

## **2 ENVIRONMENTAL DESIGN AND PLANNING CONSIDERATIONS**

### **2.1 Introduction**

The project requires a framework to address environmental concerns identified before construction. The environmental design and planning considerations provide guidance during engineering design and preconstruction planning to avoid or reduce potential adverse environmental impacts of the project and to enhance potential positive environmental impacts of the project. The environmental design and planning considerations are intended to:

- comply with applicable regulatory requirements
- incorporate industry standard practice
- respond to community inputs, where relevant

#### **2.1.1 Potential Environmental Impacts**

Project activities have the potential to affect environmental receptors during all phases of the project. Effects on environmental receptors could be positive or negative. It is the proponents' intent to enhance beneficial impacts and to reduce detrimental impacts.

Potential environmental impacts include:

- air, water and soil pollution
- noise
- permafrost degradation or induced ground freezing
- surface or subsurface drainage alteration
- erosion
- settlement and slope instability
- loss or disturbance of plant communities
- loss or disturbance of aquatic and terrestrial habitats
- disturbance and displacement of fish, and marine and terrestrial wildlife
- disturbance of heritage resources
- conflicts with existing land uses

#### **2.1.2 Applicable Publications**

The environmental design and planning considerations are based on current applicable national, territorial, regional, provincial, i.e., Alberta, and industry publications. The publications listed in the following tables were used as reference material for developing the environmental design and planning considerations:

- Table 2-1: National Publications

- Table 2-2: Territorial Publications
- Table 2-3: Regional Publications
- Table 2-4: Alberta Publications
- Table 2-5: Industry Publications

Although the lists are not comprehensive, they are considered adequate for environmental design and planning considerations.

**2.1.3 Mitigation by Design and Planning**

The project-specific environmental design and planning considerations provide mitigation by design and planning, i.e., location, design and timing of activities during all project phases (see Table 2-6). Measures are included to avoid or reduce adverse impacts and create or enhance positive impacts. Site-specific mitigation will be developed as the project design is further refined.

See Section 3, Environmental Management Plans, for further discussion on managing:

- emissions
- water
- waste
- hazardous materials
- transportation and logistics
- wildlife
- reclamation
- operations

**Table 2-1: National Publications**

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Canadian Council of Ministers of the Environment</li> </ul>	<i>Canadian Environmental Quality Guidelines</i> (Canadian Council of Ministers of the Environment 1999a with updates to 2002)
	<i>Canadian Water Quality Guidelines for the Protection of Aquatic Life</i> (Canadian Council of Ministers of the Environment 1999b with updates to 2002)
	<i>Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil</i> (Canadian Council of Ministers of the Environment 2001)
	<i>Environmental Code of Practice for the Measurement and Control of Fugitive VOC Emissions from Equipment Leaks</i> (Canadian Council of Ministers of the Environment 1993)
	<i>Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks</i> (Canadian Council of Ministers of the Environment 1995)

Table 2-1: National Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>Canadian Council of Ministers of the Environment (cont'd)</li> </ul>	<i>National Emission Guidelines for Commercial or Industrial Boilers and Heaters</i> (Canadian Council of Ministers of the Environment 1997)
	<i>National Emission Guidelines for Stationary Combustion Turbines</i> (Canadian Council of Ministers of the Environment 1992)
	<i>Soil Quality Guidelines for the Protection of Environmental and Human Health</i> (in Canadian Council of Ministers of the Environment 1999c with updates to 2002)
<ul style="list-style-type: none"> <li>Canadian Environmental Assessment Agency</li> </ul>	<i>Canadian Environmental Assessment Act</i> (Government of Canada 2003a)
<ul style="list-style-type: none"> <li>Canadian Food Inspection Agency</li> </ul>	<i>Seeds Act</i> (Government of Canada 1985)
<ul style="list-style-type: none"> <li>Canadian Standards Association</li> </ul>	<i>Z662-03 Oil and Gas Pipeline Systems</i> (Canadian Standards Association 2003)
<ul style="list-style-type: none"> <li>Canadian Wildlife Service</li> </ul>	<i>Guidelines for Petroleum Industry Activities that affect Species at Risk in Prairie and Northern Region</i> (Canadian Wildlife Service 2003)
	<i>Management of Migratory Bird Sanctuaries in the Inuvialuit Settlement Region: Anderson River Delta Bird Sanctuary, Banks Island Bird Sanctuary No. 1, Banks Island Bird Sanctuary No. 2, Cape Parry Bird Sanctuary, Kendall Island Bird Sanctuary</i> (Canadian Wildlife Service 1992)
<ul style="list-style-type: none"> <li>Environment Canada</li> </ul>	<i>Canadian Environmental Protection Act</i> (Government of Canada 1999a)
	<i>Export and Import of Hazardous Waste Regulations</i> (Government of Canada 1992c)
	<i>Guide for Reporting to the National Pollutant Release Inventory 2001</i> (Environment Canada 2001)
	<i>Migratory Birds Convention Act</i> (Government of Canada 1994a)
	<i>Migratory Birds Regulations</i> (Government of Canada 1994b) pursuant to the <i>Migratory Birds Convention Act</i> (Government of Canada 1994a)
	<i>Migratory Bird Sanctuary Regulations</i> (Government of Canada 1994c) pursuant to the <i>Migratory Birds Convention Act</i> (Government of Canada 1994a)
	<i>Ocean Disposal: Dredged Sediments. Inventory of Potential Impacts and Mitigation Measures</i> (Environment Canada 1996b)
	<i>The Pipeline Industry and the Migratory Birds Convention Act</i> (Canadian Pipeline Environment Committee 2003)

