

SCOTT RESOURCE SERVICES INC.
Environmental Consultants
31856 Silverdale Avenue, Mission, B.C. V2V 2K9
Tel: (604) 820-1415 Fax: (604) 820-1621
e-mail Scottres@telus.net



TRANSMITTAL FORM

Date: October 25, 2001

MoELP file: A2005033(MIS)
FOC file: 01-HPAC-PA2-000-000487
Our file: 508.01

200-20/Hatzic

Al Jonsson, Project Engineer
Fisheries and Oceans Canada
100 Annacis Parkway
Delta BC
V3M 6A2

Re: Post Construction Report - Lagace Creek Sediment Basins and Stream Complexing

Enclosed are 4 copies of the above post construction report for review and distribution. Per Section 9.0 of the FOC authorization the following items are outstanding in relation to the project:

Covering impacted banks (e.g. with hydroseed or geotextile material) was never accomplished. As explained in the post construction report, the banks consist primarily of coarse bed material and erosion and sediment transport is not likely. However, the impacted areas should at least be hand seeded during the next growing season (April 2002). This could be accomplished by The Hatzic Valley Watershed Committee, when riparian planting is conducted.

Identification of planting sites along Lagace Creek has yet to be conducted. Graham Danaluz of the Fraser Valley Regional District (FVRD) stated that this would be accomplished by Scott Resource Services Inc. (SRS) as part of a habitat assessment of Lagace Creek after the system has been mapped by FVRD using SHIM procedures (mapping should be completed by December 2001). Planting of 2500 plants as well as live staking per the FOC authorization is also still required. The FVRD stated that The Hatzic Valley Watershed Committee, would be responsible for riparian planting.

Please phone Jim Scott or Andrew Walter (604-820-1415) if you have any comments or questions concerning this report.

Sincerely,

SCOTT RESOURCE SERVICES INC.

Andrew Walter
Project Biologist

enclosures (4)

cc. Vic Galay, Northwest Hydraulic Consultants
Graham Daneluz, Fraser Valley Regional District
Anne Waskett-Myers, Ministry of Water, Land and Air Protection

SCOTT RESOURCE SERVICES INC.
Environmental Consultants
31856 Silverdale Avenue, Mission, B.C. V2V 2K9
Tel: (604) 820-1415 Fax: (604) 820-1621
e-mail Scottres@telus.net



FOC file: 01-HPAC-PA2-000-000487
MWLAP file: A2005033(MIS)
Our file: 508.01

October 18, 2001

Al Jonsson, Project Engineer
Fisheries and Oceans Canada
100 Annacis Parkway
Delta BC
V3M 6A2

Re: Post Construction Report - Lagace Creek Sediment Basins and Stream Complexing

1.0 Introduction

Northwest Hydraulic Consultants (NHC) retained Scott Resource Services Inc. (SRS) to assist in monitoring sediment pond excavation and instream complexing work undertaken on Lagace Creek in the Fraser Valley Regional District (Attachment 1). Construction of the sediment basins and associated habitat complexing commenced on September 24 and was completed on October 5, 2001. The sediment basins were constructed as part of flood protection works for property adjacent to Lagace Creek and was monitored daily by Jim Scott and Andrew Walter of SRS.

2.0 Environmental Mitigative Strategies

The following mitigative strategies were implemented in order to carry out the work:

- salvage fish from watercourse impacted by sediment pond creation (completed in phases);
- work in isolation of flow by diverting the water and berming the work area;
- ensure spoil placement site will not impact the watercourse;
- ensure impact to riparian areas is kept to a minimum;
- ensure machinery is clean and leak free prior to start up; and,
- ensure spill kits are on site.

3.0 Pre-Construction Work

3.1 Fish Salvages

Fish salvages were conducted On September 24 and 25 when the watercourse was diverted into a channel along the left bank and again on October 2 when water was diverted into the sediment basins. During each salvage, the upstream end of the affected channel was isolated with a 6mm hardware cloth fence and a seine net used to corral fish and chase them out of the work area. Downstream fencing was then erected, effectively isolating the site. An electroshocker was then used to salvage the remaining fish. As water was diverted in stages, visual searches for stranded fish were conducted and fish salvaged using dip nets and buckets.

