APPENDIX C

Cartwright Junction to Happy Valley-Goose Bay Trans Labrador Highway Alternative (Outfitter) Route Environmental Impact Statement and Comprehensive Study Report

JACQUES WHITFORD PROJECT NO. NFS09308-0008
MINASKUAT PROJECT NO. M6-0008

CARTWRIGHT JUNCTION TO HAPPY VALLEY-GOOSE BAY TRANS LABRADOR HIGHWAY ALTERNATIVE (OUTFITTER) ROUTE ENVIRONMENTAL IMPACT STATEMENT AND COMPREHENSIVE STUDY REPORT

OCTOBER 2003

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OCTOBER 6, 2003

EXECUTIVE SUMMARY

Introduction

The Department of Works, Services and Transportation (WST) is proposing to construct the Trans Labrador Highway (TLH) - Phase III between Happy Valley-Goose Bay and Cartwright Junction. This highway will be the final section of an all-season ground transportation route that links central and southern Labrador, and connects, through western Labrador, with the provincial highway network in Québec and the highway system on the island of Newfoundland via a ferry connection in southern Labrador.

This environmental impact statement (EIS) and comprehensive study report (CSR) focuses on the route identified by the Newfoundland and Labrador Outfitters Association (hereafter referred to as the outfitter route), which was determined to be a viable alternative to the preferred route for the TLH - Phase III. The EIS/CSR fulfills both the provincial and federal environmental assessment requirements, as well as the requirements outlined in the guidelines issued in December 2002 and comments presented in the April 2003 deficiency statement for the EIS/CSR prepared for the preferred route. The preferred route for the highway was described and assessed in JW/IELP (2003a), which was submitted to the Minister of Environment in January 2003.

Alternatives to the Project

The alternative to the project, whether the preferred or outfitter route is used, is to not construct the TLH - Phase III. This would mean that the highway system across Labrador would not be completed and there would be no transportation link established between Happy Valley-Goose Bay and southern Labrador. In the event that the TLH - Phase III is not constructed, the project purpose would be met through maintaining and/or improving existing air and marine transportation systems linking the Happy Valley-Goose Bay area with southern Labrador and the island of Newfoundland. However, this would not address the high costs associated with operating these systems or high costs for individuals and businesses using the services.

In contrast, the year-round, all-season lower cost ground transportation system provided by a highway system spanning Labrador will decrease dependence on expensive air and marine passenger and freight services. Travel plans made by area residents will not depend on flight and ferry schedules. The ground transportation link will also benefit local businesses. In addition, this change in transportation may lead to a reduction in overall greenhouse gas emissions in the region. However, there will also be a corresponding decrease in carbon sinks in the region, with approximately 496 ha of forested land being removed for the outfitter route right-of-way.

Alternative Means for Carrying Out the Project

Thirteen route alternatives were considered for the TLH - Phase III. Review of these routes considered the following: topographic and geographic factors; technical/engineering factors, such as design considerations, construction and maintenance standards, and watercourse crossing numbers, size and location; environmental factors; socio-economic factors; and construction and operation costs. Of the possible route options, the preferred route (A1, A4 and A5) and outfitter route (A13 section and the portions of the preferred route that

are common to the outfitter route) are the only two options that are considered further for the TLH - Phase III and subjected to an environmental assessment.

The Proposed Undertaking

The TLH - Phase III constructed along the outfitter route will be a two-lane, all-season, gravel surface highway approximately 280 km in length. The highway will be constructed to a Rural Collector Undivided 80 km/hr design standard with a posted speed limit of 70 km/hr. Similar to the existing sections of the TLH, the highway will have a 9.5-m wide gravel surface and a right-of-way width of 40 m. The normal clearing width of 30 m will be reduced wherever possible, particularly around waterbodies. Grubbing width will be limited to 20 m rather than the standard 30 m. Intersections on the TLH - Phase III will occur at the junction with the Phase I portion of the TLH near Happy Valley-Goose Bay and the Phase II portion at Cartwright Junction.

The outfitter route will cross 115 watercourses between Happy Valley-Goose Bay and Cartwright Junction. The majority of the crossings will be made using cylindrical culverts ranging in size from approximately 1,200 to 5,000 mm. Eight of the crossings will require pipe arch structures, while four of the watercourse crossings (Churchill River, Traverspine River, Kenamu River, and Paradise River) will require bridges. The Churchill River will also require a partial causeway of 500 m to be built in conjunction with the bridge.

Other features of the highway are borrow pits and major excavations, maintenance depots, signage and roadside pull-off locations. Most borrow pits established for the TLH - Phase III will be temporary. However, some may continue to be used during operation for road maintenance and winter ice control materials. The project will also involve other temporary features during construction, including temporary watercourse diversions, construction camps, laydown areas and waste disposal facilities.

Construction of the TLH - Phase III along the outfitter route will occur in several phases between 2004 and 2010. Pre-design work for the highway is currently underway and detailed design will be ongoing throughout construction. Procurement/tendering will be completed each year prior to the start of the construction season, which will extend from mid-May to the end of November. Construction will start at both ends of the route (i.e., at Happy Valley-Goose Bay and at Cartwright Junction on the Phase II portion of the TLH) in 2004, and will involve:

- site preparation, including surveying, right-of-way clearing, grubbing and debris disposal (including disposing of organic soil, slash, grubbed material and wood fibre);
- transporting equipment, construction materials and related supplies to construction sites, including transporting, storing and handling hazardous materials, fuels, lubricants and explosives;
- establishing, operating and removing construction camps and laydown areas;
- blasting operations;
- excavating, including disposing of excess/waste rock, overburden and potential acid-generating rock;
- establishing and operating borrow pits, including identifying sources of borrow material;
- subgrade construction;
- installing watercourse crossing structures, and activities in and around watercourses; and
- site rehabilitation and environmental monitoring.

It is anticipated that the TLH - Phase III will be operated and maintained in perpetuity, and will require seasonal maintenance and periodic repair. Maintenance depots will be established for storage of highway maintenance equipment. Traffic volume is expected to be light, with most travel occurring between spring and fall. Appropriate signage, including directional and safety signs, and wildlife crossing signs, where necessary, will be posted.

WST's environmental management strategy includes application of the Precautionary Principle, incorporation of environmental protection measures, environmental protection planning, rehabilitation of disturbed areas, and monitoring, as required. Construction and operation will comply with all applicable standards and regulations, environmental protection guidelines and regulations, and WST specifications. An environmental protection plan (EPP) will be prepared for each construction phase.

Issue Scoping and Stakeholder Consultation

An issue scoping process was undertaken to identify the Valued Environmental Components (VECs), both biophysical and socio-economic, for the environmental assessment and the issues and concerns to be considered. The issue scoping process involved:

- reviewing the guidelines issued by the Department of Environment for the assessment;
- consulting with the Innu, including meetings with Innu Nation, a consultation program on route selection, information leaflets, public meeting, presentation to high school students, radio announcements and interviews with elders and others familiar with the area;
- holding public information sessions in Happy Valley-Goose Bay, North West River, Cartwright and Port Hope Simpson between October 7 and 10, 2002;
- consulting with outfitters, municipalities, and economic development and tourism organizations;
- reviewing public submissions received during the public review period for the project registration, including submissions from the Labrador Métis Nation and outfitters;
- reviewing results of field and archival research undertaken in relation to the assessment; and
- reviewing reports and documents related to work undertaken on Phases I and II of the TLH.

Issues and concerns identified regarding the project includes items relating to highway design and construction, highway operation and maintenance, biophysical environment, resource use and users, cultural and historic resources, tourism and recreation, Aboriginal way-of-life, culture and resource use, socio-economic environment, and aspects of environmental assessment and planning. It was during this issue scoping and consultation process that the outfitter route was identified by members of the Newfoundland and Labrador Outfitters Association. The majority of the issues and concerns identified during the process are also relevant to the outfitter route.

Through the issue scoping process, 16 VECs were identified. The environmental assessment focuses on raptors, waterfowl, caribou, furbearers, fish and fish habitat, species at risk, geomorphology, water resources, wetlands, riparian habitat, historic resources, resource use and users, Akamiuapishku/Mealy Mountains National Park, tourism and recreation, employment and business, and community life. These VECs were considered in the environmental effects assessment.

Environmental Effects Assessment

Information is presented on each of the 16 VECs as collected from existing literature and database sources, interviews and field studies. The EIS/CSR completed by JW/IELP (2003a) for the preferred route, as well as component studies and other supporting studies, contain information of relevance to the outfitter route, as the western and eastern sections of the two routes are common to both. Supporting studies were conducted for the environmental assessment on the outfitter route, including studies for raptors, waterfowl, caribou, and fish and fish habitat. Armitage and Stopp (2003) provide detailed information on Innu land and resource use and discussion of potential environmental effects resulting from the project. No requirement for further information on Innu land and resource was identified.

The methods used for this environmental assessment are largely based on the work of Beanlands and Duinker (1983) and the Canadian Environmental Assessment Agency (1994; 1999). The approved guidelines for the EIS/CSR also shaped the strategy for the environmental assessment. Mitigation and monitoring/follow-up programs were identified. The assessment is conducted on a VEC-by-VEC basis, with each VEC being addressed in a single section. Specific steps for assessing each VEC are:

- determining assessment boundaries;
- describing the existing environment;
- identifying potential interactions between the project and VEC;
- identifying issues and concerns;
- presenting existing knowledge about the potential project-VEC interactions;
- identifying issues and concerns;
- identifying mitigation measures;
- assessing environmental effects;
- evaluating environmental effects significance;
- assessing and evaluating cumulative environmental effects; and
- identifying environmental monitoring and follow-up programs, if required.

Project-VEC interactions were analyzed to determine potential effects associated with project components and activities. The analysis for each VEC was carried out for each project phase and potential accidental and/or unplanned events. Potential accidental or unplanned events considered are: highway failure; fires; fuel or chemical spills; vehicle and equipment accidents; and vehicle failure. The analysis used qualitative and, where possible, quantitative information available from existing knowledge and appropriate analytical tools, as well as considering identified mitigation measures. To eliminate or reduce any predicted environmental effects, mitigative measures were incorporated into the project design. Residual environmental effects were predicted for VECs following the application of proposed mitigation measures.

The residual environmental effects of each project phase were evaluated as either significant, not significant or positive, based on the definitions of significance developed for each VEC. Where appropriate, significant and not significant ratings are further rated as major or moderate (significant) and minor or negligible (not significant). The significance of residual environmental effects, as determined for each of the VECs, is summarized in Table 1. For any adverse significant effects identified, likelihood, level of confidence and the sustainable use of renewable resources were also considered (as required by the *Canadian Environmental Assessment Act* (CEAA)).

Although highway construction and operation may result in adverse environmental effects, they are not likely to be significant for any of the VECs identified for the environmental assessment. However, the potential residual effects of accidental events, depending on the nature, timing and duration of the events, may range from negligible (not significant) to major (significant) (Table 1).

Table 1 Summary of Residual Environmental Effects Significance

VEC	Construction	Operation	Accidental Events
Raptors	Not Significant (Minor)	Not Significant (Minor)	Significant (Moderate)
Waterfowl	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Minor)
Caribou	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Minor)
Furbearers	Not Significant (Minor)	Not Significant (Minor)	Significant (Moderate)
Fish and Fish Habitat	Not Significant (Minor)	Not Significant (Minor)	Significant (Moderate)
Species at Risk	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Minor)
Geomorphology	Not Significant	Not Significant	Not Significant
Water Resources	Not Significant (Minor)	Not Significant (Minor)	Significant (Moderate)
Wetlands	Not Significant	Not Significant	Not Significant
Riparian Habitat	Not Significant	Not Significant	Not Significant
Historic Resources	Not Significant (Minor)	Not Significant (Minor)	Significant (Major)
Resource Use and Users (not including Innu land and resource use, see Armitage and Stopp (2003))	Not Significant (Minor)	Not Significant (Minor)	Not Significant to Significant (Minor to Major)
Mealy Mountains National Park	Not Significant	Not Significant	Not Significant
Tourism and Recreation	Not Significant (Negligible)	Not Significant (Minor)	Not Significant to Significant (Negligible to Major)
Employment and Business	n/a	Not Significant (Negligible)	Not Significant (Minor)
Community Life	Not Significant (Minor)	Not Significant (Minor)	Not Significant (Minor)

Cumulative Environmental Effects

Cumulative environmental effects are the likely effects of the project on the environment combined with other past, existing and imminent projects and activities. Determining cumulative environmental effects of the TLH - Phase III project considered the following existing, planned or potential projects and activities:

- existing sections of the TLH (Phases I and II);
- other roads in central and southern Labrador;

- Akamiuapishku/Mealy Mountains National Park;
- hydro development, including transmission lines;
- forestry activities;
- tourism and recreation activities, including outfitting operations;
- land and resource use activities, including consideration of increased access, by Innu and other residents of Labrador;
- Voisey's Bay mine/mill development;
- mineral exploration; and
- low-level military flight training.

As the likelihood, nature, location and timing of any actions induced by the TLH - Phase III are not known and control of most potential induced actions and related effects is beyond the responsibility of WST, assumptions were made for assessing cumulative environmental effects of induced actions, including:

- other projects and activities will be subject to appropriate planning and management;
- other projects and activities will be subject to the appropriate government requirements (e.g., legislation, regulations and guidelines) for protecting crown resources;
- relevant government agencies will have adequate resources to effectively carry out their mandate with respect to enforcement;
- adherence to existing regulatory requirements will not measurably change; and
- the TLH - Phase III will be designated a protected road and subject to the *Protected Road Zoning Regulations* administered by the Department of Municipal and Provincial Affairs.

Taking these assumptions into consideration, no significant adverse cumulative environmental effects were identified for the outfitter route. While increased use of the area will result from improved access provided by the highway, the planning and control measures in place to govern other activities and development that may be carried out in the area act to reduce the potential for adverse cumulative effects.

Monitoring

WST will conduct environmental compliance monitoring throughout project construction to ensure that EPP provisions, permits, approvals and authorizations are followed. Prior to each construction season, a survey for active raptor nests (specifically osprey and bald eagle) will be completed within 800 m of the construction zone and a survey for active beaver lodges/ponds will be conducted within 100 m of the construction zone. Prior to the start of any construction on the outfitter route, the following will be completed:

- study to further assess acid-generating rock potential;
- field investigations to assess geotechnical parameters of materials to be used for construction;
- study to further assess the potential for encountering rare plants; and
- historic resources survey.

WST will also support fish population studies to be completed during the construction phase. The protocols for these studies have been developed by the Inland Fish and Wildlife Division, who will take the lead in the survey. No environmental effects monitoring program is proposed for the TLH construction and operation.

Summary and Conclusions

The environmental assessment of the TLH - Phase III project considered two route alternatives, a preferred route, as presented in JW/IELP (2003a), and an alternative route, referred to as the outfitter route and the subject of the environmental assessment presented in this report. Based on the environmental assessment of the biological VECs, no constraints have been identified that apply to one route more than the other. The assessment predicts that there will be minor (not significant) effects to the environment resulting from the construction and operation of the road. More severe induced effects of other activities are possible; however, the severity of the effects depends on the assumptions that are made regarding future activities and interactions with the road.

Based on the socio-economic VECs that were examined, no great differences were determined for the effects of the preferred and outfitter routes. There will be positive benefits to employment and business, and minor (not significant) effects to other socio-economic VECs (i.e., resource use and users, and tourism and recreation) for either route. The minor (not significant) effects that have been concluded address the wider socio-economic picture, with individual stakeholder interests being considered in the balance. While the highway will not preclude the establishment of the Akamiuapishku/Mealy Mountains National Park, the park itself would afford protection to many of the VECs.

Given that WST will apply the same best available technology and practice to the construction and operation of the TLH - Phase III (preferred or outfitter route), there are no differences between the two routes that preclude the highway from being constructed along the preferred route. As the purpose of the TLH-Phase III is to complete a reliable and cost-effective all-season, ground transportation system in Labrador that provides a link between communities in western Labrador with those of southern Labrador, the decision then is logically based on cost-effectiveness. Taking into consideration the lower cost for constructing the preferred route (note that the outfitter route costs $7.5 million more to construct, plus $4.5 million for an additional year of ferry service), and the fact that a highway along the preferred route will be cheaper to maintain and will present a lower cost transportation alternative for users, WST intends to proceed with construction of the TLH - Phase III along the preferred route as outlined in JW/IELP (2003a).

Tables of Concordance

The following tables identify where information is presented in the EIS/CSR. A Table of Concordance (Table 2) with the EIS/CSR guidelines for the TLH - Phase III indicates where specific items from the guidelines are addressed within the EIS/CSR, while a Table of Concordance with Sections 16(1) and 16(2) of CEAA is provided as Table 3.

Table 2 Table of Concordance with the Trans Labrador Highway - Phase III Environmental Impact Statement and Comprehensive Study Report Guidelines

EIS/CSR Guideline Requirements	Where Addressed in the EIS/CSR
Executive Summary	
Executive Summary	Executive Summary
Table of Concordance	Executive Summary
Introduction	
Name of Undertaking	Section 1.1
Identification of Proponent	Section 1.2
Purpose of the Environmental Impact Statement	Section 1.4.1
The Proposed Undertaking	
The Prospective Site and Study Area	Section 3.1.1
Rationale/Need/Purpose of the Project	Section 3.1.2
Alternatives	Chapter 2.0
• Alternatives to the Project	Section 2.1
• Alternative Methods of Carrying out the Project (including outfitter's preferred route and routing criteria)	Section 2.2
Relationship to Legislation, Permitting, Regulatory Agencies and Policies	Sections 1.3 and 3.2
General Project Description (Project Features)	Section 3.3
Construction	Section 3.4
Operation and Maintenance	Section 3.5
Abandonment (Decommissioning)	Section 3.6
Environment	
Existing Environment	Chapter 4.0
• Meteorological Conditions	Section 4.1.2
• Atmospheric Conditions	Section 4.1.2
• Ambient Noise Levels	Section 4.1.1
• Hydrological Conditions, including hydrologic, hydraulic and design parameters	Section 4.3.2
• Hydrological Conditions, including hydraulic and water quality	Section 4.3.2
• Geography and Topography	Section 4.1.3
• Geology and Geomorphology	Sections 4.1.3.1 and 4.1.3.2
• Wetlands	Section 4.2.1.2

EIS/CSR Guideline Requirements	Where Addressed in the EIS/CSR
• Flora (including species at risk)	Section 4.2.1
• Fauna (including species at risk)	Sections 4.2.2 and 4.2.3
• Fish	Section 4.3.3
VEC-Specific Discussion of Existing Environment	Chapter 7.0
• Raptors	Section 7.1.3
• Caribou	Section 7.3.3
• Furbearers	Section 7.4.3
• Migratory Birds	Section 7.2.3
• Species at Risk (flora and fauna)	Section 7.6.3
• Geomorphology	Section 7.7.3
• Water Resources	Section 7.8.3
• Wetlands	Section 7.9.3
• Riparian Habitat	Section 7.10.3
• Historic Resources	Section 7.11.3
• Tourism and Recreation	Section 7.14.3
• Akamiuapishku/Mealy Mountains National Park	Section 7.13.3
• Resource Use and Users	Section 7.12.3
• Fish and Fish Habitat	Section 7.5.3
• Community Life, Employment and Business	Sections 7.15.3 and 7.16.3
Component Studies (report summaries)	Sections 1.4.3 and 1.4.4
• Land and Resource Use	Not Applicable
• Migratory Birds (including but not limited to harlequin duck)	Section 1.4.3.1
• Raptors	Section 1.4.3.2
• Caribou	Section 1.4.3.3
• Fish and Fish Habitat	Section 1.4.3.4
• Historic Resources	Not Applicable
• Tourism and Recreation	Not Applicable
• Community Life, Employment and Business	Not Applicable
Data Gaps	Section 4.5
Future Environment Without the Project	Section 4.6

EIS/CSR Guideline Requirements	Where Addressed in the EIS/CSR
Environmental Effects	
The following must receive particular attention: • land and resource use; • Akamiuapishku/Mealy Mountains National Park; • fish and fish habitat; • water resources; • tourism and recreation; and • community life, employment and business.	 Section 7.12 Section 7.13 Section 7.5 Section 7.8 Section 7.14 Sections 7.15 and 7.16
Scope of the Assessment	Appendix A (Terms of Reference)
Effects of the Environment on the Highway	Section 3.8
Capacity of Renewable Resources that are Likely to Significantly Affected by the Project	Section 8.5
Predicted Environmental Effects	Chapter 7.0
• Methodology	Sections 7.1.2, 7.2.2, 7.3.2, 7.4.2, 7.5.2, 7.6.2, 7.7.2, 7.8.2, 7.9.2, 7.10.2, 7.11.2, 7.12.2, 7.13.2, 7.14.2, 7.15.2, and 7.16.2
• Spatial and Temporal Boundaries	Sections 7.1.1, 7.2.1, 7.3.1, 7.4.1, 7.5.1, 7.6.1, 7.7.1, 7.8.1, 7.9.1, 7.10.1, 7.11.1, 7.12.1, 7.13.1, 7.14.1, 7.15.1, and 7.16.1
• Temporal Boundaries for Construction and Operation	Sections 7.1.1, 7.2.1, 7.3.1, 7.4.1, 7.5.1, 7.6.1, 7.7.1, 7.8.1, 7.9.1, 7.10.1, 7.11.1, 7.12.1, 7.13.1, 7.14.1, 7.15.1, and 7.16.1
• Project-VEC Interaction Determination Strategy	Section 5.4
• Cumulative Environmental Effects Methodology	Section 6.5
• Environmental Assessment Methodology	Chapter 6.0
• Definitions of Significance	Sections 7.1.9, 7.2.9, 7.3.9, 7.4.9, 7.5.9, 7.6.9, 7.7.9, 7.8.9, 7.9.9, 7.10.9, 7.11.9, 7.12.9, 7.13.9, 7.14.9, 7.15.9 and 7.16.9
• Potential Interactions	Sections 7.1.4, 7.2.4, 7.3.4, 7.4.4, 7.5.4, 7.6.4, 7.7.4, 7.8.4, 7.9.4, 7.10.4, 7.11.4, 7.12.4, 7.13.4, 7.14.4, 7.15.4 and 7.16.4
• Issues and Concerns	Sections 7.1.5, 7.2.5, 7.3.5, 7.4.5, 7.5.5, 7.6.5, 7.7.5, 7.8.5, 7.9.5, 7.10.5, 7.11.5, 7.12.5, 7.13.5, 7.14.5, 7.15.,5 and 7.16.5
• Existing Knowledge	Sections 7.1.6, 7.2.6, 7.3.6, 7.4.6, 7.5.6, 7.6.6, 7.7.6, 7.8.6, 7.9.6, 7.10.6, 7.11.6, 7.12.6, 7.13.6, 7.14.6, 7.15.6, and 7.16.6
• Environmental Effects Analysis	Sections 7.1.8, 7.2.8, 7.3.8, 7.4.8, 7.5.8, 7.6.8, 7.7.8, 7.8.8, 7.9.8, 7.10.8, 7.11.8, 7.12.8, 7.13.8, 7.14.8, 7.15.8 and 7.16.8

EIS/CSR Guideline Requirements	Where Addressed in the EIS/CSR
Sustainable Development	Sections 7.1.9, 7.2.9, 7.3.9, 7.4.9, 7.5.9, 7.6.9, 7.7.9, 7.8.9, 7.9.9, 7.10.9, 7.11.9, 7.12.9, 7.13.9, 7.14.9, 7.15.9, 7.16.9 and 8.5
Cumulative Environmental Effects	Sections 7.1.10, 7.2.10, 7.3.10, 7.4.10, 7.5.10, 7.6.10, 7.7.10, 7.8.10, 7.9.10, 7.10.10, 7.11.10, 7.12.10, 7.13.10, 7.14.10, 7.15.10 and 7.16.10
Environmental Protection	
Mitigation	Sections 7.1.7, 7.2.7, 7.3.7, 7.4.7, 7.5.7, 7.6.7, 7.7.7, 7.8.7, 7.9.7, 7.10.7, 7.11.7, 7.12.7, 7.13.7, 7.14.7, 7.15.7 and 7.16.7
Emergency Response/Contingency Plan	Section 3.9.5
Environmental Monitoring and Follow-Up Programs	Sections 3.9.8, 7.1.11, 7.2.11, 7.3.11, 7.4.11, 7.5.11, 7.6.11, 7.7.11, 7.8.11, 7.9.11, 7.10.11, 7.11.11, 7.12.11, 7.13.11, 7.14.11, 7.15.11 and 7.16.11
Rehabilitation	Section 3.9.7
Residual Effects	
Residual Effects	Sections 7.1.8, 7.2.8, 7.3.8, 7.4.8, 7.5.8, 7.6.8, 7.7.8, 7.8.8, 7.9.8, 7.10.8, 7.11.8, 7.12.8, 7.13.8, 7.14.8, 7.15.8 and 7.16.8
Effects Evaluation	Sections 7.1.9, 7.2.9, 7.3.9, 7.4.9, 7.5.9, 7.6.9, 7.7.9, 7.8.9, 7.9.9, 7.10.9, 7.11.9, 7.12.9, 7.13.9, 7.14.9, 7.15.9 and 7.16.9
Public Participation	
Public Participation Program	Section 5.2.4
Public Concerns	Section 5.3
Environmental Protection Plan	
Environmental Protection Plan Outline	Section 3.9.4
References Cited	
Personal Communications	Section 10.1
Literature Cited	Section 10.2
Personnel	
Brief Descriptions of Personnel Expertise and Qualifications	Not Applicable
Studies Undertaken in Conjunction with EIS	
Resource Use and Users Component Study	Not Applicable
Waterfowl Component Study	Section 1.4.3.1; JW/MLP 2003a
Raptor Component Study	Section 1.4.3.2; JW/MLP 2003b
Caribou Component Study	Section 1.4.3.3; Otto 2003

EIS/CSR Guideline Requirements	Where Addressed in the EIS/CSR
Fish and Fish Habitat Component Study	Section 1.4.3.4; JW/MLP 2003c
Historic Resources Component Study	Not Applicable
Tourism and Recreation Component Study	Not Applicable
Community Life, Employment and Business Component Study	Not Applicable
Innu Land and Resource Use Study	Not Applicable

Table 3 Table of Concordance with CEAA Section 16(1) and 16(2)

Section 16(1) and (2) Requirements	Where Addressed in the EIS/CSR
Executive Summary	Executive Summary
Introduction	
Project Overview	Section 1.1
Purpose of the Project	Section 3.1.2
Need for the Project	Section 3.1.2
Timing Considerations	Section 3.4.1
Regulatory, policy and planning context	Section 1.3
Project Description	
The Prospective Site and Study Area	Section 3.1.1
Definition of the Project	Section 1.1
Alternative Means of Carrying Out the Project	Section 2.2
Alternatives to the Project	Section 2.1
Scope of Assessment	
Scope of the Project	Appendix A (Terms of Reference); Section 5.1
Factors to be Considered	Appendix A (Terms of Reference); Section 5.1
Scope of Factors	Appendix A (Terms of Reference); Section 5.1
Public Participation	
Public Participation Program	Section 5.2.4
Methods and Results of the Program	Section 5.2.4 and 5.3
Description of the Existing Environment	
General Environmental Context	Chapter 4.0
VECs in the Study Area	Chapter 4.0
Relationships Between Environmental Components	Chapter 4.0
Sensitivity to Disturbance	Chapter 4.0
Environmental Effects	
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TO BE PROVIDED SEPARATELY

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ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
ASL	Above Sea Level
ATV	All-terrain Vehicle
BP	[Years] Before Present
BPCH	Buchans Plateau Caribou Herd
$CaCO_3$	Calcium Carbonate
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CCREM	Canadian Council of Resource and Environment Ministers
CEAA	*Canadian Environmental Assessment Act*
CFL Co	Churchill Falls (Labrador) Company
CHRS	Canadian Heritage Rivers System
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch per Unit Effort
CSP	Corrugated Steel Pipe
CSR	Comprehensive Study Report
CWS	Canadian Wildlife Service
dBa	Decibels in the A-weighted Spectrum
DBH	Diameter at Breast Height
DDRR	Department of Development and Rural Renewal
DFO	Department of Fisheries and Oceans Canada
DFRA	Department of Forest Resources and Agrifoods
DND	Department of National Defence Canada
DOC	Dissolved Organic Carbon
DTCR	Department of Tourism, Culture and Recreation
ECM	Environmental Compliance Monitoring
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ESO	Environmental Surveillance Officer
ESWG	Ecological Stratification Working Group
EQL	Estimated Quantitation Limit
FGA	Fiander-Good Associates Limited
FMD	Forest Management Districts
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GRHS	Grenfell Regional Health Services
HADD	Harmful Alteration, Disruption or Destruction

IBP	International Biological Programme
IELP	Innu Environmental Limited Partnership
JW/JWEL	Jacques Whitford Environment Limited
KP	Kilometre Point
KPa	KILOPASCALS
LLTA	Low-Level Training Area
LMN	Labrador Métis Nation
LMSS	Land Management and Survey Systems
MAPA	Department of Municipal and Provincial Affairs
MLP	Minaskuat Limited Partnership
MMCH	Mealy Mountains Caribou Herd
MOD	Mineral Occurrence Database
MOU	Memorandum of Understanding
NLH	Newfoundland and Labrador Hydro
NO_X	Nitrogen Oxides
NRCAN	Natural Resources Canada
NTS	National Topographic Survey
NWPA	*Navigable Waters Protection Act*
NWWG	National Wetlands Working Group
PAH	Polycyclic Aromatic Hydrocarbon
PAO	Provincial Archaeology Office
PTA	Practice Target Area
RA	Responsible Authority
RCMP	Royal Canadian Mounted Police
RLU 80	Rural Local Undivided 80 km/hr
RWMCH	Red Wine Mountains Caribou Herd
SO_2	Sulphur Dioxide
TAC	Transportation Association of Canada
TLH	Trans Labrador Highway
USDOT	United States Department of Transportation
VBNC	Voisey's Bay Nickel Company Limited
VECs	Valued Environmental Components
VHF	Very High Frequency
VOCs	Volatile Organic Compounds
WDFW	Washington Department of Fish and Wildlife
WHMIS	Workplace Hazardous Materials Information System
WRMD	Water Resources Management Division
WST	Department of Works, Services and Transportation

1.0 INTRODUCTION

1.1 The Project

The Cartwright Junction to Happy Valley-Goose Bay Trans Labrador Highway (TLH) will be a two-lane, all-season, gravel surface highway extending from Cartwright Junction in the east to Happy Valley-Goose Bay in the west. This highway is Phase III of the TLH and will link the existing TLH highway sections to the east (Phase II) and west (Phase I). The project is referred to as the TLH - Phase III throughout this environmental impact statement (EIS) and comprehensive study report (CSR).

This EIS/CSR focuses on the route identified by the Newfoundland and Labrador Outfitters Association (hereafter referred to as the outfitter route), which was determined to be a viable alternative to the preferred route for the TLH - Phase III (see Chapter 2.0 for discussion of alternatives). The preferred route for the highway was described and assessed in JW/IELP (2003a), which was submitted to the Minister of Environment in January 2003. The two route alternatives are outlined in Figure 1.l.

1.2 The Proponent

The TLH - Phase III project is proposed by the Department of Works, Services and Transportation (WST). WST is the Government of Newfoundland and Labrador department responsible for providing a safe, efficient and environmentally sustainable transportation system for the province, including primary and secondary highways, community access roads, and air and marine transportation facilities.

Project contacts are:

Corporate Body:	Department of Works, Services and Transportation Government of Newfoundland and Labrador 6th Floor, West Block, Confederation Building St. John's, NL A1B 4J6
Chief Executive Officer:	Don Osmond, Deputy Minister (709) 729-3676 (phone) (709) 729-4285 (fax)
Environmental Assessment Contacts:	Terrence McCarthy Senior Coordinator, Trans Labrador Highway (709) 729-3640 (phone) (709) 729-0283 (fax) McCarthT@gov.nf.ca

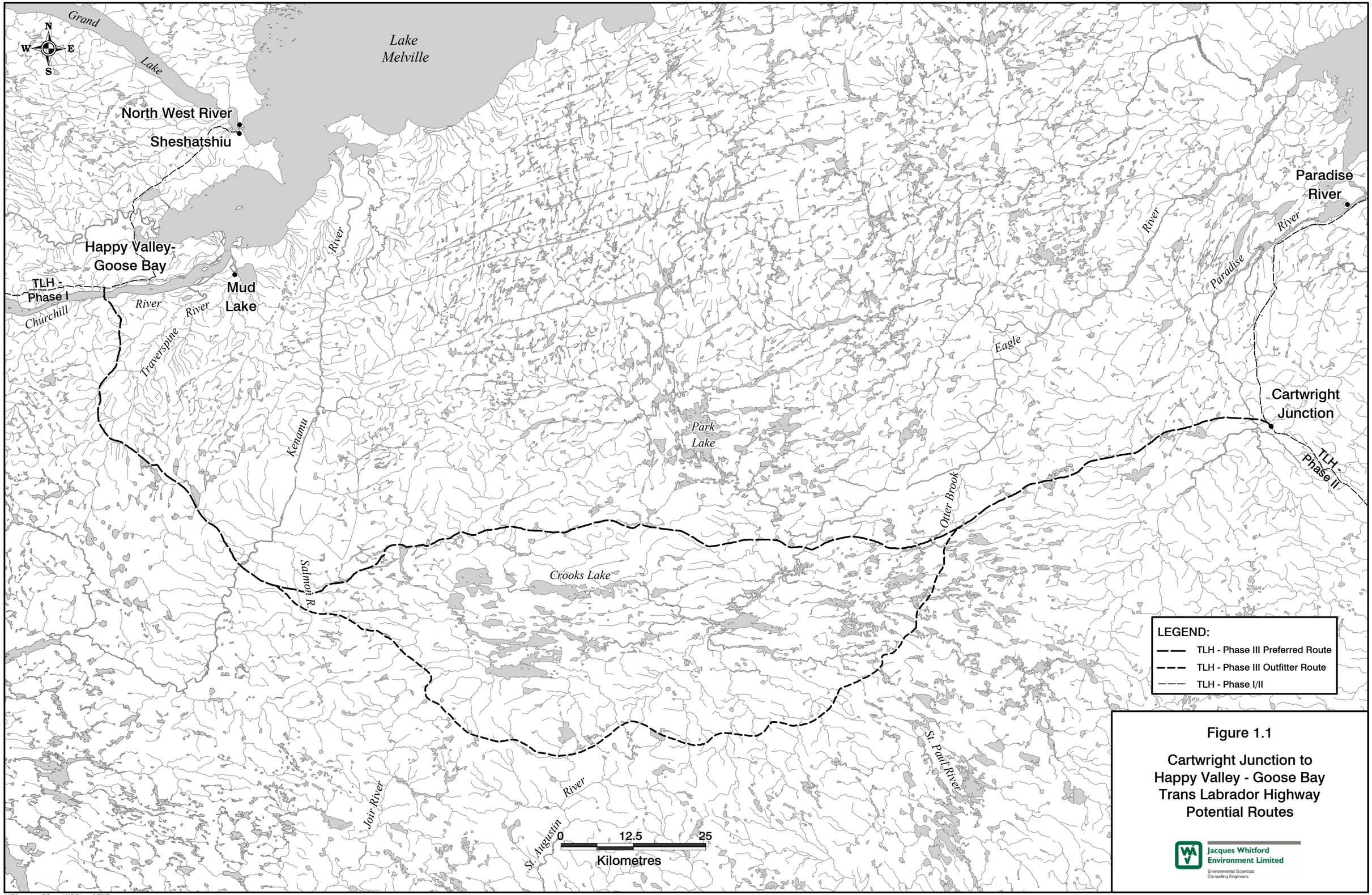

Figure 1.1

Cartwright Junction to
Happy Valley - Goose Bay
Trans Labrador Highway
Potential Routes

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NFS09308-ES-31.WOR 28SEPT03 2:15pm

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1.3 Regulatory Framework

The proposed TLH - Phase III is subject to a cooperative environmental assessment that meets the requirements of the provincial environmental assessment process as outlined under the *Environmental Protection Act*, and the federal environmental assessment process as outlined by the *Canadian Environmental Assessment Act* (CEAA). Following release from the environmental process, the project will be subject to various environmental approvals.

