



BAKER RIVER PROJECT RELICENSE

Aquatic Resources Working Group Technical Sub-committee on Instream Flows

September 25, 2003
9:00 a.m. - 3:00 p.m.

U.S. Forest Service
Conference Room A/B (425/775-9702)
21905 - 64th Avenue West, Mountlake Terrace, WA

MEETING NOTES

Meeting Purpose: Develop a process to resolve flow-related issues for Baker River Project relicensing.

Fish Team Leader: Arnie Aspelund, 425-462-3442, aaspel@puget.com

PRESENT: Arnie Aspelund (PSE), Nick Verretto (PSE), Cary Feldmann (PSE), Phil Hilgert (R2), Stuart Beck (R2), Jason Shappart (Louis Berger Group), Gary Sprague (WDFW), Steve Fransen, (NOAA Fisheries), Chuck Ebel (USACE), Stan Walsh (Sauk-Suiattle Indian Tribe/Swinomish Tribal Community), Marc Daily (Meridian Environmental, Inc.), Jim Pacheco (Ecology), Lorna Ellestad (Skagit County), Ruth Mathews (TNC), Margaret Beilharz, by phone (USFS) and Craig Addley by phone (Utah Water Research Laboratory), Lyn Wiltse, facilitator (PDSA Consulting), Paul Wetherbee (PSE), and Dawn Schink, (PSE) note taker.

MEETING HANDOUTS

- Annotated agenda and handout package (pages 1-102)
The main handout package contained hardcopies of files e-mailed to participants on 09/24/03.
The names of files discussed in each section are italicized and in brackets.
- Middle Skagit River instream flow study transects (two 11x17" maps)
- Nine 11x17" hourly habitat model worksheets

REVIEW MEETING OBJECTIVES AND AGENDA

MEETING OBJECTIVES

- Report on progress towards development of middle Skagit River habitat models.
- Respond to action items identified at the June 30, 2003 technical subgroup meeting.

1) Review Agenda

2) Status of Action Items from June 30, 2003 Instream Flow Technical Meeting

...adapted from June 30 meeting record:

Task	Anticipated Schedule
Hourly flow routing model	July 18 (available on eRoom)
Stage: discharge relationships	July 18 (see agenda item No. 3)
Worksheets for all transects	August 1 [<i>MidSkagitphabsimTR1only.092303.xls</i>]
Initial runs of hourly habitat models	August 15 (see agenda item No. 5)
Initial runs of daily habitat models	September 19 (mid-late October)

Report on Outstanding Action Items (...from June 30 instream flow meeting)

- Arnie: send Rod and Lorna May 2nd meeting handouts (hardcopies distributed after June 30 meeting) **DONE**
- Phil: meet with Hal Beecher-WDFW July 15 to address lower Skagit River PHABSIM substrate/cover protocols [*MiddleSkagitsubstrate-covercodes.092303.doc*] **DONE**
- R2 to send out graphs of wetted width for individual transects- -noting that data presented at the June 30 meeting do not incorporate accretion or travel time (distributed at the Aug 12 ARWG meeting). **DONE**
- R2 to examine frequency/magnitude of middle Skagit freezing [*Freezing TempAnalysis-Memo.092303.doc*] Passed out at the August 14th Aquatics Resource Working Group. **DONE**
- All: R2 will be looking for comments on the Varial zone analysis and spawning: incubation analyses. **DONE**

3) Recap Flow and Habitat Modeling Procedures

Phil summarized the process used to evaluate alternate operational scenarios. PSE contracted with Powel, Ltd. to develop HYDROPS, an hourly operational model that tracks reservoir and powerhouse discharge levels given different operating constraints. Five representative years, using an energy year of August 1 through July 31, were selected to evaluate initial model runs. To date, PSE has used HYDROPS to evaluate recent conditions and a proposed action alternative that was used in the Preliminary Draft Environmental Assessment (PDEA). PSE and Powel are now using HYDROPS to run operational scenarios requested by Stan Walsh-SSIT/STC and the USFS. Example HYDROPS output for an average energy year (1995) were distributed and discussed as background for the middle Skagit River habitat runs to be discussed later in the meeting.