Salvage totals are as follows:

- coho salmon - 264
- rainbow trout - 41
- cutthroat trout - 1
- sculpin species - 520
- lamprey species - 16

All fish were released unharmed downstream of the work site (under the Farms Road bridge). See Attachment 2 for the appropriate salvage permits and the salvage report.

3.2 Preparatory Works

Vic Galay of NHC contacted Doug Anderson (the land owner and person doing the work) the week of September 17 to go over the Fisheries and Oceans Canada (FOC) authorization requirements pertaining to the project. Prior to start up, machinery and spill kits were inspected by SRS. The excavator used for sediment pond creation had been steam cleaned and was free of leaks. A spill kit was on-site and adequate for the task at hand.

As the FOC authorization was issued in late September, Vic Galay was concerned that excavation of the sediment basins as first planned and agreed to by FOC would not be feasible before the end of the work window (October 1, 2001). A revised plan was drafted by Vic Galay involving excavation of only 3 bars (Bars 3, 4 and 5 in Attachment 3 and Photographs 1 and 2 in Attachment 4) as opposed to 5. It was felt by Vic Galay that the upstream bars had the most gravel and could be excavated deeper than the downstream 2 bars.

To allow for the excavator to work in the dry, a berm was constructed to divert water into a channel along the left bank. Water was first diverted into a channel along the right bank and the left bank channel over excavated to accommodate flow and to encourage subterranean flow into the channel. A berm was also constructed to ensure that flow would not enter the work site during a high water event (Photograph 3; Attachment 4). The flow was then diverted into the newly excavated channel. All stream diversions were done in stages to allow for slow dewatering, thus enabling SRS to salvage any stranded fish. Construction of berms and channel diversions occurred without incident. Sediment plumes of short duration (approximately 10 minutes) were created as water was diverted.

4.0 Construction of Sediment Basins

Excavation began on September 25, 2001, in isolation of flow (Photograph 4; Attachment 4). The excavator operator (Rob Anderson) was cognisant of staying above the peat layer and careful to slope banks at a minimum 2:1 slope. During excavation it was observed that the depth of the gravel was less than originally anticipated. NHC assumed that gravel could be excavated to a depth of approximately 2m. Actual gravel depth ranged from 0.5 to 0.75m.

It became clear to SRS on September 26, that the Andersons showed a reluctance regarding the creation of the 3 contoured basins connected by spawning habitat (in essence a beaded channel) as per the accepted NHC plan drawing. SRS informed NHC and FOC of the conflict on September 26.

NHC proposed the following changes on September 26 in attempt to reach a compromise with the Andersons:

- create only 2 basins rather than 3, by excavating the whole site and then recreating a separation berm with a spawning platform; and,
- use native boulders (approximately 1 foot diameter) rather than importing 2 foot rip rap when creating spawning platforms.

Both SRS and FOC viewed the creation of only two ponds as an unacceptable deviation from the proposed plan. On October 27, the Andersons agreed to build up two berms in order to create the three basins as well as leaving 5m wide openings to create the spawning platforms. As the depth of the excavation was limited, pool creation would be encouraged by building up berms. The low flow notches between the berms, where spawning platforms would be placed, were staggered (the upstream one toward the right bank and the downstream one toward the middle of the channel) to encourage a naturally meandering channel over time.

An on site meeting was held on September 28 with Al Jonsson and Craig Sciankowy (FOC), Vic Galay (NHC), Jim Scott and Andrew Walter (SRS) in attendance. The use of smaller diameter native boulders as opposed to rip rap when creating the spawning platforms was deemed acceptable to FOC. It was also determined at this time that the majority of in-stream large woody debris (LWD) complexing be completed downstream of the basins where the channel was better established.

It was apparent that in order to complete the project, the in-stream work would have to extend into the first week of October. FOC agreed to extend the work window on a day by basis and that work would have to halt if significant numbers of spawning salmon began to enter the excavation area.