1.3.1 Provincial Environmental Assessment Process

The TLH - Phase III project was registered pursuant to the *Environmental Assessment Act, 2000* on April 3, 2002. This act was later repealed and its contents were incorporated into the *Environmental Protection Act*, which received royal assent on May 22, 2002. Following both government and public review, the Minister of Environment determined on June 19, 2002 that further environmental assessment (an EIS) was required for the proposed project. Consistent with subsection 52(1) of the *Environmental Protection Act*, the Minister appointed an Environmental Assessment Committee with representation from all relevant provincial and federal government departments and agencies to provide advice on scientific and technical matters related to the proposed undertaking. The Environmental Assessment Committee includes representation from:

- Environmental Assessment Division, Department of Environment;
- Water Resources Division, Department of Environment;
- Inland Fish and Wildlife Division, Department of Tourism, Culture and Recreation;
- Department of Forest Resources and Agrifoods;
- Labrador and Aboriginal Affairs;
- Parks and Natural Areas Division, Department of Tourism, Culture and Recreation;
- Strategic Tourism Product Development, Department of Tourism, Culture and Recreation;
- Provincial Archaeology Office, Department of Tourism, Culture and Recreation;
- Urban and Rural Planning Division, Department of Municipal and Provincial Affairs (MAPA);

- Department of Mines and Energy;
- Department of Fisheries and Oceans (DFO);
- Environmental Protection Branch, Environment Canada; and
- Parks Canada.

As per Section 53 of the *Environmental Protection Act*, the Environmental Assessment Committee prepared guidelines for preparing the EIS/CSR for the TLH - Phase III project. These guidelines were subject to a public review period, as per Subsection 59(1) of the *Environmental Protection Act*. After approval from the Minister of Environment, the guidelines were provided to the project proponent in December 2002. These guidelines, provided in Appendix A, establish the framework for preparing the EIS/CSR by outlining the format and information requirements. A Table of Concordance with the guideline requirements is provided in the Executive Summary.

At the provincial level, the environmental assessment is also subject to a Memorandum of Understanding (MOU) between Innu Nation and the Departments of Environment, and Labrador and Aboriginal Affairs. Following submission of the EIS/CSR to the Minister of Environment, the EIS will be examined to ensure that it fulfills the requirements of the guidelines and to determine the acceptability of the proposed project following a review of the anticipated effects, proposed mitigation measures and monitoring program. When a decision has been made, the Minister of Environment will recommend whether the undertaking should be released subject to terms and conditions or that it not be permitted to proceed.

1.3.2 Federal Environmental Assessment Process

The TLH - Phase III project is also subject to CEAA, the federal environmental assessment legislation. DFO is the lead Responsible Authority (RA) for the federal assessment, as there is a requirement for approvals under the *Navigable Waters Protection Act* (NWPA) and potential for issuance of authorizations under the *Fisheries Act*. To date, DFO have assumed that watercourse crossings will be designed and constructed in such a manner as to avoid any harmful alteration, disruption or destruction (HADD) of fish habitat (B. Brown, pers. comm.). Federal Authorities, providing expert advice to DFO on the environmental assessment, are Environment Canada, Parks Canada and Health Canada. Representatives from DFO, Environment Canada and Parks Canada have been included in the joint provincial/federal Environmental Assessment Committee appointed for the environmental assessment (Section 1.3.1).

DFO has determined that a CSR under CEAA must be prepared for the TLH - Phase III. CEAA requires that the following factors be addressed in a comprehensive study:

- environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project;
- cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- significance of the environmental effects;
- public comments;

- technically and economically feasible mitigation measures for any significant adverse environmental effects of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any alternative means;
- the need for, and the requirements of, any follow-up program in respect of the project;
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future; and
- any other matter relevant to the comprehensive study required to be considered.

A Table of Concordance with the CEAA requirements for a comprehensive study is provided in the Executive Summary.

1.3.3 Environmental Authorizations

Following release from both the provincial and federal environmental assessment processes, the TLH - Phase III project can be expected to require a number of approvals, permits and authorizations prior to project initiation. In addition, throughout project construction and operation, compliance with various standards contained in federal and provincial legislation, regulations and guidelines will be required. The project proponent will also be required to comply with any other terms and conditions associated with the EIS/CSR release. Potential environmental authorizations as they relate specifically to the project description are discussed in detail in Section 3.2.

In addition, following settlement of the Innu land claim, currently under negotiation between Innu Nation and the federal and provincial governments, WST must comply with the terms set out in the final settlement.

1.4 Environmental Impact Statement and Comprehensive Study Report

1.4.1 Purpose

This EIS/CSR presents information about the project and the results of the environmental assessment conducted for the project. The environmental assessment focuses on the outfitter route and addresses the 16 Valued Environmental Components (VECs) as outlined in the original guidelines. VECs assessed include raptors, waterfowl and passerine birds, caribou, furbearers, fish and fish habitat, species at risk, geomorphology, water resources, wetlands, riparian habitat, historic resources, resource use and users, Akamiuapishku/Mealy Mountains National Park, tourism and recreation, employment and business, and community life.

The EIS/CSR for the outfitter route fulfills both the provincial and federal environmental assessment requirements, as well as the requirements outlined in the guidelines issued in December 2002 and comments presented in the April 2003 deficiency statement for the EIS/CSR prepared for the preferred route. Information on each VEC, as collected from existing literature and field studies, project-VEC interactions, environmental effects and mitigation measures is presented. Component studies, described in Section 1.4.3, were conducted for the environmental assessment of the outfitter route to address information gaps.

1.4.2 Document Organization

The EIS/CSR was prepared by Jacques Whitford Environment Limited (JW) with Minaskuat Limited Partnership (MLP), and with support from Land Management and Survey Systems (LMSS) and Northlands Associates. Information on the study team and brief descriptions of each team member's expertise and experience were provided in Appendix B of JW/IELP (2003a), the EIS/CSR for the preferred route.

This EIS/CSR for the outfitter route is organized as follows:

Executive Summary — The executive summary identifies the proponent, and provides a synopsis of the project description, predicted environmental effects, mitigation measures, residual and cumulative environmental effects, and proposed monitoring and follow-up programs. Tables of Concordance with the EIS/CSR guidelines and CEAA requirements are provided in the executive summary to aid reviewers in ensuring that all requirements have been fulfilled.

Chapter 1 — Chapter 1.0 identifies the proponent, describes the purpose of the EIS/CSR, outlines the regulatory framework for the environmental assessment and describes the EIS/CSR organization. A summary of the component studies is also provided.

Chapter 2 — Chapter 2.0 describes the alternatives to the project and alternatives for carrying out the project, including a description of the route alternatives considered for the TLH - Phase III. The chapter concludes with a comparison of the two routes considered to be viable for the project.

Chapter 3 — Chapter 3.0 describes all components of the project. The discussion addresses: the purpose of the project, including rationale and need for the highway; schedule for project review, construction and implementation; permits, approvals and authorizations that may be required; construction and operation phases; environmental protection measures; and accidental events. The chapter concludes with a discussion of environmental management planning for the project.

Chapter 4 — Chapter 4.0 describes the existing environment of the study area. The project area is described in detail with respect to various components of the environment, including predicted future environmental conditions in the absence of the project.

Chapter 5 — Chapter 5.0 describes the scope of the assessment, and provides a synopsis of the issue scoping process and the issues and concerns raised during public information sessions and other scoping activities. The VECs, as identified in the EIS/CSR guidelines and the issues scoping exercise, are described.

Chapter 6 — Chapter 6.0 describes the methods used for assessing environmental effects. The methods are the same as those presented in Chapter 5.0 of the EIS/CSR for the preferred route.

Chapter 7	Chapter 7.0 provides the environmental effects assessment for each VEC, including boundaries, methods, existing conditions, potential project-VEC interactions, issues and concerns, existing knowledge, mitigation, effects analysis and evaluation, cumulative environmental effects, and environmental monitoring and follow-up measures that will be implemented.
Chapter 8	Chapter 8.0 presents concluding statements regarding the anticipated environmental effects that may result from the project using the outfitter route, a summary of specific mitigation measures/monitoring and follow-up commitments.
Chapter 9	References and personal communications cited in the EIS/CSR are provided in Chapter 9.0.
Appendices	Supporting materials are provided in the appendices.

1.4.3 Additional Supporting Studies

Additional supporting studies for the environmental assessment on the outfitter route include component studies conducted in conjunction with the environmental assessment. These component studies were submitted separately to the Minister of Environment for government and public review. A brief summary of each component study is provided in Sections 1.4.3.1 to 1.4.3.4. Other supporting documentation is noted in Sections 1.4.4 and 1.4.5.

1.4.3.1 Waterfowl Component Study

The waterfowl component study was conducted by JW and MLP, with assistance from LMSS, from June to September 2003. The objective of this study was to conduct original research and compile available information to describe waterfowl and waterfowl habitat along the portion of the outfitter route (i.e., the alternative highway route section identified as A13 in the EIS/CSR for the preferred route) that had not previously been assessed (see Chapter 2.0 for details on alternative routes). This component study was submitted to the Department of Environment as part of the addendum prepared by JW/MLP (2003a) for the waterfowl component study conducted on the preferred route.

Following the methodology used for surveys along the preferred route (JW and LMSS 2003a), five aerial surveys were conducted along the A13 section of the outfitter route in 2003: May 9 (early spring staging); May 23 (spring staging); June 9-10 (breeding); July 16-17 (brood/moulting); and September 4-5 (fall staging). To ensure that the area examined by this component study encompassed physical disturbance from the proposed project, a conservative buffer area was also included. Therefore, the study area comprised areas of wetland and waterbodies within 5 km on either side (i.e., 10-km wide) of the proposed A13 section of the outfitter route. Rivers with potential harlequin duck habitat were surveyed for 10 km on either side of proposed highway crossings.

Using either a Bell 206 L or Aerospatiale "A" Star helicopter, survey speed was approximately 50 km/hr at an altitude not greater than 30 m above ground level. Areas of open water and wetland habitat were identified

by the navigator/recorder, who directed the pilot and two other experienced observers over the course of each survey. Communication through an intercom system on the aircraft used a 12-hour clock for orientation, to locate and identify observations according to species and sex. All sightings were plotted directly onto 1:50,000 National Topographic Survey (NTS) map sheets (with the proposed route plotted on the maps in advance) and verified using the aircraft's global positioning system (GPS).

A total of five aerial surveys were conducted. Species diversity and numbers were low during the May 9 survey, as much of the survey area was still ice or snow covered. Only American black duck, green-winged teal and merganser sp. were observed. By the May 23 survey, species diversity and numbers increased and during the June survey, the greatest numbers of ducks were observed. American black ducks were observed in all highway sections during most surveys and were among the most commonly observed species during surveys. Similarly, Canada geese were observed in all highway sections during most surveys with distributions being fairly even between highway sections. Ring-necked ducks were the most abundant ducks during the fall survey with a concentrations in the central section of the highway. Mergansers were observed on all five surveys in 2003 while observations of other species such as scoters, northern pintail and green-winged teals varied between surveys

Similar to results observed along the preferred route, waterfowl observations during the series of surveys along the A13 section of the outfitter route indicate species occur at relatively low densities throughout wetland habitat in the study area. However, the large amount of potential habitat that is available results in waterfowl being widely distributed throughout the area. A total of 16 wetlands surveyed in June 2003 exhibited waterfowl densities greater than 0.10 birds/ha. The wetland with the highest density (1.2 birds/ha) is located approximately 160 m from the proposed highway route. Three of the sixteen are immediately adjacent to or within the highway right of way.

The western portion of the outfitter (A13 section) route (approximately 30 km) appears to support a larger number of waterfowl than the eastern and central sections due to the volume of wetland and small waterbodies that are present in that area.

1.4.3.2 Raptor Component Study

The Raptor Component Study was conducted by JW, MLP and LMSS from June to September 2003. The objective of this study was to conduct original research and compile available information to describe raptors and raptor habitat along the portion of the outfitter route that had not previously been assessed (i.e., the alternative highway route identified as A13 in the EIS/CSR for the preferred route). This component study was submitted to the Department of Environment as part of the addendum prepared by JW/MLP (2003b) for the raptor component study conducted on the preferred route.

Similar to the study conducted on the preferred route, the current study area consisted of a 2-km wide corridor centred on the A13 section of the outfitter route. Original survey data were collected during a specific survey designed for raptors or incidental observations made during waterfowl surveys conducted within the same area. The raptor survey followed a predetermined route outlined on 1:50,000 topographic map sheets, that covered approximately 500 m on each side of the highway right-of-way. The survey route varied (was widened) in some locations of greater potential habitat, such as river valleys and lake/pond networks, within the 2-km-wide survey corridor.

The specific aerial survey for raptors was conducted on June 20, 2003. The 206L Bell helicopter was maintained at a height of 50 to 100 m above ground. Flights were conducted at a speed of approximately 100 km/h and particular attention was placed on higher points of land within the coverage area and on trees adjacent to smaller tributary steams. All observations were recorded on 1:50,000 topographic maps and locations confirmed using the aircraft GPS.

A total of 13 osprey nests were identified within the 2-km study area. No bald eagle nests or cliff nests were observed during the survey. Eight of the thirteen osprey nests were active; five were empty and, of these, three were considered old and in disrepair. Several nests were concentrated in complexes of wetlands and waterbodies associated with the western portion of the outfitter (A13 section) route as it turned north back toward the Eagle River area.

Eight osprey nests fall within 800 m of the centre line of the outfitter (A13 section) route. Of these eight, two are within 200 m of the centre line of the outfitter (A13 section) route. No nests are located within 50 m of the centre line of the outfitter (A13 section) route.

1.4.3.3 Caribou Component Study

The Caribou Component Study was completed by the Science Division of the Department of Tourism, Culture and Recreation from June to September 2003. The objective of the study was to conduct additional research on the Mealy Mountains Caribou Herd (MMCH), specifically to provide information on herd movements during the calving and post-calving period. Aerial surveys were supplemented with VHF collars fixed to 11 female caribou. This component study was submitted to the Department of Environment as part of the addendum prepared by Otto (2003) for the caribou component study conducted on the preferred route.

From June13 to 21, 2003 (calving season), 25 percent of all 5 by 5 km blocks within a 10-km buffer of both the preferred and outfitter routes were surveyed by helicopter (total of 76 blocks). As both routes have common east and west sections, there were essentially four (east, west, south, and north) sub-areas surveyed. Blocks were considered for survey if greater than 50 percent of their area was within the 10 km buffer surrounding a route. All potential blocks were classified as either bog (estimated greater then 50 percent bog) or forest (estimated great then 50 percent forest) from maps. Bog areas were surveyed at twice the rate at which they occurred in each of the four sub-areas and were chosen randomly from available blocks, with the remaining required blocks were randomly chosen from the available forest blocks. All blocks were labelled with an alphanumeric code denoting sub-area, number, and cover type.

Surveys were flown using an A-Star 350D helicopter from June 13 to 21, 2003. Blocks were covered in a north-south fashion on “lines” spaced approximately 500 m apart, for approximately 10 lines per block. When

survey efficiency required, number of lines per block was modified slightly. All wildlife sightings made were recorded and geo-referenced. When caribou were sighted, all reasonable effort was made to classify the animal(s) by age and sex.

No caribou were observed in the west sub-area. In the east sub-area, two caribou were observed. In the south sub-area, five caribou were observed in blocks, including one doe-calf pair. Five other caribou were observed in the south sub-area during transit flights. The north sub-area contained the greatest number of caribou observations with 12, including four doe-calf pairs. Caribou density per block ranges from 0.52 caribou/km^2 for the northern sub-area to 0.167 caribou/km^2 in the southern sub-area. Further, caribou density ranged from 0.0204 caribou/km^2 in the northern sub-zone to 0.00654 caribou/km^2 in the southern sub-zone. It is likely that sightability of caribou was very much related to predominant cover, since all caribou observations made during surveys were made in blocks denoted as predominantly bog. The two caribou observations made within predominantly forest blocks were made in-transit and were within bogs in the forest block.

A post-calving aerial survey was completed on August 12 to 21, 2003 using a methodology similar to that used for the calving season block survey, with the exception that survey effort on each of the four sub-areas was equal relative to number of available blocks in each sub-area and, based on results from post-calving telemetry surveys, forest and bog blocks were randomly chosen for survey based on their relative abundance within specific sub-areas (i.e., if bog blocks made up 25 percent of available blocks, then 25 percent of survey effort was directed at bog blocks). Effort per block was expanded to attempt to compensate for decreased sightability of caribou within forest cover. However, no caribou were observed during this survey.

Three telemetry flights were performed on July 15, July 31, and August 12, 2003 to determine locations of all collared caribou from the MMCH. In total, 28 relocations were made, with 19 relocations made in forest cover or very heavy forest cover. Nine relocations were made in areas ranging from bog to wetland to open lichen forest. Data collected on post-calving season telemetry flights strongly suggest that caribou are using forested areas for cover during this period. These results are consistent with observations made on collared individuals from the MMCH during post-calving season 2002, and for individually-collared caribou from other populations including the Red Wine Mountains Caribou Herd (RWMCH) and the Lac Joseph Caribou Herd during post-calving season.

1.4.3.4 Fish and Fish Habitat Component Study

A Fish and Fish Habitat Component Study was conducted by JW and MLP from July to September 2003. The objective of this study was to review existing information on the distribution of fish species in the study area and conduct field surveys at all of the proposed watercourse crossing locations along the A13 section of the outfitter route. Fish sampling that was not conducted in 2002 was conducted at selected sites in 2003. This component study was submitted to the Department of Environment as part of the addendum prepared by JW/MLP (2003c) for the fish and fish habitat component study conducted on the preferred route.

Aerial surveys by helicopter were conducted at all crossing locations along the A13 section of the outfitter route (i.e., the crossings that were not surveyed in 2002). Route section A13 crosses two additional watersheds. There are nine crossings in the St. Augustin River watershed and there are no crossings in the small portion of the Joir River/Little Mecatina River watershed crossed by the route. Ground surveys were conducted at all ground-accessible crossing sites where the upstream area was greater than 2 km^2, and the

habitat was classed as spawning and rearing habitat (Beak Type I or Type II habitat). In total, 64 new crossings were surveyed from the air and 25 ground surveys were completed.

The fish habitat was characterized at each crossing location, using standard terminology and classifications. Stream width, water depth, substrate, habitat type, riparian vegetation, and apparent obstructions to fish migration or navigation were recorded for all crossings. The same information was recorded in more detail during ground surveys, along with water velocity, stream gradient and selected water quality parameters (temperature, pH, conductivity, dissolved oxygen and turbidity). A water sample was also taken to determine total dissolved solids, alkalinity and dissolved metals.

The results of the field surveys indicated that 30 of the proposed new crossing locations are small streams with a width of less than 2 m. The details of some of the crossings could not be determined due to the small size of the stream and the dense overhead canopy of the forest. At least 28 of the crossings comprised productive fish habitat (Type II habitat).

Twenty fish species are reported in the five watersheds that the highway will transect; however, only half of these are common in the study area. Fish sampling using electrofishing methods at nine crossing locations revealed brook trout at all sites, while northern pike, white sucker and longnose sucker were less prevalent.

Water quality data were compiled for 25 of the proposed watercourse crossing locations. Most of the water quality values are typical for the region. Parameters such as aluminum and iron were found at levels above the Canadian Council of Ministers of the Environment (CCME) Guideline for the Protection of Aquatic Life at some locations, a situation that is quite common in Newfoundland and Labrador waterbodies. Other parameters such as cadmium, selenium and silver had values that were either above the CCME guidelines or at levels that could not be compared to the guidelines, due to the level of quantification attained by the analytical laboratory.

1.4.4 Studies Previously Completed for the TLH - Phase III

The EIS/CSR completed by JW/IELP (2003a) for the TLH - Phase III preferred route contains much information of relevance to the outfitter route, as the western and eastern sections of the two routes overlap. Component studies and other supporting studies completed for the environmental assessment of the preferred route also provide important information for the environmental assessment of the outfitter route. These studies include:

- Waterfowl Component Study (JW and LMSS 2003a);
- Waterfowl Component Study Addendum (JW/MLP 2003a);
- Raptor Component Study (JW and LMSS 2003b);
- Caribou Component Study (Otto 2002a);
- Progress Report on Caribou Study (Otto 2002b);
- Caribou Component Study Addendum (Otto 2003);
- Fish and Fish Habitat Component Study (JW/IELP 2003b);
- Fish and Fish Habitat Component Study Addendum (JW/MLP 2003c);
- Land and Resource Use Component Study (JW 2003a);
- Historic Resources Component Study (IELP 2002);

- Tourism and Recreation Component Study (JW 2003b);
- Tourism and Recreation Component Study Addendum (JW/MLP 2003d);
- Community Life, Employment and Business (JW 2003c); and
- Innu Land and Resource Use Study (Armitage and Stopp 2003).

Brief descriptions of these studies (except for Otto (2003b), see (Section 1.4.4.1 and JW/MLP (2003a; 2003c; 2003d) see Sections 1.4.4.2 to 1.4.4.4) were presented in Section 1.4.3 of JW/IELP (2003a) and the complete reports were submitted to the Department of Environment in relation to the environmental assessment of the preferred route for the TLH - Phase III. The reports on waterfowl, raptor, caribou, and fish and fish habitat contain information relevant to the portions of the outfitter route that overlap with the preferred route, namely the western and eastern sections of the route.

The information provided in the reports on land and resource use, tourism and recreation, community life, employment and business, and Innu land and resource use is also applicable to the area of the outfitter route, as the study areas for these studies encompassed both the preferred and outfitter route. The case is the same for the regional historic resources study area, with the regional study area encompassing both the preferred and outfitter routes. However, the field work for this original study only focused on the preferred route.

1.4.4.1 Progress Report on Caribou Component Study for Preferred Route

In September 2002, a progress report on telemetry results for the MMCH was submitted by the Science Division. The information contained in the progress report was used to conduct the assessment of the environmental effects of the preferred route on the MMCH (JW/IELP 2003a). However, the progress report was not included as part of the Caribou Component Study submitted by the Science Division in December 2002 (Otto 2002a). The progress report is provided in Appendix G of the addendum to the EIS/CSR for the preferred route and is summarized below.

Telemetry monitoring of movement patterns and seasonal habitat use by six radio-collared caribou resulted in 48 relocations (including capture locations). No consistent pattern of movement or range use emerged. Three of the six collared animals (two males, one female) exhibited the relatively sedentary pattern typical of woodland caribou. Three others (two females, one male) moved up to 100 km during the monitoring period. The locations of collared animals lie within the traditional range of the herd, and indicate that members of the herd were present in the area of the proposed highway. Approximately 10 percent of the locations were located over a small area 40 km south of the highway, approximately 20 percent were located to the north, within 40 km of the highway but were more widely dispersed. Of these locations, one or more were within 5 km of the highway. The remaining 70 percent of the locations were more than 40 km north of the highway and spread over a large area

1.4.4.2 Waterfowl Component Study Addendum

Following submission of the Waterfowl Component Study (JW and LMSS 2003a) to the Department of Environment, the document was examined to determine whether it fulfilled the requirements of the guidelines. Before a decision could be reached on the project; it was determined that additional information was required. A deficiency statement outlining comments and requirements for further information on waterfowl was provided to WST in April 2003.

The addendum addresses questions and comments as outlined in the deficiency statement, presenting a response to each individual comment and question. The topics covered by the addendum include:

- general comments;
- study area;
- aerial surveys;
- regional population status of ducks;
- broods/moulting;
- fall staging;
- wetland size versus waterfowl abundance;
- probability of occurrences of waterfowl versus wetland areas;
- wetland and riparian habitat potential for waterfowl; and
- editorial revisions.

In addition, a waterfowl component study was required for any alternative determined to be viable, in this case the outfitter route. A component study focusing on the outfitter was conducted as part of this addendum (see Section 1.4.3.1).

1.4.4.3 Fish and Fish Habitat Component Study Addendum

Following submission of the Fish and Fish Habitat Component Study (JW/IELP 2003b) to the Department of Environment, the document was examined to determine whether it fulfilled the requirements of the guidelines. Before a decision could be reached on the project; it was determined that additional information was required. A deficiency statement outlining comments and requirements for further information on waterfowl was provided to WST in April 2003.

The addendum addresses questions and comments as outlined in the deficiency statement, presenting a response to each individual comment and question. The topics covered by the addendum include:

- general comments;
- watersheds;
- methods for ground surveys and water quality sampling;
- background information on stream crossings;
- fish habitat;
- fish species;
- water quality field measurements and laboratory results;
- field data and photographs; and
- missing information.

In addition, a fish and fish habitat component study was required for any alternative determined to be viable, in this case the outfitter route. A component study focusing on the outfitter was conducted as part of this addendum (see Section 1.4.3.4).

1.4.4.4 Tourism and Recreation Component Study Addendum

Following submission of the Tourism and Recreation Component Study (JW 2003b) to the Department of Environment, the document was examined to determine whether it fulfilled the requirements of the guidelines. Before a final decision could be reached on the project, the requirement for further information has been identified. A deficiency statement outlining comments and requirements for further information on tourism and recreation was provided to WST in April 2003.

The addendum addresses questions and comments as outlined in the deficiency statement, presenting a response to each individual comment and question. Deficiency statement comments were addressed using in-house sources and data and, where necessary, communication/interviews with representatives from relevant agencies. The topics covered by the addendum include those related to:

- tourism markets currently being attracted to Labrador;
- investment in tourism facilities in Labrador;
- needs/interests of Labrador's tourism markets;
- level of participation in various tourism activities in Labrador;
- tourist expenditures in Labrador;
- tourism assets in Labrador;
- experience with tourism potential associated with other circular routes; and
- contribution of the tourism and recreation industry in Labrador to the local economy.

1.4.5 Other Related Documentation

A number of other documents have been prepared in relation to the TLH in general, as well as specifically for Phases I and II of the TLH. A bibliography listing of these documents was provided in Section 1.4.4 of JW/IELP (2003a). These documents have either been previously submitted to the Department of Environment in relation to previous environmental assessments for Phases I and II of the TLH, or are available from WST.

2.0 PROJECT ALTERNATIVES

Alternatives to the project, and viable technical and economic alternatives for carrying out the project, have been considered. The main alternative to the project is to not construct the TLH - Phase III. Subsequent to this are the alternatives of maintaining the status quo in air and marine transportation services or improving or changing air and marine transportation services in the region to fulfill the project purpose. Several alternative means (i.e., routes) of carrying out the project are also identified and described.

The following information provides details on the potential alternatives associated with the TLH - Phase III. This information incorporates and expands on the information provided in Section 2.2 of JW/IELP (2003a), the EIS/CSR prepared for the preferred route.

2.1 Alternatives to the Project

The alternative to the project, whether the preferred or outfitter route is used, is to not construct the TLH - Phase III. This would mean that the highway system across Labrador would not be completed and there would be no transportation link established between Happy Valley-Goose Bay and southern Labrador. In the event that the TLH - Phase III is not constructed, the project purpose would be met through maintaining and/or improving existing air and marine transportation systems linking the Happy Valley-Goose Bay area with southern Labrador and the island of Newfoundland.

The air and marine transportation services provided in southern Labrador have changed due to the completion of TLH - Phase II, with the number of flights to communities in southern Labrador having been reduced. With completion of Phase II, an all-season, ground transportation link has been established between the majority of communities in southeastern Labrador. The number of operating air strips will eventually be reduced, with a regional airport being established for the region. Marine services to communities connected to the highway will cease. However, it is intended that ferry service would continue to be provided between Cartwright and Happy Valley-Goose Bay and the Labrador north coast. The change in marine services will translate into an estimated cost savings of $4.5 million annually.

Maintaining existing air and marine transportation services will not address the high costs associated with operating these systems or high costs for individuals and businesses using the services. While improving air and marine transportation services to Happy Valley-Goose Bay will provide benefits to the area, improving existing services and continued maintenance of these services will require a substantial investment. Also, user costs will likely increase.

In contrast, the all-season, ground transportation link provided by the TLH - Phase III will provide benefits that outweigh maintaining and/or improving existing air and marine transportation services. The year-round, lower cost transportation system provided by a highway system spanning Labrador will decrease dependence on expensive air and marine passenger and freight services. Travel plans made by area residents will not depend on flight and ferry schedules. The ground transportation link will also benefit local businesses.

The proposed TLH - Phase III has the potential to result in considerable social and economic benefits. However, these effects will not occur if the proposed project does not proceed.

Without the TLH - Phase III, the socio-economic environment of Labrador will be affected in the future by other ongoing and potential development projects and activities. The socio-economic environment of Southern Labrador has and will continue to change as a result of the Phase II portion of the TLH. This recently completed highway will create opportunities for new and accelerated development activity and future economic growth in the region. Potential changes to the existing transportation systems in this region and the associated socio-economic effects were assessed in the environmental assessment for the Phase II portion of the highway (JW 1998a). The recently proposed changes to Southern Labrador's marine and air traffic services and infrastructure (as discussed above) and any related socio-economic effects will occur whether or not the TLH - Phase III is constructed.

Projects, such as the Voisey's Bay mine/mill development and possibly the Churchill River Power Project, will generate considerable economic activity that may help to curb the population decline experiences in most regions of Labrador in recent years, and have positive implications for other components of the socio-economic environment such as services and infrastructure. The proposed highway would contribute further to these positive effects.

The change in transportation services in the region will also lead to changes in the greenhouse gas (GHG) emissions, in particular carbon dioxide (CO_2) emissions, experienced in the region (Table 2.1). Calculations indicate that GHG emissions will likely be less following the completion of the TLH – Phase III and elimination of the ferry service and reduced air service.

Table 2.1 Greenhouse Gas Emissions (CO_2) Associated with Regional Travel

	Estimated Level of CO_2 Generated by Current Travel (ktonnes)	**Estimated Level of CO_2 Generated by Future Travel (ktonnes)**
Passenger and Light Duty Vehicles	-	4.31
Heavy Duty Trucks	-	0.19
Ferry	4.3	-
Aircraft	0.8	0.09
Total	**5.1**	**4.49**

The effect of the project on transportation-related GHG emissions was calculated based on the assumption that highway construction would result in the elimination of the ferry service, a reduction in the air service to the communities, and a sustained vehicular traffic all year on the highway.

To calculate vehicle GHG emissions, emission factors were taken from Faiz et al. (1996) for heavy duty diesel trucks and for passenger vehicles. Truck fuel consumption was estimated to be 38 L/100 km. Cars and light trucks are estimated to consume 10 L/100 km. These estimates are within approximately 10 percent.

The future vehicle traffic on the road is estimated to be 200 cars per day, for a daily total of 80,500 vehicle kilometres. The CO_2 emissions associated with this traffic is estimated to be 11.8 tonnes of CO_2/day. An

additional estimated two tractor trailers would emit a further 518 kg of CO_2/day. For an annual operating period of 52 weeks, the annual CO_2 emissions would be 4.5 ktonnes.

The fuel consumption of the ferry is estimated to be 1,584,000 L/year, based on an assumption of three ferry trips per week for 22 weeks per year, with 72,000 L of fuel being used each week (i.e, 24,000 L per round trip of 24 hours). On combustion, this is equivalent to an annual CO_2 emission level of 4.3 ktonnes.

Aircraft were assumed to be Twin Otter or other small aircraft, and fuel consumption was estimated from FAA 1994. Aircraft fuel consumption is estimated at 210 L/hr at cruising speed. The adjustment in air service to accommodate changes in demand and scheduling will be a reduction from daily flights through eight airports to a weekly flight through five airports. Assuming that this will correspond to equivalent cruising flight time reductions from four to three hours, the CO_2 emissions reduction is calculated to be from 0.8 to 0.09 ktonnes/year; that is, approximately a factor of 10.

