



Fraser  
River  
Estuary  
Management  
Program

**Sediment Budget**  
**&**  
**Dredging Activities**  
**Annual Report**  
**For the Fiscal Year**  
**April 1, 2002 to March 31, 2003**

**Prepared by FREMP**



## 2002/03 SEDIMENT BUDGET AND DREDGING ACTIVITIES ANNUAL REPORT

### ***1. INTRODUCTION***

The Fraser River Estuary Management Program (FREMP) is a partnership among federal, provincial and regional government agencies to foster co-ordinated and sustainable activities in the Fraser River estuary.

FREMP is guided by its Estuary Management Plan (EMP). Developed through a multi-stakeholder consensus process in 1994 and updated in 2003, the EMP outlines a shared vision, goals and an action plan for improving the environmental, economic, and social health of the estuary. A key target in the EMP is to manage the removal of sediment from the Fraser River while maintaining the sediment regime of the river in balance. Through the work of its Dredge Management Advisory Committee, FREMP developed a tool, called the “Sediment Budget”, which allows FREMP to deliver on this key EMP target.

### ***2. THE FREMP SEDIMENT BUDGET***

The FREMP Sediment Budget is used to ensure that the average amount of sediment removed over a five- to ten-year period does not change the shape of the riverbed. This “averaging” approach acknowledges two factors:

- The amount of sediment deposited by the Fraser River’s annual spring flood fluctuates widely from year to year.
- Even in years where a relatively low amount of sediment flows into the estuary, water action may form underwater sandbars that need to be removed to prevent grounding of ships using the Fraser River. Conversely, in years where large amounts of sediment may enter the estuary, not all of it will pose a navigational hazard, and therefore, all of it may not need to be removed.

The FREMP Sediment Budget covers sand-sized sediment in the estuary as far upstream as Mission. For the purposes of the Budget, “sand” is any material that has a grain size between 0.177mm and 2.000mm. All other materials are not considered in the Budget because coarser material does not generally enter the estuary and finer materials do not deposit in the main navigation channel.

The Sediment Budget is derived from a mathematical model which is described in detail in a report entitled “Lower Fraser River Sediment Budget Analysis” prepared for FREMP in 1999 by Northwest Hydraulic Consultants. This model was reviewed in the 2002/03 year and results are discussed below.



### ***3. THE 2002/03 BUDGET***

The Sediment Budget is calculated annually for what is called the “freshet” year. Generally, the dredging period runs from August of one calendar year to March of the next calendar year.

The Sediment Budget formula requires data for two separate variables:

- 1) the freshet volume between April and September at Hope; and
- 2) the annual peak discharge at Mission.

For the 2002/03 freshet, these respective values measured 78,000 million cubic metres and 11,300 cubic metres per second. **Placing these values into the Sediment Budget formula gave an estimate that the incoming sediment bed load would be approximately 2.98 million cubic metres during the period April 1, 2002 to March 31, 2003<sup>1</sup>.** Thus, whereas the 2001/02 inflow was classified as an extremely low inflow year, the 2002/03 inflow can be classified as a moderately high inflow year.

#### **Review of the Sediment Budget**

If the sediment budget equation is to be relied upon as a tool to properly manage dredging in the Lower Fraser River, there must be confidence in the equation's ability to accurately predict sediment inflows to the Lower Fraser River. Since the inception of the Sediment Budget concept, FREMP has been committed to evaluating the predictive ability of the equation and the Dredge Management Advisory Committee (DMAC) recommended that this evaluation occur every five years. The 2002/03 program year marked the first occurrence of this recommended evaluation cycle, and a study was undertaken by Northwest Hydraulic Consultants (NHC).

In its December 2002 report, NHC concluded that:

- A sediment surplus has accumulated since 1996. This surplus totals 2.9 million m<sup>3</sup> since 1996 and about 1 million m<sup>3</sup> since 1998;
- The original target dredging figure of 70% of sediment inflow still seems reasonable, and only applies to less than 0.177mm fraction (i.e. grain size);
- The Fraser River appears to be a stable “transport reach” between Mission and Douglas Island.

The consultants recommended that FREMP consider maintaining the sediment balance over the long term (10 years), as there is less need for concern about individual years.

