Weber Hydroelectric Project Relicensing
Draft Fisheries Work Group Meeting Notes
UDWR Northern Regional Offices
Ogden, Utah
May 4, 2016

Meeting Participants
Eve Davies, PacifiCorp
Ben Gaddis, Gaddis Consulting, Facilitator
Jesse Waldrip, Kleinschmidt Associates
Frank Shrier, PacifiCorp
Paul Thompson, Utah Division of Wildlife Resources
Paul Burnett, Trout Unlimited
Paul Badame, Utah Division of Wildlife Resources
Dawn Alvarez, U. S. Forest Service
Kari Lundeen, Utah Division of Water Quality
Bill Damery, Utah Division of Water Quality
George Weekley, U. S. Fish and Wildlife Service
Fred Reimherr, Trout Unlimited
Stewart Edwards, PacifiCorp
Claire McGrath, Federal Energy Regulatory Commission (by phone)
John Mudre, Federal Energy Regulatory Commission (by phone)

Action Items from the May 4, 2016 Meeting	
All	• Determine value and cost of viewing window – Add level of commitment to next agenda, including funding sources.
Davies	• Discuss commitment to keeping low level outlet open with PacifiCorp management. • Clarify proposed change in operation of north and south gates with PacifiCorp management. • Inform FWG of PacifiCorp management's decision on the fish passage preferred alternative.
Waldrip	• Complete additional hydraulic calculations on pool and weir function under different flows in the 34-50 cfs range (should this alternative be chosen). • Prepare conceptual drawings of traditional vertical slot • Update Design Criteria Memo, including completion of item 12.

Decisions Made at This Meeting

- Agreed to recommend a traditional vertical slot fish passage structure for the Weber River. FWG's choice will be forwarded to PacifiCorp management for review and approval.

MEETING OPENING

Introductions and Review of Agenda

Gaddis opened the meeting, asked participants to introduce themselves and reviewed the day's agenda (Attachment 1). The agenda, drawings of the existing site plan, conceptual drawings of the four fish passage alternatives, and a table summarizing design criteria and alternatives were posted in the room.

Project Updates

Whitewater Boater Flow Focus Group

Davies provided updates on PacifiCorp's Weber relicensing process to the group. She reported that as part of the recreation study, a focus group for whitewater boaters who use the Weber River was held in downtown Ogden the previous evening. Davies provided a synopsis of the findings. She said boaters who use project area are enthusiastic and are interested in boating lower flows than she initially thought, for example they would go out for 350 cfs flows. She said they are accustomed to poor access, so safe, legal access is not a concern for them. She said they understand that PacifiCorp can't provide large boater flows (for example, 1000 cfs) because of the way the plant operates; however, if PacifiCorp turned the pipe off once in a while they'd be interested in boating the resulting flows.

There was informal discussion of the compatibility of flows for fish and whitewater boating flows. Reimherr asked group members, if they could have any flows they wanted in the Weber River, biologically speaking, what would they be? Thompson said flushing flows every year, for example 1000 cfs every year for a few weeks. But we take what we get given the water year, he said, because PacifiCorp is not storing water that can be released.

Davies discussed the flow regime and noted that drier may be the new normal at Weber. Burnett noted that warmer temperatures earlier in the year may be contributing. Davies emphasized that PacifiCorp has no water storage rights on the Weber River and can't control flows.

FERC Project Coordinator

Claire McGrath told the group she will be leaving the project and FERC in about three weeks. She introduced John Mudre, the FERC staff member who will take over the project. Mudre has 25 years of experience with FERC and is also working with PacifiCorp on the Klamath.

Study Plans

Davies noted that today is the last day for public comment on the study plans that were filed with FERC April 4. No comments have been received thus far.

Entrainment Study

Shrier told the group he is going out tomorrow morning (Thursday, May 5) to review the project in preparation for the entrainment study, July 18-20, 2016. He plans to walk through the process, check infrastructure, and talk to operators to be sure of what can be done before proceeding with the study.

He said fisheries work group members who are interested are welcome to join him and to plan on meeting at 9 a.m.

Background Material
Burnett noted that he distributed a fish passage alternatives analysis technical memo for the Myton Diversion to Fisheries Work Group (FWG) members by email prior to the meeting. The memo includes information on the swimming capabilities of bluehead suckers that may be helpful to this group, he said.