- HYDROPS output for Recent Conditions and PDEA Draft Action Alternative
 - Energy Year 1995 (Average)

Recent Conditions [*PSE.01 1995_Level2AOutput.pdf*, *1995PSE.01_L2Tables.txt*]

PDEA Draft Action [*PSE.02 1995_Level2AOutput.pdf, 1995PSE.02_L2Tables.txt*]

- Middle Skagit River Flow Routing Analyses of HYDROPS Output

Output from the HYDROPS model is fed into the Skagit River flow routing model, which calculates stage and flow at 23 transect locations between the Baker River confluence and Sedro-Woolley.

- Travel Time (covered in June 30 instream flow technical meeting)
- Accretion (covered in June 30 instream flow technical meeting)
- Stage: Q relationships

Phil and Stuart described the process used to develop stage:discharge relationships at each of the 23 Skagit River transects; the model has been reviewed by a USFS contractor who approved use of the model for Skagit River flows less than 60,000 cfs.

[*SkagitXSectionsRatingCurves.092403.doc, R2SkagitModelReviewFINAL.091603.doc*]

- Transect weighting (covered in June 30 instream flow technical meeting)
- Middle Skagit Hourly Habitat Analyses
 - Wetted Area vs. Flow, by transect, weighted reach (Aug 12 ARWG handout)
 - Ramping Rates, by scenario, by transect and weighted reach (see Agenda Item No. 5)
 - Varial Zone, by scenario, by transect and weighted reach (see Agenda Item No. 5)
 - Spawning Transect Area vs. 2-day low flow by scenario
 - Spawning Transect
 - Area vs. scour risk by scenario
- Middle Skagit Daily Habitat Analyses (to be discussed in October)
 - PHABSIM (mainstream and secondary channels)
 - Backwater sloughs, by wetted area of selected sites, by wetted area of all sites, by wetted area by 1-ft depth increments of selected sites
 - Side-channels, by wetted area of selected sites, by wetted area of all side-channels

4) Instream Flow Management Decisions

Alternative instream flow regimes will be a topic of upcoming RESOLVE sessions. As a precursor to those sessions, energy values and reservoir refill considerations were discussed.

- Peak and off-peak energy values were discussed in relation to monthly, unregulated Project inflow [*EnergyStreamflowPlot.09240k3.xls*]. NOTE: Energy values reported in the 09/25/03 meeting have since been updated; revised charts and tables of energy values will be distributed at the October 16 RESOLVE session (R2 ACTION ITEM).
 - Baker Project inflows are low in March and late summer but high during the winter and the May-July snowmelt runoff period.
 - Energy values are comparatively low during the May-July runoff period when inflow is high and regional energy supplies exceed demand. Storing water during the spring

snowmelt period allows PSE to increase releases during periods of lower inflow but higher energy values. Factors such as turbine efficiency, available head associated with pool levels, and differential in peak/off-peak energy values all complicate power production making the HYDROPS model a useful tool in accurately comparing the effects of alternate operational scenarios.

- Reservoir Refill. Discussion of fish considerations associated with reservoir refill was initiated; however, some meeting participants stated that improved knowledge of the consequences of reservoir refill was needed to support discussion of alternate scenarios. In addition, some participants stated that they would rather begin discussion of instream flow regimes before considering reservoir implications. Rather than attempt to fill out the matrix [*relative priority.092403.doc*], a round-table format was followed giving meeting participants the opportunity to identify general concerns regarding reservoir refill. Participants were encouraged to assign a relative rating of concern regarding the issue (high level of concern is a greater priority than a low level of concern). The following list is not meant to be comprehensive, but is simply a starting point for further discussion.

- Determine fish flows first!
- Lorna would like to see, graphically, a comparison between regulated and unregulated monthly inflow to identify historic refill periods (data are in A-24 Part 1 report).
- Having a summary of reservoir inflow volume by various refill periods would help people understand seasonal refill/flow release trade-offs (**R2 ACTION ITEM**)
- Being able to adjust flow releases to a time when it's more valuable may be beneficial to both power and aquatic resource interests - but it would depend on the specifics.
- Some people thought there should be shared coordination between Seattle City Light and PSE, and that PSE should not be held responsible to respond to SCL flow patterns.
- Gary suggested that "Expert Choice", or some other prioritization program could be used to get identify refill scenario trade-offs; others disagreed noting that it is too formal and takes too much time.
- Steve wondered if it the group's responsibility to represent or inform other resource groups, or if the aquatics working group should concentrate on their specific within resource issues. Most participants thought they should identify and address within resource issues before going to other groups for their input on reservoir refill issues.
- Assume higher reservoir pool levels for longer periods is good for sockeye rearing (High level of concern)
- Quantify euphotic zone volume by varying reservoir pool level and seasonal turbidity as one indicator of the effects of reservoir pool levels on sockeye production (High level of concern)(**R2 ACTION ITEM**)