Excavation proceeded without further incidents per agreed upon conditions based on the September 28 meeting. On October 3, a temporary bridge was placed at the upstream end of the excavation to access the left bank and redirect flow into the newly created sediment ponds. A cut off berm was placed in stages at the upstream end of the left channel, slowly redirecting water into the pond in a controlled manner. A short sediment plume occurred due to the initial flush of water into the ponds.

After the left channel had been dewatered, the channel was regraded (Photograph 5; Attachment 4). The berms separating the three sediment basins were also keyed into the left bank and graded (Photograph 6; Attachment 4). A 20m section of vegetated berm at the downstream end was left as a vegetated island (Photograph 7; Attachment 4). The bridge was taken out without impacting the water column, however one ford with the excavator was necessary when taking the bridge out. The ford occurred without incident. Construction of the 3 sediment basins was completed on October 5, 2001.

The constructed berm used to separate the excavation from flowing water, effectively contained sediment laden water for the duration of the works. The berm overtopped at the downstream end during a large rain event on September 26, 2001. This was not a problem however, as water at the downstream pond had already settled out considerably, the release was small and after mixing with the main flow, the suspended sediment was less than 75mg/l immediately downstream of the site.

5.0 Stream Complexing

5.1 Spawning Platforms

A total of three spawning platforms were constructed for the project. A row of boulders (approximately 5m in width) were placed downstream of the temporary bridge location, and native spawning size gravel placed upstream (Photograph 8; Attachment 4).

Two spawning platforms were also constructed to connect the 3 sediment basins (Photograph 9 and 10; Attachment 4). Native spawning size gravel was placed in the platform compartments as well as directly upstream of these two spawning platforms.

The platforms were constructed on October 4 and appropriate modifications made on October 5 per FOC recommendations.

5.2 Large Woody Debris Placement

The original plan for LWD placement was to place two structures per excavated sediment basin, necessitating at least six structures for the three completed sediment basins. Due to the uncertainty of the channel morphology over time within the excavated sediment basins, FOC, NHC and SRS agreed that the majority of LWD complexing be conducted downstream of the basins where the channel is starting to stabilize. Jack Mussel was hired to professionally install the structures. A total of 21 pieces of LWD were used for 7 structures. Following is a list of structure placement and design:

- LWD Structure 1 - 1 large root wad with boulders placed on top, placed in the upstream sediment basin (Photograph 11; Attachment 4)
- LWD Structure 2 - 2 root wads and 2 logs placed at the downstream end of the excavation along the right bank. A brush mat was placed on top of the structure (Photographs 12 and 13; Attachment 4)
- LWD Structure 3 - 2 root wads and 3 logs placed downstream of the excavation along the right bank (Photograph 14; Attachment 4)
- LWD Structure 4 - 4 root wads placed downstream of the excavation along the right bank. A brush mat was placed on top of the structure (Photograph 15; Attachment 4)
- LWD Structure 5 - 3 root wads and 1 log placed downstream of the excavation along the right bank. A brush mat was placed on top of the structure (Photograph 16; Attachment 4)
- LWD Structure 6 - 2 logs placed downstream of the excavation along the left bank (Photograph 17; Attachment 4)
- LWD Structure 7 - 1 log placed downstream of the excavation along the right bank (Photograph 18; Attachment 4)

All structures, except LWD Structure 1, were cabled and secured to lock blocks keyed into the bank. Lock blocks were buried for aesthetic purposes. See Attachment 5, for an aerial photo of LWD structure locations.

5.3 Boulder Clusters

During the on site meeting on September 26, FOC requested boulder clusters in a variety of locations downstream of the sediment basins. Boulder clusters were placed in four agreed upon locations (Attachment 5). Following is a list of boulder clusters:

- Cluster 1- five boulders placed downstream of LWD Structure 2 (Photograph 12; Attachment 4)
- Cluster 2- six boulders placed upstream of LWD Structure 5 (Photograph 16; Attachment 4)
- Cluster 3 - five boulders placed downstream of LWD Structure 6 (Photograph 17; Attachment 4)
- Cluster 4 - seven boulders placed adjacent to LWD Structure 7 (Photograph 18; Attachment 4)

6.0 Site Restoration

Three ramps were excavated to access the river in order to effectively carry out the excavation as well as the creation of berms and spawning platforms. LWD structures were placed in locations lacking in riparian vegetation, however excavation was necessary to key in lockblock anchors. All disturbed sites were graded upon completion of the project, however hydroseeding was never completed on the impacted slopes due to the lateness of the project. The slopes consist of coarse stream bed material that is quite stable, however, during the next planting season (Spring 2002), these sites should either be hydroseeded or hand seeded as well as planted with riparian vegetation.