NHC also noted that in any given year, the difference between estimate runoff volumes from flow forecasts in March and April and estimates made four months later (in August) using preliminary data discharges can be significant. Therefore, early forecasts for sediment inflows should be updated when more accurate published flow data become available in late summer.

---

<sup>1</sup> This figure represents the refined Sediment Budget, calculated in August 2002, which is based on more accurate data for estimated freshet volumes.



NHC suggested that ongoing and new monitoring will be needed, including sediment sampling and discharge data at Mission, river surveys upstream of Mission every five years, and collecting periodic samples of grain size from the river bed and spoil at all sites. This monitoring will help ensure that data is available to evaluate the sediment budget equation. The report recommended that further progress on predicting the long-term effects of dredging will require better understanding of the physical processes governing sediment transport and sediment deposition along the lower river, and noted the need to support research into this area by UBC and the Geological Survey of Canada.

#### **4. DREDGING ACTIVITIES IN 2002/03**

During the period April 2002 to March 2003, **2.79 million cubic metres of sediment were removed** from the navigation channel of the Fraser River. Thus, dredging managers were above the Sediment Budget in the 2002/03 dredging year. Note, however, that the re-evaluation of the Sediment Budget equation illustrates the need for a long term equilibrium compared to individual years.

*Sediment was removed as follows:*

Amount of sediment removed from the river and taken to upland sites (A):	<b>1.94 million m<sup>3</sup></b>
Amount of sediment removed from the river and disposed in ocean (B):	<b><u>0.85 million m<sup>3</sup></u></b>

Total removed from River = (A) + (B) = **2.79 million m<sup>3</sup>**

The map (attached to the end of this report) shows the locations where sediment was dredged during 2002/03, and for comparison purposes, where sediment was dredged during 2001/02.

#### **5. OVERALL SEDIMENT BUDGET BALANCE DURING PAST SIX YEARS**

2002/03 marks the sixth year that FREMP has forecasted the sediment (size between 0.177 mm and 2.000 mm) that enters the Lower Fraser River. The table below summarizes the annual Sediment Budget forecasts (in millions of cubic metres) and the actual amount of sediment removed from the River by dredging (in millions of cubic metres) during the past six years.

The data shown below for the Sediment Forecast and Budget are taken from past FREMP Dredging Annual Reports<sup>2</sup>. Note that a comparison of forecast versus hindcast (actual) volumetric sediment loads in the NHC report showed that forecast loads are generally quite close to actual loads.

Data for “Actual Removed from the River” has been updated in this Annual Report based on the December 2002 Northwest Hydraulics report. Where previous Annual Reports included in this column dredging totals for all particle sizes, the numbers below for “Actual Removed from River” now reflect net removal of sediment greater than 0.177 mm.

<sup>2</sup> Previous FREMP Dredging Annual Reports reported a maximum of cubic meters that could be removed without changing the shape of the riverbed. This represented the 70% level of the Sediment Forecast.



“Net Infill” compares “Actual Removed from River” against the “70% of Sediment Forecast” (i.e. what is still available to be dredged in keeping with sustainable sediment removal).

“Percentage of Forecast Removed” compares actual removed against the sediment bed load forecast.

Year	Sediment Forecast (0.177mm to 2.000mm)	70% of Sediment Forecast	Actual Removed From River (>0.177mm)	Net Infill Or (Net Removal)	% of Forecast Removed
1997/98	4.7	3.3	1.32	1.98	28.1%
1998/99	1.11	0.78	1.00	(0.22)	90.1%
1999/00	4.5	3.15	1.85	1.30	41.1%
2000/01	1.7	1.19	1.20	(0.01)	70.6%
2001/02	0.6	0.4	0.76	(0.36)	126.7%
2003/03	2.98	2.09	2.79	(0.70)	93.6%
<b>1997/98 to 2002/03</b>	<b>15.59</b>	<b>10.91</b>	<b>8.92</b>	<b>1.99</b>	<b>57.2%</b>

The 1999 report by Northwest Hydraulic Consultants stated that “using the results of the Sediment Budget, an approximate long-term equilibrium can be maintained if the net dredging volumes are maintained at about 70% of the incoming bed material load”. During the past six years, the volume of dredged material amounts to **57.2%** of the forecasted bed material load. Thus, there has been a net infill in the navigation channel during the past six years that is estimated to be **1.99 million cubic metres**.<sup>3</sup>

## 6. OTHER DREDGING-RELATED ACTIVITIES DURING 2002/03

### *Impact Assessment of Dredging Activities at Proposed Transfer Pit Site on Barnston Island*

In 2000, the Fraser River Port Authority (FRPA) contracted Limnotek Research & Development Inc. to conduct a three-year \$225,000 study to assess the possible impact that dredging may have on the aquatic community in the Fraser River near Barnston Island. The results of the study will be used to determine if a permanent transfer pit site can be established upstream in this reach of the Fraser River near Barnston Island. The study is being coordinated by FRPA.

