THE ECONOMIC IMPORTANCE OF THE LOWER FRASER RIVER

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Prepared by the Richmond Chamber of Commerce with the assistance of D.E. Park & Associates Ltd. and with the support of:

Richmond Chamber of Commerce	Burnaby Board of Trade	Maple Ridge & Pitt Meadows Chamber of Commerce
Surrey Board of Trade	Greater Langley Chamber of Commerce	Chilliwack Chamber of Commerce
The Vancouver Board of Trade	Delta Chamber of Commerce	Hope & District Chamber of Commerce
Tri-Cities Chamber of Commerce	Mission Regional Chamber of Commerce	Province of British Columbia, Ministry of Transportation and Infrastructure
Abbotsford Chamber of Commerce	New Westminster Chamber of Commerce	

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ACKNOWLEDGEMENTS

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- Delta Chamber of Commerce
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- Province of British Columbia, Ministry of Transportation and Infrastructure

Special thanks go to the report's principal researcher and co-author, Dave Park, of D.E. Park & Associates Ltd., and to co-author Matt Pitcairn, Manager of Policy and Communications at the Richmond Chamber of Commerce, who provided extensive support in data gathering, stakeholder engagement, document preparation and drafting report sections. The experience and detailed knowledge of Allen Domaas, retired CEO of the Vancouver Fraser Port Authority, has also added significantly to this report.

A number of organizations and knowledgeable individuals were consulted and generously provided input and perspective to this work. While their support was both invaluable and appreciated, this report does not necessarily speak for them.

ECONOMIC IMPORTANCE OF THE LOWER FRASER RIVER IN BRIEF

The Lower Fraser River (LFR) is a vitally important resource for the Lower Mainland, British Columbia, and Canada as a whole. In addition to port activity, the LFR supports a myriad of other economic activities essential to the region and beyond. Given its strategic assets, the river is poised to become an even more significant economic driver in the future.

PRIMARY ECONOMIC INDICATORS

- The port function of the LFR rivals Canadian traffic on the St. Lawrence Seaway, both in terms of tonnages and jobs
- Port Metro Vancouver is the largest port in Canada and largest port by export tonnage in North America
- The Lower Mainland has over 50% of B.C.'s population and $50 billion dollars' worth of development in the floodplain of the LRF
- Soil in Fraser Valley supports some of the most fertile agricultural land in Canada and annually generates more than 62% of the province's gross farm receipts ($1.6 billion)
- 9 of 10 Federal Small Craft Harbours (SCH) in the region are located along the LFR. Steveston hosts the largest SCH in Canada, a key facility for the commercial fishing industry on the B.C. coast

THREATS TO FUTURE SUSTAINABILTY

- 300,000 people live in the floodplain of the LFR. By 2040, an additional one million people will be living in the Lower Mainland region, putting additional pressure on all infrastructure upgrades
- Sea levels at the mouth of the river are expected to rise in excess of one metre by end of this century:
  - Preliminary estimates place cost of diking upgrades by 2100 at nearly $9 billion for the tidal areas of the river and for adjacent coastal reaches
- Storm surges, combined with high tides in El Nino years, could overtop existing flood protection infrastructure, even without additional sea level rise
- In some years, the spring freshet has come close to overtopping the existing dikes along the freshwater part of the river in the Fraser Valley
- Damage from a major dike failure along the Lower Fraser could cost tens of billions of dollars, with very serious impacts on the economy of this region, B.C. and all of Canada
- Each year during the spring freshet, approximately 32 million m^3 of sediment is transported by the Fraser River, with roughly 10% of this material settling in the lower reaches of the river. There is a strong need for increased dredging of these parts of the river
- Need for preservation of industrial land is clear: Between 1980 - 2010, the Cities of Vancouver, Richmond, Burnaby & Surrey altogether lost 3000 hectares of industrial land

RECOMMENDATIONS

The Fraser River is not an arbitrary subsection of geography that any one agency can deal with independently. All levels of government and other key stakeholders must come together in such a way that they are committed to, and tasked with, managing the Lower Fraser River as an interconnected system, in which the interests of navigation, public safety, and the natural environment are managed holistically as one system.

This report calls on the federal, provincial, regional and municipal governments to immediately:

- **Take a lead role in bringing together the relevant stakeholders; and**
- **Appropriately fund, empower and task the group with putting in place a collaborative regional strategy, addressing long-term secure funding and management requirements for the entire Lower Fraser River and adjacent lands.**

ECONOMIC IMPORTANCE OF THE LOWER FRASER RIVER

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EXECUTIVE SUMMARY

The Lower Fraser River is a vitally important resource for the Greater Vancouver region, the province of British Columbia, and the entire country. In addition to port activity on the Lower Fraser River that rivals Canadian traffic on the St. Lawrence Seaway, the Lower Fraser supports a myriad of other economic activities essential to the region and beyond. Given its strategic assets, the river is poised to become an even more significant economic driver in the future.

However, the Lower Fraser faces a number of key challenges. If these are not dealt with effectively and promptly, they could jeopardize future growth and result in great damage and huge financial losses in the nearer term.

This report outlines a detailed profile of the importance of the Lower Fraser River. It also provides a clear delineation of the challenges facing the river, and concludes with a call to action to ensure future sustainability in the face of these challenges.

The Lower Fraser River is an Economic Powerhouse

The Lower Fraser River is crucially important to the Fraser Valley and Metropolitan Vancouver. It provides for a wide variety of uses, including as an economic waterway for port activity, recreational destination, productive commercial and sport fishing area, agricultural delta and marine transportation corridor. The Lower Fraser is a key factor in supporting the 2.6 million people of the Lower Mainland.

Port Activity

The Vancouver Fraser Port Authority (doing business as Port Metro Vancouver) is the largest port by export tonnage in North America and is the country's principal ocean gateway to the Pacific. Port infrastructure on the Lower Fraser River estuary is an integral part of Port Metro Vancouver, accounting for a significant portion of current port tonnages and jobs. Given that the majority of remaining developable port lands for all of Port Metro Vancouver are on the river, the Lower Fraser is destined to play an increasingly important role in overall port activity and future growth.

Viewed another way, if the Lower Fraser River existed as a stand-alone port, it would still be an important port for Canada. Prior to the amalgamation of the Lower Mainland ports in 2008, the Fraser River Port Authority was the third largest port in Canada based on domestic, export, and import tonnage. The impact of the port function of the Lower Fraser is comparable in importance to the impact of Canadian traffic on the St. Lawrence Seaway, in terms of annual cargo tonnages, employment and particularly annual wages.

		Lower Fraser River*	St. Lawrence**
Cargo	(Million Tonnes)	25.7	36.5
Jobs	(FTE's)	52,900	63,000
Wages	($ Billions)	$2.62	$2.88

* The Lower Fraser River impact shown in the table is for 2008; the St Lawrence Seaway impact is for 2010

** St. Lawrence data covers Canadian cargo carried on the Montreal-Lake Ontario section of the seaway and the Welland Canal between Lake Ontario and Lake Erie

Small Craft Harbours and Recreational Boating

The water and the shores of the Lower Fraser provide existing and potential recreational opportunities for the millions of people who live in the Lower Mainland of B.C. The river provides the basis for a range of recreational boating, and at its mouth, Steveston Harbour is the key hub of commercial fishing for the west coast of Canada.

There are nine federal government small craft harbours between Mission and the mouth of the river. In addition to supporting the commercial fishing industry, the Small Craft Harbours program enables a variety of fishing, aquaculture, recreation, tourism, shipping and other marine activities to occur.[1]

Fisheries

Fisheries are a key part of the economic importance of the Lower Fraser River. Both commercial fisheries and sport fishing have long been significant contributors to economic activity along the river. The historical fishing activity of First Nations has continued, and been joined by the fishing activities of many others using the rich resources of the river.

The Fraser River and its tributaries offer all five species of Pacific Salmon on seven of the most productive rivers in the province.[2] Historically, sockeye salmon in particular have been a vital part of fisheries in the river. While sockeye tend to attract the greatest level of attention, other salmon species fished for in the Lower Fraser River and its immediate tributaries include pink, coho, Chinook and chum. Steelhead and trout are also included in the Lower Fraser River fishery.

For British Columbia as a whole, aside from infrequent years when the sockeye catch is exceptionally large, the total landed value of the commercial catch of other salmon species and the total wholesale value of those species tends to be considerably larger than the corresponding values for sockeye salmon.

White sturgeon attracts significant sport fishing in the Lower Fraser River. The largest freshwater fish species in Canada, it can exceed six metres in length and weigh up to 635 kilograms.

Across the province, the total value of the contribution to gross domestic product from all fish processing every year is much higher than the contribution from all commercial (capture) fisheries. Typically, fish processing contributes twice or more the impact of fish capture activity.

[1] GSGislason & Associates Ltd., *Regional Benefits of Small Craft Harbours: Greater Vancouver Region,* prepared for Small Craft Harbours, Fisheries and Oceans Canada, Vancouver, B.C., March 2006. The other information in this section regarding small craft harbours is from the same source.

[2] Mission and District Chamber of Commerce, http://www.missionchamber.bc.ca/pages/Attractions/ Accessed August 30, 2013.

Agriculture

The soils within the Fraser Valley are some of the most fertile in Canada,[3] and "the region has one of the longest frost-free periods in Canada,[4] making the area highly favourable for agriculture. Between 1991 and 2006, there was a 22% increase in the amount of land being farmed in the Fraser Valley Regional District.[5] With respect to flexibility and diversity of markets, it is a tremendous advantage to producers in this region to be in close proximity to large urban markets and to the (U.S.) border.[6]

The valley and delta of the Fraser River support agricultural production that totalled $1.6 billion in 2011, representing a majority of the agricultural output of British Columbia. There is significant potential for increased agricultural output in the area, depending upon the effects of climate change and the availability of water for irrigation. However, there are threats to agriculture from flooding and salt water intrusion that could seriously affect the agricultural capability of the region.

Other River-Dependent Activities

The forest products industry is an important factor in economic activity along the Lower Fraser River. While there have been closures of some major timber processing facilities along the river, many remain and make a substantial contribution to economic activity. Satellite photography mapping of the Lower Fraser River shows that there are, or were at the time of mapping, 47 forest industry facilities along this part of the river. These include a significant number of sawmills, as well as shake and shingle mills, a veneer/plywood mill, a pulp mill, a combined pulp and paper mill, wood chip mills, wood chip/sawdust handling facilities, barge loading and unloading facilities, lumber storage, log sorting/log storage yards, and pole yards.

Aggregate is the most abundant natural resource on the planet. Its materials include sand, gravel and crushed stone.[7] Aggregates are an important cargo shipped into the Lower Fraser River. They are essential to the manufacture of concrete and to road construction, and hence to much of the construction in Metro Vancouver and the Fraser Valley. In 2011 and 2012, the inbound waterborne shipments of dry bulk minerals (presumably largely aggregate) to the tidal areas of the Lower Fraser River were 4.1 to 4.3 million tonnes annually.

Recreational boating is an important part of recreational activity on the Lower Fraser River, including for sport fishing, travel to recreation properties and other leisure uses. Pleasure craft moored along the river also may be used for recreational purposes on the Strait of Georgia or elsewhere. In total on the

[3] Crawford E., MacNair E., *Fraser Valley & Metro Vancouver Snapshot Report*, B.C. Agriculture Climate Change Adaptation Risk + Opportunity Assessment Report, March 2012, the British Columbia Agriculture & Food Action Initiative. http://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf. Accessed September 27, 2013.

[4] Crawford E., MacNair E., 2012.

[5] Crawford E., MacNair E., 2012.

[6] Fraser Valley Regional District. *Agricultural Economy in the Fraser Valley Regional District*. September 2011. http://www.fvrd.bc.ca/InsidetheFVRD/RegionalPlanning/Documents/Regional%20Snapshot%20Series/Agriculture%20Snapshot.pdf, cited in Crawford E., MacNair E., 2012.

[7] B.C. Ministry of Energy and Mines and Responsible for Core Review, *Aggregate Operations in British Columbia*. http://www.empr.gov.bc.ca/Mining/Aggregate/Pages/default.aspx. Accessed January 19, 2014.

Lower Fraser River and its principal tributaries, there are 36 marinas or clusters of docks for recreational boats. Some of these also cater to commercial fishing vessels, as discussed later in this report.

The Lower Fraser River is the basis for a great deal of outdoor recreation, including the use of parks, trails, golf courses and other land-based and water-oriented outdoor activities. Parks flank the river in numerous locations. Trails, often built on top of the very extensive diking system, parallel much of the course of the river. Through the Experience the Fraser (ETF) initiative, the Province, Metro Vancouver, the Fraser Valley Regional District and Trails BC will partner with communities and First Nations to establish trail routes and use the natural heritage and infrastructure to develop integrated land and water-based recreation and cultural heritage opportunities along the Lower Fraser River to facilitate tourism and active, healthy living.[8]

The float plane facility on the Middle Arm of the river at Vancouver International Airport is a vital feature that enables the linkage of water-based air services between Greater Vancouver and communities relying on float plane services. In 2013, there were 28,373 float plane take offs and landings on the middle arm of the Fraser River, moving 104,819 passengers[9] and supporting approximately 300 direct jobs.[10]

The historic village of Steveston is a living example of how the Fraser River is an integrated, interconnected system. Once the centre of the largest aggregation of cannery operations in the British Empire, today Steveston is still a key component in the Pacific west coast fishing industry, and home to the largest small craft fishing harbour in Canada. Steveston exists and thrives because of the resources and opportunities provided by the Fraser River, but the community's livelihood, centred on fishing, agriculture, and tourism, will be at risk if the surrounding environment is not properly maintained via dredging and diking upgrades. This is an issue shared by all communities bordering the river.

The Lower Fraser River Faces Significant Challenges

There are a number of significant issues that have put the Lower Fraser River – and hence, those activities that depend upon it – at serious risk. These challenges include:

- Flood prevention;
- Coping with sea level rises;
- Maintaining navigation and deepening the shipping channel;
- Renewing overland transportation links;
- Protecting and irrigating agricultural land
- Preserving industrial lands; and
- Coordinating the multiple stakeholders and stewards of the river.

[8] *$2.5 Million for Experience the Fraser Project,* Ministry of Tourism, Culture and the Arts.
[9] Vancouver Airport Authority Communications Department, February 2014.
[10] Brown, M. Senior Planner, Strategic Planning, Vancouver Airport Authority. Personal communication, May 2013.

These issues are coincident and interrelated. In order to ensure the future health and prosperity of the Fraser River and the Lower Mainland region, they must be addressed and managed holistically.

Vulnerability to Flooding

There are 300,000 people and $50 billion worth of development on the flood plain of the Lower Fraser River. These are vulnerable to the increasingly frequent extreme weather events that are projected to impact the river.

In 2007, the river came perilously close to overtopping the dikes in the Fraser Valley during the spring freshet. A recent authoritative study predicts that "….so-called 100-year flood events will occur in roughly four- to ten-year intervals...."[11] The flooding in 2013 in Calgary and Toronto, as well as research concerning the increased incidence of extreme weather as a result of climate change, has highlighted the need to act urgently to enhance flood protection along the Lower Fraser.

Flood Prevention

The river poses a substantial threat to this key economic region. Historically, there have been devastating floods from the spring freshet of the river. In addition, with rising sea levels, there is a growing threat of winter storm surges that could overtop the extensive diking system along the tidal part of the river and adjacent coastal reaches. There is an urgent need to revitalize the dikes and increase their height to protect the tidal areas of the river in Greater Vancouver and the upstream agricultural land, First Nations and urban communities vulnerable to the annual spring flood threat.

Coping with sea level rise

One of the primary challenges facing the Lower Fraser River today is a lack of funding for comprehensive flood and navigation management. According to recent studies, sea levels at the mouth of the river could rise by in excess of one metre by the end of this century. In order to protect the businesses and livelihoods of those who depend on the river, as well as residents and public facilities, an ongoing, coordinated program of investment in improved diking and other protective features is imperative. Preliminary estimates place the cost of this program during this century at nearly $9 billion for the tidal areas of the river and for adjacent coastal reaches. This cost estimate is contingent on dredging continuing, with removal volumes roughly equalling disposition.[12]

Failing to deal expeditiously with this problem would leave a large part of the Lower Mainland at risk of enormous damage. In addition to the threat from sea level rise and potential earthquake damage,

[11] *PICS Climate News Scan*, July 24, 2012. The *PICS News Scan* is produced by ISIS at the Sauder School of Business, University of British Columbia, and PICS, the Pacific Institute for Climate Solutions hosted and led by the University of Victoria. http://isistalks.sauder.ubc.ca/content/pics-climate-news-scan-24-july-2012. Accessed August 12, 2013.

[12] Northwest Hydraulic Consultants in letter dated March 30, 2012 to Ministry of Forests, Lands and Natural Resources Operations. This letter is an essential part of: *Cost of adaptation – Sea Dikes & Alternative Strategies,* prepared by Delcan and subconsultants for the British Columbia Ministry of Forests, Lands and Natural Resources Operations, with the support of Natural Resources Canada, October 2012.

currently, storm surge combined with high tides in El Niño years could overtop existing flood protection infrastructure, even without additional sea level rise. [13]

Measures Needed to Prevent Extreme Economic Losses

With the growing risk of extreme weather events, it is very important that a collaborative, multi-level government effort be undertaken to renew flood protection. Dikes and other protective measures must be redesigned, taking into account the effects of major earthquakes that will inevitably strike the Lower Mainland. The damage from a major dike failure could cost tens of billions of dollars, with major impacts on the economy of this region, British Columbia and indeed, all of western Canada. The revenues of the governments of British Columbia and of Canada would suffer very seriously from disruption of the regional economy and of exports through the Pacific Coast. At the same time, there would be an urgent need for many billions of dollars in government expenditures to cover the cost of damages in the region and to assist in economic recovery.

Maintaining Navigation

The current of the Lower Fraser River annually brings with it many millions of tonnes of gravel, sand and finer sediment, particularly during the spring freshet period. Over millions of years, that material has built up the valley floor and the delta of the river. At the same time, it threatens navigation in the river, requiring extensive and expensive ongoing dredging to ensure navigable depths and the removable of deposits that clog the river channels. The annual net cost of this, after the sale of recovered sand, has consistently exceeded $3 million, excluding the cost of maintaining secondary channels. While the main shipping channel is being maintained by ongoing dredging, there is inadequate funding for maintenance of the secondary channels, resulting in serious impediments to their use.

River Crossings

The Lower Fraser River is a major barrier to land transportation. With the growth of population and commerce in the area and the aging of existing river crossings, there is a continual need for investment in new and replacement bridges and tunnels. The new Port Mann Bridge was recently opened, at a total cost, including related highway improvements, of $3.3 billion. The George Massey Tunnel is to be replaced with a new bridge at a cost that could be in the same order of magnitude. Completed in late 2013 at a cost of $1.25 billion, the South Fraser River Perimeter road connects to all five major Fraser River crossings. The Pattullo Bridge is being studied with a view to either major rebuilding or replacement. The New Westminster Rail Bridge was reaching its capacity and slated for potential replacement, although improvements in co-operation and operating efficiency by the railways involved have at least temporarily postponed the need for this.

[13] Crawford E., MacNair E., *Fraser Valley & Metro Vancouver Snapshot Report*, B.C. Agriculture Climate Change Adaptation Risk & Opportunity Assessment Report, March 2012, the British Columbia Agriculture & Food Climate Action Initiative. http://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf
Accessed September 27, 2013.

Investment in Infrastructure

Historically and at present, investment in infrastructure associated with the Lower Fraser River has been a major economic stimulus for the Lower Mainland and for the province as a whole. Construction activity linked to the river has been an important source of income for construction workers and suppliers and for designers and construction management. In turn, the indirect and induced ("multiplier") effects on the economy have provided further positive effects. As a prime example, the recently completed Port Mann Bridge and related highway construction at a total cost of over $3 billion has injected a massive economic impetus to the region. Bridge users will repay the cost of the bridge over time through the tolls that they pay, but the improvements will significantly reduce travel times along the corridor, and will improve connections within and between communities. Goods movement will be expedited, and transit service along the corridor will be facilitated. The safety of those using the corridor will also be increased.[14]

Preserving Industrial Lands

Industrial land and facilities have grown alongside the various channels of the Lower Fraser. However, there is an increasing shortage of suitable industrial lands, resulting in a significant drag on the regional economy and additional pressure on agricultural land. Over the 30-year period between 1980 and 2010, the City of Vancouver and the cities of Richmond, Burnaby and Surrey altogether lost 3,000 hectares of industrial land. The need for the preservation of industrial land is clear.

Coordinating the Multiple Stakeholders and Stewards of the River

One of the main challenges to managing the Lower Fraser River is coordinating the many government and non-government stakeholders that maintain it. At the time of writing this report, there were 15 municipal governments and 29 First Nations groups along the banks of the Lower Fraser River, and over 20 provincial and federal ministries involved in its administration.