7.0 Post Construction Monitoring

7.1 Physical Habitat

Assessment of physical stability of the site is required two times during the first winter (December, 2001 and Spring 2002). From 2002 to 2006, biannual assessments of the site, noting physical stability and functionality of the basins and stream complexing features is required. For a period of three years from the time of planting, an annual assessment of newly established riparian vegetation shall be conducted. Plant survival must be 80% for shrubs and 100% for trees for the duration of the monitoring program.

7.2 Salmonid Utilization

Minnow trapping within the basins and within complexing features shall be conducted biannually for a period of five years (2002 to 2006) to determine seasonal salmonid utilization. Spawner surveys must be conducted during peak chum and coho spawning periods for a period of five years (2002 to 2006) to determine adult salmonid usage of the sediment basin, cover structures and spawning platforms.

8.0 Conclusions (compliance with approval conditions and difficulties encountered)

8.1 Mitigation

The creation of the sediment basins as well as the stream complexing features were achieved with minimal sediment disturbance. Machinery was clean and in good operating condition for the duration of the project. Channel diversions and berms effectively isolated the work site during excavation of basins and effectively mitigated sediment release. Sediment plumes created during channel diversions were short lived (5 to 10 minutes in duration) and no stressed fish were observed. Fish salvages were effectively carried out with no problems encountered. The gravels and sands excavated from the basins were stock piled 15m back from the top of bank on Doug Andersons property.

8.2 Sediment Basin Design and Instream Complexing Design

Due to a number of factors, it was necessary to make significant design changes to the originally accepted sediment basin plan developed by NHC. As the FOC authorization was only received the week of September 17, 2001, it was felt by NHC that excavation of all 5 bars as originally planned would not be feasible prior to the end of the work window (October 1). Therefore, NHC made the decision to excavate only 3 of the 5 bars (the upstream most bars) where gravel accumulation was thought to be most abundant. All five of the gravel bars could have been excavated had the authorization been received closer to the beginning of the work window (August 1).

A general reluctance on the part of the property owner (Doug Anderson) and the excavator operator (Rob Anderson) to follow the NHC plan drawings, resulted in sediment basins that were not contoured according to the design submitted to FOC. SRS feels that it would have been beneficial had property owner been more involved in the design process. If it became clear that the Andersons had concerns during the design phase, issues could have been addressed and perhaps resolved, design modifications incorporated or a new site chosen.

The average excavation depth within the sediment basins was approximately 0.75m, limiting the capacity of the sediment basins and the functionality of the traps as rearing habitat for fish species. SRS believes that it would be beneficial to excavate test holes, during the design phase of a gravel removal project to determine the actual depth of the gravel deposits.

NHC, SRS and FOC felt that the majority of the in-stream structures (e.g. boulder clusters and LWD structures) be placed downstream of the sediment basins where the channel is beginning to stabilize as opposed to within the sediment basins themselves as was first agreed by FOC. SRS believes it more desirable to provide complexing within the vicinity of sediment traps but not necessarily within the trap itself, due to the temporary nature of the complexing (the traps will eventually fill with sediment covering the structure). SRS believes that instream complexing features (e.g. spawning platforms, boulder clusters and LWD structures) have met FOC expectations per on-site meetings on September 26, 28 and October 3, 2001.

8.3 Site Restoration

As stated in Section 6.0, impacted areas have been graded but have not been covered (e.g. with hydroseed or geotextile mat). The banks are quite stable as the substrate consists primarily of coarse bed material, however, the impacted areas should at least be seeded during the next growing season (April 2002).

