

Section 8 Risk Assessment Approach



8. Risk Assessment Approach

8.1 Introduction

This section presents the methodology and results of the formal, semi-quantitative environmental risk assessment undertaken for TTP. The environmental risk assessment presented in this section should be read in conjunction with the description of impacts and the preventative and management measures employed in the project as presented in **Section 9**.

Some aspects assessed in the Draft EIS have been excluded from the formal risk assessment. Atmospheric emissions and specifically greenhouse gases were excluded due to their global scales of impact. Such global scale hazards cannot be effectively assessed using the same methodology as the local or regional environmental impacts of the project.

Furthermore, social, economic and land use impacts have also been excluded from this risk assessment, as they cannot be accurately assessed in a semi-quantitative manner. Measurement of social impacts can be highly subjective, representing a ‘snap-shot’ of views and opinions that vary through time. These impacts are better identified and assessed through formal consultation with affected communities over longer durations than would normally be applied to the risk assessment of environmental impacts. The Social Impact Assessment is presented in **Section 11** and the land use impacts are addressed in **Section 10**.

It should be recognised that a formal risk assessment of environmental issues is only one tool employed to identify and rank the key environmental impacts of the TTP. The value of the risk assessment is as a high-level screening tool, to identify the impacts and prioritise actions to minimise them. The results of the risk assessment should not be interpreted in isolation from the broader environmental assessment process described within this Draft EIS.

8.2 Risk Assessment Methodology

Environmental risk assessment is a process that evaluates the likelihood and consequences of an adverse environmental effect occurring as a result of exposure to one or more hazards. The TTP has developed a risk assessment methodology, broadly based on the Australian and New Zealand Standards Risk Management principles and processes (AS/NZ 4360:1999 and AS/NZ HB 203:2000).

The main elements of the environmental risk assessment process comprise:

- establishing the context;
- identifying the potential environmental hazards and pathways for exposure;
- assessing the potential environmental impact of the hazard, the resulting environmental consequences and the likelihood that the hazard would occur;
- identifying preventative and management measures;
- recovery.

8.2.1 Context

The environmental risk assessment covers all identified potential environmental effects associated with the design, construction, operation and decommissioning of the pipeline and associated facilities during routine and non-routine conditions. Appropriate preventative and management measures are identified, where necessary, that will manage all identified potential significant environmental impacts.

8.2.2 Hazard Identification

A 'hazard' is defined as a substance or situation that is a source of potential harm. A hazard does not result in harm unless an 'event' occurs, allowing sensitive receptors to be exposed to the hazard. The 'Hazard Identification' process is conducted to firstly identify all those substances or situations that represent a hazard, and secondly, to identify the events that may lead to these hazards being realised. An integral part of this process is to identify preventative measures to prevent hazards from eventuating and management measures to minimise the harm caused if they were to occur.

Alcan undertakes a hazard identification process for all projects and activities. For TTP HAZID (Hazard Identification) workshops were conducted in November 2003 and June 2004, and finally in September 2004, involving a multi-disciplinary team with a wide range of expertise, appropriate knowledge of the project and experience with the potential hazards of similar projects (Woodside 2003c). These workshops also involved a multi-disciplinary team of stakeholders including the NLC and government representatives. Internal workshops to identify the main Environmental Hazards were also conducted as required. The output from the various workshops was used to generate a risk register covering the main hazards resulting from the TTP. Potential risks to human health, damage to the environment, Alcan's assets or reputation were considered. Each environmental hazard identified was analysed and considered in the context of the environmental sensitivities and existing pressures in the receiving environment.

8.2.3 Environmental Risk Assessment

The environmental risk was defined by two factors, the likelihood (probability) of an event occurring (hazard being realised) and the potential consequences of that event occurring.

The risk assessment evaluated these factors using the following process:

- Conduct a detailed examination of each identified hazard including: potential events that could cause the hazard to eventuate, the pathways for this to cause an environmental consequence, the preventative and management measures that would be applied to prevent the hazard from occurring, and the severity of the consequence. This examination should allow the likelihood of an event occurring to be determined, along with the severity of possible impacts.
- Secondly, to use the output of likelihood and consequence to "characterise the risk" and rank its severity on a risk matrix.

Each of the identified hazards and the project activity that results in that hazard were subject to the assessment process. The environmental risk assessment included consideration of the physical and chemical characteristics of the hazard and the short-term and long-term effects to flora and fauna, including changes to communities, habitat and rare and threatened species.

The potential for environmental resources to recover from an impact was also considered in the assessment of environmental risks.

Control of Risks: Control and management of risks is a critically important part of the project and will be integrated into all phases of the TTP from early planning through to construction, operation and the eventual decommissioning of the pipeline and facilities. The assessment of environmental risks includes considering the effect of preventative and management measures. Preventative measures to reduce the likelihood of an event, and management measures to minimise and mitigate the consequences all form part of the risk control approach. Specific preventative and management measures for each identified hazard are presented in **Section 9**.