Forest and wetland ecosystems have the ability to remove carbon from the atmosphere (as CO_2) and to incorporate this carbon into plant biomass. The decay of this biomass leads to the accumulation of carbon in forest soils and wetlands. Preservation of these carbon sinks is now recognized as an important measure in reducing levels of atmospheric CO_2.

While the GHG emissions may be reduced due to the changes in transportation in the region, there will be a corresponding decrease in carbon sinks in the region. The clearing of the proposed right-of-way will result in the disturbance of approximately 840 ha for the outfitter route. This will include the permanent loss of approximately 496 ha of standing biomass in forested land, which will be cleared for the outfitter route right-of-way). Construction activities will also lead to the loss of carbon from soils as a result of disturbance of soils on the right-of-way. Loss of soil carbon occurs whenever soils are disturbed and manipulated, and results from increased activity of soil micro-organisms.

Loss of carbon from standing forest biomass is considered to be low when compared to the extent of carbon losses due to forest harvesting and forest fires. Approximately 25,000 ha of Labrador forests was lost to fires alone in 2002. During construction, salvageable wood resources will be allocated for other processing, such as for fibre of lumber, in order to preserve some of this carbon in a non-atmospheric form. Minimizing the area of soils and vegetation disturbed during construction will help to mitigate losses if carbon from standing biomass and from soils.

Following construction, all areas with the exception of the permanent road surface and shoulders will be re-vegetated. Soil carbon that is lost during construction will therefore be replenished over time, once roadside vegetation becomes established and is maintained.

2.2 Alternative Means for Carrying Out the Project

Several alternative routes were considered for the TLH - Phase III (Figure 2.1). Review of these routes considered the following:

- topographic and geographic factors;

- technical/engineering factors, such as design considerations, construction and maintenance standards, and watercourse crossing numbers, size and location;
- environmental factors;
- socio-economic factors; and
- construction and operation costs.

The alternative routes were also considered on the basis of the following environmental and socio-economic criteria outlined in the guidelines for the EIS/CSR (Appendix A):

- avoidance of wetland areas;
- avoidance of adverse effects on and enhancement of benefits for existing or potential tourism operations;
- avoidance of environmentally sensitive areas;
- avoidance of additional stress on land and resources through increased access;
- avoidance or reduction of effects on Innu land use;
- avoidance or reduction of effects on the proposed Akamiuapishku/Mealy Mountains National Park; and
- avoidance or reduction of effects on woodland caribou (MMCH).

Thirteen route alternatives were considered for the TLH - Phase III. Each of these alternatives is described below and shown in Figure 2.1.

2.2.1 Original Proposed Routes for the Trans Labrador Highway in Central Labrador (A6 and A7)

A study conducted by Fiander-Good Associates Limited (FGA) between 1991 and 1992 under the Comprehensive Labrador Cooperation Agreement assessed the social and economic feasibility of developing a highway system through Labrador that would connect with the National Highway System (FGA 1993). This study was overseen by an advisory committee comprised of representatives from the federal and provincial governments, Joint Councils of Labrador, Combined Councils of Labrador and the Labrador Community Futures Committee. As part of this larger study, FGA (1993) considered the options of constructing and not constructing a highway through central and southern Labrador. FGA (1993) considered two route options through southern Labrador: a route heading southeast from Muskrat Falls through central Labrador with no connecting routes to the coastal communities and terminating in Forteau (A6); and a route to the east that would connect to several coastal communities and Route 510 at Red Bay (A7).

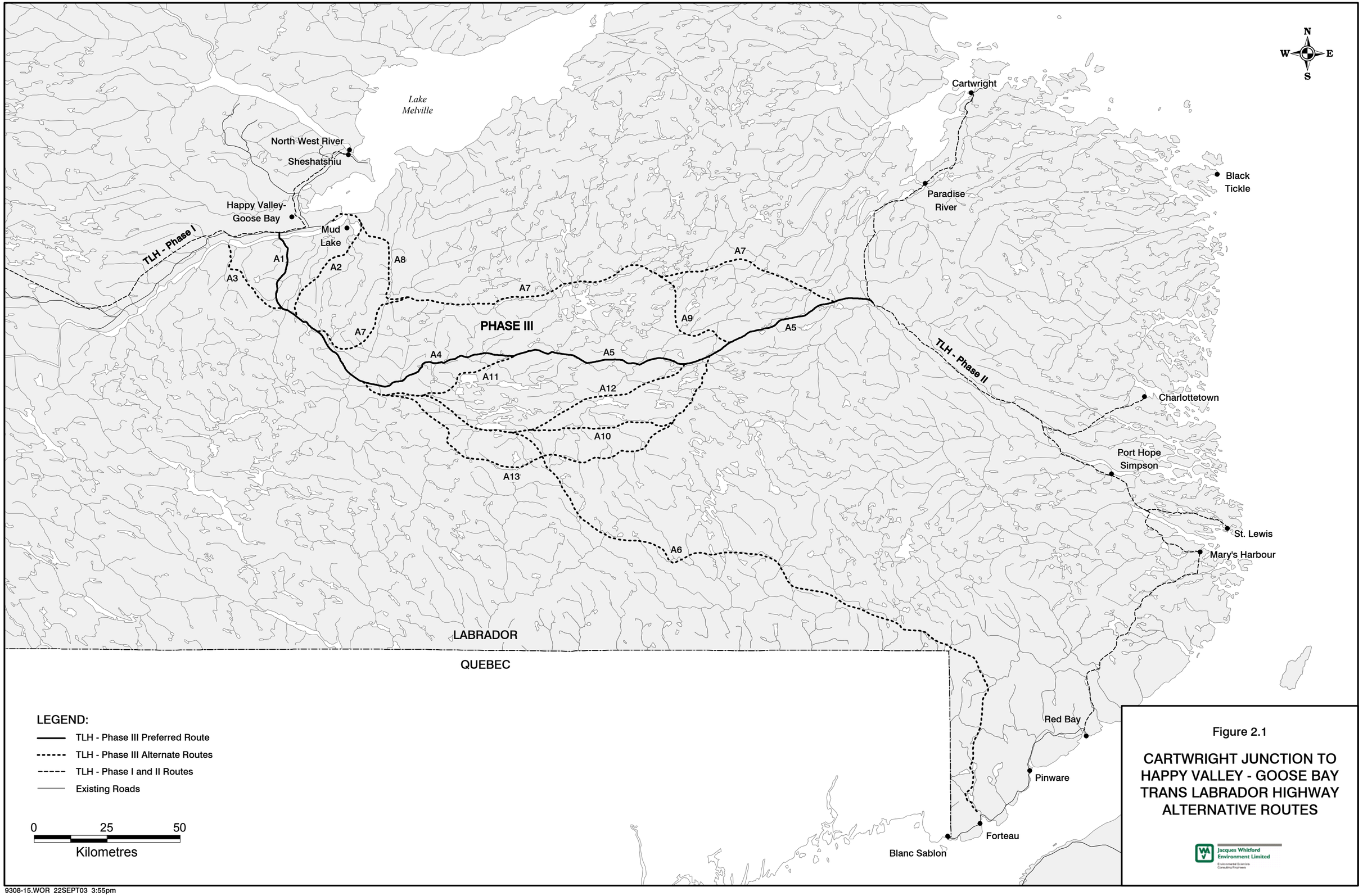

Figure 2.1

CARTWRIGHT JUNCTION TO HAPPY VALLEY - GOOSE BAY TRANS LABRADOR HIGHWAY ALTERNATIVE ROUTES

Jacques Whitford Environment Limited

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The Muskrat Falls to Forteau (Direct Link) Route (A6) would involve a 378-km highway through central Labrador, with a bridge across the Churchill River at Muskrat Falls, an additional 3 km of highway from Muskrat Falls to connect with the highway between Churchill Falls and Happy Valley-Goose Bay, and upgrading of the existing route between Muskrat Falls and Happy Valley-Goose Bay. Route selection took into consideration long-range plans for hydro power development, avoidance of wetland areas and reducing interference with lands traditionally used and occupied by the Innu. However, FGA (1993) found that there was little public support for the Muskrat Falls-Forteau Direct Link Route and that the option would generate no positive effects for Labrador until the whole route was complete, with the exception of possible access to forest resources near Forteau.

It was the more easterly route (A7) that had the greatest public support and the greatest estimated benefits. FGA (1993) found that a highway system with a route through southern Labrador, connecting several of the coastal communities, provided the greatest net benefits for Labrador, the province and Canada. They estimated that such a system would contribute positive annual economic benefits to Labrador ($125.1 million), the province ($115 million) and Canada ($158.6 million). WST chose to revise this more easterly route by bringing it further east and providing more direct access to southern Labrador communities. This refinement of the FGA (1993) route comprises the recently completed TLH - Phase II (Red Bay to Cartwright) route.

Based on the decision made during the Phase II development to develop the coastal route (A7), the Muskrat Falls to Forteau (Direct Link) Route (A6) was no longer considered as an alternative. However, during consultation with the Innu Nation during the planning for the TLH - Phase III, the Innu indicated that they would like further consideration given to the A6 route. The Innu had major concerns with the A7 route (i.e., the portion of A7 crossing the interior area as shown on Figure 2.1) due its proximity to Park Lake (*Iatuekupau*) and the Eagle (*Iatuekupau-shipu*) and Kenamu (*Tshenuaniu-shipu*) rivers, as well as other areas used by the Innu. Therefore, they wanted to explore the potential for developing the A6 route. WST also had major technical concerns about the A7 route, including the crossing points on the Eagle River and Kenamu River, and the fact that the route was closer to the mountains, had a higher elevation and crossed rougher terrain.

Based on the concerns of both parties, it was decided to drop the A7 route from further consideration. While some additional consideration was given to the A6 route, it was not selected as the preferred alternative due to the fact that it would not provide the connecting link with the coastal highway already developed.

2.2.2 Preferred Route (A1, A4 and A5)

The preferred route for the highway begins east of Muskrat Falls and crosses the Churchill River at Black Rocks (the Innu place name for this area is *Mishtashini-shipiss*) to intersect with Phase I route of the TLH approximately 9 km west of the Hamilton River Road intersection in Happy Valley-Goose Bay. This intersection of the Phase III and I portions of the TLH is located within the municipal boundaries of the Town of Happy Valley-Goose Bay. The highway extends approximately 75 km from the crossing to the southeast before turning to the northeast for a distance of 175 km to Cartwright Junction (87 km south of Cartwright). This 250-km section of highway comprises three route alternatives (A1, A4 and A5) shown on Figure 2.1.

This routing (A1, A4 and A5) best approximates the route as identified in Innu Nation (2002). The rationale provided by Innu Nation (2002) for this route included:

- locating the highway as far as possible away from the main lakes used by the Innu;
- avoiding areas of known historic resources and burial sites;
- avoiding Innu hunting areas; and
- minimizing access points to key resource harvesting areas, in particular the Eagle River (*Iatuekupau-shipu*) headwaters and Kenamu River (*Tshenuamiu-shipu*).

Based on the interest shown by Innu Nation (2002) for this routing, and technical and economic considerations, this routing was determined to be the preferred routing. This preferred routing was subject to an environmental assessment, which is presented in JW/IELP (2003a).

2.2.2.1 Black Rocks (*Mishtashini-shipiss)* Crossing (A1)

This is the preferred location for a bridge and causeway crossing on the Churchill River. This alternative is approximately 44 km in length, and is approximately 11 km shorter than the Muskrat Falls crossing point (A3) and 29 km shorter than the English Point crossing (A2). This translates into a cost savings of approximately $3.3 to 8.7 million (at $300,000 per kilometre) for construction and $55,000 to 145,000 (at $5,000 per kilometre) annually for operation. Overall, at $18 million to construct, it is the least expensive of the crossing alternatives and will have a shorter construction schedule. In addition, it is the crossing point on the Churchill River that is preferred by the Innu Nation (Innu Nation 2002).

2.2.2.2 Route North of *Uinikush* (A4)

This section of highway begins approximately 44 km from the crossing of the Churchill River. The route, approximately 56 km in length, proceeds north of Crooks Lake (*Pepuakamau*) and extends east to join Alternative A5. Both Alternatives A4 and A5 were identified in Innu Nation (2002).

2.2.2.3 Route Between Park Lake (*Iatuekupau*) and *Mashku-nipi* (A5)

This highway route proceeds north of Crooks Lake (*Pepuakamau*) and south of Park Lake (*Iatuekupau*) for a distance of approximately 117 km. This alternative was originally part of the A11 alternative (see Section 2.2.4.4) identified by Innu Nation (2002).

2.2.3 Alternatives for Crossing the Churchill River

Two options were considered for crossing the Churchill River, A2 and A3 (Figure 2.1). Both options would extend south of the Churchill River to connect with the eastern portion of the route through the interior.

2.2.3.1 English Point Crossing (A2)

Using this alternative, the highway would begin to the east of Happy Valley-Goose Bay with a bridge across the Churchill River at English Point. It would then extend southwest for approximately 53 km before joining the preferred route (i.e., A4 and A5). This alternative will add an extra 29 km to the preferred route, which translates into an additional cost of approximately $8.7 million ($300,000 per kilometre) for construction and $145,000 annually ($5,000 per kilometre) for operation. In addition, the cost of a bridge at this location is estimated at $70 million because a single-span bridge would be necessary to avoid ice jamming and associated flooding issues on the Churchill River. This route would also cross the Kenamu River (*Tshenuamiu-shipu*) and follow the river south, which were concerns for the Innu (Innu Nation 2002). Therefore, this alternative was not considered further.

2.2.3.2 Muskrat Falls Crossing (A3)

Using this alternative section, the highway would begin to the west of Happy Valley-Goose Bay with a bridge across the Churchill River at Muskrat Falls. It would then extend southeast for approximately 47 km before joining the preferred route (A4 and A5). This alternative would add an extra 11 km to the preferred route, again translating into additional costs of approximately $3.3 million ($300,000 per kilometre) for construction and $55,000 annually ($5,000 per kilometre) for operation. In addition, it would add one year to the construction schedule. There are further cost implications associated with the additional one year of construction, as well as costs associated with providing an additional year of marine services. Estimated costs for operating the marine services in Southern Labrador for an additional year are $4.5 million.

Both the Town of Happy Valley-Goose Bay and Newfoundland and Labrador Hydro (NLH) indicated concerns with this alternate crossing point. The Town of Happy Valley-Goose Bay considers the route to be too far away from the town to support economic development initiatives in central Labrador. NLH has concerns about a bridge at Muskrat Falls due to any constraints that it might present for any future hydro development plans in the area. In addition, any future hydro development plans may require the bridge to be relocated. This again would translate into additional costs for highway development. Therefore, this alternative was not considered further.

2.2.4 Alternative Routes through Central Labrador

There were six options considered for traversing the interior. All of these routing options would begin approximately 44 km south of the Churchill River crossing and extend across the interior.

2.2.4.1 Route from A7 to English Point (A8)

This route, approximately 50 km in length, was proposed by the Town of Happy Valley-Goose Bay to shorten the highway length in the event that the A7 route was selected. It would link with the crossing location at English Point. While this alternative would shorten the highway by approximately 40 km and translate into a cost savings of approximately $12 million for construction (at $300,000 per kilometre), as noted previously the bridge crossing at English Point would cost approximately $70 million. There were also technical and environmental concerns associated with using this proposed routing. The Innu were concerned about the route proximity to the Kenamu River and were opposed to having the highway placed in the river valley. In

addition, the river valley was noted as having highly erodible soils (Innu Nation 2002). These concerns regarding the A8 route and the fact that concerns about the A7 route led to its no longer being considered as an alternate, meant there was no need for further consideration of A8.

2.2.4.2 Route Connecting to the A7 Route (A9)

Similar to the A8 alternative, this approximately 41-km long route alternative was proposed as a means for addressing issues regarding the Eagle River crossing in the event that the A7 route was selected. However, as concerns regarding the A7 route have led to its no longer being considered, this route alternative was not considered further.

2.2.4.3 South of Crooks Lake (*Pepuakamau*) (A10)

This is an alternative route that begins approximately 67 km from the start of the preferred route at the Churchill River. It proceeds south of Crooks Lake (*Pepuakamau*) and then east to rejoin the preferred route at A5. This alternative of approximately 104 km in length would add an extra 18 km to the preferred route, translating into additional costs of approximately $5.4 million for construction (at $300,000 per kilometre) and $90,000 annually for operation (at $5,000 per kilometre). This alternative was proposed to address Innu concerns with alternatives A11 and A12 (discussed below). However, it also passed through an area used by the Innu for hunting (Innu Nation 2002). Therefore, given the additional cost implications and the fact that the route was not liked by the Innu, it was not considered further.

2.2.4.4 Route North of *Mashku-nipi* (or *Kamishikamat*) (A11)

This proposed alternative route of approximately 36 km in length is located east of A4. It proceeds north of Crooks Lake (*Pepuakamau*) and extends east to join Alternative A5 on the preferred route. This alternative was not liked by the Innu. The preference is to keep the highway away from the *Mashku-nipi* and *Mishtashini* areas traditionally used the Innu (Innu Nation 2002). Therefore, it was not considered further.

2.2.4.5 Route through *Nekanikau* (A12)

This proposed alternative route of approximately 58 km in length would shorten alternative A10. It passes south of Crooks Lake (*Pepuakamau*) and extends east to join A5 on the preferred route. Major concerns were identified with this alternative, including the crossing of the South Branch of the Eagle River and a burial site located in the area. The Innu consulted regarding route alternatives preferred to have the TLH - Phase III located away from the *Nekanikau* area, which has been used traditionally by the Innu (Innu Nation 2002). Therefore, this route was not considered further.

2.2.4.6 Route Proposed by Outfitters (A13)

This is an alternative route that extends south of A10. This route was identified by members of the Newfoundland and Labrador Outfitters Association during the consultation program.

At approximately 280 km in length, this proposed route is approximately 30 km longer than the preferred route (A1, A4 and A5). This translates into approximately $8.3 million ($300,000 per kilometre) in

additional construction costs and additional annual maintenance costs of approximately $137,500 ($5,000 per kilometre annually). However, a cost savings of approximately $1.5 million would be realized through the elimination of the bridge on the South Branch of the Eagle River. This would reduce the additional construction costs for this route to approximately $6.8 million, but an additional year would be added to the construction schedule. Additional costs would apply for maintaining the marine ferry service for an additional year (currently estimated at $4.5 million annually). There will also be additional costs for users of the highway.

Review of Innu Nation (2002) indicated that there were concerns about any development occurring around the main lakes of the region that are used by the Innu for harvesting activities, and that development would be best kept away from these areas. Of particular concern was the area of the Eagle River headwaters, through which the outfitter route would pass. Innu Nation (2002, p. 4) states: *All Innu consulted believe that the road must be kept as far away as possible from the main lakes used by the Innu for harvesting activities. These lakes include Uinikush, Nekanikau, Pepuakamau (Crooks Lake), Uapinatsheu-nipi, Mishtashini, Mitshishutshishtun, Eshkanat-katshipukutiniht and Mashkunipi.* Further concern is raised in Innu Nation (2002) about non-Innu access to lands in areas crossed by the highway, in particular access to areas in the headwaters of the Eagle River (*Iatuekupau-shipu*).

The outfitter route segment, identified as A13 in Figure 2.1, crosses the Eagle River headwaters. As the Eagle River headwaters were clearly stated as a concern for the Innu, the outfitter route which also traverses the headwaters did not appear to alleviate this issue. Thus, combined with the additional costs and schedule implication, the outfitter route was not considered further in the EIS/CSR completed by JW/IELP (2003a) in January 2003.

Following direction from the Minister of Environment in April 2003, the outfitter route as a possible routing for the TLH - Phase III was subjected to more detailed study. This EIS/CSR presents the results of the environmental assessment on the outfitter route.

2.2.5 Conclusion on Alternative Routes

Of the possible route options, the preferred route (A1, A4 and A5) and outfitter route (A13 segment and the portions of the preferred route that are common to the outfitter route) are the only two options that are considered further for the TLH - Phase III and subjected to an environmental assessment. As noted, the environmental assessment of the preferred route is provided in JW/IELP (2003a). This EIS/CSR provides the environmental assessment for the outfitter route.

The remaining alternatives were not considered further for various reasons. The original routes (A6 and A7) identified by FGA (1993) were eliminated from further consideration, due in part to the decisions made with respect to the routing of TLH - Phase II. The Muskrat Falls to Forteau (Direct Link) route (A6) did not provide the connecting link with the coastal highway already developed. The Innu had major concerns with the A7 route due to its proximity to Park lake (*Iatuekupau)* and the Eagle (*Iatuekupau-shipu*) and Kenamu (*Tshenuaniu-shipu*) rivers, as well as other areas used by the Innu. There were also technical concerns with this route, including the crossing points on the Eagle and Kenamu rivers, and the fact that the route was closer to the mountains, had a higher elevation and crossed rougher terrain.

The alternative crossing locations on the Churchill River also posed concerns. The English Point crossing (A2) would cross the Kenamu River (*Tshenuaniu-shipu*) and the follow the river south, which was a concern for the Innu. In addition, the cost of bridge for this crossing location was estimated at $70 million. Both the Town of Happy Valley-Goose Bay and NLH expressed concerns with the Muskrat Fall (A3) crossing location. The town considered the route to be too far from the town to support economic development initiatives in central Labrador, while NLH was concerned about the constraints that a bridge at Muskrat Falls may place on hydro development.

With respect to the alternative routings through central Labrador, only the A4 and A5 segments which are part of the preferred route and the A13 segment which is a part of the outfitter route are being considered in the environmental assessment. The remaining route segments either posed potential concerns for Innu land use due to their proximity to lakes and rivers traditionally used by the Innu or had originally been considered in connection with the original A7 routing, which was eliminated due to concerns raised by the Innu and technical considerations.

2.3 Comparison of Preferred and Outfitter Routes

This section focuses on the two routes considered for TLH - Phase III, the preferred route (as previously assessed in JW/IELP (2003a)) and the outfitter route (the subject of the environmental assessment presented in this report).

2.3.1 Technical Factors

The preferred route for the TLH - Phase III comprises three route segments (A1, A4 and A5) as shown on Figure 2.1. This 250-km route begins east of Muskrat Falls and crosses the Churchill River at Black Rocks (the Innu place name for this area is *Mishtashini-shipiss*) to intersect with the Phase I route of the TLH approximately 9 km west of the Hamilton River Road intersection in Happy Valley-Goose Bay. This intersection of the Phase III and I portions of the TLH is located within the municipal boundaries of the Town of Happy Valley-Goose Bay. The highway extends approximately 75 km from the crossing to the southeast before turning to the northeast for a distance of 175 km to Cartwright Junction (87 km south of Cartwright).

The outfitter route outlined in discussions with the Newfoundland and Labrador Outfitters Association includes portions of the preferred route (i.e., that is the segments on the western and eastern end of the preferred route) and a alternative alignment (as shown by A13 on Figure 2.1) for the central portion of the route. This central portion extends further into the southern portion of central Labrador, connecting with the A4 route section in the west and the A5 route section in the east. At approximately 280 km in length, the outfitter route alternative is approximately 30 km longer than the preferred route (A1, A4 and A5).

The crossing structure types proposed for both routes are summarized in Table 2.2.

Table 2.2 Proposed Crossing Structure Type

Structure Type	Preferred Route	Outfitter Route
Bridge/Causeway	1	1
Bridge		
Single Span	3	2
Two Span	2	1
Pipe Arch	17	8
Cylindrical Culverts/Circular Pipe	72	103
Total	95	115

2.3.2 Biophysical Factors

In light of the criteria listed in Section 2.2, a number of biophysical aspects of the area were reviewed, including noise, climatic conditions, topography and terrain, water, wetlands and riparian habitat conditions, wildlife and fish and fish habitat.

2.3.2.1 Ambient Noise

With respect to ambient noise levels, conditions along the outfitter route can be expected to be similar to those found along the preferred route. The area in which both the preferred and outfitter routes are found is, for the most part, wilderness with virtually no human-made noise. Ambient noise will vary depending on factors, such as terrain, temperature, season, wind and proximity to naturally occurring noise sources such as running water or rapids. Ambient noise levels may vary by over a factor of 10 depending on site conditions. Background noise levels are anticipated to be in the range of 20 to 30 dBA (i.e., decibels in the A-weighted spectrum, which reflects the spectral response of human hearing) (Kinsler et al. 1982). Beside a medium stream with small rapids, noise levels may approach 50 dBA, roughly the level of conversation. For example, ambient noise measurements collected along three rivers in the interior of Labrador (Kenamu, Kenemich and Naskaupi Rivers) ranged between 52 and 64 dBA, depending on site conditions (Trimper et al. 1998). The lower noise levels were recorded at wooded sites along slow-moving water, while the higher noise levels were recorded in open areas near rapids.

2.3.2.2 Climate

The outfitter route for the TLH - Phase III lies within the same climatic regions as the preferred route. These climatic zones are illustrated in Figure 4.1. The outfitter route extends further south in the Southeastern Labrador Interior climatic zone, which is closer to the Strait of Belle Isle frontal cyclone track than the Interior Labrador climatic zone. The climate in the Southeastern Labrador Interior zone is less continental than the Interior Labrador zone to the north, with a greater proportion of total precipitation occurring in winter. Annual precipitation for the Southeastern Labrador Interior zone is in the 1,000 to 1,200 mm range, compared to a range of 900 to 1,100 mm in Interior Labrador zone. Thus, the outfitter route extends further south into an area that may be subject to higher levels of snowfall.

2.3.2.3 Topography and Terrain

The elevation along both the preferred and outfitter routes ranges up to approximately 600 m above sea level (asl). The outfitter alternative is relatively more rugged than the preferred route to the north. Along both routes, occurrence of permafrost is likely isolated and located mainly in wetland areas. Dominant vegetation along both routes is comprised of closed, dense stands of black and white spruce with balsam fir on slopes.

Both the preferred and outfitter routes cross Grenville Province lithologies of Late Paleoproterozoic age (1,000 million and 1,700 million years). The region is divided geologically into several components: gneisses, foliated granitoid rocks and a metamorphosed mafic intrusion occur in the south; the Mealy Mountains Intrusive Suite, comprising anorthosite and monzonite, and minor leucotroctolite, leuconorite, monzonorite, quartz monzonite and granite occurs in the north; and gneisses and moderately to strongly foliated granitoid rocks occur in the east.

The geology underlying the area of the outfitter route comprises similar lithologies to that seen along the preferred route for the TLH - Phase III. Rock along the outfitter route consists of granodioritic orthogneiss (lesser quartz dioritic and granitic orthogneiss), granite and syenite plutons, and granitoid rocks of the Mealy Mountains Intrusive Suite.

Surficial geology comprises dominantly basal lodgement tills and ablation till, with lesser glaciofluvial deposits, such as eskers, as compared to the preferred route. Similar to the northern area, there are numerous geomorphological features, as identified from surficial geology maps, in the vicinity of the outfitter route. These features include structural linears, drumlins, morainal ridge, esker, abandoned river channel, kettle holes, abandoned beach ridge and escarpment in unconsolidated materials.

Currently, there are no mineral exploration licenses held near the area of the preferred or outfitter routes. The nearest exploration activity is approximately 90 km to the east-southeast. Two mineral occurrences were identified along the outfitter (A13 section), one for iron and the other mica. However, on the eastern end of the preferred route (the section common to both the preferred and outfitter routes) there were four mineral occurrences (all mica occurrences). There were also three mineral occurrences (two pyrite and one titanum) on the section of the preferred route, not shared with the outfitter route.

Outcrop exposure in the area of the outfitter route is relatively limited, only one area of potential acid-generating rock was identified on the A13 section of the route and the geology consists of rock that is generally not known to be acid-generating. Therefore, the potential for encountering acid-generating rock is also limited. While potential for encountering acid-generating rock is higher along the preferred route, only one area of potential was identified on the central portion of the route. The western segment of the preferred route that is also common to the outfitter route has the greatest area of potential for encountering acid-generating rock.

2.3.2.4 River Basins

Key highlights of a comparison between the river basins associated with the preferred route and the outfitter routes are:

- The length of preferred route for TLH - Phase III is approximately 250 km.
- The outfitter route alternative is 280 km long, extending approximately 30 km (11 percent) longer than preferred route.
- The outfitter route alternative has approximately 153.5 km of route between stream crossing #37 to #82 that deviates from the preferred route (i.e., alternative section of preferred route is 126 km). These two alternative route sections are the focus of the following comparison.
- The section of preferred route between crossings 37 to 82 consists of:
  - approximately 21 km in the Kenamu River basin; and
  - approximately 105 km in the Eagle River basin.
- The section of outfitter route alternative between crossings 37 to 82 consists of:
  - approximately 14 km in the Kenamu River basin;
  - approximately 19 km in the St. Augustin River basin (draining southward to the Quebéc North Shore);
  - approximately 115.5 km in the Eagle River basin; and
  - approximately 5 km in the Joir River Basin, a tributary to Little Mecatina River.
- The common section on the eastern end of the route has approximately 11 km in the Eagle River basin.
- The common section on the western end of the route has approximately 25 km in the Kenamu River basin.

A summary of route length information for the river basins crossed by both the preferred and outfitter routes is presented in Table 2.3.

Table 2.3 Summary of Route Length Through Seven River Basins

River Basin	Approximate Route Length (km)	
	Preferred Route	Outfitter Route
Churchill River Basin	13.4	13.4
Traverspine River Basin	21.7	21.7
Kenamu River Basin Distance common to both routes	51 33.7	42 33.7
Eagle River Basin Distance common to both routes	120.5 11.4	134.1 11.4
Joir River Basin	0	6.3
St. Augustin River Basin	0	18.9
Paradise River Basin	47.7	47.7
Total	254.3	284.1

The difference between the two route sections is that the outfitter route alternative is approximately 30 km longer than preferred route. The length of the outfitter route within the Kenamu River basin is 85 percent the length of the preferred route. The outfitter route is 9 percent longer within the Eagle River basin, and 24 km of the outfitter route alternative is within the St. Augustin River basin and 5 km is in the Joir River Basin, which are not traversed at all by the preferred route.

2.3.2.5 Watercourse Crossings

Key highlights of a comparison of watercourse crossings along the preferred and outfitter routes are:

- The outfitter route alternative has watercourse crossings # 37 and #82 at the west and east ends respectively, and there are:
  - 44 watercourse crossings located along the preferred route between crossings #37 and #82 including:
    - five preferred route crossings are in the Kenamu River basin, and
    - 39 preferred route crossings are in the Eagle River basin;
  - 61 watercourse crossings in addition to #37 and #82 are located on the outfitter route alternative; and
  - 51 other crossings are located on the preferred route, giving a total of 112 crossings for the outfitter route alternative.
- Three watercourse crossings on the outfitter route alternative are in the Kenamu River basin:
  - one is a first-order watercourse with upstream basin less than 2 km^2;
  - one is a first-order stream with upstream basin less than 2 km^2;
  - one is a third-order or greater stream (compared to two on the preferred route); and
  - there are no second-order streams (compared to one on the preferred route);
- There are 49 watercourse crossings on the portion of the outfitter route alternative located in the Eagle River basin:
  - 18 are first-order streams with upstream basins less than 2 km^2 (compared to 16 on the preferred route);
  - 10 are first-order streams with upstream basins greater than 2 km^2 (compared to six on the preferred route);
  - seven are second-order streams (compared to eight on the preferred route);
  - 13 are third-order or higher streams (compared to eight on the preferred route); and
  - one crossing appears to be at a narrow portion of a lake (compared to one on the preferred route).
- There are nine watercourse route crossings along the outfitter route alternative that are located in the St. Augustin River basin, which drains southward to the Quebéc North Shore. Five of these crossings are on first-order streams with upstream basins greater than 2 km^2.

A summary of the watercourse crossings located in the river basins crossed by the preferred and outfitter routes is presented in Table 2.4.

Table 2.4 Summary of Watercourse Crossings in Six River Basins Along the Preferred and Outfitter Routes

Watercourse Crossing Information		Preferred Route	Outfitter Route
Churchill River Basin	Total Watercourse Crossings	12	12
	1st order streams (basins < 2 km^2)	6	6
	1st order streams (basins > 2 km^2)	0	0
	2nd order streams (basins < 2 km^2)	1	1
	2nd order streams (basins > 2 km^2)	3	3
	3rd or more order streams	2	2
Traverspine River Basin	Total Watercourse Crossings	15	15
	1st order streams (basins < 2 km^2)	6	6
	1st order streams (basins > 2 km^2)	2	2
	2nd order streams (basins < 2 km^2)	1	1
	2nd order streams (basins > 2 km^2)	1	1
	3rd or more order streams	5	5
Kenamu River Basin	Total Watercourse Crossings	15	13
	1st order streams (basins < 2 km^2)	4	4
	1st order streams (basins > 2 km^2)	4	4
	2nd order streams	3	2
	3rd or more order streams	4	3
Eagle River Basin	Total Watercourse Crossings	40	53
	1st order streams (basins < 2 km^2)	16	17
	1st order streams (basins > 2 km^2)	6	14
	2nd order streams	8	10
	3rd or more order streams	9	12
	Crossing a pond	1	0
St. Augustin River Basin	Total Watercourse Crossings	0	9
	1st order streams (basins < 2 km^2)		0
	1st order streams (basins > 2 km^2)		3
	2nd order streams		4
	3rd or more order streams		2
Paradise River Basin	Total Watercourse Crossings	13	13
	1st order streams (basins < 2 km^2)	2	2
	1st order streams (basins > 2 km^2)	5	5
	2nd order streams	2	2
	3rd or more order streams	4	4
Total Watercourse Crossings for Route		95	115

The outfitter route has two less watercourse crossings in the Kenamu River basin, but nine more in the Eagle River basin. As three of the Kenamu River crossings and all 49 of the Eagle River crossings on the outfitter route are upstream of the preferred route crossings, it is intuitive that they are comparatively smaller in upstream basin area and, therefore, proportionately smaller in flows. Nine stream crossings are in the St. Augustin River basin, for a total of 71 crossings on the outfitter route alternative, which is 16 more watercourse crossings than along preferred route.

