24.0 Hazard and Risk

24.1 EHS First

EHS First is Alcan's environment, health and safety management system. It aligns with the key elements of the ISO 14001 Standard for Environmental Management Systems as well as the OHSAS 18001 Standard for Occupational Health and Safety Assessment System. Alcan Gove's Environmental Management System is certified to ISO 14001. Alcan Gove plans to be certified to the OHSAS 18001 Standard during 2005.

EHS First provides the framework to manage Alcan Gove's environmental, health and safety risks by using a comprehensive risk management process in accordance with the requirements of the Australian/New Zealand Standard AS/NZS 4360: 1999 Risk Management. The overall risk management process as outlined in AS/NZS 4360 is summarised in Figure 24.1.1.

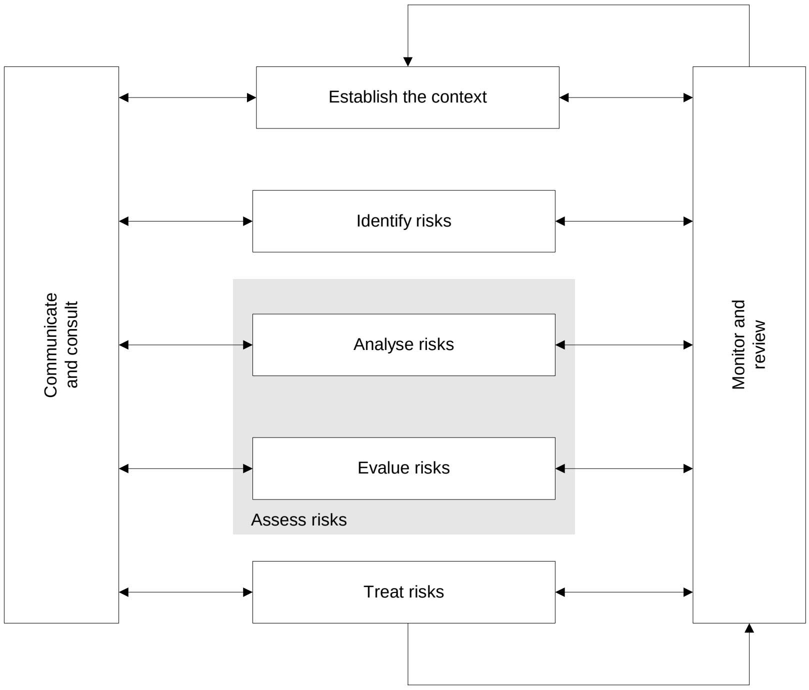

Figure 24.1.1
Risk Management Process

The following subsections provide an overview of the way in which Alcan Gove currently manages its risks. This approach will also be used to manage risks during the construction phase of the Third Stage Expansion and the subsequent operation of the expanded refinery.

24.1.1 Establish the Context

The context in which the risk management process applies is that of the Alcan Gove operations and its stakeholders. These stakeholders include the landowners, workforce, government, community groups, local residents, ecosystems, and the general environment as well as territory, national and international stakeholders.

24.1.2 Identify the Risks

Occupational health and safety hazards and environmental aspects relating to the existing operations and the Third Stage Expansion have been identified for each of the following activities:

- Design;
- Construction;
- Commissioning;
- Operation;
- Maintenance;
- Emergency situations;
- Shut down; and
- Closure.

Reviews are conducted for each of the above activities to identify all relevant occupational health and safety hazards and environmental aspects. Hazards/aspects are identified using the following processes:

- Review of current operations risk register;
- Input from process specialists;
- Review of prior incidents throughout the industry;
- Review of similar industries; and
- Formal hazard studies including HAZOPs (Hazard and Operability Studies), and CHAZOPs (Control Hazard & Operability Studies).

Occupational health and safety risks are identified for each occupational health and safety hazard, and environmental impacts are identified for each environmental aspect.

When site personnel identify a new activity, product or service, or they identify a new hazard or aspect, it is recorded in the Alcan Gove Global Risk Register and the risk is analysed.

24.1.3 Analyse the Risks

The risks are analysed by considering the likelihood of the event occurring and the associated consequences. The consequence is determined by considering what would happen if the existing controls that manage the hazard or aspect (eg. procedures, training, engineering controls, monitoring) have failed. The evaluation of risk is in accordance with AS/NZS 4360:1999.

24.1.4 Evaluate Risks

Each analysed risk is compared with the relevant criteria to determine whether or not it can be considered as being acceptable or not. Risks are then ranked to identify priorities for their treatment and/or management.

24.1.5 Treat Risks

Risks that are not acceptable must be controlled in accordance with the following hierarchy of control.

