BAKER RIVER PROJECT RELICENSE

Aquatic Resources Working Group
Technical Sub-committee on Instream Flows

December 15, 2003
9:00 a.m. - 3:00 p.m.
Puget Sound Energy
Camelot Conference Room, 2nd floor (425/424-6550)
19900 North Creek Parkway, Bothell, 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), Stuart Beck (R2), Cary Feldmann (PSE), Phil Hilgert (R2), Hal Beecher (WDFW), Chuck Ebel (USACE), Jeff McGowan (Skagit County), Brad Caldwell (DOE), Ruth Mathews (TNC), Stan Walsh (Sauk-Suiattle Indian Tribe/Swinomish Tribal Community), Jason Shappart (Meridian Environmental, Inc.), Margaret Beilharz, (US Forest Service) on the phone, and Lyn Wiltse, facilitator (PDSA Consulting), and Dawn Schink, (PSE) note taker.

1) Review Draft Agenda *[AnnotatedAgenda-121503]*

Decisions and recommendations from the November 17, 2003 instream flow meeting were listed in the annotated agenda (handout) to allow participants the opportunity to review and revise prior actions. If meeting participants still agree with the previous recommendation, the decision is considered final and will be implemented in the analysis process. Recommendations and actions identified during the December 15, 2003 meeting are characterized as NEW Decisions and will be considered tentative until reviewed at the next meeting.

Reference to files previously provided for the November 17, 2003 instream flow technical meeting are shown in [brackets], reference to files provided for the December 15, 2003 meeting are *[bracketed and italicized]*.

2) Status of Action Items from November 17, 2003 Instream Flow Meeting

√ All - Review the meeting materials, draft meeting record and recommended analysis decisions, and submit edits or changes to the meeting record before the next instream flow meeting.

√ All – Let Sue know if you would like a copy of the 2003 helicopter video (Sue has made copies made for SSIT/STC, USFS, Skagit County, PSE-Bellevue, PSE-Concrete, DNR and the R2 Baker library).

□ Stuart/Phil – examine alternative locations to measure ramping rate compliance and prepare a recommendation for the group to consider at the next meeting.

√ All – set aside Dec 15th, Monday for next Instream Flow Technical team meeting.

√ All – set aside Dec 17th for next Aquatics RESOLVE session - and encourage the "Olympia contingent" to attend the meeting. **Meeting canceled.**

3) Recap Flow and Habitat Modeling Procedures

- HYDROPS Post-Processing: 5 Representative Energy Years (EY) through Level 3, 12 years through Level 4 (EY 1991 to EY 2002). "What to include in Level 3 and 4?"
- Middle Skagit River Flow Routing of HYDROPS Output
  - Travel Time, Accretion, and Stage:Q relationships covered in previous meetings
- Transect weighting [Transect Weighting Comparison – 111403.doc] [UpdatedTransect Weighting.doc]

  Previous Decision: Decision stands

  No change to flow routing model.

  We agreed to minor changes to transect weightings.
- Critical Ramping Flow [CriticalFlowEvaluation.111003.xls]

  Previous Decision: Decision stands.

  Recommend that the critical downramping flow be set at 30,000 cfs, as measured at the USGS Skagit River gage near Concrete.

  NEW Decision/Action :

  R2 to consider location and procedures to measure ramping rate compliance and prepare a recommendation for the group to consider at the next meeting.

4) Skagit Hourly Habitat Analyses

- Ramping Rates [1995 Hourly Summary 111403.xls (Figures 15-26)]

  Previous Decision: Decision stands.

  We agreed to recommend that R2 include monthly charts of excursions of WDFW criteria, and stage drops exceeding 1, 2 and 4 inches per hour when

flows are less than 30,000 cfs in Level 3 and Level 4 HYDROPS post-processing analyses.

- Varial Zone [1995 Hourly Summary 111403.xls (Figures 1-14)] OK

  Previous Decision: Decision stands.

  Recommend that Figures 1 and 8 (Upper extent based on previous 12 hours & lower extent on previous 7 days), and Figures 5 & 12 (Upper and lower extent based on previous 12 hours) be incorporated into Level 3 and Level 4 HYDROPS post-processing analyses.

- Flows During Spawning Periods [SalmonSpawnTiming-111403.doc]

  Previous Decision: - Decision modified.