<sup>3</sup> Numbers used in the table are taken from FREMP Dredging Annual Reports, and so represent sediment forecasts based on preliminary discharge data. The NHC Report (2002) included findings based on actual sediment loads.



The study area covers a portion of the Fraser River upstream of the Port Mann Bridge near Barnston Island adjacent to the main navigation channel. The project at Barnston Island is structured into two assessments: one at a temporary transfer pit site located at the lower end of Barnston Island and the other at the proposed permanent transfer pit site at the upper end of Barnston Island, adjacent to the Katzie First Nation dock.

Dredging occurred at the temporary transfer pit in March 2000 and all field tasks related to assessment of the temporary transfer pit are complete. The draft report of this phase of the work was submitted during 2001/02. The field tasks for the next phase (proposed permanent pit) are underway and Limnotek Research will provide an update after each sampling episode. Dredging at the proposed permanent transfer pit occurred between mid-November of 2001 and late-January of 2002. Field tasks for this project were completed in fall 2002 and a final report is expected in summer 2003. Limnotek is also compiling data sets from three dredging impact studies (Mission, Barnston temporary pit, Barnston permanent pit).

#### *Fraser River Dredging Registry Database*

During the 2001/02 year, a Dredging Registry Database customized interface was created and installed by Northwest Hydraulic Consultants. Copies of the Registry exist at North Fraser Port Authority, Fraser River Port Authority, Coast Guard and FREMP. The Registry is a customized Microsoft Access data interface shell at this point. As a result of initial data input, it was determined that the data interface needed upgrading.

In 2002/03, DMAC oversaw a project to upgrade the data entry interface, improve the linkages between the Registry and FREMP's Geographic Information System, and find a cost-effective way to make the Dredging Registry Database accessible via the Internet. Building on an initial database, the project involved redesigning the database for installation at both Fraser Port and FREMP offices. The database contains dredging data from 1999-2002 including information about particle size, what amount was dredged, and where it was disposed. An associated data layer is also available on the FREMP GIS. The database will be updated, likely on an annual basis and with data from Fraser Port. The consideration of making the database web-accessible will need to be considered as future funding permits.

#### *Dredging Impact Assessment – Sapperton Bar*

A dredging impact assessment is also underway at Sapperton Bar. Following submission of a proposal in October 2002 and subsequent changes to the project's sampling design, Limnotek began this study and dredging took place between December 2002 and January 2003. The study involves the collection of benthic invertebrates, turbidity observations and fish data collection in the area both before and after dredging. All sampling in fall 2002 and spring 2003 was completed successfully. The next sampling is scheduled for fall 2003, at which time the full suite of benthic invertebrate and fish data will again be collected for comparison to the fall 2002 and to a smaller extent the spring 2003 data. This fall 2003 sampling at Sapperton will complete the field portion of the study.



## **7. MEMBERS OF WLUC**

The following agencies are represented on FREMP's Water and Land Use Committee and provide input and expertise with respect to dredging matters:

Fisheries and Oceans Canada

- Habitat and Enhancement Branch
- Canadian Coast Guard

Environment Canada

Fraser River Port Authority

North Fraser Port Authority

Public Works and Government Services  
Canada

BC Ministry of Water, Land and Air  
Protection

Land and Water BC

## **8. FOR FURTHER INFORMATION**

For further information on FREMP, the Sediment Budget, or this Annual Report, please contact:

Anna Mathewson  
Manager/Policy Coordinator  
FREMP  
5945 Kathleen Avenue, Suite 501  
Burnaby, B.C. V5H 4J7

telephone: (604) 775-5755  
fax: (604) 775-5198

e-mail: [amathewson@bieapfrempp.org](mailto:amathewson@bieapfrempp.org)

