CLAYTON FALLS SPAWNING CHANNEL ENVIRONMENTAL ASSESSMENT

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Prepared by
Sigma Engineering Ltd.
1444 Alberni Street, Vancouver BC. V6G 2Z4

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CLAYTON FALLS
SPAWNING CHANNEL ENVIRONMENTAL ASSESSMENT

1 INTRODUCTION

Sigma Engineering Ltd provided a partial Impact Assessment of the installed spawning channel at the outlet of the Clayton Falls powerhouse. The purpose of the appraisal is to provide an environmental evaluation on the pink salmon resource.

1.1 SITE AND LOCATION

The site of the works is approximately 4 km west of Bella Coola and is located on the Clayton Falls Creek. The tailrace serves as a spawning channel, primarily for pink salmon. When the penstock is dewatered a minimum flow of $0.08m^3/s$ is provided by a separate intake located above the falls. The drainage area is $93km^3$ at the powerhouse and flows north into Bentick Arm.

1.2 PROJECT

Part of the Clayton Falls project included a salmon spawning channel as a component of the tailrace see photo #1. Since the inauguration of the facility no environmental review of the spawning channel or it's significance to the fishery has ever been completed. This survey evaluates the success of this enhancement project and reports to BCRP with a summary of the findings and recommendations for future studies or endeavors.

Although the Project was originally brought into service in 1962 it utilizes many avant-garde environmental considerations, which include:

- Selection of a stream reach that maximizes hydraulic head and flow capacity
- Objectives accomplished using a run-of-river configuration
- The "non-peaking" mode of run-of-river projects eliminates rapid and unnatural fluctuations in downstream flow.

1.3 HYDROLOGY AND GEOMORPHOLOGY

Lowest mean monthly discharges occur in summer, while highest mean monthly discharges occur in September to January in response to storm events. The flow is primarily rain-driven while snow and glaciers at higher elevations provide for spring freshet conditions.

1.4 AQUATIC ENVIRONMENT/OBJECTIVES

The target species is Pink Salmon. The overall objective is to document and evaluate the fish usage of the channel and to recommend any possible changes to improve or possibly enhance and increase the productivity. The location of the on-site work will be at the powerhouse tailrace channel. The evaluation will concentrate on the following items:

- Count the spawning fish as well as past counts.
- Estimate the maximum number of redds within the channel.
- Review flows and temperatures as available, low flows would be documented.
- Document gravel size, quantity (as related to production habitat), recruitment, size, depth and cleanliness.
- Possibility of increasing the channel size, new habitat and in stream complexing.
- Possibility of adding riparian habitat or other fish cover (Oikas et al).
- Review and documentation of fish impacts and habitat alienation.

2 METHODS

This was primarily a subjective survey on 31 August 2004. The investigation consisted mainly of interviewing on site workers, photographing the site and some minor physical measurements. The records of flow and escapement were not made available if they were even recorded as in the case of flow measurements. Fisheries and Oceans supplied the fish counts.

The stream habitat inventory used methods in accordance with the Stream Survey Field Guide (DFO and MoWLAP Survey parameters included channel width, wetted width,

gradient, habitat (pool/riffle etc.) substrate, estimated discharge and velocity, in stream cover, islands and gravel bars, back and side channels, and environmental impacts.

The physical water quality was sampled during the field trip include pH, turbidity, temperature, oxygen, conductivity, and hardness. These parameters were made with a YSI oxygen and a YSI conductivity meters. Turbidity, hardness and pH were also made with calibrated YSI meters.

3 RESULTS

3.1 AQUATIC RESOURCES-FISHERIES

There are two prime areas of interest: the first is the tailrace (photo #1) which is approximately 55m by 6m or 330m^2, the second is the main channel (photo #2) below the Falls which is approximately 200m by 12m or 2400m^2 for a total maximum spawning area of 2730m^2. Since the required area for spawning pair is about 0.6m^2, the maximum number of spawning fish in these two areas (provided the entire area was usable) could be as many as 9000 fish or 4550 redds. The count for this year to date was approximately 4000 fish. More 200 pinks were counted in the Tailrace area (photo #3) waiting for reduced flows and velocities.

Two 10mx10m sections of the tailrace were selected and the redds were attempted to be enumerated, after several counts it was estimated the redd count was one redd per 1.5m^2 or about half capacity within the tailrace. Spawning starts in mid August and ends mid September. The substrate habitat in the tailrace was 5-130mm smooth gravel rock to maximum depth of about 0.12mm. Water depth was ½ m.

Based on Fisheries and Oceans undocumented information the following fish species are reported to occur in the lower reach of Clayton Falls Creek downstream of the Falls: pink, chum, and rainbow trout. Mean escapements of anadromous species are <100 chum, and 4000 pink. The most abundant species historically has been pink salmon, with a maximum-recorded escapement of >4000.