Identification of planting areas along Lagace Creek has yet to be conducted. Planting of 2500 plants as well as live staking per the FOC authorization is still required.

8.4 Chum Salmon Spawner Migration Timing

The following observations were made by SRS regarding chum salmon spawner timing through the work site:

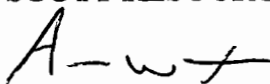
- October 3 - 2 chum (paired up) observed migrating through the work site;
- October 4 - 3 chum observed migrating through the work site;
- October 5 - 4 chum (2 pairs) observed upstream of the temporary bridge crossing;
- October 25 - 250-300 chum (live plus dead) were observed in the area from the bridge upstream to the upper end of the excavation. Many fish were observed holding in and adjacent to the habitat complexing features. In addition, there was a substantial number of fish spawning within the three sediment basins.

It appears that the initiation of spawner migration within Lagace Creek occurred at the beginning of October in 2001. As spawner numbers were low and all of the fish were observed migrating through the affected area, SRS viewed the completion of the project as an acceptable risk to the fisheries resource.

We trust that this is the information you require at this time. Please contact Jim Scott or Andrew Walter (604-820-1415) if you have any questions or comments.

Sincerely,

SCOTT RESOURCE SERVICES INC.



Andrew Walter *B.ed, Dip Tech*
Project Supervisor

Attachments (5)

cc. Vic Galay, Northwest Hydraulic Consultants
Graham Daneluz, Fraser Valley Regional District
Anne Waskett-Myers, Ministry of Water, Land and Air Protection