  Recommend that R2 integrate spawn timing and hourly flows using the proposed spawn timing periods.

  Assumptions regarding the timing of spawning salmonids were reviewed during the 12/11/03 Aquatic Resource Working Group and the 12/12/03 Technical Scenario Teamlet meeting. As a result of discussion during those meetings, the instream flow teamlet was asked to consider extending the timing of chum spawning to December 31 to be consistent with the timing periods described in technical report A-09c Middle Skagit River Salmon Spawning Surveys dated October 2003. *[SalmonSpawnTiming-revised 121503.doc]*

  NEW Analysis Decision:

  The end of the chum-spawning period will be extended from December 21 to Dec 31, consistent with the periodicity identified in technical report A-09c:Middle Skagit River Salmon Spawning Surveys. Spawn timing for other salmonid species were approved for use in the middle Skagit River habitat analyses.

- Incubation Flow and Dewatering Analyses *[SpawningPreferenceCurves.doc]*

  Previous Decision: Decision stands.

  Recommend that R2 use a running 2-day low flow (two consecutive days) as an index of incubation. Using an assumed spawning suitability factor, the risk of redd dewatering will be evaluated on a cell-by-cell basis for each transect.

  R2 has assumed that eggs within the redd environment will be affected when the river stage drops to the surface of the redds. Salmonid eggs are typically deposited 0.5 to 0.8-ft below the surface of the gravel, so this assumption may overestimate effects of dewatering on eggs. The assumption of using a 2-day low flow, rather than an instantaneous flow, to identify initiation of redd dewatering may underestimate dewatering risks; so together the two assumptions are believed to be appropriate for the analyses. While eggs may withstand short-term dewatering, alevins (newly hatched fish prior to emerging from the gravel environment) are injured when dewatered for even an hour. The alevins also need water over the gravel surface to emerge and

become free-swimming. The alevins are able to move short distances through the gravel interstices, but the range of this movement is limited to inches rather than yards. The redd dewatering and incubation analyses outlined by R2 can be used to provide an index of effects of flow levels on egg incubation, but it does not address the potential need for higher stream flows during the alevin pre-emergence and emergence periods. R2 will look at data compiled for the A-09d report (Middle Skagit River Juvenile Salmonids) and identify the periods of emergence by species.

NEW Analysis Decision:

Recommend that R2 use a 0.5 suitability index of depth and velocity HSI curves to identify potential spawning areas in the middle Skagit River.

NEW Analysis Decision:

Recommend that R2 assume for their analyses that impacts to salmonid eggs occur when the water stage drops to the elevation of the surface of the spawning site.

NEW Analysis Decision:

Recommend that R2 use a 90-day incubation period for fall spawning salmonids and a 70-day incubation period for steelhead spawning in the middle Skagit River. R2 will attempt to identify salmonid emergence periods, and at the next meeting, the group will consider extending the incubation period and/or other methods to address flow conditions during the alevin pre-emergence period.

- Scour Analyses

  Flood events may decrease egg survival through physical scouring of the egg pockets, and through intrusion of fine sediments into the redd environment that decreases oxygen exchange and smothers the eggs. Both potential effects can be evaluated by modeling shear velocities. While both physical scouring and fine sediment intrusion may be affecting egg survival, the process will be referenced as 'redd-scour'.

  Inception of redd-scour will be assessed on a cell-by-cell basis within each transect using the Meyer-Peter and Muller method. According to this method, bed load transport would be initiated when the shear stress on the bed surface is sufficient to disrupt the armor layer and expose the underlying finer sediment particles to the flow. Within each cell, the median gravel size (D_{50}) was estimated from a visual assessment of substrate composition taken during low flow conditions. Similarly, D_{90}, considered representative of the surface roughness of the substrate, was also derived from the visual assessment.

  Hydraulic results from the PHABSIM model will be used to determine the nominal shear stress within each cell. The total energy loss in rivers results from a combination of form drag and surface friction. The effective shear stress represents the portion of nominal shear stress associated with surface friction, and thus represents the portion of the nominal shear stress capable of transporting the channel bed material. The Meyer-Peter and Muller (1948) method accounts for the effective shear stress. Based on this method, redd-scour would occur when the

effective shear stress is sufficient to mobilize the armor layer of the substrate material. Once the armor layer is disturbed, scour of underlying sediments occurs rapidly, thus disruption of the armor layer is a reasonable indicator of the effects of scour on egg pockets.

