TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

23 NAVIGATION ASSESSMENT

There are two navigable waterways within the PMH1 corridor, the Brunette River and the Fraser River. The public's right to navigation is protected by the NWPA *(*revised 1985*)*.

This chapter presents an overview of the legislative authority regarding navigation within the PMH1 project limits; identifies marine users of the Brunette and Fraser rivers; describes the existing and planned Highway 1 crossings these waterways; identifies potential project impacts to marine navigation; and provides proposed mitigation measures. Also discussed in this chapter are potential impacts of the Project on air navigation, and proposed mitigation measures to address these impacts.

23.1 Legislative Authority

Navigation and the use of the navigable waterways within the PMH1 project area are controlled by the Navigable Waters Protection Division (NWPD) of Transport Canada, and the Fraser River Port Authority (FRPA). The objective of the NWPD is to protect the public's right to navigation. The FRPA, a federally mandated port authority operating under the *Canada Marine Act*, administers Fraser Port. In addition to maintaining port related activities, the FRPA administers water lot leases within its jurisdiction.

23.1.1 Navigable Waters Protection Act

The NWPA protects the public right of navigation, and regulates the construction of works that may infringe on this right. The NWPA is administered by the NWPD and it applies to all navigable waters in Canada. The NWPA defines navigable water as:

> Any body of water capable in its natural state, of being navigated by floating vessels of any description for the purposes of transportation, recreation or commerce; it also includes a canal and any other body of water created or altered for public use, as a result of the construction of any work, as any waterway where public right of navigation exists by dedication of the waterway for public purposes, or by the public having acquired the right to navigate through long use. (Typlan, 2007 from Meyers, 1999).

The NWPA requires that formal approval from Transport Canada be obtained prior to the construction of structures that cross navigable waters. Formal approval is provided by a Letter of Understanding issued by a NWPD officer on behalf of the Federal Minister of Transportation.

The Letter of Understanding is issued to a project proponent, outlining the following: proposed construction works; the navigational envelope (both vertical and horizontal clearance requirements); and a mitigation plan that addresses marine communications during the construction period. Issuance of this Letter of Understanding is subject to a satisfactory review of the final design and development plan for structures by the Contractor. A Marine Communication Plan is a condition of approval as outlined in the Letter of Understanding and addresses construction-related navigation issues, including: the methodology and timing of bridge construction; hydraulic assessment of the final design, and the development of protocols for navigation safety communications with stakeholders (**Appendix 23A**).

23.1.2 The Fraser River Port Authority

The FRPA is designated under the *Marine Act* as the lead agency responsible for leases, permits and licenses along the reaches of the river under its jurisdiction. The jurisdiction of the FRPA extends from Sandheads Reach, at the mouth of the main arm of the Fraser River, east to Kanaka Creek in Maple Ridge, and north to Grant Narrows at the head of Pitt River, and includes the area of the river crossed by the Port Mann Bridge. Key responsibilities of the FRPA include:

- Facilitating trade through the Port's marine terminals;
- Administering the property within its jurisdiction, which includes federal and provincial Crown Lands covered by water, as well as upland areas owned by the federal government;
- Overseeing the harbour;
- Maintaining the navigation channels;
- Environmental stewardship; and
- Community involvement.

(Fraser River Port Authority, n.d.)

23.2 Brunette River

The Brunette River flows from Burnaby Lake through Burnaby, Coquitlam and New Westminster to its confluence with the Fraser River. The Brunette River was historically navigable by shallow draught vessels from the Fraser River to Burnaby Lake. At present, however, navigation is impeded upstream of the North Road Bridge by three concrete/rock riffle piers, which were built to protect salmon spawning areas. Navigation is also impeded by the Cariboo Dam, a water-control structure located at the outlet of Burnaby Lake. Sections of Brunette River between the obstacles are navigable, during periods of high water flow, by light, shallow draught vessels (e.g., recreational canoes and inflatable rafts) though portage access is required.

23.2.1 Existing Brunette River Bridge

Highway 1 crosses the Brunette River in Burnaby approximately 1 km west of North Road. The existing bridge over the Brunette River is 105 m long and 31 m wide and carries six lanes of traffic; three east-bound and three west-bound. The bridge is of box and girder type construction, and is supported by concrete piers set upon concrete foundations.

The minimum navigational clearances proposed for the Brunette River crossing are the existing clearances approved for the existing structure, which are 3 m of vertical clearance above the 100 yr flood elevation and 8 m of horizontal clearance centered on the thalweg. This clearance would be more than adequate for any navigation on this watercourse. It is very likely that much greater clearances will be provided due to the river cross-section and the highway profile.

23.2.2 Proposed Works – Brunette River Bridge Widening

The PMH1 reference concept requires widening of Highway 1 between the Brunette and Gagliardi interchanges from six to eight lanes, and includes widening of the existing Brunette River Bridge structure. To accommodate the additional lanes on the bridge, it would be widened by approximately 5.3 m on each side (**Figure 23-1**). The pre-design concept calls for two additional piers to be located within the Brunette River channel (**Figure 23-2**).