DESIGN CRITERIA MEMO REVIEW

Kleinschmidt's Design Criteria Memo for fish passage at Weber was distributed to the FWG prior to this meeting and included the design criteria portion of the alternatives development table in Attachment 2. Waldrip displayed the design criteria portion of the table as an overhead and edited criteria based on input from the FWG as the discussion proceeded (changes are shown in red in Attachment 2).

Specific points of discussion are listed below by criteria:

2) Life Stage of Target Species– intended to pass adult fish.

3) Velocities – clarified sustained vs burst speeds.

9) Period of Operation – Reviewed calculations and noted flows of 92 cfs would be needed in the river to safely operate the fish ladder.

10) River Flow Operating Range – noted that high velocity flows beyond a certain level would wash out attraction flows, making the fish ladder less effective during that period. An issue with the south gate may require some retrofit to make the project operate as described here. This would be a baseline change, regardless of alternatives.

12) Diversion Dam Tailwater Operating Range – Additional data is needed to complete this criterion, leaving 'TBD' for now.

18) Attraction Flow - Reimherr asked whether assessment is necessary to determine this (i.e., does the flow specified need to be confirmed?). Weekley said the figures are within BMPs and are standard FWS criteria. Burnett said he believes these numbers will prove effective based on his experience. More important is the location of the fish ladder. Davies noted that low light, ice, and debris are all issues in the project area and asked whether this would be an issue with the fish ladder. Waldrip said ice at the ladder should be frazil ice.

21) Viewing Window – Waldrip said representations of the viewing window on the drawings are very, very preliminary, as not much planning has gone into a viewing window yet. He said an alternative to the viewing window could be an underwater camera. Davies said PacifiCorp management may have concerns about the viewing window in terms of project safety and security, as well as budgetary

concerns. The group discussed whether the purpose of the window was public access/education or monitoring of fish that are being passed.

23) Debris Handling – Weekley said sediment load has been an issue at a project he is working on at Myton. Waldrip noted that the headpond does a good job at trapping sediment. Burnett said organic sediment will be the biggest concern at this location.

26) Cost - Davies said the fish ladder design request was for the best ladder for the least cost, as available funding has to stretch. Shrier noted that we can't get to dollars at this point, as we are still at the conceptual level. Reimherr asked if less is spent on fish passage, is more money available for other things? Davies said yes. Reimherr asked whether spilling water for whitewater takes away money for fish. Davies said yes. Davies said PacifiCorp is looking to do the best for the most with available funding. Fish passage has been identified as the most important issue, she said, so a large chunk of money is being devoted to that.

Alvarez asked if the proposed viewing window could be considered mitigation for other resources, like recreation. She noted that members of this group are fish-oriented but the viewing window could enhance recreation/interpretation. Davies said yes, but the group should be aware of safety and maintenance concerns, such as the possibility of the window being shot, or covered by debris, requiring that staff to go in and clean it so it remains functional—these concerns have been raised by PacifiCorp management.

The following additional criteria were noted and added to the table:

27) Maintenance
28) Operation
29) Durability, sustainability, lifespan with high flows, ice, etc.
30) Footprint

ALTERNATIVES DEVELOPMENT

An alternatives development table (Attachment 2) was posted in the room and displayed and edited via overhead as discussion with the FWG proceeded. Waldrip clarified that the fish ladder will be operable when the plant is operating; therefore, any time the headpond is full, as outlined in criteria 9. He asked whether that was agreeable and said if not, plans being presented would not apply. Paul Burnett asked how frequently the gates are open and not generating power during high flows. Davies said not very often. Once during a fire, and during work on pipes when offline. Only once in a century has the plant been off for an entire year, she said, so very infrequently. It can happen, but is not likely. Edwards said this would only occur when working on the gates or the pipe. Thompson asked whether PacifiCorp is planning to keep the low flow channel open in the future. He noted that it hasn't always been open, but now we would be counting on it. Shrier asked whether that was due to a broken mechanism. Davies said yes, that was the problem. Davies said she will take Thompson's question to PacifiCorp management and will report back to the FWG**.** Edwards said it's always a good idea to keep the sediments moving in the system. Waldrip said PacifiCorp may have to come in and keep any island being formed cleaned up.