Table 2-1: National Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Environment Canada</li> <li>• Fisheries and Oceans Canada</li> <li>• Canadian Heritage</li> </ul>	<p><i>Species at Risk Act</i> (Government of Canada 2002a)</p>
<ul style="list-style-type: none"> <li>• Fisheries and Oceans Canada</li> </ul>	<p><i>Fisheries Act</i> (Government of Canada 1985a)</p> <p><i>Freshwater Intake End-of-Pipe Fish Screen Guidelines</i> (Department of Fisheries and Oceans Canada 1995)</p> <p><i>Fish Screening Directive</i> (Fisheries and Oceans Canada 1999)</p> <p><i>Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters</i> (Wright and Hopky 1998)</p> <p><i>Interim Operational Position Statement for Pipeline Crossings in the Prairies Area</i> (Fisheries and Oceans Canada 2004)</p> <p><i>Marine Mammal Regulations</i> (Government of Canada 1993a)</p> <p><i>Navigable Waters Protection Act</i> (Government of Canada 1985b)</p> <p><i>Navigable Waters Works Regulations</i> (Government of Canada 1988)</p> <p><i>Navigable Waters Protection Program Pipeline Crossing Guidelines</i> (Fisheries and Oceans Canada 2003)</p> <p><i>Policy for the Management of Fish Habitat</i> (Department of Fisheries and Oceans Canada 1986)</p> <p><i>Protocol for Temporary Winter Access Water Crossings for Oil &amp; Gas Activities in the Northwest Territories</i> (Fisheries and Oceans Canada 2002a)</p> <p><i>Protocol for Water Withdrawal for Oil and Gas Activities in the Northwest Territories</i> (Fisheries and Oceans Canada 2002b)</p> <p><i>Working Near Water: Considerations for Fish and Fish Habitat. Reference and Workshop Manual – Northwest Territories</i> (Cott and Moore 2003)</p>
<ul style="list-style-type: none"> <li>• Governments of Canada, Denmark, Norway, the Russian Federation and the United States of America</li> </ul>	<p><i>International Agreement on the Conservation of Polar Bears</i> (Governments of Canada, Denmark, Norway, the Union of Soviet Socialist Republics and the United States of America 1973)</p>
<ul style="list-style-type: none"> <li>• Health Canada</li> </ul>	<p><i>Controlled Products Regulations</i> (Government of Canada 1985)</p> <p><i>Hazardous Products Act</i> (Government of Canada 1985)</p>

Table 2-1: National Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Health Canada (cont'd)</li> </ul>	<i>Summary of Guidelines for Canadian Drinking Water Quality</i> (Health Canada 2003)
<ul style="list-style-type: none"> <li>• Indian and Northern Affairs Canada</li> </ul>	<i>Environmental Guidelines: Pits and Quarries</i> (Indian and Northern Affairs Canada 1982)
	<i>Environmental Operating Guidelines: Hydrocarbon Well Sites in Northern Canada</i> (Indian and Northern Affairs Canada 1994a)
	<i>Land Use Guidelines: Access Roads and Trails</i> (Indian and Northern Affairs Canada 1994b)
	<i>Northern Benefits Requirements Associated with New Exploration Programs</i> (Indian and Northern Affairs Canada 2003)
	<i>Reclamation Guidelines for Northern Canada</i> (Indian and Northern Affairs Canada 1987)
<ul style="list-style-type: none"> <li>• National Energy Board</li> </ul>	<i>Consultation with Aboriginal Peoples: National Energy Board Memorandum of Guidance</i> (National Energy Board of Canada 2002)
	<i>Canada Oil and Gas Production and Conservation Regulations</i> (Government of Canada 1990) pursuant to the <i>Canada Oil and Gas Operations Act</i> (Government of Canada 1985c)
	<i>Filing Manual</i> (National Energy Board 2004)
	<i>Onshore Pipeline Regulations</i> (Government of Canada 1999b) pursuant to the <i>National Energy Board Act</i> (Government of Canada 1995)
<ul style="list-style-type: none"> <li>• Transport Canada</li> </ul>	<i>Air Pollution Regulations</i> (Government of Canada 1978a) pursuant to the <i>Canada Shipping Act</i> (Government of Canada 2001a)
	<i>Canada Shipping Act</i> (Government of Canada 2001a)
	<i>Garbage Pollution Prevention Regulations</i> (Government of Canada 2000) pursuant to the <i>Canada Shipping Act</i> (Government of Canada 2001a)
	<i>Pollutant Substances Pollution Prevention Regulations</i> (Government of Canada 2002b) pursuant to the <i>Canada Shipping Act</i> (Government of Canada 2001a)
	<i>Guidelines for the Control of Ballast Water Discharge from Ships in Waters Under Canadian Jurisdiction</i> (Transport Canada 2001)
<ul style="list-style-type: none"> <li>• Transport Canada</li> <li>• Indian and Northern Affairs Canada</li> </ul>	<i>Arctic Shipping Pollution Prevention Regulations</i> (Government of Canada 1978b) pursuant to the <i>Arctic Waters Pollution Prevention Act</i> (Government of Canada 1985d)