23.2.3 Potential Effects on Navigation

During bridge widening, recreational navigation along the section of the Brunette River in the vicinity of Highway 1 will be temporarily impeded by the presence of construction equipment and by coffer dams erected to allow construction of foundations and piers. However, no impacts to navigation are anticipated during operations of the widened bridge.

23.2.4 Navigational Clearance Requirements

There will be no change to the existing vertical and horizontal clearances, as outlined in **Chapter 23.2.1**.

23.2.5 Potential Effects of Bridge Widening on Channel Hydraulics and Geomorphological Processes

As part of the reference concept, one in-river pier is planned for Brunette River Bridge widening, and one pier would be in the wetted perimeter during high water. Significant effects to Brunette River hydraulics and channel geomorphology are not anticipated to result from the addition of an in-river pier. Should the Contractor's final design for the bridge widening entail in-river pier placement, an assessment of the changes to hydraulics and sediment deposition patterns, and downstream geomorphology will be required.

23.2.6 Conditions of Approval

As the existing Brunette crossing is already approved under the NWPA, any modification of the structure will require a Section 10 approval under the NWPA prior to commencement of work.

Figure 23-1 Elevation Drawing of Brunette River Bridge Widening

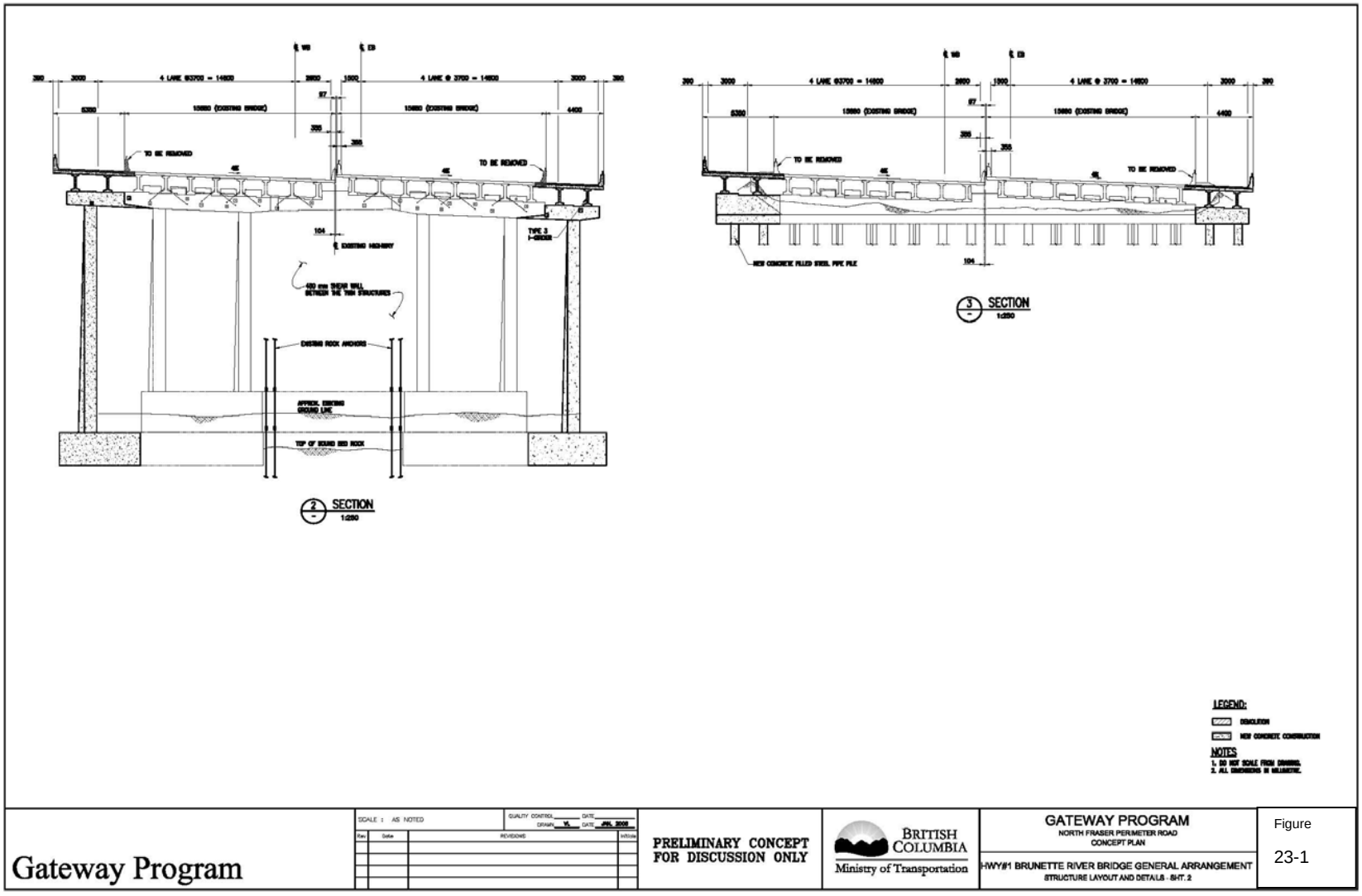
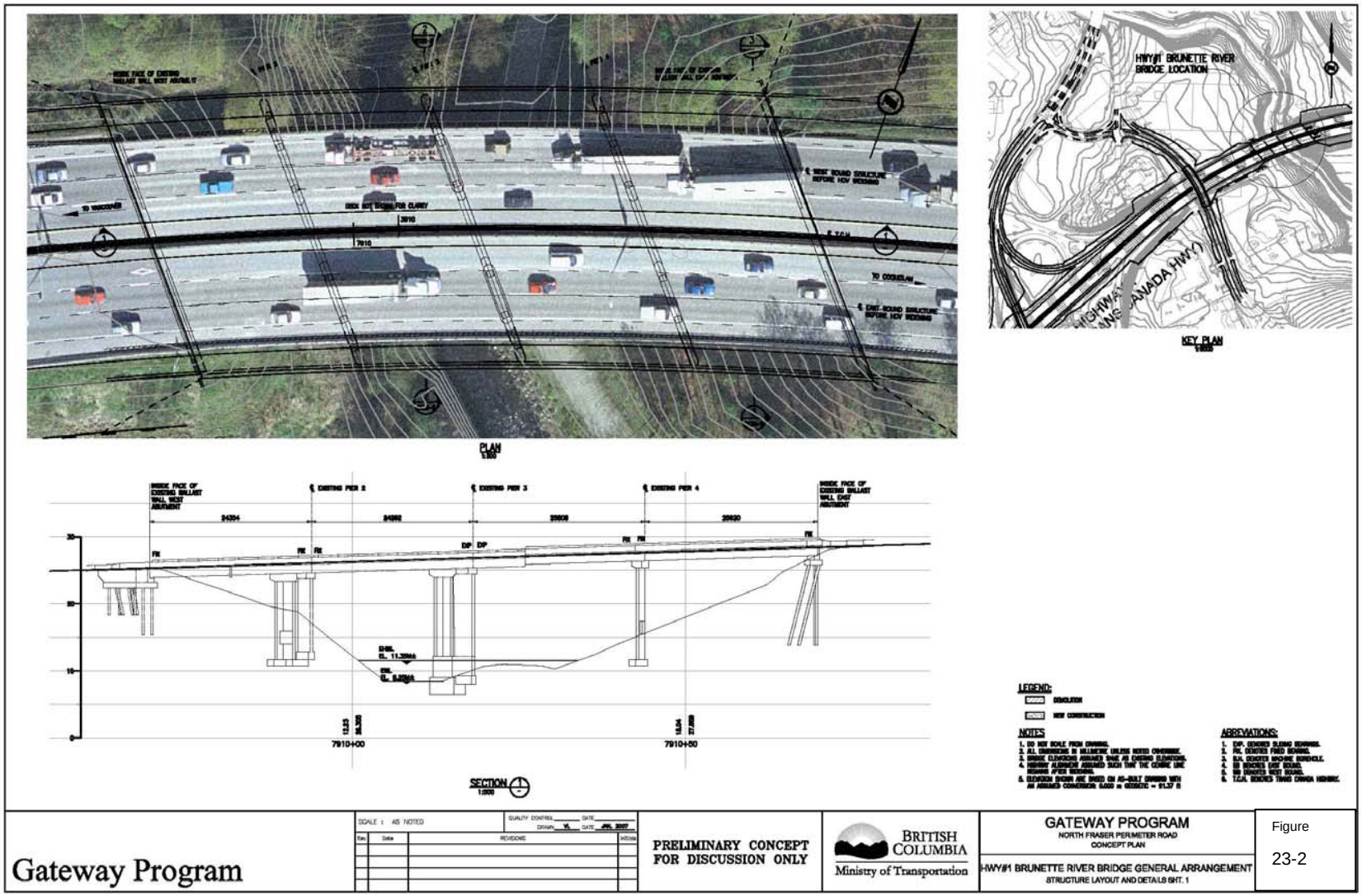


Figure 23-2 Elevation Drawing of Brunette River Bridge Widening



23.3 Fraser River

The Fraser River is navigable by marine vessels from its mouth to the town of Yale, approximately 175 km upstream. However, river depth limits the draught of marine vessels capable of navigating upstream of New Westminster. The lower reaches of the main channel of the Fraser River are dredged regularly to permit the passage of deep sea marine vessels from its mouth to the Fraser Surrey Docks, located approximately 30 km upstream (FREMP, 1999 - 2006). Upstream of Fraser Surrey Docks the river is not dredged regularly, which limits navigation in these reaches.

There is considerable marine traffic and activity in the vicinity of the Port Mann Bridge. This section of the river is used by pleasure craft, fishing vessels, and tug-boats; mid-sized vessels, such as tug-towed booms, smaller barges, and crane barges; and larger vessels, including dredgers, log barges, gravel/rock barges and crane barges (TyPlan, 2007). In addition to transiting marine vessels, marine activity in the vicinity of the Port Mann Bridge, includes log storage and booming.