- Elimination of the risk;
- Substitution for a situation of lower risk;
- Engineering control;
- Administration controls; and
- Personal protective equipment.

Where it is deemed that there are inadequate controls in place, additional controls are developed. Such controls may include:

- Equipment (eg. bunded area, sump pump, baghouse);
- Process or maintenance procedures (eg. standard task instructions, signs, area procedure manuals);
- Monitoring and measurements procedures (eg. inspections, alarm);
- Emergency response procedures; and
- Training.

The existing risk register and risk management program will be extended to include all components of the expanded refinery. In this way the risks from the expanded refinery will be managed in the same proven manner that has been successfully applied to the existing operations.

24.1.6 Communicate and Consult

Communication and consultation involve dialogue with key stakeholders about risks and associated controls.

At Alcan Gove this process occurs through a range of processes that include the community consultative committees, site EHS committees, public reporting, and through the consultation process established for the EIS.

24.1.7 Monitor and Review

The final task in the process is to monitor and review the risks, the performance of the risk management system, and any changes that may affect the risks and the management system. Where the monitoring and review process identifies an inadequacy or non-conformance, the risk management process is repeated and corrective actions implemented.

24.2 Assessment of Off-Site Safety Risk

24.2.1 Introduction

The refinery is situated in a relatively safe location, being on a peninsula and bounded on three sides by the ocean. The nearest residential area is Galupa, which is near the southern plant boundary, but is well separated from hazardous process areas. Nevertheless, a quantitative risk assessment of the expanded refinery has been undertaken to ensure that all potential off-site safety risks are understood and managed.

A quantitative safety risk assessment has been undertaken by Marsh Pty Ltd, an international risk management consultancy. A full copy of their report is given in Appendix I. Its scope was to assess any risks from the expanded refinery that could lead to a fatality beyond the refinery boundary during its ongoing operations. The areas considered were:

- Mine and borefields;
- Residue disposal area;
- Refinery/wharf/power station/harbour tank farm; and
- Overland conveyor.

The study methodology involved first identifying all of the scenarios associated with the operations that could result in an impact outside the boundary fence. Once these scenarios were identified, the consequences of each scenario were assessed to determine if, should the scenario occur, it could result in a fatality of any person at on off-site facility. For those scenarios with the potential for off-site impacts, the likelihood of that scenario occurring was then estimated to determine the probability of a fatality. The predicted probability of the risks occurring were then compared against the relevant criteria to determine whether or not they are acceptable.

24.2.2 Hazard Identification

The first step in the risk assessment was to identify all of the various hazards associated with the operation that could potentially result in an off-site injury or fatality. This was undertaken in a workshop attended by relevant design and site engineers familiar with the refinery's existing operations and the proposed expansion. The following scenarios were identified for boundary consequence and risk analysis during the workshop.

- Scenario 1 – Chlorine Release from Water Treatment (near the mine)
- Scenario 2 – Low Temperature Digester Overpressure
- Scenario 3 – Low Temperature Digestion Flash Vessel Overpressure
- Scenario 4 – Low Temperature Digestion Flash Vessel Explosion
- Scenario 5 – Low Temperature Digestion Boiling Caustic Cloud Release
- Scenario 6 – High Temperature Digester Overpressure
- Scenario 7 – High Temperature Digestion Flash Vessel Overpressure
- Scenario 8 – High Temperature Digestion Flash Tank Explosion
- Scenario 9 – Structural Failure of Thickener/Washer
- Scenario 10 – Liquor Purification Kiln Explosion
- Scenario 11 – Hydrate Filtration Tank Failure
- Scenario 12 – Precipitator Vessel failure
- Scenario 13 – Calcination Kiln Explosion
- Scenario 14 – Boiler Explosion (Fuel Side)
- Scenario 15 – Boiler Explosion (Steam Side)
- Scenario 16 – Condensate Receiver Overpressure

- Scenario 17 – Unconfined Vapour Cloud Explosion (Gate Station)
- Scenario 18 – Pipeline Jet Fire at Gate Station
- Scenario 19 – Jet A1 or Petrol Tank Explosion
- Scenario 20 – Light Fuel Tank Farm Fire
- Scenario 21 – Bunker Oil Fire

A detailed investigation of each of the above potential boundary hazard scenarios is provided in Appendix I.

24.2.3 Consequence Analysis

24.2.3.1 Consequence Models

The consequences of each of the scenarios identified above were assessed using a number of relevant computer based models.

