

**ENVIRONMENTAL MITIGATION PLAN**  
**SUTHERLAND 43.5km STREAM CROSSING REPLACEMENT**  
Replacing a 1400mm closed metal pipe with a 4270 x 1840 x 21000 open bottom arch  
on concrete footings



In accordance with the FIA Restoration and Rehabilitation Component,  
Aquatic Activity Area: Fish Passage

*Funded under  
Investment Schedule  
Project Plan*

Prepared for:  
BC Timber Sales, Vanderhoof District  
Stuart-Nechako Business Area  
Box 190, 1522 Highway 16,  
Vanderhoof, B.C., V0J 3A0

Prepared by:  
Karen Grainger, R.P.Bio.  
Box 996, Burns Lake, B.C., V0J 1E0  
[klg2@telus.net](mailto:klg2@telus.net)

September 2009

## Summary:

The critical points of this Environmental Mitigation Plan for the contractor to consider when bidding and planning are:

1. **Stream Crossings:** One crossing is allowed (there and back). If additional crossings are required, a work bridge should be planned for.
2. **Outlet Pool:** The outlet pool must be maintained, not filled in as per the engineered drawings. It is an important habitat feature.
3. **Fish Salvage and Stream Diversion:** Fish salvage and stream diversion are required. Overnight pumping of the streamflow will be required if streambed construction is not completed.
4. **Streambed Gravel Source:** 1.5 loads of gravels/cobbles are required for streambed construction. BCTS is recommending a gravel source at 15.5km on the Sutherland FSR. Regardless of the source, the streambed gravels need to be clean. If there are fines in the gravel, the loads may need to be washed away from the site. Gravel that is not clean will not be put in the site. Another option is to purchase gravels that are already screened and washed.
5. **Long-term Erosion Control:** Silt fences may or may not be required. Properly installed silt fences are trenched.
6. **On-site Environmental Monitoring:** An Environmental Monitor required for one day that will include streambed construction and a final inspection for long-term erosion control measures. Fish salvage will be required prior to stream diversion.
7. **Referrals and Permits:** No referrals to MOE or DFO are required if within timing windows of July 15 to April 15. A fish collection permit is required for fish salvage and was applied for on September 10<sup>th</sup>.

## 1.0 Overview

### 1.1 Project Scope

BCTS (Stuart-Nechako Business Area, Vanderhoof District) has rated the stream crossing at Sutherland 43.5km as a high priority for replacement under the FIA Fish Passage Activity criteria. Fish presence, habitat quality and passage restrictions were confirmed by Avison Management in 2008. Engineered site plans and general arrangements were prepared by DWB Consulting Services Ltd in the summer of 2009. The existing crossing is a 1400mm CMP with 2m fill. The proposed design is for a 4270 x 1840 x 21000 open bottom arch on concrete footings. Stream crossing replacement is planned for October 2009.

### 1.2 Project Objectives

Priorities for the Environmental Monitor for this project are:

1. To prevent sedimentation at the site during construction.
2. To ensure protection of fish at the site during construction through fish salvage.
3. To ensure the finished site provides fish passage.
4. To maintain existing fish habitat at the site as possible, and ensure the new site provides as high quality fish habitat as possible.
5. To ensure long term erosion and sediment control measures are in place.

### 1.3 Project Location

Access to the site is by 2WD from Vanderhoof. From the District office: Highway 16 west approximately 45km to the turnoff to the Nautley Reserve. Straight through over the bridge and approximately 5km to the Sutherland FSR turnoff to the left. The site is at 43.5km. Total distance from Vanderhoof is approximately 93.5km. The UTM of the site is 10U 375282 6023158.

## 2.0 Stream and Fish Inventory Information

### 2.1 Watershed Code

This stream is WSC 480-993600-63500-37500, of the Babine Lake Watershed, and is the outlet tributary of Charlotte Lake.

