# Comment Response Record for the Independent External Peer Review of the Columbia River System Operations Environmental Impact Statement

# USACE Final Evaluator Responses and Panel Final BackChecks

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Contract No. W912HQ-15-D-0001
Task Order: W912HQ20F0008

for

Department of the Army
U.S. Army Corps of Engineers
Ecosystem Restoration Planning Center of Expertise
Mississippi Valley Division

August 12, 2020

## Final Panel Comment 1

**The implementation of adaptive management in the CRSO would benefit from a more robust, science-based adaptive management model that can be used to guide program development and support future decision making.**

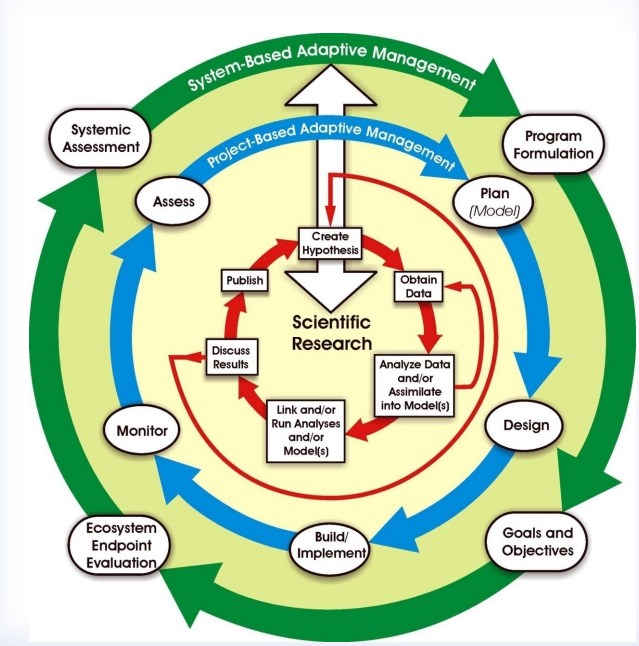
### Basis for Comment

Because the two fish population models vary widely in the predicted effect on juvenile passage mortality, especially as it is related to spill, the Co-lead Agencies propose to use adaptive implementation of the flexible spill operation to test the assumptions in the models. Although this is a good, standard implementation of adaptive management, clearly, there are too many tradeoffs, conflicts, viewpoints, and dynamic interacting subsystems to define any one uniquely qualified alternative for the CRSO. The Panel thus believes that an effective CRSO will have to adapt and respond to new information and changing conditions over time. To detect important conditions, adaptive management requires appropriate data collection and monitoring, followed by data analysis, synthesis, and evaluation consistent with explicit contingency action plans. An effective learning process is required.

Traditional adaptive management often results in an extended field-based, build-test-adapt sequence of projects with inherent long project times, high costs and limited programmatic success, whereas a more science-based adaptive management process may accelerate ecosystem response and recovery.

The Panel thus believes that the CRSO DEIS would benefit from a more robust, science-based, adaptive management model that includes: defining assumed knowns/unknowns; coupling laboratory, field and numerical experimentation; developing data needs and data collection programs; and defining feedback loops into both detailed scientific studies and higher-level programmatic decisions. This more science-based adaptive management (see figure below) approach 1) recognizes the role of fundamental and applied scientific research to answer basic unresolved questions, 2) uses a traditional project-based adaptive management at each dam to prototype preferred alternatives, 3) integrates the research and project-based learning in the overall program, and 4) typically uses models (like Comprehensive Passage [COMPASS]/Life-Cycle Modeling [LCM] and/or Comparative Survival Study [CSS]) to integrate knowledge and understanding across the three levels of adaptive management. Additionally, uncertainties in the system-scale model often drive the need for additional research or field-based experimentation and/or prototype testing.

## Final Panel Comment 1




### Significance – Medium/High

Implementation of a practically optimal CRSO will require a timely, robust, scientific adaptive management model to confirm, test, or modify management operations and effectively deal with changing conditions and new information over time.

### Recommendations for Resolution

1. Improve the adaptive management discussion in the CRSO DEIS based on the issues and concerns summarized above.
2. Develop a rigorous, science-based adaptive management framework to promote a better understanding of general fish passage models and specific models related to TDG.
3. Develop a responsive, science-based adaptive management framework for maintaining or improving CRSO effectiveness and efficiency over time as conditions change and new information is obtained.

| PDT Final Evaluator Response (FPC #1) | | | | |
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| **X** | **Concur** | | **Non-Concur** | |
| Explanation: The co-lead agencies agree that "implementation of a practically optimal CRSO will require a timely, robust, scientific adaptive management model to confirm, test, or modify management operations and effectively deal with changing conditions and new information over time." We have added additional content to Appendix R to more clearly make this point. The preferred alternative will be implemented using a robust monitoring plan to help narrow the uncertainty between the two models and to determine how effective increased spill can be towards increasing salmon and steelhead returns to the Columbia Basin. The framework for the adaptive management process is detailed in Appendix R, Part 2 Process for Adaptive Implementation of the Flexible Spill Operational Component of the Columbia River System Operations EIS. It is the intention of the co-lead agencies to engage regional state, tribal, and federal biologists in the development of an appropriate adaptive management process utilizing their respective salmonid management expertise. The goal of that adaptive management process would be to consider additional opportunities to further the effectiveness of the operation while maintaining the goals of the flexible spill operation which are: provide benefits for salmon and steelhead, maintain opportunities to operate the CRS for hydropower generation in a flexible manner that provides value to the Northwest, ensure operations are implementable by the Corps while continuing to meet all authorized project purposes, and implement the operation in a manner that reduces uncertainty while improving the learning opportunities around how operations of the CRS can influence the magnitude of latent mortality effects. The co-lead agencies have not made any determinations on what the preferred approach would be for a regionally developed study plan, and intend to develop that study jointly with regional sovereigns. Unforeseen outcomes or unintended consequences will be monitored and adjusted using current in-season management teams such as the Technical Management Team. | | | | |
| **Recommendation 1:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: Additional content was added to Appendix R to improve the adaptive management discussion as noted in this comment. The co-lead agencies will develop the fine-scale details of the adaptive management approach collaboratively with regional experts from federal, state, and tribal fisheries management agencies. | | | | |
| **Recommendation 2:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: The co-lead agencies will update the biological models used in the EIS as new information is developed based on monitoring of the preferred alternative. This will be a continual process as new information is developed under actual operations of the PA. | | | | |
| **Recommendation 3:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: The co-lead agencies will monitor and assess the effectiveness and efficiency of CRS operations based on monitoring associated with the PA. The co-lead agencies will update and modify operations as warranted based on monitoring results. | | | | |

| Panel Final BackCheck Response (FPC #1) | | | |
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| X | Concur | | Non-Concur |

## Final Panel Comment 2

**The CRSO DEIS does not identify which built resources are eligible for listing in the NRHP, and what effects project actions would have on such resources.**

### Basis for Comment

To determine the effects of a project action or undertaking on a built resource, the CRSO DEIS would need to identify whether the built resource is eligible for listing in the NRHP. Specifically, the CRSO DEIS would need information on the "determination of effects" process as defined under 36 CFR 800.5 of the NHPA, and the "determination of NRHP eligibility" process under 36 CFR Part 60. The CRSO DEIS also would need to explain how both processes are applied to built resources.

A built resource that is 50 years or older is not automatically eligible for listing in the NRHP. A cultural resource needs to possess enough physical integrity to be able to convey its historic significance and obtain the level of importance under at least one of the four eligibility criteria (A-D), as defined in the NRHP Criteria for Evaluation (36 CFR Part 60).