In most cases, a computer based modelling program called ARCHIE was used. Automated Resource for Chemical Hazard Incident Evaluation (ARCHIE) has been approved for distribution by the US Federal Emergency Management Agency, the U. S. Department of Transportation, and the US Environmental Protection Agency.

ARCHIE will generally overestimate potential threats to communities, but in occasional cases underestimations are possible. For this reason, where possible, two methods were used to model a single scenario of each type. For example, the results provided by ARCHIE for vessel overpressure explosions were tested for accuracy using the TNT equivalent method described in Lees (1991). The method which provided the most conservative consequence estimate was then adopted for the remainder of similar scenarios.

24.2.3.2 Consequence Criteria

The consequences of the identified scenarios are radiated heat flux from fires, toxic gas concentrations from a chlorine leak, or incident overpressure from explosions.

For heat flux from fires, the injury zone is defined as the distance from the source at which a 40 second exposure could lead to second degree burns. The radiated heat flux at this point is 5 kW/m2. The fatality zone represents the 10 kW/m2 boundary and is the threshold for fatality.

The concentration for chlorine that is likely to cause minor irritation is 3 ppm (parts per million). The threshold concentration for fatalities caused by chlorine is 20 ppm.

The consequences for incident overpressure from explosions are summarised in Table 24.2.1.

Table 24.2.1
Incident Overpressure Effects

Incident Overpressure	Damage
2 kPa	Missile limit; 10% window glass broken
3.5 kPa	Large and small windows usually shattered; occasional damage to window frames
7 kPa	Partial demolition of houses, made uninhabitable; residential housing limit
14 kPa	Partial collapse of walls and roofs of houses
35 kPa	Wooden utility poles snapped; nearly complete destruction of houses; 20-25% chance of fatality for people inside buildings
70 kPa	Total destruction of buildings; 30% chance of eardrum rupture for person in open; <1% chance of fatality for persons in open

Sources: Lees (1996), Emergency Plans – Guidelines for Major Hazard Facilities (1996)

24.2.3.3 Consequence Analysis Results

The results of the consequence analysis of each scenario are detailed in Appendix I and are summarised in Table 24.2.2. This table summaries the maximum distance from the source where the identified consequence will impact.

Table 24.2.2
Consequence Analysis Summary

Scenario	Consequence	Maximum Distance from Source at which the Consequence Occurs (m)
1 – Chlorine Release	Toxicity Limit	4800
	Fatality Threshold	1700
2 – LT Digester Overpressure	7kPa Incident Overpressure	386
	35kPa Incident Overpressure	134
	70kPa Incident Overpressure	75
3 – LT Digestion Flash Vessel Overpressure	7kPa Incident Overpressure	292
	35kPa Incident Overpressure	101
	70kPa Incident Overpressure	57
4 – LT Digestion Flash Vessel Explosion	7kPa Incident Overpressure	141
	35kPa Incident Overpressure	47
	70kPa Incident Overpressure	33
6 – HT Digester Overpressure	7kPa Incident Overpressure	299
	35kPa Incident Overpressure	101
	70kPa Incident Overpressure	67
7 – HT Digestion Flash Vessel Overpressure	7kPa Incident Overpressure	384
	35kPa Incident Overpressure	134
	70kPa Incident Overpressure	74
13 – Calcination ESP Explosion	7kPa Incident Overpressure	292
	35kPa Incident Overpressure	98
	70kPa Incident Overpressure	66

Scenario	Consequence	Maximum Distance from Source at which the Consequence Occurs (m)
14 – Boiler Fuel Side Explosion	7kPa Incident Overpressure	186
	35kPa Incident Overpressure	63
	70kPa Incident Overpressure	43
15 – Boiler Steam Side Explosion	7kPa Incident Overpressure	336
	35kPa Incident Overpressure	117
	70kPa Incident Overpressure	65
16 – Condensate Receiver Overpressure	7kPa Incident Overpressure	78
	35kPa Incident Overpressure	27
	70kPa Incident Overpressure	15
17 – Natural Gas Vapour Cloud Explosion	7kPa Incident Overpressure	1830
	35kPa Incident Overpressure	614
	70kPa Incident Overpressure	416
19 – Diesel Tank Explosion	7kPa Incident Overpressure	152
	35kPa Incident Overpressure	51
	70kPa Incident Overpressure	35
20 – Light Fuel Tank Farm Fire	Injury Zone	144
	Fatality Zone	100
21 – Bunker Oil Tank Explosion	7kPa Incident Overpressure	234
	35kPa Incident Overpressure	79
	70kPa Incident Overpressure	53

For the following scenarios some of their specified consequences could occur under certain circumstances at off-site facilities:

- Scenario 1 - this relates to the chlorine tank at the water supply borefield which is located within 1 km of the Gove airport. The airport is within both the irritation and fatality limits for this scenario.
- Scenario 17 - this relates to a gas explosion at the gate station should gas be delivered to the refinery. It is located approximately 850 m from Galupa which would be within the residential housing limit of 7 kPa incident overpressure. This can result in the partial demolition of houses.