Previous Decision: Decision stands.

Recommend that R2 develop models that integrate spawning site suitability and an index of sediment movement (shear index) to identify and isolate the risk of high flow events affecting egg-to-fry survival.

- Integrate Redd Dewatering and High Flow Analyses

[SpawningIncubationConceptualModel.doc]

[EffectiveChinookSpawningWidth.doc] Page *15*

[SpawningIncubation1995.doc]

Jason requested that plots be developed showing comparisons of proposed actions to PSE.01 (Recent Conditions) for the NEPA documents. Ruth suggested a comparison of one or more alternative actions to Unregulated Baker/Regulated Skagit. Phil stressed that R2 can compare an alternative action to PSE.01 and Unregulated Baker/Regulated Skagit for Level 3 (n=5 years), but does not want to start mixing alternatives when making Level 4 runs (n=12 years). It was agreed that Level 4 will not be run until the group has narrowed down the list of alternative scenarios to three or four.

Previous Decision: Decision stands.

Recommend that R2 develop an index of maximum sustainable spawning habitat that integrates the risk of redd dewatering and effects of flood flows on egg to fry survival.

NEW Analysis Decision:

Level 3 - Recommend that R2 implement the hourly dewatering models in Level 3. For each scenario, R2 will develop plots of effective spawning width, effective spawning/incubation width (accounting for redd-scour only), effective spawning/incubation width (accounting for redd-dewatering only), and effective spawning/incubation width (accounting for both redd-scour and redd-dewatering) for pink, Chinook, chum and steelhead at 23 transect locations and a transect-weighted, reach-averaged summary, comparing the target scenario with PSE.01 (Recent Conditions) and Unregulated Baker River/Regulated Skagit River.

Level 4 - Since Level 4 analyses will only be run for a few scenarios, the group agreed to defer identifying which scenarios to use for comparison until a subset of likely alternatives is apparent.

NEW Analysis Decision/Action:

The group requested that R2 run the effective spawning analyses assuming that Baker Project releases could be maintained at 4 kcfs, 6 kcfs, 8 kcfs, 10 kcfs, 16 kcfs and 32 kcfs flows during the peak Chinook spawning period of September 25 to October 31. R2 will use Unregulated Baker/Regulated Skagit flows for the November 1 to September 24 period for the five representative years. The results may help identify the potential benefits of maintaining higher releases during the spawning period. One objective would be to identify the flow at the benefits of additional Baker Project releases begin to provide less effective spawning habitat.

6) Middle Skagit Daily Habitat Analyses (weighted Usable Area: WUA)

- PHABSIM (mainstem and secondary channels)
  - Model calibration details [PHABSIMHydraulicCalibration.doc]

Previous Decision: Decision stands.

Recommend that R2's PHABSIM model be accepted as a basis for analysis of potential habitat (Weighted Usable Area) in the middle Skagit River.

- Weighted Usable Area (WUA) vs. flow relationships for pink, Chinook, chum and steelhead spawning for the middle Skagit River

[WUA-Spawning-121103.xls]

[WUA-Spawning-SelectedTransects.doc]

Stan stressed that he will be looking at releases from the Baker River Project that provide protection during the incubation season commensurate with flows released during the spawning season. Phil reiterated that the high-volume runoff of the Baker Basin and the small volume of available reservoir storage affects PSE's ability to limit flow releases during the spawning season and augment minimum flows during the incubation season. The HYDROPS modeling efforts and the middle Skagit River analyses will be used to explore available options.

Previous Decision: Decision stands.

Develop WUA vs. flow relationships for pink, Chinook, chum and steelhead spawning, and Chinook and steelhead rearing.

New Analysis Details: Recommend that R2 develop daily habitat time series and 5%, 20%, 50%, 80% and 95% monthly habitat values of WUA vs. flow for pink, Chinook, chum and steelhead spawning as part of Level 4 HYDROPS post-processing analyses.

- Initial results for Chinook and steelhead rearing Weighted Usable Area (WUA) vs. flow for the middle Skagit River

[WUA-Rearing-121103.xls]

[ChinookRearingWUAJuneJulyAugust.doc]

The group observed that the amount of rearing WUA did not appear sensitive to flow changes. Daily and hourly flow fluctuations during the summer months of 1995 (representative year) did not affect the amount of rearing WUA. Stan noted that the WUA calculations only address mainstem rearing habitat and do not address rearing habitat in backwater sloughs and side channels. Phil agreed and noted that separate models of backwater sloughs and side channels (off-channel habitats) have been developed (discussed at the November 17, 2003 meeting). The backwater slough and side channel models indicate that off-channel habitat increases as mainstem flows increase.