A small municipal park (Maquebeak Park) with a boat launch facility, used mainly by recreational boaters, is located on the north bank of the Fraser River immediately downstream of the Port Mann Bridge.

Highway 1 crosses the Fraser River via the Port Mann Bridge, approximately 42.5 km upstream from the river's mouth and about 8 km upstream of New Westminster. At Port Mann, the Fraser River is approximately 900 m wide, and includes a 201 m wide primary navigation channel, named Queen's Reach, and a secondary navigation passage, the Essondale Reach.

23.3.1 Marine Traffic and Activity Near the Port Mann Bridge

23.3.1.1 Large Commercial Vessels

Navigational clearances are defined based on the identification of the largest vessels (identified as control vessels) that either currently or potentially transit the navigational channel. Accordingly, recommendations with respect to navigational clearance (both vertical and horizontal) requirements for the proposed new Port Mann Bridge were developed through the identification of the largest marine vessels that are currently, and are anticipated to be, using this section of the river (**Table 23-1**)

Table 23-1 Characteristics of Large Marine Vessels Transiting Under the Port Mann Bridge

Vessel type	Hull type	Current Operators	Length (m)	Beam (m)	Air draft (m)
Dredgers	Trailing Section Hopper Dredger, Cutter Suction Dredger	FRPD, Sceptre	50.3 - 95	13.6 - 16.1	18.3 - 28.0
Log Barges	Self-dumping log barge	Seaspan, Rivtow, Sea-link	105.6 - 138[(1)]	21 - 29.3	27 - 39
Gravel/Rock Barge	Flat Barge, Bulk Carrier[(1)]	Rivtow, Seaspan, Lafarge	76 - 110	18.9- 24.4	18.9 - 24.4
Chip Barges	Flat Barge	Seaspan, Rivtow	63.4 - 100[(2)]	15.2 - 24[(3)]	13 - 20
Intermodal[(4)]	Container Barge	Seaspan	121.9	23.2	12.3

(TyPlan & Westmar, August 2004)

Notes

1. The Seaspan 250 bulk carrier does not currently transit past the Port Mann Bridge.

2, 3. The largest chip barge transiting the Port Mann Bridge in 2005 was 63.4 m in length, with a 15.2 m beam.

4. Intermodal barges are not currently transitting past the Port Mann Bridge.

The types and numbers of commercial vessels projected to transit under the Port Mann Bridge will depend on the economic conditions of the underlying industries as well as physical constraints due to the river bed characteristics upstream of New Westminster. TyPlan and Westmar (2004) estimated that in 2004 there were approximately 3,600 one-way transits under the Port Mann Bridge made by large marine vessels annually, and that the number of transits is projected to increase to nearly 8000 over the next 20 years (**Table 23-2**).

23.3.2 Commercial, Recreational and Aboriginal Fishing near the Port Mann Bridge

Commercial, recreational and aboriginal salmon fisheries occur in the vicinity of the Port Mann Bridge. The commercial fishery is discussed in **Chapter 17.3.** Access for recreational activities, including recreational fishing, is also discussed in **Chapter 17**. As part of the marine use assessment for navigation, commercial fishermen operating in the vicinity of the proposed new Port Mann Bridge were consulted regarding the proposed new crossing (**Appendix 23A**).

The aboriginal fishery is discussed in **Chapter 28**.

Table 23-2 Estimated Current and Future Large Marine Vessel Transits under the Port Mann Bridge

Vessel Type	Estimated current one-way transits (2005)	Estimated future one-way transits
Dredgers	8	400
Log Barge	26	284
Gravel/Rock Barge	1388	2572
Chip Barges	2160	3892
Intermodal Barges	0	633
Total	**3582**	**7781**

(TyPlan and Westmar, August 2004)

The PMH1 project will work with the Contractor to ensure that the navigational channel is maintained and that access to commercial and aboriginal fisheries is considered during construction. The Marine Communication Plan (**Chapter 23.4.3.1**) and Marine Construction Plan (**Chapter 23.4.3.2**), to be developed by the Contractor in accordance with the requirements of the NWPA, will consider potential navigational effects related to commercial and aboriginal fisheries.

23.3.2.1 Water Lot Leases

There are over 30 water lot leases in the vicinity of the existing Port Mann Bridge. Water lot leases are used for a variety of industrial and non-industrial activities, as summarized in **Table 23-3.** Additional information on water lot leases is provided in **Appendix 23A** of this Application.

Table 23-3 Water Lot Leases in Proximity to the Port Mann Bridge

Water lease use	Number of leases	%
Forestry (log booms)	16	50%
Marine Operators/Towing	3	9%
Government	4	13%
Utility	4	13%
Industry	5	16%
Total	32	100%

(Typlan, 2007 from FRPA)

23.3.3 Existing Port Mann Bridge

The Port Mann Bridge is a steel tied arch bridge that crosses the Fraser River between Surrey and Coquitlam. The bridge carries five lanes of Highway 1: three east-bound and two west-bound. The Port Mann Bridge is 2093 m long, including a 366 m main span. The primary navigation channel under the Port Mann Bridge, the Queen's Reach, provides 201 m of horizontal channel clearance and 42 m of vertical clearance above high water at 2.5 m geodetic. In addition, east of the main channel, there is one secondary navigational passage, with 35 m horizontal and 25 m vertical clearance, and two working passages, each with 35 m horizontal clearance.