2.3.2.6 Water Quality

Water samples were collected at 25 sites along the A13 segment of the outfitter route in 2003 to augment 35 sites that were sampled along the preferred route in 2002. The water was very dilute, low colour, low turbidity, neutral to slightly acidic, low alkalinity and low dissolved organic carbon. Metal concentrations

were all low except for elevated aluminum and iron. The water quality is typical of that found in other regions of Labrador and on the Island.

The outfitter route alternative crosses the St. Augustin River approximately 2 km downstream of St. Augustin Lake (Unnamed Lake). Environment Canada sampled this lake at four stations in September 1983 for the NAQUADAT database (Lockerbie 1987). The results of their sampling were similar to those of the samples taken along other river basins along the TLH - Phase III route.

2.3.2.7 Wetlands

Wetland habitats (i.e., lichen scrub/open bog, open bog, string bog and tree bog) comprise approximately 32 percent of the landscape within 5 km of the outfitter route. In comparison, approximately 29 percent of the landscape within 5 km of the preferred route is comprised of wetland habitats. Since both routing options occur in the same ecoregion, vegetation associated with these wetland habitats would likely be the same along both routes. Similarly, riparian habitat would likely be comprised of the same vegetation species on both routes.

The wetland forms present along the preferred and outfitter routes are provided in Table 2.5. A total of 345 wetlands were identified within 100 m of the centre line of the preferred route, while 444 wetlands were identified within 100 m of the outfitter route.

Table 2.5 Wetland Type Found Along the Preferred and Outfitter Routes

Wetland Type and Form	Number within 100 m of Right-of-Way		Proportion of all Wetlands (%)	
	Preferred	Outfitter	Preferred	Outfitter
Bogs				
Dome Bog	3	3	0.8	0.7
Basin Bog	86	133	24.9	29.9
Shore Bog	26	39	7.5	8.8
Slope Bog	66	80	19.1	18.0
String Bog	69	77	20.0	17.3
Total	**250**	**332**	**72.5**	**74.7**
Fens				
Atlantic Ribbed Fen	11	18	3.2	4.0
Slope Fen	33	15	9.6	3.4
Stream Fen	9	13	2.6	2.9
Total	**53**	**46**	**15.4**	**10.4**
Marshes				
Kettle Marsh	**5**	**10**	**1.4**	**2.2**
Swamps				
Stream Swamp	**37**	**56**	**10.7**	**12.6**

2.3.3 Wildlife

The same avifauna species are expected to occur along both the preferred and outfitter routes. Habitat disturbance from highway construction and improved access during highway operation will occur on both routes. The outfitter route has less forested area within 5 km than the preferred route (53 percent versus 61 percent). This, coupled with the absence of large river intersections (i.e., such as the Eagle River) on the outfitter route, means there may be less habitat potential for raptors such as osprey to occur along the outfitter route. Results of surveys along the preferred and outfitter routes indicate that there are less osprey nests in the vicinity of the outfitter route than are found along the preferred route (one nest and five nests with in 50 m of the centre line, respectively).

Conversely, the larger quantity of open habitat types along the outfitter route (40 percent of land area within 5 km of route is barren or wetland habitat) may result in increased habitat potential for species at risk such as the short-eared owl. One short-eared owl was observed along the preferred route during surveys in 2002 and one short-eared owl was observed along the outfitter route during surveys in 2003. Other species at risk such as harlequin duck and the Mealy Mountain caribou may be found along either route. However, the outfitter route alternative is closer to the southern periphery of the MMCH range.

2.3.4 Fish and Fish Habitat

Fish habitat was surveyed at all of the watercourse crossings on the A13 segment of the outfitter route. No primary data have been collected along the outfitter route with regard to fish habitat. Limited data on either route have been obtained for fish, including sampling using electrofishing at selected crossing sites conducted in 2003. Approximately 18 km of the outfitter route is located in the St. Augustin River watershed, with nine watercourse crossings in the upper basin. The 1983 sampling conducted in St. Augustin Lake included fish tissue analysis (Lockerbie 1987)). Northern pike, brook trout and white sucker were taken in the lake.

2.3.5 Socio-economic Factors

In light of the criteria listed above, a number of socio-economic aspects of the area were reviewed, including historic resources, community life, resource use and users, parks and special areas, tourism and recreation, and employment and business.

2.3.5.1 Historic Resources

There are 41 recorded archaeological and ethnographic sites within a 10 km-wide corridor along the preferred route, 37 of which were found during the 2002 field survey (IELP 2002). The field assessment yielded evidence of precontact use of the project area at two sites, both dating to the Intermediate Indian period (3,500 to 2,000 Before Present (BP)). In addition, 35 sites dating to the late historic and/or contemporary period were also identified. Several Innu camp locations and Settler tilts used during the early part of the twentieth century were also recorded. However, the cultural affiliation of a number of recent sites and particularly cutting locations and trails remain undetermined and could indicate activities conducted by either group. Most of the sites discovered in 2002 are located in the western portion of the project area. Further investigation will be conducted along the highway route prior to construction.

It was estimated that approximately 15 percent of the sites located to date were situated on or at short distances from the preferred route and would be directly affected by construction. In addition, 85 percent of the sites located within the corridor may be indirectly affected by the project due to improved access to the project area during construction and operation.

The potential for historic resources within the project area appears to be high in six areas (50 percent of the total number of areas investigated during the 2002 field survey; e.g., river junctions and preferred sections of shorelines such as points and constrictions). Of these, five lie in the western portion of the project area. Elsewhere, the potential varies from low (one area) to moderate or reduced (three areas) or remains indeterminate (two areas).

Based on the best information available at this time, it is anticipated that the probability of encountering archaeological resources is also highly variable across the outfitter route. The shoreline of major streams and lakes have the highest potential to yield important historic resources. The outfitter route alternative crosses 115 watercourses, in contrast to the preferred route which crossed 95 watercourses. It is possible that the overall potential of the western portion of the study area would also be the highest. However, the outfitter route extends further away from the coast and traverses extensive bog at the headwater of rivers and tributaries, particularly in the western portion of the route. It also traverses inter-fluvial upland areas. The overall archaeological potential for such areas is thought to be lower. It is worth noting that several eskers are located near the outfitter route. Eskers are commonly used as sources of granular materials for road construction, but they also serve as passage routes for caribou through the taiga and they were among preferred hunting locations (JWEL 2000). Therefore, it is anticipated that the archaeological potential of the area may be higher due to the presence of these features. There were six areas of positive potential identified along the outfitter route in a study of archaeological potential conducted on the route (Appendix E), including three areas with moderate-high potential.

2.3.5.2 Community Life

The outfitter route for the TLH - Phase III crosses the same regional economic zones as those crossed by the preferred route. All communities of central and southern Labrador (i.e., Happy Valley-Goose Bay, North West River, Sheshatshiu and Mud Lake on the western end of the proposed highway and Cartwright, Charlottetown, Port Hope Simpson, St. Lewis and Mary's Harbour at the eastern end) will experience changes as a result of the final highway link across Labrador. Aspects of community life apply to both the preferred and outfitter routes. However, as the outfitter route alternative is longer, it will mean a greater travel distance between the Lake Melville area and the coast.

2.3.5.3 Resource Use and Users

Resource users in the vicinity of the proposed TLH - Phase III preferred and outfitter routes include the Innu, Settler/Metis, other Labrador residents and tourists to the area. A variety of resource use activities are occurring throughout south-central Labrador and other activities could potentially be initiated in either area.

There are 115 watercourse crossings along the outfitter route. These watercourses are located within six watersheds: Churchill River; Traverspine River; Kenamu River; Eagle River; Paradise River; and St. Augustin. The outfitter route also crosses a portion (5 km) of the Joir River watershed area. Therefore, the outfitter route alternative would involve two watersheds more than the preferred routing. This has implications for involvement of other user groups, not previously associated with the area around the preferred routing.

While hunting and fishing in central and southern Labrador are undertaken by local residents, visitors from elsewhere in the province, Canada and other countries also participate in wildlife harvesting and fishing. There are 19 commercial outfitting camps located in central and southern Labrador near the TLH - Phase III preferred and alternative routes (Table 2.6). These camps are fly-in camps, offering fishing and/or big game hunting adventures. Fishing activity at these camps usually occurs within 5 to 10 km of the camp location, and most of the angling activity is hook and release. With respect to the outfitter route alternative, the majority of the outfitting camps are located to the north of the proposed route. Only two of the camps lie to the southeast of the proposed route (Figure 2.2). While some outfitting camps will be more distant from the highway should the outfitter route be used, some of the camps will actually be closer to the highway (Table 2.6).

Both the preferred and outfitter routes would provide access for resource users into the Labrador interior for activities such as fishing.

2.3.5.4 Parks and Special Areas

The study area for the Akamiuapishku/Mealy Mountains National Park encompasses approximately 21,500 km^2, extending from Lake Melville and Groswater Bay, south to the Eagle River watershed and east from the Kenamu River to the coast of Labrador. Both the preferred route and outfitter route alternatives are located within the national park study area; however, the outfitter route alternative is located in the southern portion of the national park study area. Either routing alternative would provide access for resource users into the park.

The outfitter route alternative is located south of the two International Biological Programme (IBP) sites located in the vicinity of the route, while the preferred route crosses one of the IBP sites. There are no designated or nominated heritage rivers in Labrador. Both the preferred and outfitter routes cross the watersheds of the main rivers in the region, as well as the main stem and tributaries of the rivers.

Table 2.6 Commercial Outfitting Camps in the Vicinity of the Preferred and Outfitter Routes

No.*	Operator	Lodge	Location	Approximate Distance from Preferred Route (km)	Approximate Distance from Outfitter Route (km)
1	Adventure North Ltd.	Crooks Lake	Crooks Lake	8.1	26.4
2	Camp 1155 Ltd.	Camp 1155	Upper Eagle River	11.9	19.9
3	Coopers' Minipi Camps	Anne Marie Lake Lodge	Upper Minipi River	53.1	53.06
4	Coopers' Minipi Camps	Minipi Lake Lodge	Upper Minipi River	66.9	66.91
5	Coopers' Minipi Camps	Minonipi Lodge	Upper Minipi River	44.5	44.41
6	Department of National Defence	No Name Lake (Family Wilderness Camp)	No Name Lake	23.3	13
7	Eagle Lake Sport Fishing Ltd.	Eagle Lake Lodge	Eagle Lake	19.1	15.5
8	Goose Bay Outfitters Ltd.	Lower Eagle River Lodge	Lower Eagle River	52.7	49.11
9	Igloo Lake Lodge Ltd.	Igloo Lake Lodge	Igloo Lake	18.5	32.1
10	Labrador Angling Adventures Ltd.	Awesome Lake Lodge	Awesome Lake (English River)	93	93.0
11	Labrador Interior Outfitters Ltd.	St. Paul's Lodge	St. Paul's River (Headwaters)	58.8	24.3
12	Labrador Outdoors Inc.	Little Minipi Lake Lodge	Little Minipi River	49.2	49.2
13	Labrador Sportsfish Ltd.	Eagle's Nest	Eagle River	36.4	66.5
14	Labrador Venture Ltd.	Birchy Lake Lodge	Birchy Lake, Upper St. Paul River	43.4	26.3
15	Osprey Lake Lodge	Osprey Lake	Osprey Lake (Eagle River watershed)	13.7	5.3
16	Park Lake Lodge Inc.	Park Lake Lodge	Park Lake	19.6	49.2
17	Rifflin' Hitch Lodge Limited	Rifflin' Hitch Lodge	Eagle River	39	39
18	Six North Fishing Lodge	Lac Mercier Lodge	Lac Mercier	21.1	21.2
19	Warrick Pike	Whitey's Lodge	Whitey's Lake	11.1	11.1

* See Figure 2.2 for approximate camp locations.
Sources: DTCR 2002a; T. Kent, pers. comm.; P. Dawe, pers. comm.; personal communications and interviews with outfitters.

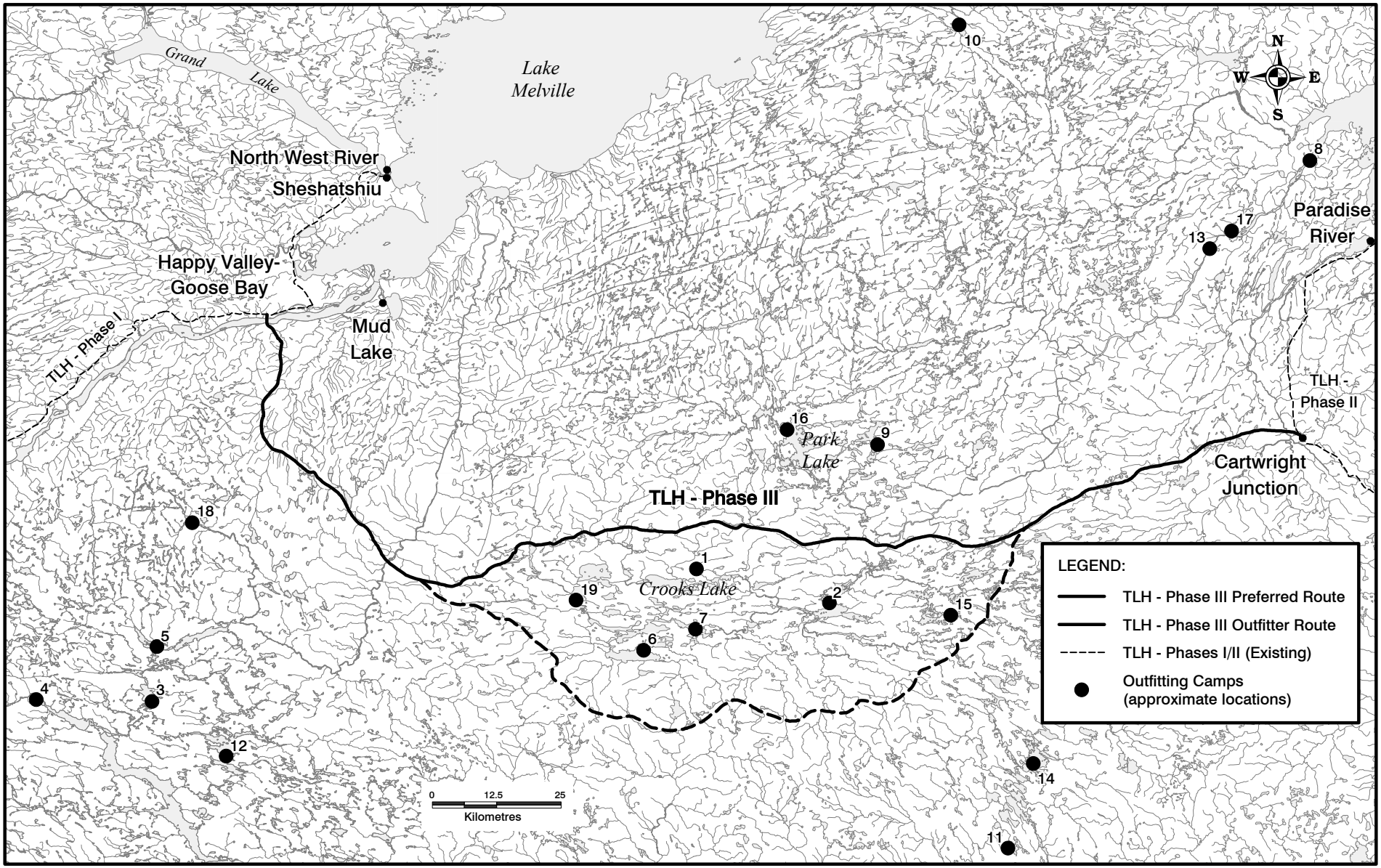

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Figure 2.2

Outfitting Camps

2.3.5.5 Tourism and Recreation

The tourism industry is an important part of the economy of Newfoundland and Labrador. Some of the more popular tourism activities in Labrador at present include fishing and hunting, nature tourism (e.g., bird, whale and iceberg watching), adventure tourism (e.g., hiking and boating), and cultural and heritage tourism (e.g., visiting historic sites and festivals). Local residents also participate in these and other recreational activities. These types of activities are likely to continue in central and southern Labrador and participation levels may actually increase as a result of completing the highway link across Labrador. These changes will occur irregardless of whether the preferred or outfitter route is selected.

As with providing access to resource users, tourists would have access to areas in south-central Labrador with either the preferred route or outfitter route. Also, either of the routes would provide a link between Happy Valley-Goose Bay and Cartwright Junction allowing people to travel between the two regions and on to locations in western Labrador and Quebéc or to the Labrador Straits and the island of Newfoundland. The link, with either the preferred or outfitter route, will now allow ground transportation across Labrador.

One main difference between the preferred and outfitter route alternatives is that the outfitter route is more distant from five of the outfitting camps, in comparison to the preferred route, and is closer to six of the outfitting camps.

2.3.5.6 Employment and Business

Completing the TLH across Labrador has the potential to directly and indirectly affect local economies of individual communities and of the region as a whole, irregardless of whether the preferred or outfitter route is selected. There is potential for changes in the production and supply of goods and services, business climate, and community life as a result of improved access provided as a result of completing the highway link across Labrador. These changes would be the same for either the preferred or outfitter route.

The longer outfitter route will require an additional year of construction, as well as continuing the ferry service for an additional year. This will have positive implications for employment and business opportunities associated with an extra year of ferry service. While the outfitter route is longer and will require some additional time to complete the work, it is not expected to change the number of workers required. Also, it is anticipated that the jobs available during operation would be the same for either the preferred or outfitter route.

A longer construction period also has implications for the broader economic benefits anticipated as a result of a highway across Labrador, which will not be realized until the final link in the TLH has been completed.

2.3.6 Economic Factors

The estimated costs for constructing the 250-km preferred route (A1, A4 and A5) is $75 million (assuming $300,000 per kilometre), not including costs associated with bridges. Taking bridges into consideration, the total cost for constructing the preferred route is $100 million. Estimated annual operating costs for a 250-km highway are $1.25 million.

The additional length (approximately 30 km) for the outfitter route translates into approximately $9 million ($300,000 per kilometre) in additional construction costs and additional annual maintenance costs of approximately $137,500 ($5,000 per kilometre annually). However, a cost savings of approximately $1.5 million would be realized through the elimination of the bridge on the South Branch of the Eagle River. While this would reduce the additional construction costs for this route, an additional year would have to be added to the construction schedule to account for constructing a longer highway. Total estimated construction costs for the outfitter route, with bridges, is $107.5 million. Estimated annual operating costs for a 280-km highway are $1.4 million.

2.3.7 Conclusions

Key aspects of the preferred and outfitter routes are summarized in Table 2.7. Using this information, various comparisons can be made depending on the values of different stakeholders. For example, comparing the length of route segments and the number of watercourse crossings indicates that by using the outfitter route, there will be a longer section of highway and a greater number of watercourse crossings within the Eagle River watershed. The various characteristics of the routes were considered in the effects analysis for the preferred route (as presented in JW/IELP (2003a)) and for the outfitter route environmental assessment as presented in Chapter 7.0.

Table 2.7 Comparison of Factors Associated with the Preferred and Outfitter Routes

No.	Criteria/Factors	Preferred Route	Outfitter Route
Technical and Physical Factors			
1	Topography/Terrain/Elevation	• Up to 600 m asl	• Up to 600 m asl
2	Geology/Geomorphology	• 8 mineral occurrence sites. • No mineral exploration licenses near route. • 6 areas of potential ARD.	• 7 mineral occurrence sites. • No mineral exploration licenses near route. • 6 areas of potential ARD.
3	Soils/Permafrost	• Glacial deposits <5 m. • Isolated permafrost (<10 percent).	• Glacial deposits <5 m. • Isolated permafrost (<10 percent).
4	Climate	• Interior Labrador, Interior Lake Melville, Southeastern Labrador Interior.	• Interior Labrador, Interior Lake Melville, Southeastern Labrador Interior. • Extends farther into Southeastern Labrador Interior - may be subject to higher snowfall levels.
5	Route Length	• 254 km	• 282 km
6	Number of Watercourse Crossings	• 95	• 115

No.	Criteria/Factors	Preferred Route	Outfitter Route
7	Crossing Structure Size	• 1 bridge with causeway. • 5 bridges (i.e., bridge only). • 17 pine arches. • 72 cylindrical culverts.	• 1 bridge with causeway. • 3 bridges (i.e., bridge only). • 8 pipe arches. • 103 cylindrical culverts.
8	Area of Disturbance	• 750 ha disturbed by clearing for the route. • 481 ha of lost standing biomass in forest land removed (carbon sink loss).	• 840 ha disturbed by clearing for the route. • 496 ha of lost standing biomass in forest land removed (carbon sink loss).
Biological Factors			
1	Raptors	• 25 nests within 800 m of centre line. • 5 nests within 50 m of centre line.	• 15 nests within 800 m of centre line. • 1 nest within 50 m of centre line.
2	Waterfowl	• Species composition same between two routes. • No harlequin ducks observed. • Largest grouping n=>50 birds.	• Species composition same between two routes. • No harlequin ducks observed. • Largest grouping n=22 birds.
3	Woodland Caribou	• Located more centrally in MMCH range.	• Closer to southern periphery of MMCH range.
4	Furbearers	• 105 beaver lodges.	• 86 beaver lodges.
5	Fish and Fish Habitat	• Route crosses five major watersheds with stream crossings in each. • No rare or endangered species identified.	• Route crosses seven major watersheds with stream crossings in six of them. • No rare or endangered species identified.
6	Species at Risk	• 33 potential sites for rare plants. • One short-eared owl observed. • No harlequin ducks observed.	• 47 potential sites for rare plants. • One short-eared owl observed. • No harlequin ducks observed.
7	Water Resources	• Dilute, low colour, low turbidity, neutral to slightly acidic, low alkalinity and low dissolved organic carbon. • Low metal concentrations, except for aluminum and iron.	• Dilute, low colour, low turbidity, neutral to slightly acidic, low alkalinity and low dissolved organic carbon. • Low metal concentrations, except for aluminum and iron.
8	Wetlands (avoid wetlands)	• 345 wetlands within 100 m of centre line. • 29 percent of vegetation within 5 km of right-of-way is wetland or other open type.	• 442 wetlands within 100 m of centre line. • 32 percent of vegetation within 5 km of right-of-way is wetland or other open type.
9	Riparian Habitat	• Average tree cover at stream crossings: 48%. • Average open(bog) cover at stream crossings: 6%. • 11.4 ha removed by construction at stream crossings.	• Average tree cover at stream crossings: 44%. • Average open(bog) cover at stream crossings: 7%. • 12.8 ha removed by construction at stream crossings.
10	Environmentally Sensitive Areas (avoid areas of known sensitivities)	• None specifically identified.	• None specifically identified.

No.	Criteria/Factors	Preferred Route	Outfitter Route
Socio-economic Factors			
1	Historic Resources	• 41 archaeological and ethnographic sites within 10-km corridor. • 35 late historic and/or contemporary sites. • Several early 20th century Innu camps and Settler tilts.	• 41 recorded sites in vicinity of outfitter route. • Probability for archaeological resources is variable across the route. • No field survey conducted on the route. • Potential ranges from low-moderate to moderate-high. • There are 6 areas of positive potential, including 3 areas of moderate-high potential.
2	Resource Use and Users	• Hunting, (black bear, waterfowl and small game), fishing and trapping carried out in region. • Kenamu River and Eagle River plateau and headwaters important areas for Innu and Settler/Métis. • 19 outfitting camps, closest at approximately 8 km. • No provincial or national parks. • 3 International Biological Program (IBP) sites, route passes through Site 53. • No forestry, mining or hydroelectric power development. • 92 km within low-level training area (LLTA) and 84 km from practice target area (PTA)	• Hunting (black bear, waterfowl and small game), fishing and trapping carried out in region. • Kenamu River and Eagle River plateau and headwaters important areas for Innu and Settler/Métis. • 19 outfitting camps, closest at approximately 5 km. • No provincial or national parks. • No forestry, mining or hydroelectric power development. • 3 IBP sites, route adjacent to southeasern corner of Site 53. • 119 km with LLTA, and 84 km from PTA.
3	Akamiuapishku/Mealy Mountain National Park	• Route is located with the national park study area. • 397 ha forest and 30 ha unforested area removed as a result of highway construction.	• Route is located within the national park study area, but in the southern portion of the study area. • 227 ha forest and 140 ha unforested area removed as a result of highway construction.
4	Canadian Heritage Rivers	• There are no nominated or designated heritage rivers.	• There are no nominated or designated heritage rivers.
5	Tourism Operations (avoid adverse effects and enhance benefits for existing and potential operations)	• Highway will provide road access into central Labrador. • Closest outfitting camp approximately 8 km.	• Highway will provide road access into central Labrador. • Closest outfitting camp approximately 5 km.
6	Employment and Business	• Provides a highway link across Labrador. • Shorter route for commercial trucking and personal travel. • Six-year construction period. • Employment less than TLH - Phase II (smaller project).	• Provides a highway link across Labrador. • Route 30 km longer than preferred route (approximately an estimated extra hour longer for a return trip). • Seven-year construction period. • Employment less than TLH - Phase II (smaller project).
7	Community Life	• Provide a highway link across Labrador. • 4 communities central Labrador, 11 communities southern Labrador.	• Provide a highway link across Labrador. • 4 communities central Labrador, 11 communities southern Labrador.

No.	Criteria/Factors	Preferred Route	Outfitter Route
Construction and Operations Costs			
1	Construction Costs ($300,000/km)	• $75 million, without bridges. • $100 million, with bridges.	• $84 million, without bridges. • $107.5 million with bridges. • $4.5 million for one additional year of ferry service.
2	Annual Operation Costs ($5,000/km annually)	• $1.25 million annually.	• $1.4 million annually.

3.0 PROPOSED UNDERTAKING

3.1 The Project

The TLH - Phase III will be a two-lane, all-season, gravel surface highway between Happy Valley-Goose Bay and Cartwright Junction (87 km south of Cartwright), where it will connect with the Phase II route of the TLH (Figure 3.1). The highway will form the final link in a highway system extending from the Labrador Straits region in southeastern Labrador to western Labrador and onwards through Québec.

3.1.1 Project Location and Study Area

The proposed outfitter route for the TLH - Phase III spans central Labrador (Figure 1.1). The preferred route for the highway begins east of Muskrat Falls and crosses the Churchill River at Black Rocks, approximately 9 km west of the Hamilton River Road intersection in Happy Valley-Goose Bay. It then extends southeast before turning east and then northeast towards Cartwright Junction. The western and eastern sections of the outfitter route are common to the preferred route, while the central portion of the outfitter route deviates further to the south. This section is approximately 155 km long and is shown as A13 on Figure 2.1. Overall, the outfitter route is 30 km longer than the preferred route, with a total length of 280 km.

This environment assessment focuses on the outfitter route. The project boundary is defined by the 40 m right-of-way established for the highway. All physical structures and related works for the project will be carried out within this right-of-way.

The study area is defined by the:

- physical extent of the project, specifically the outfitter route and 40-m right-of-way;
- extent of aquatic and terrestrial VECs potentially affected by the highway;
- extent of land use for subsistence, commercial, cultural, recreational, spiritual and aesthetic purposes by Aboriginal and non-Aboriginal people and communities that may be affected by the project; and
- local and regional economic effects of the project.

In general, the larger study region encompasses much of the area of Regional Economic Zone 3 (Central Labrador) and the northwestern portion of Regional Economic Zone 4 (Southeastern Aurora) (Figure 3.2). However, the specific study area varies for each VEC. Study area boundaries are discussed in Section 6.1, with VEC-specific boundaries discussed in each VEC section in Chapter 7. The environmental setting, including natural and human elements, for the larger study area is described in Chapter 4.

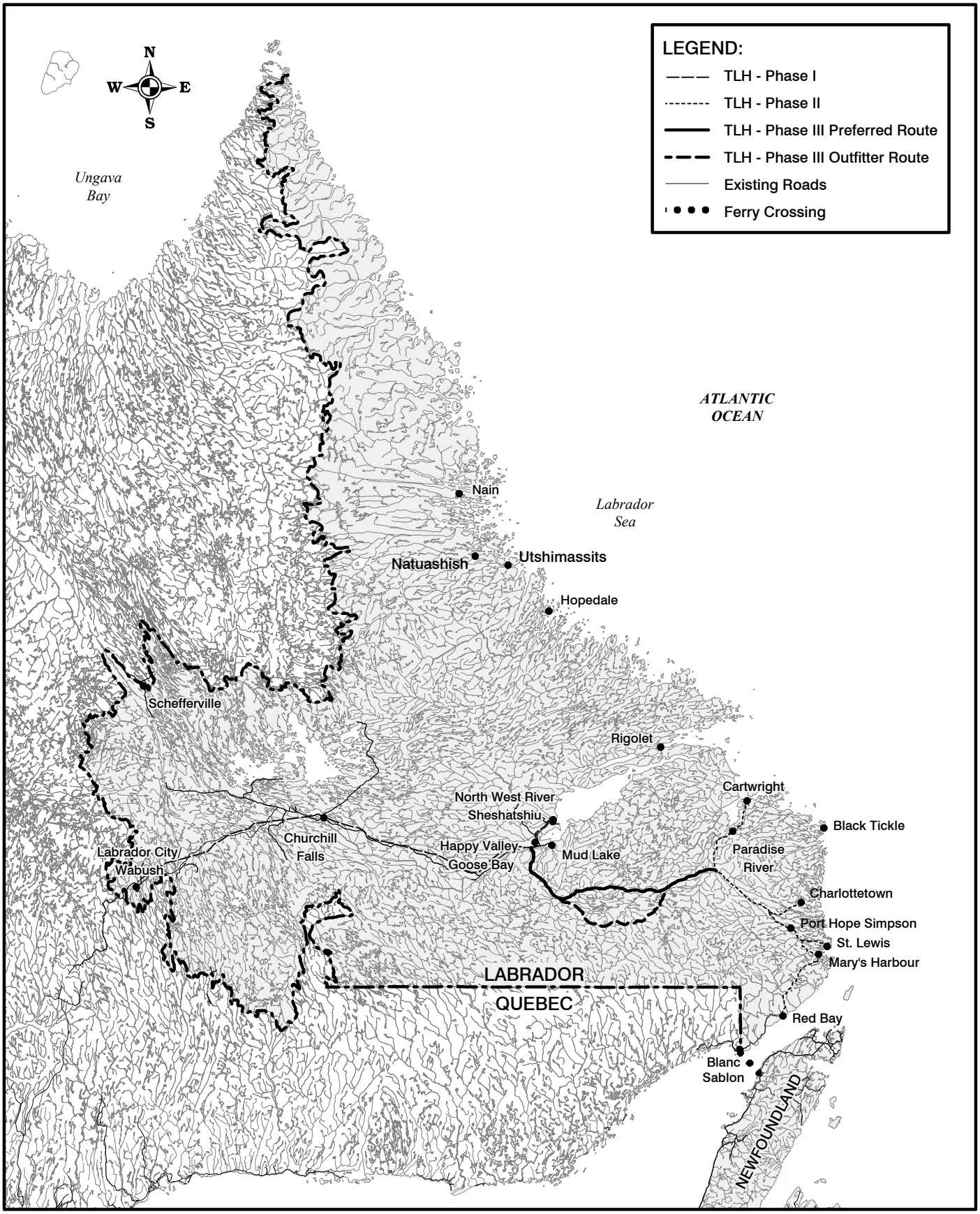

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FIGURE 3.1

TRANS LABRADOR HIGHWAY

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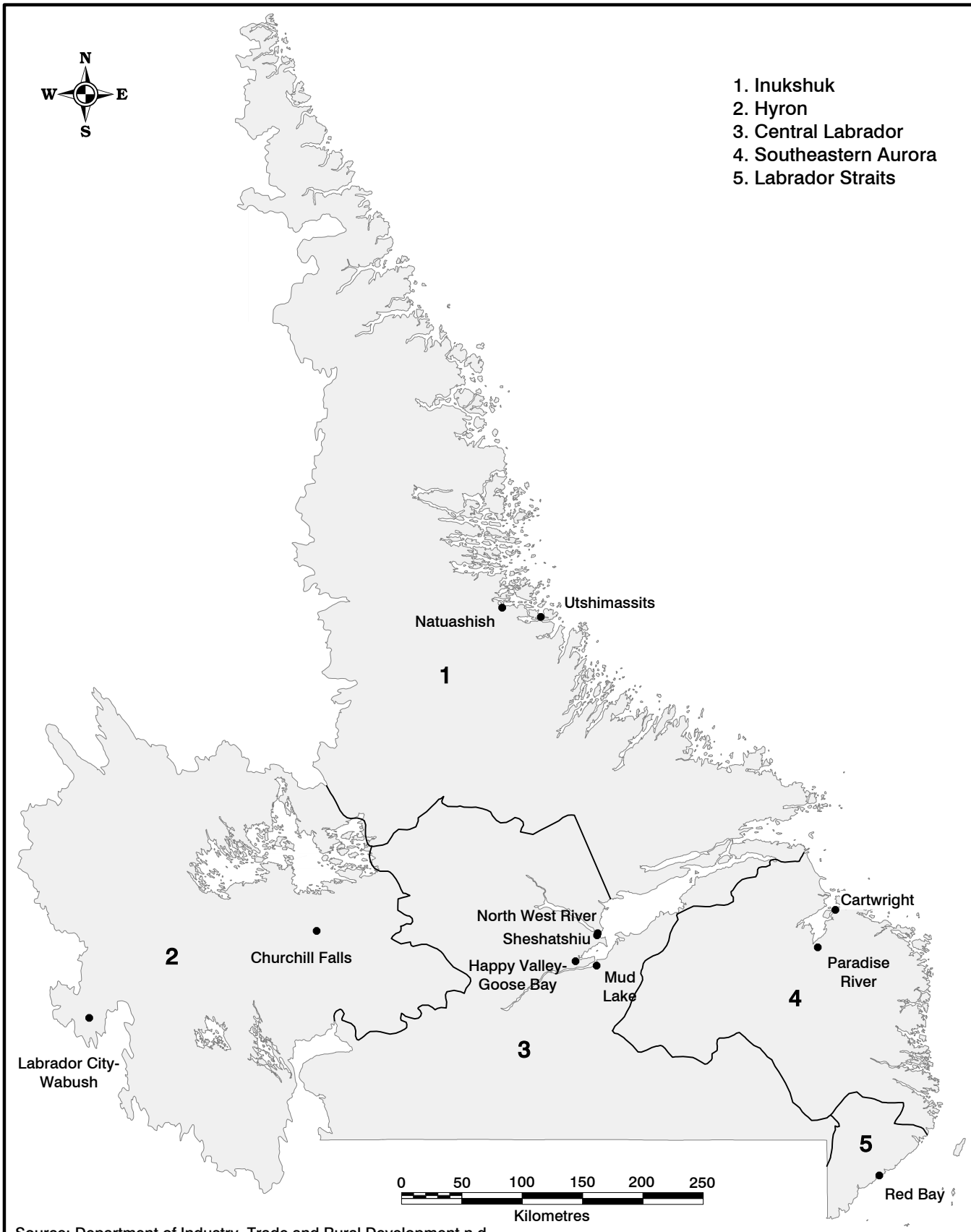

Source: Department of Industry, Trade and Rural Development n.d.