Table 2-2: Territorial Publications

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>Government of the Northwest Territories</li> </ul>	<i>Consolidation of Pesticide Act</i> (Government of the Northwest Territories 1988a)
	<i>Environmental Guidelines for the Construction, Maintenance and Closure of Winter Roads in the Northwest Territories</i> (Government of the Northwest Territories, Department of Transportation 1993)
	<i>Environmental Protection Act</i> (Government of the Northwest Territories 1988b)
<ul style="list-style-type: none"> <li>Indian and Northern Affairs Canada</li> </ul>	<i>Northwest Territories Waters Act</i> (Government of Canada 1992a)
<ul style="list-style-type: none"> <li>Northwest Territories Water Board</li> <li>Mackenzie Valley Land and Water Board</li> <li>Gwich'in Land and Water Board</li> <li>Sahtu Land and Water Board</li> </ul>	<i>Northwest Territories Waters Regulations</i> (Government of Canada 1993b) pursuant to the <i>Northwest Territories Waters Act</i> (Government of Canada 1992a)
<ul style="list-style-type: none"> <li>Indian and Northern Affairs Canada</li> <li>Prince of Wales Northern Heritage Centre</li> </ul>	<i>Northwest Territories Archaeological Sites Regulations</i> (Government of Canada 2001b)
<ul style="list-style-type: none"> <li>Indian and Northern Affairs Canada</li> </ul>	<i>Territorial Dredging Regulations</i> (Government of Canada 2003b) pursuant to the <i>Territorial Lands Act</i> (Government of Canada 1985e)
	<i>Territorial Land Use Regulations</i> (Government of Canada 2003c) pursuant to the <i>Territorial Lands Act</i> (Government of Canada 1985e)
<ul style="list-style-type: none"> <li>Northwest Territories Protected Areas Strategy Advisory Committee</li> </ul>	<i>Northwest Territories Protected Areas Strategy: A Balanced Approach to Establishing Protected Areas in the Northwest Territories</i> (NWT Protected Areas Strategy Advisory Committee 1999)
<ul style="list-style-type: none"> <li>Northwest Territories Transportation</li> </ul>	<i>A Guideline for Fuel Storage and Handling</i> (Government of the Northwest Territories, Department of Transportation 2002)
	<i>Highway Maintenance Standard – 431 – Snow Road Construction</i> (Northwest Territories Highways 1993)
<ul style="list-style-type: none"> <li>Northwest Territories Workers' Compensation Board</li> </ul>	<i>Consolidation of Work Site Hazardous Materials Information System Regulations</i> (Government of the Northwest Territories 1990a) pursuant to the <i>Safety Act</i> (Government of the Northwest Territories 1996)
<ul style="list-style-type: none"> <li>Prince of Wales Northern Heritage Centre</li> </ul>	<i>Historical Resources Act</i> (Government of the Northwest Territories 1988c)

Table 2-2: Territorial Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Prince of Wales Northern Heritage Centre</li> <li>• Indian and Northern Affairs Canada</li> <li>• Northwest Territories Department of Education, Culture and Employment</li> </ul>	<p><i>Northwest Territories Archaeological Sites Regulations</i> (Government of Canada 2001b) pursuant to the <i>Northwest Territories Act</i> (Government of Canada 1985f)</p>
<ul style="list-style-type: none"> <li>• Resources, Wildlife and Economic Development</li> </ul>	<p><i>Air Quality Code of Practice Upstream Oil and Gas Industry Consultation Draft</i> (Government of the Northwest Territories, Resources, Wildlife and Economic Development 2002b)</p> <p><i>Critical Wildlife Areas Regulations</i> (Government of Northwest Territories 1990b) pursuant to the <i>Wildlife Act</i> (Government of the Northwest Territories 1988d)</p> <p><i>Forest Protection Act</i> (Government of Northwest Territories 1988e)</p> <p><i>Guideline for Ambient Air Quality Standards in the Northwest Territories</i> (Government of the Northwest Territories, Resources, Wildlife and Economic Development 2002a)</p> <p><i>Guideline for the General Management of Hazardous Waste in the Northwest Territories</i> (Government of the Northwest Territories – Resources, Wildlife and Economic Development (GNWT RWED) 1998a)</p> <p><i>Guideline for Industrial Waste Discharges in the Northwest Territories</i> (GNWT RWED 1998b)</p> <p><i>Used Oil and Waste Fuel Management Regulations</i> (Government of the Northwest Territories 2003) pursuant to the <i>Environmental Protection Act</i> (Government of the Northwest Territories 1988b)</p> <p><i>Wildlife Act</i> (Government of the Northwest Territories 1988d)</p>
<ul style="list-style-type: none"> <li>• Resources, Wildlife and Economic Development</li> <li>• Fisheries and Oceans Canada</li> </ul>	<p><i>Northwest Territories Fishery Regulations</i> (Government of Canada 2003d) pursuant to the <i>Fisheries Act</i> (Government of Canada 1985a)</p>