The challenges facing the Fraser River will require long-term management and funding, with substantial financial obligations. Plans and commitments need to be made that extend well beyond the political mandate of any currently elected government. Compounding the problem is the fragmentation, which requires compromises among various jurisdictions and authorities.

Stakeholders Must Come Together to Devise and Execute a Comprehensive Long-Term Strategy to Sustain the Lower Fraser River

The Fraser River is not an arbitrary subsection of geography that any one agency can deal with independently. All levels of government and other key stakeholders must come together in such a way that they are committed to, and tasked with managing, the Lower Fraser River as an interconnected system in which the interests of the economy, the population, navigation, public safety, and the natural environment are managed holistically as one system.

[14] Port Mann/Highway 1 Improvement Project, *Benefits,* http://www.pmh1project.com/about-the-project/project-overview/Pages/Benefits.aspx Accessed January 29, 2014.

This report calls on the federal, provincial, regional and municipal governments to immediately:

- **Take a lead role in bringing together the relevant stakeholders; and**
- **Appropriately fund, empower and task the group with putting in place a collaborative regional strategy, addressing long-term secure funding and management requirements for the entire Lower Fraser River and adjacent lands.**

1. Introduction

The Lower Fraser River is an invaluable asset, not only to the region, but to British Columbia and Canada as a whole. Its importance and contribution is comparable to the impact in Eastern Canada of the Montreal-Lake Ontario section of the St. Lawrence Seaway.

The Lower Fraser is flanked by major railways, highways and energy transmission infrastructure, and is a key part of Canada's largest port, which is also the country's main gateway to the Asia Pacific. Transportation facilities along the Lower Fraser move huge shipments of goods and bulk commodities, to and from Western Canada, across the continent and around the globe.

Beyond international and domestic trade, the Lower Fraser River and its valley host a broad range of other activities, including commercial and sport fisheries, forest products facilities, a majority of British Columbia's agricultural production and eco-tourism/outdoor recreation.

However, there are challenges that must be addressed to ensure the river's vibrant and bright future. These issues are interdependent, complex and require both a current and an ongoing perspective. There is a pressing need for a collaborative, long-term action plan to ensure a sustainable future for the river and its related assets, and hence for its contribution to British Columbia and Canada.

For a number of reasons (historical, jurisdictional and political), myriad stakeholders are directly and indirectly involved in various aspects of the river's management, development, and ongoing use. Historically, this has led to increasingly narrow, piecemeal solutions to specific issues.

One of the primary challenges facing the Lower Fraser River today is the lack of a comprehensive flood and navigation management strategy. Recent studies suggest that sea levels at the mouth of the Fraser could rise in excess of one metre by the end of this century. In order to protect the agriculture, businesses, residents and public facilities directly affected by the river, ongoing dike improvements and sediment management strategies are necessary, with cost estimates of roughly ten billion dollars.

In addition to the challenges to the river itself, significant pressures also face the lands adjoining the river. These include a growing shortage of suitable industrial lands and increasing congestion on the road network, resulting in a significant drag on the economy.

The Lower Fraser River has the ability to provide a substantial competitive advantage that will continue to build not only this region, but also make a significant contribution to economic prosperity for all of British Columbia and Canada as a whole. This report has been prepared with the intent of providing a sound foundation from which a more comprehensive and broad-based strategy for the long-term sustainability and prosperity of the Lower Fraser River can be developed and implemented.

Recognition goes to those organizations that funded this endeavour:

- Richmond Chamber of Commerce
- Surrey Board of Trade

- Vancouver Board of Trade
- Tri-Cities Chamber of Commerce
- Abbotsford Chamber of Commerce
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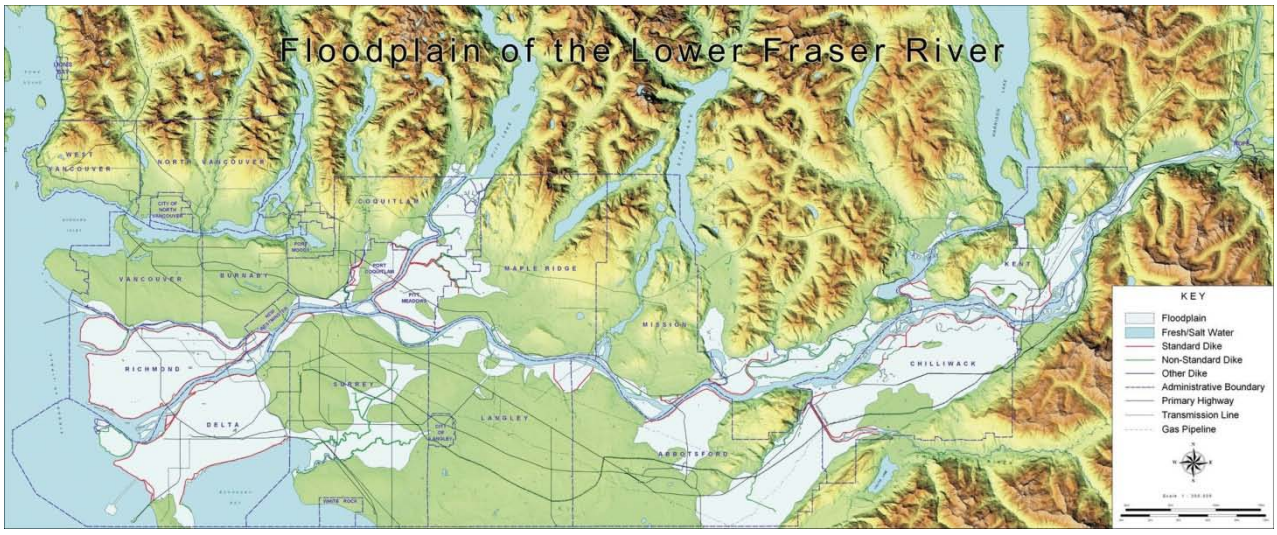
A number of organizations and knowledgeable individuals were consulted and generously provided input and perspective to this work. While their support was both invaluable and appreciated, this report does not necessarily speak for them.

1.1 Scope and Study Objective

This report is primarily focused on the Lower Fraser River and adjacent land, stretching from the mouth of the Fraser River to the beginning of the Fraser Canyon at Hope.



Map courtesy of the Fraser Basin Council

This study has three primary objectives:

- To highlight the economic significance of the Fraser River to the Metro Vancouver region, to British Columbia, and to Canada as a whole, with an impact comparable to that of the Canadian traffic on the St. Lawrence Seaway;
- To examine threats to the sustainability of the Lower Fraser River; and
- To highlight the need for a comprehensive strategy to ensure the future of the river as a key local, regional and national resource.

1.2 Approach and Method

This study was undertaken as secondary research. The approach involved gathering information from a broad range of subject matter experts and resources, and synthesizing that information into a single, comprehensive report.

The information was collected from two main sources:

- A discussion program with Chambers of Commerce in the Lower Fraser River region and with significant stakeholders such as Port Metro Vancouver, the Fraser Basin Council, the Lower Fraser River Fisheries Alliance, and the Steveston Harbour Authority (see Appendix B for a full list), and
- Relevant reports and studies conducted by, or on behalf of government authorities, Statistics Canada, the Fraser Basin Council and a wide variety of other authoritative sources as indicated in footnotes throughout the report.

1.3 Report Outline

The main sections of this report consist of four primary components, examining the significance of the Fraser River:

Section	Subject
2.	A short historical synopsis
3.	Overview of economic impact
4.	Challenges to future prosperity
5.	Recommendations for a sustainable future

2. Historical Importance of the Lower Fraser River

For millennia, the Fraser River has carved a path through British Columbia, piercing the rocky walls of the coastal mountains and forming a vital transportation artery.

The Fraser River is the longest river in British Columbia, draining more than a quarter of the province. Its headwaters are in the Rocky Mountains, and after traversing nearly 1,400 kilometres, it empties into the

Strait of Georgia. The lower part of the river flows through the Fraser Valley, and at its mouth contributes to the major urban concentration of Metropolitan Vancouver.

Prior to the arrival of European explorers, the Fraser River was crucial to the lives of many of B.C.'s Aboriginal Peoples. Its banks and tributaries were home to half of all the First Nations in the Province, and the river served as their major transportation corridor as well as a key source of food.

After the arrival of New World explorers, the Fraser River continued to play a key role in the development of what has become Western Canada. The river helped facilitate the fur trade, the gold rush, and the construction of nation-building transportation routes, linking the West Coast with the rest of Canada.

After the end of the gold rush in the late 1800s, European settlement in the region continued, as newcomers began to establish their roots on the banks of the Lower Fraser River. Like the First Nations people before them, early settlers recognized the tremendous gift of the river and harvested the resources of the region using the river itself for its rich fishery, for transporting other resources and as a support for agriculture and community life.[15]

Unfortunately, the Fraser River was also a natural divider between the north and south sides of the Fraser Valley. As transportation infrastructure was built, the purpose of much of it was to cross the Fraser River, rather than use it as a waterway.

Over time, transportation networks, including roads, railways, ferries and bridges were built across the Fraser River, fuelled by, and in turn accelerating, population growth. The fertile land offered by the river became increasingly cultivated and today enables concentrated farming output, accounting for a majority of the value of British Columbia's farm production.

Today, the tidal reaches of the Fraser River are home to a major metropolitan area and are a vital part of the port and shipping infrastructure of the province and of Canada. The Lower Mainland has over 50 per cent of British Columbia's population and has 50 billion dollars' worth of development in the floodplain.[16]

Despite the advancement of technology, people living on the shores of the Fraser River today face the same challenges as the early settlers. The river has a history of major floods, and the area is dependent on the integrity of 600 km of diking, 400 flood boxes, and 100 pump stations to keep homes, businesses and public facilities above water.[17]

The Fraser River requires two different flood prevention regimes. In the upper reaches, from Hope to Mission, river dikes hold back the strong surges of spring freshet. In the lower reaches, around Delta

[15] http://www.fraserbasin.bc.ca/_Library/Water/report_chr_fraser_river_2010.pdf pg. 10
[16] British Columbia Ministry of Forests, Lands and Natural Resource Operations.
[17] British Columbia Ministry of Forests, Lands and Natural Resource Operations.

and Richmond, “sea dikes” are needed to hold back the storm surges and increases in tidal height due to global climate changes. In the reaches between these areas are a combination of “river” and “sea” dikes to contain the combination of freshets and storm surges.[18]

Over the last century, the function of the Fraser River has evolved to the point where it is now an integral part of the most significant economic hub in Western Canada. In terms of tonnage, the river’s port facilities are a significant part of one of the largest ports on the west coast of North America. This gateway to Canada and the Pacific has a serious need for attention and funding with respect to flood protection and navigation management. Each of these areas is explored more fully in the following chapters of this report.

3. The Fraser River Today: Economic Impact

What the St. Lawrence Seaway is to Eastern Canada, the Lower Fraser River is to Western Canada. The regional and national significance of the Lower Fraser River is substantial.

While the leading economic impact of the Lower Fraser River relates to its use as a port, the river also supports a number of other economic activities, including small craft harbours, fishing and agriculture. Each major economic activity is profiled in the following sections of this report.

3.1 Port and Shipping Activities

Port and shipping facilities and related activities represent a vital part of the economic activity of the Lower Fraser River. This infrastructure forms a key part of Port Metro Vancouver, which is the largest port by tonnage in Canada[19] and the country’s principal ocean gateway to and from the Pacific.

[18] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[19] American Association of Port Authorities: Port Industry Statistics. *World Port Rankings – 2011.* http://aapa.files.cms-plus.com/PDFs/WORLD%20PORT%20RANKINGS%202011.pdf Accessed January 17, 2014.

Map of Port jurisdiction courtesy of Port Metro Vancouver

3.1.1 Lower Fraser River Ports Prior to Port Amalgamation

A report prepared just prior to the 2008 amalgamation of the two Fraser River ports and the major ocean port of Vancouver, to form Port Metro Vancouver, indicated that the Fraser River ports accounted for 22,000 direct jobs in 2005.[20] This was over 40 per cent of all the jobs in the port facilities and activities combined in the enlarged port, and represented about $1 billion in annual wages and a direct GDP impact of approximately $1.8 billion.

Prior to port amalgamation, each of the ports of the Lower Mainland concentrated on unique aspects of port activity. The Burrard Inlet port specialized in containers and bulk/break bulk product exports and imports. It provided facilities for large passenger ships. The Burrard administration focused on port development in support of national economic growth, and serving particular industries.[21]

The Fraser River ports focused on development of the river as a fully functional harbour. This entailed working toward an adequate land base for marine terminals, water-dependent industry, and back-up

[20] Letter dated February 7, 2007, from Port Amalgamation Transition Committee, addressed to Mayor and Council, Corporation of Delta.

[21] The information in this and the following three paragraphs was provided by Allen Domaas, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

lands for ancillary services (such as warehousing, manufacturing and distribution). In general, this could be referred to as regional economic development, with spin-offs to national economic growth.[22]

These two orientations derived from the fact that each port began life as a "harbour" administration. However, during the Great Depression in the 1930s, the Burrard port administration required financial support from the federal government, which then took administrative control and direction in support of national objectives and meeting the port needs of specific industries. The Fraser River administrators continued to support a regional economic focus.

Following the introduction of the Canada Marine Act, and the amalgamation of the Lower Mainland ports in 2008, the strategic focus of the port is now primarily on terminal activity. This entails identifying, acquiring, and preparing terminal sites; working to ensure sufficient infrastructure exists to smooth the flow of goods to and from the terminal, with a focus on national economic development. It also involves taking account of local concerns, and balancing these against the broader needs of the regional, provincial and national economies.

3.1.2 Cargo

Port Metro Vancouver is by far the largest port in Canada in terms of the amount of cargo handled, is the fourth busiest port by tonnage in North America,[23] and by export tonnage is the largest port in North America. In 2012, the Lower Fraser River accounted for nearly one-quarter of the total cargo tonnage handled by Port Metro Vancouver.[24]

Before the economic recession that started in 2008, the amount of cargo handled by the Lower Fraser River ports had reached a peak annual level of 19.4 million tonnes.[25] After a significant decline resulting from the recession, cargo shipments through the river ports have grown substantially, reaching 27.5 million tonnes in 2012.[26] That is 42 per cent higher than the pre-recession peak.[27]

3.1.3 Jobs

An economic analysis carried out by InterVISTAS Consulting Group has shown that the direct economic impact of Port Metro Vancouver upon all locations in Canada in 2012 included 45,200 jobs.[28] The direct, indirect and induced economic impact of the Lower Fraser River ports, including employment, is indicated in the section below dealing with their overall economic impact.

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[22] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, April 2014.

[23] Statistics Canada, *Shipping in Canada – 2007,* Catalogue no. 54-205-X. http://www.statcan.gc.ca/pub/54-205-x/54-205-x2007000-eng.pdf.

[24] Special tabulation, Port Metro Vancouver.

[25] Statistics Canada, *Shipping in Canada,* Catalogue no. 54-205-X. Various years.

[26] Special tabulation, Port Metro Vancouver.

[27] These figures may exclude tonnage carried or towed by vessels of less than 5 gross registered tonnes.

[28] *2012 Port Metro Vancouver Economic Impact Study, Final Report,* prepared for Port Metro Vancouver by InterVISTAS Consulting Group,, May 31, 2013.

The jobs supported directly by Port Metro Vancouver are high-paying positions, with the average annual compensation per direct person year across all industries directly related to the Port totaling nearly $67,000. This is approximately 53 per cent greater than the average wage in Canada of $44,000 in November 2012.[29]

Immediately prior to the amalgamation that created Port Metro Vancouver, the wages earned in jobs at the Fraser River ports were only slightly less than those at the then-Port of Vancouver. Based on current information, it appears that this norm continues across Port Metro Vancouver.[30]

3.1.4 Overall Economic Impact of Lower Fraser River Ports and Shipping

Preliminary analysis carried out during the current study indicates that the impact of port and shipping facilities and related activities for the Lower Fraser River in 2012 was approximately 41,500 jobs, $2.5 billion in wages, and $4 billion in GDP. This is the impact on all locations in Canada, and includes the indirect and induced (multiplier) effects. For British Columbia alone, the corresponding impacts of the Fraser River ports in 2012 incorporated some 32,000 jobs, $2 billion in wages, and $3 billion in GDP.

3.1.5 Comparison to St. Lawrence Seaway

The tonnage of cargo handled by the Fraser River ports approaches that of Canadian cargo handled by the St. Lawrence Seaway between Montreal and Lake Ontario.[31] [Note: This does not include the U.S. part of seaway traffic nor Canadian traffic destined for or originating in the upper Great Lakes.] In 2011, Canadian cargo carried on the Montreal-Lake Ontario section of the seaway totalled 28.7 million tonnes,[32] in comparison with the 26.9 million tonnes of cargo handled in the Fraser River section of Port Metro Vancouver.[33]

If the Welland Canal between Lake Ontario and Lake Erie is included, the total Canadian seaway traffic increases to 36.5 million tonnes, as shown in the following table. This is the tonnage that moved via the St. Lawrence Seaway in 2010 to and from ports in the provinces of Ontario and Quebec.

Even taking the Welland Canal into account, the economic impact of the port facilities on the Lower Fraser River still challenges the impact of the St. Lawrence Seaway with respect to jobs, and particularly with respect to wages. [Note: The Lower Fraser River impact shown in the following table is for 2008; the St Lawrence Seaway impact is for 2010.]

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[29] *2012 Port Metro Vancouver Economic Impact Study, Final Report,* prepared for Port Metro Vancouver by InterVISTAS Consulting Group, May 31, 2013.

[30] Based on letter dated February 7, 2007, from Port Amalgamation Transition Committee, addressed to Mayor and Council, Corporation of Delta.

[31] Martin Associates, *The Economic Impacts of the Great Lakes – St. Lawrence Seaway System* (2011), Chapter IV: "Impacts of the St. Lawrence Seaway".http://www.greatlakes-seaway.com/en/pdf/eco_impact_full.pdf. Accessed August, 2013.

[32] The St. Lawrence Seaway Management Corporation, *Annual Report 2011-2012/Delivering Economic Value, Annual Report 2011-2012/Delivering Economic Value.* http://www.greatlakes-seaway.com/en/pdf/slsmc_ar2012_nar_en.pdf Accessed January 17, 2014.

[33] Source: Custom tabulation by Port Metro Vancouver.

2010 Economic Impacts: Fraser River vs. St Lawrence	Fraser River (Main & North Arms)	St. Lawrence Seaway
CARGO - ALL COMMODITIES		
Metric Tonnes	**25,707,757**	**36,547,367**
Economic Impact		
Jobs	**52,900**	**63,041**
Direct	21,610	29,512
Indirect	23,450	13,310
Induced	7,880	20,220
Wages (Millions)	**$ 2,620**	**$ 2,883**
Direct	$ 1,110	$ 1,430
Indirect	$ 1,050	$ 915
Induced (FR)/ReSpending-Local Cons'n (StL)	$ 460	$ 538

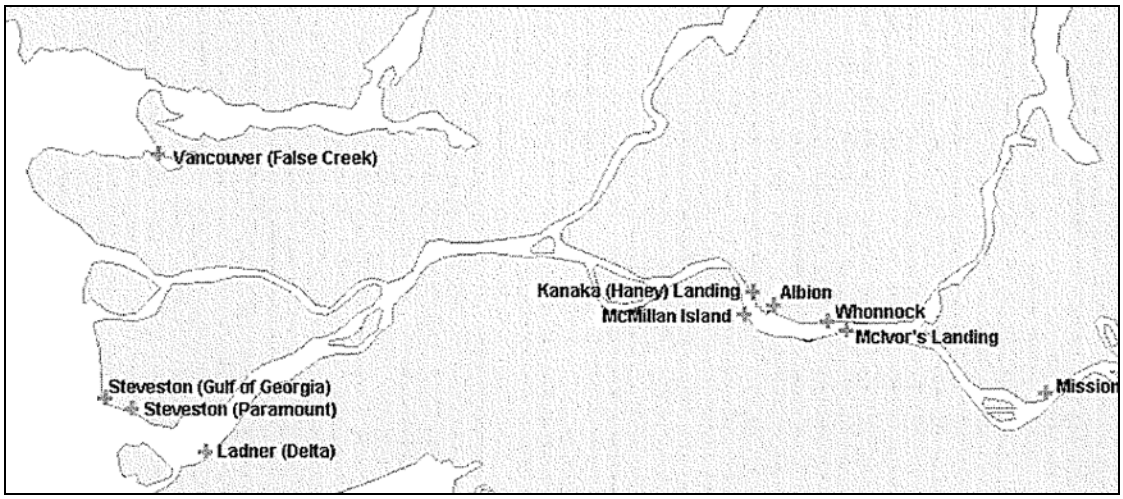
Sources: Fraser River figures based on 2008 PMV Economic Impact Study (Final Rpt, INTERvistas, 2008 Nov 25)
St. Lawrence figures from "Economic Impacts of the Great Lakes-St. Lawrence Seaway System, Executive Summary" (Martin Associates, October 18, 2011)

Table courtesy of Port Metro Vancouver (Please note that the St. Lawrence Seaway only refers to Canadian traffic)

3.2 Small Craft Harbours

The government of Canada through its Department of Fisheries and Oceans (DFO) has a Small Craft Harbours (SCH) program that operates and maintains a national system of harbours in support of the commercial fishing industry. The SCH program enables a variety of fishing, aquaculture, recreation, tourism shipping and other marine activities to occur.[34]

There are nine small craft harbours on the Lower Fraser River, and a further small craft harbour in the City of Vancouver at False Creek. The six small craft harbours located between Surrey and Mission are particularly important to that area, since in that part of the Lower Fraser River there are very few other moorage facilities.