Thompson noted that is just a river process. Shrier said that in some cases gravel is being moved but fines are the concern for most. Waldrip noted that keeping the outlet open would be part of the FERC license, and if incorporated into the license, PacifiCorp must provide or be out of compliance, he said. Agencies could file a complaint. Thompson said his concern was that the low level outlet was previously left out of service for a couple of decades.

Waldrip showed drawings and photographs of the existing site via overhead. He said he and his team looked at many possible designs and the ones presented are the ones that met the FWG's criteria. Conceptual drawings of each alternative were posted in the room for review and discussion. Issues noted for each alternative were posted on the drawings on sticky notes during the discussion. Waldrip reviewed details of each design.

Alternative 1 - Denil Fishway

Waldrip reviewed details of the design. He noted that a viewing window would be more of a room than a platform and would be below grade. Davies asked what happens to the bottom of the ladder at high flows, when it's inundated. Shrier said it would just be underwater. She asked if the structure could be undermined, or if there were similar concerns in regards to durability. Waldrip said it would be okay and noted that all alternatives were similar in this regard. Waldrip said he doesn't believe the fish passage structure would ever be completely overtopped/inundated, only the bottom portion. Photos of an existing Denil fishway were shown via overhead.

Alternative 2 – Pool and Weir

This alternative includes two possible designs: Alternative 2a, a regular pool and weir and Alternative 2b, which would include supplemental attraction flows and a smaller footprint. Davies asked about the piping of supplemental flows and possible maintenance/durability issues. Waldrip estimated the lifespan at 30 years, assuming proper maintenance.

Alternative 3 – Vertical Slot

Waldrip said the vertical slot design shown is serpentine, but there are other types. This alternative includes two possible designs: Alternative 3a, a serpentine vertical slot and Alternative 3b, a traditional vertical slot (no drawing of 3b available at this meeting). Sizing down and adding supplemental flows is not feasible for this alternative.

Alternative 4 – Natural Channel

Waldrip said this alternative is also a pool and weir fishway, but with rock. Such fishways would normally be more meandering, he said, but in this case it is less so to preserve the parking lot. Structural dividers will be included. Waldrip was asked about maintenance under this alternative. He said if high flows move the rock, the hydrology would change. Also, it would be more difficult to clear of sediment as it settles in between the rocks. Weekley asked if the structure could be grouted. Waldrip said he doesn't

think it is needed here but it is a concern. With a cement structure, it's possible to get in and clear sediment, he said.

Davies noted for the record that Thompson was leaving the meeting. She noted that the group may try to reach consensus on a design later in the meeting. Thompson said Paul Badame will represent UDWR and he has confidence in the fisheries biologists present.

Comparison of Alternatives

After the review of alternatives was complete, Gaddis asked for group members' thoughts.

Reimherr asked if all four alternatives are equal as far as fish are concerned. Gaddis noted that according to the alternatives table, all four would pass fish. Badame said he doesn't know what the exact differences among alternatives would be. Shrier said he thinks the vertical slot and pool and weir may be better than the Denil at passing bluehead suckers. Waldrip said according to the literature, the Denil will pass suckers. He said he doesn't believe there is a way to differentiate the alternatives via published studies but he agrees with Shrier--if ranking by effectiveness, the Denil would be less effective, with pool and weir more effective. But the differences in effectiveness would be very small, he said. Weekley said he is considering effectiveness with this slope, with these fish. Gaddis asked everyone to choose an alternative, write it down on a slip of paper, and pass it up. Referring to the design criteria table posted in the room (see Attachment 2), he said nothing noted means no significant difference among the alternatives. He said issues noted are those anticipated to require more discussion. Gaddis said that for the first 12 criteria, the alternatives were roughly the same.

For the vertical slot design, Waldrip was asked whether the entrance could be moved away from the base, allowing the exit to move down as well (i.e., move the full footprint down). This would help with sediment deposition. Waldrip said yes, it would be feasible but would require more concrete. Waldrip said if the serpentine design is selected, he likes the idea of moving it downstream a little.

Gaddis said there is still flexibility on the exact location of certain things for any of the alternatives. He said exits can be moved on any of the alternatives and asked the group to focus on alternative preference.