Table 2-3: Regional Publications

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>Deh Cho First Nations</li> <li>Indian and Northern Affairs Canada</li> </ul>	<i>The Deh Cho First Nations Interim Measures Agreement</i> (Deh Cho First Nations, Government of Canada and Government of the Northwest Territories 2001)
<ul style="list-style-type: none"> <li>Environmental Impact Screening Committee</li> </ul>	<i>Operating Guidelines and Procedures</i> (Environmental Impact Screening Committee 2002)
<ul style="list-style-type: none"> <li>Fisheries Joint Management Committee</li> </ul>	<i>Beaufort Sea Beluga Management Plan</i> (Fisheries Joint Management Committee 2001)
<ul style="list-style-type: none"> <li>Gwich'in Tribal Council</li> </ul>	<i>Business Policy for Work in the Gwich'in Settlement Area</i> (Gwich'in Tribal Council 2003a)
	<i>Gwich'in Comprehensive Land Claim Agreement</i> (Government of Canada and the Gwich'in Tribal Council 1992)
	<i>Land Management and Control Guidelines with Schedule of Rates, Fees &amp; Penalties</i> (Gwich'in Tribal Council 2003b)
	<i>Working for the Land: Gwich'in Land Use Plan</i> (Gwich'in Land Use Planning Board 2002)
<ul style="list-style-type: none"> <li>Indian and Northern Affairs Canada</li> <li>Mackenzie Valley Land and Water Board</li> <li>Gwich'in Land and Water Board</li> <li>Sahtu Land and Water Board</li> </ul>	<i>Mackenzie Valley Land Use Regulations</i> (Government of Canada 1998a) pursuant to the <i>Mackenzie Valley Resource Management Act</i> (Government of Canada 1998b)
<ul style="list-style-type: none"> <li>Indian and Northern Affairs Canada</li> <li>Sahtu Land and Water Board</li> </ul>	<i>Sahtu Dene and Métis Comprehensive Land Claim Agreement</i> (Sahtu Tribal Council, Government of Canada, Government of the Northwest Territories 1993)
<ul style="list-style-type: none"> <li>Inuvialuit Game Council</li> </ul>	<i>Flight Altitudes/Routes and Interference with Inuvialuit Harvesting</i> (Inuvialuit Game Council 2002)
<ul style="list-style-type: none"> <li>Inuvialuit Game Council</li> <li>North Slope Inupiat</li> </ul>	<i>Inuvialuit - Inupiat Polar Bear Management Agreement in the Southern Beaufort Sea</i> (Inuvialuit Game Council and North Slope Inupiat 2000)
<ul style="list-style-type: none"> <li>Inuvialuit Joint Secretariat</li> </ul>	<i>Community Conservation Plans for Inuvik, Tuktoyaktuk and Aklavik</i> (Community of Aklavik, Wildlife Management Advisory Council (Northwest Territories) and Joint Secretariat 2000; Community of Inuvik, Wildlife Management Advisory Council (Northwest Territories) and Joint Secretariat 2000; Community of Tuktoyaktuk, Wildlife Management Advisory Council (Northwest Territories) and Joint Secretariat 2000)
<ul style="list-style-type: none"> <li>Inuvialuit Land Administration</li> </ul>	<i>Inuvialuit Land Management System (ILMS)</i> (ILA 2004)



Table 2-3: Regional Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Inuvialuit Land Administration</li> <li>• Indian and Northern Affairs Canada</li> <li>• Inuvialuit Regional Corporation</li> </ul>	<p><i>The Western Arctic Claim: The Inuvialuit Final Agreement</i> (Inuvialuit of the Inuvialuit Settlement Region and the Government of Canada 1988)</p>
<ul style="list-style-type: none"> <li>• Mackenzie Valley Environmental Impact Review Board</li> </ul>	<p><i>Generic Terms of Reference for the Environmental Assessment of Oil and Gas Developments in the Mackenzie Valley</i> (Mackenzie Valley Environmental Impact Review Board 2001)</p>
<ul style="list-style-type: none"> <li>• Mackenzie Valley Land and Water Board</li> </ul>	<p><i>Mackenzie Valley Resource Management Act</i> (Government of Canada 1998b)</p>
	<p><i>Public Consultation Guidelines for Development Applications to the Mackenzie Valley Land and Water Board</i> (Mackenzie Valley Land and Water Board 2003)</p>
<ul style="list-style-type: none"> <li>• Sahtu Dene Council and District Land Corporations: Yamoga Land Corporation, Tulita Land Corporation (Ernie MacDonald Land Corporation) and Deline Land or Financial Corporation</li> </ul>	<p><i>Sahtu Preliminary Draft Land Use Plan</i> (Sahtu Land Use Planning Board 2003)</p>
<ul style="list-style-type: none"> <li>• Sahtu Land and Water Board</li> <li>• Indian and Northern Affairs Canada</li> </ul>	<p><i>Sahtu Dene and Métis Comprehensive Land Claim Agreement</i> (Sahtu Tribal Council, Government of Canada and Government of the Northwest Territories 1993)</p>
<ul style="list-style-type: none"> <li>• Sahtu Land and Water Board</li> </ul>	<p><i>Land Use Permit Process (Draft)</i> (Sahtu Land and Water Board 2002)</p>
<ul style="list-style-type: none"> <li>• Wildlife Management Advisory Council (Northwest Territories)</li> <li>• Fisheries Joint Management Committee</li> </ul>	<p><i>Inuvialuit Renewable Resource Conservation and Management Plan</i> (Wildlife Management Advisory Council (Northwest Territories) and Fisheries Joint Management Committee 1998)</p>

Table 2-4: Alberta Publications

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>Alberta Agriculture, Food and Rural Development</li> <li>Alberta Environment</li> </ul>	<i>Native Plant Revegetation Guidelines for Alberta</i> (Native Plant Working Group 2001)
<ul style="list-style-type: none"> <li>Alberta Agriculture, Food and Rural Development</li> </ul>	<i>Weed Control Act</i> (Government of Alberta 2000e)
<ul style="list-style-type: none"> <li>Alberta Community Development</li> </ul>	<i>Historical Resources Act</i> (Government of Alberta 2000a)
	<i>Policy Statement: Historical Resources Conservation Work Occasioned by Development Programs</i> (Alberta Culture 1977)
<ul style="list-style-type: none"> <li>Alberta Energy and Utilities Board</li> </ul>	<i>Guide 38: Noise Control Directive - User Guide</i> (Alberta Energy and Utilities Board 1999a)
	<i>Guide 55: Storage Requirements for the Upstream Petroleum Industry</i> (Alberta Energy and Utilities Board 2001a)
	<i>Guide 56: Energy Development Application Guide and Schedules</i> (Alberta Energy and Utilities Board 2003)
	<i>Guide 60: Upstream Petroleum Industry Flaring Requirements</i> (Alberta Energy and Utilities Board 1999b)
	<i>Guide 60: Updates and Clarification</i> (Alberta Energy and Utilities Board 2001b)
	<i>Guide 64: Facility Inspection Manual</i> (Alberta Energy and Utilities Board 2002)
	<i>Noise Control Directive (ID 99-08)</i> (Alberta Energy and Utilities Board 1999c)
	<i>Oil and Gas Conservation Act</i> (Government of Alberta 2000b)
	<i>Oil and Gas Conservation Regulations</i> (Government of Alberta 1971) pursuant to the <i>Oil and Gas Conservation Act</i> (Government of Alberta 2000b)
	<i>Operating Guidelines for Industrial Activity in Caribou Range – Northwest Alberta (IL 94-22)</i> (Alberta Energy and Utilities Board 1994)
	<i>Pipeline Act</i> (Government of Alberta 2000c)
	<i>Pipeline Regulation</i> (Government of Alberta 2003) pursuant to the <i>Pipeline Act</i> (Government of Alberta 2000c)
	<i>Preservation of Archaeological, Palaeontological and Historical Resources: Policy Update (IL 82-11)</i> (Alberta Energy and Utilities Board 1982)
	<i>Suspension, Abandonment, Decontamination and Surface Land Reclamation of Upstream Oil and Gas Facilities (IL 98-02)</i> (Alberta Energy and Utilities Board 1998)