Source: GS Gislason & Associates Ltd., Regional Benefits of Small Craft Harbours: Greater Vancouver Region, prepared for Small Craft Harbours, Fisheries and Oceans Canada, Vancouver

[34] GS Gislason & Associates Ltd., *Regional Benefits of Small Craft Harbours: Greater Vancouver Region,* prepared for Small Craft Harbours, Fisheries and Oceans Canada, Vancouver, B.C, March 2006. The other information in this section regarding small craft harbours is from the same source.

The average total monthly boat counts at all ten of the small craft harbours along the Lower Fraser River and at False Creek in 2004 were 690 commercial fishing vessels, 280 recreational/pleasure craft, and 70 commercial and other vessels.

Total employment at these small craft harbours in 2004 was 26 person years. Total revenues were $3.7 million and expenditures $3.4 million.

The estimated economic activity related to the existence and operations of the SCH network of harbours in the Greater Vancouver area (in 2004) was $210.1 million for commercial fishing, $6.5 million for marine-based recreation, and $2.8 million for other activity, for a total of $219.4 million. The commercial fishing figure includes substantial value added from processing. The Greater Vancouver area is the hub of the commercial fishing industry in British Columbia, and the location of over half of total provincial fish processing employment"

The direct economic impacts of the expenditures outlined above include $234.5 million (2004 dollars) in annual GDP, $76.5 million annual wages and benefits and 2,205 person-years of employment in that year.

The annual (2004) sum of direct, indirect and induced impacts (i.e. including "multiplier" effects) associated with the SCH network of harbours (in Greater Vancouver) and related activities was estimated to be $197.4 million in GDP, $111.7 million in wages and benefits, and 3,250 person-years of employment.

The figures cited above are approximate estimates, and include the impact of the single small craft harbour in the City of Vancouver, located at False Creek. It should be noted that portions of the economic impacts cited above are also included in some of the other sections of this report.

3.3 Fraser River Fisheries

Fisheries are a key component of the economic importance of the Lower Fraser River. Both commercial fisheries and sport fishing have long been significant contributors to economic activity along the river.

The Fraser River fishery is administratively complex and therefore difficult to document in simple terms. The ocean run fish spawning in the Fraser River, largely salmon and oolichan, are managed by Fisheries and Oceans Canada. The resident fish, such as white sturgeon, are managed by the British Columbia Ministry of Environment. In the past, this division has led to delays in the approval of projects involving the river, as each ministry sought to maximize benefit to the species it administered.[35]

The Fraser River fishery has evolved significantly over the years. Originally, the aboriginal communities fished with traps and set nets in the lower estuary. With the arrival of non-aboriginal settlers, the most

[35] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

common fishing practice became the boat-based gillnet. This method provided fishers the ability to place their nets in the paths of the fish, rather than hoping the fish would travel through the set net.[36]

Over time, the Department of Fisheries and Oceans developed a policy that the Fraser River fishery would be a tertiary fishery, meaning most fish would be caught in the open ocean. The size of the Fraser River fishery would be determined by the number of fish the department wanted on the spawning grounds. This policy caused river fishermens' income to vary widely depending on the size of the fish run in general, and the amount of fish caught by the open ocean fishers.

3.3.1 Salmon

As outlined below, The Fraser River and its tributaries offer all five species of Pacific Salmon on seven of the most productive rivers in the province.[37]

Salmon continue to surprise us, showing us new ways in which their oceanic migrations eventually permeate entire terrestrial ecosystems.[38] Salmon provide food and nutrients to a whole food web."[39]

3.3.1.1 Sockeye Salmon

Historically, sockeye salmon in particular have been a vital part of fisheries in the river. Sockeye tend to attract much more attention than the other salmon species. Fraser River sockeye salmon are vitally important for Canadians.[40] Aboriginal and non-Aboriginal communities depend on sockeye for their food, social, and ceremonial purposes; recreational pursuits; and livelihood needs,[41] and they are key components of freshwater and marine aquatic ecosystems.[42]

Although the annual sockeye runs in the Fraser River have trended downwards in numbers of fish over the past two decades, there have been much larger runs in some years. Indications in mid to late summer were that the 2013 Fraser River sockeye salmon run might be roughly 4 million fish. However, relatively warm water in the river could have resulted in a comparatively high rate of mortality before the fish spawned.

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[36] The information in this and the following three paragraphs has been provided by Allen Domaas, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[37] Mission and District Chamber of Commerce, http://www.missionchamber.bc.ca/pages/Attractions/ Accessed August 30, 2013.

[38] "Wolves would rather eat salmon," *Science News,* September 4, 2008. http://www.sciencedaily.com/releases/2008/09/080901205633.htm . Accessed August, 2013.

[39] *Science News,* 2008

[40] English, K.K., Edgell, T.T., Bocking, R.C., Link, M.R., and Raborn, S.. 2011. *Fraser River sockeye fisheries and fisheries management and comparison with Bristol Bay sockeye fisheries.* LGL Ltd. Cohen Commission Technical Report 7. Vancouver, B.C. www.Cohencommission.ca. Accessed August 29, 2013.

[41] English et al.

[42] English et al.

The most recent available figures from Fisheries and Oceans Canada for the total number of sockeye salmon in the commercial fisheries catch in British Columbia and the landed value of that catch date from 2012, when the 818,000 fish caught had a reported value of $9.2 million.[43]

Projections made by the Pacific Salmon Commission near the end of the 2012 Fraser River sockeye salmon run indicate that there were approximately 2.3 million fish in the run. As a first approximation, applying the average value per commercially caught sockeye to the entire run suggests that the total value of the run would have been in the order of $25 million.

This in effect assumes the same value for every fish, whether it was in the commercial catch, in the First Nations catch, in the recreational fish catch or other fishery, or whether or not it succeeded in spawning. In either of the latter two cases, it would have contributed to the ecosystem.

The subsequent processing and other value adding activities of those sockeye salmon that were part of the commercial catch would have added significantly to their economic contribution.

The wholesale value of sockeye salmon processed in British Columbia in the years 2009, 2010 and 2011 was between three and eight times the landed value of the catch, although some salmon imported from the U.S. for processing in B.C. were included in the wholesale value.[44]

3.3.1.2 Other Salmon Species

In addition to sockeye salmon, other salmon species fished for in the Lower Fraser River and its immediate tributaries include pink, coho, chinook and chum. Steelhead and trout also are included in the Lower Fraser River fishery.

For British Columbia as a whole, aside from infrequent years when the sockeye catch is exceptionally large, the total landed value of the commercial catch of other salmon species and the total wholesale value of those species tends to be considerably larger than the corresponding values for sockeye salmon.

The value of other fish species caught in the Lower Fraser River runs is not immediately available. The fishery for some key species such as white sturgeon is catch and release.

[43] Fisheries and Oceans Canada, Pacific Region, *2012 Annual reports of catch and value shipments.* http://www.pac.dfo-mpo.gc.ca/stats/comm/summ-somm/annsumm-ommann/2012/ANNUAL12_USER_ommann/2012/ANNUAL12 Accessed multiple times.
and British Columbia Minister of Agriculture, *British Columbia Seafood Production 2009 – 2011, Year in Review,* http://www.env.gov.bc.ca/omfd/reports/Seafood-YIR-2011.pdf Accessed multiple times.

[44] Fisheries and Oceans Canada and British Columbia Minister of Agriculture.

3.3.2 White Sturgeon

White sturgeon is a species that attracts significant sport fishing in the Lower Fraser River. These sturgeon, the largest freshwater fish species in Canada,, can exceed six metres in length and weigh up to 635 kilograms.[45]

Over the past century, white sturgeon populations have been adversely affected by overfishing, diking and drainage projects, dwindling food resources, and declining water quality as human populations and activities have intensified.[46] However, conservation measures have helped to stabilize the population of this fish in the Lower Fraser.

In the 1900s, white sturgeon was the subject of a commercial fishery in the Lower Fraser that decimated the stock. Unlike many other fish, the white sturgeon takes 25 years to reach sexual maturity. Hence, the few young sturgeon that survived the commercial fishery did not start producing offspring until the late 1920s. These fish then produced offspring in the mid-1940s that did not produce a new generation until the late 1960s. So while the stock is recovering, the pace is, and will remain, slow.[47]

3.3.3 Fish Processing

For British Columbia as a whole, the value of the contribution to gross domestic product from all fish processing every year is much higher than the contribution from all commercial (capture) fisheries. Typically, fish processing might contribute twice or more the impact of fish capture activity.[48]

Fish and seafood processing revenues (in B.C.) totalled $427.5 million in 2011, an increase of 2.1% over 2010. Revenues have been in recovery since tumbling 29.8% in 2007.[49]

Gross domestic product in the fish and seafood processing industry inched ahead 1.2% in 2011, to $177.5 million. The increase follows a 9.4% recovery in 2010, after three consecutive years of decline.[50] Fish and seafood processing employment in 2011 was estimated at 2,400, down 11.1% from 2010.[51] Wages and salaries climbed 3.6%, to $105.3 million in 2011.[52]

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[45] *White Sturgeon: Species at Risk*. Fisheries and Oceans Canada. http://www.pac.dfo-mpo.gc.ca/publications/pdfs/sturgeon-esturgeon-eng.pdf Accessed January 31, 2014.
[46] *White Sturgeon: Species at Risk*
[47] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.
[48] GS Gislason & Associates Ltd.
[49] *British Columbia's Fisheries and Aquaculture Sector*, 2012 Edition, January, 2012, B.C. Stats, prepared for the Department of Fisheries and Oceans Canada under agreement with Statistics Canada. http://www.bcstats.gov.bc.ca/Publications/AnalyticalReports.aspx. January, 2012, B.C. Stats, Accessed August 31, 2013.
[50] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.* January 2012, B.C. Stats, prepared for the Department of Fisheries and Oceans Canada under agreement with Statistics Canada. http://www.bcstats.gov.bc.ca/Publications/AnalyticalReports.aspx Accessed August 31, 2013.
[51] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[52] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*

The proportion of the economic impact of fish processing in British Columbia that might be attributed to the Lower Fraser River does not appear to be immediately available.

3.3.4 Sport fishing

The Lower Fraser River in the past, and in favourable years more recently, has been a prime location for sport fishing.

In the latest in a series of reports that analyze the economic significance of B.C.'s fisheries and aquaculture sector, the provincial government defines the sport fishing industry as including the sport fishing-related activities of all industries that sell directly to anglers.[53] These include sales to anglers involving retailers of sport fishing equipment, marinas, boats, fuel, air and water transportation, accommodation, food and beverage services, guiding and other purchases.

The most recent analysis found that sport fishing contributed $360 million to B.C.'s total GDP in 2011 (nominal dollar amount at basic prices).[54] In that year, sport fishery accounted for nearly half of the total GDP of the fisheries and aquaculture sector in the province.[55]

Approximately 8,400 people were employed in (B.C.'s) sport fishing industry in 2011.[56] Wages and salaries in freshwater and saltwater sport fishing activities in B.C. in 2011 totalled $219 million.[57]

The proportion of that that could be attributed to the Lower Fraser River is not completely clear. However, an information sheet issued by the Fraser River Action Plan provides some indication of the impact:

> "Although difficult to determine exactly, the recreational fishery on the Fraser makes important contributions to B.C.'s economy through jobs in support industries (about half of the 15,000 provincial total). Sport fishing as a whole generates $180 million a year in direct revenues and indirect value as part of the province's $5 billion-a-year tourism industry – it is estimated that one-third of every tourism dollar spent is directed toward some aspect of recreational fishing. Fraser chinook and coho form an important part of the sport fishing catch, causing almost half of happy smiles on anglers' faces"….[58]
>
> "….Not to be overlooked are the many social and cultural benefits the Fraser's fisheries provide through recreation, tourism and enhancement of our way of life. Many of the benefits derived from recreational fishing and from the Native fishery are non-economic: family outings to catch crab in the estuary, children fishing for trout in the creek, First

[53] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[54] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[55] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[56] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[57] *British Columbia's Fisheries and Aquaculture Sector, 2012 Edition.*
[58] Single untitled page, Fraser River Action Plan, Communications Officer, Environment Canada, North Vancouver, and Communications Manager, Fisheries and Oceans Canada, Vancouver, undated.

Nations' ceremonial use of eulachon and much more. These provide value to people's lives that cannot be measured with dollars and cents."[59]

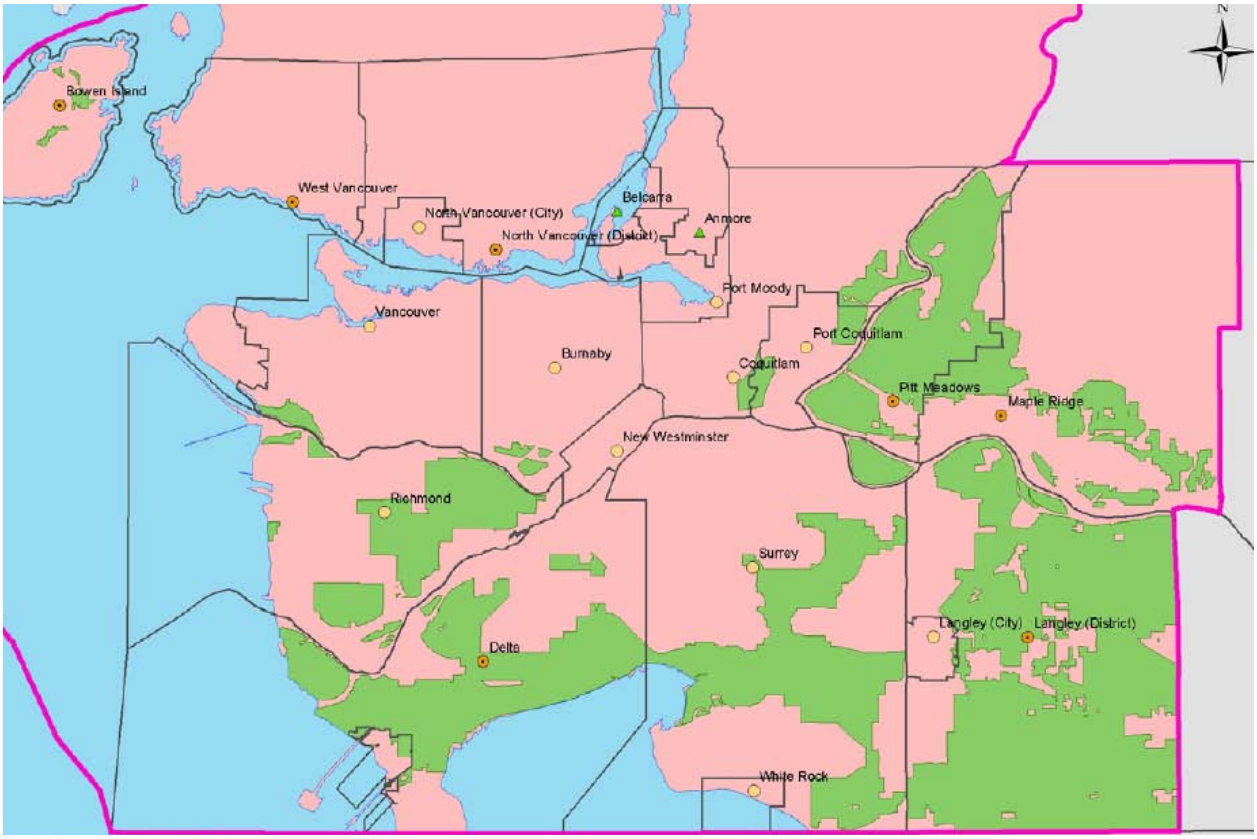
3.4 Agriculture in the Lower Fraser Region

The soils within the Fraser Valley are some of the most fertile in Canada,[60] and the region has one of the longest frost-free periods in the country,[61] making the area highly favourable for agriculture. Between 1991 and 2006 there was a 22% increase in the amount of land being farmed in the Fraser Valley Regional District.[62]

There are many different types of agricultural products generated on farms within the Fraser Valley and the Metro Vancouver region. Dairy and poultry production is prominent. More than 25 different types of field vegetables are grown throughout the region, with the vast majority of the berry production in B.C. occurring in the Fraser Valley and Metro Vancouver.[63]

The Fraser Valley and the areas in the estuary of the river annually generate more than 62% of the province's gross farm receipts (about $1.6 billion in the region).[64] Altogether there are more than 5,000 farms in the region.[65] Agriculture in the Fraser Valley and the impact of the river on agriculture in the region are therefore very important to the economy of both the region and the province.

[59] Single untitled page, Fraser River Action Plan.
[60] Crawford E., MacNair E., *Fraser Valley & Metro Vancouver Snapshot Report*, B.C. Agriculture Climate Change Adaptation Risk + Opportunity Assessment Report, March 2012, the British Columbia Agriculture & Food Climate Action Initiative. http://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf. Accessed September 27, 2013.
[61] Crawford E., MacNair E., 2012.
[62] Crawford E., MacNair E., 2012.
[63] Crawford E., MacNair E., 2012.
[64] Crawford E., MacNair E., 2012.
[65] Crawford E., MacNair E., 2012.



Map of Agriculture Reserve in Metro Vancouver, from Agriculture Water Demand Model Report for Metro Vancouver, April 2013

3.4.1 Potential for Increased Agricultural Production

There is potential for a substantial increase in this region's agricultural production, provided that additional irrigation and corresponding water supply are used.[66]

A detailed analysis of the agricultural demand for water in Metro Vancouver indicates that there is already a substantial need for water from the Fraser River.[67] There is also a large potential for increased irrigation of crops in Metro Vancouver, with a very large increase in the use of water from the Fraser and its tributaries, and corresponding increase in agricultural production.[68] A parallel report to be completed within the next several months appears likely to have a similar finding for the Fraser Valley as a whole. At that time, the extent of the availability of water from the Fraser River for irrigation may become clearer, together with the extent of potential increases in production.

[66] Van der Gulik, T. Neilsen, D. Fretwell, R. Tam, S., *Agricultural Water Demand Model Report for Metro Vancouver,* June 2013. 500300-7_Agriculture_Water_Demand_Model-Metro_Vancouver_Report. Accessed September 30, 2013.
[67] Gulik et al 2013.
[68] Gulik et al 2013.

3.4.2 Precipitation, Irrigation, Drainage and Climate Change

In the Fraser Valley there is generally an overabundance of rainfall in the winter, followed by a deficiency of precipitation in the summer.[69] Irrigation is required for most crops in most areas (of the Fraser Valley) in the summer, while[70] drainage and irrigation are critical management requirements to ensure that soil moisture conditions can be maintained in a condition conducive to crop growth and production.[71]

"The impacts of climate change are expected to include warmer and wetter winters in the Lower Fraser Valley, while summers are anticipated to become warmer and drier.[72] The agricultural challenges may include increased demand for irrigation water in the face of potentially decreased availability.[73] However, a recent, authoritative report states that, "The potential challenge in the Fraser Valley and Metro Vancouver region was not seen to be a lack of water supply, but rather an inability to access water where and when required."[74]

Although water from wells is widely used for irrigation in the region, water from the Fraser River also plays an important role. Irrigation water is obtained from ditches along the river, which local drainage authorities allow to flood with river water for irrigation use.[75]

Drainage from agricultural lands in the Fraser Valley is a key factor that rivals irrigation in terms of importance. This includes dikes and pumps to transfer drainage water to the river.