The CRSO DEIS states that any modification/alteration of a historic property would be considered an adverse effect to the characteristics that make a property eligible for listing in the NRHP. A historic property means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP, as defined in 36 CFR 800.16(I)(1) of the National Historic Preservation Act (NHPA) of 1966, as amended, 16 U.S.C. 470-470w-6. Under the MO2 alternative, the project would upgrade the historic spillway weirs at McNary, Ice Harbor, and Lower Monumental Dams to newer, adjustable weirs. This undertaking or project action would have an effect, but the effect would not necessarily be adverse unless the dams and the original spillway weirs were determined eligible for the NRHP. The replacement of original components of a NRHP-eligible built resource would be considered an adverse effect if the characteristics that make the property eligible are compromised by the project action. An alteration or modification to a historic property, however, does not necessarily adversely affect the characteristics that make a property eligible for the NRHP. A modification or alteration can be compatible with the original operation and appearance of the property (i.e., in-kind replacement, a common maintenance activity, and/or technological upgrade).

The CRSO DEIS refers to adverse, moderate, or minor/negligible effects of CRSO structural measures on cultural resources. The CRSO DEIS would benefit from more information on the approach used to make such determinations. For example, on page 7-7, under MO1, the CRSO DEIS states that there would be "…additional major effects at Hungry Horse, Lake Roosevelt and Dworshak Reservoirs." On page 7-15, the CRSO DEIS states that "…there would be major social effects, including impacts to cultural resources at Lake Roosevelt, John Day, and Hungry Horse Reservoirs…". The next sentence then states that "There would be additional moderate effects to cultural resources at the remaining Columbia River projects due to additional drawdown." Additional information describing the major and moderate effects to cultural resources, the extent of project actions and impacts, and the process for arriving at the conclusions presented would be beneficial.

### Significance – Medium/High

The effects of the operational and structural measures presented, as well as the effects of project actions, on the built resources under the various alternatives cannot be fully addressed without knowledge of their NRHP eligibility.

## Final Panel Comment 2

### Recommendations for Resolution

1. Add the NRHP eligibility status of CRSO built resources so the effects of the operational and structural measures on the built resources can be determined.
2. Describe the NRHP Criteria of Evaluation (36 CFR Part 60) process and how it is applied to built resources.
3. Describe the process used to determine the effects of operational and structural measures on NRHP-eligible built resources under the various alternatives, including a determination of "adverse effects," "no adverse effects," or "no historic properties affected" due to project actions.

## PDT Final Evaluator Response (FPC #2)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: The co-lead agencies acknowledge the importance of the National Historic Preservation Act (NHPA) and implement a robust section 106 compliance program in keeping with the FCRPS Systemwide Programmatic Agreement (SWPA), as described in section 3.16.1. NEPA requires a broad comparative analysis of impacts to the known resources within a study area and across all alternatives. This is in contrast to the NHPA which only requires effects be assessed on cultural properties that are listed on, or may be eligible for listing to, the National Register of Historic Places (NRHP). The co-lead agencies respectfully disagree it is necessary for the draft EIS to identify resources that are eligible for listing in the NRHP, and what effects project actions would have on such resources. This was not possible due to the high number of known cultural resources in the study area, which exceeded 4,500 archeological sites, traditional cultural properties, and historic built resources. A very small amount of these 4,500 resources have had determinations of eligibility to the NRHP completed. Thus if the analysis were only conducted on eligible or NRHP listed sites, then the co-lead agencies would have a dramatically inadequate impact analysis based on the sites known to exist but which were not factored into the analysis due to their unknown NRHP status. Throughout section 3.16, the draft EIS conducts a comparative impact analysis across all action alternatives of the impacts to cultural resources, as required by NEPA, regardless of a specific resources' eligibility to the NRHP. The reviewers comment suggests the cultural resources impact analysis should follow the process outlined in the section 106 regulations described at 36 CFR 800. The co-lead agencies are following 36 CFR 800.14 Federal Agency Program Alternatives (b) Programmatic agreements for compliance with NHPA.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: The co-lead agencies respectfully disagree it is necessary to add the NRHP eligibility status of CRSO built resources. The impact analysis on built resources was conducted without regard to NRHP eligibility status in order to conduct the most comparative analysis possible across the range of action alternatives. In order to focus the analysis on properties potentially impacted within the NEPA study area(s), the co-lead agencies focused on known historic built resources that had the highest likelihood of being impacted. Also, as mentioned above, the co-lead agencies existing section 106 program has identified many potential historic properties but eligibility status has yet to be determined

| PDT Final Evaluator Response (FPC #2) | | | | |
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| due to the high number throughout the system. Thus completing an impact analysis to cultural resources solely based on a resources established NRHP eligibility would not be sufficient or complete. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The co-lead agencies respectfully disagree that a description of 36 CFR Part 60 will contribute to the comparative NEPA impact analysis conducted across the action alternatives. As mentioned above, section 3.16.1 of the draft EIS describes the work of the co-lead agencies ongoing FCRPS section 106 compliance program and also the link to BPA's public website providing program information and related documents. That section 106 program does focus on historic properties and often uses the NRHP Criteria of Evaluation in furthering the co-lead agencies section 106 compliance efforts. | | | | |
| **Recommendation 3:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The co-lead agencies respectfully disagree it is necessary to describe the process used to determine the effects of operational and structural measures on NRHP-eligible built resources under the various alternatives, including a determination of "adverse effects," "no adverse effects," or "no historic properties affected" due to project actions. This would essentially replace the NEPA analysis used in the draft EIS with the terminology and process used for section 106 compliance. The co-lead agencies describe their compliance with section 106 of the NHPA in Section 8.4.1 of the draft EIS. This section demonstrates the use of the Systemwide Programmatic Agreement to organize the co-lead agency compliance with Section 106. The SWPA describes the adverse effects of the operations and maintenance of the system on historic properties and outlines the necessary course of actions for the co-lead agencies to follow in order to resolve adverse effects. | | | | |
| **Panel Final BackCheck Response (FPC #2)** | | | | |
| **X** | **Concur** | | **Non-Concur** | |
| Explanation: The Panel understands and appreciates the PDT's response, but feels that the Co-lead agency's Section 106 compliance program would be strengthened by using the National Register of Historic Places (NRHP) eligibility process in conjunction with their Sitewide Programmatic Agreement under the 36 CFR 800.14 Federal Agency Program Alternatives (b) Programmatic Agreement for compliance with the National Historic Preservation Act. Using the NRHP eligibility process to identify historic properties would streamline the Co-lead agency's ability to determine the effects of the operational and structural measures on historic properties and resolve any adverse effects. The Co-leads would only need to concentrate on those built resources that are eligible for the NRHP, or historic properties. Thus, the Co-leads could focus on those historic properties with the highest likelihood to be impacted by the operational and structural measures under the various alternatives. | | | | |

## Final Panel Comment 3

**The assessment of climate change does not consider the impacts of increases in extreme climate events.**

### Basis for Comment

In addition to increases in annual and seasonal average temperatures and precipitation, it is expected that the number of extreme events (for both temperature and precipitation) will increase based on the most recent climate assessments. It is unclear how those extremes were factored into the alternative assessments. If USACE considered potential changes to the standard project flood or the probable maximum flood as a result of climate change, it does not appear to be clearly documented in the CRSO DEIS or supporting documentation. In addition, the DEIS does not explain how future updates to the Intergovernmental Panel on Climate Change reports will be incorporated into the CRSO program over the duration of the project life. The Panel notes that in each climate assessment report, the general information indicates that the climate is changing faster than previously projected.

### Significance – Medium

Developing a robust method to update the CRSO as a result of the latest climate assessments will be important to the successful implementation of the CRSO project.