Waldrip said on the natural channel alternative, an entrance similar to the other alternatives could be used. Alvarez asked what the advantage of the natural channel is. Burnett said cost. He said he does not believe it's feasible. Aesthetics could be an advantage, but perhaps that is not applicable here. Waldrip said it may have some advantages, but it depends on how well constructed and maintained it is. Davies expressed concern that the natural channel design could come unraveled. Waldrip asked if the group would like to eliminate the natural channel alternative. Reimherr said he'd selected natural channel alternative but after hearing Davies' experience with such structures, he is comfortable withdrawing it. Shrier noted that if there were a blowout, rebuilding would require PacifiCorp to shut the fish ladder off and put a backhoe in the channel. The FWG agreed to eliminate this alternative for the following reasons:

1) Erosion at the base (fishway entrance)
2) Significant maintenance if reconstruction is needed
3) Potential for maintenance – less effective at certain times
4) Will still look like a structural channel so not aesthetic
5) Access to plant - Would have to install a bridge

Gaddis said [based on polling] the next least preferred alternative would be the Alternative 1 - Denil. Reimherr asked if the Denil option cost less, would that free up funds for other things. Gaddis said while it's true there's one pot of money for mitigation, the FWG should focus on getting the best fish ladder for the money, and not try to pull in other, unknown issues. He asked what the advantages and disadvantages of the Denil structure would be. Weekley said he is not a big fan of supplemental attraction flows, which may create maintenance headaches. Also, the Denil is typically used on smaller systems. Shrier said he has seen Denil ladders used as temporary structures while permanent ladders were being built, but they worked. However, he said he has read that suckers are reluctant to use them and they are a target species here. Badame agreed. He said he believes it could be higher maintenance. Shrier noted that the required supplemental attraction flows would create two compliance points for PacifiCorp, and so would be more work. Davies said she has built in some funding for operation and maintenance (O&M), but would have to keep this in mind. Waldrip said the other alternatives would also require maintenance—with the Denil it's a valve, with weirs it's a gate. He said he thinks they are the same as far as long-term maintenance. He said the Denil is self-flushing and won't fill with sediment. It's just large debris [that is a problem]. He said he doesn't think the cleaning requirements are significantly different between the alternatives. Weekley said if something big is flushed down during high flows, it could take out a few baffles, so screens and the possibility of blowing out baffles are issues. Depth issues and the proposed fish trap were discussed. It was noted this structure would not be as deep relative to grade. Shrier suggested a structure for lifting fish out rather than people going in. Gaddis noted that Denil received only one vote. Waldrip said he voted for it, as the Denil is the least-cost alternative that met all criteria and all alternatives would have maintenance requirements. Gaddis asked, with supplemental flows, would the Denil have two compliance points? Waldrip said yes. Reimherr asked if there would be less debris with Denil. Waldrip said possibly. He said he thinks there's a very small difference in effectiveness between the alternatives. Davies said then we are not ready to eliminate the Denil. Waldrip noted there is a significant price difference between the Denil and other alternatives. In order to choose, the FWG must balance cost and maintenance cost. Cleaning of screens was noted as a maintenance concern for this alternative. Over the long term, the Denil may be more costly due to O&M. Badame said maintenance needs can also result in decreased effectiveness, so that's an issue for him. Alvarez said suckers are an issue for her. Davies noted there is an operator at the Weber plant every day, so maintenance is more likely get done. She said trash racks are cleaned daily on the intake already. Shrier noted that not all costs are the same to PacifiCorp. Specifically, capital cost and O&M costs are not the same. There is some recovery of capital costs, he said, while O&M costs are out of pocket and are a bigger issue to PacifiCorp.

Moving to pool and weir alternatives (2a and 2b), Gaddis said the FWG was split on the two types.

Edwards said the problems with Alternative 2b (which includes supplemental attraction flows) would be the same as those noted for the Denil. Gaddis asked if the FWG would like to eliminate this alternative.

Davies said no, it was being considered because of its smaller footprint as cost control. Also, O&M would not be overly daunting and sucker may be more likely to use it.

It was noted that Alternative 2a would be deep relative to grade (about 10-12 feet deep). It also may be relatively easy to clean. In comparison, Alternative 3a would be 17 feet deep.

Waldrip said Alternative 2b, with its smaller footprint, may be slightly advantageous over Alternative 1. This eliminates cost difference issues. He said the hydraulic design would be different for the two. He said the group has not been discussing feasibility of putting in a fish trap. Badame said Thompson asked about this and asked that the FWG keep it in mind. Gaddis said this relates to depth. Burnett noted that a bypass flow would help facilitate sampling.