3.4.3 Other Factors Affecting Agriculture

The economic performance of a good deal of agriculture in the Fraser Valley depends upon supply managed agricultural production, involving dairy, egg and poultry operations.[76]

The current human and social resources of the (agricultural) sector (in the area) are being stretched and this is impacting the ability to manage during difficult and changing conditions. A new challenge on this front will soon arise, as many producers are also nearing retirement[77]

The evolution of agriculture in the valley of the Lower Fraser River provides other significant advantages, however. The Fraser Valley and Metro Vancouver combined have a critical mass of producers able to

[69] Zbeetnoff Agro-Environmental Consulting, Serecon, *Abbotsford Agricultural Strategy – Agriculture Profile,* City of Abbotsford, 2009. http://www.abbotsford.ca/Assets/Abbotsford/Dev+Services+-+Planning+and+Environment/City+of+Abbotsford+Agriculture+Profile.pdf. Accessed September 30, 2013.
[70] Crawford E., MacNair E., 2012.
[71] Zbeetnoff, 2009.
[72] Zbeetnoff, 2009.
[73] Zbeetnoff, 2009.
[74] Crawford E., MacNair E., 2012.
[75] C:\Users\windows\Documents\New folder\My Documents\Fraser River\Ambient water quality objectives for Fraser River sub-basin from Kanaka Creek to the mouth.htm
[76] Crawford E., MacNair E., 2012.
[77] Crawford E., MacNair E., 2012.

support businesses providing agricultural goods and services including input and equipment suppliers and consultants. The B.C. Ministry of Agriculture also maintains a high proportion of its staff in Abbotsford, while a large number of very active industry organizations are located in the Fraser Valley (and some in Metro Vancouver).[78]

Agriculture in the Lower Fraser area has the advantage of proximity to major population centres and to the U.S. border. With respect to flexibility and diversity of markets, it is a tremendous advantage to producers in this region to be close to large urban markets and to the border.[79]

As described in sections 4.1.5 and 4.2 of this report, the risk of flooding by salt water breaching dikes in the tidal reaches of the river poses a high-risk situation for agricultural production in this region. [80] Currently, a storm surge combined with high tides in El Niño years could overtop existing flood protection infrastructure, even without additional sea level rise.[81]

3.5 Other River-Dependent Activities and Values

There are a variety of other river-dependent activities and associated economic impacts that are attributable to the Lower Fraser River. Some of the more significant of these include activities of the forest products industries, the handling of aggregates, recreational boat marinas or docks, parks, trails and other outdoor recreation, and the float plane terminal at Vancouver International Airport. These are described below.

3.5.1 Forest Products Industry

The forest products industry is an important factor in economic activity along the Lower Fraser River. While there have been closures of major timber processing facilities along the river, many remain and make a substantial contribution to economic activity.

A review of satellite photography mapping of the Lower Fraser River shows that there are, or were at the time of mapping, 47 forest industry facilities along this part of the river. These include a significant number of sawmills, as well as shake and shingle mills, a veneer/plywood mill, a pulp mill, a combined pulp and paper mill, wood chip mills, wood chip/sawdust handling facilities, barge loading and unloading facilities, lumber storage, log sorting/log storage yards, and pole yards.

The river is a vital transportation link for the movement of raw material and shipment of much of the material produced by these facilities. Significant lengths of the shoreline of the river between the Georgia Strait and Mission are taken up with moored log booms. Several million tonnes of logs annually

[78] Crawford E., MacNair E., 2012.
[79] Fraser Valley Regional District. *Agricultural Economy in the Fraser Valley Regional District*. September 2011. http://www.fvrd.bc.ca/InsidetheFVRD/RegionalPlanning/Documents/Regional%20Snapshot%20Series/Agriculture%20Snapshot.pdf, cited in Crawford E., MacNair E., 2012.
[80] Crawford E., MacNair E., March 2012.
[81] Crawford E., MacNair E., March 2012.

are moved into or out of the Fraser, and a substantial proportion of these are converted to wood products in facilities along the river.

As of 2009 (the latest year for which statistics have been published), there were seven major sawmills located on the Lower Fraser River, with a combined annual production capacity estimated to be 890 million board feet.[82] There was one veneer plant and one combined veneer and plywood plant, with a total annual capacity estimated to be 616 million square feet on a 3/8-inch thick basis. There were also two mills producing wood chips, with a total estimated capacity of 388 thousand BDUs (bone dry units) of output.

The total log input corresponding to the solid wood output capacities cited above is approximately 4 million cubic metres per annum.

There are also a number of smaller sawmills, as well as shake and shingle mills along the river.

The pulp mill and the combination pulp and paper mill on the river have a total pulp capacity of 174,000 tonnes per annum; the paper capacity of the combined mill was 76,000 tonnes of annual output.

Employment in the major sawmills along the river in 2009 was approximately 1,000 jobs, and in the pulp and paper facilities, roughly 350 jobs, depending on the percentage utilization of the facilities.[83] Moderate additional employment would have been associated with the other types of forest products facilities mentioned above.

3.5.2 Aggregates

Aggregate is the most abundant natural resource on the planet. Its materials include sand, gravel and crushed stone. Aggregate materials are essential to life [84] in much of the world.

Aggregate demand growth tends to be roughly proportional to population growth.[85]

Aggregates are an important cargo shipped into the Lower Fraser River. They are essential to the manufacture of concrete and to road construction, and hence to much of the construction in Metro

[82] Source of statistics in this section: *Major timber processing facilities in British Columbia 2009,* Competition and Innovation Branch, Ministry of Forests, Lands and Natural Resource Operations, Victoria, July 2011.
[83] Lumber conversion factors derived from Germain, Benoit, *An overview of the lumber industry in Canada 2004 to 2010,* Manufacturing and Energy Division, Statistics Canada, catalogue no. 11-261-M no. 89, http://www.statcan.gc.ca/pub/11-621-m/11-621-m2011089-eng.pdf, accessed Nov. 24, 2013, and Statistics Canada, CANSIM – 303–0064, *Lumber production, shipments and stocks,* www5.statcan.gc.ca/cansim/a21, accessed November 24, 2013.
[84] B.C. Ministry of Energy and Mines and Responsible for Core Review, *Aggregate Operations in British Columbia.* http://www.empr.gov.bc.ca/Mining/Aggregate/Pages/default.aspx. Accessed January 19, 2014.
[85] B.C. Ministry of Energy and Mines.

Vancouver and the Fraser Valley. The market appears to bear transportation costs up to approximately 50 kilometres by truck and 150 kilometres by barge.[86]

In 2011 and 2012, the inbound waterborne shipments of dry bulk minerals (presumably largely aggregate) to the tidal areas of the Lower Fraser River were 4.1 to 4.3 million tonnes annually.[87] These shipments do not appear to include sand dredged from the river itself, which is a form of aggregate dealt with elsewhere in this report.

British Columbia's aggregate industry produced approximately 36.6 million tonnes of sand, gravel and crushed stone in 2012, with a value of $327 million, worth slightly less than $9 per tonne.[88] At that amount per tonne, the waterborne aggregate shipments into the tidal areas of the Lower Fraser River would have had a total value of roughly $38 million.

3.5.3 Recreational Boat Marinas/Docks

Recreational boating is an important part of recreational activity on the Lower Fraser River, including sport fishing, travel to recreational properties and other leisure uses. Recreational boats moored along the river also may be used on the Strait of Georgia or elsewhere.

In addition to the relevant information in this report dealing with small craft harbours, a review of satellite photo mapping of the river from its mouth to Hope has helped to reveal the extent of recreational boat marinas or docks on the Lower Fraser.

On the river and subsidiary channels below New Westminster (Main Arm, Middle Arm and North Arm), there are 13 marinas or clusters of docks for recreational boats. On the Pitt River and Pitt Lake, there are 14 of these. On the Fraser River between the mouth of the Pitt River and Mission, there are 8 marinas or clusters of docks for recreational boats. The only other group of docks is at the south end of Harrison Lake. The lack of marinas and docks on the Fraser River proper between Mission and Hope in part seems likely a result of the smaller concentration of population in this area, and in part because of the greater difficulty of navigation and wilder aspects of that part of the river.

In total, on the Lower Fraser River and principal tributaries there are 36 marinas or clusters of docks for recreational boats. Some of these cater to commercial fishing vessels, as discussed in the preceding section of this report. From the satellite photo mapping, it is not always distinct as to which types of vessels were moored, and in some cases vessels no doubt were in use away from moorage.

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[86] Levelton Engineering Ltd. in cooperation with Coriolis Consulting Corp., *Lower Mainland Aggregates Demand Study, vol. 1, Aggregate Supply and Consumption,* prepared for B.C. Ministry of Employment and Investment, June 1996. Accessed January 19, 2014 at B.C. Ministry of Energy and Mines., http://www.empr.gov.bc.ca/Mining/MineralStatistics/MineralSectors/ConstructionAggregates/ReportsandPublications/Documents/leveltonreport.pdf

[87] Source: Port Metro Vancouver

[88] B.C. Ministry of Energy and Mines.

No attempt was made to count vessels at the marinas or docks. In addition, there is no way of knowing the number of vessels away from their usual place of moorage. Also, many boats could be stored on dry land, moved about on trailers, and launched from boat ramps. However, speculative calculations suggest that there could easily be in excess of 1,000 boats used on the Lower Fraser River for recreational purposes.

In the previous section of this report, it was indicated that there may be approximately 700 commercial fishing vessels moored in the small craft harbours in Greater Vancouver. As of 2004, there were 1,185 licensed commercial fishing vessels in the Greater Vancouver region, according to DFO licensing records. In addition to small craft harbours, there are other mooring facilities in the region that are used by commercial fishing vessels.[89]

Recreational boating has strong potential for growth along the Fraser, Pitt, and Harrison rivers. One perspective is that the best stimulus to increase recreational boat use in the Lower Mainland would be to create municipal waterfront access for recreational boaters. At present, there are few opportunities for them to access urban commercial areas on the river. There are constraints to park or government administrators securing that access, which is both hard to obtain and costly. No government body has a mandate to provide "water to land" access points. Currently, the thrust of most, if not all, park administrations are to provide the public access to view the water, but fewer places for access to the water.[90] One of the few examples of a concerted effort to provide this access is Steveston Harbour in Richmond.

3.5.4 Parks, Trails and Other Outdoor Recreation

The Lower Fraser River is the basis for a great deal of outdoor recreation, including parks, trails, golf courses and other land-based and water-oriented outdoor recreation. Parks flank the river in numerous locations, with trails often built on top of the very extensive diking system which parallels much of the course of the river.

3.5.4.1 Experience the Fraser

Experience the Fraser (EFT) is a recreational and cultural tourism partnership (established in 2009) that extends from Hope to the Strait of Georgia. The Province of British Columbia will provide Metro Vancouver and the Fraser Valley Regional District with $1.25 million apiece to begin development of a system of inter-regional trails, river-based infrastructure and heritage features through the Lower Fraser River corridor.[91] A further $1 million in funding for this agreement was provided by the provincial government in 2012.[92]

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[89] GS Gislason & Associates Ltd.

[90] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[91] *$2.5 Million for Experience the Fraser Project,* Ministry of Tourism, Culture and the Arts, news release, April 9, 2009. http://www2.news.gov.bc.ca/news_releases_2005-2009/2009TCA0014-000812.htm#

[92] *$1 million for parks and trails along Lower Fraser River,* news release, B.C. Ministry of Forests, Lands and Natural Resource Operations, April 9, 2012. http://www.metrovancouver.org/mediaroom/Media%20Releases/2012-04-09-1millionParksTrailsAlongLowerFraserRiver.pdf Accessed January 20, 2014.

Through the ETF initiative, the Province, Metro Vancouver, the Fraser Valley Regional District and Trails BC will partner with communities and First Nations to establish trail routes and use the natural heritage and infrastructure to develop integrated land and water-based recreation and cultural heritage opportunities along the Lower Fraser River to facilitate tourism and active, healthy living.[93] These opportunities are outlined in the map below:

Source: Fraser Valley Regional District / www.bieapfremp.org/fremp/projectreview/index.html

Experience the Fraser will also celebrate the Lower Fraser River wildlife, communities, people and their stories through cultural events, festivals, theatre and the arts.[94] Over 550 km of trails (43 per cent of which are already in place) and blueways will connect communities along the Fraser River. ETF will act as a catalyst to encourage and strengthen tourism and economic development initiatives.[95] The partnership between the Province and the two regional districts demonstrates the ongoing commitment to build the Experience the Fraser vision and showcase the Lower Fraser River as a premier recreation, heritage and tourism destination.[96]

It is critical that all participants understand that while this program can and will bring much-needed attention to the river, trails and recreation infrastructure must be sensitively placed to ensure the shoreline is not inhibited for future commercial uses.[97]

3.5.3.2 Fraser River Estuary Management Program

An integrated management approach was established through the Fraser River Estuary Management Program (FREMP) in the 1990s. Adopted by FREMP in 1994 and updated in 2003, the *Fraser River Estuary Management Plan*: *A Living Working River* provides "….a framework for integrating the

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93 *$2.5 Million for Experience the Fraser Project,* Ministry of Tourism, Culture and the Arts.
94 *$2.5 Million for Experience the Fraser Project,* Ministry of Tourism, Culture and the Arts.
95 *Experience the Fraser,* Fraser Valley Regional District.
http://www.fvrd.bc.ca/INSIDETHEFVRD/REGIONALPLANNING/Pages/ETF.aspx
Accessed December 31, 2013.
96 *$1 million for parks and trails along Lower Fraser River,* news release, B.C. Ministry of Forests, Lands and Natural Resource Operations, April 9, 2012.
97 Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

management of human and natural activities in the estuary.[98] The plan provides a framework for intergovernmental co-operation on how and where current and future use of the water and shoreline will occur along with linkages to adjacent upland areas within the Fraser River estuary."[99]

As of early 2013, funding specifically earmarked for the FREMP expired. However, the process of reviewing projects to ensure that activities continue to align with federal and provincial legislations pertaining to environment and navigation continues. On an interim basis, Port Metro Vancouver is performing this function.[100] FREMP is discussed further as part of section 4.5 of this report.

In parallel with FREMP and partially integrated with it was the Burrard Inlet Environmental Action Program (BIEAP). Established in 1991, Burrard Inlet Environmental Action Program (BIEAP) and its partners coordinated a joint action program to improve and protect the environmental quality of Burrard Inlet.[101] As with FREMP, since early 2013, responsibility for the continuation of BIEMP has been undertaken by Port Metro Vancouver.

3.5.5 Float Plane Terminal at Vancouver International Airport

The float plane facility on the Middle Arm at the Vancouver International Airport is another aspect of the economic importance of the Lower Fraser River. This facility is a vital feature that enables numerous linkages of water-based air services between Greater Vancouver and communities relying on float plane services. It is also important for connections to land-based airport services and the larger air services network.

In 2013, there were 28,373 float plane take offs/landings occurred on the middle arm of the Fraser River, moving 104,819 passengers.[102] According to the most recent employment data available (2010), this activity supports approximately 300 direct jobs.[103]

3.6 Local Example: Steveston Harbour

The historic village of Steveston is a living example of how the Fraser River is an integrated, simultaneous, interconnected system.

Steveston is located in the southwest corner of the City of Richmond. The village is a great example of the many past and present opportunities provided by the Fraser River, along with future challenges to safety and sustainability.

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[98] *Fraser River Estuary Management Plan.*
[99] *Fraser River Estuary Management Plan.*
[100] *Project Review,* Fraser River Estuary Management Plan. http://www.bieapfremp.org/fremp/projectreview/index.html Accessed January 30, 2014.
[101] Burrard Inlet Environmental Action Program. http://www.bieapfremp.org/main_bieap.html. Accessed April 28, 2014
[102] Vancouver Airport Authority Communications Department, February, 2014.
[103] Brown, M. Senior Planner, Strategic Planning, Vancouver Airport Authority. Personal communication, May, 2013.

3.6.1 Early Steveston

Long before the canneries which put Steveston on the world map were established, the Coastal Salish people lived in the area, harvesting the rich fishing grounds of the region. By the mid-1800s, European settlers began to arrive on Lulu Island, attracted by the fertile soil of the delta. Over thousands of years, the river deposited this silt, creating extremely fertile soil that is ideal for farming.

Steveston was named after its founding family, Manoah and Martha Steves and their six children. They were one of the first families to establish their roots in the southwest corner of Lulu Island. The favourable conditions soon brought many farmers to the region during the second half of the 19th century, and agriculture began to thrive.

Towards the turn of the century, the immense potential of the Fraser River salmon fishery was realized, and the focus of Steveston quickly changed. The small fishing camps present in the 1870s shifted to large scale cannery operations by the late 19th century, and Steveston and the entire B.C. coast grew to become the largest cannery operation in the British Empire.[104]

With this economic boom came other developments in Steveston, such as hotels, saloons and even a local opera house. The boom also contributed to a population growth that made Steveston a particularly multicultural community – home to First Nations, Europeans, Japanese and Chinese, all working side by side.[105]

Steveston quickly became known as "Cannery Row" after the numerous fish canneries which then occupied the waterfront. Cannery Row hit its peak in 1901, with a total of 15 canneries which extended eastward from the Fraser River's mouth at Garry Point Park, as it is known today.[106] Canneries were established on both sides of the river and from its mouth upstream as far as New Westminster, but the symbolic site for this economic activity is Steveston.

The number of canneries would soon decline as large corporations consolidated many of the smaller operations. Additionally, automation of the industry halved employment, but ultimately, fish processing in Steveston would carry through to the latter part of the 20th century.[107]

3.6.2 Steveston Today

Steveston has a vibrant past that has been captured in the establishment of numerous historic sites along the Fraser River, among them the Gulf of Georgia Cannery National Historic Site, Britannia Shipyards National Historic Site, London Heritage Farm and the Steveston Museum. These, together with other complementary facilities, food and beverage establishments, seashore walks and attractive

[104] Harold Steves et al., *Steveston Cannery Row: An Illustrated History Cannery Row* (Richmond: Lulu Island Printing, 1998) 5.
[105] Tourism Richmond http://www.tourismrichmond.com/media/media-kit/steveston-publish-ready-articles/
[106] Stacy Duncan, *Steveston's Cannery Channel* (Richmond: Planning Department, 1986) 1.
[107] *About Steveston.*

scenery, make Steveston Harbour a key focal point for tourism in Richmond and the Greater Vancouver Regional District.[108]

The concentration of nationally significant historic sites has recently stimulated the City of Richmond and community leaders to explore the potential of UNESCO World Heritage status for the area. "It would further entrench the fact our little town at the mouth of the Fraser River has a significant story to tell about the history of the area – its people and industries," explained a local advocate for UNESCO designation in a *Richmond News* editorial.[109]

While the canneries of yesteryear serve as a reminder of the past, and are the foundation of a thriving tourism industry today, the fishing industry still remains active. Steveston is presently home base for the largest small craft fishing harbour in Canada. It is a key facility for the commercial fishing industry on the British Columbia coast, providing a full range of services to support the regional fishing fleet.[110] At present, Steveston is the home port for approximately 700 commercial fishing vessels and an additional 450 transient commercial fishing vessels during certain periods of the year.[111]

Agriculture also remains an active part of the community. The Steves family farm is still raising Holstein cattle, which were originally brought from Oregon in 1881, and the eastern edge of the community is lined with active agricultural operations.

3.6.3 Maintaining Steveston

In 1891, the City of Richmond passed bylaws authorizing the first diking and dredging activities in and around Steveston. Just three years later, the largest Fraser River flood in recorded history would hit Steveston, and impact every community along the banks of the river.

Today, 123 years after the first diking and dredging projects were authorized, the village of Steveston continues to struggle with the ongoing challenges of navigation and flood management on the Fraser River.

In 2010, Fisheries and Oceans Canada submitted a proposal to the B.C. Environmental Assessment Office to make modifications to Steveston Harbour with the purpose of reducing the long term dredging requirements within the harbour. The dual purposes for the initiative are improving the Harbour Authority's viability while providing economic benefits to fishers and the community.[112] The concept plan involves the creation of new coastal habitat to reduce siltation within the harbour, and the expansion of the existing dike systems around the community.

[108] *Project Description – Steveston Harbour,* Fisheries and Oceans Canada, February, 2010.
[109] Lorne Slye, Richmond News opinion piece, Feb 5, 2014
[110] *Project Description – Steveston Harbour.*
[111] *Project Description – Steveston Harbour.*
[112] *Project Description – Steveston Harbour.*

The project would potentially involve a partnership between all major stakeholders, including the municipality, province, federal government, local harbour authority and Port Metro Vancouver. This forward-thinking, innovative plan would focus on the long-term needs of the harbour and surrounding community, to address the existing and future environmental challenges Steveston will face. The current outlook appears to be that as a result of the habitat it would create, the upstream part of this project is likely to have a higher priority than the downstream part.

Ultimately, Steveston is just one of many locations dependent on the Fraser River. Steveston exists and thrives because of the resources and opportunities provided by the river. However, the community's livelihood, centred on fishing, agriculture, and tourism, is also at risk if the surrounding environment is not properly maintained through dredging as well as diking upgrades – issues by no means unique to Steveston.

3.7 Summary of Key Lower Fraser River Economic Indicators

In summary, the Lower Fraser River is an economic generator for the region, the province, and for the entire country. In coming years, the national significance of the Lower Fraser River will increase, as trade with the Pacific region intensifies.