### Recommendation for Resolution

1. Develop and describe a science-based adaptive management process for the incorporation of the latest data from the National Climate Assessment and other credible climate reports.

## PDT Final Evaluator Response (FPC #3)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: Extreme events were included in the climate analysis. Through on-going regional climate change studies and work, the co-lead agencies evaluated potential shifts in precipitation and temperature patterns and resulting changes in unregulated Columbia Basin streamflow timing and volumes. The evaluation consisted of the full range of the latest climate change projections developed using multiple global climate models, emissions scenarios, downscaling techniques, and hydrologic models. Details of this evaluation are in chapter 4 of the EIS. This information was used to describe the potential effects (both beneficial and adverse) on the river systems and resources due to potential changes in climate for all alternatives.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: Emerging climate change information will be considered on an ongoing basis as it relates to the Preferred Alternative. A specific plan will not be included in the EIS.

| Panel Final BackCheck Response (FPC #3) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The response from the PDT that emerging climate change information will be considered is satisfactory. | | | |

## Final Panel Comment 4

**The approach used to determine what constitutes a built resource versus an archaeological property is too narrow and subjective.**

### Basis for Comment

For the purposes of this CRSO DEIS, a built resource over 50 years of age, no longer in use, and deteriorating is considered an archaeological property. However, there are numerous built resources around the country, including in the Pacific Northwest, that are vacant, are not in use, and show signs of deterioration but are still considered a built resource rather than an archaeological property.

This CRSO DEIS would benefit from a broader, more flexible approach in what constitutes a built resource versus an archaeological property. While the criteria used to determine NRHP eligibility are the same for both built resources and archaeological properties, the NRHP eligibility criteria (and status) of both built resources and archaeological properties are important barometers in describing their different physical condition, historical integrity, and cultural significance. These criteria could provide a more definitive standard for describing what is a built resource versus an archaeological property.

### Significance – Medium

A broader, more objective approach that clearly defines what constitutes a built resource versus an archaeological property would provide clarity for understanding the differences and treatment of both types of resources under the various alternatives.

### Recommendations for Resolution

1. Adopt a clear standard (or a set of benchmarks) for what constitutes a built resource versus an archaeological property that reflects a more flexible but definitive approach, using NRHP eligibility criteria (and status) as one barometer in defining the two types of resources.

2. Develop a standard that reflects the definition used by State Historic Preservation Officers in the States of Washington, Oregon, Montana, and Idaho to determine what is a built resource versus an archaeological property.

## PDT Final Evaluator Response (FPC #4)

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| **Concur** | **X** | **Non-Concur** |

Explanation: The co-lead agencies respectfully disagree the approach used to determine what constitutes a built resource versus an archaeological property is too narrow or subjective. The co-lead agency cultural resources team leads have over approximately 70 years of combined professional cultural resources management experience and are very cognizant of the resource characteristic differences between pre-contact archeological sites, post-contact and historic archeological sites, historic built environment sites, to include buildings and structures, and multi-component sites, or sites that exhibit one or more characteristics or evidence of one or more of the aforementioned site types. The agencies provide an adequate description of what constitutes an element of the built environment

| PDT Final Evaluator Response (FPC #4) | | | | |
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| in section 3.16.2.5 of the draft EIS. In this section, the co-lead agencies list 11 specific categories of built resources that were carried forward throughout the comparative impact analysis across all the action alternatives. The different variety of built resource types within these specific 11 categories were expanded upon in a series of historic themes within the text of section 3.16.2.5 These themes included hydroelectricity development, Columbia and Snake River Transportation, Transportation, Urban Development, and Irrigation. This approach to the built environment incorporates various definitions from the SHPO's of historic resources and identifies historic themes to appropriately classify the historic buildings and structures known to exist within the study area. In addition, section 3.16.2.2 lists 18 specific archaeological resource types that are used for impact analysis. The impact analysis demonstrated the majority of impacts to historic built resources would stem from the various structural measures proposed for the different action alternatives. This impact analysis is described in 3.16.3.3 through 3.16.3.7 for the No Action Alternative through the Multiple Objective Alternative 4. Section 7.7.18 of the draft EIS provides the description of the impact analysis of the Preferred Alternative to all cultural resources, including the historic built environment. | | | | |
| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The co-lead agencies feel the definition of a built resource versus an archaeological property provided in sections 3.16.2.2 (archaeological resource types) and 3.16.2.5 (built environment) is adequate for the analysis required for the draft EIS. As mentioned above, the draft EIS did not use NRHP eligibility as a benchmark to include a particular cultural resources within the impact analysis. In addition, the co-lead agencies disagree using NRHP eligibility criteria (and status) as a barometer in defining two different types of resources (archaeological versus historic built resource) is an adequate approach. Current standards and practices have shown all types of historic properties can demonstrate NRHP significance under all four criteria described in 36 CFR 60.4. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: There are varying definitions of archaeological sites and historic built resources between the State Historic Preservation Offices in the states of Washington, Oregon, Montana, and Idaho. For this reason the co-lead agencies utilized as broad a definition as possible of both archaeological site types and built environment resource types to conduct the comparative impact analysis as required by NEPA. | | | | |

| Panel Final BackCheck Response (FPC #4) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel still feels that the DEIS would benefit from a broader, more flexible approach on what constitutes a built resource versus an archaeological property that would provide clarity for understanding the differences and treatment of both types of resources under the various alternatives. Clearly the standard that defines a built resource that is over 50 years of age, no longer in use, and deteriorating as an archaeological property does not provide such flexibility. While the Panel appreciates that the State Historic Preservation Offices in the states of Washington, Oregon, Idaho and Montana use varying definitions of what constitutes an archaeological resource versus a built resource, the Co-lead agencies could develop an approach based on the consensus of the definitions used by those states. | | | |

## Final Panel Comment 5

**The definition of local versus non-local visitors is not appropriate for the aggregation of economic impacts from changes in recreation.**

### Basis for Comment

The methodology for estimating regional economic impacts using IMPLAN is based on the distinction between local and non-local visitors. Non-local visitors are considered those traveling more than 60 miles *to the site*. The regions in the recreation analysis are very large, extending more than 60 miles from most sites. So, it seems a visitor could be counted as a non-local, thereby including their trip expenditures in the regional IMPLAN analysis, when those expenditures should be counted as local *to the region*, in which case their expenditures should be excluded from the IMPLAN analysis. This methodology is applied inappropriately. The CRSO DEIS needs to clearly reconcile the apparent misuse of non-local visits in the regional economic impact analyses.

**Site-level Analysis** - As an example, all visitors from Seattle would be considered non-local visitors to Regions A, B, C, and D. Therefore, all lost visits to every site in Region A from people who live in Seattle should be counted as lost economic activity to Region A. Similarly, all lost visits to every site in Region B from people who live in Seattle should be counted as lost economic activity to Region B, and so on for Regions C and D.

To aggregate the economic impact to Region A from these lost Seattle-resident visits, simply add up the economic impact at each site in Region A, and so on for Regions B, C, and D. To aggregate the economic impact across the CRSO area, simply add up the economic impact across all regions.

**Region-level Analysis** - Portland, Oregon, however, is located in Multnomah County, which is considered part of Region D in the recreation analysis (see Table 2-5 of Appendix M). Portland is close enough to Bonneville to be considered local to the site, but Portland visitors to John Day would be considered non-local to the site even though they reside within the same economic region (Region D). So, lost visits from Portland residents to John Day should be included in an IMPLAN analysis of the economic impacts *at John Day site*. But lost visits from Portland to John Day are *local to Region D.* Therefore, it is inappropriate to include those lost visits in an IMPLAN analysis of the economic impacts *to the region*—the money the Portland visitors would have spent at John Day is still being spent within Region D. To correctly assess the economic impact to each region, one must define local versus non-local visits *to the region*. It is inappropriate to simply add up each of the site-level impacts across the region.