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FIGURE 3.2

REGIONAL ECONOMIC ZONES
IN LABRADOR

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3.1.2 Project Purpose and Rationale

Regardless of which route is selected, the purpose of the TLH - Phase III is to complete a reliable and cost-effective all-season ground transportation system in Labrador that provides a link between communities in western Labrador with those of southern Labrador. This final link in the TLH will connect the previously completed Phase I portion of the TLH between western Labrador and Happy Valley-Goose Bay, and the recently completed Phase II portion of the TLH between Red Bay and Cartwright. When completed, the TLH - Phase III will provide a connection with the provincial highway network in Québec and the network on the island of Newfoundland (via a ferry connection between Blanc Sablon, QC and St. Barbe, NL).

The TLH - Phase III will provide direct economic benefits through employment. Constructing the TLH - Phase III will provide seasonal employment for 2,800 people. A number of full-time jobs will also be created for highway operation and maintenance.

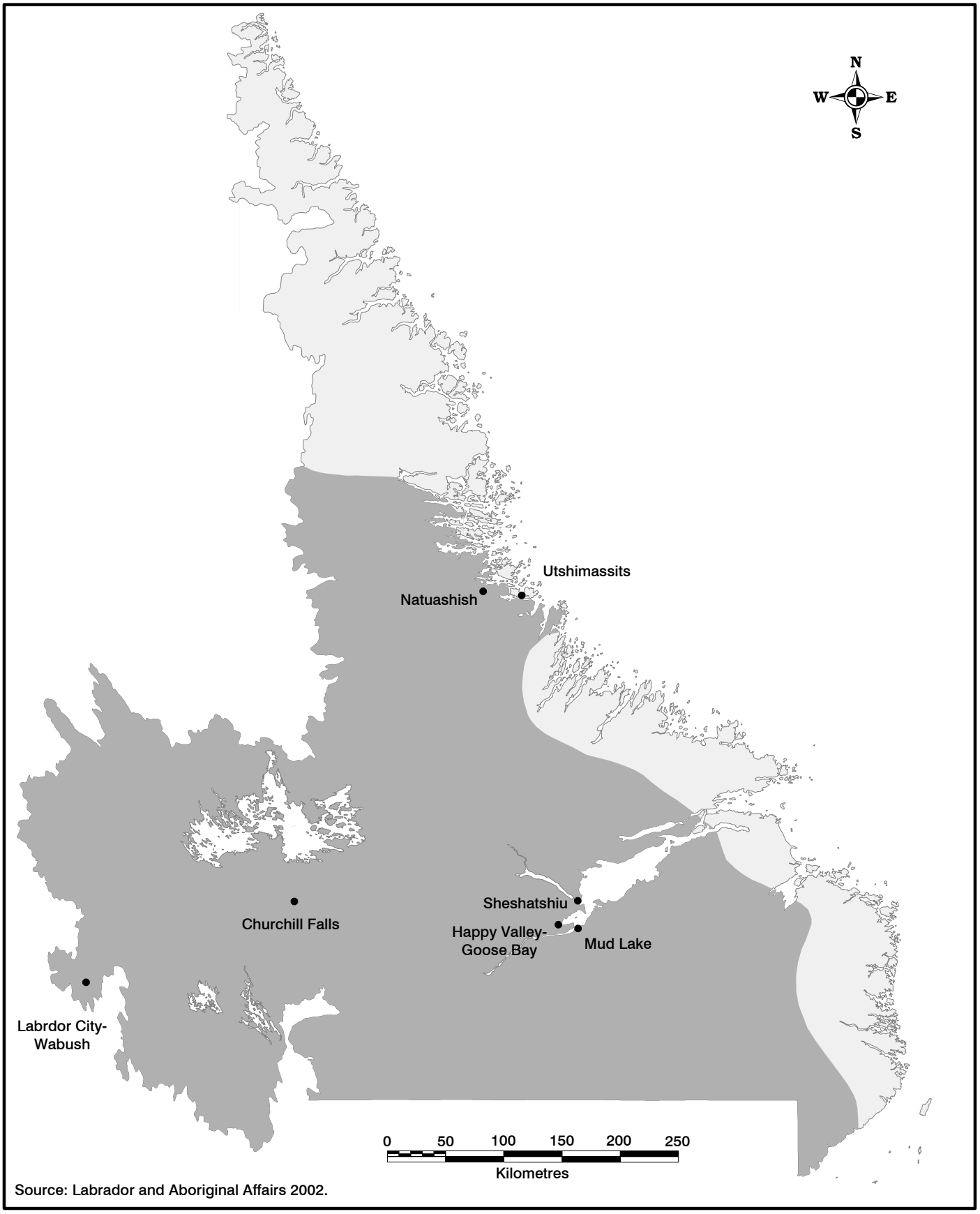
Completing the TLH across Labrador will also generate a number of social and economic benefits, including:

- increased and more economical transportation options for area residents traveling within the region or between the region and Québec and the island of Newfoundland;
- increased and more economical transportation options for people traveling to Labrador;
- reduced dependence on air and marine transportation services;
- increased infrastructure to support economic development opportunities;
- improved access to health, education and recreational facilities in Labrador and on the island of Newfoundland;
- reduced sense of isolation; and
- reduced personal and business travel costs.

Alternatives to the project, and viable technical and economic alternatives for carrying out the project, are described in Chapter 2.

3.2 Regulatory Approval Requirements

Following release from both the provincial and federal environmental assessment processes, the TLH – Phase III project is expected to require a number of approvals, permits and authorizations prior to project initiation. Also, throughout project construction and operation, compliance with various standards contained in federal and provincial legislation, regulations and guidelines will be required. WST Specifications 801 (Owner's Policy) and 805 (Contractor Responsibilities) outline provisions dealing with permitting and compliance. WST will also comply with any terms and conditions associated with the EIS/CSR release. The TLH - Phase III will also be subject to the terms and conditions of the Innu land claim settlement, currently being negotiated between Innu Nation and the federal and provincial governments. When the land claim has been settled, WST will comply with the terms set out in the final agreement. The Labrador Innu land claim area is shown in Figure 3.3.



Source: Labrador and Aboriginal Affairs 2002.

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FIGURE 3.3

LABRADOR INNU
LAND CLAIM AREA

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A list of potential regulatory approvals and compliance standards that may be required for the TLH – Phase III project is provided in Table 3.1. All appropriate permits, authorizations and approvals will be obtained for the project. Where appropriate, authorizations will be obtained by individual contractors (WST Specification 805). In the case of documents issued under the NWPA, the required authorizations will be obtained by WST.

WST is aware of the following strategies, policies and codes of practice dealing with pollution prevention and toxic substances management:

- National Guidelines for Decommissioning Industrial Sites;
- Pollution Prevention: A Federal Strategy for Action;
- A Strategy to Fulfill the CCME Commitment to Pollution Prevention;
- Toxic Substances Management Policy; and
- Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

The requirements of relevant strategies, policies and codes will be followed as appropriate. In addition, relevant WST specifications pertaining to highway design, construction and operation will be followed. Relevant WST specifications were provided in Appendix D of JW/IELP (2003a).

Table 3.1 Potential Environmental Authorizations for the Trans Labrador Highway – Phase III

Potential Authorization Required	Applicable Legislation	Activity Requiring Regulatory Approval/ Compliance	Responsible Agency	Requirements
Federal				
Responsible Authority's Decision	CEAA and Regulations	Project	Relevant Federal Department	The requirements of CEAA must be fulfilled. DFO, the RA for the federal environmental assessment, has indicated the project will require a CSR pursuant to CEAA.
Permit for Construction Within Navigable Waters	NWPA and Regulations	Construction of watercourse crossings and placement of drainage structures.	Canadian Coast Guard, Department of Fisheries and Oceans	A permit is required for any works or construction activity located below the high water mark, either over, under, through or across any navigable waters. This could include any structure, device or thing that may interfere with navigation. An application, including photographs, must be submitted for each alteration to a navigable waterway. Any temporary watercourse diversion must also be included with the original application for that specific crossing.
Authorization or Letter of Advice for Works or Undertakings Affecting Fish Habitat	*Fisheries Act*, Section 35(2)	Construction of watercourse crossings and placement of drainage structures.	Department of Fisheries and Oceans	Application must be made if fish habitat may be affected. Where potential for harmful effects to fish habitat can be prevented, a Letter of Advice will be issued outlining appropriate mitigation procedures or conditions to be followed. Authorizations will only be issued where there will be a loss of fish habitat that cannot be avoided by mitigation measures. The authorization requires a habitat compensation plan to be developed and agreed to by DFO and proponent before the authorization is given.

Potential Authorization Required	Applicable Legislation	Activity Requiring Regulatory Approval/ Compliance	Responsible Agency	Requirements
Temporary Magazine Licence	*Explosives Act*	Temporary storage of explosives at laydown areas.	Natural Resources Canada	Should blasting be required for the project, a licence will be required to store explosives on site.
Explosives Purchase and Possession Permit	*Explosives Act*	Purchase and possession of explosives.	Natural Resources Canada	A permit is required to purchase and possess explosives.
Explosives Transportation Permit	*Explosives Act*	Transportation of explosives.	Natural Resources Canada	A permit is required for transporting explosives.
Radio Station License	*Radio-communication Act*	Use of radios on site during the project.	Industry Canada	A licence must be obtained for each radio used on site.
Compliance Standard	*Fisheries Act*, Section 36(3), Deleterious Substances	Any run-off from the project site being discharged to receiving waters.	Environment Canada, Department of Fisheries and Oceans	Environment Canada is responsible for Section 36(3) of the *Fisheries Act*. However, DFO is responsible for matters dealing with sedimentation. Discharge must not be deleterious and must be acutely non-lethal.
Compliance Standard	*Migratory Birds Convention Act* and Regulations	Any activities which could result in the mortality of migratory birds and endangered species and any species under federal authority.	Canadian Wildlife Service, Environment Canada	Prohibits the deposit of oil, oily wastes or any other substances harmful to migratory birds in any waters or any area frequented by migratory birds. The Canadian Wildlife Service should be notified about the mortality of any migratory bird in the project area, including passerine (songbirds) and waterfowl species.
Compliance Standard; permit may be required.	*Migratory Birds Convention Act* and Regulations	Right-of-way clearing and blasting.	Canadian Wildlife Service, Environment Canada	Prohibits disturbing, destroying or taking a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, and possessing a live migratory bird, carcass, skin, nest or egg, except when authorized by a permit.
Compliance standards; permits may be required.	National Fire Code	On-site structures (temporary or permanent).	Engineering Services Division, Government Service Centre	Approval is required for fire prevention systems in all approved buildings.
Compliance standards; permits may be required.	National Building Code	On-site structures (temporary or permanent).	Engineering Services Division, Government Service Centre	Approval is required for all building plans.
Policy	Federal Policy on Wetland Conservation	Any disruption of wetland habitat.	Environment Canada	The goals of this policy should be considered in cases where a project could affect wetland habitat.

Potential Authorization Required	Applicable Legislation	Activity Requiring Regulatory Approval/ Compliance	Responsible Agency	Requirements
Provincial				
Release from Environmental Assessment	*Environmental Protection Act*	Project	Department of Environment	Notice has been given by the Minister of Environment that an EIS is required for the project. The EIS will be used by the Minister, in consultation with Cabinet and Innu Nation (subject to an MOU signed by Innu Nation and provincial government), to determine the acceptability of the project based on its anticipated residual environmental effects.
Certificate of Approval for any Alteration to a Body of Water	*Water Resources Act*	Any activities which may alter a water body.	Water Resources Division, Department of Environment	Permits are required for construction activities within 15 m of the high watermark of any water body. An application form is required for each alteration.
Certificates of Approval for any Instream Activity (including Culvert Installation, Bridges and Fording a Watercourse)	*Water Resources Act*	Any in-stream activity.	Water Resources Division, Department of Environment	Approval is required for any in-stream activity, including culvert installations and fording activities, before undertaking the work. This also includes any development within 15 m of the high watermark of any water body.
Certificate of Approval for Construction Site Drainage	*Water Resources Act*	Any run-off from the project site being discharged to receiving waters.	Water Resources Division, Department of Environment	Approval is required for any run-off from the project site being discharged to receiving waters.
Water Use Authorization	*Water Resources Act*	Water withdrawal for use at temporary camp or during construction and operation activities.	Water Resources Division, Department of Environment	Water use authorization is required for all beneficial uses of water.
Certificate of Approval for Storing and Handling Gasoline and Associated Products	*Environmental Protection Act*, and *Storage and Handling of Gasoline and Associated Products Regulations*	Storing and handling gasoline and associated products.	Engineering Services Division, Government Service Centre	A Certificate of Approval is required for storing and handling gasoline and associated products.
Permit for Storage, Handling, Use or Sale of Flammable and Combustible Liquids	*Fire Prevention Act*, and *Fire Prevention Flammable and Combustible Liquids Regulations*	Storing and handling flammable liquids.	Engineering Services Division, Government Service Centre	This permit is issued on behalf of the Office of the Fire Commissioner. Approval is based on a review of information provided for the Certificate of Approval for Storing and Handling Gasoline and Associated Products. No additional submission is required.
Fuel Cache Permit	*Environmental Protection Act* and *Environmental Guidelines for Fuel Cache Operations*	Temporary fuel storage.	Engineering Services Division, Government Service Centre	A permit is required for any temporary fuel storage in a remote location.
Quarry Permit	*Quarry Materials Act* and Regulations	Extracting borrow material.	Mineral Lands Division, Department of Mines and Energy	A permit is required to dig for, excavate, remove and dispose of any Crown quarry material.
Permit to Burn	*Forestry Act* and *Forest Fire Regulations*	Any burning required during the project.	Department of Forest Resources and Agrifoods	A permit is required to light fires outdoors between April and December. Permits are not issued during forest fire season.

Potential Authorization Required	Applicable Legislation	Activity Requiring Regulatory Approval/ Compliance	Responsible Agency	Requirements
Cutting Permit	*Forestry Act* and *Cutting of Timber Regulations*	Clearing land areas for the right-of-way, borrow pits, camp sites or laydown areas.	Department of Forest Resources and Agrifoods	A permit is required for the commercial or domestic cutting of timber on crown land.
Certificate of Approval for Septic Systems less than 4,546 L per day.	*Environmental Protection Act*	Sewage disposal and treatment at construction camps and maintenance depots.	Engineering Services, Department of Government Services and Lands	A Certificate of Approval is required for commercial septic systems in an unserviced area, not covered by a municipality.
Certificate of Approval for Installation of a Sewage System	*Sanitation Regulations*, under the *Health and Community Services Act*	Sewage disposal and treatment at construction camps and maintenance depots.	Department of Health and Community Services	Sewage disposal systems designed, constructed or installed to service a private dwelling or a commercial or other building with a daily sewage flow less than 4,546 L must be approved by an inspector before installation.
Certificate of Approval for a Water Withdrawal System of 4,500 L per day or greater	*Water Resources Act*	Water supply at temporary camps and maintenance depots, and for use in construction activities (e.g., dust control).	Water Resources Division, Department of Environment	Certificate of Approval is required for any private water withdrawal system of 4,500 L/day or greater.
Certificate of Approval for Installation of Water Supply System	*Sanitation Regulations*, under the *Health and Community Services Act*	Water supply at temporary camps and maintenance depots.	Department of Health and Community Services	Water supply systems designed, constructed or installed to service a private dwelling or a commercial or other building, including systems not governed by a municipal council, local service district or local water committee, must be approved by an inspector before installation.
Certificate of Approval for a Waste Management System	*Environmental Protection Act* and *Waste Management Regulations*	Waste disposal associated with construction and operation.	Department of Environment, Department of Health and Community Services	Approval is required for waste disposal (e.g., incineration or burying). Used tires must be disposed according to regulations.
Food Establishment Licence – Temporary Facility Permit	*Health and Community Services Act, Food and Drug Act* and *Food Premises Regulations*	Establishing and operating a temporary camp and kitchen facility, or using/upgrading existing facilities.	Operations Division, Department of Government Services and Lands	A licence is required to operate food premises. Where municipal services are unavailable, two copies of plans and specifications for water supply and sewage disposal must be submitted with application for a licence. Food premises are routinely inspected to ensure compliance.
Permit to Destroy Problem Animals	*Wildlife Act*	Dealing with nuisance wildlife.	Forest Resources Branch, Department of Forest Resources and Agrifoods	The Forest Resources Branch provides direction on handling nuisance animals. Details on the situation must be provided for a permit to be issued.
Compliance Standard	*Fire Prevention Act*, and *Fire Prevention Regulations*	On-site structures (temporary or permanent).	Engineering Services Division, Government Service Centre	All structures must comply with fire prevention standards.
Compliance Standard	*Environmental Protection Act* and *Ozone Depleting Substance Regulations*	On-site fire extinguishing equipment.	Department of Environment	Fire extinguishing equipment must be handled or stored according to regulations.

Potential Authorization Required	Applicable Legislation	Activity Requiring Regulatory Approval/ Compliance	Responsible Agency	Requirements
Compliance Standard	*Environmental Control Water and Sewage Regulation* under the *Water Resources Act*	All waters discharged from the project.	Pollution Prevention Division, Department of Environment	A person discharging sewage and other materials into a body of water must comply with the standards, conditions and provisions prescribed in these regulations for the constituents, contents or description of the discharged materials.
Compliance Standard	*Sanitation Regulations*, under the *Health and Community Services Act*	Sewage and waste disposal.	Department of Heath and Community Services	Outlines standards for sewage and waste disposal.
Compliance Standard	*Dangerous Goods Transportation Act* and Regulations	Storing, handling and transporting fuel, oil and lubricants.	Department of Works, Services and Transportation	If the materials are transported, handled and stored fully in compliance with the regulations, a permit is not required. A Permit of Equivalent Level of Safety is required if a variance from the regulations is necessary. Transporting goods considered dangerous to public safety must comply with regulations.
Compliance Standard	*Historic Resources Act*	Any known archaeological sites near project area or sites encountered during construction or operation.	Provincial Archaeology Office, Department of Tourism, Culture and Recreation	All archaeology sites and artifacts are considered to be the property of the Crown and must not be disturbed. Any archaeology materials encountered must be reported to the Provincial Archaeology Office. Any proposed alterations to the project should be referred to the Provincial Archaeology Office for approval.
Archaeological Research Permit	*Historic Resources Act*	Any archaeological investigations required.	Provincial Archaeology Office, Department of Tourism, Culture and Recreation	A permit is required for any archaeological investigations on land or underwater.
Compliance Standard	*Occupational Health and Safety Act* and Regulations	Project-related occupations.	Department of Labour	Outlines minimum requirements for workplace health and safety. Workers have the right to refuse dangerous work.
Compliance Standard	*Workplace Hazardous Materials Information System (WHMIS) Regulations*, under the *Occupational Health and Safety Act*	Handling and storage of hazardous materials.	Operations Division, Department of Government Services and Lands	Outlines procedures for handling hazardous materials and provides details on various hazardous materials.
Municipal				
Approval for Waste Disposal	*Urban and Rural Planning Act, 2000,* and Relevant Municipal Plan and Development Regulations	Waste disposal.	Town/Community Council	The use of a community waste disposal site in Newfoundland and Labrador by proponents/contractors to dispose of waste requires municipal approval. Restrictions may be in place as to what items can be disposed of a municipal disposal site.
Development or Building Permit	*Urban and Rural Planning Act, 2000,* and Relevant Municipal Plan and Development Regulations	Development within municipal boundary.	Town/Community Council	A permit is required for any development or building within municipal boundaries.

3.3 Project Features

The primary features of the TLH - Phase III are the highway and its right-of-way, intersections, watercourse crossing structures, borrow pits and major excavations, maintenance depots, signage and roadside pull-off locations. Most borrow pits established for the TLH - Phase III will be temporary. However, some may continue to be used during operation for highway maintenance and winter ice control materials. The project will also involve other temporary features during construction, including temporary watercourse diversions, construction camps, laydown areas and waste disposal facilities.

3.3.1 Highway

The TLH - Phase III will form the final link in a highway system extending from the Labrador Straits region in southeastern Labrador to western Labrador and onwards through Québec. This two-lane, all-season, gravel surface highway (outfitter route) will extend over approximately 280 km between Happy Valley-Goose Bay and Cartwright Junction, located 87 km south of Cartwright, on the Phase II portion of the TLH (Figure 1.1).

At the western end, the TLH - Phase III will begin east of Muskrat Falls, with a bridge and causeway structure crossing the Churchill River at Black Rocks, which is located on the Phase I portion of the TLH approximately 9 km west of the Hamilton River Road intersection in Happy Valley-Goose Bay. From this point, the route extends southeast before turning east and then northeast to connect with the Phase II route at Cartwright Junction. The A13 section of the outfitter route would cover a distance of approximately 155 km.

There are no access roads being proposed as part of this project as there are no communities along the highway route. Several alternative route sections were considered during project planning. These alternatives are described in detail in Chapter 2.0, along with the rationale for why they are not being considered further.

Design standards for the highway are similar to those used for the upgraded Phase I portion of the TLH and recently constructed Phase II portion of the TLH between Red Bay and Cartwright. Design standards of the Transportation Association of Canada (TAC) are highlighted in Table 3.2. These standards were met or exceeded for the Phase I and II portions of the TLH, and a similar approach is being taken in planning for the TLH - Phase III.

Table 3.2 Design Standards for the TLH - Phase III

Feature	Design Standard	Actual Standard
Posted Speed Limit (km/hr)	80	70
Maximum Gradient (%)	8	8
Cross-slope for Drainage (%)	3	3
Minimum Radius of Curve (m)	190	190
Maximum Super Elevations (%)	6	6
Stopping Sight Distance (m)	110 minimum, 120 desirable	140 minimum, 150 desirable
Minimum Passing Sight Distance (m)	480	560
Source: TAC 1999a.		

The TLH - Phase III will be designed to a Rural Local Undivided 80 km/hr (RLU 80) design standard, with a posted speed limit standard of 70 km/hr. A minimum stopping sight distance of 140 m will be provided along the entire route, with a desired stopping sight distance of 150 m being provided where possible. A minimum passing sight distance of 560 m will be provided as frequently as possible to ensure adequate passing opportunities. The relationship between horizontal and vertical alignments will comply with good design practice and TAC standards. Actual design standards for the TLH - Phase III are summarized in Table 3.2.

A typical cross-section for the highway is provided in Figure 3.4. The highway will have a surface width of 9.5 m. The highway surface will be graded with 3 percent slope from the highway centre line. The minimum fill depth will be approximately 1 m, except in transition areas between fill sections and highway cuts. Excavations containing unsuitable materials will only be excavated where the design slope reaches the maximum allowed slope of 8 percent for the main route. Minimum slopes (maximum gradient) for fill slopes and other material cut slopes will be 1.5:1 and minimum slopes through solid rock will be 1:4.

3.3.2 Right-of-way

The RLU 80 highway will have a right-of-way width of 40 m. The clearing width will be 30 m, with efforts made to reduce this width as necessary, in particular around watercourses. The grubbing width along the right-of-way will be 20 m instead of the standard 30 m. Grubbing widths near watercourses will be further reduced where possible.

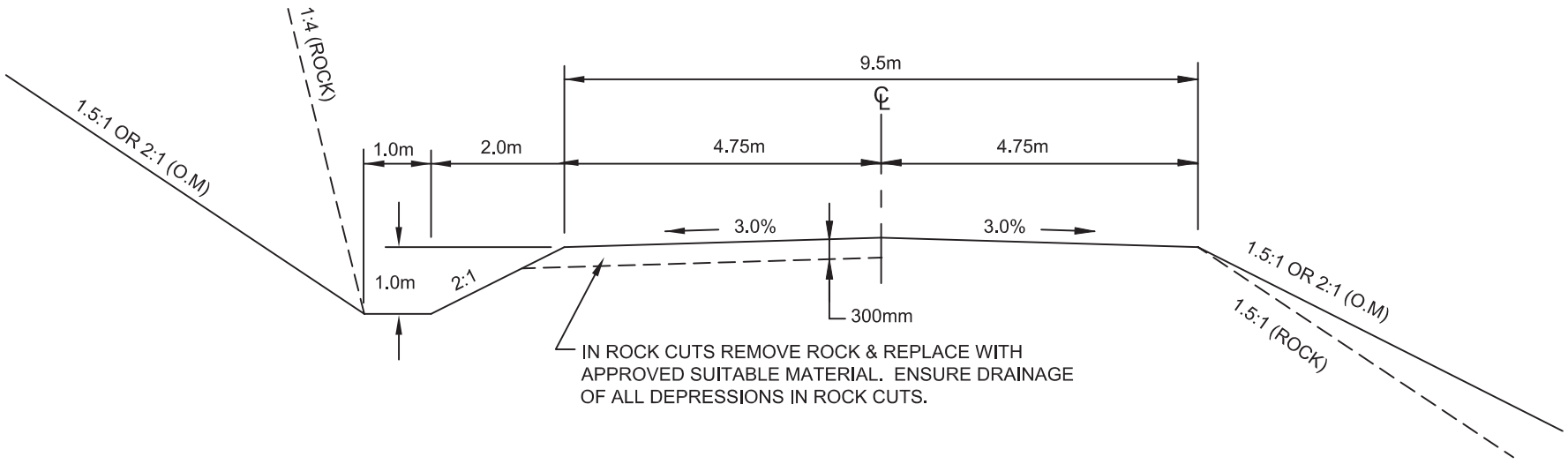
3.3.3 Intersections

There are only two intersections planned for the TLH - Phase III, at the western and eastern ends of the route. Intersections will be designed in accordance with TAC standards (TAC 1999a). They will have a turning radius that meets the requirements of tractor trailers.

3.3.4 Watercourse Crossings

Based on 1:50,000 NTS mapping for central Labrador, the outfitter route will cross 115 watercourses between Happy Valley-Goose Bay and Cartwright Junction, with four watercourses requiring bridge structures, one with a partial causeway structure, and eight requiring pipe arch culverts. The locations where bridge, causeway and pipe arch culverts will be required along the TLH - Phase III route are shown on Figure 3.5. Information on the crossing location, and type and size of the structures to be placed at each crossing is provided in Table 3.3. The remainder of the crossings will require culverts ranging in size from 1,200 to 5,000 mm.

STANDARD WIDTH OF R.O.W. 40.0m
STANDARD WIDTH OF CUTTING 30.0m
STANDARD WIDTH OF GRUBBING 20.0m



Source: Department of Works, Services and Transportation 2002.

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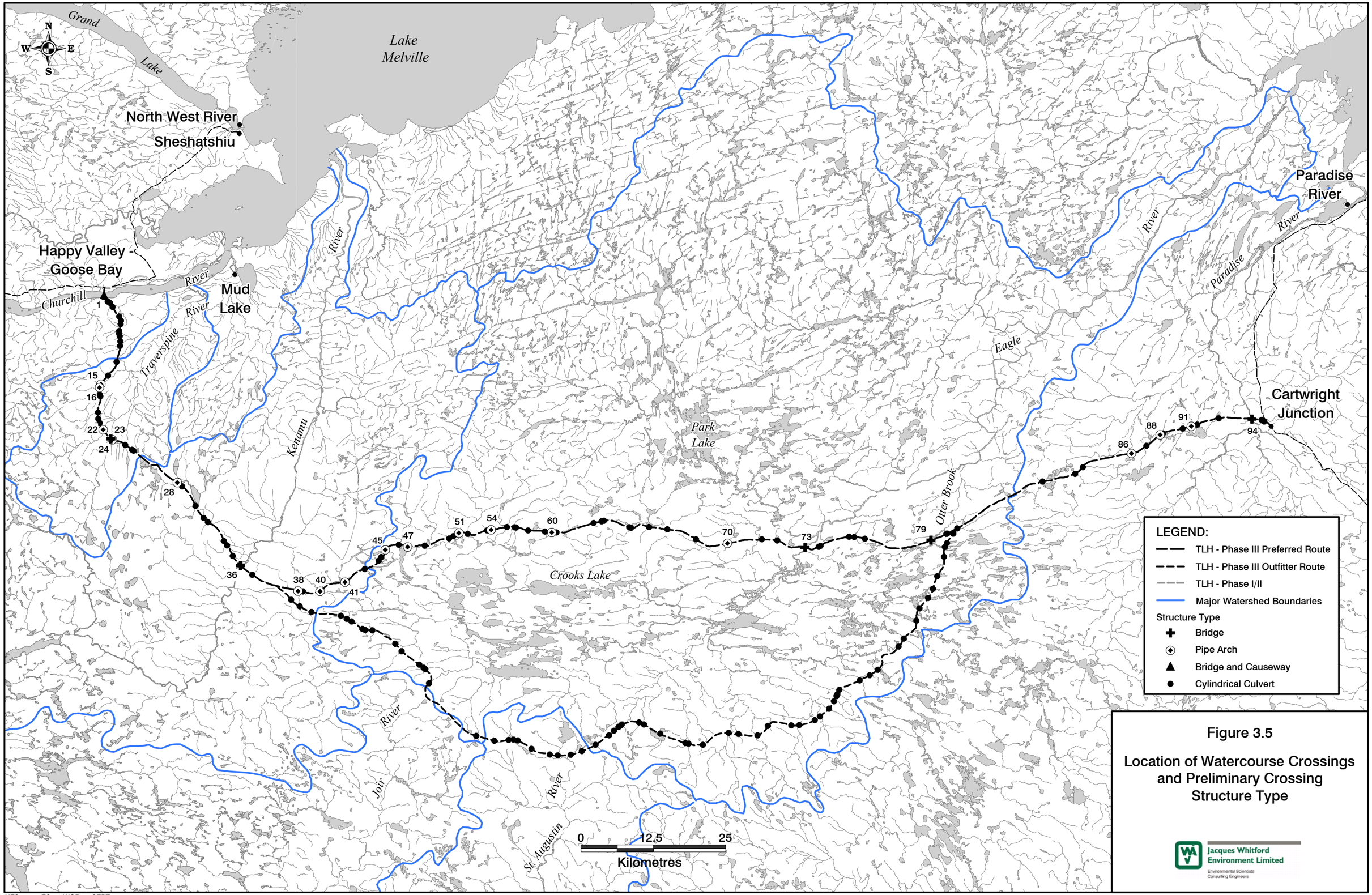
Figure 3.4

TYPICAL TRANS LABRADOR HIGHWAY CROSS SECTION



LEGEND:

- TLH - Phase III Preferred Route
- TLH - Phase III Outfitter Route
- TLH - Phase I/II
- Major Watershed Boundaries

Structure Type

- Bridge
- Pipe Arch
- Bridge and Causeway
- Cylindrical Culvert

Figure 3.5

Location of Watercourse Crossings and Preliminary Crossing Structure Type

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Table 3.3 TLH - Phase III Watercourse Crossings Requiring Bridge, Causeway and Pipe Arch Structures

Crossing No.	Watercourse	Watershed	Preliminary Structure Type	Preliminary Structure Size
1	Churchill River	Churchill	Bridge and Causeway	3 bridge spans, 120 m each; 500 m causeway
15		Traverspine	Pipe Arch	4,370 mm x 2,870 mm
16		Traverspine	Pipe Arch	5,890 mm x 3,710 mm
22		Traverspine	Pipe Arch	5,890 mm x 3,710 mm
23	Traverspine River	Traverspine	Bridge	15 m bridge span
24		Traverspine	Pipe Arch	4,370 mm x 2,890 mm
28		Traverspine	Pipe Arch	4,370 mm x 2,870 mm
36	Kenamu River	Kenamu	Bridge	2 bridge spans, 30 m each
86		Eagle	Pipe Arch	5,490 mm x 3,530 mm
88		Eagle	Pipe Arch	3,890 mm x 2,690 mm
91		Eagle	Pipe Arch	4,370 mm x 2,870 mm
94	Paradise River	Paradise	Bridge	60 m bridge span

Note: Watercourse crossing numbers listed correspond with those shown in Figure 3.5. All other crossings will have corrugated steel pipe (CSP) structures.

3.3.4.1 Design Criteria for Crossing Structures

Watercourse crossings will be designed and constructed in consultation with the provincial Water Resources Division and with DFO to ensure that crossing structures are installed in a manner that minimizes effects on fish and fish habitat. WST will consult with provincial and federal government officials to ensure that the best available data are used for designing watercourse crossings. Construction details for each watercourse crossing (including bridge or culvert type, clearance from watercourse, height, width, length, diameter and other relevant information) will be submitted to the provincial Water Resources Division and DFO prior to construction. As well, all appropriate environmental authorizations will be obtained.