All of the other scenarios will not significantly affect off-site facilities or people.

Although these potential consequences have been identified, the actual risk of these hazards is determined by a combination of the consequence and likelihood (Section 24.2.4). It is this overall risk that is compared to the acceptance criteria.

24.2.4 Likelihood Analysis

The two scenarios (1 and 17) that were shown by modelling to be potentially hazardous off-site were further investigated to estimate the likelihood of these scenarios eventuating and causing harm. This was done using documented failure frequency and likelihood estimations. The methodologies that were utilised are detailed in Appendix I.

Detailed likelihood estimations were only conducted if the hazardous scenarios could potentially affect off-site facilities. This is due to the fact that the exposure timeframe for people on the surrounding beaches or bushland is considered to be low.

The likelihood of missiles due to explosions was not quantified, as the density of permanent dwellings within the potential missile range is low. This means that the likelihood of a person occupying the space in which a small missile may land at a given time is very low. Permanent residential areas (Galupa) account for less than 0.7% of the land area within a 1 km radius of the centre of the process area, and less than 0.2% within 2 km.

24.2.4.1 Scenario 1 Likelihood

For people at the airport to be affected by a chlorine release, the conditions listed in Table 24.2.3 below must all combine concurrently, ie the worst case conditions must be met.

Table 24.2.3
Worst Case Scenario Conditions and Estimated Likelihood

Condition	Likelihood Estimate	Basis of Estimate
Sudden and total release	$1x10^{-5}$/yr	UK HSE (2003) Based on highest frequency of either vessel of pipe rupture.
Stability Class F	~50%	Needs to be low wind conditions and at night (ARCHIE).
Wind in right direction	~50%	The prevailing wind conditions are highly seasonal.

The product of these likelihood estimates is $2.5x10^{-6}$/yr.

In the absence of any more relevant guidelines, criteria from the NSW Dept of Planning (1997) are often used in risk assessments. These criteria recommend that the frequency of toxic concentrations which may cause significant injury to sensitive members of the public should not exceed $1x10^{-5}$/yr in residential areas. From the above likelihood estimate it can be seen that according to these criteria, the risk associated with this scenario is acceptable.

The NSW Dept of Planning (1997) also suggests that the individual risk of fatality at a residential development should not exceed $1x10^{-6}$/yr. If it is assumed that 10% of people may be fatally affected by an exposure to 20 ppm, then the risk of fatality at the airport is $2.5x10^{-7}$/yr and is therefore within the NSW guidelines. This assumption is conservative considering that 20 ppm is the threshold for fatality (Guidelines for Major Hazard Facilities, 1996).

Because the risk assessment process has identified this issue, Alcan Gove is currently replacing the chlorine gas system with solid chlorine pellets which will control the risk.

24.2.4.2 Scenario 17 Likelihood

While Scenario 17 has the potential to cause an incident overpressure of 7 kPa (the residential housing criteria – Table 24.2.1) at the settlement at Galupa, the likelihood is extremely remote. As discussed in Appendix I, for this to occur it would be necessary for a full rupture of the gas pipeline and for the vapour cloud to ignite. The likelihood of these two events occurring is approximately $2.63x10^{-6}$. The NSW Department of Planning (1997) recommends that the frequency of incident overpressures in excess of 7 kPa occurring in residential areas should not exceed $5x10^{-5}$/yr. Hence the risk at Galupa is within the recommended criteria.

The NSW Department of Planning (1997) also suggests that the individual risk of fatality at a residential development should not exceed $1x10^{-6}$. If it is assumed that 20% (NSW DOP, 1997) of people inside buildings may be fatally injured by an incident overpressure of 21 kPa (ie. the approximate overpressure contour at Galupa) and that the wind is blowing from the north towards Galupa (50% probability) then the risk of fatality at Galupa can be estimated at $2.63x10^{-7}$. This is within the NSW Department of Planning guideline.

24.2.5 Safety Risk Summary

The quantitative safety risk assessment has shown that there are no unacceptable off-site risks to life. This has been based on consideration of the effects of explosion, heat flux, projectiles and toxic gases released from all potentially significant emergency scenarios. The assessment has determined that the proposed separation distances and risk management strategies will ensure that there will be no significant off-site risks associated with the expanded refinery. The analysis has shown that the risks to local residents and members of the public fall within acceptable levels (NSW Department of Planning, 1997).