Gaddis said the votes between Alternatives 2ab and 3ab were evenly split. Shrier said he is changing his vote to Alternative 3 after hearing the possibility of moving the structure downstream and the smaller footprint. Alvarez said she is also thinking of switching to Alternative 3.

Edwards noted that the serpentine vertical slot (Alternative 3a) was more expensive and asked why it might be considered better. Depth was noted as the major reason for the additional cost. This alternative would also be more expensive for O&M, accessibility issues, fish trap, and safety. It also has a larger footprint. Gaddis asked what the issue is with footprint. Cost, as well as taking out recreation access were noted as issues.

Waldrip said fish may favor the serpentine vertical slot. Some like to follow along the wall, where friction slows flow slightly there. FWG members said it is not known whether that is true of the target species here; however, the traditional vertical slot is known to work for these species.

Supplemental flows were discussed in more detail.

<u>Issues with Supplemental Flow</u>

Plusses:

- Smaller footprint
- Easier sampling
- Lower capital cost

Minuses:

- Maintenance of screens – more opportunities for fish passage to be down, as in must clean at least daily
- Potential for an additional compliance point

<u>Without Supplemental Flow</u>

- Less chance for being out of compliance
- Only once compliance point.
- Less O&M

Burnett noted an issue with pool and weir. He said there would not be as much flexibility with flow as this type of fishway would operate differently under different flows. Gaddis asked whether all alternatives would operate differently under different flows. Waldrip said the vertical slot would be better equipped to handle changing flows. Waldrip said he would like to do some additional calculations on how the pool and weir would operate under different flows in the 34-50 cfs range.

Gaddis asked whether the FWG would to like to keep or eliminate supplemental attraction flows.

Davies said she thinks the additional compliance point is making her reconsider her support of supplemental attraction flows. Edwards said while he hates the idea of going to a larger footprint, he also doesn't favor the additional compliance point.

Mudre said compliance concerns may be addressed by writing flexibility into the requirements (for example, +/- some percent). He said noncompliance may end up being noted in the record, but no action would be taken unless there were some continuing problem. Gaddis noted that while flexibility could be written into the requirements, there would still be two potential "screw-up" points instead of one.

Gaddis called for a check-in vote on supplemental flows.

Gaddis said one vote was cast for supplemental flows. Davies said that was her vote. She said supplement flows would allow us to keep certain benefits but she is comfortable with the group's decision to eliminate them. Waldrip said supplemental flows could also make it easier to moderate flows. Trap handling may also be a benefit, Davies said.

Davies said she got an answer on the question regarding historic very high flows in the project area. She said almost 8,000 cfs was the highest on record in 1896, followed by 7600 cfs in 1952, 7200 in 1893, 6720 in 1922, and 6160 in 1986. That year (1986), operators noted that they sandbagged, opened the gates, and generated and barely made it. She said flows of this magnitude are not as likely since Echo Reservoir went in (there has been only one such flow since then) but there is still some potential for damage at highest possible flows.

Gaddis asked if the FWG would like to eliminate Alternatives 1 & 2b, with supplemental flows. The FWG agreed to eliminate them, leaving the following alternatives under consideration: pool and weir, serpentine and traditional vertical slot.

Vertical slot was noted as known to be effective with target species and requiring less depth.

Serpentine was noted as effective, low maintenance, and with better flow dynamics, especially for weaker swimming fish. However, it would require more depth.

Pool and weir would require a larger footprint and may not accommodate multiple flow conditions.

Weekley said he is leaning towards Alternative 3a or 3b for bluehead suckers.

Waldrip said if Alternative 2a is chosen, he needed to complete the calculations mentioned above for flows. The advantage of Alternatives 3a and 3b is that the whole water column is available.

Gaddis asked whether anyone was strongly in favor of Alternative 2a - pool and weir. None were, and Alternative 2a was eliminated. Alternatives 3a and 3b remained. Waldrip said from an engineering

standpoint, he likes traditional slot since hearing it works for the species of concern. It's also easier to engineer, he said. Alvarez said it is also narrower, so it would not encroach on the recreation area as much.

Gaddis drafted the following comparison table:

	Alternative 3a – Serpentine Vertical Slot	Alternative 3b - Traditional Vertical Slot
Engineering complications	Simple +	Simple
Proven effectiveness for Bonneville cutthroat trout and bluehead sucker	Known -	Known
Footprint	Bigger	Smaller
Hydraulics	Smoother	Less smooth
Capital cost	More	Less
Access	--	--
Fish trap	--	--
O&M	--	--
Depth	~17 ft.	~10 ft.