- Avoid spill frequency & magnitude (High level of concern)
- Smolt outmigration through the reservoirs does not appear to be related to the volume of reservoir refill (inflow vs. outflow) at the Baker Project reservoirs, but there does appear to be a relationship at other Pacific Northwest reservoirs (Moderate level of concern since no site-specific indication)
- Spawning/Redd dewatering – reservoir draw down in the fall causes salmon to spawn higher along the river channel (Moderate level of concern)
- Predation - relationship between sockeye fry survival and reservoir pool levels (Low level of concern)
- Predation – low reservoir pool levels may force fish migrating from the reservoirs into tributary streams to pass through shallow, exposed tributary delta reaches where they may be at greater risk of predation (Low level of concern)
- Avoid spill at dams since it contributes to scour in the Skagit River (High level of concern)
- Low reservoir pool levels may affect quality of tributary habitat (High level of concern)
- Bull trout spring and summer habitat needs should be a spring reservoir refill consideration (Low level of concern)
- Bull trout late summer and fall habitat needs should be a fall reservoir drawdown consideration (High level of concern)
- Baker Lake reservoir operation schedule should consider impacts on Lake Shannon - needs better coordination (High level of concern)
- Refill schedule should allow sufficient water to operate the downstream fish passage facility while avoiding spill (High level of concern)
- Annual refill schedule should consider amount of water stored in upper basin as snow pack that will be melting and contributing to inflow during the late May through July runoff period (Moderate level of concern)
- Reservoir levels should be high enough to allow access to fry release sites or other fish release operations (High level of concern)
- Need to Refill Baker Lake to full pool by Memorial Day (Low level of concern)
- Need to refill Baker Lake to –5 by Memorial Day (Moderate level of concern)
- Refill Baker to –10 by Memorial Day (Moderate to high level of concern)
- Refill Baker to –15 by Memorial Day (High level of concern)

5) Middle Skagit River Hourly Habitat Analyses: Ramping Rates and Varial Zone under Recent Conditions and PDEA Draft Action Alternative

Stuart discussed the procedures used to quantify the effects of flow fluctuations on habitats in the middle Skagit River. Ramping rate analyses are intended to quantify the rate of stage change (i.e. inches per hour) since the rate of stage change is assumed to be related to the risk of fish stranding. Varial zone analyses are intended to quantify the magnitude, timing and frequency of flow fluctuations, which affect fish trapping and benthic productivity. The analyses are related but describe different effects of flow fluctuations. Both types of analyses are needed to evaluate the effects of flow fluctuations on aquatic resources. Using a series of worksheet tables, Stuart explained the procedures used to conduct the analyses and identified several indices that R2 is proposing to use when evaluating Baker Project flow fluctuations. Data on ramping rates (e.g. hours of flow changes exceeding 1 and 2-inches per hour) will be developed on a per transect per hour basis, but will then be summarized by month and for the weighted combination of all 23 instream flow transects. Number of ramping events and varial zone analyses will be developed for selected level 3 HYDROPS runs calculating:

- a) Annual assessment of entire study reach;
- b) Annual assessment of selected transects;
- c) Seasonal variations of entire study reach; and
- d) Seasonal variations of selected transects.

Discussion continued regarding the desirability of using selected (indicator) transects compared to a weighted average of all transects, and modifying the periods used to calculate maximum and minimum stage levels. General comments:

- Ramping rate calculations should identify only those flow fluctuations occurring below a critical flow level (e.g. assume 18,000 cfs for initial runs). This will reduce “noise” associated with calculating flow fluctuations associated with flood control and other high flow events.
- Ramping rate calculations of 1-inch per hour should take into account WDFW seasonal and diurnal criteria. Under WDFW guidelines, flow fluctuations of less than 2-inches per hour are allowed November 1 through February 15, and nighttime February 16 through June 15.