While the risk to life is acceptable, it is recognised that there could be other impacts should any of the above scenarios occur, and these would be dealt with under the site's emergency response program (Section 24.4).

24.3 Health & Safety

24.3.1 Management System

During both the construction and operation of the extended refinery, Alcan Gove will operate in accordance with the requirements of the NT Mining Management Act. The construction and operation of the facility will also operate within the requirements of Alcan's EHS Management System.

The Alcan Environment, Health and Safety (EHS) Management System, EHS First aligns with the key elements of the ISO 14001 Standard for Environmental Management Systems as well as the OHSAS 18001 Safety Systems Standard.

The key site-wide health and safety procedures in the Alcan Gove EHS Management System include the following:

- Loss prevention – general;
- Electrical hazards;
- Working at heights;
- Vehicles and mobile equipment;
- Access and work permits;
- Hazardous substances;
- Explosive power tools;
- Health protection and management;
- Fitness for work;
- Fire hazard management; and
- Managing change.

A key safety procedure that is implemented is the clearance certificate procedure. A Standard Clearance Certificate is required before any of the following works can take place within the refinery:

- Any electrical, mechanical or instrument maintenance on items of plant or equipment;
- Any work on plant or equipment requiring isolation;
- Any work involving confined space entry; and
- For any other work where special risks or hazards exist.

A series of danger tags is used to identify equipment associated with maintenance, access and shutdown activities. In addition, a Confined Space Entry Board and Procedure provides a mechanism for the control of the preparation, monitoring and maintenance of safe conditions in a confined space for the duration personnel are required to occupy that space.

The existing health and safety procedures and controls will be extended to incorporate all relevant aspects of the expanded refinery.

For the construction stage of the Third Stage Expansion, contractors will be required to prepare an EHS Management Plan in accordance with the requirements of the Alcan EHS First and the site's EHS system. The EHS Management Plan will be required to include the following types of information:

- Environment, Health and Safety Policy;
- Environment, Health and Safety Performance Indicators;
- Hazard Identification and Risk Assessment Procedures including a risk register;
- Environment, Health and Safety Procedures which address the environmental aspects and occupational health & safety hazards identified during the risk assessment;
- Responsibilities and accountabilities for environment, health and safety;
- Waste Management Program;
- Emergency response procedures; and
- Monitoring systems to ensure compliance with the determined control measures.

In this way the environment, health and safety aspects of the construction phase can be controlled and managed in accordance with the existing construction management procedures.

24.3.2 Workplace Hazards

The key workplace hazards at Alcan Gove and associated with the refinery expansion include:

- Noise;
- Caustic Soda (Sodium Hydroxide);
- Sulfuric Acid;
- Dust;
- Lime; and
- Heat.

The management strategies that will be applied to control these hazards are described below.

24.3.2.1 Noise

The refinery expansion will be designed to ensure that noise levels in the general workplace are as low as possible through good engineering design. In some instances, due to the nature of the equipment required in some unit operations, the noise levels adjacent to such equipment may exceed 85 dB(A). Where such circumstances exist, measures will be taken where possible to minimise exposure of refinery personnel to the prescribed noise level of 85Leq.8 dB(A) to the source of the noise by erecting sound attenuation structures such that the noise is contained and not allowed to invade surrounding operating areas.

In some circumstances it is not practical to contain noise. In such circumstances, the extremities of operating areas containing equipment items producing excessive noise will be signposted (in accordance with Australian Standard AS 1319) to notify personnel entering the area that appropriate hearing protection is required. All personnel will be provided with hearing protection that conforms with Australian Standard AS 1270 and management systems are in place to ensure that plant personnel conform with hearing protection requirements.

24.3.2.2 Caustic Soda

In an alumina refinery, the most prevalent hazard to personnel is caustic soda (sodium hydroxide). Caustic soda is a hazard to personnel mainly due to its ability to chemically attack human skin and tissue. It is at its most hazardous when in refinery solutions that are hot. In such circumstances, the combined action of the heat and the caustic soda can cause severe burning on contact with skin and tissue. Of particular concern is contact with eye tissue as caustic soda solutions can cause severe damage to eye tissue on contact often resulting in blindness.

The key to prevention of eye injuries and in particular those injuries caused by contact with caustic soda is the use of chemical monogoggles. All operational areas within the expanded refinery will be mandatory monogoggle and personal protection equipment (PPE) areas. All personnel (including visitors) in these area will be required to wear appropriate PPE at all times.

