Environmental Monitor's 30 Day Post-Construction Report for the December 2010 Outlet Channel Construction at Little Big Bar, Fraser River

Prepared By:

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DFO Authorization No.:09-HPAC-PA1-00034
MNRO File No.: A2005597
NWPA Approval No.: 8200-10-8026.2

January 2011

SCOTT RESOURCE SERVICES INC.
Environmental Consultants
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January 27, 2011

Our File: 813.0502
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NWPA No.: 8200-10-8026.2

Ann Griffin
Ministry of Public Safety and Solicitor General
Emergency Management BC
2nd Floor 525 Fort Street
Victoria, BC V8W 9J1

Re: Environmental Monitor's 30 Day Post-Construction Report for the December 2010 Outlet Channel Construction at Little Big Bar, Fraser River

1.0 Introduction

Scott Resource Services Inc. (SRS) was retained by Emergency Management BC (EMBC) to complete fish salvages, assess fish habitat and potential impacts, prepare a mitigation plan and monitor outlet channel construction operations at Little Big Bar (Location Map, Attachment 1). The original project was initiated as part of the Lower Fraser River Sediment Management Program.

An Authorized sediment removal of 68,550 m^3 was carried out in January-March 2010 at Little Big Bar. The engineered design of this removal did not include a low flow outlet channel, and the design could not be amended at the time due to the risk to pink salmon redds at the bar edge. The peak freshet discharge was below average in 2010, and did not reconfigure the site to establish hydraulic connectivity at low flows. The site became a strand area for fish on the declining limb of the hydrograph below approximately 1,800 m^3/s, as measured at the Water Survey of Canada gauge 08MF005 (Fraser River at Hope). In order to comply with conditions of the original agency approvals, remedial works were necessary to excavate an outlet channel from the removal site to the Fraser River and restore fish passage.

Little Big Bar is a small point bar on the left bank of the Fraser River, adjacent to Big Bar. The bar is located within the Rosedale sub-reach, which begins at Hopyard Hill and extends to the upstream end of Powerline Island. The bar is located approximately 1 km downstream from the Agassiz-Rosedale Bridge. It is separated from Big Bar by a major side channel. The UTM

coordinates of the centre of the bar are 10 U, 586814 E, 5451726 N. A seasonally wetted side channel flows between Little Big Bar and the left bank of the Fraser River. The left bank of the Fraser River is reinforced with rip rap in this vicinity. A dike has been constructed parallel to the river bank in this location.

The works followed procedures outlined in the amended Fisheries and Oceans Canada (DFO) Authorization (No. 09-HPAC-PA1-00034) and the Ministry of Natural Resource Operations (MNRO) Section 88 Water Act Order (File A200597). The outlet channel design (Attachment 2) was created by Kerr Wood Leidal Associates (KWL) in consultation with SRS. Site layout was completed by SRS. Minor modification of the design to include a 0.15 – 0.20 m deep low flow swale was needed to tie in to the removal site invert, as shown in Attachments 2 and 3. The removal works were carried out by Link's Contracting & Aggregate Supplies. Full-time monitoring was provided by Jenni Konken and Martin Stol of SRS. Photographs of the works are provided as Attachment 4.

The December 14, 2010 DFO amendment to the existing Authorization included the following changes:

- excavation of an outlet channel connecting the removal area to the Fraser River, with a maximum footprint of 2,045 square metres and totalling no more than 760 cubic metres of sediment to be stockpiled within the previously authorized excavation footprint;
- applying appropriate mitigation measures as described in the Authorization to minimize impacts to fish and fish habitat during the works; and
- follow-up fish salvages as necessary to ensure fish are safely relocated to the Fraser River from the removal area.

In addition, a Section 88 Order was issued by MNRO on December 14, 2010 requiring EMBC to undertake the following actions with subject conditions:

- designate an environmental professional to conduct weekly inspections of the strand pool and salvage fish from ice-free areas until the outlet channel is constructed;
- excavate an outlet channel that allows fish to access other wetted areas of the channel prior to March 31, 2011. This excavation was subject to a number of conditions; and,
- contract the Environmental Monitor to complete post-construction reports and inspections for fish stranding.

2.0 Pre-construction and construction activities

2.1 Fish salvage

Fish salvages using multiple methods were conducted by SRS in November and December, 2010. Salvages were conducted by 30m beach seine, gee-type minnow trapping, and electrofishing (DFO license number XR 293 2010). The 0.7m deep pool of the site had frequent connection to the side channel up until late October as river levels fluctuated. An initial salvage of the site by beach seining was conducted on November 1, 2010. The catch per unit effort was relatively low considering the large area salvaged. The entire removal area was seined except for

an area of sand substrate on the southeast end of the removal area. Fish mortality may result when seining occurs over sandy substrate, as the fine mesh of the net collects sand along with the fish, and gills can become clogged. Water depths remained stable in the first half of November until cold weather caused the site to freeze over on November 20, 2010. Additional salvages could not be completed after November 20 until the ice had melted.

Beach seining was again completed in preparation for the channel excavation on December 15 and 21, 2010. At that time, water levels had dropped, and the sand area was no longer wetted. Minnow traps were set for 24 hours on two occasions: December 15/16 and 19/20, 2010. No fish were captured by minnow trapping, likely due to the small size and low numbers of fish remaining in the pond. Electrofishing had the highest success rate after the initial salvage on November 1, 2010. Catch results are presented in Table 1. Minnows (*Cyprinidae*), suckers (*Catostomidae*) and lampreys were the most common groups captured. Individuals were all juvenile, with many too small to identify to species while maintaining a minimal handling time, which is necessary to reduce stress on the fish and prevent mortality. The fish sampling permits from DFO and MOE also did not allow for lethal sampling for the retention of voucher specimens, therefore fish were released unharmed after being counted and identified, and some very small fish were only identified to family.

Table 1. Catch results of fish salvage works at Little Big Bar, November 2010 to January 2011.

	1-Nov-10	8-Dec-10	10-Dec-10	15-Dec-10		19-Dec-10		21-Dec-10		22-Dec-10	9-Jan-11	**Total**
	SN[1]	EF[2]	EF[3]	SN[1]	MT[4]	EF[5]	MT[4]	EF[6]	SN[1]	EF[7]	EF[7]	
Chinook (*Oncorhynchus tshawytscha*)	27	1	-	5	-	-	-	-	-	-	-	**33**
Sockeye (*Oncorhynchus nerka*)	4	-	-	2	-	-	-	-	-	-	-	**6**
Cutthroat trout (*Oncorhynchus clarki*)	1	-	-	-	-	-	-	-	-	-	-	**1**
Mountain whitefish (*Prosopium williamsoni*)	-	-	-	2	-	-	-	-	-	-	-	**2**
Peamouth chub (*Mylocheilus caurinus*)	6	17	5	58	-	5	-	28	-	26	-	**145**
Leopard dace (*Rhinichthys falcatus*)	6	-	6	67	-	19	-	22	-	33	-	**153**
Longnose dace (*Rhinichthys cataractae*)	2	-	-	4	-	-	-	-	-	2	-	**8**
Redside shiner (*Richardsonius balteatus*)	1	-	-	1	-	-	-	-	-	-	-	**2**
Minnows (general)	436	40	7	-	-	3	-	3	-	120	-	**609**
Largescale sucker (*Catostomus macrocheilus*)	1	72	37	88	-	3	-	7	-	43	-	**251**
Mountain sucker (*Catostomus platyrhyncus*)	1	-	-	-	-	-	-	-	-	-	-	**1**
Suckers (general) (*Catostomus* sp.)	189	-	-	-	-	-	-	-	-	-	-	**189**
Threespine stickleback (*Gasterosteus aculeatus*)	8	2	3	20	-	5	-	1	-	31	-	**70**
Sculpins (general) (*Cottus* sp.)	10	4	-	1	-	-	-	-	-	-	-	**15**
Lamprey	-	275	90	-	-	21	-	72	-	150	45	**653**
Total	**692**	**411**	**148**	**248**	**0**	**56**	**0**	**133**	**0**	**405**	**45**	**2138**

[1] 30 m beach seine
[2] Electrofisher settings G5, 500V, 2310 seconds
[3] Electrofisher settings G5, 600V, 1524 seconds
[4] 24 hour set with baited gee-type minnow traps
[5] Electrofisher settings G5, 600V, 1692 seconds
[6] Electrofisher settings G5, 600V, 645 seconds
[7] Electrofisher settings G5, 600V

2.2 Before construction works

SRS inspected the site for evidence of salmon spawning on December 8, 2010. The results of this inspection were submitted to EMBC in a memorandum titled "*December 8, 2010 site assessment memorandum - Little Big Bar*" dated December 9, 2010. The memorandum included a map of probable redd locations, all of which were outside of the proposed outlet channel area.