Watershed hydrological characteristics will be determined by WST prior to construction. While there are limited hydrological data available for Labrador in comparison to the island of Newfoundland, flow and other watercourse data are available and can be used to extrapolate from one area to another.

The main methods for determining stream flow will be the regional flood frequency method for Labrador as described in Rollings (1997) and the rational method as described in TAC (1982). Rollings (1997) developed a regional flood frequency formula for Labrador using stream flow gauging stations in Labrador and Québec. A list of all active and discontinued stream flow gauging stations in Labrador, including station identification number, location and description, is provided in Table 3.4. Some stream flow gauging station characteristics, including period of record, are shown in Table 3.5.

Table 3.4 Stream Flow Gauging Stations in Labrador

Station Number	Station Name
02XA003	Little Mecatina River above Lac Fourmont
02XA004	Riviere Joir near Provincial Boundary
02XD002	North Brook near Red Bay
03NE001	Reid Brook at Reid Pond Outlet
03NF001	Ugjoktok River below Harp Lake
03NG001	Kanairiktok River below Snegamook Lake
03OA001	Ashuanipi River at Menihek Rapids
03OA003	McPhadyen River near the Mouth
03OA004	Ashuanipi River below Wightman Lake
03OA005	Wabush Lake at Lake Outlet
03OA006	Julienne Lake below Wabush Lake
03OB002	Churchill River at Flour Lake
03OB003	McKenzie River below Andre Lake
03OC002	Atikonak River at Atikonak Rapids
03OC003	Atikonak River above Panchia Lake
03OC004	Atikonak River (West Branch) below Kepimits Lake
03OC005	Atikonak River above Atikonak Lake
03OC006	Atikonak River at Gabbro Lake
03OC007	Atikonak Lake
03OD001	Churchill River near Churchill Falls
03OD002	Unknown (Aitkonak) River at Twin Falls
03OD003	Unknown (Aitkonak) River at Lake 51
03OD004	Metchin River (East Branch) near Winokapau Lake
03OD005	Churchill River at Churchill Falls Powerhouse
03OD006	Atkonak River at Ossakmanuan Lake Control Structure
03OD007	East Metchin River
03OE001	Churchill River above Upper Muskrat Falls
03OD002	Minipi River near Minipi Lake
03OE003	Minipi River below Minipi Lake
03PB001	Naskaupi River at Fremont Lake
03PB002	Naskaupi River below Naskaupi Lake
03QC001	Eagle River above Falls
03QC002	Alexis River near Port Hope Simpson

Source: Rollings 1997; Department of Environment n.d.

Table 3.5 Characteristics of Stream Flow Gauging Stations in Labrador

Station Number	Start Year	Finish Year	Years of Record	Complete Years of Record	Flow Regime	Drainage Area (km^2)
02XA003	1978	1.993e+119	1.614e+52	1.313014153e+46	Natural	4,540
02XA004	1980				Natural	2,060
02XD002	1984				Natural	35.5
03NE001[1]						
03NF001	1979				Natural	7,570
03NG001	1979				Natural	8,930
03OA001	1952				Regulated	19,000
03OA003	1972				Natural	3,610
03OA004	1972				Natural	8,310
03OA005[1]						
03OA006[1]						
03OB002	1955				Natural	33,900
03OB003	1972				Natural	1,040
03OC002	1955				Natural	19,900
03OC003	1972				Natural	15,100
03OC004	1972				Natural	7,070
03OC005	1972				Natural	3,680
03OC006	1973				Regulated	21,400
03OC007[1]						57,500
03OD001	1954				Natural	
03OD002	1962				Regulated	22,800
03OD003A[2]	1955				Natural	19,900
03OD003B[2]	1964				Regulated	19,900
03OD004	1972				Natural	1,090
03OD005	1972				Regulated	69,200
03OD006	1977				Regulated[3]	Unknown
03OD007[1]						
03OE001A[2]	1948				Natural	78,800
03OE001B[2]	1972				Regulated	92,500
03OE002	1972				Natural	2,220
03OE003	1979				Natural	2,330
03PB001	1955				Natural	8,990
03PB002	1978				Natural	4,480
03QC001	1966				Natural	10,900
03QC002	1978				Natural	2,310

[1] No characteristics available.
[2] Streamflow records split into two parts: natural flows and regulated flows.
[3] Zero Flow 1977-1993.
Source: Rollings 1997.

The rational method has three main inputs, including the runoff coefficient, drainage basin area and rainfall intensity. The runoff coefficient represents the integrated effects of soil properties, ground cover, terrain slope and depression storage. The runoff coefficient for this project is estimated to be in the range of 0.25 to 0.35. The area of the drainage basin has been estimated from 1:50,000 scale contour maps. Rainfall intensity is calculated by using the time of concentration as an input to standard rainfall charts. The time of concentration is the time taken for storm runoff to travel from the most remote point of the basin to the culvert site. Rainfall intensities can be calculated for a number of return periods. Using these inputs, the design flows are calculated for the TLH - Phase III project using the rational method. Adjustments are made for antecedent precipitation, snow melt and storage effects of ponds and lakes.

Following estimation of the design flows, culvert(s) size is determined. The use of overflow culverts at higher elevations to offset the effects of ice build-up will be determined during final design and site visits. WST will follow internal guidelines, which WST has prepared in consultation with DFO, for culvert slope, depth of flow and velocity in culverts >25 m in length.

For bridges, determination of bridge sizes and openings are based on an assessment of various information specific to each site involved. Water flows are determined using the hydrologic modelling procedure, including the flood estimation for Labrador and regional flood frequency methods recommended by the provincial Water Resources Division, as outlined by Rollings (1997). For locations that are not immediately at a gauge station or are on an ungauged river, the Transposition of Flood Discharges (TAC 1982) is used to help confirm the results. The above flow information is used for hydraulic calculations with Mannings Equation to calculate current velocities and estimated water levels. The hydrologic information and hydraulic calculations are considered with site surveys and observation, soils investigation information, known wind effects, physical evidence of high water points and scour, tidal information (where applicable) and navigation requirements to determine final bridge configurations.

Additionally, investigation of ice conditions through review of historical information and actual observation of spring breakup and rafting patterns will be undertaken at bridge sites, as this may pose an important consideration in final bridge configuration. Estimation of scour potential and tidal effects on the Churchill River will follow the methodologies from the TAC *Guide to Bridge Hydraulics* (Neill 1973). Typically, a one-in-one hundred-year (1:100) flood event, including tidal effects where applicable, with an additional 1 m of vertical 'freeboard' height above this water level, will be the minimum design flow governing the bridge size. Other considerations, such as physical high water evidence and NWPA requirements, could further influence bridge size as necessary. A similar methodology has been used successfully on the design of various bridges on the existing TLH from Wabush to Happy Valley-Goose Bay and between Red Bay and Cartwright.

3.3.4.2 Bridges

There will be four bridges placed along the outfitter route, with no bridges being required on the A13 section (Table 3.3). The typical bridge structure to be used is a concrete structure with steel girders placed over concrete abutments and covered with a concrete deck. Bridges will be designed to accommodate usual flow, as well as a 1:100-year flood event. Abutments and footings will be placed on land or partially in the water. The height of the bridge will be determined on the basis of the high water mark. All bridges will be designed to have 1 m freeboard (i.e., 1 m between the bottom of the bridge deck and the high water mark) and to meet requirements of NWPA for navigability. TAC guidelines for bridge hydraulics, as discussed in Neill (1973), will be followed.

The bridges will be designed according to WST's design criteria and standards, and will accommodate normal flow, tides on the Churchill River and other flow conditions. These crossings will be designed to allow continued navigation of the watercourse, including use by smaller vessels such as canoes, kayaks and motorized boats. WST will consult with the Canadian Coast Guard (CCG) regarding bridge design, including clearances, and obtain required authorizations under NWPA. Clearances, as well as other required information, will be outlined on the detailed design drawings submitted with applications made under the NWPA.

Factors used to determine whether a bridge is required for a crossing include flow determination, scour potential, soils investigation, navigational use of watercourses, effects of ice and ice blockage, tidal information on the Churchill River, and field investigations.

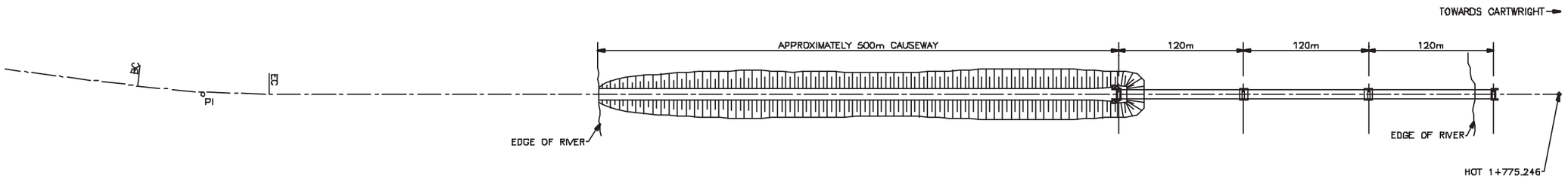
3.3.4.3 Partial Causeway

The crossing on the Churchill River will include a bridge and partial causeway. The bridge/partial causeway location, length, width, infill area, footprint and profile of the crossing area are shown on Figure 3.6. The typical TLH cross-section shown in Figure 3.4 is similar to that which will be used for the causeway. However, the causeway will have armour stone for protection along some side slopes.

The proposed bridge/partial causeway will involve similar considerations for bridge sizing and openings as described in Section 3.3.4.2. The causeway will be of rockfill construction. The rockfill will be clean blasted quarry rock, preventing washout and minimizing silt plume formation. The causeway width at the bottom will vary according to the depth of water. Side slopes will be built to a slope of 1.5:1.

As with the bridges, the partial causeway will be designed according to WST's design criteria and standards, and will accommodate normal flow, tide and other flow conditions and maintain the navigability of the watercourse. Similar bridge and causeway combinations were constructed for the Phase II portion of the TLH, (e.g., bridge/causeway structures cross the St. Lewis River and Alexis River).

PI 0+473.178
< 7° 15' 30" LT
R 1000
ST 63.426
LC 126.682
EXTERNAL 2.009
BC 0+409.752
EC 0+536.434



BM #6
TACK IN STUMP
CL 0+280
ELEV. 86.125

BM #5
TACK IN STUMP
CL 0+465
ELEV. 85.914

BM #4
POINT ON STUMP
CL 0+796
ELEV. 90.883

BM #1
MARK ON ROCK
TOP OF CLIFF
ELEV. 100.000

BM #2
MARK ON ROCK
RT STA. 1+700
ELEV. 81.937

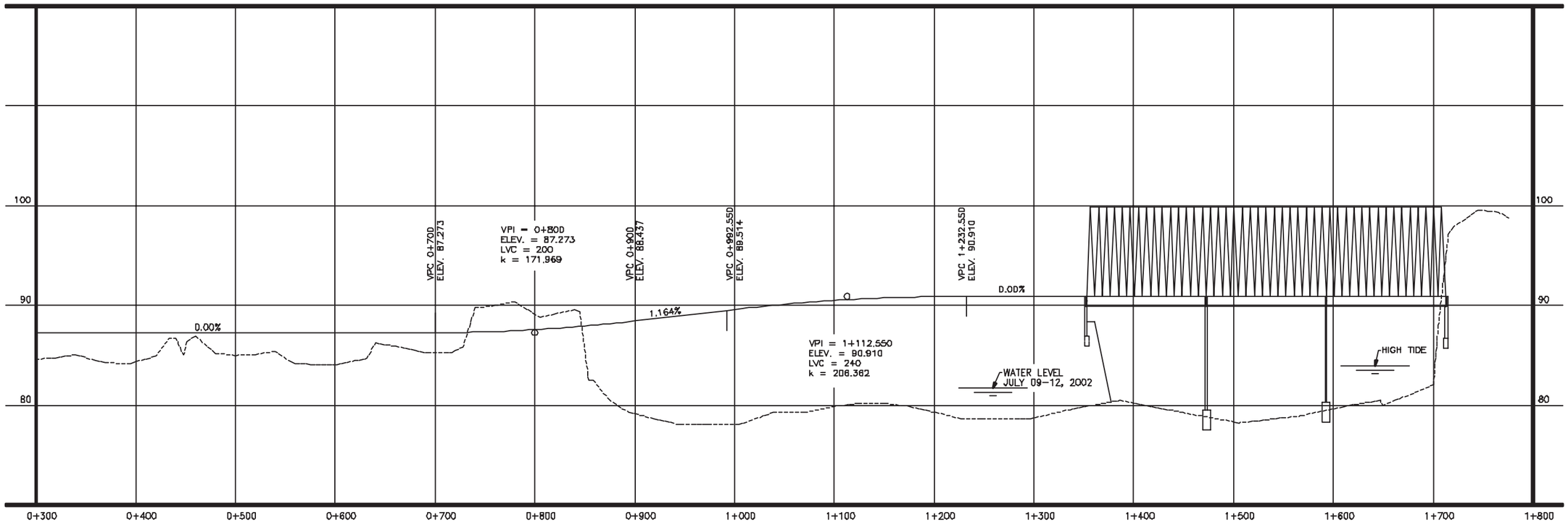


FIGURE 3.6

PROPOSED CHURCHILL RIVER BRIDGE AND CAUSEWAY FOR THE
BLACK ROCKS CROSSING LOCATION

The 500-m causeway will cover a total of 25,000 m^2 (approximately 2.5 ha) of river bottom with one causeway section. The causeway will extend a distance of 500 m from the north bank of the Churchill River. Three 120-m bridge spans will complete the crossing of the river.

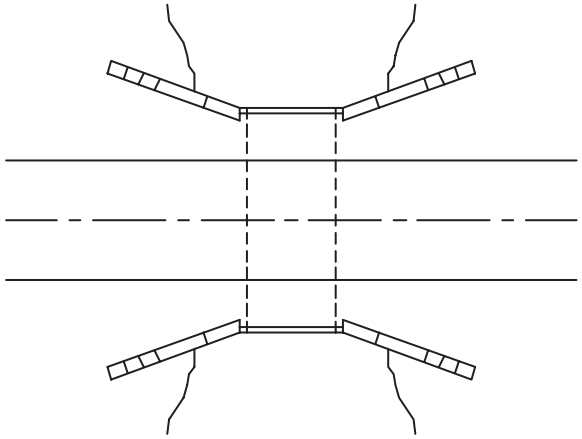
3.3.4.4 Pipe Arch and Cylindrical Culverts

While detailed design work, watercourse and watershed characteristics, and existing environmental conditions will determine or confirm the type of structure placed at each crossing point, preliminary review of the route indicates that the majority of the watercourse crossings and related watersheds are small and can be accommodated by cylindrical culverts or CSP. CSPs used will vary in diameter from approximately 800 to 5,000 mm and will accommodate normal flow conditions, storm drainage and snow melt. Pipe arch structures up to 7 m in diameter will be used at wider crossing points (Table 3.3) and will be designed to accommodate normal flow conditions, storm flow and snow melt. Standard details of the pipe arch culverts are shown in Figure 3.7.

The culverts used will be appropriately sized to ensure that velocities through the structures adhere to DFO guidelines (Gosse et al. 1998) for culvert slope, depth of flow and velocity in culverts. Baffles will be installed to accommodate fish migration, where necessary.

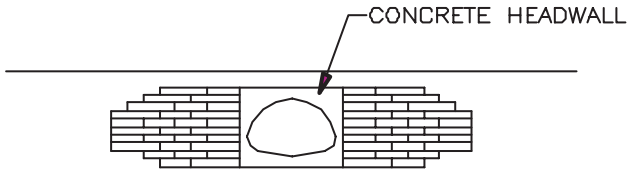
Culverts longer than 25 m and at watercourse crossings where fish passage will be facilitated will have slopes no greater than 0.5 percent to ensure that water velocity through the culvert does not exceed 0.9 m/s. To further facilitate fish migration in culverts >25 m in length, concrete baffles will be incorporated into the design of those structures. These concrete baffles will provide resting pools for fish, as well as maintain adequate depth of water for fish use (i.e., 200 mm in the culvert). Culverts will be sized to withstand increased flow due to water freezing in the culvert. Special attention will be given to erosion and scour protection at inlet and outlet control areas. Outlet pools, designed according to DFO guidelines (Gosse et al. 1998), will be constructed at all culvert crossings where fish migration is a concern.

To determine the culvert type to be installed, WST will calculate values for 1:10 and 1:100-year flood events for each watercourse crossing. For a 1:10-year flood event, culverts are designed to have the maximum water levels rise to the top of the culvert. Culverts designed to withstand a 1:100-year event have a headwater-to-depth ratio of 0.1:1 and are designed to accommodate water levels up to 10 percent above the culvert top. The culvert type will be designed to the higher of the two values resulting from these two calculations to ensure that all water in a flood event can pass through the culvert. TAC (1982) standards for culvert and flow calculations will be followed.



TYPICAL PLAN
(Not to Scale)

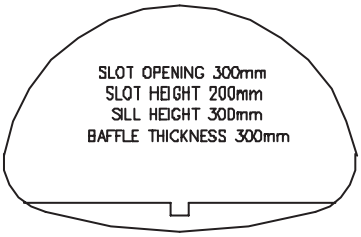
HEADWALL WILL ONLY BE INSTALLED IF REQUIRED

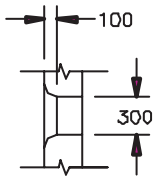


ANCHOR BOLTS 19 mm ø x 300 mm C/W 2 NUTS SPACED @ 244 mm C–C ALONG THE CIRCUMFERENCE OF THE PIPE.

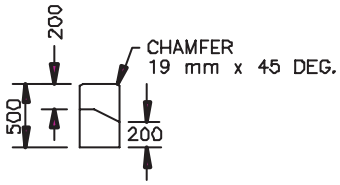
TYPICAL HEADWALL ELEVATION
(Not to Scale)

BAFFLES WILL ONLY BE INSTALLED IF REQUIRED IN THE FIELD

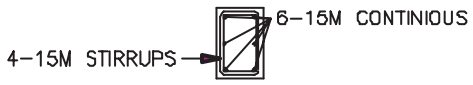




PLAN OF WEIR



SECTION OF WEIR



TYPICAL BAFFLE REINFORCING STEEL

BAFFLE DETAIL
(Not to Scale)

Source: WST 2002.

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Figure 3.7

Pipe Arch Standard Details

3.3.5 Temporary Watercourse Diversions

Temporary watercourse diversions will be used when it is necessary to construct bridge abutments or install pipe arches or culverts in the dry. Diversion techniques will depend on the size of the watercourse, and may include diversion channels, pumping flow around the construction area or using sandbags or cofferdams to restrict flow to one portion of the watercourse. Diversion structures will allow fish passage and will not obstruct flow. Diversion techniques and erosion protection will be addressed in the environmental protection plan (EPP) and will follow procedures outlined in WST Specification 405.

3.3.6 Temporary Construction Camps

A construction camp will be built for each construction phase (in conjunction with the temporary laydown area for that phase as discussed in Section 3.3.7). Camps will be designed to accommodate 40 to 50 workers, and provide sleeping, shower and kitchen facilities in mobile trailers. An administrative/office trailer will also be located at the camp. In some cases, individual workers may bring their own trailers to the construction campsite. This practice will be at the discretion of the contractor, who will be responsible for setting up, operating and removing temporary camps. Where construction is taking place near a community, workers may use local facilities.

As with the laydown areas, camp locations will be determined based on construction plans for that phase and will meet the requirements of WST Specification 830. The selected sites will have appropriate soil conditions for temporary sewage systems and will be more than 100 m from any waterbody, wetland or sensitive wildlife habitat. All camps will be located within the highway right-of-way to minimize vegetation clearing.

Siting and operating the camp will adhere to all regulatory requirements, including approval from the Town of Happy Valley-Goose Bay if a camp is located within the town. Operations will comply with legislation and regulations governing sanitation and food premises. Basic first aid equipment and supplies will be available at the camp. Medical services will be available at the clinic in the nearest town or through a medical evacuation request.

3.3.7 Temporary Laydown Areas

Laydown areas will be used to store large materials, such as culverts, bridge materials and heavy equipment, and for equipment maintenance and repair. They may also be used for fuel storage and equipment refuelling, depending on the distance to the nearest community. Near Happy Valley-Goose Bay, contractors may rely on local fuel suppliers.

Above ground bulk fuel storage tanks will be used. Self-dyked tanks with built-in dykes will be used to store up to 15,000 L of fuel for equipment and camp operation. Handling of fuel and other hazardous materials will be the responsibility of the contractors but will follow procedures outlined in WST Specification 820 and those contained in the EPP.

Laydown area locations will be determined based on the design plans and requirements for each phase and all laydown areas will comply with WST Specification 830. Laydown areas will be located at least 100 m

from any watercourse or wetland and will comply with all regulatory requirements. Efforts will be made to locate these areas in borrow pits and near construction camps.

All laydown areas will be decommissioned and rehabilitated after construction is complete. Some may be used for maintenance depot locations, depending on proximity to communities and suitable highway maintenance and ice control borrow material. As with construction camps, the contractor is responsible for setting up, operating and decommissioning the laydown area.

3.3.8 Borrow Pits and Major Excavations

Contractors will use borrow material from the right-of-way where possible and, if necessary, will establish borrow pits within 2 km of the highway. The total number of borrow pits and amount of borrow material required for the project has not been determined. The quantity of material require depends on detailed design. Pits will be developed throughout construction when deemed necessary by the contractor and depending on the availability of suitable sites.

While most borrow pits will be temporary construction features, some will be used during highway operation and maintenance for highway repair and winter ice control materials. These borrow pits will be maintained by WST throughout operations or until they are no longer necessary (i.e., all suitable materials at the site have been used). All borrow pit sites that are no longer required will be rehabilitated.

To minimize environmental damage, borrow areas will be developed according to provincial environmental legislation and regulations, and WST specifications for borrow activities (Specification 207), and pits and quarries (Specification 310).

Vegetation will be cleared from the area and organic material stockpiled for use in site rehabilitation. When the contractors (construction) or WST (operations) close a borrow pit, the disturbed area will be graded to slopes less than 2:1 and rehabilitated to encourage rapid revegetation and to prevent erosion and sedimentation. Encounters with late season frost will be handled on a site-specific basis, depending on the extent of frost conditions and environmental sensitivities such as proximity to waterbodies. Details on establishing, using and rehabilitating borrow pits will be outlined in the EPP.

Highway design will determine the amount of major excavation required. Some sections will require more excavation than others, depending on the topography and terrain, as well as the specific design for that section. Excavation of organic materials may be necessary depending on the design. If unsuitable materials are excavated during highway construction, efforts will be made to incorporate this material into the sideslope or backslope area of the right-of-way or in establishing laydown area and construction camp sites. In the event that the material cannot be used, it will be disposed of in a designated disposal area.

3.3.9 Waste Disposal Sites, Facilities and Practices

Industrial and domestic wastes generated during construction will be disposed of as approved by regulatory agencies. Temporary sewage disposal systems will be installed and maintained according to regulatory and permit requirements, and WST Specification 825 requirements. Sites selected for construction camps must have soil conditions suitable for sewage disposal systems.

Domestic garbage will be collected and stored in wildlife-proof containers. Containers will be emptied regularly in waste disposal sites, as approved by the Government Service Centre. Near communities, domestic and industrial wastes will be disposed of in community waste disposal sites pending approval from the town. For more isolated camps, waste may be incinerated or landfilled according to regulatory and permit requirements. Regular waste collection and disposal schedules will be strictly followed to prevent attracting wildlife. No wastes will be deposited in or near watercourses or wetlands.

Where possible, WST will require contractors to follow provincial waste diversion regulations or policies, including provincial programs for beverage containers, tires and waste oil and other petroleum products. Discarded tires will be handled according to the requirements of the provincial tire recycling program established by the *Waste Management Regulations* and used oil will be collected for recycling or reuse according to the new *Used Oil Control Regulations*, that will become effective on April 1, 2003. In addition, any scrap metals will be taken to a scrap metal recycling operation.

3.3.10 Maintenance Depots and Winter Camps

Road maintenance depots will be required for storing equipment, sand and salt, and maintaining heavy equipment. However, the number and locations of depots have not been determined. Depot locations will be selected based on criteria such as proximity to communities, and good borrow materials for highway repair and ice control. Due to the light industrial activities that occur at maintenance depots, they are typically located outside communities in appropriate land use areas.

The depots will have a garage for maintenance activities, equipment storage and a sand storage or stockpile area. Typical equipment to be kept on site includes snow blower, front-end loader, truck with plow, a flat bed truck and pick up trucks. The depot would also have a small kitchen and accommodation facilities, for emergency use.

Two winter camp facilities will be established along the route for winter work crews. These will be linked to maintenance depots that are established along the route. Locations and land area requirements for the camps will be determined in consultation with WST regional and maintenance personnel, as well as with Innu Nation. Two potential locations for the winter camp/maintenance depots are at Cartwright Junction and a point halfway between Cartwright Junction and Happy Valley-Goose Bay.

3.3.11 Signage

Standard highway signs will be placed at appropriate locations along the route. Designing, siting and installing highway signs will comply with WST Specifications 580 (for permanent signage), and 701 to 750 (for temporary construction signage). Signage related to moose or caribou crossings will be placed in consultation with the Inland Fish and Wildlife Division. DFO is responsible for placement of any signs related to scheduled fishing rivers (e.g., Eagle River and Paradise River). Signs related to tourism attractions and services must comply with the provincial policy for such signage (DTCR n.d.).

3.3.12 Roadside Pull Off Locations

Rest stops or viewpoint locations may be developed along the route. However, these locations will be determined during construction and will be planned in consultation with Innu Nation, Parks Canada, Department of Tourism, Culture and Recreation, and area tourism and economic development organizations. Factors, such as safety and tourism and economic development potential, will play a role in determining these locations.

3.4 Construction

Construction of the TLH - Phase III will involve the following activities:

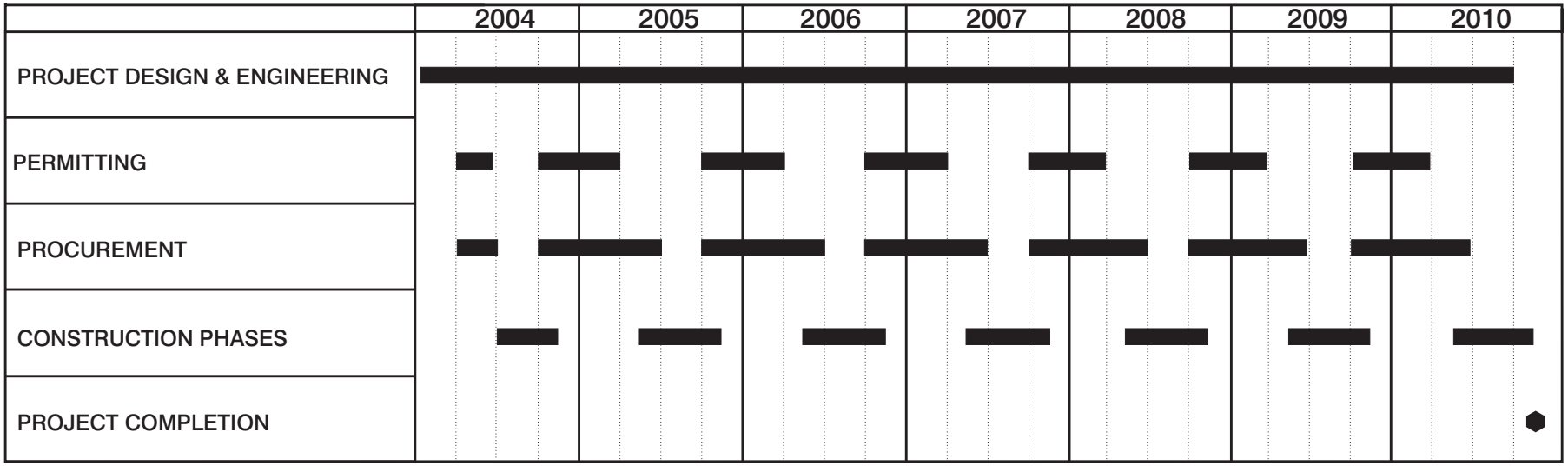
- site preparation, including surveying, right-of-way clearing, and grubbing and debris disposal (including disposing of organic soil, slash, grubbed material and wood fibre);
- transporting equipment, construction materials and related supplies to construction sites, including transporting, storing and handling hazardous materials, fuels, lubricants and explosives;
- establishing, operating and removing construction camps and laydown areas;
- blasting operations;
- excavating, including disposing of excess/waste rock, overburden and potential acid-generating rock;
- establishing and operating borrow pits, including identifying sources of borrow material;
- subgrade construction;
- installing watercourse crossing structures, and activities in and around watercourses; and
- site rehabilitation and environmental monitoring.

Construction will comply with all applicable standards and regulations, environmental protection guidelines and regulations, and WST specifications (provided in Appendix D of JW/IELP 2003a). A series of environmental protection measures will also be implemented in accordance with the potential project effects identified through the environmental assessment process (Section 3.9.3). An EPP will be prepared for each construction phase.

The Resident Engineer will ensure that all construction activities comply with the EPP and all regulations, permits, approvals and authorizations. An Environmental Surveillance Officer (ESO) will provide technical support to the Resident Engineer, as well as perform environmental inspections and liaise with regulatory agencies. Details on roles and responsibilities are presented in Section 3.9.2.

3.4.1 Project Schedule

WST plans to complete the outfitter route by 2010 (Figure 3.8). In order to meet this target, WST must begin construction in 2004, with subsequent construction phases occurring each year until 2010.



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Jacques Whitford Environment Limited

Environmental Scientists
Consulting Engineers

FIGURE 3.8

CARTWRIGHT JUNCTION TO HAPPY VALLEY - GOOSE BAY
TRANS LABRADOR HIGHWAY
PROJECT SCHEDULE FOR OUTFITTER ROUTE

Pre-design work for the highway is currently underway and detailed design will be ongoing throughout construction. Procurement/tendering will be completed each year prior to the construction season, with the first tender call occurring before construction in 2004. The responsibility for obtaining the necessary permits for construction activities, camps, laydown areas and waste disposal will lie with the contractor. Permits will be obtained upon contract award prior to the start of each construction phase.

Construction will start at both the western and eastern ends of the proposed highway route (i.e., at Happy Valley-Goose Bay and at Cartwright Junction on the Phase II portion of the highway) in 2004. During the seven-year construction period, the annual construction season will extend from mid-May to the end of November. Bridge construction on the Churchill River will start in the first year.

Subgrade construction for the outfitter route will cost approximately $300,000 for each kilometre constructed, with total construction costs, including bridges, estimated at $107.5 million.

3.4.2 General Construction Practices

3.4.2.1 Site Preparation

Surveying

The highway centre line will be surveyed prior to right-of-way clearing and the start of any construction. A cut-line will be established to provide access for surveyors. Environmental protection measures for vegetation clearing and grubbing apply to line-cutting and surveying activities (Section 3.9.3).

Right-of-way Clearing

Preparing the 280-km right-of-way for the outfitter route will involve removing trees and shrubs along the route. The clearing width will be 30 m, with efforts made to reduce clearing around watercourses to maximize a buffer zone where possible. Trees and shrubs will be cleared with chain saws or other hand-held equipment. Mechanical clearing methods may be used in areas where terrain disturbance will not cause topsoil loss or sedimentation of watercourses and waterbodies. All merchantable or forest product timber will be salvaged; the remainder will be burnt or mulched.

All work will be carried out according to the environmental protection measures for vegetation clearing listed in Section 3.9.3 and the following WST specifications:

- Specification 201 - Clearing and Grubbing;
- Specification 202 - Clearing;
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation; and
- Specification 850 - Protection of Vegetation and Wetlands.

Grubbing and Debris Disposal

Grubbing of the organic vegetation mat and/or the upper soil horizons will be limited to that necessary to meet the project engineering requirements. A grubbing width of 20 m will be used instead of the standard 30 m. Grubbing will be carried out immediately prior to subgrade construction to limit the exposure of large areas of erodible soils. Topsoil and organic materials will be stockpiled and used in site rehabilitation.

A 30-m buffer zone of undisturbed natural vegetation will be maintained between watercourses and areas of grubbing activity, where possible. If specific site conditions require modification to the buffer zone, this will be undertaken in consultation with the DFO Area Habitat Biologist. A minimum buffer zone of 20 m, as recommended by Gosse et al. (1998), will be maintained at all times between work areas and waterbodies or courses, except where specified otherwise or in areas where the slope is greater than 30 percent. Where the slope is greater than 30 percent, the minimum width of the buffer zone will be calculated by the following formula:

Buffer Width (m) = 20 m + 1.5 x slope (percent)

If the available space allows for establishing wider buffer zones, then wider zones will be maintained between construction areas and watercourses, and will be developed in consultation between the Resident Engineer and DFO.

The work will be carried out according to the environmental protection measures for vegetation clearing and grubbing listed in Section 3.9.3, and the following WST specifications:

- Specification 201 - Clearing and Grubbing;
- Specification 203 - Grubbing;
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation; and
- Specification 850 - Protection of Vegetation and Wetlands.

3.4.2.2 Mobilization and Transportation

Contractors hired by WST will be responsible for transporting the necessary equipment, materials and supplies to the construction site. For construction starting at the Churchill River, access to the site will be through Happy Valley-Goose Bay. While ground transport will be the primary means for moving equipment to site, commercial shipping services may be used to move equipment (not obtained locally) into the Happy Valley-Goose Bay area. Likewise, for construction starting at Cartwright Junction, equipment and supplies not obtained locally may be brought in via ferry and the Phase II portion of the TLH. Some heavy equipment (not obtained locally) may be transported by barge to Cartwright and then moved by ground transport to the construction site.