Through good process engineering design, the refinery has eliminated many sources of potential contact between refinery caustic liquors and operating personnel. Engineering design has ensured that loss of containment from vessels and pipes is as far as practicable eliminated so as to minimise the possibility of personnel being exposed to contact with liquor from spills and housekeeping operations carried out in elevated workplaces. These same design principles will be applied to the Third Stage Expansion.

Exposure of other areas of the body to caustic will be minimised during all routine operating tasks by the mandatory wearing of protective safety equipment. Such mandatory equipment includes long pants/shirt or coveralls, caustic resistant and waterproof protective safety footwear, and chemical resistant PVC gloves.

24.3.2.3 Sulfuric Acid

Sulfuric acid is used in the refinery for chemical cleaning of heat transfer surfaces. In general, these solutions are completely contained in pressure rated equipment. Sulfuric acid is a hazardous and corrosive substance and will be handled and stored in accordance with the requirements of AS 3780: 1994.

Sulfuric acid in its concentrated form is toxic and irritating and corrosive to tissue. Contact will result in rapid destruction of tissue. Even relatively short contact with tissue will inevitably result in severe chemical burns.

Specialised personnel protective equipment are mandatory when handling sulfuric acid and shall include chemical resistant PVC gloves and suits, full face shields for facial protection and acid resistant footwear.

24.3.2.4 Dust

Operations within the refinery include the handling of bulk materials including bauxite, bauxite residue, lime and alumina.

Alumina dust is typically regarded as a non-fibrogenic nuisance type dust. Alumina dust will be significantly reduced from the expanded refinery and the general environment through good engineering design using the latest dust control technology. All pneumatic alumina conveying systems in the refinery will be equipped with dust collectors to recover dust from transport air prior to discharge of that air to the environment.

Bauxite is typically transported and handled with significant moisture content and can be considered low dusting. Dust controls along the bauxite conveyor systems ensure the bauxite is not a health and safety problem.

The refinery has a commitment to workplace housekeeping and will apply these principles to the expanded refinery. This will ensure that spillage of solid materials capable of generating airborne dust will be promptly and systematically removed to minimise the probability of dust generation from such sources.

24.3.2.5 Lime

Lime is used in the alumina refining process. It is generally used as a milk of lime slurry. As is the case with caustic liquors, heat exacerbates the danger that lime slurries pose to human skin and tissue. As a consequence, lime slurry will be handled in much the same manner as the caustic soda solutions described above with particular emphasis on appropriate personnel protective equipment.

Lime slurry also presents a major hazard on contact with the eyes (as does caustic soda). The refinery’s commitment to the policy of mandatory wearing of chemical monogoggles in all refinery operating areas prevent the possibility of lime slurry related eye injuries.

Lime dust has the potential to cause damage to eyes and be a respiratory irritant. It can cause damage to eye tissue if it is allowed to enter the eyes. Sound engineering practice will ensure that proper dust collection facilities are installed to control lime dust from conveyors and handling systems. Lime handling equipment will be engineered so as to minimise spillage and the resulting possibility of contact between personnel and quick lime.

24.3.2.6 Heat

The alumina refining process handles and contains many fluids and solids at elevated temperatures. Through careful engineering design supported by detailed hazard and operability studies, potential hazards to employees through contact with hot substances and surfaces will be identified.

Having identified such hazards, the workforce shall be protected from exposure through the use of appropriate personnel protection (insulation, barriers etc) and other engineering practices.

24.3.2.7 Personal Protective Equipment

Personal protective equipment is provided to all employees and is required to be worn within all designated areas of the refinery. The basic equipment includes:

- Safety helmet;

- Safety helmet with face shield and safety glasses or monogoggles;
- Safety glasses with fixed side shields;
- Safety footwear; and
- Standard Class 1 safety clothing.

The requirements for personal protective equipment at the existing refinery will be extended to apply to all areas of the expanded refinery.

24.4 Emergency Management

24.4.1 Emergency Management Manual

An Emergency Management Manual has been prepared for the Alcan Gove operations. This manual documents the response systems that will be implemented in the event of an emergency at the site.

During emergency situations, the manual indicates that emergency responses will be prioritised as follows:

- To preserve life and ensure the safety of personnel;
- To minimise impacts on the environment;
- To minimise impacts on process, property and assets; and
- To minimise impacts on business and company image.