A pre-construction meeting was held on December 20, 2010 with Link's Contracting and SRS to discuss environmental concerns and requirements per the DFO Authorization and MNRO Water Act Order. The removal boundary was staked by SRS on December 19, 2010. The boundary was staked using UTM coordinates for corner points provided by the KWL design. Coordinates were located using a hand-held Garmin GPS with an accuracy of +/- 3m.

2.3 During construction works

The works commenced on December 20, 2010 and were completed on December 23, 2010. The weather conditions were mostly overcast and cool during the works. A single excavator was used. The excavator was inspected by SRS and determined to be leak-free and free of excess oil or grease. A spill kit was kept on board, and the operator was experienced with Fraser River sediment removal works. Links Contracting informed SRS that the excavator was running on environmentally sensitive, inherently biodegradable hydraulic fluid. The excavator returned to the dike at the end of each day for refueling. No refueling took place on the bar top.

The excavator accessed the bar top by driving down a section of the rip rap bank which was devoid of vegetation. It then drove across a sand bar and continued westward (downstream) towards the work area. The access route avoided potential redds along the bar edge.

SRS determined that to completely remove the berm which separated the removal area from the side channel, the design grade (0.4 %) could not be achieved within the design footprint. The outlet channel would need to be extended on both ends in order to achieve a depth and grade to drain the removal area. Upon consultation with KWL and DFO, it was determined that a longer, deeper low flow swale could be constructed within the authorized outlet channel provided that the total Authorized removal area and volume were not exceeded. The width of the outlet channel was decreased in order to compensate for the increased length and depth of the low-flow swale. The outlet channel was constructed to the modified design boundaries with a near 0% gradient, except within the low flow swale, where a grade of approximately 0.4 % was achieved. The swale concept sketch by KWL, as well as an annotated drawing showing the final configuration, are provided in Attachments 2 and 3.

The outlet channel was excavated within the stakes laid out by SRS. Initially a berm was maintained along the north and south sides to prevent release of fine sediment during construction. A silt curtain was installed immediately downstream of the channel, prior to connecting the channel to the river. Fish salvages were completed prior to channel tie in.

Sediment removed from the outlet channel was placed at the downstream end of the removal area. The boundary of the sediment placement area was laid out as per the design drawing, and the perimeter and profile of the stockpile was blended to the surrounding bar top at its boundary.

Once the outlet channel was connected to the river, turbidity was measured upstream and downstream of the work area, as well as within the area contained by the silt curtain. Background levels upstream of the work area were 2.9 to 8.8 NTU, while downstream of the site they ranged from 6.7 to 27.8 NTU. Within the silt curtain the turbidity was recorded at up to 265 NTU while the low flow swale was being excavated. The curtain was effective in mitigating the

release of sediment into the main channel. Once the instream portion of the work was completed and the suspended sediment had settled, the silt curtain was removed.

While exiting the bar for the final time, the excavator operator used his bucket to smooth any major ruts in the bar top that had been caused by the tracks of the excavator driving the same route over the bar top twice daily. An engineer from KWL was onsite to inspect the rip rap bank and determine if any remedial works would be needed to ensure stability. No remedial works were deemed immediately necessary after repositioning one piece of rip rap that had been displaced as the excavator climbed the bank.

The discharge in Fraser River, according to Water Survey of Canada gauge 08MF005 (Fraser River at Hope) for the duration of the works (December 20th to 23rd), gradually declined from approximately 900 to 780 m^3/s. The western portion of the removal area and the outlet remained submerged with sufficient depth to allow passage of fish (Photograph 17).

2.4 After completion of the works

As per the amended Authorization, SRS plans to undertake weekly inspections of the removal area until the 2011 freshet. Any residual pools which are not connected to the outlet channel will be salvaged for fish. The first such inspection and fish salvage occurred on January 9, 2011.

3.0 Difficulties encountered during the works and additional comments

Fish salvage permits secured for the works did not allow lethal fish sampling for voucher samples, as was required by the MNRO Order. Retention of fish voucher samples is not standard practice for fish salvages; however, such permits can be obtained if required by the agencies in future projects.

4.0 Conclusions

Link's Contracting were diligent in meeting the terms of the amended DFO Authorization and MNRO Order. The works followed the revised design plans and did not exceed the authorized footprint area. No major problems were encountered during the works.

As per Conditions 4.1 and 5.9.1 of the amended Authorization, follow-up monitoring of the removal area by topographic survey will include the outlet channel area. A survey is required following the first of either a major freshet (>8,766 m^3/s) or the freshet of 2012.

Regular inspections will be completed by SRS as water levels drop to winter low flows, and salvages of any isolated pools within the site will be conducted. These requirements and timelines are provided in the DFO Authorization and MNRO Order.

If there are any additional questions or comments please contact our office.

SCOTT RESOURCE SERVICES INC.

Martin Stol, *B.Sc., Dipl. Tech.*
Project Manager

Jenni Konken, *AScT, B.Sc., Dipl. Tech.*
Project Biologist

Reviewed by:

K. J. (Jim) Scott, *R.P.Bio., AScT.*
Senior Consultant

COLLEGE OF APPLIED BIOLOGY
K.J. (Jim) Scott
R.P. Bio #788
CAB

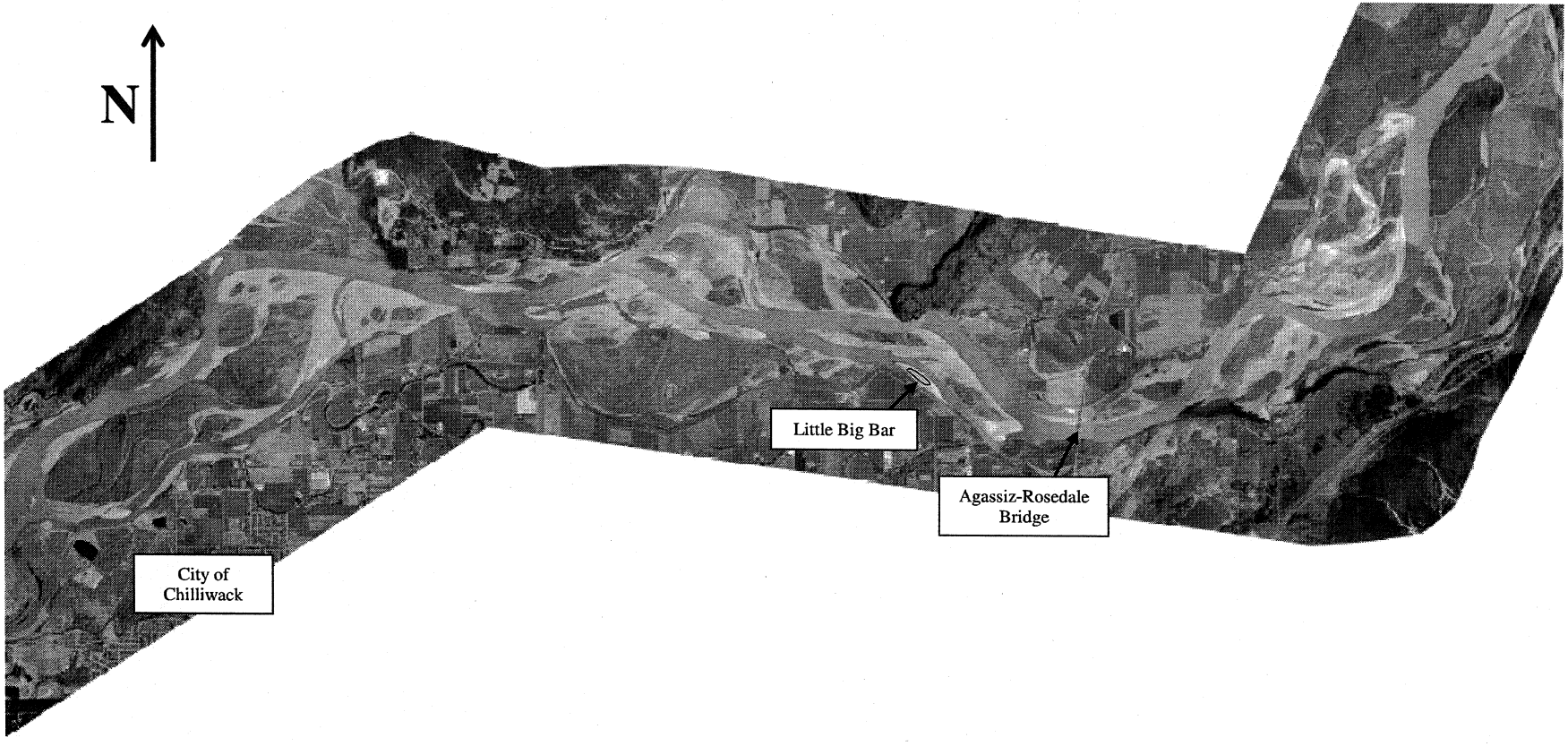
Attachments:

