4.3, A4.4** and **A4.5** in accordance with AS/NZS 4360:2004, and consistent with the specific objectives and context of the PHA being prepared.

**Table A4.3**
**Qualitative Likelihood Rating**

| Level | Descriptor | Description |
|---|---|---|
| A | Almost Certain | Is expected to occur in most circumstances. |
| B | Likely | Will probably occur in most circumstances. |
| C | Possible | Could occur. |
| D | Unlikely | Could occur but not expected. |
| E | Rare | Conceivable, but only in exceptional circumstances. |
| Source: HB 203:2006 (Standards Australia, 2006) - Table 4(A) | | |

**Table A4.4**
**Qualitative Consequence Rating**

| Level | Descriptor | People | Environment | Asset / Production |
|---|---|---|---|---|
| 5 | Catastrophic | Multiple fatality | Extreme environmental harm, eg. widespread catastrophic impact | More than $5M ($5 million) loss or production delay |
| 4 | Major | Permanent total disabilities, single fatality | Major environmental harm, eg. widespread substantial impact | $1M to $5M loss or production delay |
| 3 | Moderate | Major injury or health effects, eg. major lost workday case/permanent disability | Serious environmental harm, eg. widespread and significant impact | $500k ($500k thousand) to $1M loss or production delay |
| 2 | Minor | Minor injury or health effects, eg. restricted work or minor lost workday case | Material environmental harm, eg. localised and significant impact | $50k to $500k loss or production delay |
| 1 | Insignificant | Slight injury or health effects, eg. first aid/minor medical treatment level | Minimal environmental harm, eg. interference or likely interference to an environmental value | Less than $50k loss or production delay |
| Source: Modified after HB 203:2006 (Standards Australia, 2006) - Table 4(B) | | | | |