Waldrip said he could add a fish trap to the exit channel of either alternative (at the top), so effectiveness of the ladder is known. Gaddis said it appears that hydraulics is the biggest advantage of Alternative 3a. For Alternative 3b it is cost, effectiveness and simplicity. Also, it is known to pass the target species.

Gaddis called for a vote between the two remaining alternatives.

- FWG members agreed unanimously to support Alternative 3b – traditional vertical slot, with Reimherr not voting/neutral.

Davies said she will walk the FWG's decision back to PacifiCorp management and will relay the discussion and engineering concerns. She noted that stakeholders don't have the entire say and PacifiCorp management is the ultimate decision maker. She said she should have a decision by May 20.

Viewing Window

Edwards asked whether, after hearing today's discussion, the FWG is still interested in a viewing window. Waldrip said it would be a 3-sided concrete room, below grade, and at river level. Davies said she doesn't think a decision is needed today but she would like to hear everyone's concerns. Edwards said the window would be several feet below the level of the river, would need ADA compliance, and staff would have to clean a window that's 10 feet down. Shrier asked what the purpose of the window was--public viewing or scientific? ADA compliance would be required if it were for the public. Weekley said in terms of scientific information, he would rather have a fish trap than a viewing window 10 times over. He said a window doesn't tell you whether fish are passing (based on location). Burnett said he doesn't think we need the window, we just wanted to explore the option of having one and were thinking of it as an outreach tool. He said he did see a lot of value in Idaho Power's viewing room and web cam. But he said he is aware that turbidity is an issue on the Weber, especially in the spring, and

even with a camera. But he said he would value a fish trap. Mudre said a camera screening to another location could also be considered. Alvarez said the Forest Service would look at the viewing window as public outreach, from a science standpoint a camera or pit tagging would be more valuable. She said they were not going to fall on their sword over a viewing window. Waldrip noted that the window would be in a trench.

REVIEW AND CONCLUSION

Design Criteria Approval

Design criteria are not yet to the point of approval, Gaddis said, but no disagreement was noted at this meeting.

Alternative Decision Summary

Why Eliminated?

Alternative 1 – Denil Fishway: FWG decided they did not want supplemental attraction flows, with screens being the main issue.

Alternative 2a – Pool and Weir: No advantage over Alternatives 3a or 3b.

Alternative 2b – Pool and Weir with supplemental flows - Same reasoning as Alternative 1

Alternative 3a – Serpentine vertical slot: because traditional vertical slot is known to be effective.

Alternative 4 – Natural Channel

- Erosion at the base (fishway entrance)
- Significant maintenance if reconstruction is needed
- Potential for maintenance – less effective at certain times
- Will still look like a structural channel so not aesthetics
- Access to plant - Would have to install a bridge

Next Meeting

Next meeting will take place Wednesday, July 13. FWG will discuss the selected alternative. Waldrip noted the FWG's preferred alternative was the one alternative there was no sketch of. He also noted that the items added to bottom of criteria table (see Attachment 2) were decision criteria, not design criteria and he may move/separate them

Next Steps

- 15% conceptual design drawings – Kleinschmidt, July 13
- Design criteria memo update – Kleinschmidt, May 20
- Traditional vertical slot conceptual drawing – Kleinschmidt
- Draft alternatives memo – Kleinschmidt, June 3
- Finish criteria 12 – (TBD) - Kleinschmidt
- Ensure low level outlet will be operational (low level outlet part of fish passage) – Davies, May 20

- South spillway gate – Davies, May 20
- Value and cost of viewing window – PacifiCorp internal and the FWG

Review of Calendar Items

- May 20 – next Kleinschmidt deliverable; PacifiCorp decision on preferred alternative
- June 3 - Draft Alternatives Memo to FWG
- July 1 - Comments on Alternatives Memo due from FWG
- July 13 – Next FWG meeting – workshop alternative analysis memo – estimated 4 hours.