1. Site Location
2. Outlet Channel Design Revised With Low Flow Swale Sketch
3. Outlet Channel With Low Flow Swale Approximate Final Configuration
4. Selected Site Photographs

Attachment 1

Site Location

Attachment 1 – Site Location



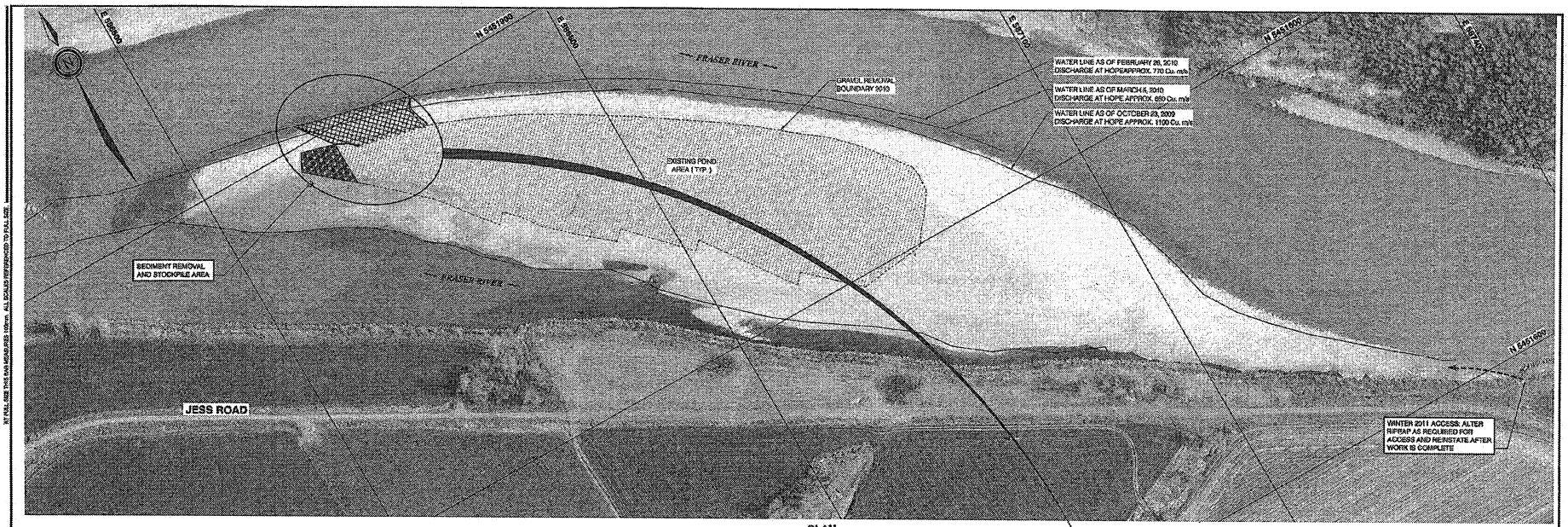
Orthophoto provided by Northwest Hydraulic Consultants.

Attachment 2

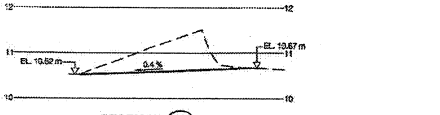
Outlet Channel Design

Revised With Low Flow Swale Sketch

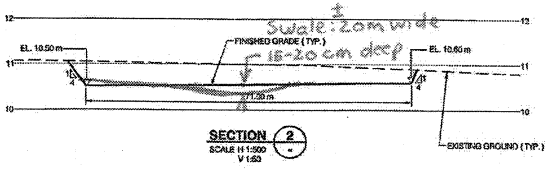
by Kerr Wood Leidal Associates



PLAN
SCALE 1:1000



SECTION 1
SCALE H 1:500
V 1:50



SECTION 2
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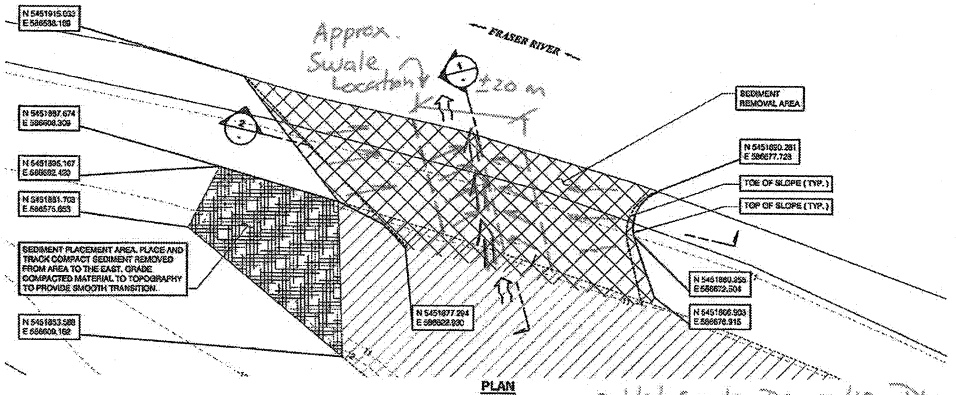
V 1:50



PLAN
SCALE 1:500

outlet Swale Dec 21/10 JM

SURVEY DATA FROM TUNBRIDGE & TUNBRIDGE (DRAWING DATED 8TH MARCH, 2010)
2009 ORTHOPHOTO (FLIGHT DATE: APRIL 12, 2009, DISCHARGE AT HOPE: 760 M³/S)

ISSUED INFORMATION	Issued for	Issue	Date	Issued By
	Reference			
	Approvals	AT	NOV. 24/10	
	Tender			
	Permits			
	Construction			
	Record Drawings			

REVISION INFORMATION	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision
	0	OCT. 29/10	JM	CA	JM	
	1	NOV. 24/10	JM	CA		REMOVAL AREA RELOCATED, ADDED STOCKPILE AREA

Rev. No.	Date	Designed	Drawn	Checked	Description of Revision

KERR WOOD LEIDAL associates limited
CONSULTING ENGINEERS

EMERGENCY MANAGEMENT BRITISH COLUMBIA
2011 FRASER RIVER SEDIMENT REMOVAL
LITTLE SIG BAR
SITE PLAN

KWL Project No.	284.054	Scale	AS SHOWN
Sheet	11 of 11	Rev. No.	1
Check EMBC		Drawing Number	SW10

PRINTED ON 100% RECYCLED BOND

XT FULL SIZE THIS SHEET MEASURES 110mm. ALL SCALES REFERENCED TO FULL SIZE
11/25/2010 8:16 AM
CADMUK
O:\2000-4999\284-054\1500 Drawings\pdf\284-054SW10Rev1.dwg