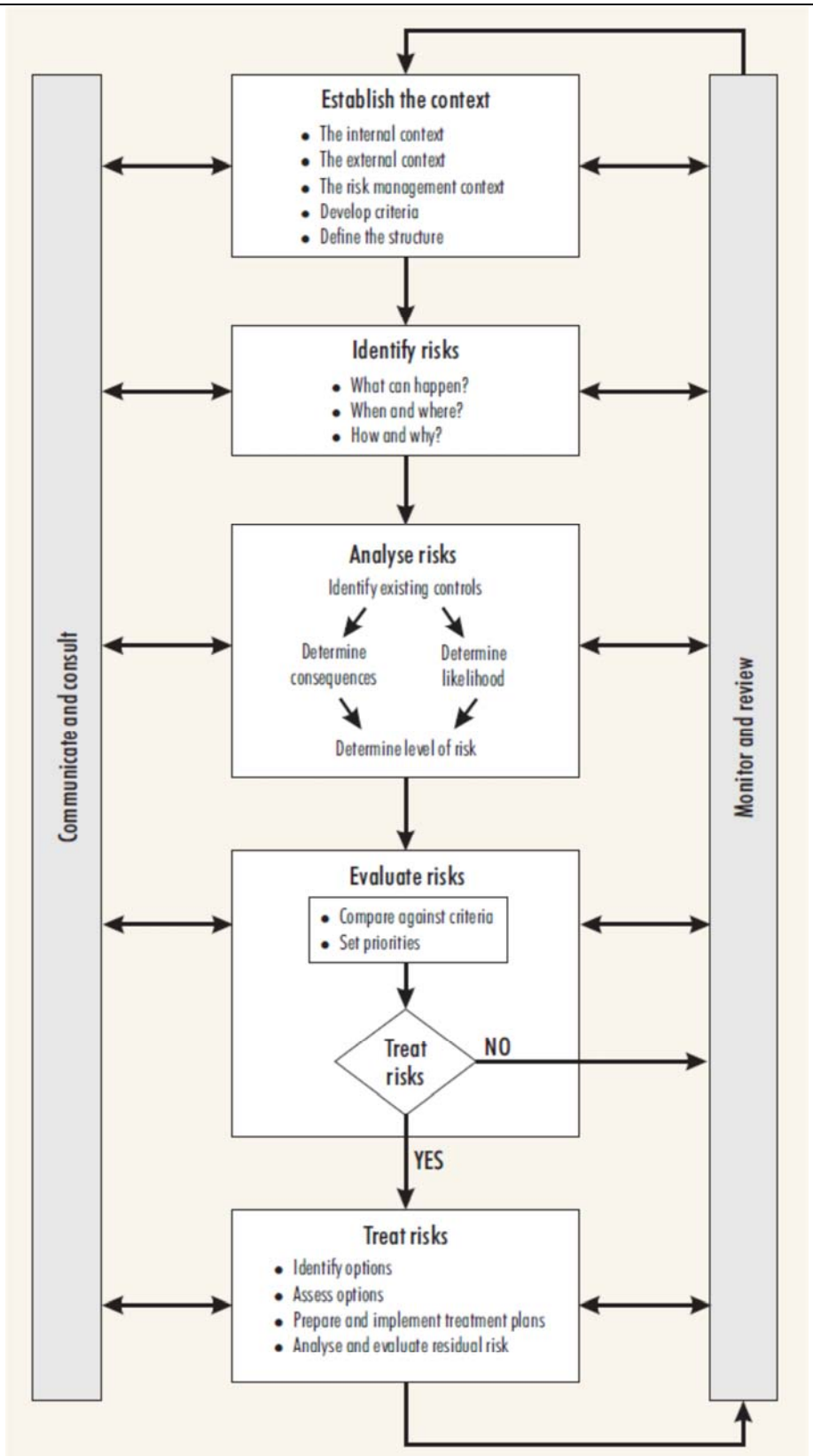


**Figure A4.2**
**Risk Management Process**

**Table A4.5**
**Risk Rating Matrix**

| Likelihood | Consequences (Descriptor / Level) | | | | |
|---|---|---|---|---|---|
| | Insignificant / 1 | Minor / 2 | Moderate / 3 | Major / 4 | Catastrophic / 5 |
| A (Almost Certain) | A | A | I | I | I |
| B (Likely) | T | A | A | I | I |
| C (Possible) | T | T | A | A | I |
| D (Unlikely) | T | T | T | A | A |
| E (Rare) | T | T | T | T | A |

Note: Rating modified after HB 203:2006 (Standards Australia, 2006) - Table 4(C)

The risk ratings noted in **Table A4.5** are defined as follows.

- **Tolerable (T)**: The risk associated is acceptably low.
- **As low As Reasonably Practicable (A)**: The risk has been reduced to as low a level as possible and all feasible controls and mitigation strategies are implemented.
- **Intolerable (I)**: The risk cannot be reduced to an acceptable level with residual impacts likely to have significant impact on the local environment or stakeholders. Intolerable risk would preclude the development of the Project.

Risk acceptance criteria for the Project require risks to be reduced to a Tolerable (T) level. This has been completed for the Project and the results are summarised in **Table A4.6**.

### A4.3.5 Hazard Identification

#### A4.3.5.1 Overview

The risk screening process undertaken in accordance with SEPP 33 identified solid potassium amyl xanthate, sodium cyanide (30% solution), hydrogen peroxide (50% w/w solution) and solid lead nitrate as a potentially hazardous materials to be used, stored and transported to and from the Project Site.

The hazard (or risk) identification summary tables presented in Sections A4.4 provide a summary of the potential off-site risks and hazards identified for the Project and a qualitative assessment of the risks posed. This summary table considers the component areas of the Project where the potentially hazardous materials would be used, stored or transported, the types of incidents attributable to this potentially hazardous material and the risk treatment or management measures that would be adopted.

#### A4.3.5.2 Component Areas

The following component areas were identified for the use, storage and transport of sodium cyanide for the purposes of hazard identification and assessment.

- Transport to the Project Site.
- Storage facilities within the Project Site.
- Ore treatment and processing within the Processing Plant.
- Tailings and Process Water Management.

#### A4.3.5.3 Incident Classes

The following generic classes of incidents were identified:

- accidents;
- leaks/spills;
- fire; and
- theft / sabotage.

These incident classes have been applied to the component areas to identify scenarios for which control/mitigation measures were developed.

#### A4.3.5.4 Project Risk Treatment Measures

General hazard control would be documented in the following management programs that will be developed for the Project.

- Hydrocarbon, Chemical and Reagent Management Plan
- Contractor Management Plan
- Safety Management Plans
- Bushfire Management Plan

Additionally, the following hazard control measures would be adopted for the Project.