Commercial shipping services will be used when transporting any equipment and supplies by sea. All vessels operating in Canadian waters are subject to the *Canada Shipping Act* and its regulations, and it is the responsibility of the vessel owners and operators to comply with this legislation. Response to spills or any releases of hazardous materials during shipping of equipment and supplies are the responsibility of the vessel operator and owner.

Transporting and storing hazardous materials such as fuels, lubricants and explosives will be done according to applicable legislation and regulation, as well as WST Specification 820 (Storage and Handling of Fuels and Other Hazardous, Toxic or Dangerous Materials).

With construction starting near the communities, travel to the construction sites from communities will be by vehicle. Construction personnel, not from the area, will travel primarily by air to the nearest community. Some construction personnel may travel by barge or boat with the equipment. For construction sites away from communities, construction personnel will stay in temporary construction camps.

3.4.2.3 Construction Camps and Laydown Areas

Sites selected for temporary construction camps and laydown areas will be areas deemed to be of low value for other uses (e.g., abandoned borrow pits or previously disturbed areas). The contractor, in consultation with WST, will establish temporary camp sites and laydown areas at the start of each construction season. The contractor will provide a list of potential locations to the Resident Engineer and any other relevant agencies. The sites will be maintained according to the environmental protection measures outlined in Section 3.9.3 and will comply with WST Specification 830 (Marshaling Yards and Temporary Work Camps) and all applicable legislation and permit conditions.

3.4.2.4 Aggregate Extraction and Excavations

Blasting Operations

Blasting and excavation activities will be minimized. However, if blasting is required, explosives will be used in a manner that will minimize damage to landscape features and surrounding objects. Blasting will be carried out according to all applicable regulations and environmental protection measures outlined in Section 3.9.3. Excavated materials, if suitable, will be used in subgrade construction. Unsuitable materials will be incorporated into the shoulder and backslope areas of the right-of-way or disposed of in a designated area.

Excavations

Highway design will determine the amount of excavation required. Some sections may require more excavation than others, depending on the topography and terrain, as well as the specific design for that section. Excavation of organic materials may be necessary depending on the design. Effort will be made to incorporate material excavated during highway construction into the sideslope or backslope area of the right-of-way or in establishing laydown area and construction camp sites. In the event that the material cannot be used, it will be disposed of in a designated disposal area.

All excavation will be carried out according to WST specifications, including:

- Specification 204 - Grading of Fill;
- Specification 205 - Classification of Excavated Materials;
- Specification 206 - Grading of Cuts;
- Specification 208 - Excavation of Ditches;
- Specification 211 - Excavation Overhanging Rock and Rock Slide Debris;

- Specification 212 - Excavation of Muskeg or Bog;
- Specification 815 - Protection of Watercourses and Water Bodies; and
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation.

Borrow Areas

The number of borrow pits and amount of borrow material required for the project have not been determined. Quantities required depend on detailed design. Pits will be developed throughout construction when deemed necessary by the contractor and depending on the availability of suitable sites. To minimize environmental damage, borrow areas will be developed and operated according to provincial legislation and regulations, and WST specifications for borrow activities (Specification 207), and pits and quarries (Specification 310).

Vegetation will be cleared from the area and organic material stockpiled for use in site rehabilitation. When the contractors (construction) or WST (operations) are finished with a borrow pit, the disturbed area will be graded to slopes less than 2:1 and rehabilitated to encourage rapid revegetation and to prevent erosion and sedimentation. Encounters with late season frost will be handled on a site-specific basis, depending on the extent of frost conditions and environmental sensitivities such as proximity to waterbodies. Details on establishing, using and rehabilitating borrow pits will be outlined in the EPP.

Environmental protection measures are outlined in Section 3.9.3. WST specifications will be followed including:

- Specification 207 - Borrow;
- Specification 310 - Using of Pits, Quarries and Stockpiles for Production of Materials Supplied by the Contractor;
- Specification 815 - Protection of Watercourses and Water Bodies; and
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation.

Acid Generating Rock

Addressing acid rock drainage (ARD) is a time-consuming environmental issue on any large-scale construction project, as well as one that is technically challenging. ARD can be defined as a low pH, iron and sulphate-bearing water usually formed when rocks containing sulphide minerals (e.g., pyrite and pyrrhotite) are exposed to the atmosphere or an oxidizing environment, and are subsequently leached by water. Although there is a lack of surficial bedrock along the TLH - Phase III route, shallowly buried bedrock may contain sulphide mineralization that may produce ARD if disturbed.

Further detail on the area geology is provided in Section 4.1.3.1, which indicates that the potential for encountering sulphide-bearing rock along the route is low.

This description was prepared based on a review of existing geological information and mapping for the area. WST is committed to carrying out a field investigation, prior to the start of construction, to further define the ARD potential along the route. This field investigation will focus on the areas of potential ARD as identified in Figures 4.3 to 4.6, evaluating the problematic areas and ground-truthing the planned route, when more detailed design information becomes available. The survey will identify portions of the route having high

and low risk for encountering acid drainage conditions, based on bedrock potential to produce acid drainage and overburden thickness.

Determining the bedrock potential will involve evaluating bedrock geologic units and accessing mineralization potential. The mineralization potential of selected rocks will be assessed by laboratory screening for total sulphur. If the total sulphur exceeds 0.3 percent, subsequent analysis using the modified Sobek method (or other approved acid base accounting test) will be conducted. A test result will be considered "acid producing" if it sulphide sulphur content $\geq$ 0.3 percent and the neutralization potential to acid producing potential ratio less than or equal to 3.0. Based on test results, further tests will be conducted on a select number of samples that are found to be "acid producing". These tests may include metals scan, total inorganic carbon and past pH.

The field survey will provide specific information for preparing the EPP section on construction activities in acid generating rocks or in the event acid generating rocks are encountered during construction. The EPP will be organized to address four main topics: acid rock excavation; procedures for acid-generating rock disposal; procedures for acid-generating rock exposures; and the procedures for handling acidic water during construction. The EPP will present an overview of how acid-generating rock areas are identified and standard operating procedures pertaining to the four topics identified. A decision process diagram will be used for each of the four topics that provides a summary of decision and action items for major topics. These diagrams will allow the Resident Engineer to quickly identify the action required to address conditions that may arise within acid rock during construction.

For those areas identified as acid producing by the laboratory analyses and cannot be avoided by realigning the TLH - Phase III, there are mitigative measures which may be taken. These measures will reduce the effects that ARD may have on the surrounding environment. These measures, as outlined below, will also be covered in the EPP. The applicability of the measures will depend on the site specific issues within each area of concern.

- To minimize water and oxygen contact with the exposed rock faces, exposed surfaces will be covered with such materials as low permeability soil, geotextile or spray on application such as shotcrete for vertical faces.
- Identify upgradient surface water and groundwater flow directions based on topographic, survey and/or intrusive measures and, as appropriate, divert upgradient water flows, while considering the effects on other environmental aspects (i.e., fisheries).
- Control acidic water movement by constructing an interceptor trench or cut-off wall between the affects area and downgradient surface waters, or installing and pumping from a well or sump within the rock immediately downgradient of the affected area.
- Minimize areas of disturbance in potential acid-generating rocks.
- Exercise proper construction procedures during excavation in acid generating rocks, such as blast control, removing all loose materials and minimizing exposure times of rock cuts.

Any potential acid-generating rock encountered along the route will be handled according to the environmental protection measures outlined above, as well as those noted in Section 3.9.3.

The adverse effects of blasting operations within sulphide-bearing (i.e., acid generating) rocks can result from exposing fresh rock faces and disturbing the insitu rock. It is on these exposed rock faces and overbreak areas that oxidation of sulphide minerals takes place and acid is generated, due to the presence of oxygen, water and the sulphide bearing rocks. If areas of acid-generating rocks can not be avoided through highway design and routing, procedures will be identified in the EPP for the contractor to follow during highway construction. These procedures will be aimed at minimizing the potential for ARD problems resulting from blasting activities in these rocks.

3.4.2.5 Subgrade Construction

Quarried rock and gravel will be used for subgrade construction. The highway will be surfaced with a maintenance-grade crushed stone. Construction materials will be obtained from borrow pits established within the right-of-way or within 1 km either side of the right-of-way. Suitable materials obtained from excavation areas will be incorporated into the subgrade construction.

Subgrade construction will be carried out according to WST specifications:

- Specification 204 - Grading of Fill;
- Specification 301 - Scarifying and Reshaping;
- Specification 315 - Selected Granular Base Course;
- Specification 815 - Protection of Watercourses and Water Bodies;
- Specification 840 - Dust Control; and
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation.

3.4.2.6 Watercourse Crossing Structures

All watercourse crossings will be constructed “in the dry” (i.e., flow will be temporarily diverted around construction activity). Cofferdams and other diversion structures will be constructed with sufficient capacity to accommodate peak flows from the watercourse being diverted, as well as any sudden increases in water levels. Precautions will be taken to ensure that fish are not left stranded in the “dry” work area. Fish recovered from the work area will be returned unharmed to the watercourse as directed by DFO representatives.

Flow diversions will be performed with due care and caution to prevent pollution, siltation or other damage to watercourses. Pumping equipment will be available on-site in the event of an emergency. Silted water from diversion operations will be pumped to vegetated areas or sedimentation basins. Excavated material will be removed from the site and stockpiled away from the watercourse. When the crossing construction is complete, the diversion structure will be removed and flow returned to its original channel. There will be no permanent diversions of flow.

Temporary bridges will be installed at some crossings to aide in constructing bridges. Only native timber will be used for the temporary bridges; no pressure-treated timber will be used. Fording will be minimized and only carried out with approval from DFO.

All work in and around watercourses will be planned in consultation with DFO and conducted according to WST's specifications, including:

- Specification 131 - Road or Bridge Diversions;
- Specification 142 - *Navigable Waters Protection Act*;
- Specification 180 - Unwatering Incidental to Work;
- Specification 401 - Ditching for Streams;
- Specification 403 - Excavation for Foundations;
- Specification 405 - Temporary Diversion of Streams;
- Specification 411 - Select Backfill for Long Span Structural Plate Structures;
- Specification 421 - Supply and Installation of Pipe Culverts;
- Specification 423 - Supply and Installation of Structural Plate Pipe;
- Specification 424 - Supply and Installation of Structural Plate Arch;
- Specification 426 - Design, Supply and Installation of Long Span Structural Plate Arch;
- Specification 430 - Screen End Treatment for Corrugated Steel Pipe;
- Specification 450 - Concrete Footings for Structural Plate Arches;
- Specification 522 - Disposal or Salvage of Culvert or Pipe;
- Specification 610 - Rip-Rap Treatment;
- Specification 615 - Amour Stone;
- Specification 815 - Protection of Watercourses and Water Bodies;
- Specification 816 - Silt Fence;
- Specification 817 - Check Dam Sediment Trap;
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation;
- Specification 902 - Excavation for Foundation, Unwatering and Extra Backfill for Structures; and
- Specification 914 - Bridge Deck Waterproofing.

Environmental guidelines issued by the provincial Water Resources Management Division will also be followed when constructing watercourse crossings, including guidelines for:

- general construction practices (WRMD 1997a);
- fording (WRMD 1992a);
- bridges (WRMD 1989);
- culverts (WRMD 1992b);
- watercourse crossings (WRMD 1992c);
- diversions, new channels and major alterations (WRMD 1997b); and
- pipe crossing (WRMD 1997c).

3.4.2.7 Site Rehabilitation and Monitoring

All construction camps will be dismantled when no longer required for construction and the sites rehabilitated. Laydown areas and borrow pits, not required for operation and maintenance, will also be rehabilitated. Stockpiled topsoil and organic material from right-of-way clearing will be used in rehabilitation of these sites. The need for revegetation will be considered on a site-specific basis. Any revegetation activities undertaken will follow WST Specifications 855 (Re-vegetation), 631 (Seeding), 632 (Hydroseeding), 634 (Soil for Hydroseeding) and 635 (Lime for Hydroseeding).

Monitoring activities will be carried out as required. Monitoring and follow-up commitments are discussed in Section 3.9.3, each VEC section and summarized in Chapter 8.

3.4.3 Employment

Highway construction will be carried out on a contract basis through the Government of Newfoundland and Labrador public tendering process. Workers will be hired for specific construction phases at the discretion of the contractor. It is anticipated that local hiring will be preferred by contractors due to cost efficiency and commitment to local economic development.

The actual number of workers for each construction phase will vary depending on factors such as the type and number of watercourse crossing structures for that phase, and distance to suitable borrow material. A summary of the employment associated with construction of Phase II of the TLH is provided in Table 3.6. During construction of Phase II of the TLH, approximately 10 of the WST staff and 11 of the contract staff each year were female. However, these numbers fluctuated from year to year.

It is expected that overall employment levels for constructing the highway along the outfitter route will be lower than those for Phase II due to the fact that the TLH - Phase III, overall, is a smaller construction project. There will only be two construction projects annually (i.e., one at each end of the outfitter route) compared to Phase II, which had several construction projects being carried out each year. The work for the outfitter route will be spread over a seven-year period, versus the four-year period for construction of Phase II. Therefore, on an annual basis, a smaller work force will be required. With respect to work force, there is already a trained work force in the area with experience from working on the Phase I and II portions of the TLH. It is expected that many of these workers will also be used for Phase III. In addition, any WST staff have recall rights.

Table 3.6 Employment Summary for the TLH - Phase II Construction

Construction Season	WST Staff				Contractor Staff				Total Annual Employment						
	Labrador	Newfoundland	Other	Total	Labrador	Newfoundland	Other	Total	Labrador		Newfoundland		Other		Total
									No.	%	No.	%	No.	%	No.
1998-1999	66	24	0	90	88	153	3	244	154	46	177	53	3	0.9	334
1999-2000	53	7	0	60	151	172	8	331	204	52	179	46	8	2	391
2000-2001	132	69	1	202	191	404	29	595	323	41	473	59	30	4	797
2001-2002	68	55	0	123	168	412	29	580	236	34	467	66	29	4	703

All contractors will be required to comply with the *Occupational Health and Safety Act.* Over the six-year construction period, it is anticipated that the following occupations will be required:

- civil engineers;
- structural engineers;
- engineering technicians;
- draftspersons;
- brush cutters;
- highway surveyors;
- heavy equipment operators;
- drillers and blasters;
- electricians;
- carpenters;
- heavy equipment mechanics;
- labourers;
- truck drivers;
- concrete finishers;
- concrete technicians;
- steel erectors; and
- cooks/cooks' assistants.

3.5 Operation and Maintenance

The TLH - Phase III will be a permanent year-round highway requiring seasonal maintenance and periodic repair. Estimated annual maintenance costs are $5,000 for each kilometre of highway, with an approximate total cost of $1.4 million annually for a highway along the outfitter route.

Traffic volume is expected to be light, with most travel occurring between spring and fall. The highway will be policed to ensure enforcement of speed limits and emergency response.

Appropriate signage, including moose or caribou crossing signs where necessary, will be posted. Highway signage will meet the requirements of the Manual for Uniform Traffic Control Devices (TAC 1999b). Pressure-treated wood will be used for sign posts.

Development activities along highways classed as protected roads are controlled under the *Protected Road Zoning Regulations*. Protected Road Zoning Plans are prepared by MAPA for protected roads and a permit is required for development. Waste and littering along the highway are subject to the *Highway Traffic Act* and *Environmental Protection Act*.

3.5.1 Maintenance Depots, Winter Camps and Storage Locations

Maintenance depots will be established for storing graders, backhoes, loaders, trucks, snow plows and other required equipment. These facilities will be selected and maintained to ensure minimal habitat disturbance. All applicable environmental protection measures (e.g., erosion control and fuel storage requirements) will be implemented at maintenance depots.

3.5.2 Borrow Pits

While most borrow pits will be temporary construction features, some will be used during highway operation and maintenance for highway repair and winter ice control materials. These borrow pits will be maintained by WST throughout operations or until they are no longer necessary (i.e., all suitable materials at the site have been used). All borrow pit sites that are no longer required will be rehabilitated.

Environmental protection measures are outlined in Section 3.9.3. WST specifications will be followed, including:

- Specification 207 - Borrow;
- Specification 310 - Using of Pits, Quarries and Stockpiles for Production of Materials Supplied by the Contractor;
- Specification 815 - Protection of Watercourses and Water Bodies; and
- Specification 845 - Equipment Operation and Prevention of Erosion and Siltation.

3.5.3 Maintenance

Regular maintenance programs will be established when the highway is operational year-round. The highway will be inspected regularly to ensure that the surface and subgrade do not deteriorate. Watercourse crossings and drainage structures will be checked regularly to ensure that they are not blocked. Care will also be taken to ensure that erodible areas are stabilized; these areas will be inspected to ensure effectiveness of stabilization.

Summer maintenance activities will be performed as required, including:

- grading (one to two times per year);
- ditch cleaning;
- vegetation management;

- repairing guide rails as necessary (Specifications 640, 643 and 645); and
- maintaining and repairing highway signs (Specifications 580 and 590).

During the winter months, maintenance will include regular snow clearing and the application of sand for ice control (Specification 317). Snow clearing and ice control will meet WST standards, and the highway will be inspected regularly to ensure that the highway has been plowed in an acceptable and safe manner.

Both summer and winter maintenance may be carried out on a contract basis. This is the practice for the TLH between Happy Valley-Goose Bay and Western Labrador, and between Cartwright and Red Bay.

3.5.4 Employment

Maintenance labour requirements will include:

- maintenance supervisor;
- maintenance foreman;
- truck drivers;
- heavy equipment operators;
- heavy equipment mechanics; and
- labourers.

3.6 Decommissioning

It is anticipated that the TLH - Phase III will be operated on a permanent basis and maintained in perpetuity. Therefore, plans for decommissioning have not been developed. However, should decommissioning be required for all or part of the TLH - Phase III, a detailed decommissioning plan would be developed to acceptable standards of the day and would outline procedures for rehabilitating disturbed areas along the highway right-of-way. The plan would be reviewed by government and interested members of the public prior to its implementation.

3.7 Accidental Events

Accidental events that could occur in relation to this project include highway failure, forest and on-site fires, fuel or chemical spills, vehicle and equipment accidents, and vehicle failures. The highway will provide a transport route for personal vehicles and large tractor trailers. Thus, there is a risk of accidental fires and/or fuel and chemical spills resulting from day-to-day highway operations. A vehicle-vehicle collision is a potential event that poses a risk to human health and safety, while a vehicle-wildlife collision poses a risk to human and wildlife safety.

The likelihood of any of these events occurring during the construction and operation of the highway is low. The likelihood will be further reduced through the environmental protection measures outlined in Section 3.9.3. The project will be undertaken by experienced contractors in accordance with established codes of practice and safe work procedures. In addition to environmental protection measures, prevention and response procedures will be established to address emergency situations and accidental events. These prevention and response procedures will be incorporated into construction EPPs (Section 3.9.5).

3.7.1 Highway Failure

A collapse or failure of part of the highway or a crossing structure could occur during construction or operation. While the highway will be constructed in accordance with all relevant standards and regulations, unforeseen accidental failures may occur. In the event of such a failure, the immediate concern would be for the safety of people in the area. A highway failure could also result in the loss of terrestrial habitat and disruption of localized wildlife activities. If the failure was to occur in the vicinity of watercourses, there is potential for deterioration of water quality and effects on freshwater fish and fish habitat.

3.7.2 Fires

During construction, the burning of brush and slash may present a risk for forest fires. All burning activities will comply with permits issued by the Forest Resources Division, Department of Forest Resources and Agrifoods. Burning of material will be prohibited in dry conditions as required by the Forest Resources Division. Procedures for fire prevention and response will be outlined in the construction EPPs (Section 3.9.5).

Forest fires could occur during both construction and operation of the TLH - Phase III as a result of collisions and increased human activities near the highway. The immediate concern in the event of a forest fire would be the effects of flames and smoke on the health and safety of people in the area, including site personnel. A forest fire could also affect wildlife in the area, including the loss of terrestrial habitat and disruption of localized wildlife feeding activities. A fire in the vicinity of watercourses could also result in the deterioration of water quality and subsequent effects on freshwater fish and fish habitat.

Air emissions from burning trees and/or equipment (depending on the location of the fire) include particulates, CO_2, carbon monoxide (CO), nitrogen oxides (No_x), sulphur dioxide (SO_2), volatile organic compounds (VOCs) and polyaromatic hydrocarbons (PAHs). Reduced air quality due to high particulate levels could occur over distances greater than 10 km; however, the persistence of these conditions would likely be of short duration. The magnitude of any effects would be determined by the location, size and duration of the fire and the nature of the combustible material.

The regional headquarters for the Department of Forest Resources and Agrifoods is located in North West River, with district offices in Cartwright, Port Hope Simpson and Red Bay. Fire response equipment, such as pump units and hoses, is based in North West River, Cartwright and Port Hope Simpson. Water bombers are based in Happy Valley-Goose Bay and Wabush, and during the summer a helicopter based in Happy Valley-Gosse Bay is contracted for fire standby. A second helicopter may be based in Cartwright during the fire season. Approximately 80 seasonal personnel provide fire response services. Additional equipment and personnel can be requested as necessary from the island of Newfoundland, as well as outside the province. Fire indices are monitored during peak season (mid-May to mid-September). The level of response to a reported fire is assessed on the basis of potential human injury, fire location (proximity to settlements and camps), potential loss of resources and weather conditions. Both the TLH - Phase I and II routes have been designated as fire priority zones.

3.7.3 Fuel or Chemical Spill

A fuel or chemical spill could occur either on land or in water during construction or operation of the highway. During construction, spills could result during refuelling of equipment or vehicles, or could be associated with fuel or chemical transportation and storage. During operations, spills could result from accidents during transportation of hydrocarbons or other hazardous materials along the highway. Fuel spills could also occur from the collision of vehicles not involved in transport of hydrocarbons. Spill response and cleanup would be the responsibility of the individual or company holding the necessary permits to transport the material.

The magnitude of effects of an accidental spill would be influenced by the volume of the spill, the nature of the spilled material, the time of year and the location of the spill site. Large on-land fuel or chemical spills could have effects on the health of people in the area, site personnel or nearby wildlife as a result of direct contact with spilled material or reduced air quality due to emitted vapours. Spills occurring near or in watercourses may result in water contamination and associated effects on fish and fish habitat.

During construction, standard precautions and procedures for handling, storing and transporting fuels and other hazardous materials will be implemented as outlined in WST Specification 820 and the environmental protection measures presented in Section 3.9.3. These prevention measures will reduce the likelihood of accidental fuel or other hazardous material spills. To ensure effective spill response and cleanup, WST will outline response procedures in its construction EPPs and will require all contractors to comply with the construction EPPs through contractual requirements (Section 3.9.5).

Small spills of fuel or diesel oil and many other spilled materials can be easily and rapidly cleaned up by on-site personnel and result in no lasting environmental effects. In the event of such a spill, the contractor shall immediately report the spill to 772-2083 (St. John's), or at 1-800-563-9089 (outside the St. John's area), or to Environment Canada at 1-709-772-7745 (24 hours). A follow-up in writing must be provided within two weeks. Useful information to include in the spill report includes:

- location;
- time of observation of spill;
- reported by;
- probable sources of the spill;
- probable time of spill;
- nature of material spilled;
- probable volume of spill;
- probable duration of spill;
- area affected;
- mobility of spill;
- weather, water or geographic conditions;
- action being taken to contain and/or control the spill;
- personnel at the scene of the spill;
- resources threatened (e.g., water supply, bird colony and fish kills);
- other agencies contacted; and
- any other pertinent information.

Steps will be taken to abate the discharge, clean up the affected area, dispose of waste materials at an approved waste disposal site with the permission of the owner/operator, and restore the area to the satisfaction of the Department of Government Services and Lands.

Response equipment, such as absorbents (granular absorbents for land spills, and absorbent pads or cat-tails for recovery of oil from a water surface) and open-ended barrels for collection of oiled debris, will be available on-site and personnel will be trained in response procedures. Sources of additional spill response equipment (e.g., pumps and containment booms) will be identified in the EPP. The probability of a large spill occurring during construction is extremely low.

During highway operations, there are several steps that can be taken to minimize the risk of an accidental fuel or other hazardous material spill. Most of these steps are aimed at avoiding vehicle collisions and include enforcement of posted speed limits, proper maintenance of the highway, and proper clearing of snow and ice. In addition, many large tanker trucks transporting hazardous materials are required to have spill response equipment on hand in the event of a spill.

3.7.4 Vehicle and Equipment Accidents

Vehicle-vehicle, vehicle-wildlife and/or vehicle-pedestrian collisions could occur during construction or operation of the highway. Injury to workers or others resulting from equipment accidents could also occur during construction or operation. These accidents would involve obvious risks to human health and safety, as well as wildlife (e.g., porcupine) mortality. The highway will be policed to ensure that speed limits and traffic regulations are observed; this will reduce the risk of accidents due to speeding and/or careless driving. Policing will also ensure timely emergency response in the event of an accident. The highway will be maintained to WST safety standards throughout the year, including snow clearing and ice control. Signage will include wildlife warnings to ensure vigilance on the part of drivers. These measures will reduce the risk of collisions along the highway; however, risk can never be completely eliminated and is highly dependent on individual drivers and other uncontrollable factors (e.g., weather conditions).

3.7.5 Vehicle Failure

In the event of vehicle breakdown on the highway, policing will be an important safety measure for addressing such events. This may also be an issue for workers maintaining the highway in the winter. A stranded vehicle on the highway in freezing temperatures could result in adverse effects to human health, including death. As well, a stalled vehicle could cause another vehicle to collide with pedestrians, wildlife or other vehicles.

3.8 Effects of the Environment on the Project

The study region is best characterized as occurring in the Interior Labrador and Interior Lake Melville climatic regions (Banfield 1981). The part of the proposed highway which occurs in the Interior Labrador region is described as possessing a relatively continental influence (i.e., long and severe winters with heavy snow accumulation, and short, cool summers receiving the highest proportion of precipitation). The Interior Lake Melville area characterizes the western portion of the proposed highway, towards Happy Valley-Goose Bay. This region is similar to the Interior Labrador region, except that it experiences less harsh climate (i.e., shorter winters, warmer summers and longer growing period) Snowfall occurs in all months except July and August, ranging from approximately 15 to 86 cm in area communities.. The maximum and minium monthly temperatures for Happy Valley-Goose Bay and Cartwright are presented in Table 4.1. The maximum and minimum total monthly precipitation is presented in Table 4.1. Wetlands (bogs and fens) occur throughout the area.

The highway will cross seven watersheds. Most contain Atlantic salmon and brook trout. There are 16 scheduled salmon rivers along the proposed outfitter route and all are located in the Eagle River and Paradise River watersheds. Freeze-up typically occurs in central and southern Labrador in late November/early December and spring thaw occurs between mid-April and early May, with some variability depending on size and location of waterbodies.

As with any highway construction project, the primary effect of the environment on the proposed highway will be on watercourse crossing-structure design. The size of culvert openings will depend on several environmental features:

- drainage basin area;
- rainfall intensity;
- soil properties;
- ground cover;
- slope of terrain; and
- depression storage.

The size of bridge opening will depend on several environmental features:

- water flow;
- estimated frequency of flooding;
- soil characteristics;
- ice; and
- wind.

Site-specific information will be collected and/or forecast for each watercourse crossing; these parameters will be used in different models to determine design flows. Best engineering practice will be used to design the culvert and bridges, including fish passage requirements and culvert design guidelines developed by DFO, and navigation requirements for bridge structures as provided by DFO.

The climatic conditions will limit the construction schedule from mid-May to the end of November. The cold winter temperatures preclude the use of salt for ice control. There will be no direct application of salt to road surfaces primarily because the salt would not be effective at temperatures less than -10°C. Due to the maximum design gradient, the terrain will restrict routing availability.

One of the environmental events which could affect the project is the possibility of a forest fire resulting from a lightning strike. Such an event could have the potential to delay a construction season and could result in the evacuation of personnel and the loss of property (i.e., a construction camp or laydown area).

The results of the EIS/CSR will be considered in the final design phase. Where possible, sensitive areas (presence of archaeological sites, plant species at risk, sulphide-bearing rock) will be avoided. Where areas cannot be avoided, appropriate mitigation measures will be applied as described elsewhere in the EIS/CSR.

There is a lack of knowledge about the potential effects of climate change that may be experienced in Labrador. EMAN-North (2001) notes that northeastern Canada, especially Labrador, is responding differently to changes in temperature than other parts of northern Canada. While it is not currently known what the predictions are for Labrador with respect to climate change, potential changes, such as rising sea level, changes in sea ice patterns and ocean currents, storm surges and more frequent storms, and temperature changes, may have implications for the climate in south-central Labrador.

For example, increasing temperatures may result in more precipitation falling as rain rather than snow. Should increasing amounts of rain be combined with more violent storms, this would have implications for watercourse crossing structures. Similarly, cooling temperatures may result in more snow and ice, which has implications for spring runoff. Watercourse crossing structures will be designed to allow for the passage of increased flow and ice, and to handle 1:100-year storm events. As well, changes in ice formation would have implications for ice control requirements.

Major cuts and fills along the right-of-way can affect the deposition of snowfall, depending on micro-climatic conditions. This would have implications for snow clearing requirements.

The normal surveillance of the highway will be the responsibility of the Royal Canadian Mounted Police (RCMP). It is assumed that adverse weather conditions will be taken into consideration and appropriate travel advisories provided to restrict travel during severe weather conditions.

During construction, climate change may affect the project if there is an increase in the frequency and severity of storms, one of the forecasted effects of climate change. However, it is unlikely that the magnitude of these changes within the construction period will be sufficient to cause any effects. The “normal” variation of weather will be greater than the incremental effect of climate change. In the longer term, any increased frequency of adverse weather may, or may not be sufficient to be observed.

3.9 Environmental Management Planning

WST is committed to sound environmental management practice. Environmental management planning provides a framework through which WST can ensure that environmental protection measures are implemented and appropriate monitoring is conducted. A sound environmental management strategy and

appropriate mitigation measures can eliminate or minimize any adverse environmental effects. WST's environmental management plan (EMP) includes:

- consideration of the Precautionary Principle;
- environmental protection measures;
- environmental protection planning;
- environmental awareness training;
- rehabilitation of disturbed areas;
- contingency and emergency response planning;
- environmental compliance monitoring (ECM); and
- environmental effects monitoring (EEM), if required.

The EMP outline put forth by WST incorporates both standard and project-specific mitigation measures aimed at eliminating or minimizing any adverse environmental effects. The EMP also outlines WST's commitment to rehabilitation, contingency planning and monitoring, as required. These elements provide the tools necessary for WST and its contractors to implement and monitor project components. WST will implement the EMP and continue the application of best practices throughout highway construction and operation.

The details of the EMP will be finalized in consultation with the appropriate regulatory agencies after the project is released from the environmental assessment process and final design plans are available. WST will consult with the appropriate regulatory authorities, including the Department of Environment, DFO and Environment Canada to determine monitoring and reporting procedures during construction and operation phases.

3.9.1 Precautionary Principle

The precautionary principle, as defined by the 1992 Rio Declaration on Environment and Development, states that: *Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.* This principle helps shape WST's approach to environmental management. In accordance with the Precautionary Principle, WST is committed to applying appropriate and cost-effective measures throughout project planning and implementation that will prevent serious or irreversible damage. The precautionary principle will guide highway planning, design and implementation, and scientific uncertainty about potential effects will not be a reason for postponing use of mitigation measures.

It is WST's policy to protect the environment along the highway route (TLH - Phase III) and in adjacent work areas such as borrow or quarry sites, laydown areas and construction camps. WST will require contractors to consider the best available technology for all activities and use appropriate measures to prevent adverse effects (including pollution events), where possible.

3.9.2 Management and Reporting Structure

The outfitter route will be constructed over a seven-year period. There will be two construction sites each year (e.g., one each at the western and eastern ends of the proposed route). WST will have a dedicated Resident Engineer for each construction site phase) (i.e., section being completed). The Resident Engineer, who is responsible for each construction site, will be responsible for ensuring daily, on-site environmental compliance and implementation of EPP requirements, permit conditions and WST specifications. The Resident Engineers have overall responsibility for their respective construction phases and for ensuring that all environmental commitments are adhered to by the contractor. The Resident Engineer will report to WST's Regional Engineer in Happy Valley-Goose Bay, who in turn reports to the Regional Director. The Regional Director reports to the Executive Director of Roads, who reports to the Deputy Minister. Overall responsibility for the project, including environmental reporting, rests with the Senior Coordinator for the TLH.

The ESO dedicated to the project will be responsible for ECM, evaluating the effectiveness of protection measures and reporting non-compliance events. The ESO will liaise daily with the phase-specific Resident Engineers and regularly visit each construction site during the season. The ESO will report to the Senior Environmental Planner in St. John's. Both the Resident Engineers and ESO will have authority to take immediate corrective action.

3.9.3 Environmental Protection Measures

Environmental protection measures or mitigation are required for compliance with regulations, permits or letters of advice. Current construction standards provide improved environmental awareness and enhanced protection in response to the recognition that prevention is more cost-effective than remediation.

Environmental safeguards have been incorporated into project design to protect the natural and socio-economic environment. These include, but are not limited to, erosion control measures when working near waterbodies, and properly storing and handling fuel and other hazardous materials. All construction and operations/maintenance activities will be conducted according to WST specifications and environmental standards. Construction activities and associated protection measures are listed in Table 3.7, while environmental protection measures for operation are outlined in Table 3.8.

Table 3.7 Environmental Protection Measures (Highway Construction)

Construction Activities		Environmental Protection Measures	
1	Vegetation Clearing	1.1	All clearing will comply with WST's Specifications 201, 202 and 835, and the *Commercial Cutting Permit*, *Operating Permit* and *Permit to Burn*.
		1.2	Disturbed areas will be minimized. All areas to be cleared will be marked in advance.
		1.3	Any trees outside the cleared right-of-way that pose a safety hazard (i.e., are unstable, or leaning and extending over the highway) to highway users will be removed.
		1.4	Permanent and temporary buffer zones of undisturbed vegetation will be retained on either side of the watercourse crossing structures. Where possible, for highways adjacent to water bodies, the buffer zone of undisturbed vegetation between clearing activities and water bodies will be determined by the formula: 20 m + (1.5 x Slope (percent)), (as recommended by Gosse et al. 1998).