Attachment 1: Meeting Agenda

Weber Hydroelectric Project Re-licensing

Fisheries Working Group Fish Passage Alternatives Development Meeting

Date: **May 4, 2016**
Time: **9:00 a.m. – 4:00 p.m.**
Location: **UDWR Northern Regional Office, 515 E. 5300 S., Ogden, UT 84405**
Also via conference call; call-in info: 1-877-820-7831 / 141672#

Meeting purposes

- For the Fisheries Working Group to discuss and approve the design criteria.
- For the Fisheries Working Group to discuss various fish passage alternatives and choose a recommended fish passage alternative (type of fishway and general fishway layout).

Agenda

Time	*Agenda item (breaks taken as needed)*
9:00 – 9:30	Meeting opening • Welcome and introductions • Agenda overview • Updates, including study plans
9:30 – 10:30	Design criteria memo review and approval
10:30 – 12:00	Alternatives development session 1: Overview discussion of draft alternatives
12:00 – 3:30	Alternatives development session 2: Detailed discussion about and input on draft alternatives
3:30 – 4:00	Wrap up and next steps
4:00	Adjourn

Attachment 2: Weber Fish Passage Alternatives Development Table

CRITERIA[1]			Fish Passage Alternative (Type of Fishway and General Fishway Layout)			
			Alternative 1: Denil Fishway	**Alternative 2: Pool & Weir Fishway**	**Alternative 3: Vertical Slot Fishway**	**Alternative 4: Natural Channel**
1.)	**Target Species**	Bonneville Cutthroat Trout (BCT) Bluehead Sucker	All 4 fishway alternatives are capable of accommodating the target species.			
2.)	**Life Stage of Target Species**	Fishway is intended primarily for adult fish, however it is anticipated that all life stages 150 mm and larger will be capable of using the fishway.	All 4 fishway alternatives are capable of accommodating the range of fish sizes/life stages identified.			
3.)	**Fishway Water Velocity Targets (Based on Fish Swim Speed)**	Bonneville Cutthroat Trout – 3-5 ft/sec (sustained speed[2]) Bluehead Sucker – 4 ft/sec (sustained speed[2]) or less preferable	All 4 fishway alternatives are capable of accommodating the range of water velocities that have been identified.			
4.)	**Design Population**	No set design population criteria	N/A			
5.)	**Station Hydraulic Capacity**	320-365 cfs	N/A			
6.)	**Minimum Flow**	34-50 cfs	N/A			
7.)	**Low Level Gate Hydraulic Capacity**	• Approximately 200 cfs under normal pond conditions • When head pond is dewatered the low level gate will pass approximately 100 cfs before water starts to spill over the concrete invert of the open spillway gates.	N/A			
8.)	**Spillway Radial Gate Hydraulic Capacity**	Each gate (two total) has a capacity in the range of 2,300 to 2,700 cfs under normal pond conditions.	N/A			
9.)	**Period of Operation of Fishway**	Fishway will be in operation anytime the headpond is full. The headpond is dewatered during winter freezing conditions when the river flow is below the turbine operating range. In order for the turbine to operate the river flow must be in the range of 85-95 cfs. The fishway will not be operated during periods when the headpond is dewatered. When the headpond is dewatered the low level outlet gate will be opened to allow fish passage[3]. The following water velocities have been calculated for various flow conditions through the low level outlet gate: Q = 34 cfs ➔ V = 2.7 fps Q = 40 cfs ➔ V = 3.2 fps Q = 50 cfs ➔ V = 4.0 fps Q = 60 cfs ➔ V = 4.8 fps Q = 70 cfs ➔ V = 5.6 fps Q = 80 cfs ➔ V = 6.4 fps Q = 90 cfs ➔ V = 7.2 fps Q = 100 cfs ➔ V = 8.0 fps	All 4 fishway alternatives are capable of operating throughout the period of operation identified.			