**CRSO Area-level Analysis** - The same issue arises when estimating the impacts to the entire CRSO. A new definition of local versus non-local *to the CRSO* must be employed. It is inappropriate to simply add up each of the region-level impacts. For example, lost visits in Region B from visitors who reside in Region A should be included in an IMPLAN analysis of Region B; those lost visits should not be included in an IMPLAN analysis of the entire CRSO because the Region A visitors are local to the CRSO.

### Significance – Medium

Accurately aggregating the economic impacts to each sub-region and the CRSO area as a whole is necessary to assess the impacts of each alternative.

## Final Panel Comment 5

### Recommendations for Resolution

1. Define local versus non-local visitors to each site clearly.
2. Define local versus non-local visitors to each economic region clearly.
3. Define local versus non-local visitors to the CRSO area clearly.
4. Run IMPLAN models for each region using the appropriate definition of local versus non-local visits to the region to aggregate the economic impacts from changes in recreation within Regions A, B, C, and D properly.
5. Run an IMPLAN model for the entire CRSO area using the appropriate definition of local versus non-local visits to the CRSO area to aggregate the economic impacts from changes in recreation across Regions A, B, C, and D properly.

## PDT Final Evaluator Response (FPC #5)

| | Concur | X | Non-Concur |
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Explanation: The PDT does not concur that the definition of local versus non-local visitors is not appropriate for the aggregation of economic impacts from changes in recreation. The focus of the regional economic impact analysis is at the site- or project- level, which is designed to estimate the economic impacts in terms of jobs and income of changes in non-local visitor spending in gateway communities. Visitor spending profiles (from standard expenditure profiles) are estimated for spending at the site level, not the regional level. The changes in non-local visitor spending in gateway communities at each site compared to the No Acton Alternative were aggregated for all projects in the region to show the total changes in jobs and income supported by non-local visitor spending across all gateway communities in the region. Region-based IMPLAN models (and not site-specific models) were used for consistency with the regional economic evaluation across resources and to simplify the modeling approach. The regional economic effects (jobs and income) would largely be experienced by communities surrounding the recreation sites and parks (i.e., in gateway communities) where the changes in visitation would occur. However, because a broader IMPLAN regional model was used, relatively larger multipliers at the regional level (versus the site-level) capture economic activity linkages across the broader region, rather than only impacts experienced at or near the gateway communities.

The reviewer suggested that the proposed methodology for estimating regional economic effects likely overstates the lost “regional” visitation and expenditures. The commenter is concerned that some non-local visits that are considered to be lost from a particular site may actually still occur elsewhere in a region. The PDT agrees that visitors could be local to some sites, while they could be considered non-local at other sites within a region. However, the available data on visitation defines visits as being either local or non-local at the site-level; it does not capture the origins and destinations of every visitor. Without the specific information on origin of visitors, the PDT has assumed that non-local visitors would forego their travel to the gateway community if a site is unavailable, which indeed is likely to overstate the actual number of visits that would be “lost”. The PDT also concurs that there may be some substitution by visitors within sites or within other projects within a region, for example, if a particular

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boat ramp or area is unavailable for a period of time due to high or low water conditions. Therefore, the evaluation is likely to overestimate changes in visitation (and non-local visitation). However, it should be noted that other aspects of the recreation evaluation, such as under counting of non-reservoir based recreation (river reaches), would likely underestimate the visitation and associated economic impacts. The limitation on visitor origin and destination data could not be practically resolved for the purposes of this study.

Some of these limitations are described in Section 3.11.3.1, Recreation Methodology. The PDT has added additional caveats to describe the assumptions around the non-local visitor spending in the FEIS.

**The following additions have been made to Section 3.11.3.1 (changes shown in bold italics):**

**Recreational Visitation**

**As described previously, visitation estimates are not available for all sites, and visitation data likely under-estimates river recreational visitation.** The methodology presented above includes a number of assumptions due to data limitations. In particular, specific data about the behavior of recreationists when faced with varying river and reservoir conditions in the Basin is not known with certainty. The assumptions used in this analysis are conservative (i.e., they are more likely to overstate than understate effects of changes to water-based visitation), **but the methodology is the best approach available given existing information.** In particular, quantified effects do not take into account the potential for spatial substitution or temporal substitution.[1]

1(foot note) That is, if a particular boat ramp is made temporarily inaccessible by changes in reservoir elevations, a recreationist might use a different ramp, pursue a shore-based activity on a given trip occasion ***to the same site, or make a trip to a different site in the region***. The current methodology assumes that recreationists (local and non-local visitors) would forego that particular visit and not visit other adjacent reservoirs. Second, quantified effects do not take into account the potential for temporal substitution. That is, a recreationist may take a trip earlier or later in time to make up for a lost trip on another occasion due to an inaccessible boat ramp.

**The following additions and changes have been made to section 3.11.3.1, Methodology (change shown in the italicized and bolded text):**

**Regional Economic Effects**

Regional economic effects are measures of changes in economic activity as a result of changes in expenditures (also known as visitor spending) associated with recreational visitation. The approach to assess the regional economic effects is briefly described in this section. First, quantified changes in visitation resulting from changes in water surface elevations and boat ramp accessibility (results from the social welfare effects evaluation) are multiplied by per-day visitor spending estimates for recreation **at each river reach or reservoir**.

The change in non-local visitation was estimated based on data on visitation patterns at affected sites. The focus of the regional economic effects evaluation was on non-local visitors **to the site or project** because, while local visitors are likely to continue to spend money in the affected area even if they forgo particular recreation trips, non-local visitors may divert spending to other areas if particular trips are not taken due to access issues. A majority of visitors in the study area are considered to be non-

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local (agencies define local by the distance travelled to sites, which is generally 30 or 60 miles, depending on agency). The percentage of visitors who are non-local for each reservoir/river reach are presented in Appendix M.

Second, estimates of non-local visitor spending in **each reservoir/river reach** are **aggregated for each region** to estimate the **changes in** regional economic activity in terms of jobs, income, and sales using the input-output model, IMPLAN. The regional economic effects and changes in effects would primarily be experienced in communities surrounding the recreation sites and parks (i.e., in gateway communities), although broader effects across the region could also occur. IMPLAN is a widely used industry-standard input-output data and software system that is used by many Federal and state agencies to estimate regional economic effects. The underlying data for IMPLAN is derived from multiple sources, including the Bureau of Economic Analysis, the Bureau of Labor Statistics, and the U.S. Census Bureau. Any potential effects to regional economies associated with changes in recreation quality are discussed qualitatively.

**Again, the current methodology associated with changes in water-based visitation assumes that recreationists (local and non-local visitors) when faced with reduced access would forego that particular visit and not visit other reservoirs. The specific origin of the visitor is not known for non-local visitors, precluding a regional assessment of whether the visitor spending would be local or non-local to the region.**

Regional economic effects are presented by CRS region and in total for the Basin. The study area for each region includes multi-county areas as shown in Table 3-259. Region-based IMPLAN models (and not site-specific models) were used for consistency with the regional economic evaluation across resources and to simplify the modeling approach. The regional economic effects (jobs and income) would largely be experienced by communities surrounding the recreation sites and parks (i.e., in gateway communities) where the changes in visitation would occur. However, because a broader IMPLAN regional model was used, relatively larger multipliers at the regional level (versus the site-level) capture economic activity linkages across the broader region, rather than only impacts experienced at or near the gateway communities.. A county was assigned to a CRS region if the majority of the county's area lies within the region.