- **Maintenance –** Ongoing and timely maintenance of all mobile and fixed plant and equipment in accordance with the manufacturer's recommended maintenance schedule, and consistent with the maintenance schemes required by relevant standards. Only vehicles permitted to carry dangerous goods would be used for transport of sodium cyanide.
- **Staff Training –** Operators and drivers would be trained and (where appropriate) licensed for their job descriptions. Only those personnel licensed to undertake skilled and potentially hazardous work would be permitted to do so.
- **Engineering Structures –** Civil engineering structures would be constructed in accordance with applicable codes, guidelines and Australian Standards.
- **Contractor Management** – All contractors employed by the Proponent would be required to operate in accordance with the relevant Australian Standards, NSW Legislation and Project Contractor Management Plan.
- **Storage Facilities –** Storage and usage procedures for potentially hazardous materials would be developed in accordance with Australian Standards, relevant legislation and Material Safety Data Sheets.

## A4.4 PRELIMINARY HAZARD ANALYSIS

A qualitative assessment of risks associated with the use, storage and, in the case of sodium cyanide, transport the following chemicals are presented in **Tables A4.6** to **A4.9**.

- solid potassium amyl xanthate;
- 30% sodium cyanide solution;
- solid lead nitrate; and
- 50% w/w hydrogen peroxide solution.

Given that the Project has been identified as 'potentially hazardous' the proponent would implement hazard treatment measures, where required, to produce a 'tolerable' level of risk in accordance with the risk acceptance criteria described in Section A4.3.4. Reference is made to the control measures identified in Section A4.3.5.4.

**Table A4.6**
**Hazard Assessment – Potassium Amyl Xanthate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities | Accident | Accident within the storage area | • Storage of material only in manufacturer's original packaging.<br>• Storage of material in an appropriately designed facility under cover and with adequate access for vehicles and personnel.<br>• Storage of appropriate spill-clean up and equipment and materials in the vicinity of the storage location.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 3 | T |
| | Spill | Inadequate maintenance and/or design resulting in spillage. | • Storage of material in an appropriately designed facility under cover and with adequate access for vehicles and personnel.<br>• Storage of appropriate spill-clean up and equipment and materials in the vicinity of the storage location.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area<br>– Advise senior site management of the spill. | D | 2 | T |

**Table A4.6 (Cont'd)**
**Hazard Assessment – Potassium Amyl Xanthate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities (Cont'd) | Fire | Outbreak of fire in storage area | • Appropriate design of storage locations, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards. | E | 3 | T |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 2 | T |
| Ore Treatment and Processing | Accident | Accident within the Processing Plant area resulting in spillage | • Restricted vehicle access to the Processing Plant area enforced.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | E | 2 | T |
| | Spill | Operator error or poor maintenance leading to spill. | • Processing Plant contained within a bunded area capable of retaining any spill.<br>• Restricted vehicle access to the Processing Plant area enforced.<br>• Regular inspections of the plant completed and any maintenance requirements reported and enacted.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Processing Plant personnel provided with appropriate training.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 2 | T |

**Table A4.6 (Cont'd)**
**Hazard Assessment – Potassium Amyl Xanthate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore Treatment and Processing (Cont'd) | Spill (Cont'd) | | • Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | | | |
| | Fire | Outbreak of fire in Processing Plant area | • Appropriate design of Processing Plant in accordance with relevant design standards, including limitation of ignition sources and appropriate installation of electrical equipment.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards. | D | 2 | T |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Project personnel onsite at all times during operations. | E | 2 | T |
| Tailings and Process Water Management | Accident /Spill | Leak from or rupture of tailings pipeline. | • Tailings pipework placed within drainage channels to restrict dispersal of tailings in the event of a spill.<br>• Spill trays installed where pipeline crosses drainage feature(s).<br>• Environmental inspections and reporting completed regularly.<br>• Pumping ceased immediately on identification of leak.<br>• Pumping only to recommence following repair of leak.<br>• All tailings material excavated and manually placed within the Tailings Storage Facility. | D | 1 | T |