24.4.2 Emergency Procedures Manual

The Emergency Procedures Manual, which is part of the Emergency Response Manual, outlines the procedures to be followed in the event of an emergency. It includes:

- The process for implementation of the Emergency Management System, including:
  - Identification of responsibilities
  - Training
  - Pre-emergency response and recovery planning incorporating risk management contingency planning
  - Full analysis of emergencies
  - Audits and equipment inspections
  - Management support
- The context of the Emergency Management System in relation to Alcan Gove's Environment Health and Safety Systems and includes key emergency management procedures, as follows:
  - Incident Management - initial response and notification
  - Evacuation
  - Emergency Response – resources
  - Crisis Management - response and recovery

In addition to the Emergency Procedures Manual, Alcan Gove has:

- An Oil Spill Contingency Plan (“Goveplan”) which details the specific planning, training and response requirements for oil spill management.
- Standard Task Instructions, Procedures and Standards for specific tasks and activities for the prevention and management of emergencies at the operational level. These can be found in the relevant Operations Manuals throughout the site.
- Induction Procedures. Induction is undertaken for all personnel in each specific work area to ensure that they are aware of their responsibilities in an emergency.

24.4.3 Emergency Response Team

An Emergency Response Team has been established at the refinery to ensure that adequately trained and equipped personnel are readily available in the event of an emergency. The team consists of volunteers from each production shift plus the on-duty Essential Services Officers. In total there are four teams of eight to ten people each. In this way there is always a team of at least six people plus an Essential Service Officer on site at all times.

Each team trains for eight hours once per month. Training covers the following aspects:

- Fire fighting;
- Hazardous chemical incidents;
- Rope rescue for height and depth situations;
- Breathing apparatus and search and rescue in smoke;
- Confined space rescue;
- First aid; and
- Road accident rescue.

24.4.4 Emergency Response Plans

A number of Emergency Response Plans have been prepared for the site to guide those responding to a variety of potential emergency situations. The plans that have already been developed are discussed below. Further plans are currently being prepared. All plans are applicable to current operations and are regularly reviewed to ensure they meet the needs determined by risk evaluation. These reviews include reviews which will be carried out to meet the needs of the Third Stage Expansion.

24.4.4.1 Cyclone Emergency Response Plan

The plan for response to cyclone emergencies includes immediate actions such as the notification of the cyclone (Stage 1) and the cyclone warning (Stage 2). Once the cyclone has reached Stage 3A to 3B where all non-essential personnel are to be evacuated, the emergency response moves into the assessment stage. A nominated assessment team is deployed when wind speeds are less than 40 knots and they are responsible for establishing casualty status, reporting environmental damage, surveying power and utilities status, and damage to facilities or buildings. Tactical planning is then initiated with team briefings and preparation of contingency arrangements. These arrangements include undertaking casualty care, implementing environmental impact controls, restoring utilities, roads and communications, and determining community status/support. Recovery operations are also instigated, as appropriate, including the provision of welfare support, initiating clean-up and replenishing material stocks.

24.4.4.2 Oil Spill Emergency Response Plan

The plan for oil spill emergency responses includes reporting of the oil spill to personnel at the gatehouse who deploys the shift supervisor to attempt to isolate the spill at the source. The Gove oil spill plan is then initiated. The oil spill is assessed to identify the type of oil, location of the spill source, the quantity of oil and the safety, environment and community impact. Tactical planning is undertaken to outline a plan for spill containment/control including decontamination zones, for recovery of spill material and contaminated materials, for waste management, and for community communications and media management. The oil spill emergency is then responded to with tactical plans implemented. Recovery operations are instigated including the provision of welfare support, repair of facilities, and replenishment of oil and other resources.

24.4.4.3 Fire/Explosion Emergency Response Plan

The plan for emergency response to a fire or explosion includes immediate actions of raising alarms, activating radio callouts, and taking life saving actions. An assessment is made of the situation including the environmental impact assessment and evaluation of roads and access to the site. Tactical planning is then instigated to outline a containment plan, outline a plan for casualties, prepare a perimeter control plan, and undertake a survey for environmental effects from the emergency. The emergency is then responded to for issues including fire management and containment, rescue, casualty management, and environmental impact actions. Recovery operations are then instigated including the restoration of essential services to the site or town, provision of welfare, reconstruction/clean up and replenishment of material stocks.

24.4.4.4 Major Chemical Release Emergency Response Plan

The plan for response to major chemical releases includes the reporting of the incident to personnel at the gatehouse with the emergency area isolated and evacuated if required. The emergency is assessed for casualties, material loss, quantity, drainage, safety of the workforce and response team, potential environmental impacts, resource requirements and availability for response. Tactical planning and response is undertaken including the isolation of the sources of the spill, recovery at the source, and clean up. Recovery for the emergency is actioned by clean up and disposal, repairing facilities and ecological monitoring.