23.3.4 Proposed New Port Mann Bridge

The reference concept for PMH1 project calls for a new bridge over the Fraser River, downstream of the existing Port Mann Bridge. The new structure will carry vehicles east-bound, while the existing Port Mann Bridge structure will be modified to carry west-bound traffic only. The final design of the new Port Mann Bridge will include vertical and horizontal navigational clearances in accordance with the requirements of the NWPD.

23.3.5 Potential Effects

The PMH1 project has undertaken a comprehensive assessment of the navigational impacts associated with a new Port Mann Bridge. The results of this assessment are included within **Appendix 23A** of this Application. The construction of a new Port Mann Bridge can potentially affect marine navigation and other users of the Fraser River in a number of ways:

- Temporary closures or disruption of navigational channels to marine traffic during construction stages;
- Vertical and horizontal navigational clearance limitations;
- Effect on marine commercial activity in the vicinity of the proposed new Port Mann Bridge; and
- Temporary effects on commercial and First Nations fisheries within the vicinity of the proposed construction works.

23.3.5.1 Temporary Closure of Navigational Channels

During construction, barges used for activities such as pile driving and pier construction, may temporarily obstruct navigation channels. Any potential temporary closures of the navigational channels to marine traffic as a result of construction activities shall be communicated to marine users in accordance with a Marine Communication Plan and a Marine Construction Plan.

23.3.5.2 Vertical and Horizontal Clearance Limitations

Vertical and horizontal clearance requirements of the primary navigational channel, the secondary navigational passage, and working passages, both affect the types of marine vessels that can safely transit under the bridge and address vessel-pier collision risks. The new Port Mann Bridge will be designed to accommodate the needs of current and anticipated marine users along this section of the Fraser River, in accordance with NWPD requirements. The proposed navigational channel requirements of the new Port Mann Bridge are defined in the 2007 report by TyPlan: Planning and Management: *Navigation Assessment of the Port Mann/Highway 1 Project* (**Appendix 23A**).

23.3.6 Effects on Commercial Activity Surrounding the Existing and Proposed Port Mann Bridge

Water lots within the vicinity of the proposed Port Mann Bridge and surrounding shorelines support log storage and booming grounds used by a number of forest products companies. Two water lot lease holders, International Forest Products and Timberwest, may be affected directly as a result of the right-of-way requirements of the new Port Mann Bridge.

23.3.7 Effects of the New Port Mann Bridge on Channel Hydraulics and Downstream Geomorphological Processes

The Port Mann Twin Bridge Hydrotechnical Investigation conducted by Northwest Hydraulics Consultants in 2004 assessed scour at the north and south piers for two conceptual bridge configurations for the proposed Port Mann Bridge, including six different pier configurations. (**Appendix 23 A-B**). All tests for both construction and operations/maintenance phases were conducted with a discharge equivalent to the 200-year flood. It was assumed that caissons the size of the pile cap would be installed during construction. For tests incorporating riprap protection, nominal blanket dimensions were installed in the model.

Depending on pier configuration, scour depth went from minor local scour to depths of up to 12 m below the mean bed level. Pier location should take into account the effects the structure could have on the stability of the bank and the effects of the bank on flow patterns at the caisson.

In addition to local pier scour, general scour and an overall lowering of the channel in response to high flows will occur. General scour could not be determined in the tests carried out for the Port Mann Twin Bridge Hydrotechnical Investigation. As an initial estimate, however, general scour was computed based on the area of the caissons. Assuming that all bed lowering occurs in the main channel, the expected scour would be in the order of 4 m. This rough estimate needs to be confirmed for the preliminary design.

23.4 Impact Avoidance and Mitigation

The PMH1 project will undertake planning, compensation, and mitigation measures that satisfy the navigational concerns and requirements of the NWPA and the operational requirements and issues associated with water lot leaseholders managed by FRPA. These include the identification of navigational protection zones and a marine communications strategy. The measures described in **Chapters 23.4.1** to **23.4.4** relate to potential impacts to the Fraser River due to construction activities at the Port Mann Bridge while the measures described in **Chapter 23.4.5** relate to potential impacts to the Brunette River due to the Brunette River Bridge widening.

23.4.1 Navigational Protection Zones

In accordance with NWPA requirements, Navigational Protection Zones are proposed to protect the public's right to navigation within the vicinity of the proposed new Port Mann Bridge. The Navigational Protection Zones provide the Contractor with the required areas (horizontal and vertical clearances) within which no permanent works, as defined by NWPA, are allowed. Permanent works include bridge piers and bridge superstructure. In the case of two separated parallel structures, as per the reference concept, the new structure will be designed to align with current navigational channels. MOT will require a Letter of Understanding from the NWPD to allow a Contractor to undertake detailed bridge design. The Letter of Understanding will address the recommendations with respect to the navigation and operational requirements on the Fraser River, which are summarized below:

Primary Navigational Channel

- The Primary navigational channel must provide a vertical clearance of 42 m above high water at 2.5 m GSC, and a horizontal channel clearance of 211 m, consisting of a 201 m navigational channel and a safety zone as requested by the Fraser Port Authority.