New Analysis Decision: Recommend that R2 develop daily habitat time series and 5%, 20%, 50%, 80% and 95% monthly habitat values of WUA vs. flow for Chinook and steelhead rearing as part of Level 4 HYDROPS post-processing analyses..

- Side-channels: Wetted length of all sites and wetted area of all sites vs. mainstem flow
  [OffChannelSummary-111403.doc]

- Backwater sloughs: Wetted length of all surveyed sites, wetted area of all sites, and (in progress) wetted area by 1-ft depth increments of selected sites vs. mainstem flow.
  [OffChannelSummary-111403.doc]

Previous Decision: Decision stands.

Recommend that calculations of backwater slough & side channel data only be used in Level 4 analyses.

New Analysis Detail:

R2 will develop daily habitat time series and 5%, 20%, 50%, 80% and 95% monthly habitat calculations of backwater slough & side channel data in Level 4 HYDROPS post-processing. Sue Madsen-R2 will work with Ruth Mathews-TNC to modify the definition of freshets and include an index of the number of freshets on a monthly basis in Level 3 and Level 4 HYDROPS post-processing.

7) Integrating Model Results into Decision-Making

The NEPA team will begin revising the October draft PDEA in January 2004 in order to submit the License Application and final PDEA to the FERC on April 30, 2004. The ARWG will need to submit a revised operating scenario (Draft Action) and associated environmental modeling results to the NEPA team by January 26, 2004. In an effort to identify potential areas of consensus, or areas of conflicts between aquatic resources, participants were asked to openly discuss their objectives for an acceptable instream flow

regime. Feedback would not be considered to reflect an agency position, but simply an opportunity to collaborate on potential solutions. To initiate the discussion, R2 listed several documents that contained data they considered relevant to instream flow decisions.

- Seasonal and Monthly Biological Considerations
    - Salmonid spawn timing *[SalmonSpawnTiming-revised 121503.doc]*
    - Incubation and emergence timing [90-day salmon, 70-day steelhead but consider modifications for emergence]
    - Seasonal ramping rates defined by WDFW ramping rate guidelines *[WDFWRamping Rates.doc]* Page 10.
    - Reservoir euphotic zone[*EuphoticVolume_111403.doc*] Page 31 – 35.

      Baker Reservoir Zooplankton [*BakerEuphoticZonePlankton-121503.doc*, also see Azit Mazumder's June 4, 2003 draft report] Page 36 & 37

      Goal: Come up with an analysis procedure to evaluate the effect of alternate reservoir refill scenarios on reservoir productivity.
        - Key questions: early vs. late spring refill, and early vs. late evacuation of storage for flood control during the fall
        - Euphotic zone is an index of light penetration , which is related to productivity.
        - High value based on plankton abundance, warm water temperatures and presence of sockeye fry in summer
        - Stan thought the weighting factor for October, based on food availability and water temperature, should be increased from 0.6 to 0.8. After much discussion, the group agreed. Ruth thought that the March weighting factor of 0.5 was too high; after additional discussion, the group agreed to change it to 0.4.
        - Hal will ask Gary Sprague-WDFW to review the weighting factors by the end of the year. Unless R2 hears from Hal or Gary, they will use the modified weighting factors for the post-HYDROPS analyses to be produced in early January.

      Lake Shannon Reservoir [Plots of temperature and zooplankton regimes - in progress]
    - Timing of downstream movement of juvenile salmonids

      Baker reservoirs [see March 200 Initial Consultation Document]

      Middle Skagit River [see A-09d – in progress]
        - Consideration for spill avoidance
    - Natural "unregulated" hydrology regime [See A24 Part 1:Hydrology and Addendums]

- Economic Considerations
    - Average monthly energy values [*EnergyStreamflowPlot-100803*]

New Analysis Detail:

R2 will delete the columns of Weighted Peak and Off-peak Energy Values in the table, and arrange the months by Energy Year for clarity.