(Note: WDFW guidelines were not presented at the 09/25 meeting, but are reproduced here for completeness.)

Season	RAMP RATES (Inches per hour)	
	Day ⁽³⁾	Night
February 16 - June 15 ⁽¹⁾	0 (no ramping)	2
June 16 - October 31 ⁽²⁾	1	1
November 1 - February 15	2	2

⁽¹⁾ Salmon fry are present

⁽²⁾ Steelhead fry are present

⁽³⁾ Daylight is defined as one hour before official sunrise to one hour after official sunset.

Source: Hunter, M. A. 1992. Hydropower Flow Fluctuation and Salmonids: A Review of the Biological Effects, Mechanical Causes, and Options for Mitigation. Technical Report No. 119. State of Washington Department of Fisheries, Olympia, Washington.

- Summary tables and graphs should be arranged by Energy Year rather than calendar year.
- WDFW believes that evaluation of ramping rates addresses the effects of flow fluctuations on gravel bar stranding, but not pothole trapping. Varial zone calculations could be used to address trapping, but the maximum and minimum stage levels would need to be calculated on a short time step (4-hr, 6-hr or 12-hr) (**ACTION ITEM**)
- The max stage at 12-hr and min stage at 7-day (168-hour) time steps for the varial zone calculations were the subject of much discussion. Phil explained that the 7-day minimum time step was designed to allow benthic invertebrate colonization. The use of “effective” varial zone calculations treated colonization as an on-going process that increased each day rather than meeting a threshold value. Craig suggested that 45-days are needed for benthic invertebrate colonization of newly inundated substrate and only a few hours are needed to cause complete invertebrate mortality. Craig suggested that alternate time steps be considered along with having the max stage determined by a longer time step and the min stage determined by the shorter time step (i.e. reversing the order). Stuart said they would run alternate time steps and provide the results at the October ARWG meeting (**ACTION ITEM**).
- When reporting the number of ramping hours, ramping events, etc., percentile values should be reported as whisker plots in addition to monthly mean or median values.
- In Figure 5 from files 1995, 1996, and 2001 Hourly Summary.docs, the title of Figure 5 should refer to Transect 9, not Transect 23.

6) Skagit Hourly Spawning/Incubation Analysis (to be covered at the next technical meeting)

- Spawning Flow/Periodicity Assessment
- Incubation Dewatering/Scour Risk Assessment

7) Schedule and Action Items

SCHEDULE

- Arnie to contact WDFW (H. Beecher) and Ecology (J. Pacheco/B. Caldwell) technical instream flow representatives, and identify potential dates for next instream flow technical meeting; and confirm date and time for the next instream flow technical meeting during the October ARWG meeting.
- Arnie to reserve 90 minutes of the next Aquatics Resource Working Group to present updated results to the larger group, and confirm the date of the next technical meeting.

ACTION ITEMS

- Phil to distribute revised charts and tables of energy values at the October 16 RESOLVE session.

- Phil to send out A-09c (Skagit Spawning Survey Report) and A-09d (Skagit Juvenile Salmonids) reports by the October ARWG meeting and include proposed periodicities for hourly habitat analyses.
- Phil to develop tables and charts of reservoir inflow volume by various refill periods (i.e., Mar 1 through June 1, Mar 1 through June 15, Mar 1 through June 30).
- Phil to quantify euphotic zone volume by varying reservoir pool level and seasonal turbidity as one indicator of the effects of reservoir pool levels on sockeye production.
- Stuart to modify summary charts to reflect energy year, not calendar year.
- Stuart to recalculate ramping rate hours and events and exclude flow fluctuations above the critical flow level (e.g. assume 18,000 cfs for initial runs).
- Stuart to recalculate ramping rate hours and events and exclude calculations of less than 2-inches per hour that are allowed under WDFW seasonal and diurnal criteria.
- Stuart to re-run varial zone analyses using 4, 8, and 12-hour time-steps to address fry stranding during periods of downstream fry movement.
- Stuart to re-run varial zone analyses using a long period (168-hour) to identify the maximum stage and a short period (12-hour) to establish the minimum stage – reverse of what was presented on 09/25.

Next Meeting:

- Reserve 90 minutes of the October 9, 2003, ARWG meeting to update larger group and identify the date of the next technical meeting.
- Meeting adjourned on time.