Attachment 3

Outlet Channel with Low Flow Swale

Approximate Final Configuration

Annotated by Scott Resource Services

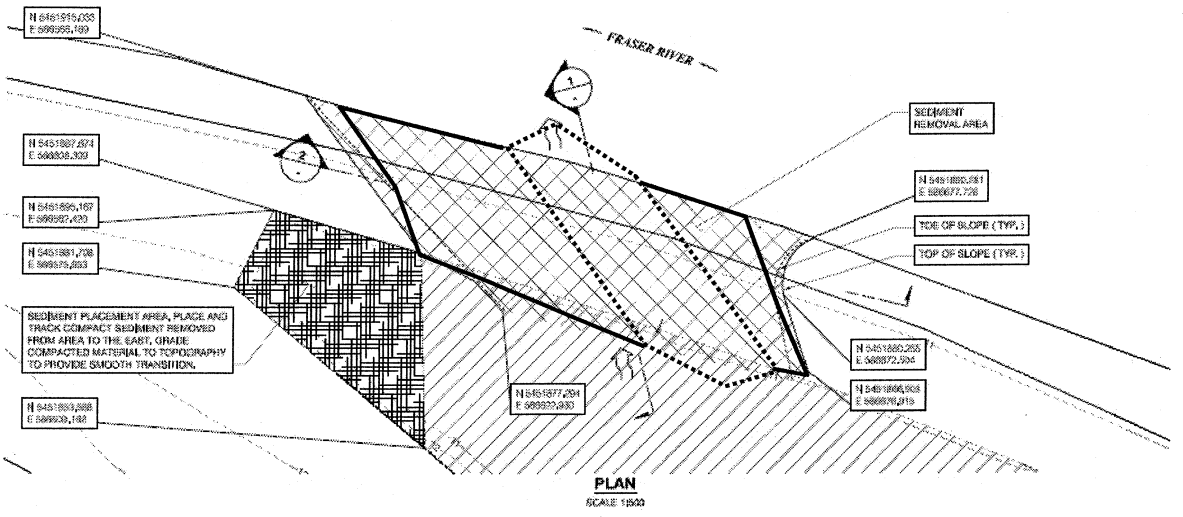
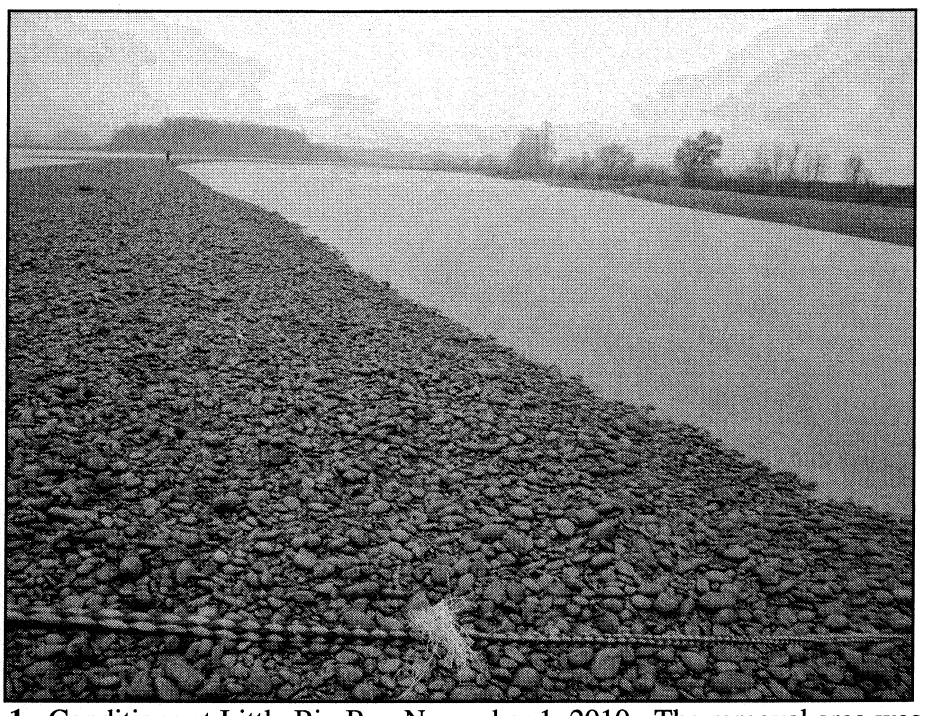


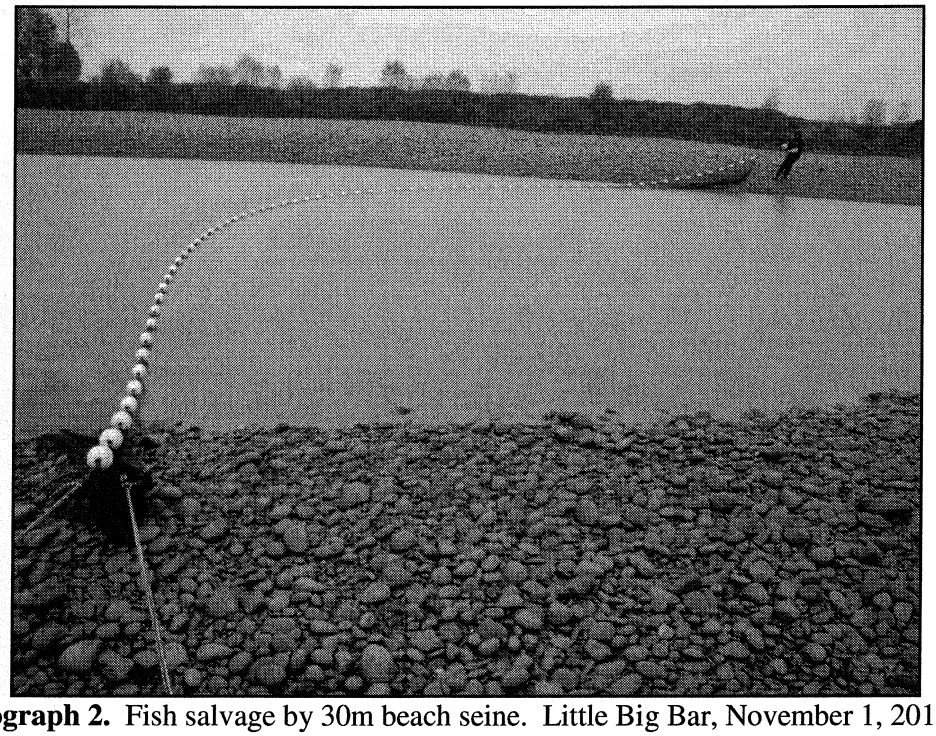
Figure: SRS annotated drawing depicting the approximate final configuration of the outlet channel (solid red line) and low flow swale (dashed red line).

Attachment 4

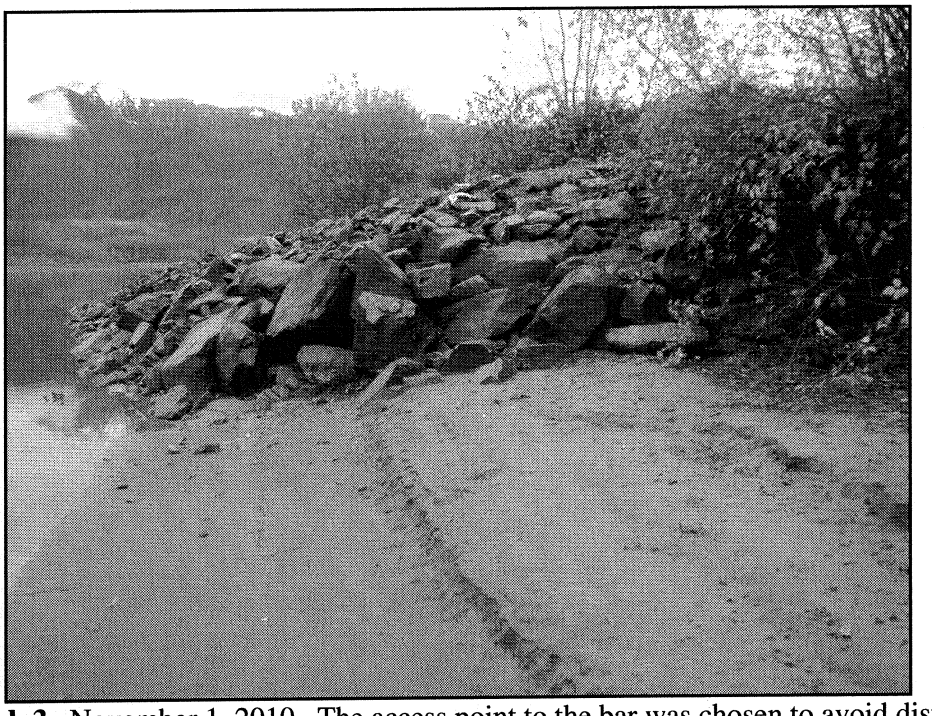
Selected Site Photographs



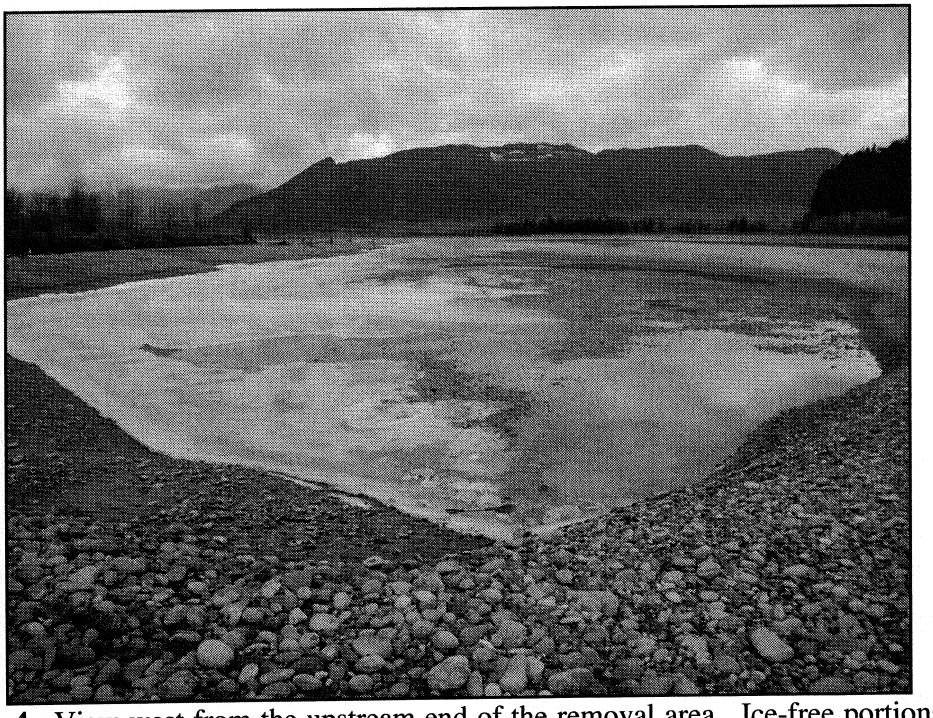
Photograph 1. Conditions at Little Big Bar, November 1, 2010. The removal area was isolated from the main channel, but water depth was sufficient to provide viable fish habitat.