- Monthly difference in peak/off-peak energy values [*EnergyStreamflowPlot-100803*]
- Dependable capacity
  [www.pse.com/hydro/baker/meetings/2003/economics20030409handout.pdf]
- Emergency generation reserves
  - There is a 5 foot energy buffer, a week of full generation. Spread out from August through March.

- Flood Control Considerations
  - Timing and volume of storage required under Corps flood control agreement
    [see October 2003 PDEA]
  - Conditions under which the Corps controls Project operations
  - PSE 8-ft flood control buffer

- Cross-Resource Considerations
  - Recreation reservoir pool levels
    - Baker Reservoir pool levels
      724.8 ft May 23-Sep 7
      713.8 ft May 9-Oct 5
    - Lake Shannon pool levels
      Based on water quality pool level of 383.
      380.75 ft = Shannon Boat Ramp.
  - Wildlife reservoir pool levels
  - Water quality reservoir pool levels
    - Baker Reservoir
    - Lake Shannon pool levels
- Instream Flow Parameters
  - Amplitude (maximum Lower Baker controlled release 'max powerhouse capacity' minus minimum instream flow (MIF) release)
    - Important to minimize amplitude during incubation - Sept 10th until July 31st.
    - Is amplitude of less importance during the period Oct 15th to Dec 15th when natural flows fluctuate due to storm events? Stan acknowledged that there is a lot of variation during that period, but part of the amplitude is going to be associated with Baker Project operations, which may exacerbate the range of natural flow fluctuations.
  - Spill avoidance (periods you want to avoid spill)
    - Stan suggested that we want to avoid spill year round; however, spill is especially injurious to fish during the spring outmigration season (Feb 1 through June 30).

- Ramping is especially injurious to fish during December to July (presence of salmon fry) and August (presence of steelhead fry).

Brad suggested the group examine critical aquatic life stages on a month-by-month basis to identify those factors that may have highest priority:

(S) Spawning (I) Incubation (R) Rearing (E) Emergence

- Fish (assume year round incubation)
  - ♦ August – Sept 10th
    1. Reservoir rearing sockeye
    2. Steelhead fry in Skagit River
  - ♦ September 10th– Mid-Oct
    1. Pink & Chinook (S)
    2. Sockeye (R)
  - ♦ Mid-October to Mid-Nov
    1. Chum (S) (I)
  - ♦ Nov & Dec
    1. Chinook (S)
    2. Chum (S)
  - ♦ Nov, Dec, Jan & Feb
    1. Sockeye in reservoir
  - ♦ December
    1. Chinook & Pink (I)
    2. Chinook Fry
    3. Chinook (S)
    4. Chum (S)
  - ♦ January
    1. Chinook & Pink (I) (E)
    2. Chum (I)
  - ♦ February
    1. Chum (I)
  - ♦ Feb – Mach 15th
    1. Chinook & Pink (A)
  - ♦ March & April
    2. Steelhead (S) (I)
    3. Chum (A)
  - ♦ April & May
    1. Steelhead (S) (I) (R)
  - ♦ May
    1. All Fry
  - ♦ June & July
    1. Steelhead (I) (R)

8) New Actions Items:

- R2: Incorporate the results of analyzing effective spawning width accounting for only dewatering of redds into the summary figures.
- R2: Send out data summary supporting spawning suitability figure.
- R2: Evaluate data compiled in A-09d (Middle Skagit River Juvenile Salmonids) and identify the timing of alevin pre-emergence/emergence by species.
- All: Submit any additional HYDROPS run requests to Paul Wetherbee by year-end.
- R2: Find out why Transect 12 provides more Chinook spawning habitat than chum and steelhead spawning habitat.
- R2: Run the effective spawning analyses assuming that Baker Project releases could be maintained at 4 kcfs, 6 kcfs, 8 kcfs, 10 kcfs, 16 kcfs and 32 kcfs flows during the peak Chinook spawning period of September 25 to October 31.
- All (including Hal Beecher contacting Gary Sprague): Get R2 your feedback on euphotic zone weighing factors by year end, or R2 will use the modified weighting factors identified during the meeting for Level 3 Analysis.
- R2: Develop a table of average monthly water temperature in the middle Skagit River.
- R2: Flesh out flow regime diagram (monthly calendar) and send it out so it can be discussed at January 8th Aquatic Resources Working Group meeting.

Next Meeting – Wednesday & Thursday, January 7 & 8, 2004