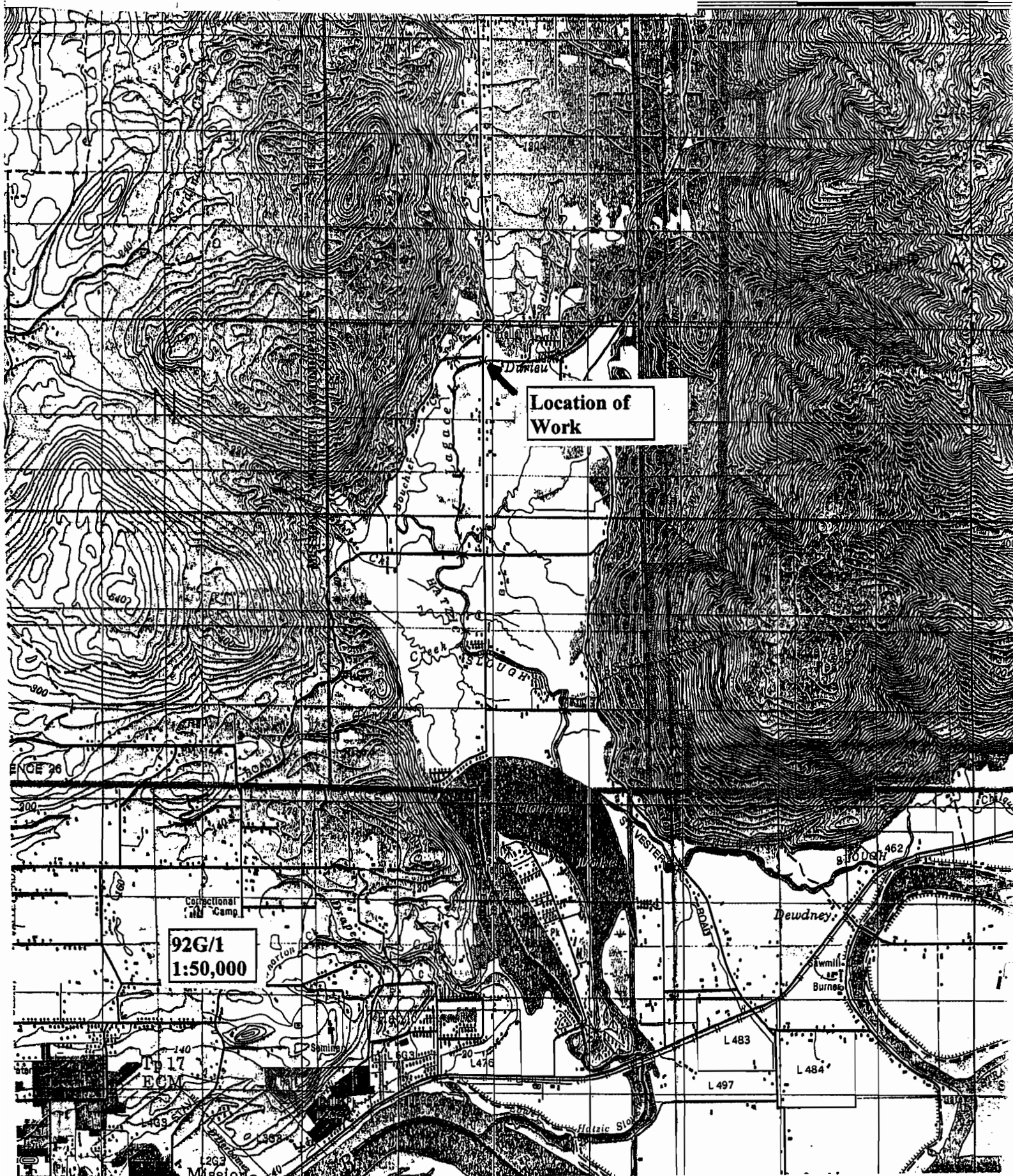
CANADA

Attachment 1. Location of Lagace Creek sediment basins and stream complexing.

58

59

60



Attachment 2. Salvage permits (MWLAP and FOC) and salvage report for Legace Creek.



File: 34770-20 (Scott Resource Service 01-17 (1))

**FISH COLLECTING PERMIT
FISH SALVAGE ONLY**

PERMITTEE: Scott Resource Services Inc
31856 Silverdale Avenue
Mission BC V2V 2K9

J. Scott, M. Thomey, A. Walter,
W. Silver, V. Harper
J. Turner, A. Sartori

Is hereby authorized under Section 19 of the *Wildlife Act*, RSBC 1996, Chap. 488 and as provided in Section 18 of the Angling and Scientific Regulations, BC Reg. 125/90, to collect fish for scientific purposes from non-tidal waters subject to the conditions set forth herein:

Permitted Waters: all waters in Region 2

Permitted Times: April 1, 2001 to March 31, 2002

Permitted Species: all species except salmon

Provincial Species Present: see FISS @ <http://www.elp.gov.bc.ca/fsh/ids/dman/>

Permitted Gear: **electroshockers, minnow traps, seine nets, dip nets, trap nets, angling

**** Use of Electroshocking subject to approval by DFO for this method for this project. Electroshocking permitted July 1 to September 30 (subject to review by staff, emergency works may be exempt), please review electroshocking sensitivity windows (copies available). Based on the time of year, passive forms of sampling (minnow trapping, etc.) must minimize disturbance of spawning adults and eggs in gravel (ie, conduct activity from the bank if possible).**

Special Conditions:

1. This permit covers all fish salvage operations where fish are returned live to the same water body within 500 m of the collection site.
2. For each salvage operation, you must provide, in writing or by phone, information on the waterbody, salvage date(s), species involved and gear used before work begins to the following Ministry offices.

Fish and Wildlife Management
10470 - 152 Street
Surrey BC V3R 0Y3

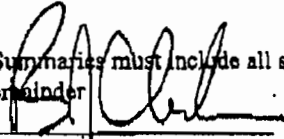
Conservation Officer Service
Nearest office to the water body (see #2, Page 2)

Phone: 582-5200 Fax: 930-7119

General Conditions:

1. Scientific Collection Summaries must include all species caught including amphibians and invertebrates
2. See reverse side for remainder

Authorized by:


Brian Clark
Regional Manager
Fish, Wildlife and Habitat Protection

Date: March 27, 2001

Permit No: PC2001-17

Any contravention or failure to comply with the terms and conditions of this permit is an offense under the Wildlife Act, RSBC 1996 Chap. 488 and BC Reg. 337/82 Sec. 8.