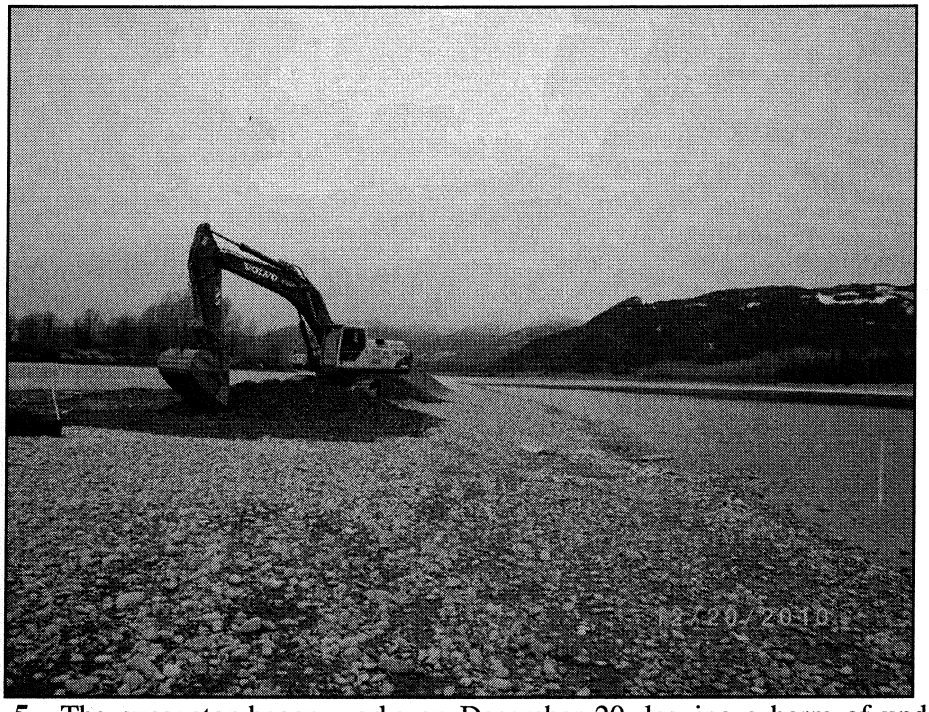
Photograph 2. Fish salvage by 30m beach seine. Little Big Bar, November 1, 2010.



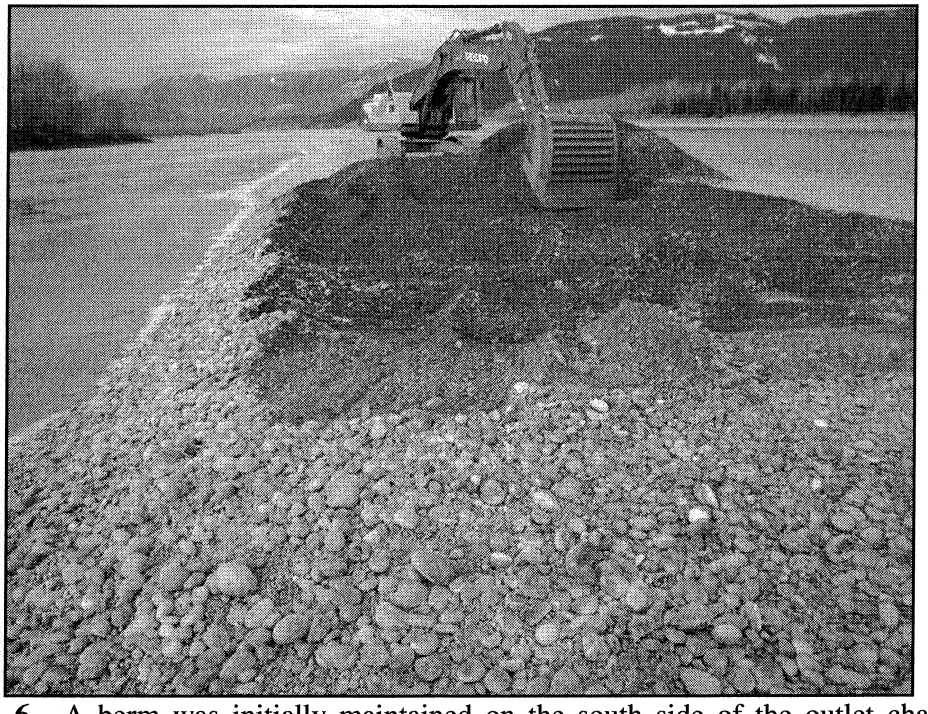
Photograph 3. November 1, 2010. The access point to the bar was chosen to avoid disturbance to riparian vegetation.



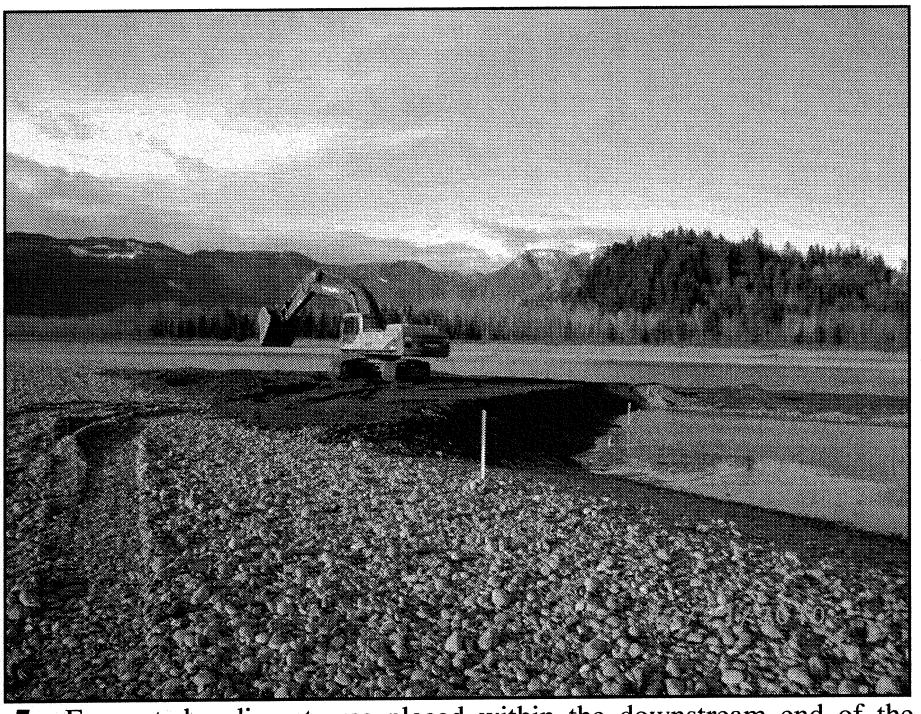
Photograph 4. View west from the upstream end of the removal area. Ice-free portions of the removal area were salvaged for fish on December 8, 2010.