The following table summarizes the significant economic activity on and adjacent to the Lower Fraser River. Although limitations of the source data preclude aggregating the information into a rigorously consistent table of indicators, this summary highlights the key economic generators:

Lower Fraser River (LFR) Marine Activity	• In 2012, LFR ports handled 27.5 million tonnes of cargo, approximately one-quarter of all tonnage handled by Port Metro Vancouver (PMV). • For British Columbia alone, the corresponding impacts of the Fraser River ports/marine activity would have been approximately 32,000 jobs, $2 billion in wages, and $3 billion in GDP (2012). • For all of Canada, the impact was approximately 41,500 jobs, $2.5 billion in wages, and $4 billion in GDP (2012). • Average annual compensation per direct person year across all industries directly related to the Port activity is nearly $67,000, approximately 53% greater than the average Canadian wage of $44,000. • The LFR marine facilities and activities are part of PMV, the largest port in Canada in terms of amount of cargo handled, the fourth busiest port by tonnage in North America and exports more tonnes of cargo than any other port in North America.
Lower Fraser River vs. Canadian Traffic on the St. Lawrence Seaway (SLS)	• In 2011, Canadian cargo carried on the Montreal-Lake Ontario section of the SLS totalled 28.7 million tonnes, in comparison with 26.9 million tonnes of cargo handled in the LFR parts of PMV. • If the Welland Canal traffic (SLS section between Lake Ontario & Lake Erie) is included, total Canadian traffic increases to 36.5 million tonnes. Even taking Welland Canal traffic into account, the economic impact of marine activities on the LFR still challenges the impact of the SLS with respect to jobs, and particularly wages.
LFR Small Craft Harbours (SCH)	• In Greater Vancouver, there are 10 SCH, with nine located on the LFR. • Steveston, located at the mouth of the Fraser River in Richmond, is home to the largest small craft harbour in Canada.
LFR Agriculture	• Between 1991 and 2006, there was a 22% increase in the amount of land being farmed in the Fraser Valley Regional District. • The Fraser Valley and the areas in the estuary of the river generate more than 62% of the province's gross farm receipts annually (about $1.6 billion in the region), and is home to over 5,000 farms.

LFR Forestry	• A recent analysis showed 47 forest industry facilities along the LFR. • Total log input corresponding to the solid wood output capacities of these facilities is approximately four million cubic metres per annum.
LFR Aggregates	• In 2011/12, the inbound waterborne shipments of dry bulk minerals (largely aggregates) to the tidal areas of the Lower Fraser River were 4.1 to 4.3 million tonnes annually. • Aggregates include sand, gravel and crushed stone, and are essential to the manufacture of concrete and to road construction.
Steveston Harbour	• Steveston is a key facility for the commercial fishing industry on the British Columbian coast and is home to the largest SCH in Canada. • In 2010, Steveston was home port for approximately 700 commercial fishing vessels and an additional 450 transient commercial fishing vessels (during certain periods of the year).

4. Future Prosperity: Sustainability Challenges

As set out in the prior chapter, the Lower Fraser River is an invaluable resource that supports and sustains a broad range of economic activities. Its value and importance is only likely to grow. Robin Silvester, President and CEO of Port Metro Vancouver, has stated that, "The Fraser River is absolutely key"[113] to the future growth and prosperity of the port.

However, there are a number of significant issues that, if not well managed, could put the river, and hence those activities that depend upon it, at significant risk.

This chapter discusses five key issues that challenge the long-term economic viability of the river:

- Flood prevention;
- Coping with sea level rise;
- Maintaining navigation and over-land transportation links;
- Preserving industrial lands; and
- Coordinating the multiple stakeholders and stewards of the river.

While each subject is presented in sequence, perhaps the most important idea to bear in mind while reading each section is that they are actually coincident and interrelated. In order to ensure the future health and prosperity of the Lower Fraser River, these issues must be addressed and managed holistically.

4.1 Flood Prevention

The Fraser River and its 13 main watersheds drain more than a quarter of British Columbia and are home to two thirds of the province's population.[114] Flood control and prevention are crucial to the provincial economy, and therefore to the economic wellbeing of the entire nation. The past, present, and future impact of flooding in the Lower Fraser River region is discussed below.

[113] Address to a meeting of The Vancouver Board of Trade, November 26, 2013

[114] http://www.fraserbasin.bc.ca/_Library/Fraser_Basin_Council/fbcB.C._strat_plan_2011-2016.pdf (pg.3) - Updated to reflect population growth based on 2011 Census.

4.1.1 Historical Flooding

The Lower Fraser River has historically demonstrated the power to cause major economic losses along its length. In 1894, the greatest flood on record occurred, affecting extensive areas in the southern half of the province. Fortunately, development was still sparse and relatively little damage was caused.[115]

British Columbia's second most damaging flood occurred in 1948 when a few dikes failed, resulting in several casualties; the destruction of about 2,000 homes; the evacuation of 16,000 residents, and approximately $210 million in damages (value in 2010 dollars).[116]

4.1.2 Development of Flood Protection

Diking in British Columbia started as early as 1864. Today, there are more than 200 regulated dikes in British Columbia with a total length of over 1100 km protecting 160,000 ha of valuable land.[117]

The Lower Mainland, which has over 50 per cent of British Columbia's population and 50 billion dollars' worth of development in the floodplain, is dependent on the integrity of 600 km of diking, 400 flood boxes, and 100 pump stations.[118]

4.1.3 Flood Threats in More Recent Years

In the spring of 2007, record snowpacks on the mountains in the Fraser River catch basin began melting, and combined with heavy rainfall. As a result, the water in the river rose to a level not reached since 1972. Evacuation alerts were given for the low-lying areas not protected by dikes along the river in the Lower Mainland.

John Les, a former mayor of Chilliwack, was solicitor-general for British Columbia at the time, and was responsible for Emergency Management British Columbia. On July 4, 2013, Les and three other former mayors of Abbotsford, Chilliwack and the District of Kent met to discuss the need for priority to address flood protection in the Fraser Valley.

At the meeting, Les noted that, "In 2007, the flood threat was much more serious … people don't realize just how close we came to disaster that year.[119] I happen to remember a certain evening calling the Premier and saying 'I might need you to call the Prime Minister tomorrow to call in the army'. Not only

[115] British Columbia Ministry of Forests, Lands and Natural Resource Operations, Dike Management and Safety, Flooding and Flood Damage, posted as Ministry of Environment –Water Stewardship Division, http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html, accessed July 8, 1913.
[116] British Columbia Ministry of Forests, Lands and Natural Resource Operations.
[117] Diking http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html#dikes
[118] British Columbia Ministry of Forests, Lands and Natural Resource Operations. http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html#dikes
[119] Henderson, J. "Flood protection should be a priority, say former Fraser Valley Mayors," *Chilliwack Times,* July 3, 2013. www.chilliwacktimes.com/story_print.html?id+8612721&s Accessed July 4, 2013.

was the river extremely high, but a storm was coming – a storm that in the end, did not hit the area, likely saving the city (Chilliwack) from flooding, according to Les.[120]

4.1.4 The Need for Action

The former mayors of all four Fraser Valley communities at the meeting noted above publicly stated that preventative measures need to be undertaken.

Recent studies have determined that a reoccurrence of the 1894 flood could cause approximately $1 billion in economic damages to the City of Chilliwack and several billion in economic damages to the City of Richmond.[121] Expected flood damages for all Fraser Valley communities have not been assessed, but the total could be in the order of tens of billions of dollars.[122]

The risk of catastrophic loss from flooding is greatest in the Lower Fraser because of a large population (over 300,000 people) and significant residential, commercial, industrial, utilities and transportation infrastructure in the floodplain.[123]

Should a major flood breach the diking system, flood plain communities at risk in the region include all or portions of Richmond, Delta, Pitt Meadows, Chilliwack, Abbotsford, Mission, Kent, Port Coquitlam, Coquitlam, Surrey and Langley.[124]

4.1.5 Potential Flood Impact on Agriculture

The occurrence of widespread inundation of land in the floodplain as a result of rising water levels, dike overtopping and/or a dike breach, poses a high-risk situation for agricultural production in this region.[125]

The potential consequences include an increase in crop and infrastructure damage and loss, relocation or loss of livestock, interruption to supply lines, and salination of soils.[126]

Considering the Fraser Valley Regional District (FVRD) and Metro Vancouver's farms generate more than 62% of the province's gross farm receipts (about $1.6 billion annually), the impact of severe flooding would be significant.[127]

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[120] "Flood protection should be a priority", *Chilliwack Times*. Subsequently confirmed by personal communication with John Les.

[121] Recent communications with the City of Richmond have indicated that damages would be significantly less than this.

[122] British Columbia Ministry of Forests, Lands and Natural Resource Operations.

[123] *Flood and the Fraser,* Fraser Basin Council, http://www.fraserbasin.bc.ca/water_flood_fraser.html. Accessed September 2, 2013..

[124] Pynn, Larry. "Next great flood imperils 300,000," *The Vancouver Sun,* January 24, 2003, citing the *State of the Fraser Basin* report issued by the Fraser Basin Council, Vancouver, January 24, 2003.

[125] Crawford E., MacNair E., *Fraser Valley & Metro Vancouver Snapshot Report*, B.C. Agriculture Climate Change Adaptation Risk + Opportunity Assessment Report, March 2012, the British Columbia Agriculture & Food Climate Action Initiative. http://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf. Accessed September 27, 2013.

[126] Crawford E., MacNair E., March 2012.

4.1.6 Increasing Risk of Flooding

As noted above, the Fraser Valley and other parts of the Fraser Basin have experienced two major floods of record, the largest in 1894 and the second largest in 1948. Scientists predict that there is a one-in-three chance that a flood of similar magnitude will occur within the next 50 years.[128]

Preventive planning and flood proofing are critical since a major flood today would have severe social, economic and environmental consequences.[129] These include risk of injury and loss of life, billions of dollars in damage to private and public property, temporary loss of infrastructure and community services, disruption of business and trade, degradation of water quality and harmful impacts on fish and wildlife habitat.[130]

Recent major flooding in Calgary and Toronto, as well as research concerning increased incidence in extreme weather as a result of climate change, has underlined the urgency for pursuing both analysis and action on flood protection along the Lower Fraser River.

Research carried out at the University of Northern British Columbia shows that the Fraser River is experiencing more extreme high and low water levels.[131] The variability stems from heavy rains and the loss of vegetation, notably from pine beetle infestation and deforestation, which would normally have retained more of the snowmelt.[132] Receding glaciers and more severe droughts, both of which are expected to worsen, are also contributing to variable water levels.[133]

Among other things, this research raises the question of whether the dikes along the Fraser will be high enough over the long term.[134] Professor Stephen Dery and others have predicted that so-called 100-year flood events will occur in roughly four to ten year intervals.[135]

4.2 Coping with Sea Level Rise

In addition to the threat of flooding from the freshwater sections of the Lower Fraser River, there is an increasing risk of flooding from the tidal portions of the river. Climate change is expected to result in increasing sea levels that would ultimately overtop the existing system of dikes designed to prevent such flooding. Other impacts affecting the tidal portion of the river could result in very large losses.

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[127] Fraser Valley Regional District. *Agricultural Economy in the Fraser Valley Regional District*. September 2011. P.7. http://www.fvrd.bc.ca/InsidetheFVRD/RegionalPlanning/Documents/Regional%20Snapshot%20Series/Agriculture%20Snapshot.pdf., cited in Crawford E., MacNair E.,, March 2012.
[128] *Flood and the Fraser.*
[129] *Flood and the Fraser*
[130] *Flood and the Fraser*
[131] *PICS Climate News Scan*, July 24, 2012. The PICS News Scan is produced by ISIS at the Sauder School of Business, University of British Columbia, and PICS, the Pacific Institute for Climate Solutions hosted and led by the University of Victoria. http://isistalks.sauder.ubc.ca/content/pics-climate-news-scan-24-july-2012. Accessed August 12, 2013.
[132] PICS Climate News Scan, July 24, 2012
[133] PICS Climate News Scan, July 24, 2012
[134] PICS Climate News Scan, July 24, 2012
[135] PICS Climate News Scan, July 24, 2012

4.2.1 Sea Level Increase, Storm Surge and Other Hazards

It is anticipated that that by the year 2100, sea levels at the mouth of the Fraser River will have increased by 1.2 metres. A concerted effort has been launched to plan for improvements to sea dikes and other protective mechanisms or new provisions for protection against sea level rise and other effects that threaten coastal areas in Metropolitan Vancouver.[136]

Protection is also required against the combined effects of storm surge, maximum high tide, wave effects and subsidence. Currently, a storm surge combined with high tides in El Nino years could overtop existing flood protection infrastructure, even without additional sea level rise.[137]

4.2.2 Salt Water Intrusion

Increasingly, there is a risk of salt water intrusion in or near the tidal areas of the Lower Fraser River. Under some conditions, dense saline water from the Strait of Georgia can be forced into the Fraser River by the incoming tide. This water can be pushed upstream as a wedge as far as New Westminster. [138] In addition to introducing salinity, this forces the downstream flow of fresh water over top of the saline water and causes the water level of the river to rise. [139]

This inflow of salt water affects the water quality in the river for irrigation. Although the prevalence of this tends to be greatest in the winter, [140] it can happen at other times. It affects the main arm of the Lower Fraser River, as well as the North Arm.[141]

As noted above, it is estimated that by the year 2100, sea levels in the Fraser River estuary could increase by as much as 1.2 metres.[142] As a consequence, the penetration of the salt wedge is likely to increase.[143]

Soil salinity can be a more general problem in Delta,[144] affecting agricultural capability in much of the agricultural land in the area.[145]

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[136] *Cost of adaptation – Sea Dikes & Alternative Strategies,* prepared by Delcan and subconsultants for the British Columbia Ministry of Forests, Lands and Natural Resources Operations, with the support of Natural Resources Canada. October, 2012. This report may be found at: http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/cost_of_adaptation-final_report_oct2012.pdf

[137] Crawford E., MacNair E., *Fraser Valley & Metro Vancouver Snapshot Report*, B.C. Agriculture Climate Change Adaptation Risk + Opportunity Assessment Report, March 2012, the British Columbia Agriculture & Food Action Initiative. http://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdfAccessed September 27, 2013.

[138] *Ambient water quality objectives for Fraser River sub-basin from Kanaka Creek to the mouth*. British Columbia Ministry of Environment, Water Management Branch, November, 1985. http://www.env.gov.bc.ca/wat/wq/objectives/fraserkanaka/fraserkanaka.html. Accessed September 27, 2013.

[139] *Ambient water quality objectives for Fraser River sub-basin from Kanaka Creek to the mouth*

[140] *Ambient water quality objectives for Fraser River sub-basin from Kanaka Creek to the mouth*

[141] *Ambient water quality objectives for Fraser River sub-basin from Kanaka Creek to the mouth*

[142] *Cost of adaptation – Sea Dikes & Alternative Strategies.*

[143] Bie, Lloyd, City of Richmond staff report on salinity of Fraser River Water, July 5, 2010.

[144] Crawford E., MacNair E., March 2012.

In addition, any breaching of a dike in the salt water reaches of the Fraser River estuary carries with it the threat of salination of agricultural soil and years of delay before the area can be returned to agricultural production. The longer term implications of salinated soils in the case of sea dike overtopping or breach is a fundamental threat to agriculture in this region.[146] The rate and depth of infiltration of salt water into the soils affects how much this situation can be managed, if at all. Mitigation options exist, but depend on investment and co-ordination across multiple levels of government.

4.2.3 Required Increases in Dike Levels

Dike crest levels used to develop the cost estimates in this study (see sections 4.2 and 4.2.1) are significantly greater than existing dike levels, which are based on design criteria from the 1970s.[147] The combined requirements for protection against these factors are over 6 metres in elevation.

Implementation would involve major construction along much of a total of 250 km of the Metro Vancouver coastal shoreline and the Fraser River shoreline, as far east as the Port Mann Bridge.[148] Sea level rise would also impact the shoreline upstream of the Port Mann Bridge, requiring the inclusion of additional areas in planning and construction.

4.2.4 The Need to Incorporate Protection Against the Seismic Effects of Earthquakes

There is also a need to incorporate protection against the seismic effects of earthquakes. These were taken into account in the preparation of the report cited above (see sections 4.2 and 4.2.1).[149] However, recent research concerning the potential amplitude of earthquakes that could impact Greater Vancouver and the Fraser Valley indicates that the seismic effects could be much larger than previously anticipated.[150] Any analysis of the work and costs to improve flood protection measures in Greater Vancouver and the Fraser Valley therefore needs to be reviewed to determine whether the degree of protection assumed to be required in fact needs to be increased.

4.2.5 Cost of Adaptation to Sea Level Rise and Other Factors

The total estimated cost of adaptation to sea level rise and other factors is $9.5 billion (before the potential increase noted in the preceding paragraph).[151] Of this total, $8.8 billion is the estimated cost for protection along the tidal part of the Lower Fraser River below the Port Mann Bridge (including Boundary Bay and coastal reaches adjacent to the mouth of the Fraser). This estimate does not include the Fraser Valley above that bridge.

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[145] "South Coast Panel, applications of interest," in *Agricultural Land Commission Annual Report, 2008-2009*, http://www.alc.gov.bc.ca/publications/annual_report_2009/pdf/southcoastpanelop.pdf
[146] Crawford E., MacNair E., March 2012.
[147] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[148] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[149] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[150] The Canadian Press, *Earthquakes amplified in silty Vancouver basin: study,* posted January 21, 2014, citing studies published January 21, 2014 in the *Bulletin of the Seismological Society of America.*
[151] *Cost of adaptation – Sea Dikes & Alternative Strategies.*

This estimate includes a contingency allowance of 50 per cent. Although a detailed analysis was carried out to arrive at the total cost, the magnitude of the contingency is indicative of the extent of the analysis required to provide a firmer estimate, and of the inherent uncertainties given the lengthy time horizon involved.

The cost estimate is applicable to the reconstruction and enhancement of the dikes, pumping stations, etc., and the addition of new features, such as flood barriers. The ongoing costs of monitoring and maintenance of the works are not included. [152] It must be noted that this cost estimate is also contingent on dredging continuing, with removal volumes roughly equalling disposition.[153]

It is important to have this estimate in order to be able to gauge the magnitude of the project and begin the task of organizing support, securing funding and developing an approach to project responsibility and management.[154] A long-term phased approach will allow for the necessary funding to be planned and budgeted. The areas of highest risk and/or highest economic value can also be prioritized.[155]

A gradual approach will have the benefit of being able to match planning and construction to the actual rate of sea level rise, which will likely influence revised estimates for the year 2100. [156]

The British Columbia Ministry of Forests, Lands and Natural Resources Operations commissioned the work undertaken in the study cited immediately above, with funding support from Natural Resources Canada. Workshops were held with provincial and municipal representatives in the process of identifying a preferred approach to protecting each of the 36 separate reaches along the shorelines in Metropolitan Vancouver that would be affected.

4.2.6 Flood Prevention Strategy

There is an urgent need to address the requirement to make large investments in flood protection infrastructure along the Lower Fraser River. The extent and importance of this, along with the jurisdictional complications, make it imperative that local, regional, provincial and federal levels of government be involved. As discussed later in this report, the decisions involved should be made within an overall regional flood protection strategy.

Some of the work to prepare a regional strategy is already in place or has been partially completed.

4.3 Maintaining Navigation and Overland Transportation Links

Maintaining (and enhancing) the navigation of overland transportation links to and across the Fraser River is critical to the ultimate livability of the Lower Mainland, and the prosperity of the provincial and

[152] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[153] Northwest Hydraulic Consultants in letter dated March 30, 2012 to Ministry of Forests, Lands and Natural Resources Operations. This letter is an essential part of the report cited above.
[154] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[155] *Cost of adaptation – Sea Dikes & Alternative Strategies.*
[156] *Cost of adaptation – Sea Dikes & Alternative Strategies.*

national economies. As mentioned previously, the Lower Fraser is ultimately a major transportation gateway that will continue to grow and connect to new markets.[157]

In order to maintain navigation capability on the Lower Fraser River, there are a variety of impediments that must be dealt with, some continuously and others at varying periods of time. Dredging, for instance, must be tended to annually. Other factors, such as the renewal of river crossings, need to be addressed at much longer intervals, as existing crossings become obsolete or demand requires new crossings.

Without a comprehensive vision for the region that dovetails with industrial land and cargo growth strategies, the livability of the Lower Mainland will decline as truck use of the roads increases, with a corresponding rise in congestion and decline in air quality. Several of these impediments and key transportation links are dealt with in the report sections immediately below.