Table 2-4: Alberta Publications (cont'd)

Jurisdiction or Agency	Publication
<ul style="list-style-type: none"> <li>• Alberta Environment</li> </ul>	<i>Alberta Ambient Air Quality Guidelines</i> (Alberta Environment 2000a)
	<i>Code of Practice for Compressor and Pumping Stations and Sweet Gas Processing Plants</i> (Alberta Environmental Protection 1996)
	<i>Code of Practice for Oil Production Sites</i> (Alberta Environmental Protection 1997a)
	<i>Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body</i> (Alberta Environment 2001)
	<i>Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines</i> (Alberta Environmental Protection 1999a)
	<i>Code of Practice for Watercourse Crossings</i> (Alberta Environment 2001a)
	<i>Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines</i> (Alberta Environmental Protection 1999b)
	<i>Conservation and Reclamation Guidelines in Alberta (C&amp;R/IL97-1)</i> (Alberta Environmental Protection 1997b)
	<i>Environmental Protection and Enhancement Act and Regulations</i> (Government of Alberta 2000d)
	<i>Environmental Protection Guidelines for Pipelines (C&amp;R/IL/94-5)</i> (Alberta Environmental Protection 1994)
	<i>Environmental Protection Guidelines for Roadways (C&amp;R/IL/00-5)</i> (Alberta Environment 2000c)
	<i>Reclamation Assessment Criteria for Pipelines: 2001 Draft</i> (Alberta Environment 2001b)
	<i>Reclamation Criteria for Wellsites and Associated Facilities: 1995 Update</i> (Alberta Environment 1995)
	<i>Revegetation Using Native Plant Materials: Guidelines for Industrial Development Sites (R&amp;R/03-3)</i> (Alberta Environment 2003a)
	<i>Substance Release Regulation</i> (Government of Alberta 1993) pursuant to the <i>Environmental Protection and Enhancement Act</i> (Government of Alberta 2000d)
	<i>Voluntary Shutdown Criteria for Construction Activity or Operations (C&amp;R/IL/98-4)</i> (Alberta Environmental Protection 1998)
<i>Weeds on Industrial Development Sites: Regulations and Guidelines (R&amp;R/03-4)</i> (Alberta Environment 2003b)	

**Table 2-4: Alberta Publications (cont'd)**

<b>Jurisdiction or Agency</b>	<b>Publication</b>
<ul style="list-style-type: none"> <li>Alberta Human Resources and Employment, Workplace Health and Safety</li> </ul>	<i>Chemical Hazards Regulations</i> (Government of Alberta 2001a) pursuant to the <i>Occupational Health and Safety Act</i> (Government of Alberta 2000f)
<ul style="list-style-type: none"> <li>Alberta Sustainable Resource Development</li> </ul>	<i>Public Lands Act</i> (Government of Alberta 2000g)
	<i>Stream Crossing Guidelines: Operational Guidelines for Industry</i> (Alberta Energy and Natural Resources 1985)
	<i>Alberta Wildlife Act</i> (Government of Alberta 2000h)
<ul style="list-style-type: none"> <li>Alberta Transportation</li> </ul>	<i>Fish Habitat Manual: Guidelines and Procedures for Watercourse Crossings in Alberta</i> (Alberta Transportation 2001)
<ul style="list-style-type: none"> <li>Boreal Caribou Committee</li> </ul>	<i>Strategic Plan and Industrial Guidelines for Boreal Caribou Ranges in Northern Alberta</i> (Boreal Caribou Committee 2001)

**Table 2-5: Industry Publications**

<b>Agency</b>	<b>Publication</b>
<ul style="list-style-type: none"> <li>Canadian Association of Petroleum Producers</li> </ul>	<i>Environmental Operating Practices for the Upstream Petroleum Industry – Alberta Operations. Pipelines Volume</i> (Canadian Association of Petroleum Producers 1999a)
	<i>Environmental Operating Practices for the Upstream Petroleum Industry – Alberta Operations. Production Volume</i> (Canadian Association of Petroleum Producers 1999b)
	<i>Hydrostatic Test Water Management Guidelines</i> (Canadian Association of Petroleum Producers 1996)
<ul style="list-style-type: none"> <li>Canadian Association of Petroleum Producers</li> <li>Canadian Energy Pipeline Association</li> <li>Alberta Energy and Utilities Board</li> <li>National Energy Board</li> </ul>	<i>Pipeline Abandonment: A Discussion Paper on Technical and Environmental Issues</i> (Pipeline Abandonment Steering Committee 1996)
<ul style="list-style-type: none"> <li>Canadian Pipeline Water Crossing Committee</li> </ul>	<i>Watercourse Crossings</i> (Canadian Pipeline Water Crossing Committee 1999)
<ul style="list-style-type: none"> <li>Gas Research Institute (GRI)</li> </ul>	<i>Horizontal Directional Drilling Best Management Practices Manual</i> (Gas Research Institute 2002)
<ul style="list-style-type: none"> <li>International Association of Oil and Gas Producers</li> </ul>	<i>Oil and Gas Exploration and Production In Arctic Offshore Regions: Guidelines for Environmental Protection</i> (International Association of Oil and Gas Producers 2002)
<ul style="list-style-type: none"> <li>World Conservation Union</li> <li>E&amp;P Forum (Oil Industry International Exploration and Production Forum)</li> </ul>	<i>Oil and Gas Exploration and Production in Arctic and Subarctic Onshore Regions: Guidelines for Environmental Protection</i> (IUCN 1993)