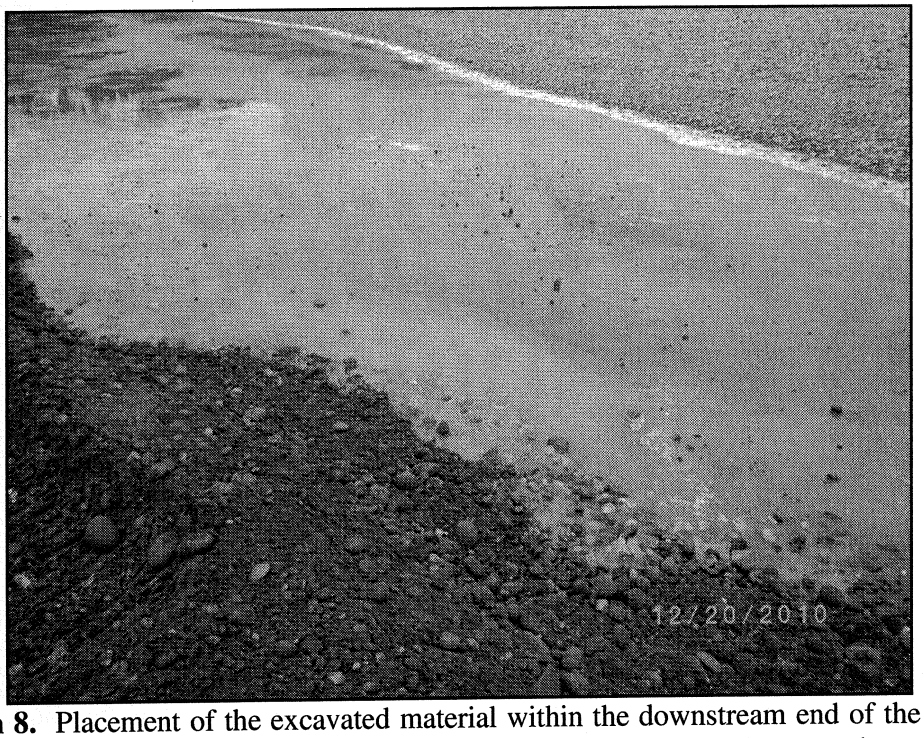
Photograph 5. The excavator began works on December 20, leaving a berm of undisturbed material along the bar edge prior to installing the silt curtain.



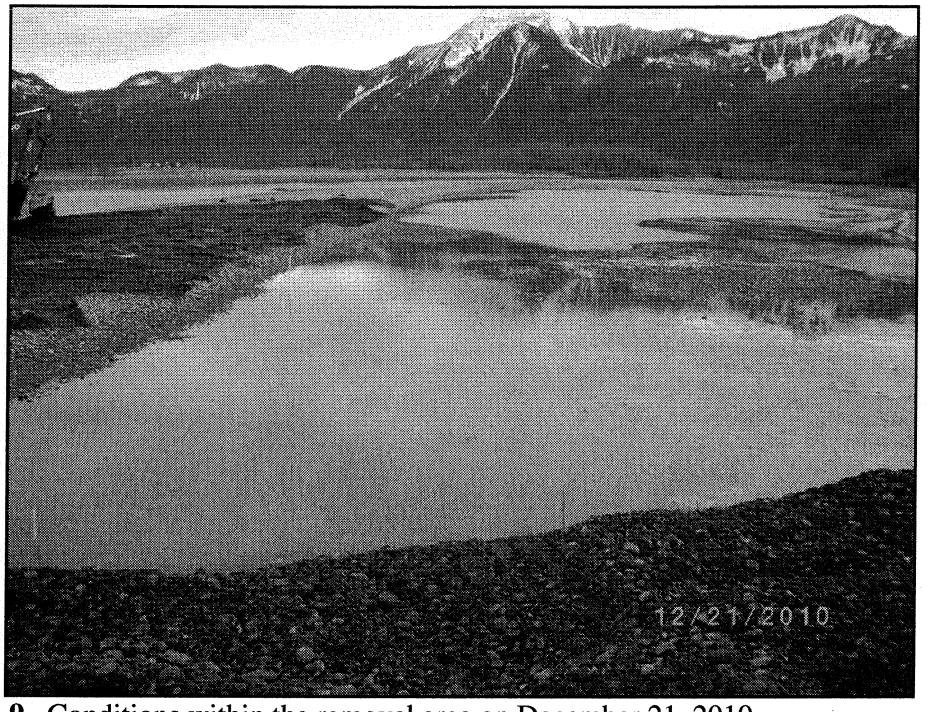
Photograph 6. A berm was initially maintained on the south side of the outlet channel, to minimize disturbance below the water line.



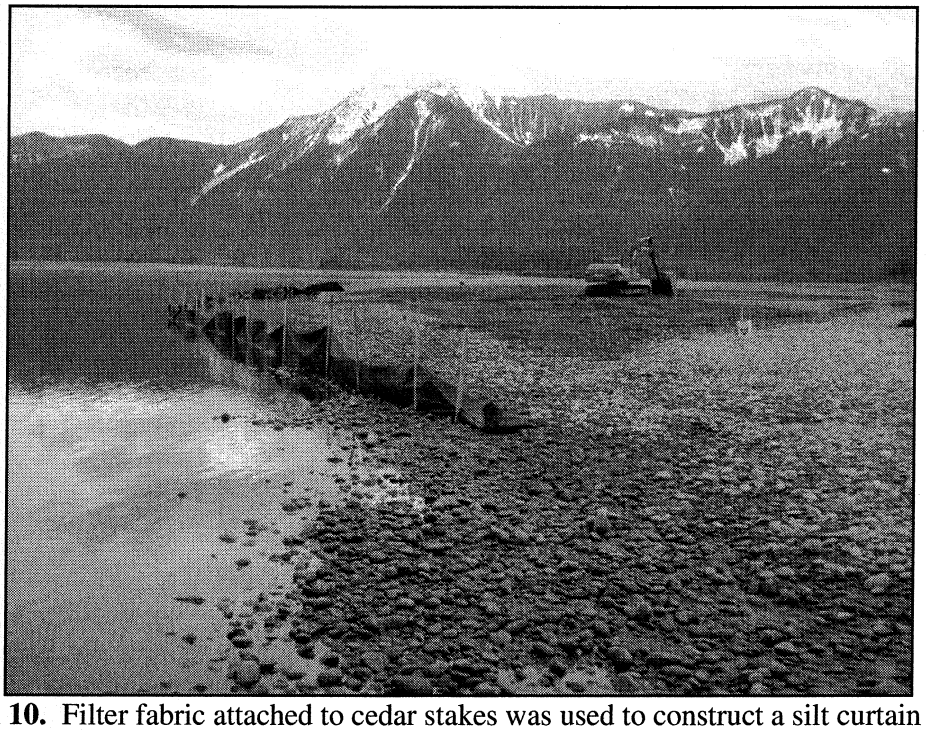
Photograph 7. Excavated sediment was placed within the downstream end of the original removal area boundary.



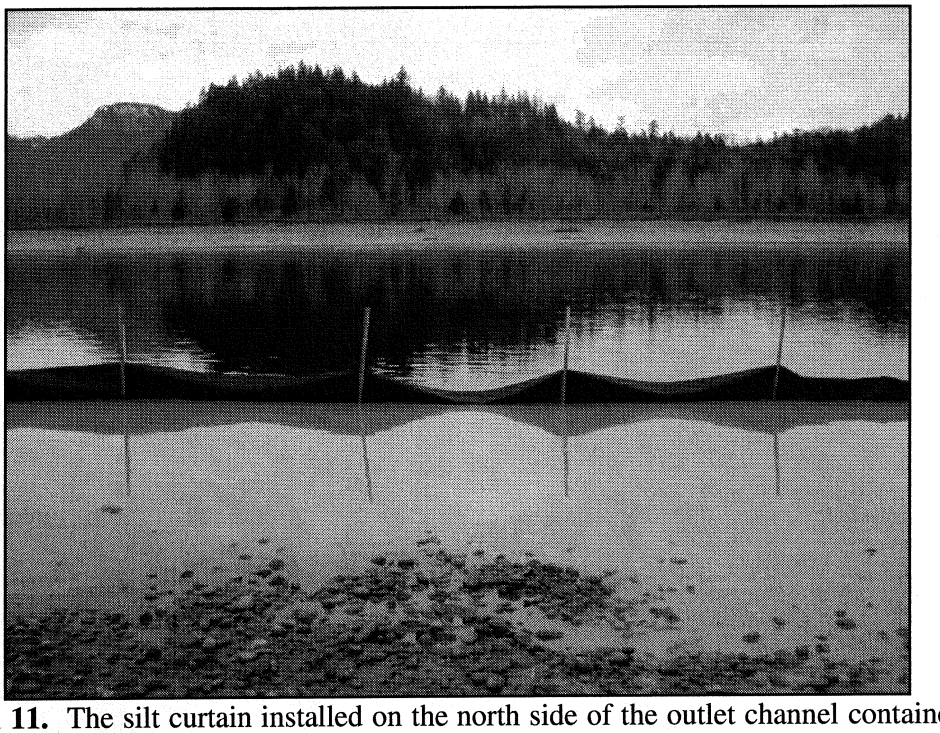
Photograph 8. Placement of the excavated material within the downstream end of the original removal area boundary resulted in a minimal and localized sediment plume at the toe of the slope. This area was previously salvaged for fish.