### 2.2 Fish Species

There is no inventory information available for this stream on Fish Wizard or the Ministry of Environment Stream Inventory Data Query website. Avison (2008) reports that fish inventory information is available from unpublished sources to confirm Rainbow Trout presence as well as northern pike-minnow and lake chub.

### 2.3 Fish Habitat

This is a beautiful stream with excellent spawning and rearing habitat as well as good overwintering habitat.

Existing upstream and downstream habitat is of similar quality and character. Gradient is 4% on average, with a gravel/cobble/boulder substrate. There is abundant cover with overhanging vegetation and undercut banks. The average downstream channel width is 2.9m.

There is a large existing outlet pool that provides excellent habitat and should be maintained.

### 2.4 Timing Windows

Reduced risk timing (in-stream work) windows for the Omineca region for Rainbow Trout are July 15 – April 15. If works are planned outside of this time period, then a variance request must be submitted to the Ministry of Environment, including a rationale for the proposed variance.

### 2.5 Existing Culvert Characteristics

- 1400mm x 19m closed corrugated metal pipe
- 2m fill depth
- 60cm culvert outfall drop with a large outfall pool >1m deep
- 3% culvert slope

### 2.6 Downstream Stream Characteristics

- Average stream width is 2.9m
- Streambed composition is 5% sand and silts, 15% gravels, 30% cobbles and 50% boulders
- Gradient varies from 2% to up to 7% due to cascade-pool morphology.





Photo 1. Sutherland 43.5km inlet.



Photo 2. Upstream from culvert.





Photo 3. Sutherland 43.5km outlet.



Photo 4. Downstream of existing culvert at Sutherland 43.5km.

### 3.0 Construction Plan

#### 3.1 Stream Diversion

This will be a challenging site to dewater: the stream has a good flow, rocky bottom and is in a gully. Diversion time should be minimized to one day. Therefore, the first day should be excavation only, not close enough to the existing culvert to cause damage or leaks. The second day will be dedicated to stream works – damming and pumping, fish salvage, existing culvert removal and streambed construction.

Damming upstream may require sandbags, tarps, plastic, plywood or sheet metal. 2 pumps will be required – one to handle the stream flow and one for water entering the work area. The streamflow will be put back into the culvert outlet pool; the sediment-laden water will be pumped to an upland location. In case the streambed construction is not completed by the end of day 2, the contractor should be prepared to man a pump overnight.

##### 3.1.1 Stream Diversion Materials

The following equipment and materials are anticipated to be required for stream diversion and in case of sediment-laden water in the construction area:

- 2 fire pumps with 100m hose
- 100 sandbags
- 80m of plastic
- tarps and plywood or sheet metal for constructing dams
- silt fencing (approx 20m long)
- straw bales (approx 20), can be used to reinforce dams and can be used later for covering exposed fill

#### 3.2 Fish Salvage

Fish salvage will be required prior to pumping. The area of fish salvage will be the area that will be dewatered upstream of the culvert. The outlet pool will not be dewatered and would be difficult to remove fish from. Fish salvage will only take place if construction is not during winter conditions. The salvage will require a scientific collection permit and certified personnel to undertake the works. All fish will be removed from the active work area with an electrofisher, placed in buckets and transported to downstream of the dam.

#### 3.3 Streambed reconstruction

After the required elevation is excavated as determined by the engineer, the 2.9m wide stream channel will be delineated. The new arch is 2m longer than the original culvert, but the outlet pool should not be filled in.

Large clean gravels should be used for the streambed substrate, but not to a depth of 300mm as this may cause dewatering. Please meet the following objectives:

- The 2.9m wide channel should be lowest in the middle to prevent dewatering at low flows and to prevent water from flowing along and under the footings.
- The maximum amount of clean stream substrate required will be  $0.2\text{m} \times 2.9\text{m} \times 21\text{m} = 12\text{m}^3$ . 300mm of gravels will likely cause dewatering of the channel, even if it is shaped to confine low flows. The depth of the gravels should be 1-2 times the size of the gravels.
- The site should be flushed and pumped to an upland site until the water runs clear.
- Boulders (clean rip rap is acceptable) should be placed randomly, approximately every 2m throughout the site to add to channel complexity.