**Table A4.6 (Cont'd)**
**Hazard Assessment – Potassium Amyl Xanthate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Tailings and Process Water Management (Cont'd) | Accident /Spill (Cont'd) | Rupture of, or leak from the Tailings Storage Facility. | • Tailings Storage Facility constructed in accordance with NSW Dams Safety Committee requirements.<br>• Regular inspections of Tailings Storage Facility walls for structural integrity.<br>• Specific operating procedures to be implemented for the construction of each lift.<br>• Tailings Storage Facility lined with impermeable clay.<br>• Monitoring of shallow piezometers (lysimeters) to detect seepage or leakage from the Tailings Storage Facility.<br>• Contingency strategy to be developed and implemented in the event seepage or leakage identified by monitoring. | E | 3 | T |
| | | Overflow or leak from Process Water Dam. | • Dam designed with suitable freeboard to retain rainfall from storm events.<br>• Dam constructed with impermeable liner.<br>• Access to the Dam to be restricted to specifically trained site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• If leak detected, flow to be isolated and contained. Water within the Process Water Dam to be pumped to either Raw Water Dam or the Tailings Storage Facility and the Dam repaired as soon as practical.<br>• Contaminated material to be excavated and manually placed within the Tailings Storage Facility. | D | 2 | T |
| | Fire | Scenario not relevant | | | | |
| | Theft / Sabotage | Scenario not relevant | | | | |

**Table A4.7**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Transport to the Project Site | Accident | Traffic accident resulting in spillage and possible pollution. | • Driver Code of Conduct implemented.<br>• Only designated transport route to be followed by driver.<br>• UN number and Dangerous Goods Class information for sodium cyanide clearly displayed on the Integrated Bulk Container (IBC).<br>• Material Safety Data Sheet (MSDS) and other relevant information on sodium cyanide from ChemAlert retained by driver and relevant Project Site personnel.<br>• Effective communication between driver and site personnel established.<br>• Transport Management Plan implemented.<br>• Emergency Management Plan for dealing with cyanide spill developed and implemented. The Plan will include the following.<br>– Advise emergency services of the spill.<br>– Isolate the spill area (if possible).<br>– Evacuate (or assist in evacuation) all persons within 1.3 km of the spill. | E | 4 | T |
| | Spill | Operator error/poor maintenance leading to leak or spill. | • MSDS and ChemAlert information retained by driver and Proponent's staff.<br>• Driver to have completed relevant training in emergency response or HAZMAT.<br>• Effective communication between driver and site personnel established.<br>• Transport Management Plan implemented.<br>• Emergency Management Plan for dealing with cyanide spill developed and implemented. The Plan will involve the following.<br>– Advise emergency services of the spill.<br>– Isolate the spill area (if possible).<br>– Evacuate (or assist in evacuation) all persons within 1.3 km of the spill. | D | 3 | T |

**Table A4.7 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Transport to the Project Site (cont'd) | Fire | Accident resulting in fire resulting in the generation of hydrogen cyanide (HCN) gas. | • MSDS and ChemAlert information retained by driver and relevant Project Site personnel.<br>• UN number and Dangerous Goods Class information for sodium cyanide clearly displayed on the IBC.<br>• Only designated transport route to be followed by driver.<br>• Driver to have completed relevant training in emergency response or HAZMAT.<br>• Effective communication between driver and site personnel established.<br>• Transport Management Plan implemented.<br>• Emergency Management Plan for dealing with fire developed and implemented. The Plan will include the following.<br>– Advise emergency services of the fire and toxic nature of sodium cyanide and HCN.<br>– Evacuate the area.<br>– Evacuate (or assist in evacuation) all persons within 1.3 km of the incident. | E | 4 | T |
| | Theft/ sabotage | Theft and malicious act/sabotage. | • Only designated transport route to be followed by driver.<br>• Breaks in journey strictly controlled and identified within Transport Management Plan. | E | 4 | T |
| Storage Facilities | Accident | Accident within the storage area | • All cyanide solution stored within adequately bunded and ventilated area.<br>• Bunding constructed to relevant construction standard.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT. | D | 3 | T |

**Table A4.6 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities (Cont'd) | Accident (Cont'd) | | • Hydrocarbon, Chemical and Reagent Management Plan implemented. | | | |
| | Spill | Inadequate maintenance and/or design resulting in spillage. | • Bunding constructed of impermeable material.<br>• Bunding constructed to relevant construction standard.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 3 | T |
| | | Inadequate maintenance and/or design resulting in spillage (cont'd). | • Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Advise emergency services of the spill.<br>– Evacuate the area.<br>– Evacuate (or assist in evacuation) all persons within 1.3 km of the spill. | E | 3 | T |
| | Fire | Fire resulting in the generation of hydrogen cyanide (HCN) gas. | • Appropriate design of storage locations, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT. | E | 4 | T |