Table 2-6: Environmental Design and Planning Considerations

Category	Environmental Issue	Design and Planning Considerations
Air quality	General	<ul style="list-style-type: none"> <li>• use best practical equipment</li> <li>• manage water vapour and particulate emissions</li> <li>• optimize logistics, e.g., decrease amount of traffic</li> <li>• identify and control fugitive emission sources</li> <li>• store materials in a manner that limits risks to air quality</li> <li>• use dust suppressants near communities when necessary</li> </ul>
	Flaring and venting	<ul style="list-style-type: none"> <li>• manage the need for and duration of flaring and venting</li> <li>• ensure that flaring and venting are only used intermittently</li> <li>• follow Alberta Energy and Utilities Board <i>Guide 60: Upstream Petroleum Industry Flaring Requirements</i> (1999b), where applicable</li> </ul>
	Fire	<ul style="list-style-type: none"> <li>• manage smoking and welding activities</li> <li>• manage the risk of forest fires</li> <li>• apply fire protection systems at select facilities</li> </ul>
	Pipeline rupture	<ul style="list-style-type: none"> <li>• design and operate the pipeline to code</li> </ul>
Noise	General	<ul style="list-style-type: none"> <li>• moderate noise with suitable scheduling of activities, equipment selection and siting away from sensitive receptors such as communities and wildlife areas</li> <li>• advise nearby residents of noise-causing activities</li> <li>• control noise to the satisfaction of applicable authorities and legislation, i.e., ensure that noise does not exceed permissible sound levels</li> <li>• follow Alberta Energy and Utilities Board <i>Guide 38: Noise Control Directive User Guide</i> (1999a), where applicable</li> </ul>
	Blasting	<ul style="list-style-type: none"> <li>• use controlled blasting techniques</li> </ul>
	Flaring and venting	<ul style="list-style-type: none"> <li>• manage the need for, and duration of, flaring and venting</li> <li>• ensure that flaring and venting are only used intermittently</li> </ul>
	Transportation	<ul style="list-style-type: none"> <li>• use designated flight corridors and altitudes near communities and known concentrations of wildlife</li> <li>• locate travel routes away from residences where practical</li> <li>• avoid the use of engine brakes near communities</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Water resources	General	<ul style="list-style-type: none"> <li>• keep the number of watercourse crossings to the minimum necessary to complete the project</li> <li>• limit disturbance near riparian areas and lakeshores</li> <li>• locate route away from watercourses and waterbodies, where practical</li> <li>• for the gathering system, install remotely controlled valves with means to isolate the pipeline at locations critical to public safety, including navigable waters</li> <li>• ensure no fish are harvested or fed by project personnel while on the job during construction</li> <li>• remove noxious riparian or aquatic plants from equipment to avoid infestation</li> <li>• keep the removal of material from below the high water mark of any waterbody to the minimum required</li> <li>• apply Fisheries and Oceans Canada <i>Guidelines for the Use of Explosives in Canadian Waters</i> (Wright and Hopky 1998)</li> <li>• apply Fisheries and Oceans Canada <i>Protocol for Water Withdrawal for Oil and Gas Activities in the Northwest Territories</i> (DFO 2002b)</li> <li>• apply Canadian Council of Ministers of the Environment's <i>Canadian Environmental Quality Guidelines</i> (1999a), where practical</li> <li>• apply the <i>Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body</i> (Alberta Environment 2000b) when in Alberta</li> <li>• avoid perched aquifers and springs, where practical</li> </ul>
	Dredging	<ul style="list-style-type: none"> <li>• control the time and amount of dredging and the location of disposal</li> <li>• apply suitable methods while dredging</li> </ul>
	Erosion	<ul style="list-style-type: none"> <li>• avoid unstable slopes near watercourses, where practical</li> <li>• use erosion control methods</li> <li>• design site-specific mitigation for erosion control</li> </ul>
	Fish habitat	<ul style="list-style-type: none"> <li>• avoid instream activities during critical times and at locations of fish activity</li> <li>• control total suspended sediment levels</li> <li>• avoid creating barriers to fish movement</li> <li>• recreate spawning, overwintering and rearing habitat as required</li> <li>• control erosion on stream approaches</li> <li>• ensure that all water intakes have adequate screening devices to prevent the passage of fish</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Water resources (cont'd)	Inundation, erosion and scour	<ul style="list-style-type: none"> <li>• design facility pads to withstand ice forces, scour and flow velocities, and to consider flooding potential, where appropriate</li> </ul>
	Obstruction and alteration of drainage or flow	<ul style="list-style-type: none"> <li>• manage disturbance of natural drainage channels</li> <li>• avoid depositing any material or placing any structure that might interfere with navigation in any water that is navigable or that flows into navigable water, where practical</li> <li>• design the pipe to account for the development of frost bulbs</li> </ul>
	Pipeline reclamation	<ul style="list-style-type: none"> <li>• restore the beds of watercourses and stabilize banks and shorelines after completing pipeline crossings</li> <li>• locate clean sources of gravel, cobble and armour for reclamation and stabilization</li> </ul>
	Pipeline rupture	<ul style="list-style-type: none"> <li>• design and operate the pipeline to code</li> </ul>
	Sedimentation	<ul style="list-style-type: none"> <li>• use trenchless or isolated crossing methods where necessary</li> <li>• select crossing and dredging methods that reduce the likelihood of sediment entrainment</li> </ul>
	Waste and contaminants	<ul style="list-style-type: none"> <li>• ensure that petroleum products, waste and effluents are not allowed to spread to surrounding lands or waterbodies, unless permitted</li> <li>• remove all construction materials from the ice surface before spring breakup</li> <li>• avoid depositing debris or material in a manner contrary to territorial, provincial or federal regulations, in any waterbody, unless permitted</li> <li>• ensure a sufficient buffer is maintained between sumps and any waterbody</li> </ul>
	Withdrawal and disposal of hydrostatic test water	<ul style="list-style-type: none"> <li>• conduct hydrostatic testing in a way that avoids adverse effects on the aquatic environment</li> <li>• apply the <i>Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines</i> (Alberta Environmental Protection 1999a) when in Alberta</li> <li>• apply the Canadian Association of Petroleum Producers' <i>Hydrostatic Test Water Management Guidelines</i> (Canadian Association of Petroleum Producers 1996)</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Soils and landforms	General	<ul style="list-style-type: none"> <li>• manage disturbance near riparian areas and lakeshores</li> <li>• manage disturbance on sloping and sidehill slope terrain</li> <li>• manage disturbance in areas with slope instability</li> <li>• control disturbance to uncommon landforms</li> <li>• reduce disturbance to the surface soil and groundcover vegetation</li> <li>• limit the movement of equipment and vehicles when the ground surface is susceptible to rutting and gouging</li> <li>• manage soil loss during clearing by using suitable scheduling, equipment and procedures</li> <li>• limit excessive handling of surface material</li> <li>• protect stored soil materials to prevent loss or degradation</li> <li>• use helicopters or pre-existing roads and trails for routine access to the right-of-way during operations, maintenance and monitoring, where practical</li> <li>• conserve surface material, where practical</li> <li>• control borrow material below the water table</li> <li>• reduce the loss of soil quality</li> </ul>
	Clearing	<ul style="list-style-type: none"> <li>• limit clearing to the area required for development</li> <li>• clear steep, erodible slopes by hand, where required to protect the slope</li> </ul>
	Contamination	<ul style="list-style-type: none"> <li>• construct petroleum product and hazardous material storage with containment, as required</li> <li>• ensure that waste and effluents are not allowed to spread to surrounding land, unless permitted</li> <li>• ensure temporary sumps are backfilled and reclaimed</li> <li>• apply the Canadian Council of Ministers of the Environment <i>Soil Quality Guidelines for the Protection of the Environment and Human Health</i> (1999c) and the <i>Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil</i> (2001)</li> </ul>
	Obstruction and alteration of drainage	<ul style="list-style-type: none"> <li>• manage the disruption and alteration of surface and subsurface drainage and flow</li> <li>• design the pipe to account for the development of frost bulbs</li> </ul>



Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Soils and landforms (cont'd)	Permafrost degradation, erosion and slope instability	<ul style="list-style-type: none"> <li>• limit disturbance to the surface layer in permafrost areas</li> <li>• identify and stabilize areas with erosion problems</li> <li>• manage construction on ice-rich slopes</li> <li>• manage grading</li> <li>• manage permafrost degradation</li> <li>• locate bridges and culverts on stable terrain</li> <li>• use site-specific erosion control structures or techniques, where practical</li> </ul>
	Reclamation	<ul style="list-style-type: none"> <li>• ensure disturbed areas are reclaimed as soon as practical</li> <li>• contour and reclaim borrow sites once they are no longer required by the project</li> <li>• contour sites to provide drainage and stability and to control erosion, where required</li> <li>• stabilize and reclaim areas affected by construction or removal activities</li> </ul>
	Terrain alteration	<ul style="list-style-type: none"> <li>• limit grading to that needed for the safe and efficient operation of equipment</li> <li>• move loose surface material to the edge of the workspace and right-of-way, in areas to be graded, and replace for reclamation purposes, where practical</li> </ul>
Vegetation	General	<ul style="list-style-type: none"> <li>• control disturbance near riparian areas and lakeshores</li> <li>• avoid sensitive and unique habitat, where practical</li> <li>• use previously disturbed areas, where practical</li> <li>• control disturbance in traditional harvest areas</li> <li>• maintain a buffer strip of undisturbed vegetation between cleared areas and public roads or navigable watercourses, where practical</li> <li>• control drainage to reduce habitat alterations</li> </ul>
	Revegetation	<ul style="list-style-type: none"> <li>• encourage and facilitate the natural recovery of native plant communities</li> <li>• establish species that provide erosion control</li> <li>• ensure that using native species is consistent with local and regional land use plans and objectives and with existing or surrounding vegetation</li> <li>• manage the use of seed and fertilizer</li> <li>• replace surface material over the disturbed area</li> <li>• conduct activities during the season that limit impacts on vegetation, where practical</li> </ul>
	Species and communities of concern	<ul style="list-style-type: none"> <li>• avoid disturbing species and plant communities of concern</li> <li>• control dust near rare plants and vegetation communities of concern</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Vegetation (cont'd)	Terrain alteration	<ul style="list-style-type: none"> <li>• manage the use of, and travel over, wet areas such as muskeg, during periods of thaw</li> <li>• avoid disturbing the organic mat, where practical</li> </ul>
	Timber	<ul style="list-style-type: none"> <li>• limit clearing to the area required for development</li> <li>• avoid trespassing beyond approved workspaces or access routes</li> <li>• use appropriate clearing methods</li> <li>• use appropriate brush and slash disposal methods</li> <li>• clear the pipeline right-of-way during winter, where practical</li> <li>• clear steep, erodible slopes by hand, where required to protect the slopes</li> <li>• retain cleared timber for project or community use, subject to benefits agreements</li> <li>• burn combustible material resulting from clearing, where practical</li> </ul>
	Weed introduction	<ul style="list-style-type: none"> <li>• use approved seed mixes, and have suitable analyses completed</li> <li>• avoid introducing weeds, invasive and non-native species</li> <li>• clean equipment before arrival on site</li> </ul>
Wildlife	General	<ul style="list-style-type: none"> <li>• manage disturbance by scheduling activities, selecting equipment and locating sites away from sensitive receptors</li> <li>• limit disturbance near riparian areas and lakeshores</li> <li>• avoid sensitive and unique wildlife habitat, where practical</li> <li>• ensure no wildlife is harvested, harassed, harmed or fed by project personnel while on the job</li> <li>• avoid disturbance to marine mammals</li> <li>• adhere to restrictions placed on activities and timing in designated areas</li> <li>• construct above-ground pipelines with consideration for all-season wildlife movements</li> <li>• keep open trenches short in length and time to allow wildlife movement, particularly during migration</li> <li>• include breaks when stringing pipe and storing equipment along or across wildlife paths</li> <li>• consider the ability of wildlife to have a clear line of sight to habitat when implementing barrier-reducing techniques</li> </ul>
	Air traffic	<ul style="list-style-type: none"> <li>• use designated flight corridors and altitudes near known concentrations of wildlife</li> <li>• ensure detours from the study area for nonproject-related purposes are prohibited</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Wildlife (cont'd)	Blasting	<ul style="list-style-type: none"> <li>• avoid blasting in sensitive areas during ecologically sensitive times</li> </ul>
	Firearms	<ul style="list-style-type: none"> <li>• ensure project personnel have no firearms on site, except for safety</li> </ul>
	Habitat alteration	<ul style="list-style-type: none"> <li>• implement techniques to maintain vegetation screening</li> <li>• encourage recovery of habitat, where practical</li> <li>• control drainage to reduce alterations to habitat</li> <li>• limit clearing to areas needed for development</li> </ul>
	Increased access	<ul style="list-style-type: none"> <li>• coordinate efforts to control increased access with government authorities and communities</li> <li>• ensure vehicles yield to wildlife</li> <li>• encourage the return of native vegetation to disturbed areas</li> <li>• use slash berms for access control and visual screens, where required</li> </ul>
	Migration patterns	<ul style="list-style-type: none"> <li>• use slash to screen the right-of-way where it crosses traditional movement corridors, e.g., north of Travaillant Lake</li> <li>• manage visual or noise disturbances near migrating animals, such as caribou and waterfowl</li> </ul>
Land and resource use	General	<ul style="list-style-type: none"> <li>• comply with the detailed terms and conditions of access and benefits agreements negotiated and specified by the proponents</li> <li>• reduce disturbance to specific lands, such as key hunting grounds and protected areas, as identified by regional organizations and land use plans</li> <li>• notify affected communities and land users before activities begin, where practical</li> <li>• plan and construct access roads and rights-of-way, to consider aesthetic concerns</li> <li>• restore trails used by trappers and hunters along access routes that have been disturbed by the project</li> <li>• manage construction activities near any privately owned or leased land or structure</li> <li>• consult with affected land users about potential conflicts and potential beneficial agreements</li> <li>• design facilities to consider aesthetic concerns</li> </ul>