### 3.4 Long-term erosion control measures

- Maintain existing riparian vegetation as much as possible.
- All exposed fills will be covered with straw mat or hay and seed.
- Silt fences at the bottom of the new fill along the wetland should be maintained until the site is stabilized (until the next summer).

Additionally, depending on what the final ditches look like, tailditches, armoring in the ditches, haybale dams or rock dams in the ditches may be required. The objective is to keep ditchwater from entering the stream.

### 4.0 Best Management Practices

The Reduced Risk Timing Windows and Measures for the Omineca Region Construction and Deactivation Measures (2004) include the following best management practices. Some of these BMPs have been specifically addressed in this EMP, such as machinery crossings of the stream.

1. The installation period must be minimized.
2. Equipment must be located on and work from the stream bank or naturally dry channel rather than within the wetted perimeter of the stream.
3. Temporary sediment control structures must be installed to reduce the risk of sediment delivery to a fish stream. These structures must be functional, maintained, cleaned out on a regular basis and cleaned prior to removal. Maintaining the natural vegetation in the vicinity of the stream crossings serves as the best sediment control measures.
4. The work area must be isolated from flowing water, to limit sediment mobilization and introduction into streams.
5. Silt-laden water may not be discharged from the work site to the channel of a fish stream during the course of works and prior to the re-establishment of streamflow.



6. If channel de-watering is conducted, fish must be salvaged from the de-watered area and returned to the stream. Fish salvaging requires a fish collection permit from MOE.
7. Two pre-installation crossings (across – first crossing; back – second crossing) by heavy equipment (e.g., hoe) are permitted for installation of crossing structures during the appropriate timing window, providing the stream bed and banks are comprised of relatively stable, non-erodible materials. If, however, the stream bed and banks are highly erodible (e.g., dominated by organic materials, silt, silt loams, etc.), and significant erosion and stream sedimentation or bank or stream channel degradation will result from heavy equipment crossings (e.g., streamflow is relatively high), a temporary work bridge must be used for fish stream crossings for the purpose of installing a crossing structure. If multiple crossings of a fish stream are required in association with the installation of a crossing structure, an appropriate temporary or permanent crossing structure (e.g., bridge, culvert) must be installed.
8. Materials such as riprap or gabion rock that is placed within a stream channel should be free of silt or other substances deleterious to aquatic life.
9. All equipment used on site should be in good repair and free of excess grease and oil. All refuelling and servicing must be conducted outside the Riparian Management Area (RMA).
10. There is no treated wood anticipated to be used within the stream channel.
11. All cast-in-place concrete and grouting must be completed isolated from fish bearing waters.
12. Where there is an ongoing risk of sediment delivery to a fish stream from road surfaces or ditches at the crossing location, permanent sediment control structures must be installed and properly maintained. Structures that are utilized – both temporary and long-term – must be functioning immediately after completion of the construction or deactivation activity. Suggested measures include, but are not limited to, those outlined in BCMOF (2002) and Chilibeck et al (1992).
13. During construction or deactivation activities, damage to the stream channel, banks and vegetation in the vicinity of the work are must be minimized.
14. During periods of heavy or persistent rainfall, work that could result in sediment delivery to a fish stream must stop. During the shutdown period, measures to minimize the risk of sediment delivery to the stream must be implemented. Shut down and measures will be directed by the EM.
15. If migrating adults or redds of species of fish that are associated with a fish stream, as listed in OPR 1 of the FPC, are observed in or downstream of the work area, work activities must be suspended and a DEO notified.
16. As part of construction or deactivation activities, the stream channel, banks and other affected work areas of the site must be restored to their approximate original configuration. Any fill material that has been temporarily added to the stream channel must be removed and deposited in a location where it cannot enter the stream channel.
17. Upon completion of construction or deactivation activities, material that is no longer being used and has the potential to harm fish or fish habitat must be placed above the normal high-water mark. These materials must be removed from the stream floodplain prior to the spring freshet.