**Table A4.7 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities (Cont'd) | Fire (Cont'd) | Fire resulting in the generation of hydrogen cyanide (HCN) gas. (Cont'd) | • Emergency Management Plan for dealing with fire developed and implemented. The Plan will include the following.<br>– Advise emergency services of the fire and toxic nature of sodium cyanide and HCN.<br>– Evacuate the area.<br>• Evacuate (or assist in evacuation) all persons within 1.3 km of the incident. | | | |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 3 | T |
| Ore Treatment and Processing | Accident | Accident within the Processing Plant area resulting in spillage of sodium cyanide solution. | • Restricted vehicle access to the Processing Plant area enforced.<br>• Processing Plant contained within a bunded area capable of retaining any spill.<br>• Maintenance and monitoring of containment capacities.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill.<br>– Consider evacuation of the site and communication with emergency services (on advice from senior site management and dependent on the nature of the material spilled). | E | 3 | T |

**Table A4.7 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore treatment and Processing (Cont'd) | Spill | Operator error or poor maintenance leading to leak or spill. | • Restricted vehicle access to the Processing Plant area enforced.<br>• Processing Plant contained within a bunded area capable of retaining any spill.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Processing Plant personnel provided with appropriate training.<br>• Regular inspections of the plant completed and any maintenance requirements reported and enacted.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill.<br>– Consider evacuation of the site and communication with emergency services (on advice from senior site management and dependent on the nature of the material spilled). | D | 3 | T |
| | Fire | Fire resulting in the generation of hydrogen cyanide (HCN) gas. | • Appropriate design of Processing Plant, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT. | E | 3 | T |

**Table A4.7 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore treatment and Processing (Cont'd) | Fire (Cont'd) | Fire resulting in the generation of hydrogen cyanide (HCN) gas. (Cont'd) | • Emergency Management Plan for dealing with fire developed and implemented. The Plan will include the following.<br>– Advise emergency services of the fire and toxic nature of sodium cyanide and HCN.<br>– Evacuate the area.<br>• Evacuate (or assist in evacuation) all persons within 1.3 km of the incident. | | | |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 3 | T |
| Tailings and Process Water Management | Accident/ Spill | Leak from or rupture of tailings pipeline. | • Tailings pipework placed within drainage channels to restrict dispersal of tailings in the event of a spill.<br>• Spill trays installed where pipeline crosses drainage feature.<br>• Environmental inspections and reporting completed regularly.<br>• Pumping ceased immediately on identification of leak.<br>• Pumping only to recommence following repair of leak.<br>• All tailings material excavated and manually placed within the Tailings Storage Facility. | C | 2 | T |
| | | Rupture of, or leak from the Tailings Storage Facility. | • Tailings Storage Facility constructed in accordance with NSW Dams Safety Committee requirements.<br>• Regular inspections of Tailings Storage Facility walls for structural integrity.<br>• Specific operating procedures to be implemented for the construction of each lift.<br>• Tailings Storage Facility lined with impermeable clay liner.<br>• Monitoring of shallow piezometers (lysimeters) to detect seepage or leakage from the Tailings Storage Facility. | E | 4 | T |

**Table A4.7 (Cont'd)**
**Hazard Assessment – Sodium Cyanide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Tailings and Process Water Management (Cont'd) | Accident/ Spill (Cont'd) | Rupture of, or leak from the Tailings Storage Facility. (Cont'd) | • Contingency strategy to be developed and implemented in the event seepage or leakage identified by monitoring. | | | |
| | | Overflow or leak from Process Water Dam. | • Dam designed with suitable freeboard to retain rainfall from storm events.<br>• Dam constructed with impermeable liner.<br>• Access to the Dam to be restricted to specifically trained site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• If leak detected, flow to be isolated and contained. Water within the Process Water Dam to be pumped to either Raw Water Dam or the Tailings Storage Facility and the Dam repaired as soon as practical.<br>• Contaminated material to be excavated and manually placed within the Tailings Storage Facility. | D | 3 | T |
| | Fire | Scenario not relevant | | | | |
| | Theft / Sabotage | Scenario not relevant | | | | |

**Table A4.8**
**Hazard Assessment – Lead Nitrate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities | Accident | Accident within the storage area | • Storage of material only in manufacturer's original packaging.<br>• Storage of material in an appropriately designed facility under cover and with adequate access for vehicles and personnel.<br>• Storage of appropriate spill-clean up and equipment and materials in the vicinity of the storage location.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 3 | T |
| | Spill | Inadequate maintenance and/or design resulting in spillage. | • Storage of material in an appropriately designed facility under cover and with adequate access for vehicles and personnel.<br>• Storage of appropriate spill-clean up and equipment and materials in the vicinity of the storage location.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area<br>– Advise senior site management of the spill. | D | 2 | T |