4.3.1 Dredging the Lower Fraser River

To enable continued navigation on the Lower Fraser River, regular maintenance dredging is required. Dredging increases the flow capacity of the river. This is important to flood protection as it keeps water levels below dike levels during periods of increased flow, such as during spring freshets.[158]

The tidal part of the Lower Fraser River experiences substantial deposition of sediments brought down the river during the annual spring freshet. Each year during this period, approximately 32 million m^3 of sediment is transported by the Fraser River, with roughly 10 per cent of this material settling in the navigation channels of the lower reaches.[159]

The estimated outflow of load materials at Sand Heads (shipping entrance to the South (Main) Arm of the River) is about 40 per cent of the load at Mission and about 45 per cent of that downstream of New Westminster.[160] This suggests that the channel transport capacity decreases substantially downstream of New Westminster and that without ongoing dredging, the reaches between Sand Heads and New Westminster would experience rapid degradation in terms of draft and navigation.[161]

From 1900 to 1998, dredging was conducted by the federal government, but in 1998, responsibility was transferred to local port authorities on the Fraser River. The logic behind this transfer was that if the federal government did not dredge in all port administrations, it should dredge in none. Given the importance of the Fraser River to the region and the country, this policy may be inappropriate, and should be reviewed in light of the growth, opportunities and threats described in this report.[162]

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[157] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.
[158] *Dredging the Lower Fraser River: Multiple Accounts Evaluation Analysis,* InterVISTAS Consulting Group, prepared for Fraser River Port Authority, September 2005.
[159] Port Metro Vancouver PowerPoint presentation to the Richmond Chamber of Commerce, 2012.11.28.
[160] Hay & Company Consultants, Vancouver, letter addressed to Captain Dave Hart, Fraser River Port Authority, dated June 28, 2005.
[161] Hay & Company Consultants, June 2005.
[162] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

Since the port amalgamation in 2008, Port Metro Vancouver self-funds and administers Fraser River dredging programs, with a focus on international and domestic trade routes.[163] The ongoing cost of dredging varies from year to year given variation in sediment deposits. Dredging costs are partially offset through the sale of dredged sand for industrial uses such as construction fill. However, this is inadequate to fully cover the costs of dredging.

Sources knowledgeable about dredging costs in the Lower Fraser River have indicated that the gross annual total is approaching $20 million, and that the net annual cost after the sale of dredgate is roughly $12 million.

As sea levels continue to rise, the demand for dredged material may also rise to increase the elevation of affected sites. Consequently, there could be significant opportunities to increase revenues from the sale of this material.

Port Metro Vancouver is committed to providing dredging in support of international and domestic trade in a manner consistent with the purposes of the Canadian Marine Act. As a result of the transfer of dredging responsibility to the ports, as well as funding shortages, many local channels are not being adequately dredged. In various sections of the Lower Fraser River, docks have become inoperable and in some cases, vessels and floats have grounded in previously used channels.

For example, Ladner and Steveston Harbour have accumulated unmanageable amounts of sediment. In response to this situation, the federal government has announced a $10 million dollar funding initiative to dredge these local channels. This initiative is a multi-stakeholder collaboration between Port Metro Vancouver, the federal Department of Fisheries and Oceans, the provincial Ministry of Transportation and Infrastructure, the Corporation of Delta and the City of Richmond. The partners involved should be commended. However, the river will continue to deposit sediment annually and additional funding will be required in the near future.

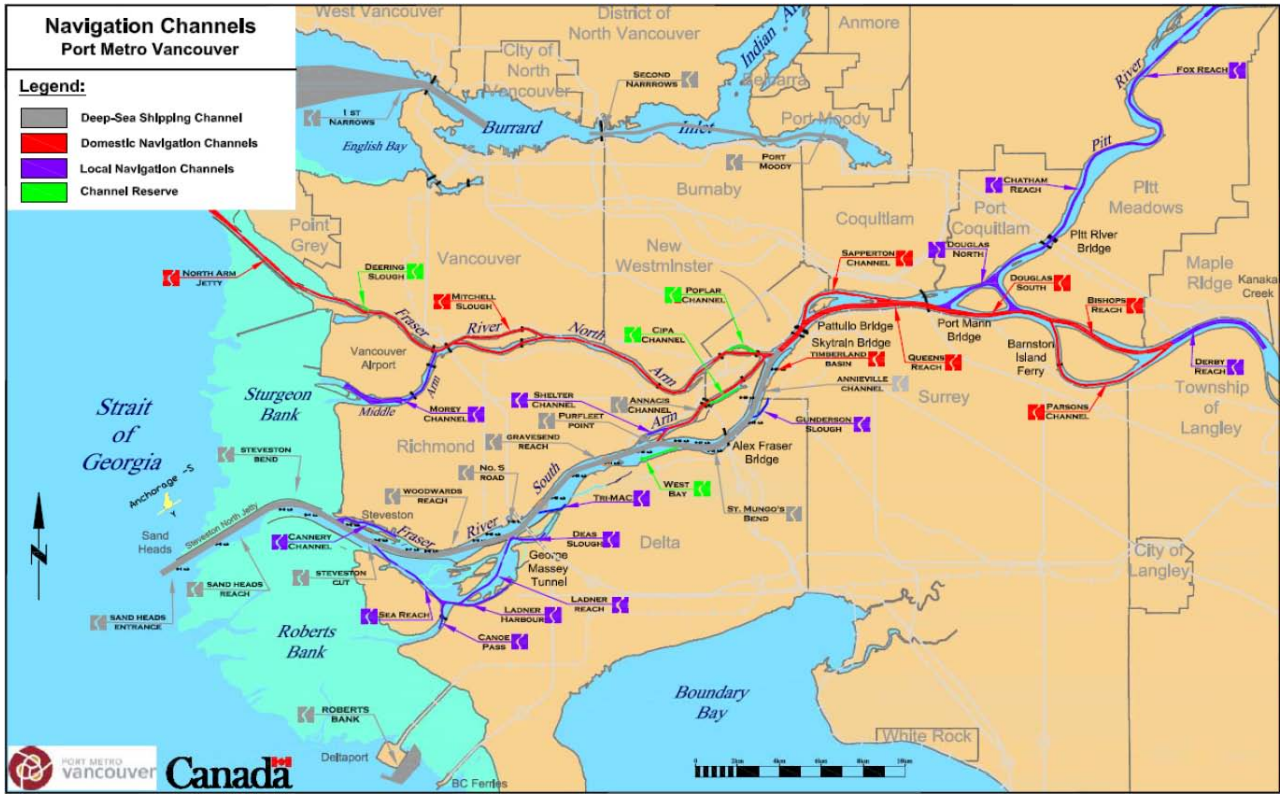
It is prudent that all levels of government and major stakeholders come together to put a long-term dredging plan in place. Allen Domaas, retired former CEO of the Fraser River Port Authority, has noted that the Fraser River is a kind of living entity that needs to be managed, and no one has taken responsibility for the overall maintenance.[164]

In the U.S., the dredging costs of commercial waterways are largely borne by the federal government through the U.S. Army Corps of Engineers. In particular, this places the use of the Fraser River for navigation at a disadvantage in comparison with competing ports on the Columbia River.[165] At the same time, the funding for dredging is raised by a tax on all U.S. ports – so, for example, the Seattle ports would be subsidizing the Columbia River ports.

[163] PMV PowerPoint presentation to the Richmond Chamber, 2012.11.28.
[164] Comment at event: *Doing Business on The Fraser River,* September 19, 2013, presented by The Surrey Board of Trade and the New Westminster Chamber of Commerce, at New Westminster, B.C.
[165] InterVISTAS Consulting Group, September 2005.

In the U.S. model of port administration, the port authority owns and administers terminals and some connecting infrastructure. It may be time for Canada to re-examine this model. The competitive pressures and factors outlined in this report indicate a need to bring the federal government mandate for channel maintenance back into focus.[166]

The following map illustrates the various river channels within the jurisdiction of Port Metro Vancouver that require regular maintenance dredging. As discussed further with respect to the Massey tunnel crossing of the river, a major aspect of future dredging requirements will be the shipping channel between the tunnel and the Sand Heads, where the channel ends and deeper water of the Strait of Georgia begins.



Map Courtesy of Port Metro Vancouver

4.3.2 The Port Mann Bridge

The original Port Mann Bridge over the Fraser River between Surrey and Coquitlam/Port Coquitlam was built in the early 1960s. As the population of the Greater Vancouver region grew and its centre shifted towards the east and increasingly to the south of the Fraser, the bridge became part of the most important east-west corridor in the region and an essential link between areas to the south and to the north of the river. Traffic over the bridge and along Highway 1 between the Fraser Valley and

[166] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

Burnaby/Vancouver via the bridge became increasingly congested, so that prior to replacement of the bridge, it was clogged in both directions on average for more than half of each 24-hour day.[167]

The replacement project is now nearly complete. In addition to the construction of a new, 10-lane cable-stayed bridge, Highway 1 is being widened over a length of 37 kilometres between Grandview Highway in the City of Vancouver and to east of 200th Street in Langley. Seven Highway 1 overpasses are being widened, nine Highway 1 interchanges are being replaced, and 15 new overpasses and underpasses will be built or rebuilt at the Cape Horn interchange.[168]

Additional HOV lanes are being built, special purpose ramps are being added at five locations, provisions are being made to add light rail rapid transit in the future, and the new bridge will have paths for both pedestrians and cyclists. The bridge will have 42 metres of navigational clearance above high water level (the same length and clearance as that already in place).[169]

The improvements will significantly reduce travel times along the corridor, and are designed to improve connections within and between communities. Goods movement will be eased, and transit service along the corridor will be facilitated. The safety of those using the corridor will be increased.[170]

The total cost to build the PMH1 Project, including construction, operations and maintenance, rehabilitation and interest, will be approximately $3.3 billion.[171] In addition to providing a much improved crossing of the Lower Fraser River with good navigational features for river traffic, the project is having and will continue to have a major positive economic impact.

4.3.3 Replacement of the George Massey Tunnel

An important constraint affecting the maximum draft for vessels using the Lower Fraser River is the George Massey Tunnel.[172] The tunnel is a key link enabling traffic on Highway 99 to cross the South Arm of the Fraser River near where it empties into the Strait of Georgia.

Built over 50 years ago, the four-lane tunnel is reaching the end of its service life, and is already beyond its traffic capacity. Anticipated substantial additional residential, commercial, industrial, port and

[167] Port Mann/Highway 1 Improvement Project, *Project Cost & Timing,* http://www.pmh1project.com/info-centre/faq/Pages/Project-Cost-Timing.aspx Accessed January 29, 2014.

[168] Port Mann/Highway 1 Improvement Project, *Project Overview,* http://www.pmh1project.com/about-the-project/project-overview/Pages/default.aspx Accessed January 29, 2014.

[169] Port Mann/Highway 1 Improvement Project, *Facts & Trivia.* http://www.pmh1project.com/about-the-project/project-overview/Pages/Facts-Trivia.aspx Accessed January 29, 2014.

[170] Port Mann/Highway 1 Improvement Project, *Benefits,* http://www.pmh1project.com/about-the-project/project-overview/Pages/Benefits.aspx Accessed January 29, 2014.

[171] Port Mann/Highway 1 Improvement Project, *Project Cost & Timing.*

[172] The quotations in this section referring to subjects prior to the decision to replace the tunnel with a bridge are extracted from a letter to Minister Mary Polak, Minister of Transportation and Infrastructure, Province of British Columbia, from The Vancouver Board of Trade, dated January 25, 2013. http://www.boardoftrade.com/documents/George%20Massey%20Tunnel%20letter.pdf, Accessed August 28, 2013.

Canada-U.S. road traffic on Highway 99 threatens to aggravate the congestion through the tunnel. The Corporation of Delta estimated the cost of the George Massey Tunnel's road congestion at $66 million in 2008. By 2041, the congestion could cost our economy an estimated $100 million per year.

The draft limit for ships passing over the top of the tunnel currently is less than 12 metres. With the increasing draft of ships that would use the river for navigation, and in particular the deepening of the Panama Canal (now slated for completion in 2015), ships with drafts of over 18 metres could potentially need to serve terminals upstream of the tunnel.

Any deepening of the shipping channel and its ongoing dredging to the new depth would require a business case justification with respect to that depth and corresponding cost, taking into account the shipping volumes and vessels to be involved. A large majority of dredging required is in the first few kilometres of the river upstream from its mouth at the Sand Heads, i.e. is downstream from the location of the Massey Tunnel.

Another concern is that the George Massey Tunnel poses a significant seismic risk. Designed at a time before earthquake resistance was well understood, the tunnel is vulnerable to even moderate earthquakes. Research has shown that large earthquakes have occurred and will again occur in southwestern British Columbia.

The Corporation of Delta has identified the George Massey Tunnel as one of the worst areas for traffic accidents on Highway 99. And yet, the loss of the tunnel would throw Lower Mainland traffic into chaos for years.

It is clear that replacement of the tunnel is an urgent priority – and the British Columbia Ministry of Transportation and Infrastructure has agreed to proceed with such a project.[173]

On September 20, 2013, Premier Christy Clark announced that the Massey Tunnel would be replaced with a new bridge on the existing Highway 99 corridor.[174] Construction of the new bridge is to begin in 2017. In the interim, engineering and technical work will proceed on the project, with development of a more detailed project scope and business case for the bridge and associated improvements in the Highway 99 corridor. The results are to be released for public discussion.[175]

The project is subject to environmental review.[176]
As noted above, with the deepening of the Panama Canal now projected for 2015, ships with drafts of over 18 metres could potentially need to serve terminals upstream of the tunnel.

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[173] *George Massey Tunnel Replacement Project,* Ministry of Transportation and Infrastructure, http://engage.gov.bc.ca/masseytunnel/, Accessed August 28, 2013.
[174] *B.C. moves forward with bridge to replace Massey Tunnel,* news release, Office of the Premier, September 20, 2013. http://www.newsroom.gov.bc.ca/2013/09/bc-moves-forward-with-bridge-to-replace-massey-tunnel.html. Accessed September 20, 2013.
[175] *B.C. moves forward with bridge to replace Massey Tunnel.*
[176] *George Massey Tunnel Replacement Project.*

However, there could be problems with the length of these ships interfering with their ability to turn around in the river. The present maximum length of a ship that can turn around in the South (main) Arm of the river in relation to the shipping channel is approximately 300 metres.[177]

After the George Massey Tunnel is removed, the size of vessels navigating the South Arm will be determined by the width of the navigation channel. The dredged width and depth of that channel will determine the vessel limitations up to a maximum length of approximately 300 metres. While removing the tunnel will allow the passage of vessels with drafts greater than the current limit of 11.5 metres, the anticipated economic impacts will need to justify the extent of any future dredging to accommodate increased vessel sizes.[178]

The major volume and cost of dredging to meet this challenge, as noted earlier in this report, would be the shipping channel between the tunnel and the Sand Heads, where the channel ends and deeper water of the Strait of Georgia begins.

4.3.4 South Fraser Perimeter Road – Highway 17

Approximately 40 km long, the South Fraser Perimeter Road (SFPR) is a new four-lane expressway along the south side of the Fraser River and across the area of Delta from Highway 99 to near the BC Ferries terminal and Roberts Bank deep sea shipping terminal.[179]

Completed in late 2013 at a cost of $1.25 billion, the SFPR is part of Highway 17 in Metro Vancouver, which connects the Tsawwassen ferry terminal in southwest Delta to 176 Street (Highway 15) in North Surrey. Strategically located, the South Fraser Perimeter Road (SFPR) also connects to Highways 1, 91, 99 and the Golden Ears Bridge.[180]

SFPR connects to all five major Fraser River crossings, which will save motorists time and offer more travel options. As an example, travel time between Highway 1 and the Tsawwassen ferry terminal is now less than 30 minutes, compared with travel times of double that using Highway 10.[181]

With the other major highway and river crossings – both existing and planned – along the Fraser River estuary, the SFPR is a key part of the much improved highway system serving this part of the Lower Fraser River and adjacent lands and communities.

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[177] Information provided by Port Metro Vancouver.

[178] Information provided by Port Metro Vancouver.

[179] *South Fraser Perimeter Road (Highway 17),* Fraser Transportation Group. http://www.sfprhighway17.ca/

[180] *South Fraser Perimeter Road (Highway 17),* Fraser Transportation Group. http://www.sfprhighway17.ca/

[181] *South Fraser Perimeter Road, B.C.'s newest highway, opens.* British Columbia Ministry of Transportation and Infrastructure, December 21, 2013. http://www.newsroom.gov.bc.ca/2013/12/south-fraser-perimeter-road-bcs-newest-highway-opens.html. Accessed April 9, 2014.

4.3.5 Pattullo Bridge

The Pattullo Bridge over the Fraser River links Surrey and New Westminster, as well as adjacent municipalities, and is a critical transportation link for the movement of people, goods and services.[182] On average, about 73,000 vehicles per weekday travel over the bridge.

The aging bridge faces a number of challenges, including seismic and structural concerns. Its structure and foundation are 76 years old and many components have surpassed their useful lives. The bridge is vulnerable to damage from even a moderate earthquake or ship collision, and does not meet current roadway guidelines, including lane widths and curvature, which creates safety and reliability issues.[183]

Traffic over the bridge (including trucks) affects the livability of adjacent communities due to air quality, noise and resulting health impacts, as well as neighbourhood traffic infiltration. TransLink owns the Pattullo Bridge and is responsible for the safe and efficient movement of people, goods and services on the bridge.[184] New Westminster, Surrey and TransLink are working together to review and evaluate potential alternatives to rehabilitate or replace the Pattullo Bridge.

The review partners aim to determine a solution that meets the needs of the communities connected by the bridge and the region overall, while ensuring the efficient movement of people, goods and services.[185] The goal is to identify a suitable funded solution no later than fall 2014.

4.3.6 New Westminster Rail Bridge

The New Westminster Rail Bridge, built in 1903-1904, is owned by the Government of Canada[186] and is operated and maintained by CN through an entrustment agreement.[187] This rail bridge across the Fraser River between New Westminster and Surrey is a key link in the Lower Mainland transportation system that affects the rail transportation part of the system in particular, but also marine transportation on the river, as well as ocean shipping. The bridge is used by all railways in the area, except for the West Coast Express.[188]

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[182] TransLink, *Pattullo Bridge,* www.translink.ca/en/Plans-and-Projects-Bridges-and-Goods-Movement/Pattullo-Bridge.aspx. Accessed November 25, 2013.

[183] Kirk & Co. Consulting Ltd. & Mustel Group, *Pattullo Bridge Review Consultation June 2013: Consultation Summary Report, September 2013.* http://www.pattullobridgereview.ca/wp-content/uploads/2013/05/Pattullo_Consultation-Summary-Report_September-2013.pdf Accessed December 30, 2013.

[184] Kirk & Co.

[185] TransLink, *Pattullo Bridge.*

[186] *Wikipedia*, "New Westminster Bridge," http://en.wikipedia.org/wiki/New_Westminster_Bridge. Accessed October 22, 2013.

[187] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[188] IBI Group, in association with Hatch Mott MacDonald, PriceWaterhouseCoopers LLP and Golder Associates, *Lower Mainland Rail Infrastructure Study,* December 2004, prepared for the Greater Vancouver Gateway Council. http://www.tc.gc.ca/media/documents/policy/136-gatewayexecsummary.pdf Accessed October 22, 2013.

On the rail system, an aging New Westminster Rail Bridge causes significant delays to rail cargo movements serving the Port of Vancouver.[189] A major part of this problem relates to the conflict between rail traffic and marine traffic, given that this is a swing bridge where marine movements take precedence. This prevents rail traffic from crossing for a substantial amount of time each day. The capacity of the existing bridge causes significant delays to all users, and will become an increasing issue in the future. In 2003, there were approximately 46 trains per day using this river crossing.[190]

The bridge is prone to being struck by marine traffic such as barges, and some of these collisions have resulted in serious damage to the bridge and its subsequent closure for relatively long periods. The narrow spans of the railway bridge limit the size of vessels that can transit the river, and ultimately increase the potential for collisions.[191] The bridge was the third most vulnerable to collision (by marine traffic) in all of Canada in the 1980s and remains susceptible, with the potential for major disruptions to cargo movement in the gateway.[192]

Replacement of the New Westminster Rail Bridge was the top priority improvement for the rail network in the Lower Mainland, according to a comprehensive 2003 report concerning the commercial transportation system in Greater Vancouver.[193] The replacement proposed would be a two-track tunnel – the preferred option as this would avoid conflict with marine traffic. An order of magnitude cost estimate for replacement of the New Westminster Rail Bridge, cited in 2003, was $750 million to $1000 million.[194]

The report identified two bottlenecks in particular, potentially limiting the future growth of train volumes passing through the New Westminster Bridge (the route to downtown ports) and the Colebrook East-West facility (the route to Roberts Bank).[195]

Together in 2003, these facilities were operating at an average level of 69 trains/day, which is well within their estimated combined operating capacity of 82 trains/day.[196] However, projections for future growth of rail traffic to/from the marine ports indicate that there will be full usage of all capacity at these bottlenecks by the year 2015.[197] By the year 2021, the rail capacity shortfall – which represents an effective loss of potential growth in commodity flows – will be the equivalent of 11 trains/day to or from the marine ports.[198]

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[189] Delcan and Economic Development Research Group, *Economic Impact Analysis Of Investment In A Major Commercial Transportation System for the Greater Vancouver Region,* Greater Vancouver Gateway Council, 2003. http://www.gvgc.ca/pdf/SW1040_FinalReport_Revised2.pdf. Accessed October 21, 2013.