General Receipt Number _____ (\$25.00)

*** THE GOVERNMENT OF BRITISH COLUMBIA IS AN "EMPLOYMENT EQUITY EMPLOYER" ***

Ministry of Environment,
Lands and Parks

BC Environment
Lower Mainland Region

Mailing/Location Address:
10470 152 Street
SURREY BC V3R 0Y3

Telephone: (604) 582-5200
Facsimile: (604) 930-7119



Fisheries and Oceans
Canada

Pêches et Océans
Canada

100 Annacis Parkway
Unit 3
Delta BC V3M 6A2

September 17, 2001

Licence # : 01.232

K.J. (Jim) Scott
Scott Resource Services Inc.
8031 Philbert Street
Mission, B.C.
V2V 3W9

Dear Mr. Scott:

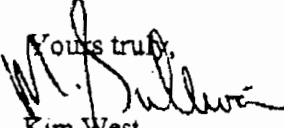
Enclosed please find a licence valid from September 17, 2001 to October 15, 2001 to permit the collection of anadromous salmonids (non-retention)(excluding steelhead) from Legace Creek, east of Mission, BC.

Please ensure the Fishery Officer listed on your licence is fully informed of your activities prior to commencement of field work.

In addition, please contact B.C. Ministry of Water, Land and Air Protection for a license to salvage non-salmon species. Please use other methods first, electroshocking as a final method.

I look forward to your report upon completion of the project.

Yours truly,


Kim West

For Management Biologist - Resource Management
Lower Fraser Area

Enclosure

cc: Dale Paterson
Scott Coultish

Canada

**Licence Authorizing Fish Collection for Scientific Purposes
Pursuant to Section 52 of the Fisheries General Regulations**

Lower Fraser River Area

Unit 3 - 100 Annacis Parkway, Annacis Island

Delta, B.C. V3M 6A2

Licence No: 01.232

Date Issued: September 17, 2001

Licence Holder: K.J. (Jim) Scott

Company/Institution: Scott Resource Services Inc.

8031 Philbert Street, Mission B.C. V2V 3W9

Phone: (604) 820-1415

Fax: (604) 820-1621

Assistants/Vessel (CFV): Andrew Walter, Vincent Harper, Jason Turner, Maureen Thomey, Clover Scott,
Walter Silver, Claudio Bianchini

1. Collection Period: from September 17, 2001 to October 15, 2001. This licence is subject to immediate termination upon written or verbal notice from a fishery officer or the Area Manager.
2. Species (Quantity): anadromous salmonids (non-retention)(excluding steelhead)
3. Collection Area (stat-area): Legace Creek, east of Mission, BC
4. Collection Methods: 1/4" stretch mesh seine nets, electroshocker
5. All fish must be returned to the water, unharmed if possible.
6. All gear left unattended must be clearly labelled: **DFO LICENCE 01.232**
7. Local Fishery Officers of the Department of Fisheries and Oceans must have prior notice of your intended operation in their area. Contact:
Scott Coulthart Fraser Valley West 607-4150
8. Fish taken under the authority of this licence may not enter commercial markets or establishments.
9. Live fish and eggs (spawn) cannot be transported or transplanted without prior written approval of the transplant committees.
10. A copy of this licence must be available for inspection at all times.
11. A summary of collection activities and data (within 30 days) and a final report of the study are to be submitted to the above address.

I AGREE TO THE ABOVE TERMS AND CONDITIONS

Applicant

Date


Kim West

SCOTT RESOURCE SERVICES INC.

Environmental Consultants

31856 Silverdale Avenue, Mission, B.C. V2V 2K9

Tel: (604) 820-1415 Fax: (604) 820-1621

e-mail: scottres@telus net



FAX COVER SHEET

Date: October 9, 2001

Our File No.: 508.01

Please deliver the following message:

TO: ☐ Carol Smiley ☐ Sandy Vogt
Ministry of Environment Department of Fisheries and Oceans

FAX NO: 930-7119 666-7112

SUBJECT: Fish Salvage Report; Lagace Creek, east of Mission B.C.

COMMENTS: Details regarding the above sampling are as follows :

Permits: MWLAP: 34770-20 (Scott Resource Service 01-17 (1))
DFO: 01.232

Project Location: Lagace Creek upstream of Farms Rd. East of Mission B.C.. See attached location map.