Secondary Navigational Passage

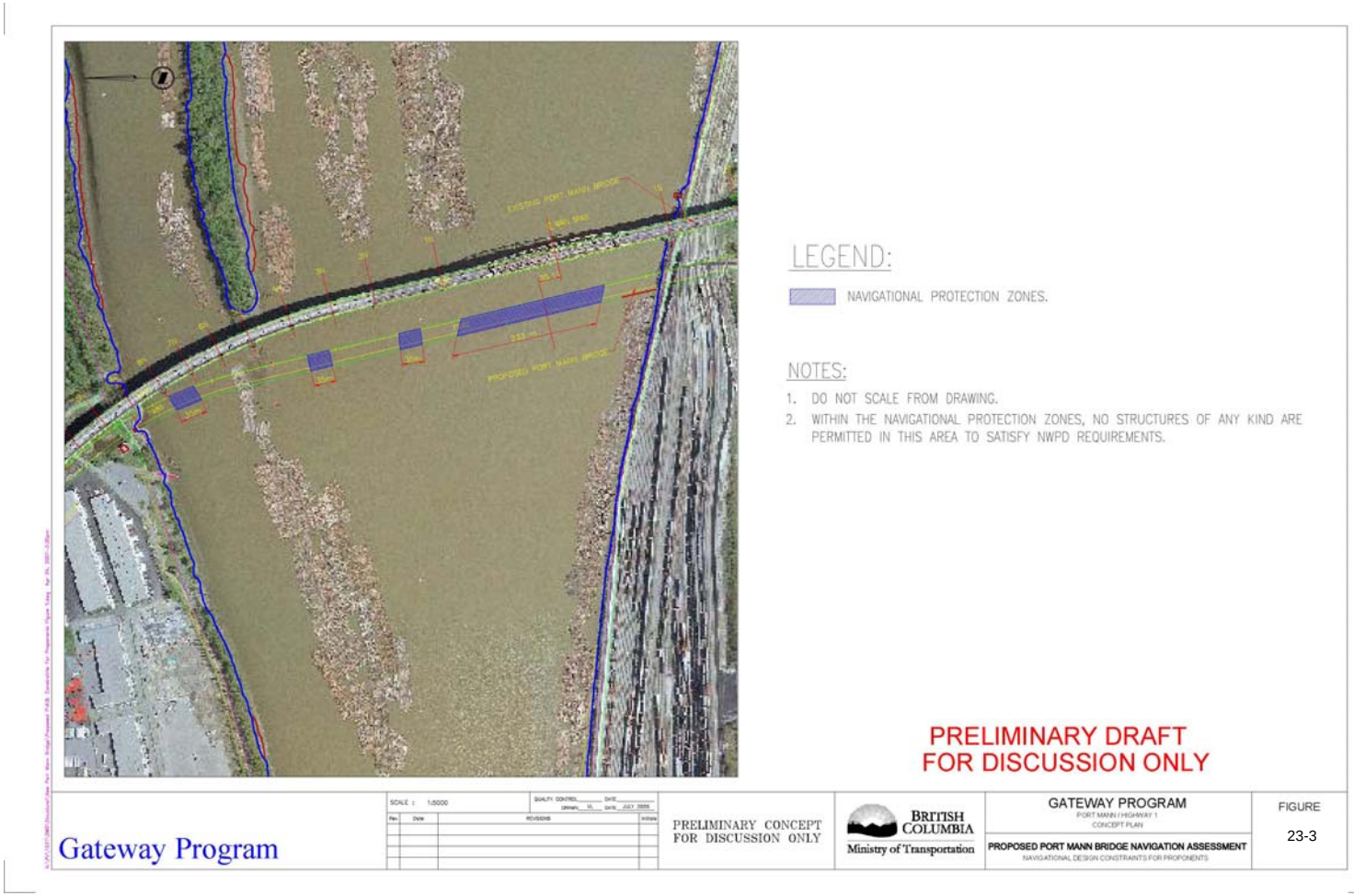
- The secondary navigational passage is to be aligned with the existing bridge piers 7N and 8N and must provide a vertical clearance of 25 m GSC and a horizontal clearance of 35 m.

Working Passages

- Two working channels are required, they will have a minimum horizontal clearance of 35 m, and will be located in alignment with the existing piers: Piers 1N and 2N; and Piers 3N and 4N (**Appendix 23A**).

The proposed Navigational Protection Zones are illustrated in **Figure 23-3**.

