

# Packwood Lake Entrainment Study Status Report

*Prepared for:*

Energy Northwest

August 14, 2007

# Study Plan Requested by:

- Washington Department of Fish and Wildlife
- US Forest Service

# Study Plan Goals

- *Identify relative abundance, age, timing and species composition of fishes entrained, impinged or otherwise affected by the Packwood Lake Hydroelectric intake structure.*

# Study Plan Objectives

- *Determine species relative abundance, age/size, timing and composition at the intake structure.*
- *Evaluate the effectiveness of the Project's screens in terms of protecting fish.*
- *Assess the potential entrainment or impingement impacts from the lake elevation and Project flow fluctuations.*
- *Develop a rule curve for lake level elevation and diversion rate, since approach velocities may exceed the state criteria of 0.33 fps at some operating scenarios.*

# Study Area

- The study is the vicinity of the intake structure for the Packwood Lake Hydroelectric Project.

# Status of Study Investigation

- Velocity Measurements
  - Higher than normal snow conditions and snow melt in 2006 resulted in delay of study until late June 2006.
  - Study continued on in 2007. Doppler proved ineffective due to turbidity of lake water after November 2006 flood.
  - Swoffer digit current meter used to measure velocities across screens in 2007

## Summary of Intake Screen Survey Dates at Packwood Lake Intake, 2007

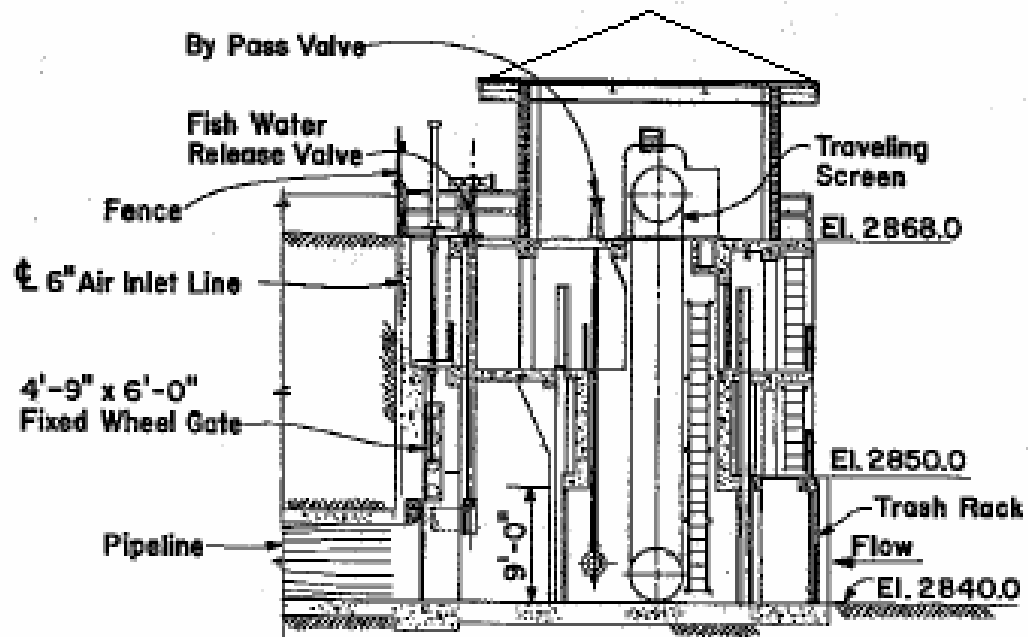
<b>Date</b>	<b>Lake Elevation</b>	<b>Plant Flow</b>
6/20/2007	2857.64	150
6/28/2007	2857.72	115
7/5/2007	2857.55	190
7/13/2007	2858.15	116
7/18/2007	2857.84	59
7/24/2007	2857.71	55

# ***Methods – Fisheries Investigations***

- Fish Behavior at:
  - Intake Structure
    - Experimental , variable-mesh gill net
    - This was changed to seine net in 2007 – fished daily
  - Trash Screens
    - Video Camera
- Record of Impingement on Trash Screens:
  - Date
  - Species/Number/Size
  - Screen

# ***Results – Engineering Criteria and Hydraulic Data***

- Screen Mesh Size: 4.3 mm X 4.3 mm
- 2 Screens: Each 9 Ft Wide, Up to 28 Ft Tall
  - Base = 2840 ft MSEL
  - Area at Lake Elevation 2857 = 306 ft<sup>2</sup>



LONGITUDINAL SECTION

INTAKE STRUCTURE

Insert Jeff's slide

# *Exceptions to Study Plan*

- Access, snow and high flows prevented starting the Study as Planned in 2006:
  - Screen monitoring March – mid May
  - Net in front of intake structure March – June (high flows and debris)
  - Debris prevented ADCP until mid-July. After this date, flows and lake elevations were relatively constant, making readings redundant
  - Debris, low visibility made video cameras of limited use

# *2007 Study Recommendations*

- Early portions of study were re-initiated in 2007 (weather and conditions permitting)
  - Screen monitoring March – June
    - Actual: June - August
  - ADCP measurements at variety of lake elevations and plant flows March – June
    - Actual: Swoffer Measurements June - August
  - Reattempt video taping March – June
    - Video conducted
  - Gillnetting in front of intake March – June
    - Replaced with Seine net

# 2007 Protocol

- Video camera used selectively when visibility was adequate
- ADCP tried unsuccessfully from March – June; Swoffer digital current meter used beginning in June to collect a range of flows and lake elevations
- Gillnet ineffective due to debris load; used seine net continuously to sample fish in front of the screens.

# Anticipated Completion of Field Study

- Velocity, lake levels and netting field measurement will continue through August 2007.
- Plant operations will complete monitoring of rotating screens and trash racks in August 2007.

# Anticipated Draft Study Report Date

- Draft report for 2006 field season was completed in November 2006
- Additional draft report with results of 2007 field season will be issued in September 2007.

# Results

- Trash rack cleaning resulted in the misalignment of screens between January 23 – April 5. Fish were entrained within intake well behind trash rack and in front of traveling screens
- Fish entrainment from June – August closely mirrored spawning timing in upper tributaries

# Potential Solutions

- Replace existing debris screens with better fitting screens
- Install additional trash screens that are suspended from the floating booms nearest the forebay