The ‘bow tie’ diagram shown in **Figure 8-1** illustrates the relationship between the threat of an undesirable event happening and the consequence of that event. The left-hand side of the ‘bow tie’ indicates the hazard, which may be associated with a number of identifiable threats. A number of barriers to these threats may be in place to reduce the likelihood of the hazardous event occurring; these are termed ‘prevention barriers’. The right hand side of the ‘bow tie’ shows the potential consequences. A number of barriers, termed ‘mitigation barriers’ may be put in place to avoid or minimise escalation of the event into a larger consequence. These safeguards or barriers may take several forms and are the measures underpinning effective management of the risk.

Interpreting Risk Assessment Output: The likelihood of the impact occurring is classified under the Environmental Risk Matrix as either: Remote; Highly Unlikely; Unlikely; Possible; Quite Likely; or Likely. The likelihood of the impact occurring is based on the expert opinion of the project team. The environmental consequence of the impact has been classified as either: Slight; Minor; Moderate; Major; Massive or Catastrophic, based on the areal extent and duration (or time for recovery) of the impact.

Risk Characterisation: Risks are characterised by combining the likelihood of the hazard occurring and the potential consequences of the hazard, allowing for the mitigating effect of prevention and management measures, to specify the level of environmental risk (residual risk) associated with each hazard. The residual risks may be low (negligible), medium, high or severe. The Risk Matrix presented in **Table 8-1** illustrates how the level of residual risk is determined.

■ **Table 8-1 Risk Matrix**

	Likelihood					
Consequence	Remote	Highly Unlikely	Unlikely	Possible	Quite Likely	Likely
Catastrophic						SEVERE
Massive						
Major				HIGH		
Moderate			MEDIUM			
Minor						
Slight	LOW					

The matrix illustrates that events with a remote likelihood of happening may have a low, medium or high risk, depending on the assessed consequences to the environment. In the same way, events with a likely probability could have low, medium, high, or even severe risk, depending on the resulting environmental consequence.

The characterisation of environmental risk into these various levels enables TTP to implement additional environmental management controls, especially for severe and high risks, to reduce the residual risk level and/or ensure that the risk is ‘as low as reasonably practicable’.

Classification of Impacts: To describe the type of change and duration of impacts, the terms defined in **Table 8-2** have been used throughout **Section 9**.

■ **Table 8-2 Classification of Impacts**

Category	Type	Description
Change	Negative	A change which reduces the quality of the environment
	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
Duration ¹	Temporary	Impact lasting minutes-weeks
	Short-term	Impact lasting months to five years
	Medium-term	Impact lasting five to ten years
	Long-term	Impact lasting decades
	Permanent	Impact that is irreversible and irrecoverable

Note 1: Source of Definitions: Woodside 2003d

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8.3 Summary of Environmental Risk Assessment

A description and assessment of the relevant biophysical impacts that could potentially result from the TTP are found in **Section 9**. These sections also discuss the appropriate preventative and management measures that will be undertaken to reduce these risks.

The risk assessment process identified that the majority of the predicted impacts on the environment would have no adverse long term impact on the environment and can be managed through the implementation of routine preventative and management measures.

The only impacts identified through the assessment process as having a higher level of potential impact, and thus requiring detailed assessment are:

- ***Erosion and runoff and soil compaction*** associated with construction activities including stockpiles, vegetation clearing, pipeline trenching, vehicle movements and road upgrades.
- ***Death, injury and disturbance to fauna*** resulting from various construction activities including earth works, blasting, vegetation clearing and fauna capture in the pipeline trench.
- ***Alteration of natural drainage and hydrology and pollution of ground water and surface water*** from vegetation clearing, road construction, fuel and chemical storage, disposal of sewage and grey water and sourcing and disposal of hydrotest water.
- ***Visual impact*** during construction from vegetation clearing, presence of construction camps and dust from construction traffic.
- ***Damage and destruction of vegetation and flora*** associated with vegetation clearing, earthworks, road upgrades and from vehicle and traffic movement during construction.
- ***Damage or destruction of aquatic ecosystems and species*** from various construction activities including vegetation clearing, construction of watercourses, disposal of sewage and grey water from construction camps and from fuel and chemical storage and handling.
- ***Damage to and disturbance of flora and fauna species of conservation significance*** during vegetation clearing, earthworks and from vehicle and traffic movement during construction.
- ***Damage or disturbance of ecologically sensitive habitats*** resulting from construction activities including vegetation clearing, earthworks and from vehicle and traffic movements.
- ***Introduction and spread of weeds and exotic fauna*** during movements of vehicles, plant and construction materials and from construction of access routes and clearing of native vegetation.
- ***Planned fire*** and alteration of ecological habitats from deliberate ignition of vegetation to reduce fire risk.
- ***Small chemical or hydrocarbon spills*** associated with vehicle and plant refuelling operations during construction.
- ***Dust emissions*** from trucks transporting material and workforce to the construction corridor along access roads and from pipeline trenching, backfill and padding during construction.

Impacts from biting insects resulting in mosquito borne disease have been considered to be a health risk rather than an environmental risk and have been considered further by the health programme (**Section 13**).

It is expected that with the implementation of appropriate preventative and management measures none of the TTP activities are likely to result in unacceptable long-term negative impacts on the terrestrial environment.