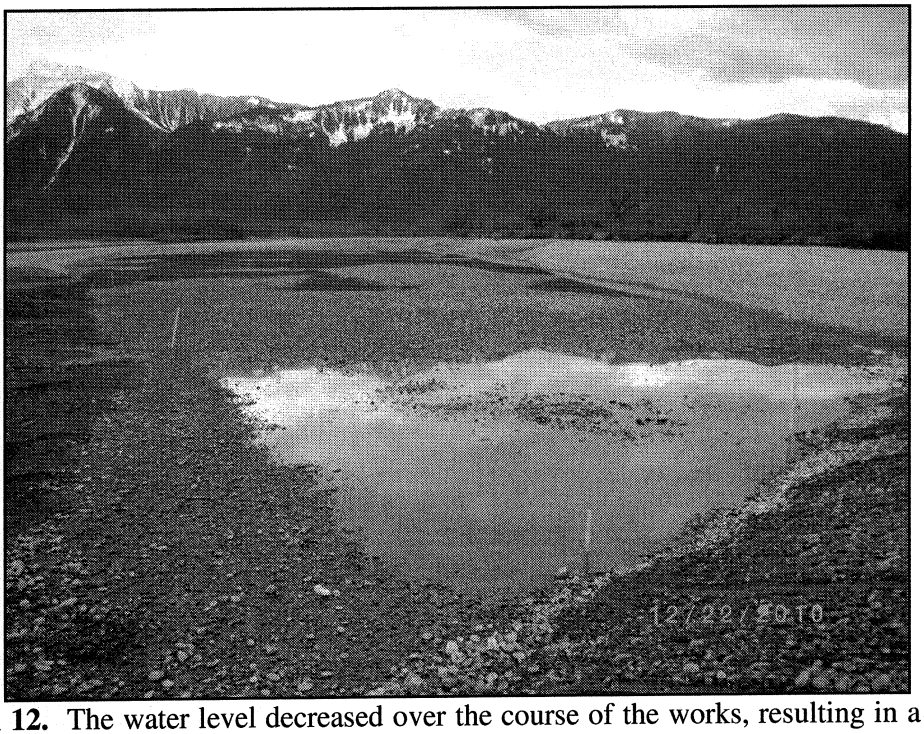
Photograph 9. Conditions within the removal area on December 21, 2010.



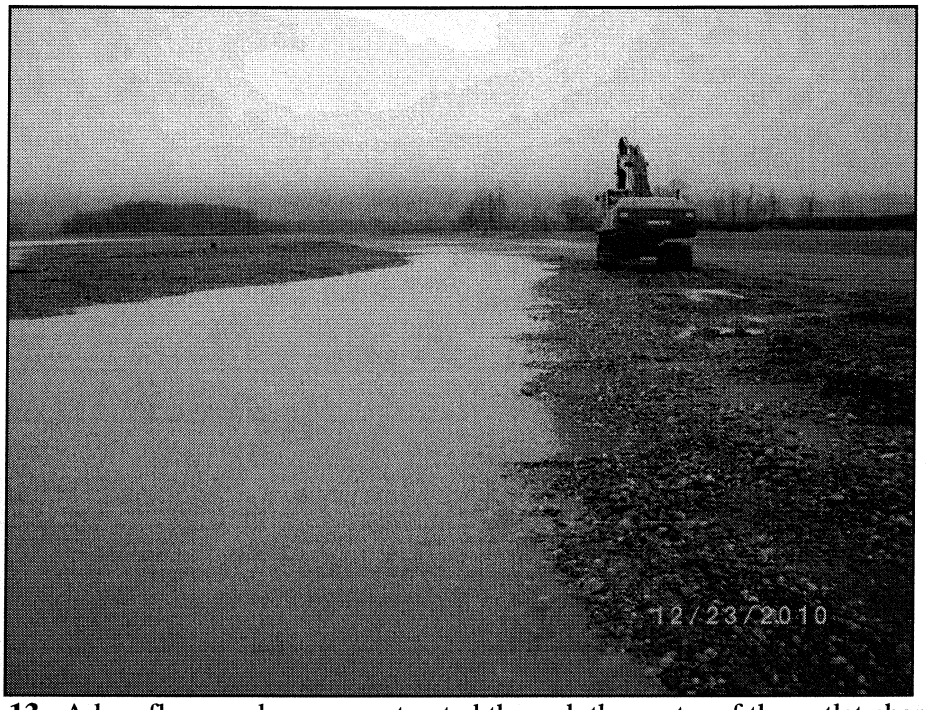
Photograph 10. Filter fabric attached to cedar stakes was used to construct a silt curtain in order to mitigate release of fine sediment into the Fraser River. December 22, 2010.



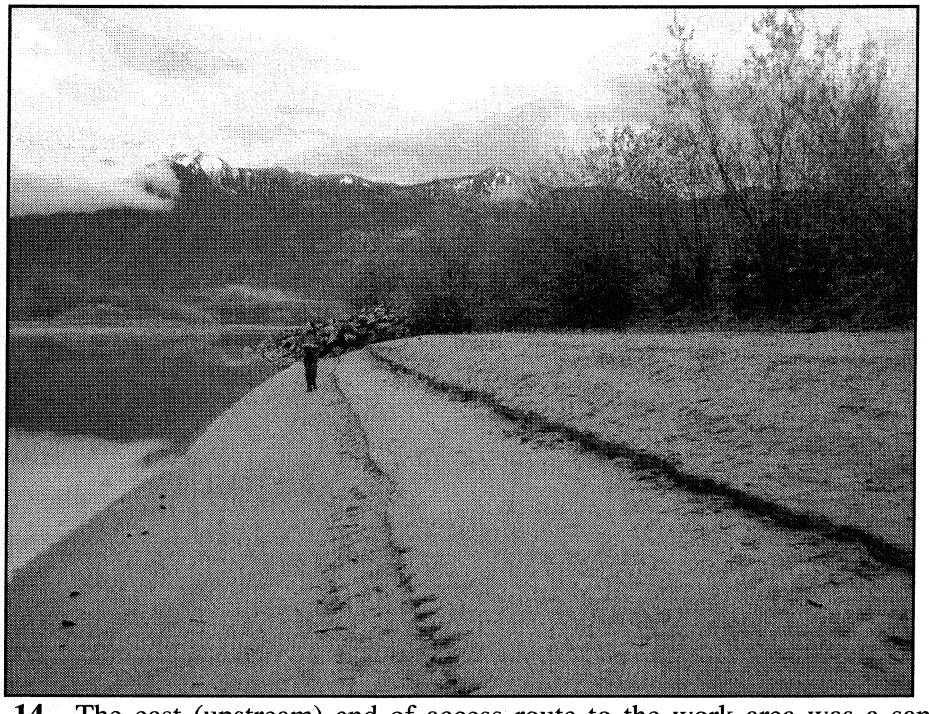
Photograph 11. The silt curtain installed on the north side of the outlet channel contained fine sediment and turbid water during tie in of the outlet channel. December 22, 2010.



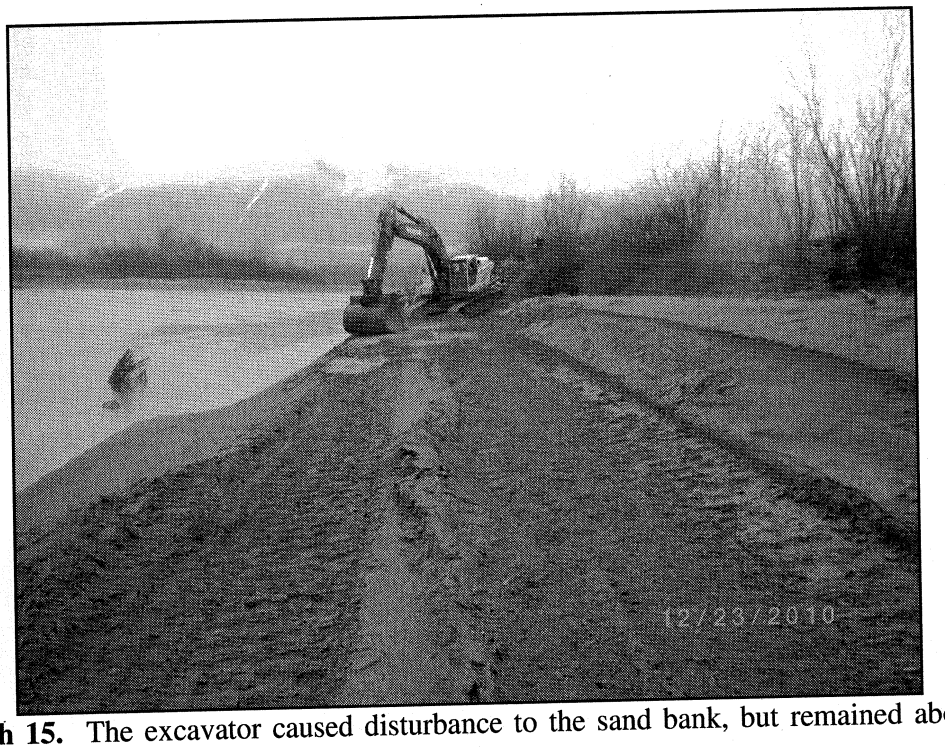
Photograph 12. The water level decreased over the course of the works, resulting in a number of shallow isolated puddles/pools that were again salvaged for fish by electrofishing.