**Table A4.8 (Cont'd)**
**Hazard Assessment – Lead Nitrate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities (Cont'd) | Fire | Outbreak of fire in storage area | • Appropriate design of storage locations, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards. | E | 3 | T |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 2 | T |
| Ore Treatment and Processing | Accident | Accident within the Processing Plant area resulting in spillage | • Restricted vehicle access to the Processing Plant area enforced.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | E | 2 | T |
| | Spill | Operator error or poor maintenance leading to spill. | • Processing Plant contained within a bunded area capable of retaining any spill.<br>• Restricted vehicle access to the Processing Plant area enforced.<br>• Regular inspections of the plant completed and any maintenance requirements reported and enacted.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Processing Plant personnel provided with appropriate training.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 2 | T |

**Table A4.8 (Cont'd)**
**Hazard Assessment – Lead Nitrate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore Treatment and Processing (Cont'd) | Spill (Cont'd) | Operator error or poor maintenance leading to spill. (Cont'd) | • Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | | | |
| | Fire | Outbreak of fire in Processing Plant area | • Appropriate design of Processing Plant in accordance with relevant design standards, including limitation of ignition sources and appropriate installation of electrical equipment.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards. | D | 2 | T |
| | Theft / Sabotage | | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Project personnel onsite at all times during operations. | E | 2 | T |
| Tailings and Process Water Management | Accident/ Spill | Leak from or rupture of tailings pipeline. | • Tailings pipework placed within drainage channels to restrict dispersal of tailings in the event of a spill.<br>• Spill trays installed where pipeline crosses drainage feature(s).<br>• Environmental inspections and reporting completed regularly.<br>• Pumping ceased immediately on identification of leak.<br>• Pumping only to recommence following repair of leak.<br>• All tailings material excavated and manually placed within the Tailings Storage Facility. | D | 1 | T |

**Table A4.8 (Cont'd)**
**Hazard Assessment – Lead Nitrate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Tailings and Process Water Management (Cont'd) | Accident /Spill (Cont'd) | Rupture of, or leak from the tailings storage facility. | • Tailings Storage Facility constructed in accordance with NSW Dams Safety Committee requirements.<br>• Regular inspections of Tailings Storage Facility walls for structural integrity.<br>• Specific operating procedures to be implemented for the construction of each lift.<br>• Tailings Storage Facility lined with impermeable clay liner.<br>• Monitoring of shallow piezometers (lysimeters) to detect seepage or leakage from the Tailings Storage Facility.<br>• Contingency strategy to be developed and implemented in the event seepage or leakage identified by monitoring. | E | 3 | T |
| | | Overflow or leak from Process Water Dam. | • Dam designed with suitable freeboard to retain rainfall from storm events.<br>• Dam constructed with impermeable liner.<br>• Access to the Dam to be restricted to specifically trained site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• If leak detected, flow to be isolated and contained. Water within the Process Water Dam to be pumped to the Process Plant, Raw Water Dam or, if WAD Cyanide concentration is less than 10ppm, to the Tailings Storage Facility. The dam would be repaired as soon as practical.<br>• Contaminated material to be excavated and manually placed within the Tailings Storage Facility. | D | 2 | T |

**Table A4.8 (Cont'd)**
**Hazard Assessment – Lead Nitrate**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Tailings and Process Water Management (Cont'd) | Fire | Scenario not relevant | | | | |
| | Theft / Sabotage | Scenario not relevant | | | | |

**Table A4.9**
**Hazard Assessment – Hydrogen Peroxide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities | Accident | Accident within the storage area | • All hydrogen peroxide solution stored within adequately bunded and ventilated area.<br>• Bunding constructed to relevant construction standard.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented. | D | 2 | T |
| | Spill | Inadequate maintenance and/or design resulting in spillage. | • Bunding constructed of impermeable material.<br>• Bunding constructed to relevant construction standard.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Advise emergency services of the spill.<br>– Evacuate the area. | D | 2 | T |
| | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 2 | T |