Figure 23-3 Elevation Drawing of Brunette River Bridge Widening



23.4.2 Conditions of Approval

The Letter of Understanding (**Appendix 23B**) requires that the Contractor be responsible for "Conditions of Approval." These conditions include the requirement that the Contractor provide technical information to the NWPD that confirm that the final bridge design will not impact navigation. Additional technical studies include, but are not limited to, the following items:

- Pre/post and during construction equipment staging areas;
- Construction timing and methodology;
- Pre/post construction hydraulic assessment study information for final design pier placement, will address potential for scour and deposition of material from the pier locations to 500 m up and downstream; and
- Development of protocols for navigation safety communications in consultation with NWPD, commercial and recreational marine stakeholders, the Katzie First Nation and Marine Communication and Traffic Services of the Canadian Coast Guard.

The final design for the bridge will also take into account the lighting and marking requirements of the NWPA (**Appendix 23A**).

23.4.3 Marine Communication Strategy

The Contractor will be required to satisfy the requirements of the Letter of Understanding, which stipulates that a Marine Communications Strategy has been prepared and approved by the NWPD (**Appendix 23A**). The Marine Communications Strategy addresses the communications and consultation activities that will be undertaken to address navigation and marine operations during bridge construction. The Marine Communications Strategy consists of a Marine Communications Plan and a Marine Construction Plan.

23.4.3.1 Marine Communication Plan

The Marine Communication Plan details the local marine communications and emergency preparedness procedures. It includes:

- An outline of marine stakeholder consultation and media related activities to be undertaken by the proponent that enables the marine community to be aware of construction activities impacting navigation;
- The establishment of an emergency telephone number for the marine community to contact during bridge construction;
- Issuance of public notices, at least once a week, over the VHF channel, and posting of notices at public marinas and with marine operators regarding the construction schedule for a two week advance period; and
- Updating NWPD project officers of weekly activities, construction schedules and delays (**Appendix 23A**).

23.4.3.2 Marine Construction Plan

The Marine Construction Plan will be prepared by the proponent to ensure that all navigational traffic utilizing the main navigational channel, the secondary navigational passage and the working passages are made aware of any construction activities that would be occurring in those areas during the construction period of the Project. The Marine Construction Plan will provide the following information regarding construction activities within the Navigation Protection Zones:

- Construction phasing;
- Construction phasing within the Primary Navigation Channel, secondary Navigation Passage and Working Passages;
- Construction phasing over other areas within the river;
- Works scheduling; and
- Staging areas for construction activities (**Appendix 23A**).

The Marine Construction Plan will indicate time periods when a navigational channel or passage needs to be temporarily closed for construction related purposes. The construction plan must consider all works and vessels to be used during the construction period, such as: barges, pile driving equipment, vessels, and cables, wire lines, anchors and tie up areas (**Appendix 23A**).

The Marine Communications Plan and the Marine Construction Plan must be approved in writing by Transport Canada and will form part of the NWPA approval for bridge construction activities.

23.4.4 Waterlot Leaseholder Compensation

MOT will negotiate a compensation arrangement with leaseholders with respect to the surrender and assumption of water lot leases needed for the Project right-of-way, based on the reference concept for the new Port Mann Bridge.

23.4.5 Impact Avoidance and Mitigation for Brunette River Bridge Widening

The Contractor will develop and implement a Communications Plan to ensure that recreational users of the water way are informed of temporary closures due to Project construction.

23.5 Navigation (Air)

The new Port Mann Bridge will be designed by the Contractor and could be a style such that its vertical height exceeds that of the existing Port Mann Bridge (i.e., a cable-stayed bridge), and thus may need to be marked for aviation safety, pursuant to the requirements of the *Canadian Aviation Regulations*.

Transport Canada has the authority to limit the height of structures within the vicinity of an airport, where airport zoning regulations have been enacted, under the *Aeronautics Act*. An airport zone consists of the "outer surface", the "approach surface" and the "transitional surface". The *Aeronautics Act* defines the outer surface as the surface located above and in the immediate vicinity of the airport, the approach surface as an imaginary inclined plane extending upward and outward from each end of the runways and the transitional surface as an imaginary inclined plan extending upward and outward from the lateral limits of a landing strip, and its approach surfaces.

Pitt Meadows Airport is the closest airport to the proposed new Port Mann Bridge. This airport is located approximately 6 km east of the bridge at is nearest point. The *Pitt Meadows Airport Zoning Regulations* define the outer surface, approach surface and transitional surface zones for this airport. While the proposed new Port Mann Bridge appears to be outside of the Pitt Meadows Airport zones, this will be confirmed during the detailed design phase of the Project.

Transport Canada issues marking guidelines, the Standards Obstructions Markings Manual, for structures that are considered obstructions under the *Canadian Aviation Regulations.* While compliance with obstruction markings provisions of the *Canadian Aviation Regulations* is generally voluntary, a proponent may be required to mark a structure pursuant to the requirements of the *Aeronautics Act* and the *Canadian Aviation Regulations*, in situations where…

> "… it is likely that a building, structure or object, including an object of natural growth, is hazardous to aviation safety because of its height and location, the Minister may, by order, direct the owner, or other person in control of the building, structure or hazard, to mark it and light it in accordance with the standards specified in the Standards Obstruction Markings Manual. " (*Canadian Aviation Regulations*, 2006-2)*.*

Pursuant to Standard 621.19 of the *Canadian Aviation Regulations,* any obstruction greater that 90 m above ground level and located within two nautical miles of a Visual Flight Rules (VFR) navigation route must be marked and/or lit. The *Canadian Aviation Regulations* defines a VFR route as… "…but not limited to: a valley, a railroad, a transmission line, a pipeline, a river or a highway" (*Canadian Aviation Regulations*, 2006-2). As the Fraser River fits the criteria of a VFR route, the new Port Mann Bridge may require marking and/or lighting. The PMH1 project will work with Transport Canada to ensure that all regulatory requirements with respect to aviation safety are addressed.