**Recreation Appendix M will be updated as appropriate to reflect the changes described for the EIS.**

| | | | | |
|---|---|---|---|---|
| **Recommendation 1:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: The regional economic impact analysis has evaluated the economic impacts of changes in non-local visitor spending at a site-level; the changes in non-local visitor spending at each project or site were aggregated for all sites within the region to estimate the economic impacts. The percentage of local and non-local visitors at each site is presented in Appendix M in Table 3-11. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The focus of the regional economic impact analysis is at the site- or project- level, which is designed to estimate the economic impact in terms of jobs and income of changes in non-local visitor spending in gateway communities at each site or project (i.e., reservoir) location. These economic | | | | |

| PDT Final Evaluator Response (FPC #5) | | | | |
|---|---|---|---|---|
| impacts are presented for each region. Data is not available on the origin of visitors in terms of within or outside the “region.” | | | | |
| **Recommendation 3:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The focus of the regional economic impact analysis is at the site- or project- level, which is designed to estimate the economic impact in terms of jobs and income of changes in non-local visitor spending in gateway communities at each site or project (i.e., reservoir) location. These economic impacts are presented for each region. Data is not available on the origin of visitors in terms of within or outside the “CRSO area.” | | | | |
| **Recommendation 4:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The focus of the regional economic impact analysis is at the site- or project- level, which is designed to estimate the economic impact in terms of jobs and income of changes in non-local visitor spending in gateway communities at each site or project (i.e., reservoir) location. These economic impacts are presented for each region. Data is not available on the origin of visitors in terms of within or outside the “region.” | | | | |
| **Recommendation 5:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The focus of the regional economic impact analysis is at the site- or project- level, which is designed to estimate the economic impact in terms of jobs and income of changes in non-local visitor spending in gateway communities at each site or project (i.e., reservoir) location. These economic impacts are presented for each region. Data is not available on the origin of visitors in terms of within or outside the “CRSO area.” | | | | |

| Panel Final BackCheck Response (FPC #5) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel is able to concur given the modified language provided by the PDT. | | | |

## Final Panel Comment 6

**The inconsistent use of datasets for the commodities modeled by SCENT and TOM distorts the comparisons of results for shipment costs.**

### Basis for Comment

The SCENT and TOM models use different years for commodities volumes. SCENT uses 2016 shipment volumes; however, it is unclear what year of shipments are modeled in TOM. Page L-3-4 states that TOM models 202 million bushels of grain based on 2014-2018 average, but page L-3-8 states that TOM models 204 million bushels of grain based on 2018 production.

More importantly, SCENT models all commodities based on 2016 volumes for MO1, MO2, MO4, the No Action Alternative, and the Preferred Alternative. TOM, however, only models wheat shipments for MO3 and the No Action Alternative. Because the SCENT and TOM models generate estimates of the extra shipping costs of each MO alternative relative to the No Action Alternative, this difference may or may not matter, depending on the relative cost of shipping wheat compared to the other commodities and whether the No Action Alternative has binding capacity constraints along any route. Both SCENT and TOM are cost minimization models, so in the face of binding capacity constraints along any route, both models will re-route the least costly commodities first.

To estimate the extra shipping costs for MO1, for example, SCENT calculates the MO1 costs for wheat combined with the MO1 costs for the other commodities, and then subtracts the No Action Alternative costs for wheat combined with the No Action Alternative costs for the other commodities. So, the extra shipping costs for MO1, MO2, MO4, and the Preferred Alternative generated by SCENT represent the extra costs of shipping wheat and the other commodities.

Now, the decision to model only wheat in the TOM is based on the fact that wheat represents a large majority of the total volume of commodities moving out of the Lower Snake (possibly 87%, depending on the year being modeled). Modeling wheat only, however, may not reflect the full impacts on transportation costs under MO3.

To estimate the extra shipping costs for MO3, TOM calculates the MO3 shipping costs for wheat and subtracts the No Action Alternative shipping costs for wheat. If wheat is the highest-cost commodity to re-route, it would be the last to be re-routed by TOM in cases of binding capacity constraint(s); all the other commodities would be re-routed before any wheat. If the No Action Alternative has binding capacity constraints when modeling only wheat, then TOM would have re-routed all other commodities under both the No Action Alternative and MO3. In that case, the TOM calculation of the extra shipping costs under MO3 (MO3 wheat shipping costs minus the No Action Alternative wheat shipping costs) would effectively be the same as the calculations made using SCENT, because the shipping costs of other commodities in TOM would be moot, having canceled out through the subtraction.

If, however, wheat is not the highest-cost commodity to re-route, the shipping costs of the other commodities would not cancel out in TOM through the subtraction. Here, if there are binding capacity constraints under MO3, then excluding those other commodities from the TOM would underestimate the amount of wheat that would be re-routed, thereby underestimating the extra shipping costs of MO3.

### Significance – Medium

## Final Panel Comment 6

The discrepancies in the use of datasets could affect the relative cost of MO3 compared to the other MO alternatives.

### Recommendations for Resolution

1. Use the same year of data for the SCENT and TOM models.
2. Provide information on the relative cost of rerouting wheat compared to the other commodities leaving the LSR.
3. Discuss the effect to shipping costs under MO3 relative to the other MO alternatives that arises from modeling only wheat in the TOM.

## PDT Final Evaluator Response (FPC #6)

| | | | |
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| | **Concur** | **X** | **Non-Concur** |

Explanation: The PDT concurs that it would be ideal to have both the SCENT and TOM models utilize identical data, but it does not concur that the effect of shipping costs under the alternatives would be significantly affected by this change. The basis for the TOM model is the regional wheat production as well as the 10-year average of downriver wheat shipments on the lower Snake River which, as the reviewer notes, is the majority of the commodities that travel on the lower Snake River.

| | | | |
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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: The PDT concurs that it would be ideal to have both the SCENT and TOM models utilize identical data, but implementing this change is not practically feasible. The SCENT used 2016 data because when the modeling effort got underway, that was the most recent data available. While somewhat aged, the 2016 data are still useful for the purpose of SCENT, which is to determine how system operational changes impact the ability of shippers/carriers to move commodities on the CSNS. The SCENT results show that hydraulically speaking, none of the alternatives (including MO3) show significant changes compared to No Action (more than one standard deviation), below Ice Harbor. Essentially, if a commodity could be on the water at Ice Harbor, it could transit the system in any alternative as it would under No Action. The TOM model and EIS refer to overall regional wheat production in the region, which uses USDA data from 2014-2018 as well, but the barged freight volumes are from Corps data that are largely aligned with the SCENT model data. The TOM model focuses on a 10-year average of downriver shipments of wheat on the lower Snake River, (using Army Corps Waterborne Commerce data). The 2016 downriver shipments of wheat are not very different from this average, suggesting that the use of 2016 data by the SCENT model is largely aligned with this data.