CRITERIA[1]			Fish Passage Alternative (Type of Fishway and General Fishway Layout)			
			Alternative 1: Denil Fishway	**Alternative 2: Pool & Weir Fishway**	**Alternative 3: Vertical Slot Fishway**	**Alternative 4: Natural Channel**
10.)	**River Flow Operating Range**	When the headpond is full the fishway will remain in operation for river flows of 34 cfs to approximately 2,500 cfs. As river flow increases above the turbine capacity the south spillway gate[4] will be opened to pass excess flow. Once the south spillway gate reaches its maximum capacity the north spillway gate will be opened to pass increasing river flows. The fishway entrance will likely be inaccessible to fish once the north spillway gate is opened, due to high velocity and turbulence from the north spillway gate discharge.	All 4 fishway alternatives are capable of accommodating the identified range of river flows.			
11.)	**Headpond Operating Range**	Typical headpond level fluctuation is in the range of 1-3 inches, but may fluctuate as high as 7 inches.	All 4 fishway alternatives are capable of accommodating the range of headpond fluctuation at the site.			
12.)	**Diversion Dam Tailwater Operating Range**	TBD, pending data acquisition[5]	All 4 fishway alternatives are capable of accommodating the range of tailwater fluctuation at the site.			
13.)	**Entrance Location**	North side of river immediately downstream of spillway. Reuse existing opening in retaining wall where min flow is currently discharged.	Yes	Will require slightly more modification to existing structure.	Will require slightly more modification to existing structure.	Will require slightly more modification to existing structure.
14)	**Exit Location**	North side of river within 60 feet of the spillway. Locating the exit further upstream could require additional excavation of sediment in the headpond to provide adequate water depth.				
15.)	**Minimum Water Depth at Fish Entrance**	2.0 ft	Yes	Yes	Yes	Yes
16.)	**Fish Entrance Gate**	Downward opening gate for adjusting attraction flow depth is preferred if tailwater depth is adequate.	Yes	Yes	Yes	It is not typical of a natural channel fishway but is feasible if desired
17.)	**Fishway Entrance Invert Related to Adjacent River Bottom**	Fishway entrance will be perched in water column.	Yes	Yes	Yes	Yes
18.)	**Attraction Flow**	34-50 cfs Attraction flow will match the minimum flow requirement.	Yes	Yes	Yes	Yes
19.)	**Supplemental Attraction Flow System**	If fishway is selected that has a conveyance flow capacity less than the 34-50 cfs attraction flow, then a supplemental attraction flow system will be needed.	Supplemental attraction flow would be required. Discuss options.	All flow would be passed through the fishway.	All flow would be passed through the fishway.	All flow would be passed through the fishway.
20.)	**Sampling Facility**	Fishway will be designed to accommodate a temporary sampling facility (i.e. a removable trap).	Yes	Yes	Yes	Adding a sampling facility would add significant complexity.

CRITERIA[1]			Fish Passage Alternative (Type of Fishway and General Fishway Layout)			
			Alternative 1: Denil Fishway	**Alternative 2: Pool & Weir Fishway**	**Alternative 3: Vertical Slot Fishway**	**Alternative 4: Natural Channel**
21.)	**Viewing Window**	A viewing window for public outreach may be desired pending feasibility. Considerations will include space constraints, security, ADA accessibility, and cost (shared cost?). Potential alternative would be an underwater camera within the fishway.	Feasible	Feasible	Feasible	Not Feasible
22.)	**Slope of Fishway**	Denil (chute type) Fishway (1:10 slope) Pool & Weir Fishway (1:10 to 1:20 slope, pending flow & drop/pool) Natural Channel Fishway (1:20 slope) Velocity criteria will control the slope of the fishway	Discuss fish passage effectiveness. All 4 fishway alternatives have proven effectiveness for trout and sucker.			
23.)	**Debris Handling**	Look into feasibility – floating/skirted boom. Angled bar racks	Discuss debris handling. All 4 fishway alternatives are capable of having floating boom and/or bar rack at fishway exit.			
24.)	**Fishway Access**	A means of access into the fishway is preferred if feasible.	All 4 fishway alternatives will have suitable access into fishway for maintenance.			
25.)	**Grating Covering Fishway**	Serrated bar grating across the top of the fishway is preferred if a structural type fishway is selected.	Yes	Yes	Yes	No
26.)	**Cost**	Affordable – Best fishway possible for the least cost	$700,000 - $1,000,000	$1.5M - $2.0M	$1.5M - $2.0M	$1.0M - $1.5M
	Operation					
	Maintenance					
	Durability & Sustainability	Material selection and capability of withstanding high flow and ice.				
	Footprint of Fishway	Encroachment on parking lot and/or recreation site				

1 - edits and notations from meeting appear in red
2 - Burst speeds higher
3 – PacifiCorp to confirm commitment to maintaining low level outlet operation
4 – Add language about updates required for south gate operator to be the primary gate used for flow control
5 – Update with language about range of tailwater being acceptable but needing additional information to provide specific range of elevations for final design purposes.