[190] Delcan and Economic Development Research Group.

[191] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[192] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

[193] Delcan and Economic Development Research Group.

[194] Delcan and Economic Development Research Group.

[195] Delcan and Economic Development Research Group.

[196] Delcan and Economic Development Research Group.

[197] Delcan and Economic Development Research Group.

[198] Delcan and Economic Development Research Group.

The Lower Mainland Rail Infrastructure Study, completed in 2004, offers somewhat different conclusions.[199] That study recommended that an engineering analysis be carried out to ascertain the physical feasibility and risk of maintaining and rehabilitating the existing New Westminster Rail Bridge.[200] If the engineering analysis determined that the bridge could not be rehabilitated to provide security of use over the planning period to 2021, then the preferred improvement alternative would be to replace the bridge with a new, higher level, lift bridge at a cost of approximately $110 million, much less than the $420 million cost of a tunnel.[201] These numbers differ from those in the 2003 report cited earlier.

If the bridge can be rehabilitated, as described above, an alternative rail operations strategy involves the railways sharing, in a coordinated arrangement using commercial agreements, the available rail capacity. With such an arrangement, there would be substantial network capacity available to accommodate projected growth, at least until 2021.[202]

Confidential discussions with knowledgeable sources indicate that the railways have successfully pursued the latter strategy. The longer-term strategy with respect to the New Westminster Rail Bridge is yet to be determined.

4.4 Preserving Industrial Lands

The map on the following page shows the extent of industrial lands in Greater Vancouver as of 2010. A substantial majority of these lands are obviously adjacent to the Fraser River, reflecting the role that the river has played in the development of industry in the region.

As Vancouver's mayor has observed, "The river made possible the industrial development and growth that was pivotal in the shaping of the city,"[203] but over the past several decades, we have seen a significant loss in lands used for industrial purposes, as well as those protected for future industrial use through the regional designations. Much of the loss of industrial lands has occurred along the shorelines of the Fraser River and Burrard Inlet that have historically accommodated port-oriented industry.

Between 1980 and 2010, the City of Vancouver lost 187 hectares of industrial land, Richmond lost 320, and Burnaby lost 706. Surrey, which in recent years has become much more business focused, lost 1771 hectares of industrial land during this period.[204]

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[199] IBI Group 2004.
[200] IBI Group 2004.
[201] IBI Group 2004.
[202] IBI Group 2004.
[203] Robertson, Gregor, Mayor of the City of Vancouver, speaking in June 2011, cited by Mither, Peter, in "Port makes plea for everyone to defend industrial land as marketers push 'last' waterfront properties," *Business in Vancouver,* May 14, 2013. http://www.biv.com/article/20130514/BIV0320/305149939/-1/BIV/port-makes-plea-for-everyone-to-defend-industrial-land-as-marketers
[204] Port Metro Vancouver, notes accompanying slides titled *Our Jurisdiction,* private communication; now public.

Port representatives have noted that the proposed Roberts Bank Terminal 2 will occupy only 115 hectares, and highlighted the potential number of jobs the lost 3,000 hectares of industrial land outlined above would have supported.

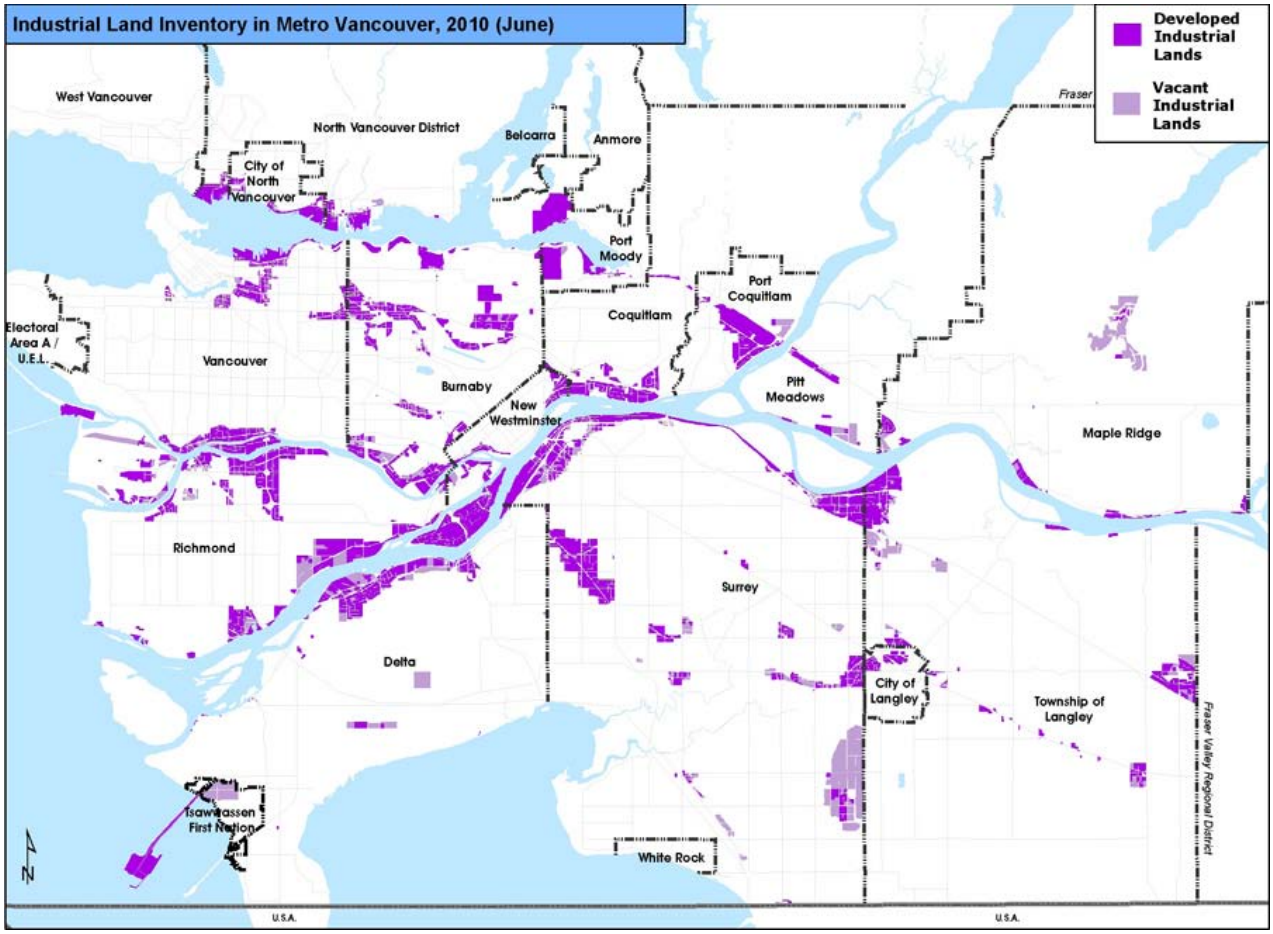
Port management has commented that this reduction of industrial lands, particularly along the waterfront is a big concern.[205] The land is essential, they say, in order to meet the demands of the growing economy and provide the jobs that will be needed in the future.[206]

4.4.1 Measures Concerning Industrial Land

Port Metro Vancouver is planning measures to deal with the situation. Among other things, these include securing the best sites on the waterfront and reserving the best possible uses in support of Canada's trade.[207] As Port President and CEO Robin Silvester put it, "It's not a question of if the port will need to grow in the face of growing global demand for products and commodities – but how."[208] He adds that, "It is not only the port which is expected to grow. So, too, is Metro Vancouver. By 2040, an additional one million people will be living in the region."[209]

To support this growth, to provide new jobs for these additional people, the region will need a secure source of industrial land.[210] The Lower Fraser River actively supports a significant cluster of manufacturing and processing businesses which contribute to the regional economy.[211]

[205] Notes to slide presentation by Port Metro Vancouver, slide 2 (circa 2010.)
[206] Yeomans, Greg, addressing B.C. Chapter of the Urban Land Institute, Vancouver, May 2, 2013, cited by Mither, Peter.
[207] Yeomans, Greg
[208] Silvester, R. president and CEO of Port Metro Vancouver. "Growing port creates prosperity", *The Vancouver Sun,* August 7, 2013.
[209] Silvester, R.
[210] Silvester, R.
[211] InterVISTAS Consulting Group, September 2005.



Source: Industrial Land Inventory in Metro Vancouver, June 2010

4.4.2 Economic Premium for Land Adjoining the River

One of the economic effects of the Lower Fraser River in developable areas is that lands adjacent to the river command a higher price as a consequence of that proximity.[212] This in part involves industrial or commercial uses where access to the river is important. It also involves residential sites offering an attractive view of the water.

The demand for residential land in the region has put tremendous pressure on industrial land that is in transition. As a result, most industrial land in transition has been converted to residential use. These conversions then exert more pressure on any existing industrial neighbours, often leading to a domino effect of more industrial conversions.[213]

From a community perspective, the recreational opportunities on and near the river also offer a valuable asset, as discussed earlier in this report.

[212] Information provided by knowledgeable source in the real estate industry.
[213] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

4.4.3 Historical Example: Decline of the Lower Fraser River Forest Products Industry

The history of forest product logistics provides a solid example for the need for unified land use planning in the Lower Mainland.[214]

Historically, almost all timber cut on the coast of British Columbia was brought to the Fraser River for processing. This movement was driven by two factors: 1) the Lower Mainland provided a large labour force to work in sawmills along the river with minimal cost for housing and transportation, as the employees lived close to the mills; 2) the fresh water of the Fraser and Pitt Rivers killed the marine borers that attacked logs when they were in salt water.

Large log inventories could be assembled in the Fraser system, allowing the wood products industry to respond quickly to the worldwide lumber market. But over time, as the logistics of wood products changed, land use along the Fraser River evolved.

Historically, forest products milled along the river were brought by barge from sawmills to ship side in New Westminster and loaded for foreign destinations. Today, with the advent of containerization, forest products are now loaded into containers either at the mill or at central assembly points. The containers are then moved to container terminals for export.

As the method of shipment changed and the productivity of log processing improved, the number of mills required to process timber declined. When mills and shipping facilities closed, they typically went to the next highest bidder for the land – the residential sector.

Today, the region has a protected supply of agricultural land, but no corresponding legislation was ever passed to identify and safeguard industrial land. This has contributed significantly to a decline in regional industrial land inventory, particularly along the water. This was confirmed by a Metro Vancouver study in 2006, which forecast the end of the industrial land inventory in the second half of this century.

4.5 Coordinating the Multiple Stakeholders and Stewards of the River

One of the main challenges in managing the Lower Fraser River is coordinating the many government and non-government stakeholders that maintain or manage the river. At the time of writing this report, there were 15 municipal governments and 29 First Nations groups along the banks of the Lower Fraser River, and over 20 provincial and federal ministries either involved in the direct administration of the Lower Fraser River, or with a significant interest in the waterway's sustained maintenance and use.

Additionally, there are countless private/public stakeholders such as Port Metro Vancouver, CN and CP Rail, YVR and BC Hydro which have an invested interest in the Lower Fraser River. (An extensive list can be found in Appendix C.)

[214] This information concerning the forest products industry along the Lower Fraser River was provided by Allen Domaas, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

The following section provides insight into the administrative, jurisdictional, and political challenges to administering the Lower Fraser River.

4.5.1 Administrative Challenges

Authority and oversight is vested with various federal, provincial, regional and municipal government departments, with work often being carried out in isolation and not as part of a comprehensive plan to address ongoing maintenance, operational and strategic requirements. Below is a list of sample legislation, at various levels of government, which may have an impact on the process for conducting maintenance and other work on the Lower Fraser River:

Government of Canada federal legislation [215]

- Canadian Environmental Assessment Act: provides for the environmental assessment of projects where the proposed project is on federal land (e.g. Indian reserve); under federal sponsorship and where a federal act applies (e.g. the *Navigable Waters Protection Act*).
- Canadian Marine Act: act for making the system of Canadian ports competitive, efficient and commercially oriented, providing for the establishing of port authorities and the divesting of certain harbours and ports, as well as other matters related to maritime trade and transport, and amending the *Pilotage Act*.[216]
- Canadian Environmental Protection Act: aimed at protecting the environment and human health by managing toxic substances, marine pollution, disposal at sea and other sources of pollution.
- Canada Water Act: provides for the co-operative management of water resources and water quality. If an agreement cannot be reached with the province, the Act provides for unilateral action by the federal government.
- Fisheries Act: the federal government has ultimate authority over fish and fish habitat through the *Fisheries Act.* Water quality is protected through provisions providing for the prevention of the pollution of waters inhabited by fish.
- Navigable Waters Protection Act: protects the public right to marine navigation and protects the safety of mariners and the marine environment (includes freshwater).

British Columbia Provincial legislation [217]

- Dike Maintenance Act: establishes the inspector of dikes to supervise the construction and maintenance of dikes and operation of dike authorities.
- Drinking Water Protection Act: requirements for emergency response, water monitoring, water source and system assessments, a process for preparing a drinking water protection plan, and other protective measures for drinking water supplies.

[215] Ministry of Environment, Water Stewardship Legislation, Overview for Waters, April 16, 2014 http://www.env.gov.bc.ca/wsd/water_rights/overview_legislation/index.html

[216] Transport Canada, Canadian Marine Act Summary, April 14, 2014 http://www.tc.gc.ca/eng/acts-regulations/acts-1998c10.htm

[217] Ministry of Environment, Water Stewardship Legislation, Overview for Waters, April 16, 2014 http://www.env.gov.bc.ca/wsd/water_rights/overview_legislation/index.html

- Drainage, Ditch and Dikes Act: establishes a comprehensive scheme for the regulation and authorization of ditches, watercourses, dikes and drainage.
- Environmental Assessment Act: establishes an environmental assessment process for the province and requires an environmental assessment certificate before a major project can be constructed. Hydroelectric power projects with the capacity to produce 50 megawatts or more are subject to review under this legislation, as are certain major projects relating to dams, dikes, water diversion, ground water extraction and shoreline modification.
- Environment Management Act: regulates industrial and municipal waste discharge, pollution, hazardous waste, and contaminated site remediation. It also requires the preparation of environmental plans for flood control, drainage, soil conservation, water resource management, waste management, and air quality management.
- Fish Protection Act: protects fish and fish habitat and authorizes the designation of "sensitive streams" for fish sustainability; covers provincial directives for streamside protection and reduction in water use during periods of drought (temporary) or in accordance with a water management plan.
- Park Act: provides for the establishment, classification and management of provincial parks and recreation areas dedicated to preserving the natural environment.
  Water Act: act provides for the allocation and management of surface water by authorizing the issuance of water licenses and approvals, the creation of reserves, development of water management plans, and establishment of water user communities.

Municipal legislation (varies among different municipalities)

- Compliance with the Official Community Plans: particularly if there is to be a change in zoning.
- Individual Municipal Bylaws: particularly regarding building by-laws.
- Local Government Act: from the perspective of water management, of greatest significance are powers and responsibilities relating to land use, growth, infrastructure (e.g. storm water management), works, and similar matters.[218]
- Minimizing impacts on residents: this can be an issue where river dredgeate is being deposited by direct pump, requiring the return of large amounts of water back to the river. This often requires the use of road and drainage rights of ways.
- Park and Trail Strategies: many local plans envision "integrated" trails system that connect the ends of trails together to create longer pathways. Unfortunately, this can pose challenges when "integrating" the trail with the adjacent river and upland uses.
- Riparian Setback Regulations: intended to protect riparian areas during residential, commercial, and industrial development by ensuring that proposed activities are subject to a science-based assessment,[219]

[218] Ministry of Environment, Water Stewardship Legislation, Overview for Waters, April 16, 2014
http://www.env.gov.bc.ca/wsd/water_rights/overview_legislation/index.html
[219] B.C. Government, Riparian Areas Regulation, April 16,2014
http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/riparian_areas.html

The processes required by these various jurisdictions can take months or often years to obtain approval. When approval is granted, limited time frames are given to complete the work. In many cases, these time frames are during freshet, when the river is too turbulent and full of debris for work to be carried out.[220]

4.5.2 Jurisdictional Challenges

The prior list of sample legislation at various levels of government speaks to the administrative challenges encountered in gaining approvals for any desired course of action, once that course of action is decided upon by the proponent.

But therein lies what is perhaps a more significant issue in managing the Lower Fraser River. Various aspects of managing the full breadth of this complex and highly interdependent system (physical, as well as economic) are in the hands of different agencies, each with different priorities and mandates.

Using dredging as an example, the primary authority for dredging the Lower Fraser River is in the hands of Port Metro Vancouver. Port Metro Vancouver manages the river with a view to maintaining navigable waters for Port activity. However, it is not tasked with planning and/or undertaking dredging that serves other needs, such as maintaining small craft harbours, flood management, or protecting/preserving Steveston Village. And they should not be tasked with this, given their mandate to run (and grow) the port. It could be argued that if Port Metro Vancouver spent money on non-essential (from the point of view of port operations) dredging and thereby diverted those funds from mission-critical port initiatives; they would in fact not be acting within their mandate.

The problem is not that Port Metro Vancouver is not acting in accord with its purpose or mission. The problem is a jurisdictional one: the current jurisdictional framework precludes, or at least significantly inhibits, viewing all facets of dredging as part of a holistic response to the various challenges facing the river.

The same can be said of managing the floodplain. In 2004, the Province of British Columbia transferred responsibility for all aspects of floodplain management to local governments, which were then made responsible for taking decisions about local floodplain development practices, including floodplain bylaws within their communities. This type of approach results in work being done in geographically or deliberately isolated areas, rather than as part of a comprehensive flood management plan for the entire Lower Fraser River.[221]

Similarly, the preservation of industrial lands along the river suffers from a jurisdictional problem. With the exception of lands owned by Port Metro Vancouver, each municipality along the river manages its own land inventory by controlling zoning and permitting. Again, it is not a question of whether or not any given local government is acting in the best interests of its municipality, but whether that means the problem of industrial lands could be addressed from a more holistic perspective.

[220] British Columbia 2013 Policy Resolution, Fraser River Navigation Management Policy 2013
[221] B.C. Chamber of Commerce, Fraser River Flood Management Policy 2013

Ultimately, every jurisdiction and stakeholder with a vested interest in or around the Lower Fraser River has a mandate to its specific constituents or shareholders. To ensure the future sustainability and prosperity of the river, and its continued role as a key economic generator for British Columbia and all of Canada, it is prudent that an overarching, multi-jurisdictional stakeholder group be established to initiate a long-term, holistic, management and funding strategy.

4.5.3 Political Challenges

As noted elsewhere in this report, possible response options to some of the challenges facing the Lower Fraser River will require extensive (in the range of 100 years) planning and substantial financial commitments (in the $8-10 billion range just for responding to sea level rises). Management plans and funding commitments need to be made that extend well beyond the political mandate of any currently elected government, at any level.

Election cycles vary across Canada, but approximately every three to five years, there is the certainty of various elections, at multiple levels of government, which result in different parties or policymakers in positions of power. Conversely, management of the Lower Fraser River requires a long-term management plan to prepare for numerous issues, including future population expansion, economic growth, increased agriculture, climate change, sea level rise, and eventual flooding occurrences.

In order to address the inherent political challenges that a democratically elected system presents, all levels of government must urgently work together to develop a multi-jurisdictional, long-term management plan which is insulated from political pressures of the day. Compromises will inevitably need to be made across jurisdictions. However, these are not insurmountable impediments to finding the right solutions to establish a long-term holistic management plan for the Lower Fraser River.