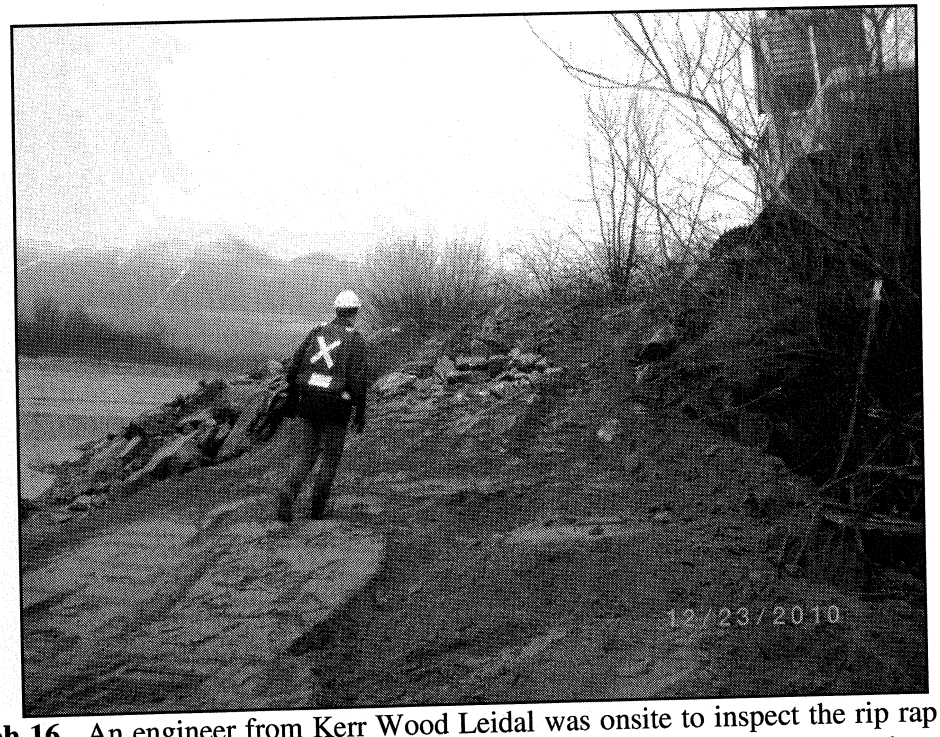
Photograph 13. A low flow swale was constructed through the centre of the outlet channel, and continued to provide a surface water connection to the removal area at a discharge of 780 m^3/s.



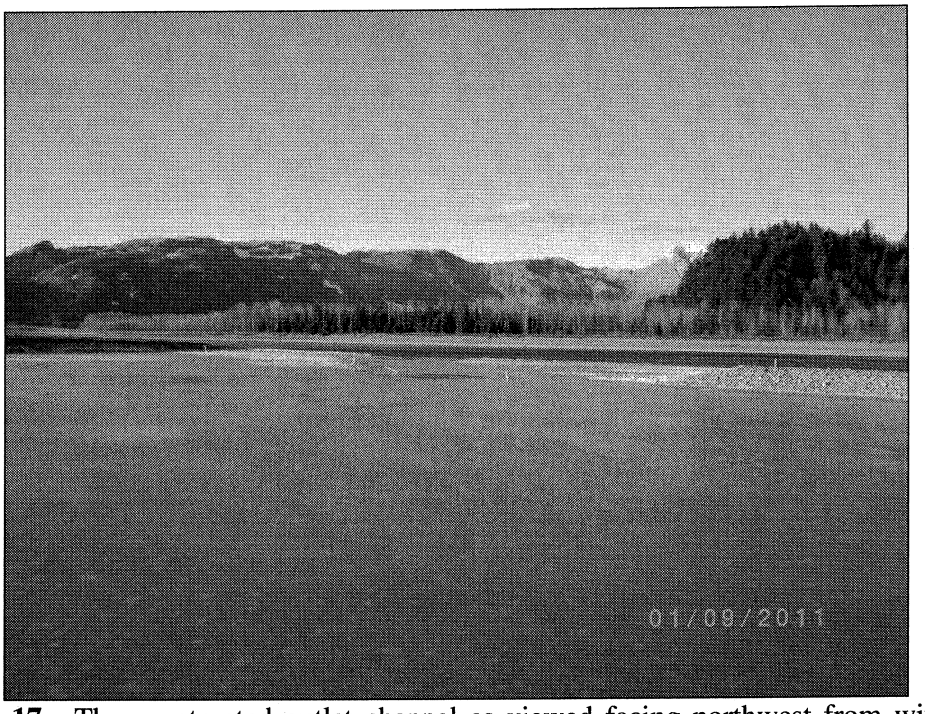
Photograph 14. The east (upstream) end of access route to the work area was a sand bank. November 1, 2010.



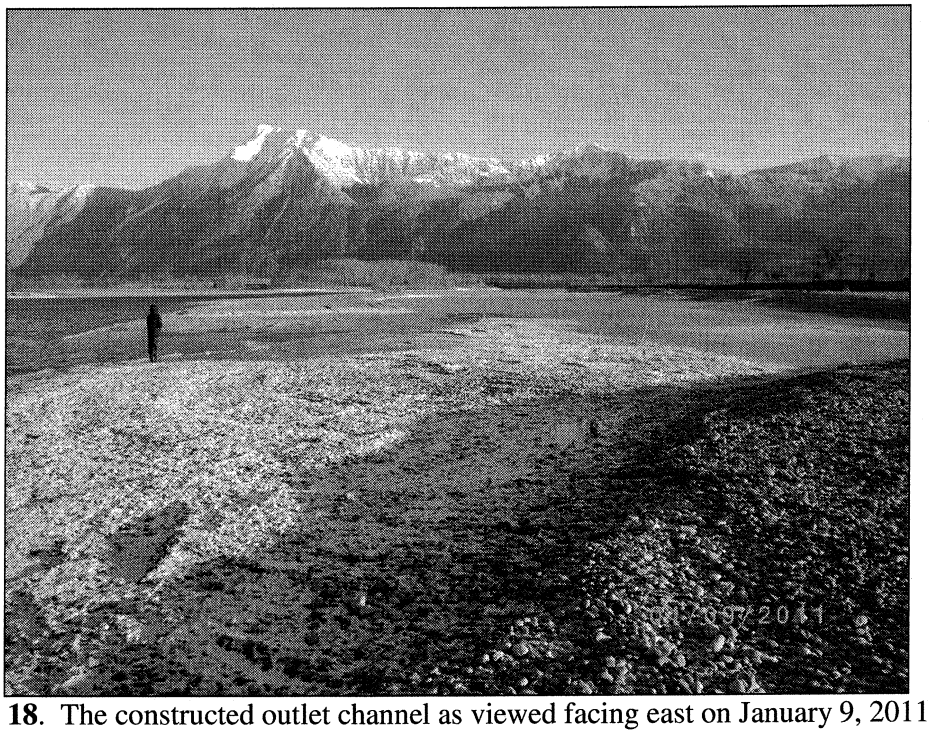
Photograph 15. The excavator caused disturbance to the sand bank, but remained above the water line and avoided all riparian vegetation.



Photograph 16. An engineer from Kerr Wood Leidal was onsite to inspect the rip rap bank as the excavator exited the bar. The excavator bucket was used to smooth the disturbance to the sand bar upon final exit of the work site.



Photograph 17. The constructed outlet channel as viewed facing northwest from within the removal site on January 9, 2011.



Photograph 18. The constructed outlet channel as viewed facing east on January 9, 2011.