Results from the fish observations indicate that the tailrace side channel has a greater spawning habitat than the main stream for salmon and trout and should be protected and

enhanced. Several possible sites for enhancement were identified. Deep pools are completely lacking. It might be possible to establish a single pool at the entrance to the tailrace-spawning channel. Additionally several large (1+meter) boulders could be placed and partially buried in the tailrace to protect and hold the gravel. These boulders would also add habitat to the spawning adult salmon. The gravel recruitment was low to non -existent in the tailrace. Several truck-loads of clean rock could be placed in the tailrace to enhance the spawning habitat. Similarly the main stem has low gravel recruitment from upstream. There is minimal opportunity to increase the spawning areas.

3.2 WATER QUALITY

Existing water quality can be classified as pristine. There are no industrial, agricultural, or domestic sources of pollution above or within the Project affected area.

All the tests (pH, specific conductance, TDS, hardness, alkalinity) were low. Two items were considered atypical, temperature and oxygen. Temperatures were low; the warmest water measured was 11.5^0C in September. This is considered low based on fish incubation and production. Fish require a certain amount of ”degree days” in order to incubate and for the eggs to hatch. Oxygen on the other hand was too high. Super saturated water was the norm during the survey. Oxygen saturation of greater than 100% was constantly measured and saturation levels of 122% were not uncommon, oxygen and temperature were measured 20 times at 10 locations in two days. Temperature measurements were 11.5^0C at all locations and dates sampled, oxygen was within a range of 9.1-9.4 mg/l.

Turbidity resulting from natural erosion and increased sedimentation from upstream mass wasting was measured as part of the habitat survey. Alpine “slides “ may be responsible for increased turbidity during periods of rain and rapid snowmelt, compared to warm dry periods when glacial melt occurs. A Fisheries Officer said the stream was clear most of the year and increased to high colour during rain events. Turbidity was measured four

times during the survey. The weather on August 31 and September 1 2004 was a flood event and the turbidity was greater than 5000 JTU (Jackson Turbidity Units).

Other parameters were typical of west coast streams and include the following: pH was 6.8; specific conductance was <10uS/cm; Alkalinity as CaO_3 was 1 mg/L; Total Hardness was <1mg/L; TDS was computed at >100mg/L likely due to the storm event. Total Nitrogen was low <0.01mg/L and Ortho-Phosphorous was also low at <0.005mg/L.

3.3 RIPARIAN

This zone is subject to flooding and stream changes on the vegetation. The area has an uneven aged canopy as well as a succession of plants from exposed gravel bars and cut banks to mature forests in the Creek. This diversity results in a major component of the stream significance for the fisheries. This important value can be seen in the food production (as drift) or in the LWD or as fish cover and protection from predators. The primary habitats for fish in this zone are LWD, stream shading, bank stability, side and back channels, in-stream boulders and cut banks.

3.4 CURRENT IMPACTED ZONES

Two minor environmental impacts were identified during the survey. These were identified as the poor quality of road construction near the tailrace and the riprap and flood protection structures. There were several tourists on site and some interference with the spawning fish was evident.

3.5 SPECIES AT RISK

During the field survey we were cognizant of the continual search for any reptile, amphibian, fish or other aquatic animal listed in the Blue or Red category. The Committee on the Status of Endangered Wildlife in Canada was contacted, as well as a literature search; all confirmed that no aquatic species at risk was located in this watershed.

4 RECOMMENDATIONS

1) Due to low recruitment, gravel should be added to the tailrace to increase egg survival. A BC Hydro or DFO fisheries or habitat biologist should be contacted for timing and gravel size.

2) Stream complexing could be added to the tailrace with the addition of several large boulders placed in mid-stream.

3) No signage is evident. There is evidence of cougars, coyote and grizzly bears in the area and tourists should be aware. As well, signage is required to keep people out of the creek from August through March each year to protect egg incubation.

4) Several pink salmon were observed below the floor of the powerhouse, directly beneath the turbine (draft tube area?). They obviously swam up the draft tubes at lower flows and were now trapped. It is recommended that a new gate with smaller openings be installed in front of the draft tube opening, see photo #4.

5) No future studies are necessary at this point.

5 REFERENCES

Department of Fisheries and Oceans and BC Ministry of Environment, Lands and Parks. 1998. Fish Habitat Information Program, Stream Survey Field Guide.

Oikos Ecological Services LTD and T.Johnson and Associates. 1996. Riparian Assessment and Prescription Procedures. Watershed Restoration Program. Field Guide TC # 06. 33pp and Appendix.

Photo #1 Tailrace

Photo #2 Falls River above the tailrace

Photo #3 Pink salmon in the tailrace

Photo #4 Water exit draft tubes