23.6 Summary and Conclusions

The PMH1 project will cross two navigable waterways, the Brunette River and the Fraser River. The public's right to navigate these waterways is protected by the federal *Navigable Waters Protection Act*. While the Brunette River at the location of the Highway 1 crossing is likely navigable only by shallow draught vessels only (such as canoes and rubber rafts) the Fraser River in the vicinity of the Port Mann Bridge is heavily used by a variety of recreational and commercial marine vessels. In addition, waterlots in the vicinity of the proposed new Port Mann crossing are currently being used for log booming and other commercial purposes. Finally, there are commercial and aboriginal salmon fisheries in the vicinity of the proposed new Port Mann crossing.

Potential impacts of the Project on marine users include:

- Vertical and horizontal clearance limitations (which affect the size of marine vessels that can safely transit under a structure);
- Temporary impedance of passage through or use of (i.e. fishing) a section of waterway during construction; and
- Right-of-way requirements through sections of waterway that currently contain commercial waterlots.

Overall, with the proposed mitigation in place, it is anticipated that the PMH1 project will have minimal navigational impacts during the construction phase on marine users of either the Brunette or Fraser rivers. The PMH1 project has undertaken extensive consultations with stakeholders to ensure that the potential impacts of the Project on marine users of the Fraser River are either avoided or mitigated. In compliance with the requirements of Transport Canada's Navigable Waters Protection Division, proposed measures will include the specification of vertical and horizontal navigational clearances for the Brunette and the Fraser rivers, the development of a Marine Communication Strategy to minimize the impact of construction activities on Fraser River marine users, and compensation arrangements with respect to leaseholders of affected waterlots.

The PMH1 project has also considered the potential impact of a new Fraser River crossing upon air navigation. The PMH1 project anticipates that a new crossing may require marking and lighting in compliance with the *Canadian Aviation Regulations*. The Project will work with Transport Canada to ensure that all regulatory requirements with respect to aviation safety are addressed.

23.7 References

Aeronautics Act. (n.d.) Pitt Meadows Airport Zoning Regulations. C.R.C., Vol. 1, c. 102. Accessed March 4, 2007 from: http://www.tc.gc.ca/acts-regulations/GENERAL/A/aa/regulations/100/aa100/aa100.htm

Canadian Aviation Regulations. 2006-2. Standard 621.19: Standards Obstruction Marking.

Fraser River Port Authority. (n.d.) Accessed December 28, 2006 from: http://www.fraserportauthority.com/news/index.html

Fraser River Estuary Management Program (FREMP). 2006. Sediment Budget and Dredging Activities: Annual Report April 1, 2005 – March 31, 2006.

Fraser River Estuary Management Program (FREMP). 2005. Sediment Budget and Dredging Activities: Annual Report April 1, 2004 – March 31, 2005.

Fraser River Estuary Management Program (FREMP). 2004. Sediment Budget and Dredging Activities: Annual Report April 1, 2003 – March 31, 2004.

Fraser River Estuary Management Program (FREMP). 2003. Sediment Budget and Dredging Activities: Annual Report April 1, 2002 – March 31, 2003.

Fraser River Estuary Management Program (FREMP). 2002. Sediment Budget and Dredging Activities: Annual Report April 1, 2001 – March 31, 2002.

Fraser River Estuary Management Program (FREMP). 2001. Sediment Budget and Dredging Activities: Annual Report April 1, 2000 – March 31, 2001.

Fraser River Estuary Management Program (FREMP). 2001. Sediment Budget and Dredging Activities: Annual Report April 1, 1999 – March 31, 2000.

Fraser River Estuary Management Program (FREMP). 2001. Sediment Budget and Dredging Activities: Annual Report April 1, 1998 – March 31, 1999.

Meyers, Yvette. 1999. The Navigable Waters Protection Act: a Review of its Application and Jurisdictional Scope. Dalhousie University, Department of Marine Affairs.

Hemmera Envirochem Inc. August 2005. CEAA Screening: North Fraser Perimeter Road, Pitt River Bridge and Mary Hill Interchange. For: Gateway Program, Ministry of Transportation.

TyPlan Consulting Ltd. and Westmar Engineering Consultants. August 2004. Final Draft for Port Mann Bridge Vertical and Horizontal Navigational Clearance Assessment. Report to Delcan Corporation.

TyPlan Planning and Management. March 2007. Navigation Assessment of the Port Mann/Highway 1. Report to Gateway Program.