The commenters note that the regional bushels of wheat produced is inconsistent has been fixed in the FEIS.

| | | | |
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| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: The TOM model analysis already incorporates changes in the costs to ship wheat under MO3. Commodities on the lower Snake River are not in competition with each other on this system.

| PDT Final Evaluator Response (FPC #6) | | | | |
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| The PDT does not find that other commodities need to be included as recommended, due to the fact that they do not historically compete for the capacity of the barge industry on the river and there is no known reason they would in the future. The movements of other commodities on the lower Snake River has been clarified in the FEIS. The operational changes under MO1, MO2, and MO4 are so minor that they are unlikely to affect wheat shipping costs. | | | | |
| **Recommendation 3:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: The operational changes under MO1, MO2, and MO4 are so minor that they are unlikely to affect wheat shipping costs. A statement to this affect has been added to section 3.10 to affirmatively state this. | | | | |

| Panel Final BackCheck Response (FPC #6) | | | |
|---|---|---|---|
| **X** | **Concur** | | **Non-Concur** |
| Explanation: Given the new information and clarifications provided, the Panel is now able to concur. | | | |

## Final Panel Comment 7

**The CRSO DEIS does not explain how the risk associated with disruption/delay due to high-water conditions is incorporated into the SCENT model, and this risk does not appear to be included in the TOM at all.**

### Basis for Comment

Because four-barge tows may be unable to safely navigate certain high-water conditions, shippers will have to either delay the movement of their four-barge tows until after high-water conditions pass or break the four-barge tow into multiple smaller tows. This is referred to as the risk of disruption/delay and represents very real risks to shippers in the CRSO. Appendix L, Section 2.4 of the CRSO DEIS states that the SCENT model addresses this risk but does not explain how it does so. More importantly, the TOM does not address this risk at all.

The SCENT model is used to estimate the extra shipping costs associated with MO1, MO2, MO4, and the Preferred Alternative. The TOM is used to estimate the extra shipping costs associated with MO3. Because TOM does not incorporate the risk of disruption/delay while SCENT does, the estimates of MO3 relative to the other MO alternatives and the Preferred Alternative are systematically biased.

### Significance – Medium

The inconsistent treatment of risk in the SCENT and TOM models could affect the relative cost of MO3.

### Recommendations for Resolution

1. Explain how the risk of disruption/delay is incorporated into the SCENT model.
2. Incorporate the risk of disruption/delay into the TOM so all MO alternatives are evaluated using the same risk framework.

## PDT Final Evaluator Response (FPC #7)

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| | **Concur** | **X** | **Non-Concur** | |

Explanation: While the commenter is correct that risk of disruption is included in the SCENT model, the commenter is not correct that risk is not incorporated in the TOM model. The typical risk of disruption is incorporated into shipper costs. Shipping would be entirely precluded from the lower Snake River under MO3. There would not be an increased risk of disruption on the Columbia River under MO3. As such, a change in risk is not relevant to the assessment that is conducted using the TOM model.

| | | | | |
|---|---|---|---|---|
| **Recommendation 1:** | **X** | **Adopt** | | **Not Adopt** |

Explanation: Disruption and delay are modeled within SCENT using the SCEN01.prn and TN0916.prn files (described in the model documentation). SCEN01.prn is the effect of flows on shipping operations and for any flow level gives the options shippers would consider (wait, 3 barge, 2 barge light load and cease). TN0916.prn is then referenced to determine which option the shippers would take given the duration of the flow condition. In the case of high flow, the options are to wait or switch to a two barge

| PDT Final Evaluator Response (FPC #7) | | | | |
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| configuration and the option chosen depends on the dispatch date relative to disruption and the disruption duration. Additional explanation has been added to Appendix L to describe this consideration of risk. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: While the commenter is correct that risk of disruption is included in the SCENT model, the commenter is not correct that risk is not incorporated in the TOM model. The typical risk of disruption is incorporated into shipper costs. There would not be an increased risk of disruption on the Columbia River under MO3. The disruption in service in the Lower Snake is captured in the TOM model. Shipping would be entirely precluded from the lower Snake River under MO3. As such, a change in risk is not relevant to the assessment that is conducted using the TOM model. | | | | |
| **Panel Final BackCheck Response (FPC #7)** | | | | |
| **X** | **Concur** | | **Non-Concur** | |
| Explanation: Given the new information and clarifications provided, the Panel is now able to concur. | | | | |

## Final Panel Comment 8

**The assumption that all new power generation and transmission infrastructure would be immediately available for all MO alternatives misrepresents the estimated costs and benefits.**

### Basis for Comment

The CRSO DEIS assumes that all new power generation and transmission infrastructure would be immediately available for all MO alternatives. This clearly is not the case; in fact, the CRSO DEIS states in several places (see Appendix H, Sections 3.2.2 and 3.2.3) that building the necessary infrastructure could take a decade or more.

The timing of costs and benefits is an exceptionally important factor when calculating the net present value of the MO alternatives and the Preferred Alternative. With discounting, future benefits and costs are valued lower than current benefits and costs. In reality, the time required to fully implement each MO alternative has a direct impact on the net present value of each alternative. As an example, imagine two MO alternatives which, when fully implemented, generate the exact same benefits each year. Now imagine one of those MO alternatives can be fully implemented 5 years earlier than the other. Over the life of the project, the MO alternative that is completed sooner would have a higher level of benefits because it is able to start generating those benefits 5 years earlier.

Now imagine two MO alternatives that cost the exact same amount in nominal dollars but have different construction schedules, with one MO alternative taking longer to construct than the other. The present value of costs for the MO alternative that spends more further into the future will be lower than the one that spends more money sooner, due to discounting. The CRSO DEIS, however, assumes that all structural measures would occur over 2 years, and the costs were divided evenly over those 2 years for all alternatives.

Assuming that all MO alternatives would be fully implemented instantly systematically misrepresents the present value of estimated benefits, while assuming that all structural measures would occur over 2 years with evenly spread costs systematically misrepresents the present value of estimated costs. Together, these could affect the net present value of each MO alternative relative to each other and to the Preferred Alternative.

### Significance – Medium

Changes to the net present value of each MO alternative and the Preferred Alternative due to these construction delays could result in changes to the overall viability of each assessed alternative.

### Recommendations for Resolution

1. Include build-out times into the power generation and transmission cost analysis.
2. Provide a relative measure of time-to-full implementation across each MO alternative and the Preferred Alternative in the CRSO DEIS if Recommendation 1 is not possible.

| PDT Final Evaluator Response (FPC #8) | | |
|---|---|---|
| Concur | X | Non-Concur |

Explanation: The commenter questions the use of 2022 as the study year for the EIS and suggests including a timeline for the implementation and cost analysis. While there is merit in evaluating costs and benefits according to the comment, Bonneville feels confident in the reasons for the approach taken in the EIS.

The focus of the CRSO EIS is to measure the impacts of the proposed system operations on various identified resources, one of which is power reliability. To do that, though, there needs to be an established point-in-time from which to measure the effects of the MOs as compared to the No Action Alternative. The EIS accomplishes this comparison by assuming each MO (and its effects) were fully in place by 2022. Both practical and analytical reasons support this approach.

Practical reasons support using 2022 as the beginning year because at the time the analysis was prepared, this year coincided with the latest available data from the Northwest Power and Conservation Council's (Council) Power Plan to run the GENESYS model to calculate the Loss-of-Load Probability LOLP. In other words, 2022 is the latest date that data are available from which to calculate the effects of the MO on LOLP. Had the EIS used 2023 or any later date, the co-lead agencies would have had to develop their own data set to estimate the effects of the MOs on LOLP. Using 2022 allowed the EIS to use, in a non-biased fashion, the Council's existing data set to run the GENESYS model with no additional adjustments.

Analytical reasons also support using 2022 as the study date. Although, there would be virtually no chance that all pre-requisites for resource construction (or elimination as in MO3) would be completed by 2022, the use of 2022 as a start year does not degrade the analysis in the EIS. In fact, it enhances it because it removes the subjective variable of resource replacement timing that could have impacted the relative weighting of the MOs. By choosing a single start year applicable across MOs, the EIS provides a level playing field from which to compare the impacts and costs of each MO (See Section 3.19 and Appendix Q for additional discussion).