4.5.3.1 Example: The Elimination of FREMP

Launched in 1985, the Fraser River Estuary Management Program (FREMP) was set up as an intergovernmental partnership among federal, provincial, and regional governments and port authorities to coordinate planning and decision-making in the Fraser River estuary. [222]

Adopted by FREMP in 1994 and updated in 2003, the *Fraser River Estuary Management Plan*: "*A Living Working River"* (EMP) provides a framework for integrating the management of human and natural activities in the estuary.[223] The plan integrates habitat management and recreation activities with strategies for water and sediment quality, log management, navigation and dredging, and urban and water-related industrial development.[224]

As of early 2013, funding specifically for FREMP expired. However, the process of reviewing projects to ensure that activities continue to align with federal and provincial legislations pertaining to environment and navigation continues. According to a FREMP project review, "While our governing agencies work

[222] *Fraser River Estuary Management Plan:* "A Living Working River",
[223] *Fraser River Estuary Management Plan.*
[224] *Fraser River Estuary Management Plan.*

towards a new model of integrated management, as of March 1st, 2013 all applications for coordinated project review will be accepted by Port Metro Vancouver."[225]

The "downsizing" of FREMP likely had the largest negative impact on the integrated management of the Lower Fraser River. The effort by FREMP to merge the programs of all levels of government was seen around the world as one of the most effective models to save and enhance urban river sheds. While many directly involved in the program saw value, the lack of political will and funding led to the reduction and limitations currently applied to the program.[226]

4.5.4 The Fraser Basin Council

The Fraser Basin Council (FBC) is a charitable, non-profit organization that brings people together to advance sustainability in the Fraser River Basin and across B.C. Established in 1997, FBC is a collaboration of four orders of government (federal, provincial, local and First Nations) along with the involvement of the private sector and civil society.[227]

At present, FBC is developing a business plan titled *Advancing a Collaborative, Regional Approach to Flood Management in British Columbia's Lower Mainland*. After extensive consultations with representatives from various levels of government and key stakeholders, FBC has developed a collaborative, multi-phased business plan to begin to address the long-term flood management requirements of the Lower Fraser River. The primary purpose of the collaborative is to advance the development and initial implementation of a regional approach.[228]

FBC is a functioning example of the benefits of coordinating multiple stakeholders and stewards of the Fraser River. Over a period of 20 years, the Fraser Basin Council has engaged the public in all regions of the Fraser River on how and what "sustainability" of the river should look like. Knowing that sustainability is best represented by a balancing of environmental, social and economic factors, and that the myriad agencies that administer unique aspects of the Lower Fraser River fall into one of these categories, the FBC is an appropriate organization to start a discussion in order to move forward.[229]

4.6 Summary of Key Lower Fraser River Economic Threats

In summary, the impact on the provincial and national economy from a significant breach of the Fraser River diking system could be in the order of billions or tens of billions of dollars, and likely would outstrip the costs of implementing a proactive long-term management system.

It is imperative to enhance the flood management system along the Lower Fraser River. It is also critical to ensure future regional economic growth through the preservation of industrial lands, and enhancement of the infrastructure adjoining and crossing the river. As a driving factor in Canada's

[225] *Project Review,* Fraser River Estuary Management Plan. http://www.bieapfremp.org/fremp/projectreview/index.html Accessed January 30, 2014.
[226] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.
[227] *About the Fraser Basin Council* http://www.fraserbasin.bc.ca/about_fbc_history.html
[228] Fraser Basin Council Business Plan – Regional Flood Management, Nov 2013, pg 27.
[229] Domaas, Allen, retired CEO of the Vancouver Fraser Port Authority, personal communication, March 2014.

economic prosperity, and a vital economic artery of both British Columbia and the prairie provinces, the Lower Fraser River must be adequately maintained and improved by the multiple jurisdictions and authorities who share the responsibility of managing this essential waterway.

The following table summarizes the significant economic threats to the Lower Fraser River. Notwithstanding the limitations of the source data that preclude aggregating the information into a rigorously consistent table of indicators, the following summary highlights impending threats to future sustainability:

Reoccurring Large Scale Flooding of Lower Fraser River (LFR)	• The floodplain of the LRF has a population of 300,000 and residential, commercial, industrial, utilities and transportation infrastructure costing over $50 billion. These residents and improvements are dependent on 600 km of diking, 400 flood boxes, and 100 pump stations for protection against flooding of the river. • A reoccurrence of the record floods on the Fraser River could result in damages along the LFR in the order of tens of billions of dollars. • Damage to national road, rail and energy links could have a major impact on key exporting and importing industries for a prolonged period. • Scientists predict that there is a 1-in-3 chance that a flood of similar magnitude to the record floods along the Lower Fraser will occur within the next 50 years. • Without major protective improvements, the cost in flood relief and in loss of revenue to all levels of government would be immense, greatly surpassing the cost of major flood events in other parts of Canada in recent years.
Impacts of Climate Change	• Research reflecting climate change predicts that flood events on the Fraser River previously supposed to occur once in 100 years will occur in roughly four to ten year intervals. • Climate change will increase the risk of flooding in both the Fraser Valley and the tidal portions of the river. • It is anticipated that that by the year 2100, sea level at the mouth of the Fraser River will have increased by 1.2 metres.
Current Storm Surge Threat	• Storm surge combined with high tides in El Niño years could overtop existing flood protection infrastructure, even without additional sea level rise.
Earthquake Threat	• Recent research concerning the potential amplitude of earthquakes that could impact Greater Vancouver and the Fraser Valley indicates that the seismic effects could be much larger than previously anticipated. • The analysis of the work and costs to improve flood protection measures along the LFR therefore needs to be reviewed to determine whether the planned degree of protection needs to be increased.
Threat of Soil Salination (Salt Wedge)	• Under certain conditions, incoming tides can force dense saline water from the Strait of Georgia into the Fraser River as far as New Westminster. • With anticipated sea level rise, the penetration of the salt wedge is likely to increase. • Salinated soils in the case of sea overtopping or breach of the dikes is a fundamental threat to agriculture in this region (the estuary of the Lower Fraser River).
Cost of Adaptation	• The total preliminary estimated cost of adaptation of the LFR to sea level rise is $9.5 billion. Of this, $8.8 billion is the estimated cost for protection along the tidal part of the LFR below the Port Mann Bridge, and the adjacent coastal reaches. This estimate is contingent on dredging continuing, with removal volumes roughly equalling disposition, which is not occurring, and will result is significant increased financial costs. • The cost of adaptation to climate change for freshwater areas of the Lower Fraser River does not appear to have been estimated as yet.
Dredging Costs	• Each year during freshet, approximately 32 million m^3 of sediment is transported by the Lower Fraser River, with roughly 10 per cent of this material settling in the navigation channels of the lower reaches of the river.

	• The ongoing cost of dredging varies from year to year. In 2003/04, the cost for dredging the main PMV shipping channel was $8.7 million. • Dredging costs are partially offset through the sale of dredged sand. Average annual costs after cost recovery have been approximately $12 million. • In the U.S., the dredging costs of commercial waterways are largely borne by a federal tax on ports, which effectively puts Fraser River ports at a competitive disadvantage to Columbia River ports.
Infrastructure Challenges	• The total cost to build the Port Mann Bridge Project, including construction, operations and maintenance, rehabilitation and interest, will be approximately $3.3 billion. • The Corporation of Delta estimates the cost of the George Massey Tunnel's road congestion was $66 million in 2008. By 2041, the congestion could cost our economy an estimated $100 million annually. • The draft limit for ships passing over top of the George Massey Tunnel is less than 12 metres. With deepening of the Panama Canal, ships with drafts of over 18 metres would need to access terminals upstream of the tunnel. A bridge is planned to replace the tunnel. • The Pattullo Bridge over the Fraser River is now 76 years old and in need of replacement. It is a critical transportation link for the movement of people, goods and services and on average moves 73,000 vehicles per weekday. • At over 100 years old, the New Westminster Rail Bridge is in need of replacement. However, the replacement has been postponed indefinitely by the railways sharing the available rail capacity in a coordinated arrangement.
Regional Growth and challenges preserving Industrial Lands adjoining the Lower Fraser River	• Over the last 30 years, the Metro Vancouver region has lost over 3,000 hectares of industrial land. • By 2040, an additional one million people will be living in the region. • To support this growth and to provide new jobs for these additional people, the region will need a secure source of industrial land, especially adjoining the LFR.
Jurisdictional Challenges	• At the time of writing this report, there were 16 municipal governments and 29 First Nations groups along the banks of the Lower Fraser River, and over 20 provincial and federal ministries involved in the administration of the river. • Elections at various levels of government run on a 3 to 5-year cycle. Proper management of the LFR depends on a 50 to 100-year perspective, extending well beyond the political mandate of any elected government.

5. Future Sustainability

Recognizing the complexity of flood hazard management issues and the multitude of jurisdictions, interests and government agencies throughout the Lower Mainland, there is a strong case for a collaborative, regional approach.[230]

Effective leadership is required to bring together all relevant stakeholders to form a proactive, long-term vision and management plan. Working with the provincial and federal governments, municipalities, First Nations and private stakeholders, there is a need to establish a comprehensive, proactive strategy to maintain navigable waters and enhance flood protection on the Lower Fraser River, based on long-term environmental and economic projections. A regional approach to flood management in the Lower Mainland is urgently required.

[230] Fraser Basin Council Report – Advancing a Collaborative, Regional Approach to Flood Management, November 2013, pg. 27

Additionally, with the billions of dollars that will be required for that over the next century, according to a recent report from the Fraser Basin Council, "it is prudent to invest in sound technical information to inform polices and management options" by strategically and incrementally improving our understanding about flood hazards, risks, and management options to best inform flood management policies and practices.[231]

New studies and examination of existing research are required to better understand the many sustainability issues related to the river, such as best sediment extraction and disposal methods, and analysis of impacts of various up river activities i.e. diking, dredging, sediment deflection, and gravel extraction.

The Fraser River is not an arbitrary subsection of geography that any one agency can wisely deal with independently. All levels of government and other key stakeholders must come together in such a way that they are committed to, and tasked with, managing the Lower Fraser River as an interconnected system in which the interests of navigation, public safety, and the natural environment are managed holistically as one system.

This report calls on the federal, provincial, regional and municipal governments and First Nations to immediately:

- **Take a lead role in bringing together the relevant stakeholders; and**
- **Appropriately fund, empower and task the group with putting in place a collaborative regional strategy, addressing short and longer term measures, secure funding and management requirements for the entire Lower Fraser River and adjacent affected lands.**

This approach is imperative to ensure public safety, as well as future sustainability and prosperity for the Lower Mainland region, British Columbia and Canada as a whole.

6. Conclusion

The Lower Fraser River has the power to dramatically affect the Lower Mainland, for better or worse. As a driving factor in Canada's economic prosperity, and a key economic artery for British Columbia, the river must be managed and maintained to help ensure economic prosperity and growth. The outcome will depend on the actions undertaken and the timing and energy with which they are pursued.

The economic impact on the provincial and national economy from a significant flood and/or from the sea level rise now occurring will be enormous, potentially in the order of tens of billions of dollars. The amount will greatly outstrip the capital and maintenance costs of a long-term flood prevention and river management system.

[231] Fraser Basin Council Report – Advancing a Collaborative, Regional Approach to Flood Management, November 2013 pg. 19

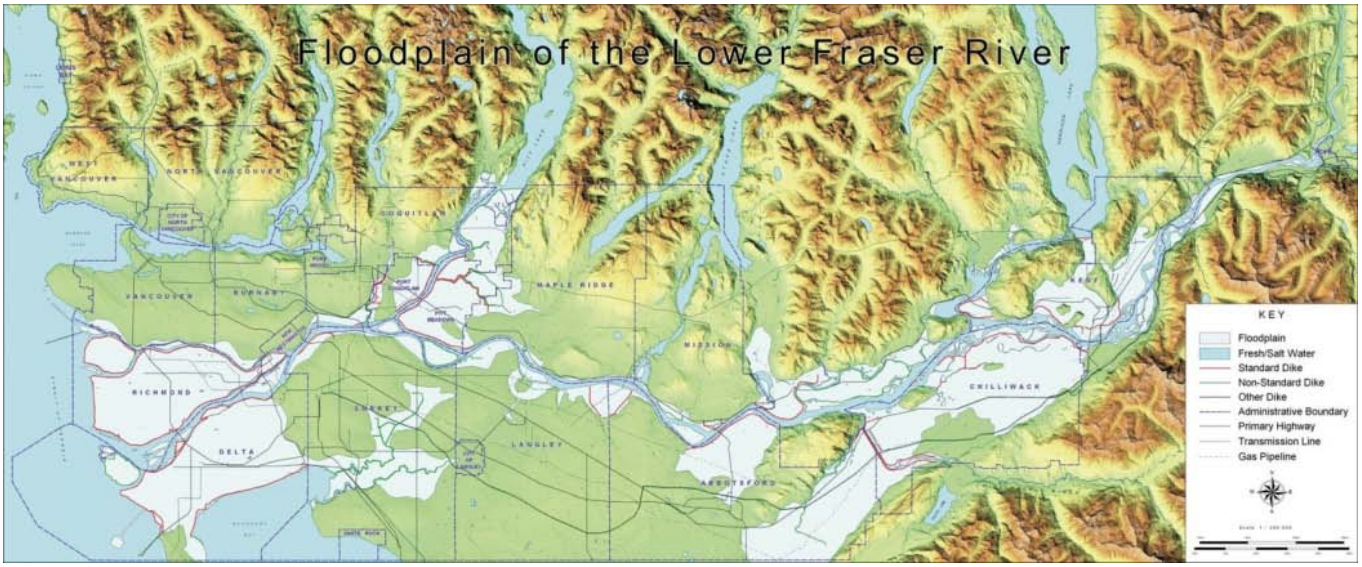
The economies and security from flooding of municipalities in the Lower Mainland are very interconnected. The consequences of poor preparation or disaster in any one area would have dramatic effects on the entire region.

This report identifies a number of major positive and negative factors that affect the economic importance of the Lower Fraser River.

It is imperative that the reader understand this paper is a call to action. There is an urgent need to bring together a multi-stakeholder coalition that will be tasked with devising a holistic, integrated and long-term plan of action to both enhance economic and other benefits coming from the river, and to prevent negative influences from very seriously damaging the economic health of the region through which the river flows – the economic health of British Columbia and of Canada.

7. Appendix

A) Map of the Lower Fraser River



B) List of individuals and organizations that contributed to this study:

Richmond Chamber of Commerce
Surrey Board of Trade
Vancouver Board of Trade
Tri-Cities Chamber of Commerce
Abbotsford Chamber of Commerce
Burnaby Board of Trade
Greater Langley Chamber of Commerce
Delta Chamber of Commerce
Mission Chamber of Commerce
New Westminster Chamber of Commerce
Maple Ridge & Pitt Meadows Chamber of Commerce
Chilliwack Chamber of Commerce
Hope and District Chamber of Commerce
Province of British Columbia
BC Chamber of Commerce
Fraser River Discovery Centre
Steveston Harbour Authority
Fraser Basin Council
Lower Fraser River Fisheries Alliance
Vancouver Airport Authority
Port Metro Vancouver
City of Richmond
City of Delta
Michael Owen of Ladner Reach Marina
Fraser Surrey Docks
Metro Vancouver
Experience the Fraser
Fraser Valley Regional District
Former CEO of the Fraser River Port Authority, Allen Domaas
Fraser River Pile and Dredge
Seaspan
Former MLA for Abbotsford-Mission Randy Hawes
Former MLA for Chilliwack John Les
Former MLA for Richmond-Centre Rob Howard

C) List of governmental agencies and major stakeholder in Lower Fraser River:

Municipalities within the Lower Fraser River Flood Basin:

City of Richmond
City of Vancouver
Corporation of Delta
City of Surrey
City of Burnaby
City of New Westminster
City of Coquitlam
City of Port Coquitlam
City of Langley
Township of Langley
District of Maple Ridge
City of Pitt Meadows
District of Mission
City of Abbotsford
City of Chilliwack
District of Kent
District of Hope
Village of Harrison Hot Springs

Regional Districts located in the Lower Fraser River Region:

Fraser Valley Regional District
Metro Vancouver (Greater Vancouver Regional District)

First Nations located in the Lower Fraser River Region:

Aitchelitz
Chawathil
Cheam
Chehalis
Katzie
Kwakwa'apilt
Kwantlen
Kwikwiwetlem
Leq'a:mel
Matsqui
Musqueam
Peters
Popkum
Scowlitz
Seabird
Semiahmoo
Shxwha:y
Shxw'ow'hamel
Skawahlook
Skowkale
Soowahlie
Squiala
Sumas
Tsawwassen
Tsleil-Waututh
Tzeachten
Union Bar
Yakweakwioose
Yale

Provincial ministries with a stake in the Fraser River:

Ministry of Aboriginal Relations and Reconciliation
Ministry of Agriculture
Ministry of Energy and Mines
Ministry of Environment
Ministry of Forest, Lands, and Natural Resource Operations
Ministry of International Trade
Ministry of Jobs, Tourism and Skills Training
Ministry of Transportation and Infrastructure
Ministry of Justice and Attorney General

Federal ministries with a stake in the Fraser River:

Minister of Aboriginal Affairs and Northern Development
Minister of Public Works and Government Services
Minister of Agriculture and Agri-Food
Minister of Industry
Minister of Infrastructure, Communities and Intergovernmental Affairs
Minister of the Environment
Minister of Transport
Minister of Fisheries and Oceans
Minister of Public Safety and Emergency Preparedness
Minister of International Trade
Minister of Natural Resources
Minister of State (Small Business and Tourism, and Agriculture)
Minister of State (Western Economic Diversification)

Stakeholders in the Lower Fraser River Basin:
(This list does not include every Fraser River stakeholder but is intended to highlight the significant level of private and non-private groups with an invested interested in the sustainability of the river):

Aboriginal Tourism Association of BC
Agassiz-Harrison Museum
Backcountry Horseman of BC
BC Agriculture Council
BC Athletics
BC Backcountry Outdoorsmen
BC Camping Association
BC Conservation Foundation
BC Ferries
BC Hydro
BC Marine Trails Network
BC Off Road Motorcycle Association
BC Parks
BC Rivers Institute/Heart of the Fraser
BC Wildlife Federation
BIEAP/FREMP
BNSF Railway
British Columbia Arts Council
Canadian Heritage Rivers System
Catherwood Towing
Central Valley Naturalists
Chilliwack Chamber of Commerce
Chilliwack Field Naturalists
Chilliwack Hiking Club
Chilliwack Museum and Archives
Chilliwack Outdoors Club
Club Tread
CN Rail
CP Rail
Community Futures North Fraser
Community Futures South Fraser
Coquitlam Heritage Society
Council of Marine Carriers
Council of Tourism Associations
Cycling BC
Delta Museums & Archives Society
Ducks Unlimited
Duckworth Management Group
Greater Vancouver Gateway Council
Federal Harbour Authorities
Federation of BC Naturalists
FortisBC
Fraser Basin Council
Fraser Harrison Smart Growth
Fraser River Coalition
Fraser River Discovery Centre
Fraser River Keeper
Fraser River Lodge and Resort
Fraser River Safari
Fraser River Salmon Table
Fraser River Sturgeon Conservation Society
Fraser Valley Bald Eagle Festival Society
Fraser Valley Conservancy
Fraser Valley Heritage Railway Society
Fraser Valley Invasive Plant Society
Fraser Valley Regional District
Fraser Valley Salmon Society
Fraser Valley Watersheds Coalition
Fresh Water Fisheries Society of BC/Go Fish BC
Great Blue Heron Nature Reserve Society

Harrison Hikers
Harrison/Agassiz Chamber of Commerce
Hike Canada/Hike BC
Hope and District Chamber of Commerce
Hope Museum
Horse Council of BC
KEEPS
Kilby Historic Site
Langley Environmental Partners Society
Langley Heritage Society
Lower Mainland Local Government Association
Maple Ridge Museum and Community Archives
Metro Vancouver
Ministry of Tourism, Culture and the Arts
Mission Community Archives
Mission Visitor Centre
New Pathways to Gold Society
New Westminster Heritage Preservation Society
New Westminster Historical Society
New Westminster Museum/Archives
Outdoor Recreation Council of British Columbia
Pacific Fisheries Resource Conservation Council
Pacific Salmon Foundation
Paddlewheeler Riverboat Tours
Parks Canada
Pathway Partners
Pitt Meadows Heritage and Museum Society
Port Coquitlam Heritage and Cultural Society
Port Metro Vancouver
Powerhouse at Stave Falls (BC Hydro)
Ravine Park Enhancement Society
Recreational Canoeing Association of BC
Richmond Museum Society
Ridge Wilderness Adventures
Rivershed Society of BC
Seaspan
Sea to Sky Trail
Seabird Island
Southern Railway of BC
Spuzzum
Stave Valley Salmonid Enhancement Society
Steveston Historical Society
Surrey Fraser Docks
Surrey Historical Society
The Land Conservancy of BC
The Nature Trust of BC
The Pacific Streamkeepers Federation
TNT Marine
Tourism Abbotsford
Tourism Chilliwack
Tourism Harrison
Tourism Hope
Tourism Kent/Agassiz
Tourism Langley
Tourism Maple Ridge Pitt Meadows
Tourism New Westminster
Tourism Richmond
Tourism Surrey
Tourism Vancouver
Trails BC
Trans Canada Trail
TransLink
Vancouver, Coast and Mountain Tourism
Vancouver International Airport
XA:YTEM Longhouse Interpretive Cen

THE ECONOMIC IMPORTANCE OF THE LOWER FRASER RIVER

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