**Table A4.9 (Cont'd)**
**Hazard Assessment – Hydrogen Peroxide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Storage Facilities (Cont'd) | Fire | Fire in storage area | • Appropriate design of storage locations, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with fire developed and implemented. | E | 2 | T |
| Ore Treatment and Processing | Accident | Accident within the Processing Plant area resulting in spillage of hydrogen peroxide solution. | • Restricted vehicle access to the Processing Plant area enforced.<br>• Processing Plant contained within a bunded area capable of retaining any spill.<br>• Maintenance and monitoring of containment capacities.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | E | 2 | T |

**Table A4.9 (Cont'd)**
**Hazard Assessment – Hydrogen Peroxide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore Treatment and Processing (Cont'd) | Spill | Operator error or poor maintenance leading to leak or spill. | • Restricted vehicle access to the Processing Plant area enforced.<br>• Processing Plant contained within a bunded area capable of retaining any spill.<br>• MSDS and ChemAlert information retained by site personnel.<br>• Processing Plant personnel provided with appropriate training.<br>• Regular inspections of the plant completed and any maintenance requirements reported and enacted.<br>• Hydrocarbon, Chemical and Reagent Management Plan implemented.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with spill developed and implemented. The Plan will include the following.<br>– Evacuate the area.<br>– Advise senior site management of the spill. | D | 2 | T |
| | Fire | Fire resulting in the generation of hydrogen cyanide (HCN) gas. | • Appropriate design of Processing Plant, including limitation of ignition sources and separate storage of flammable materials.<br>• Installation of appropriate fire management facilities, including sprinklers, extinguishers and fire hoses in accordance with relevant design standards.<br>• MSDS and ChemAlert information retained by Project Site personnel.<br>• Operational personnel to have completed relevant training in emergency response and/or HAZMAT.<br>• Emergency Management Plan for dealing with fire developed and implemented. The Plan will include the following.<br>– Advise emergency services of the fire and toxic nature of sodium cyanide and HCN.<br>– Evacuate the area. | E | 2 | T |

**Table A4.9 (Cont'd)**
**Hazard Assessment – Hydrogen Peroxide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Ore Treatment and Processing (Cont'd) | Theft / Sabotage | Theft and malicious act/sabotage. | • Access to the Project Site and Processing Plant area restricted by use of lockable gates.<br>• Storage facility to be fenced and locked. | E | 3 | T |
| Tailings and Process Water Management | Accident/ Spill | Leak from or rupture of tailings pipeline. | • Tailings pipework placed within drainage channels to restrict dispersal of tailings in the event of a spill.<br>• Spill trays installed where pipeline crosses drainage feature.<br>• Environmental inspections and reporting completed regularly.<br>• Pumping ceased immediately on identification of leak.<br>• Pumping only to recommence following repair of leak.<br>• All tailings material excavated and manually placed within the Tailings Storage Facility. | C | 2 | T |
| | | Rupture of, or leak from the Tailings Storage Facility . | • Tailings Storage Facility constructed in accordance with NSW Dams Safety Committee requirements.<br>• Regular inspections of Tailings Storage Facility walls for structural integrity.<br>• Specific operating procedures to be implemented for the construction of each lift.<br>• Tailings Storage Facility lined with impermeable clay liner..<br>• Monitoring of shallow piezometers (lysimeters) to detect seepage or leakage from the Tailings Storage Facility.<br>• Contingency strategy to be developed and implemented in the event seepage or leakage identified by monitoring. | E | 4 | T |

**Table A4.9 (Cont'd)**
**Hazard Assessment – Hydrogen Peroxide**



| Project Component | Incident Type | Scenario | Proposed Control / Treatment | Likelihood | Consequence | Risk |
|---|---|---|---|---|---|---|
| Tailings and Process Water Management (Cont'd) | Accident /Spill (Cont'd) | Overflow or leak from Process Water Dam. | • Dam designed with suitable freeboard to retain rainfall from storm events.<br>• Dam constructed with impermeable clay liner.<br>• Access to the Dam to be restricted to specifically trained site personnel.<br>• Environmental inspections and reporting completed regularly.<br>• If leak detected, flow to be isolated and contained. Water within the Process Water Dam to be pumped to the Process Plant, Raw Water Dam or, if WAD Cyanide concentration is less than 10ppm, to the Tailings Storage Facility. The dam would be repaired as soon as practical.<br>• Contaminated material to be excavated and manually placed within the Tailings Storage Facility. | D | 3 | T |
| | Fire | Scenario not relevant | | | | |
| | Theft / Sabotage | Scenario not relevant | | | | |

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