Project Description: Multiple fish salvages associated with sediment trap maintenance on Lagace Creek

Collection Method: Seine Net; Electroshocking; Dip Nets

Collection Team: Andrew Walter, Jim Scott, Walter Silver, Vincent Harper (Scott Resource Services Inc.)

Salvage Effort:

Seine Net Effort: A seine net was used on September 24 and again on Oct 3, 2001 to corral fish and chase them out of the work area.

Electroshocker Effort: An electroshocker was used on September 24, 25 and October 3, 2001 to salvage any fish that had not been chased downstream by the seine net. Water temperature was 13 Celsius. The shocker setting was I5 at 200/300 volts. Shocking effort was 9,538 seconds.

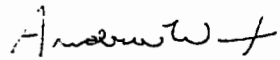
Dip Nets: The salvage also included a mop up of stray fish in isolated pools using dip nets during channel diversion

Salvaged fish are as follows:

- 264 coho (70-110 mm)
- 41 rainbow trout (65 mm-250 mm)
- 1 cutthroat trout (90 mm)
- 520 sculpin species
- 16 lamprey

All salvaged fish were released unharmed downstream of the work site.

Please call if you have any further questions or comments.



Andrew Walter
Attachment

If 3 pages (including cover) did not transmit or are unclear, please phone our office for retransmission.

[illegible]

WVCV 3438-9000

Attachment 4. Photographs of the Legace Creek sediment basins and in-stream complexing.



Photograph 1. Looking upstream at the composition of gravels and sands within Bar 4 prior to excavation, July 23, 2001.



Photograph 2. Looking upstream at the composition of gravels and cobbles within Bar 5 prior to excavation, July 23, 2001.



Photograph 3. Looking downstream at berm isolating flow from Bar 5, September 24, 2001.



Photograph 4. Looking upstream at berm effectively isolating excavation of Bar 3 from flow, September 26, 2001.



Photograph 5. Looking at upstream most sediment pond. The entrance and left bank have been graded and the separation berm with the spawning platform can be seen in the bottom right hand corner of the photo, October 5, 2001.



Photograph 7. View of centre and downstream sediment basins connected by a constructed spawning platform (white arrow). A vegetated berm was left in place at the downstream sediment basin (orange arrow), October 5, 2001.



Photograph 6. Looking upstream at berm that separates the centre sediment basin from the upstream basin (white arrow). A small 0.2m high berm (orange arrow) was left in place within the centre sediment basin to settle out sediment laden water when the left channel was regraded. Vic Galay stated that this berm would erode naturally and not cause any stranding problems, October 4, 2001.



Photograph 8. View of rock weir from the temporary bridge crossing. Two bucket loads of spawning size gravel were placed upstream of the weir, October 4, 2001.



Photograph 9. View of spawning platform connecting the upstream and centre sediment basins. Spawning size gravels were placed within each of the cells and upstream of the platform, October 5, 2001.



Photograph 10. View of spawning platform connecting the centre and downstream sediment basins. Spawning size gravels were placed within each of the cells and upstream of the platform, October 5, 2001.



Photograph 11. View of LWD Structure #1 placed in upstream sediment basin, October 5, 2001.



Photograph 12. View of LWD Structure #2 and Boulder Cluster #1, October 5, 2001.



Photograph 13. View of LWD Structure #2 with a brush mat cover, October 5, 2001.



Photograph 14. View of Jack Mussel securing LWD Structure #3 to a keyed in lockblock, October 5, 2001.



Photograph 15. View of LWD Structure #4 with brush mat cover, October 5, 2001.



Photograph 16. View of LWD Structure #5 and Boulder Cluster #2.



Photograph 17. View of LWD Structure #6 and Boulder Cluster #3, October 5, 2001.



Photograph 18. View of LWD Structure #7 and Boulder Cluster #4, October 5, 2001.

Attachment 5. Aerial photograph showing LWD and boulder cluster locations.



LWD 1 = Large Woody Debris Structure #1
BC 1 = Boulder Cluster #1