Table 2-6: Environmental Design and Planning Considerations (cont'd)

Category	Environmental Issue	Design and Planning Considerations
Land and resource use (cont'd)	Borrow sites	<ul style="list-style-type: none"> <li>plan and develop borrow sites to consider aesthetic concerns</li> <li>consult with communities regarding conserving aggregates for future community use</li> <li>use existing developed aggregates or resources, where practical</li> </ul>
	Harvesting	<ul style="list-style-type: none"> <li>compensate for trapping and hunting losses and loss of plant harvesting, as negotiated in compensation agreements</li> <li>compensate land resource users who have legal rights, for proven damage caused by the project</li> </ul>
	Seasonal use conflicts	<ul style="list-style-type: none"> <li>plan activities to manage land use conflicts</li> </ul>
	Timber	<ul style="list-style-type: none"> <li>limit clearing to areas required for development</li> <li>retain cleared timber for project or community use, subject to benefits agreements</li> </ul>
	Tourism and recreation	<ul style="list-style-type: none"> <li>avoid locating project activities and facilities in key tourism and recreation areas, where practical</li> <li>notify the public periodically throughout construction</li> </ul>
Heritage resources	General	<ul style="list-style-type: none"> <li>ensure that key persons working on the project are aware of conditions concerning heritage resources</li> </ul>
	Identification of sites	<ul style="list-style-type: none"> <li>complete a site-specific historical resources impact assessment (HRIA) before construction activities begin</li> </ul>
	Archaeological sites	<ul style="list-style-type: none"> <li>avoid known archaeological and heritage sites, unless permitted</li> <li>stop work if unknown heritage resources are encountered during construction. Report to the relevant authority immediately and ensure that the site is preserved until its significance can be assessed</li> <li>reduce the disturbance to site-specific cultural features</li> <li>avoid cemeteries and gravesites</li> </ul>
	Records and documentation	<ul style="list-style-type: none"> <li>prepare an inventory of heritage resources that will be affected by the project</li> <li>file records with applicable authorities</li> </ul>