Had the EIS assumed "build-out times" for each MO and its replacement resource portfolios, as suggested by the Panel, the co-lead agencies would have had to speculate about when the various elements of the MOs would have been in effect. This approach would have injected a subjective timing element into the measurement of the relative impacts of differing CRS operations on each of the alternatives. The Panels' example of a five-year difference between two MOs is an excellent example of the issue the co-lead agencies wanted to avoid. As described in the comment, two MOs had the same benefits on a nominal basis. However, when adding in a five-year timing difference, the MO that is completed sooner would have a higher level of benefits because it is able to start generating those benefits earlier than the other. In reaching this conclusion, the Panel presumes that there is a basis for the five-year difference and that difference can in some way be justified. But that is where the co-lead agencies believe the EIS would separate from analytical comparisons to subjective judgments on the timing elements of each MO.

For example, MO3 – with dam breaching – requires Congressional action. Had a timing element been included in the comparison of the MOs, the power resource replacement analysis could have assumed that Congress would not act by 2022, but by 2035, or some other subjective date. This approach would mean MO3 in almost all cases would produce the least amount of benefits compared to an MO that would not require congressional action. Similarly, subjective assumptions on timing could have

| PDT Final Evaluator Response (FPC #8) | | | | |
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| been employed for the construction of replacement resources, especially for large-scale solar installations requiring environmental compliance, permitting, etc., and conventional gas-fired units, which are carbon emitting and potentially constrained by regulatory policy. These subjective timing assumptions would in turn become a driving factor in estimating the costs of the replacement analysis. All of this complexity would have been added to the power resource replacement analysis with little additional analytical benefit – and potentially a detriment – to the EIS because of the speculative nature of the timing assumptions the co-lead agencies would have had to make.<br><br>The use of a single study year allows for a comparison of before-and-after effects for each alternative, utilizing the most recently available – and vetted – models and data up and through 2022. The hypothetical start year ensured that the effects of the MOs could be compared fairly with each other and the NAA without the co-lead agencies speculating on when Congress might act, when resources would be removed, or when resources would be completed.<br><br>To address concerns about potential reductions in resource costs, publicly released draft information, such as updated prices for solar and battery storage, from development of the Council's 8th Power Plan is included as rate sensitivities in the final EIS. The final EIS will include the de-escalating cost curves prepared by the National Renewable Energy Laboratory (NREL) that will be used by the Council in the 8th Power plan. | | | | |
| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: See above | | | | |
| **Recommendation 2:** | **X** | **Adopt** | | **Not Adopt** |
| Explanation: As described above, the EIS is unable to estimate the start or completion date of the MOs and has, therefore, not included a timing element in the analysis. In various sections, the EIS acknowledges that for the MOs that require replacement resources, additional time would be needed for permitting, siting, and construction. While the scale of resource construction described in the EIS is, in many cases, unprecedented, the EIS will contain a high-level description of estimated resource construction timelines based on existing projects and publicly available information. These estimates will only provide a broad outline of the time it may take to build replacement resources and will not include unknowable subjective timing issues (like the process for seeking Congressional approval for dam breach). | | | | |

| Panel Final BackCheck Response (FPC #8) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel is able to concur given the additional information and clarification provided. | | | |

## Final Panel Comment 9

**The conclusion that TDG levels exceeding 110% produce an increased risk of fish mortality is misleading.**

### Basis for Comment

The 110% of saturation criterion was established based primarily on data produced by laboratory investigations of GBD, with some support from live cage studies. This information is pertinent only for fish restrained in shallow water, not for migrants that occupy a range of depths such as in the deep reservoirs of the lower Snake and Columbia Rivers.

TDG levels would be “relatively high” or increase “risk” if the fish were restrained in shallow water, such as less than 1 meter deep. Levels of 115% to 120% of saturation are not high for fish occupying the range of available depths within the project reservoirs. This distinction is important because the CRSO DEIS gives the impression that 120% of TDG saturation would produce a high incidence of GBD and substantial mortality, which is not the case. Oregon and Washington States have regularly provided a TDG criterion of 115% in forebays and 120% at tailrace monitoring locations during the spring and summer migration periods, with no apparent deleterious effect to migrants (Whitman, 2020).

Exceeding the 110% of saturation level does not equate to GBD or mortality. Even at 120% of saturation and higher, empirical evidence has demonstrated a rare incidence of GBD within the project area. Even in the relatively shallow Kootenai River, Dunnigan (2002) observed that less than 1% of the fish collected by electrofishing showed GBD signs following exposure during June and July with TDG supersaturation (120 to >125%) during spill events that lasted from less than 1 hour to 58 hours in duration. By contrast, all captive fish held in cages showed GBD signs. This finding clearly indicates that laboratory and cage investigations do not replicate the depth behavior of fish in natural river conditions. The criterion of 110% was originally based on experiments that exposed fish to TDG supersaturation in shallow water (0.25 to 0.5 meter). These laboratory conditions do not represent the real-world conditions encountered by fish in the lower Columbia and Snake.

The TDG Average Exposure (TDG Tool) criteria are not likely to be useful in predicting biological effects of TDG supersaturation in the lower Snake and Columbia Rivers. The Panel suggests that an exposure duration of 16 hours or more to TDG levels exceeding 125% of saturation would be more useful in predicting a recognizable incidence of GBD in migrants.

### Significance – Medium

The inclusion of an accurate representation of the TDG and GBD issues in the CRSO DEIS will allow decision makers to understand the issues and resulting alternative impacts when deciding on a preferred alternative. The 110% criterion is commonly superseded by the States of Oregon and Washington annually establishing a 115% forebay and 120% tailrace criterion during the juvenile migration period.

### Recommendations for Resolution

1. Remove references to the 110% of saturation criterion other than to identify the historical regulatory standards.

## Final Panel Comment 9

2. Remove statements regarding “risk” for the TDG supersaturation analyses due to the inaccuracy of these statements. A useful risk analysis would need to evaluate fish depth conditions for migrants.

3. Document the current spill season criteria established by the states of Oregon and Washington, which allow 115% in the forebays and 120% in the tailraces of lower Snake and Columbia River dams (Whitman, 2020).

4. Review Dunnigan (2002) and report on the findings as they directly relate to the CRSO project.

**Literature Cited**

Dunnigan, J. L. (2002). Kootenai River fisheries monitoring results from the spill events at Libby Dam, June-July 2002. Montana Fish, Wildlife and Parks, Helena, Montana. 30 pp.

Whitman, R. (2020). Agenda Item I: Proposed modification to the total dissolved gas water quality standard on the Columbia River for fish passage (Action). Memorandum to Environmental Quality Commission, by Department of Environmental Quality, State of Oregon. https://www.oregon.gov/deq/EQCdocs/01242020_I_TotalDissolvedGas.pdf

## PDT Final Evaluator Response (FPC #9)

| | | | |
|---|---|---|---|
| | **Concur** | **X** | **Non-Concur** |

Explanation: TDG levels of 110% saturation does, with sufficient duration, increase the risk of mortality. However the DEIS does not emphases 110% as a standard. TDG levels among alternatives are reported as the proportion of time exceeding TDG of 120% or 125%, for modeled salmon and for steelhead only an estimated average exposure is presented. Higher TDG levels are identified as higher risk of GBT. Despite many field studies there are still many remaining uncertainties in effects in free swimming fish in general, the variety of species and life stages, so a conservative approach is prudent. The co-lead agencies did not use the TDG related mortality estimates generated by the UW TDG model in their decision making process. The co-lead agencies updated the Final EIS and clarified the description of how elevated risk of mortality associated with TDG was considered for non-salmonids.