18. All soils exposed as a result of work activities that have significant potential for delivery to a fish stream must be promptly stabilized and re-vegetated to prevent erosion and stream sedimentation. A seed mix that is ecologically suitable and minimally palatable to livestock should be used. Fertilizers applied through hand seeding may not be used where they will directly enter a fish stream.

#### 4.1 Sedimentation Incidents

Sedimentation incidents include any amount of silt deposited into water frequented by fish, or where there is a serious or eminent danger of such an occurrence. Such an incident requires notification of the DFO under Section 38(4) of the *Canada Fisheries Act*. All reasonable measures must be taken to prevent, counteract, mitigate or remedy any adverse effects that result from sedimentation.

Reportable erosion and sedimentation events reportable under the Stuart-Nechako BC Timber Sales EMS Program includes:

- Significant environmental damage.
- Abnormal sedimentation.
- A volume of material greater than 250m<sup>3</sup> has moved or in imminent danger of movement.
- A land area greater than 0.25 hectares is disturbed.
- A road or structure is damaged and requires structural repair.

#### 5.0 Environmental Monitor

Stream crossings that qualify for FIA funding under the Fish Passage activity generally need to be important or critical habitat. The Reduced Risk Timing Windows and Measures for the Omineca Region requires an Environmental Monitor for all construction in important or critical habitat, or outside the timing windows. Therefore, this project will require an Environmental Monitor.

As per the Omineca Region document:

“An environmental monitor may be required where construction occurs in critical or important habitats or where construction will occur outside of the normal timing window. The monitor acts at *arms length* from the proponent and the proponent’s contractors, reports to the DEO, and ensures that all proposed activities are completed to the satisfaction of the DEO. Construction activities may be continually monitored or periodically inspected, depending on the sensitivity of the site to disturbance and the nature of construction. It is expected that the monitor will photographically document critical or sensitive phases of the project, and record important information. The monitor must be given authority by the proponent to modify or stop operations in case of non-compliance with approved conditions or where it is anticipated that unforeseen circumstances are likely to cause an environmental problem. By allowing the monitor to represent the concerns of the DEO, costly shutdowns and complications can be avoided.

After the installation is completed the monitor will prepare a post-construction report that will detail the effectiveness of the Proponent Action Plan, identify problem areas, and make recommendations regarding further required mitigative measures and future monitoring of the site. This report must be made available to the DEO on request.

An environmental monitor must be a qualified professional or technician with adequate training and knowledge of fish habitat assessment and requirements for fish habitat protection and restoration.”

For this project, the Environmental Monitor will be on-site for the Pre-work, for stream isolation and fish salvage, during stream bed construction, and at the end of the project to ensure long-term erosion control measures are adequate. At the project completion, the EM will prepare a FIA Project Completion report.

## 6.0 Referrals

Projects only require referral to DFO and MOE if:

- it includes installation of a closed-bottomed structure; or
- if the stream contains anadromous salmon; or
- if construction is outside of timing windows for the species present.

Therefore, this project does not require referral.

DFO and MOE contacts are as follows:

Department of Fisheries and Oceans (Prince George) – Shane Smith – (250)561-5366  
Ministry of Environment (Prince George) – Bill Arthur, Sr. Ecosystem Biologist – (250)614-9902

## 7.0 References

Avison Management Services Ltd. 2008. Fish Passage Culvert Inspection Summary 26km and 43.5km Sutherland FSR and 0.7km “Charlotte Lake Road. Produced for BCTS Stuart-Nechako Business Area, Vanderhoof, BC.

British Columbia Ministry of Water, Land and Air Protection – Environmental Stewardship Division. 2004. Reduced Risk Timing Windows and Measures for the Omineca Region.

Department of Fisheries and Oceans. 1986. Policy for the management of fish habitat.

DWB Consulting Services Ltd. 2009. Engineered drawings for Unnamed Tributary to Sutherland River.