24.4.4.5 Stormwater Flooding Emergency Response Plan

The plan for response to a stormwater flooding event includes immediate actions of providing a weather monitoring alert, monitoring of flood/pond levels, and monitoring of road access. The emergency is then assessed for electrical, process, environmental impact (including overflows of mud, caustic, sewage and oil) and access. Tactical planning is instigated to develop plans for the management of impacts identified through the assessment process. The emergency is then responded to by a number of possible mechanisms including the activation of power outs, oil spill emergency response, instigating access restrictions, and monitoring road conditions. The emergency response then goes into recovery mode where clean up is undertaken with water damaged units replaced or repaired.

24.4.4.6 Residue Disposal Area Pond Wall Failure Emergency Response Plan

The plan for response to a RDA pond wall failure includes immediate actions of declaring that a critical trigger point has been reached, activation of an emergency action plan, notification of the Northern Territory Government, and evacuation of non essential personnel. The emergency is then assessed to identify the type of distress, implement monitoring of the distress, identify resources available to prevent or mitigate effects, and check communications with relevant emergency services. Tactical planning is instigated including the development of a plan for community communications, media management and traffic/public access. The emergency is responded to by actioning environmental impact controls, implementing mitigation works to stabilise embankments, and implementing plant shutdown or redirection of residue flow. Recovery for the emergency is actioned by clean up and disposal, repairing facilities and environmental monitoring.

24.4.4.7 Light Fuel Tank Farm Release Emergency Response Plan

The plan for response to a light fuel tank farm release includes isolation of the leak if safe, activation of emergency response team, and implementation of the oil spill response plan. The emergency is assessed to determine wind direction, product type, exposure and environmental impact (taking into account the nature of the spill and proximity to sensitive environments). Tactical planning is instigated including requirements for fire management, fuel restrictions, community information, traffic control planning, and media management. The emergency is responded to by rescue and evacuation, containment, extinguishment, and statutory notifications. Recovery for the emergency is actioned by spill recovery/disposal, activation of fuel restrictions, initiating repairs, health monitoring, and conducting environmental surveys.

24.4.4.8 Total Power Outage

The plan for response to a total power outage is to first check that the diesel generators are running and the emergency power is available. An assessment will then be made of the cause of the outage and how long it will take to restore full power. The tactical planning and response to the emergency will depend on the result of that assessment. Recovery from the situation will involve pre-start tests and drills and then re-establishment of power supplies from the power station.

24.4.4.9 External Transport Incident – Owned Goods (Land or Sea)

Maritime incidents could include the loss of caustic soda, fuel oil or other dangerous goods. Road incidents could include acids or other dangerous goods. In both instances, the transport agent has prime response responsibility, but Alcan Gove may/will also respond. The immediate response will be to record and report the details of the incident and to assess the potential for loss of life, environmental impact, contamination and extent of damage. Based on that assessment, the response could include contact with State/Territory emergency services organisations, activating relevant response plans for oil or chemical spills, and conducting appropriate recovery strategies including environmental clean up and monitoring. Close out activities will include debriefing and incident reporting, and a review of training and resource needs.

24.4.5 Emergency Services

Emergency services available for the general community are discussed below.

24.4.5.1 Ambulance Services

The area has three ambulance stations operated by St Johns Ambulance to provide emergency response. The stations are located at the mine, the refinery and in Nhulunbuy. There are 10 volunteer staff members. They maintain a training regime and provide external training courses to local groups including first aid and other safety courses or seminars at the local primary schools including bicycle safety and road safety awareness.

For any major incident, additional ambulance support would be provided from Darwin.

24.4.5.2 Fire Brigade Services

Nhulunbuy has one fire station which is provided by the Northern Territory Government. It has two full time officers and one auxiliary officer.

24.4.5.3 Police Services

The Nhulunbuy Police Station is the closest police facility to the refinery and provides services to Nhulunbuy and support to Yirrkala, Ski Beach and Galupa. The station has 17 police and is staffed from 8 am until midnight daily, with 2 officers on–call for the period the station is unmanned.

24.4.5.4 Natural Disaster Management

Emergency disaster and response is provided by a Disaster Management Committee which has 20 members representing major organisations in the Nhulunbuy area including Alcan Gove, YBE, Nhulunbuy Corporation and NT Government agencies. The committee has a Counter Disaster Plan in place to deal with any form of natural disaster. The local controller for the district has the ability to call on resources outside the district to provide additional support if required.

Other emergency services support is provided from Laynhapuy Homelands which operates a fully equipped first phase emergency response helicopter including an EPIRB, UHF/VHF radio and six-person launch.