Construction Activities		Environmental Protection Measures	
		1.5	At locations along the right-of-way where active migratory bird nests are present or suspected, vegetation clearing will not be conducted until eggs have hatched and young are mobile. The presence or suspected presence of active nests will be established by observations. Trees will be inspected for active bird nests prior to removal. Whenever possible, trees with active nests will be left standing until such time as the young have fledged. Bird observations will be recorded in the wildlife log kept by the Resident Engineer. A log of this nature is a standard practice and was used during construction of Phase II of the TLH.
		1.6	Standing trees will be cut to within 150 mm of the ground, and all trees, shrubs and debris removed.
		1.7	Chainsaws will be used to clear vegetation, except where alternative methods of equipment are approved.
		1.8	Slash will be piled so as not to damage vegetation outside the right-of-way. A 6.5-m break in slash piles, at least every 200 m, will allow drainage and animal access. Slash and other materials or debris will not be allowed to enter any watercourse, waterbody or wetland. Material will be piled beyond the reach of seasonal floodwaters, at least 30 m from the watercourse or body, as recommended by Gosse et al. (1998).
		1.9	All merchantable or forest product timber will be salvaged and will be the property of the contractor. Merchantable timber should be piled in the vicinity of a blasting operation or in any other area where construction activities could negatively affect the value or utility of the timber.
		1.10	Cleared unmerchantable timber, slashings and cuttings will be burnt in compliance with the *Forest Fire Regulations*, *Environmental Code of Practice for Open Burning* and the *Permit to Burn*. Fires will be located a minimum of 10 m from the existing tree line and/or adjacent piles of slash and piled merchantable timber, or as directed by the Conservation Officer. Fires will not be left unattended. Where possible, WST will consider alternative uses for wood waste, such as mulching.
		1.11	Use of rubber tires, waste oil or similar materials to ignite slash or maintain fires will be strictly prohibited.
		1.12	The work area will be kept free of all flammable waste.
		1.13	If necessary, dust from construction activities within or adjacent to communities will be controlled by water (Specification 840).
		1.14	All vehicles and equipment transported to Labrador for construction work will be cleaned prior to transport to reduce the risk of introducing new or invasive species to the area.
		1.15	All clearing will be conducted in accordance with WST Specifications 815 and 850 to protect watercourses and bodies.
2	Grubbing and Debris Disposal	2.1	All grubbing and debris disposal will comply with applicable standards and regulations, and WST Specifications 201 and 203.
		2.2	Grubbing limits for cut and fill zones will be defined in the field. Grubbing will be confined to these portions of the route and scheduled immediately in advance of highway construction to limit the exposure of large areas of erodible soils.
		2.3	When grubbing activities are required near watercourses, a minimum 30-m "no grub" buffer zone, as recommended by Gosse et al. (1998), will be maintained between grubbed areas and watercourses. The "no grub" buffer area will be clearly marked prior to any grubbing, making the area visible to heavy equipment operators.
		2.4	Grubbing will not be carried out in any watercourse, temporary buffer zone or location where water is flowing until a bridge is constructed or culvert installed. At this time, all flow will be diverted around the construction so that all grubbing and excavation procedures will be carried out in the dry.
		2.5	Filter fabric fencing will be erected at the bottom of cuts and lower sections of grubbed areas to prevent migration of soils and possible siltation of watercourses and waterbodies. Solids accumulating in a settling pond or sediment trap will be removed on a regular basis to ensure that such devices remain effective.
		2.6	Extended weather forecasts will be used to help schedule construction activities and stabilize the site, so as to avoid erosion and sedimentation conditions.
		2.7	Perimeter control structures (e.g., silt fencing, sediment traps and settling ponds) will be installed prior to any land disturbance.

Construction Activities		Environmental Protection Measures	
		2.8	Control structure integrity and effectiveness will be checked daily and immediately after storm events.
		2.9	All infill and imported material will be clean and free of contaminants and fines.
		2.10	Construction sites will be stabilized before the winter months.
		2.11	All grubbed debris, including stumps, roots, surface boulders, embedded logs, debris, matted roots and other vegetation marked for removal, will be disposed of as directed by the Resident Engineer.
		2.12	Topsoil and organics will be stockpiled, secured to prevent erosion and reserved for use in post-construction reclamation.
		2.13	Items 1.12 to 1.15 also apply.
3	Blasting	3.1	All blasting and the purchase, transport, storage and use of explosives will comply with government laws and regulations. A blasting plan will be developed and followed by contractors.
		3.2	A temporary storage magazine will be located at each laydown area. All temporary magazines will have a Temporary Magazine License from Mines and Energy Canada.
		3.3	Use of explosives will be restricted to authorized personnel. All blasters will have a Blasters Safety Certificate.
		3.4	Blasting in or near watercourses/bodies will be minimized and conducted in consultation with DFO. Blasting will be mitigated by using millisecond delays or bubble curtains.
		3.5	To minimize damage to landscape features and surrounding objects, blast charges will be directed away from trees.
		3.6	Time-delay blasting cycles will be used, if necessary, to control the scatter of blasted material and minimize instantaneous peak noise levels.
		3.7	Blasting will not occur near storage tanks or storage areas for fuel or other hazardous materials.
		3.8	For any blasting in areas of potential acid-generating rock, the amount of over-break will be minimized and the blasted rock particle size will be maximized (e.g., through use of nitroglycerin rather than an emulsion explosive or using pre-shearing techniques).
		3.9	Loose diggable material exposed at subgrade will be removed, where practical, by excavators or small equipment to minimize the volume left in the subgrade.
		3.10	Excavation of blasted material will be carried out within a few days of blasting.
		3.11	In areas where migratory birds are nesting, blasting activities will be timed to avoid sensitive periods such as incubation and early brood-rearing (i.e., after August 1).
		3.12	Uncontrolled blasting, caused by failed discharges or otherwise, will be reported immediately to DFRA or DFO officials. Where uncontrolled blasting results in degradation to terrestrial or aquatic habitats, mitigative measures as recommended by DFRA or DFO will be implemented.
		3.13	Blasting areas will be surveyed for caribou and other wildlife species. Presence of wildlife in the immediate area will result in postponement of blasting activities. Guidelines for mitigation of the effect of blasting activities on wildlife will be developed in consultation with the Inland Fish and Wildlife Division.
4	Excavation	4.1	Excavation will be carried out according WST Specifications 204, 205, 206, 208, 211 and 212.
		4.2	If excavation of unsuitable material is required, efforts will be made to incorporate excavated material into the shoulder or backslope area of the right-of-way.
		4.3	If excavated materials cannot be used, they will be disposed of at a location approved by the Resident Engineer. The topsoil in the disposal area will be removed, stockpiled and used to cover the material being disposed.
		4.4	Excavating through potential acid-generating rock in grade cuts will first be attempted by digging and ripping. If these methods cannot remove the rock, then blasting will be used.
		4.5	Potential acid-generating rock will be loaded on trucks as it is excavated and taken to a pre-determined disposal or interim storage site. Any stockpiling of acid-generating rock will follow procedures outlined in the EPP.
		4.6	Items 2.6 to 2.10 and 3.1 to 3.11 also apply.
5	Establishment and Operation of Borrow Pits	5.1	Borrow activities will adhere to all federal, provincial and municipal laws and regulations, as well as WST Specifications 207 and 310. Borrow sites will be selected and maintained in compliance with permits obtained from the Department of Mines and Energy.

Construction Activities		Environmental Protection Measures	
		5.2	Borrow pits will be developed in a controlled manner to minimize environmental effects.
		5.3	Borrow areas outside the right-of-way will be located a minimum of 150 m from any watercourse or wetland.
		5.4	Over-extension of the borrow pit operation will be prevented by staking and/or flagging the development area, stockpile area and clearing limits.
		5.5	All stumps, organic matter and topsoil will be stripped from the area to be excavated and stockpiled at least 5 m from uncleared areas and 5 m from the excavation area. Separate overburden piles will be developed (when this material is present). Topsoil and overburden will not be mixed.
		5.6	Water containing more than 30 mg/L suspended solids will not be directly discharged into a watercourse or waterbody. Silt-laden water exceeding this limit will be discharged to a vegetated area or a sedimentation basin prior to release into a watercourse or waterbody. Information on the criteria for sizing settling ponds (including storm events and run-off volumes), structures and procedures to be used, and location for disposing of accumulated solids removed from the ponds will be outlined in the EPP.
		5.7	Any borrow site that remains in operation for more than three months will have sediment control ponds and erosion protection measures. The criteria for settling ponds will be clarified on a site-specific basis depending on parameters such as soil conditions.
		5.8	Settling ponds will be cleaned on a regular basis to ensure that the retention capacity is maintained.
		5.9	If necessary, water will be used to control dust during construction. Information on conditions as to where and when water should or should not be applied will be outlined in the EPP.
		5.10	Borrow areas no longer required will be rehabilitated to permit rapid revegetation and prevent erosion and sedimentation. Borrow area rehabilitation will be completed within one month of abandonment or when a site has been unused for more than six months.
		5.11	Upon completion of excavation of a borrow pit, the area disturbed will be graded to slopes less than 2:1 (less than 0.25:1 for solid rock). Following sloping, the topsoil and any organic materials previously removed from the site will be re-spread over the disturbed area.
		5.12	Items 1, 2 and 3 also apply.
6	Installing Watercourse Crossing Structures and Instream Activities	6.1	Watercourse crossings will be constructed in compliance with government regulations, permits, and applicable WST and DFO guidelines. Culverts will be installed in compliance with the provincial Environmental Guidelines for Culverts and DFO regulations.
		6.2	Watercourse crossing structures will be installed in the dry by diverting or pumping water around the construction area. Cofferdams will be used to divert flow around the work area. To prevent dewatering downstream, streamflow will not be altered.
		6.3	To avoid sensitive periods for fish populations, all instream work will be conducted between June 30 and September 1, unless otherwise approved by DFO.
		6.4	Precautions will be taken, in consultation with DFO, to ensure that fish are not left stranded in the work area. Fish recovered from the work area will be returned unharmed to the watercourse as directed by DFO officials.
		6.5	Work will be performed in a manner ensuring that no deleterious substances, such as (but not limited to) sediment, fuel and oil, enter waterbodies.
		6.6	Fording activities will be minimized and, if possible, avoided. When fording any watercourse, approval will be obtained from DFO and the provincial Environmental Guidelines for Fording will be followed.
		6.7	An ungrubbed temporary buffer zone will be maintained on each side of watercourses until the crossing structure is ready to be installed. However, cutting and removing trees and slash will be permitted in these areas.
		6.8	Permanent buffer zones of undisturbed vegetation will be retained on either side of the construction zone. On flat grades, this buffer zone will measure 30 m total width; as grades increase, the width of the buffer will increase according to the formula: 20 m + (1.5 x Slope (percent)).
		6.9	Erosion control measures (e.g., sediment traps and filter fabric), as appropriate, will be put in place during construction to minimize erosion and siltation of waterbodies used by fish.
		6.10	Items 1.4, 2.3 to 2.10, 3.4, 5.6, 8.1, 9.5 and 9.6 also apply.

Construction Activities		Environmental Protection Measures	
7	Subgrade Construction	7.1	Items 1, 2, 3 and 4 also apply to Subgrade Construction.
		7.2	Subgrade construction will follow requirements outlined in WST Specifications 204, 301 and 315.
8	Establishing and Operating Construction Camps and Laydown Areas	8.1	Temporary construction camps and laydown areas will be established and maintained according to WST Specification 830, as well as applicable legislation, regulations and guidelines.
		8.2	The sewage and waste disposal system for construction camps will comply with the Department of Health guidelines and the *Environment Control Water and Sewage Regulations*. WST Specification 825 (Waste Management) will apply.
		8.3	Arrangements will be made for disposing site waste and sewage.
		8.4	All domestic solid waste will be collected, properly stored, removed and disposed of in an approved disposal area. The camps and work areas will be kept clear of all food scraps and garbage.
		8.5	All vehicle use will be restricted to designated roads and disturbed areas. Vehicles will yield to wildlife and any chasing, harassment or feeding of wildlife will not be permitted.
		8.6	All construction personnel will be required to follow all applicable legislation for hunting, fishing and trapping, and using and storing firearms.
		8.7	Raptor nests will not be disturbed nor the occupants harassed. Such sites will be protected from disturbance as directed by the Inland Fish and Wildlife Division.
		8.8	To prevent attracting bears or other wildlife to the camp, all food supplies will be properly stored. Domestic garbage will be contained in bear-proof containers and regularly disposed at an approved waste disposal site.
		8.9	Food will be stored in areas away from sleeping quarters and work areas.
		8.10	Efforts will be made to deter nuisance animals using non-lethal deterrents. Nuisance animals will be reported to DFRA and, if relocation is necessary, relocation will be carried out at the expense of WST.
9	Hazardous Materials Transportation, Storage, Use and Disposal	9.1	Transporting, storing and using fuels and other hazardous materials will comply with WST Specification 820 and all applicable government laws and regulations.
		9.2	All fuels and hazardous materials will only be handled by personnel trained and qualified in handling these materials.
		9.3	All necessary precautions will be taken to prevent and minimize spills, and misplacement or loss of hazardous materials.
		9.4	Smoking will be prohibited within 10 m of a fuel storage area or during refuelling operations.
		9.5	All hydrocarbon substances will be stored at least 100 m from any watercourse, waterbody or designated wetland.
		9.6	Toxic construction material (e.g., asphalt-treated timber) will be stored at least 100 m from all areas where drainage is directed into any watercourses or wetlands.
		9.7	All storage facilities will be located away from construction activity and inspected on a regular basis. Storage areas and non-portable transfer lines will be clearly marked or barricaded to prevent damage by moving vehicles.
		9.8	Hazardous materials will be disposed of according to government laws and regulations.
10	Site Rehabilitation and Monitoring	10.1	All infrastructure related to construction, such as construction camps, laydown areas and borrow pits, will be dismantled and rehabilitated when no longer required for construction or operation.
		10.2	Immediately following and during some construction activities, WST will identify areas requiring seeding/sodding or stabilization to prevent erosion.
		10.3	Re-vegetation activity will be carried out according to WST Specifications 631, 632 and 855.
		10.4	Where directed by the Resident Engineer, specific areas will be hand seeded or sodded as soon as possible.
		10.5	All work shall be carried out according to applicable WST specifications.
		10.6	Revegetated areas will be inspected periodically to ensure that growth is occurring. Additional revegetation work will be undertaken, if necessary.
		10.7	Items 2.6 to 2.10 also apply.

Table 3.8 Environmental Protection Measures (Highway Operation)

Operations Activities		Environmental Protection Measures	
1	Vehicle Movement	1.1	Roadside vegetation will be managed to prevent growth of vegetation that would restrict driver visibility.
		1.2	WST will consult the Inland Fish and Wildlife Division about potential wildlife-vehicle collision locations. WST will erect warning signs and conduct appropriate public awareness activities.
2	Road Repair and Maintenance	2.1	WST will introduce a regular highway maintenance program.
		2.2	Highway and causeway will be inspected regularly to ensure that the surface and subsurface do not deteriorate.
		2.3	The highway will be maintained and cleared of all debris and snow. Proper ice control practices (sand application) will be followed (WST Specification 317).
		2.4	Watercourse crossing structures will be inspected regularly to ensure that they are in good condition. Culverts will be inspected to ensure they are not clogged with debris.
		2.5	Erosion control structures will be inspected regularly to ensure effectiveness.
		2.6	Removal and application of protective coatings on all highway structures will be carried out according to WST specifications.
		2.7	At locations along the right-of-way where active migratory bird nests are present or suspected, vegetation clearing will not be conducted until eggs have hatched and young are mobile. The presence or suspected presence of active nests will be established by observations. Trees will be inspected for active bird nests prior to removal. Whenever possible, trees with active nests will be left standing until such time as the young have fledged. Bird observations will be recorded in the wildlife log kept by the Resident Engineer. A log of this nature is a standard practice and was used during construction of Phase II of the TLH.
		2.8	If necessary, water will be used to control dust during construction. Information on conditions as to where and when water should or should not be applied will be outlined in the EPP.
		2.9	Borrow pits will be operated, maintained and decommissioned as described in Item 5 in Table 3.7.
3	Ice and Snow Removal	3.1	The highway drainage system will be designed in such a way as to direct storm run-off to low lying vegetated areas, rather than directly into watercourses. This will provide a buffer to protect water quality.
		3.2	Salt will not be applied for ice control purposes. However, a small quantity of road salt (<5 percent) will be incorporated into the sand to maintain manageability during freezing conditions.
4	Hazardous Material Storage, Use and Transportation	4.1	All storage facilities for equipment, hazardous materials and supplies will be kept clean and orderly.
		4.2	All vehicle and equipment servicing areas will be kept clean and orderly.
		4.3	Refer to Item 9 in Table 3.7.
Note: Environmental protection measures outlined in Table 3.7 for construction activities will be applied as required during operation.			

3.9.4 Environmental Protection Plan

An EPP provides the framework for implementing environmental commitments and mitigative measures for a project. It is a concise, field-usable document providing quick reference to the environmental protection measures to be implemented for the project, as well as the overall environmental management framework for the project. It does not contain any analysis of environmental effects or mitigation measures.

WST will prepare an EPP for each construction phase (i.e., section of the highway) to be constructed during a field season. The EPPs will be specific to each section of highway being constructed. Each phase-specific EPP will be developed in consultation with the appropriate regulatory authorities, including the Department of Environment, DFO and Environment Canada, and will be subject to government review and comment prior to construction. All contractors will be required to comply with the EPP through their contract. WST's ESO will be responsible for ensuring implementation of the EPP by the contractor.

The EPP will summarize all environmental protection commitments outlined in the EIS/CSR and outline construction/operation mitigation, permit application and approval planning, monitoring activities, response procedures for accidental and unplanned events, and contact lists. It will also include a tabular breakdown of major construction and operation activities, with permits required, field mitigation and appropriate contingency planning.

A typical EPP prepared by WST outlines the following:

- WST's policy regarding environmental concerns associated with the project;
- WST, contractor, ESO and on-site personnel responsibilities;
- locations of any known environmentally sensitive areas along the highway;
- specific instructions for restricting construction due to sensitive periods for fish, wildlife or other environmental components;
- general and site-specific mitigation measures to address routine concerns and accidental events (reporting and response procedures);
- rehabilitation measures for disturbed areas;
- contact list for permits, authorization and key personnel; and
- WST environment and construction specifications (appended to the EPP).

An outline for a typical WST EPP is provided in Table 3.9. The EPP will incorporate the environmental protection measures listed in Table 3.7, emergency response and contingency measures outlined in Table 3.10, and VEC-specific mitigation measures identified in Chapter 7.0.

Table 3.9 Environmental Protection Plan Outline

1.0 INTRODUCTION
2.0 GENERAL PROTECTION MEASURES FOR CONSTRUCTION
- 2.1 Owner's (WST) Policy
  - 2.1.1 Owner's Responsibilities
- 2.2 WST Environmental Reporting
  - 2.2.1 Environmental Compliance Monitoring
  - 2.2.2 Environmental Effects Monitoring
- 2.3 Contractor Education
- 2.4 Contractor's Responsibilities
  - Table 1 - Major Regulatory Approvals
- 2.5 Numeric Standards
- 2.6 Contractor and Subcontractor's Personnel
- 2.7 Storing, Handling and Transferring Fuels and Other Hazardous Materials
- 2.8 Waste Management
- 2.9 Dust Control
- 2.10 Water Quality Monitoring
- 2.11 Laydown Areas
- 2.12 Protection of Historic Resources
- 2.13 Temporary Work Camps
- 2.14 Clearing
- 2.15 Grubbing
- 2.16 Bog Excavation
- 2.17 Borrow Areas
- 2.18 Clean-up
- 2.19 Revegetation
- 2.20 Burning and Forest Fire Prevention
- 2.21 Blasting Operations

3.0 SPECIAL PROTECTION MEASURES FOR CONSTRUCTION
- 3.1 Watercourse Crossings
  - 3.1.1 General Instructions for Watercourse Crossings
  - 3.1.2 Buffer Zones
    - Table 2 - Stream Crossings Requiring Buffer Zones
  - 3.1.3 Scheduling of Work at Watercourse Crossings
  - 3.1.4 Watercourse Crossings - General Installation Procedures
- 3.2 Off Right-of Way Travel
- 3.3 Sensitive Areas
  - 3.3.1 Equipment Operation and Erosion
  - 3.3.2 Wetland/Bogs
  - 3.3.3 Protection of Waterfowl and Raptors
  - 3.3.4 Land Sensitivity - General Guidelines for Contractors
- 3.4 Sanitary Facilities
- 3.5 Erosion and Silt Control
- 3.6 Clearing and Timber Salvage

4.0 CONTINGENCY PLANNING
- 4.1 Personnel Injury
- 4.2 Fire Prevention and Response
- 4.3 Discovery and Protection of Historic Resources
- 4.4 Discovery and Protection of Plant Species at Risk
- 4.5 Wildlife Encounter Prevention and Handling
- 4.6 Spill Prevention and Response

APPENDICES
Appendix A: General Environmental Specifications
Appendix B: Typical Cross Section
Appendix C: Typical Buffer Zones
Appendix D: Technical Information, DFO Fact Sheets
Appendix E: Topographic Map

Table 3.10 Emergency Response and Contingency Measures

Potential Activity Requiring Response		Emergency Response and Contingency Measures	
1	Personnel Injury	1.1	All work will be performed in accordance with the requirements of the *Occupational Health and Safety Act* and regulations, and WST Specification 190 (Work Place Safety Requirements).
		1.2	Following contract award, the contractor will prepare a detailed Heath and Safety Risk Assessment and Management Plan for the owner.
		1.3	As per the *Occupational Health and Safety Act* and regulations, a health and safety program, policy and committee are required in a workplace where there are 10 or more workers. The contractor will be required to comply with these requirements.
		1.4	All vehicle and equipment operators will be required to have the appropriate training and certification for the vehicles and equipment that they will operate.
		1.5	All vehicles, equipment, buildings and structures will be properly maintained and regularly inspected to ensure that they are safe to use.
		1.6	All workers will be required to have appropriate protective clothes and devices, as necessary.
		1.7	First aid room, equipment, supplies and training will be provided as required under the *Occupational Health and Safety Regulations*.
		1.8	All accidents will be reported to the Resident Engineer and/or worker health and safety representative.
		1.9	Appropriate measures will be in place for emergency evacuation of personnel.
2	Fire Prevention and Response	2.1	The work area will be kept free of all flammable waste.
		2.2	Sufficient fire fighting equipment will be available on-site, as recommended by the Department of Forest Resources and Agrifoods, to suit location, labour force and construction activities.
		2.3	Employees will be trained in the use of fire fighting equipment.
		2.4	Cleared unmerchantable timber, slashings and cuttings will be burnt in compliance with the *Forest Fire Regulations*, Environmental Code of Practice for Open Burning and the Permit to Burn. Fires will be located a minimum of 10 m from the existing tree line and/or adjacent piles of slash, or as directed by the Conservation Officer. Fires will not be left unattended. Where possible, WST will consider alternative uses for wood waste such as mulching.
		2.5	Use of rubber tires, waste oil or similar materials to ignite slash or maintain fires will be strictly prohibited.
		2.6	The nearest forest management regional or district office will be notified immediately about a forest fire.
3	Discovery and Protection of Historic Resources	3.1	Following finalization of the route location and prior to construction, a field investigation to determine the potential for encountering historic resources will be conducted.
		3.2	WST Specification 860 (Protection of Historic Resources) will be followed.
		3.3	All personnel will be instructed in the recognition of archaeological materials.
		3.4	If any archaeological materials are encountered during construction activities, the area will be flagged and activities restricted to other parts of the construction site until direction is given to continue with work activities.
		3.5	The discovery will be reported to the Resident Engineer and ESO.
		3.6	The ESO will contact the Provincial Archeology Office for instructions on how to proceed.
4	Discovery and Protection of Plant Species at Risk	4.1	A field investigation of the potential areas for plant species at risk, as identified in the predictive modelling exercise conducted for the environmental assessment, will be conducted prior to the start of construction.

Potential Activity Requiring Response		Emergency Response and Contingency Measures	
		4.2	All vehicles and equipment transported to Labrador for construction work will be cleaned prior to transport to reduce the risk of introducing new or invasive species to the area.
		4.3	The Resident Engineer and ESO will be informed about the discovery of any plant species at risk.
		4.4	The ESO will contact the appropriate regulatory authorities for direction on how to proceed.
5	Wildlife Encounter Prevention and Response	5.1	All domestic solid waste will be collected, properly stored, removed and disposed of in an approved disposal area. The camps and work areas will be kept clear of all food scraps and garbage.
		5.2	All vehicle use will be restricted to designated roads and disturbed areas. Vehicles will yield to wildlife and any chasing, harassment or feeding of wildlife will not be permitted.
		5.3	All construction personnel will be required to follow all applicable legislation for hunting, fishing and trapping, and using and storing firearms.
		5.4	Raptor nests will not be disturbed nor the occupants harassed. Such sites will be protected from disturbance as directed by the Inland Fish and Wildlife Division.
		5.5	To prevent attracting bears or other wildlife to the camp, all food supplies will be properly stored. Domestic garbage will be contained in bear-proof containers and regularly disposed at an approved waste disposal site.
		5.6	The Inland Fish and Wildlife Division will be notified immediately if any species at risk or raptor nests are located by WST personnel or contractors.
		5.7	WST will maintain a log book to record sightings of wildlife species. The Inland Fish and Wildlife Division will be consulted for direction on the development and maintenance of the log book.
6	Spill Prevention and Response	6.1	All construction personnel will be required to attend an environmental awareness section which will include information on potential accidental or unplanned events and the appropriate prevention and response procedures.
		6.2	Transporting, storing and using fuels and other hazardous materials will comply with WST Specification 820 and all applicable government laws and regulations.
		6.3	All fuels and hazardous materials will only be handled by personnel trained and qualified in handling these materials.
		6.4	All necessary precautions will be taken to prevent and minimize spills, and misplacement or loss of hazardous materials.
		6.5	Smoking will be prohibited within 10 m of a fuel storage area and during refuelling operations.
		6.6	All storage facilities for fuels and other hazardous materials will be located away from construction activity and inspected on a regular basis. Storage areas and non-portable transfer lines will be clearly marked or barricaded to prevent damage by moving vehicles.
		6.7	All hydrocarbon substances will be stored at least 100 m from any watercourse, water body or wetland.
		6.8	Toxic construction material (i.e., asphalt-treated timber) will be stored at least 100 m from all areas where drainage is directed into any watercourses or wetlands.
		6.9	Waste fuels, oils or other hazardous materials will be disposed of according to government laws and regulations.
		6.10	Any soils contaminated by small leaks of oil or grease from equipment will be disposed of according to applicable legislation.

Potential Activity Requiring Response		Emergency Response and Contingency Measures	
		6.11	Measures will be taken to ensure that construction materials such as fresh concrete, concrete additives, solvents and preservatives do not enter watercourses or waterbodies.
		6.12	Spill response equipment will be available on-site and personnel will be trained in its use. Response equipment, such as absorbents (e.g., granular absorbents for land spills, and absorbent pads or cat-tails for recovery of oil from a water surface) and open-ended barrels for collection of oiled debris, will be available at each construction site.
		6.13	The Canadian Coast Guard (CCG) (772-2083) and Government Services Centre (1-800-563-2444) will be contacted immediately in the event of all spills on-land or in the freshwater or marine environment.
		6.14	WST is aware of the Atlantic Regional Environmental Emergencies Team and will contact the appropriate member departments or agencies in the event of an emergency.
Note: The prevention and emergency response and contingency measures outlined above apply to both construction and operation phases.			

The EPP will be included as a Supplementary General Condition of WST's Tenders for each of the construction phases. WST has established environmental specifications (Division 8 Specifications) that will be included in the contract requirements and appended to the EPP. Other environmental requirements (from Specification 865) also incorporated for specific activities include:

- Clearing and Grubbing (Specifications 201, 202 and 203);
- Excavation of Ditches (Specification 208);
- Temporary Diversion of Streams (Specification 405);
- Supply and Installation of Pipe Culverts (Specification 421);
- Hydroseeding (Specification 632);
- Soil for Hydroseeding (Specification 634); and
- Lime for Hydroseeding (Specification 635).

3.9.5 Emergency Response and Contingency Plans

The emergency response and contingency measures for personnel injuries, fire prevention and response, discovery and protection of historic resources, discovery and protection of plant species at risk, highway failure events, wildlife encounter prevention and response, addressing fuel and hazardous materials spills (on land or in the water) are outlined in Table 3.10. These measures would apply during both construction and operation phases of the TLH - Phase III. All WST staff, contractors and personnel will be informed about these measures during the environmental awareness training session to be carried out prior to construction.

3.9.6 Environmental Awareness

To ensure that all project personnel are fully informed about the environmental requirements associated with the project, WST will conduct an environmental awareness session for the contractor, subcontractors and their employees. The environmental awareness training will be carried out by WST's ESO immediately prior to the start of each construction season. Attendance at this session will be compulsory.

The purpose of the session will be to familiarize all personnel with WST specification and EPP requirements, and to ensure that all personnel understand their responsibilities with respect to environmental protection.

Emergency response and contingency plans will also be addressed at the environmental awareness training session, with all parties being informed about the measures to be put in place, at each of the work and related camp sites, for responding to an emergency situation. All parties will be required to familiarize themselves with their respective roles and responsibilities with respect to prevention and response measures.

3.9.7 Rehabilitation Measures

When construction in one area is complete, all construction and surplus material will be removed from the site to an approved storage area or moved on to the next construction area. Areas, such as temporary camp or laydown areas or borrow pits, that are no longer required will be rehabilitated.

Immediately following and during some construction activities, WST will identify areas that require seeding, sodding or stabilization to prevent erosion. WST will use accepted practices for erosion control or slope stabilization along highways. Surfaces requiring revegetation will be prepared by grading and soil treatment as required. All rehabilitation work will be carried out according to applicable WST specifications and direction from appropriate regulatory agencies. WST will give consideration to using native species in any revegetation activities.

Rehabilitated areas (temporary construction camps, laydown areas and borrow pit sites) will be monitored to confirm reestablishment of vegetation. Additional revegetation work will be undertaken, if necessary.

3.9.8 Environmental Monitoring and Follow-up Programs

WST's ESO will be responsible for ensuring that requirements outlined in the EPP are followed, monitoring compliance with all regulations, permits, approvals and authorizations as outlined in Table 3.1 and WST specifications, and carrying out any other monitoring commitments. The ESO will be responsible for ensuring that all personnel are familiar with any monitoring requirements identified and that the practices outlined are followed. Each site will have a Resident Engineer who will be responsible for carrying out any required monitoring and compliance activities on-site, and reporting to the ESO as appropriate. The EPP will also outline additional control measures or stop work criteria.

The ESO will inspect activities (e.g., construction of watercourse crossing structures) to ensure that specified buffer zones are maintained and sediment and other materials do not enter watercourses. The ESO will also be responsible for conducting any sampling specified in the permits.

3.9.8.1 Environmental Compliance Monitoring

ECM refers to monitoring project activities to ensure compliance with all regulatory and self-imposed environmental standards (Barnes et al. 1986). ECM is an essential component of any project as it assures owners, regulators and the public that standards and regulations are followed. Monitoring programs also allow early detection and response in the event of any failure of planned protection measures.

Legislation, regulations, standards and guidelines requiring compliance are outlined in Table 3.1, and environmental protection measures for the project are outlined Tables 3.7, 3.8 and 3.10. Any VEC-specific ECM activities proposed for the TLH - Phase III are outlined in Chapter 7.0 and all monitoring activities are summarized in Chapter 8.0. Specific details for ECM will be determined in consultation with the appropriate regulatory agencies when the detailed project design is complete. Any ECM programs established for the project will outline:

- environmental elements to be monitored;
- timing of the monitoring activity;
- frequency and duration of the monitoring activity;
- agencies to which monitoring results will be submitted for review; and
- protocols for interpreting results and follow-up actions to be taken.

3.9.8.2 Environmental Effects Monitoring

EEM is defined by Duinker (1985) as *the taking of repetitive measurements over time of environmental variables to detect changes caused by external influences directly or indirectly attributable to a specific anthropogenic activity or development.* EEM plays an important role in follow-up to the effects assessment by evaluating the accuracy of effects predictions and effectiveness of mitigation measures, and allowing early warning and correction of unforseen effects.

VEC-specific monitoring and follow-up commitments for the TLH - Phase III are discussed in Chapter 7.0 and included in the summary of monitoring activities presented in Chapter 8.0. An EEM program is not proposed for the project. However, WST is committed to working with relevant departments, agencies and organizations on further studies pertaining to the project.

Prior to each construction season, a survey for active raptor nests (specifically osprey and bald eagle) will be completed within 800 m of the construction zone and a survey will be completed for active beaver ponds within 100 m of the highway. Prior to the start of any construction on the TLH - Phase III, the following will be completed:

- study to further assess acid-generating rock potential;
- field investigations to assess geotechnical parameters of materials to be used for construction;
- study to further assess the potential for encountering rare plants; and
- historic resources survey.

WST will also support fish population studies to be completed during the construction phase. The protocols for these studies have been developed by the Inland Fish and Wildlife Division, who will take the lead in the survey.

Construction employment, including numbers by occupation, gender and timing, will be monitored with results provided to the Minister of Environment at the end of each construction season. A similar monitoring exercise for employment was carried out for the construction on the TLH - Phase I and II. The results of the employment monitoring for Phase II are discussed in Section 3.4.3.