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| **Recommendation 1:** | | **Adopt** | **X** **Not Adopt** |

Explanation: The DEIS only mentions the 110% TDG standard at Rufus Woods Lake, where there is no waiver, but then refers to 120% and 125%. All analysis and discussions on salmon and steelhead are presented relative to exceeding 120% and 125% TDG saturation with the exceptions of page 3-397 where chum salmon eggs and sac fry are addressed where the goal is to maintain TDG below 105% of saturation. A “minor effect” was noted as possible for bull trout in Chief Joseph to McNary relative to duration above 110%. However, reanalyzing that species and reach relative to 115% / 120% would not materially improve the EIS and would not alter any decisions.

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| **Recommendation 2:** | | **Adopt** | **X** **Not Adopt** |

**PDT Final Evaluator Response (FPC #9)**

Explanation: The TDG exposure model did incorporate depths migrating fish.

TDG is a risk to invertebrates and fish as identified in the DEIS and extensively in the scientific literature, the risk to any individual depends on the organism, it's life stage, gas loading, the duration of exposure, and level of TDG saturation, and depth. In the immediate area of spillways TDG can reach extreme levels; there is significant risk for fish at relatively shallow depths, or have prolonged exposure do to tailrace eddies cycling them back into the spillway discharge. Also, MO4 and the Preferred Alternative includes maintaining TDG at 125% which, is beyond precedence for duration and lower river discharges. These levels clearly would provide risk for fish that maintains depths of less than 2 meter. We know both juvenile and adult salmon spend much of their time below compensation depth, however the dynamic of behavior is not sufficiently known to quantify the risk. Many larval fish are more sensitive relative to other life stages. The DEIS specifically mentions white sturgeon. The actual risk to fish is unknown for the reasons discussed above, but the relative risk among alternatives will be higher for alternatives with higher TDG.

| **Recommendation 3:** | | **Adopt** | **X** | **Not Adopt** |
|---|---|---|---|---|

Explanation: Page 3-295 & 3-296 of the Draft EIS discussed TDG, depth compensation. Recent updates have been made to state water quality standards. In Oregon, the Environmental Quality Commission approved a spring TDG modification of 125 percent at its January 2020 Environmental Quality Commission hearing and went into effect on February 11, 2020, after it was signed by the Oregon Department of Environmental Quality Director. In Washington, a permanent rule change to facilitate the 125 percent TDG spring spill for juvenile fish passage was approved by the U.S. Environmental Protection Agency on March 5, 2020.

| **Recommendation 4:** | | **Adopt** | **X** | **Not Adopt** |
|---|---|---|---|---|

Explanation: Depth compensation was addressed. Adding this discussion would not materially add clarity to the EIS or alter any decisions.

**Panel Final BackCheck Response (FPC #9)**

| | **Concur** | **X** | **Non-Concur** |
|---|---|---|---|

Explanation: The basic issue is use of the term "risk" in the absence of a true risk analysis. An increase of 1 % of saturation may technically produce a small increase in "risk" of the incidence or even severity of GBD. However, this increase in risk is sufficiently small as to be generally undetectable. Most Columbia River System field studies do not provide evidence of an increase in risk at slightly greater than 110 % of saturation.

Tailrace conditions are not of great concern in this issue. The extremely high water velocities of tailrace areas prohibit most fish from remaining in these areas for sufficient periods of time to develop high internal levels of TDG that may result in GBD. The recorded durations of juvenile salmonids in tailrace areas indicate resident times of minutes to several hours. Fish that remain in tailrace areas for prolonged periods need to remain near the bottom to avoid downstream displacement, thus are exposed to hydrostatic compensation that decreases the risk of GBD at TDG levels of 110-120 % of saturation. The general absence of GBD in many field studies with TDG levels of 110-120 % and higher provide evidence that depth compensation is commonly adequate to avoid increased risk of GBD during the relatively brief residence in tailrace areas.

## Final Panel Comment 10

**A percent change in the 5-year average maximum TDG as compared to the No Action Alternative does not reflect the degree of GBD impact to the fish.**

### Basis for Comment

The 5-year average maximum TDG level has not been demonstrated to produce a useful measure of the biological effects of elevated TDG levels in the natural conditions of the Columbia and Snake Rivers. At best, this criterion provides a weak comparison among CRSO alternatives and is likely to indicate an effect where none would occur.

A change in saturation of 2% at a No Action Alternative level of 120% TDG would be unlikely to produce an observable effect in overall GBD, while a 2% increase at a No Action Alternative level of 130% might produce a substantial observable effect. However, with the TDG levels generally being maintained at a 5-year average maximum TDG of 120% or lower, this issue would likely be insignificant (an exception would be situations such as Libby Dam where the downstream reach tends to be relatively shallow, making TDG levels exceeding 120% a concern). The net effect is likely to be an overestimate of the negative impact of any predicted increase in 5-year average maximum TDG levels.

### Significance – Medium

An accurate representation of the TDG and GBD issues in the CRSO DEIS will allow decision makers to understand the issues and resulting impacts under the alternatives when deciding on a preferred alternative.

### Recommendations for Resolution

1. Delete references to the 5-year average maximum TDG level, which does not accurately reflect GBD impacts.

2. Employ the 115% forebay and 120% tailrace criteria for TDG during the spring-summer migration period when determining potential effects to salmonid migrants in the lower Snake and Columbia Rivers, as suggested by the States of Oregon and Washington (Whitman, 2020).

**Literature Cited**

Whitman, R. (2020). Agenda Item I: Proposed modification to the total dissolved gas water quality standard on the Columbia River for fish passage (Action). Memorandum to Environmental Quality Commission, by Department of Environmental Quality, State of Oregon. https://www.oregon.gov/deq/EQCdocs/01242020_I_TotalDissolvedGas.pdf

| PDT Final Evaluator Response (FPC #10) | | | |
|---|---|---|---|
| | **Concur** | **X** | **Non-Concur** |
| Explanation: 5-year average maximum does not reflect to degree of risk for GBD and this information was not used for this purpose. It is an index to identify the long-term differences in TDG among alternatives to compare the water quality effects. TDG effects on fish were subjectively described due to the complexity and uncertainty in fish behavior, and differing sensitivities of different life stages. | | | |
| **Recommendation 1:** | | **Adopt** | **X** **Not Adopt** |
| Explanation: The 5-year average maximums were not purported to represent TDG impacts on fish, including the degree of risk for GBD. It is an index on such a scale that will show differences in dissolved gas productions among alternatives to compare the effects of water quality over the long-term. | | | |
| **Recommendation 2:** | | **Adopt** | **X** **Not Adopt** |
| Explanation: No change needed. For Mainstem projects, the NAA is under the 115%/120% TDG waivers, and the salmon and steelhead effects analysis qualitatively compared each alternative to gas exposures estimated for the NAA. | | | |

| Panel Final BackCheck Response (FPC #10) | | | |
|---|---|---|---|
| | **Concur** | **X** | **Non-Concur** |
| Explanation: The 5-year average maximum does not provide a useful index to distinguish differences among the alternatives evaluated by the Draft EIS. If the “5-year maximums were not purported to represent TDG impacts on fish.”, it would be of little or no value in distinguishing differences among the alternatives. The basic purpose of regulating and evaluating total dissolved gas supersaturation is to protect aquatic life.<br><br>Although there is substantial complexity in fish behavior, it is only the fish’s depth distribution that is of substantial value in determining adverse effects of total dissolved gas supersaturation. The two documents cited above (Weitkamp and Katz 1980, Weitkamp 2020) provide reference to numerous investigations that document or infer the depth of juvenile and adult salmonids that avoid gas bubble disease under reservoir and free-flowing river conditions.<br><br>This is an artificial criterion that does not usefully distinguish differences in the evaluated alternatives. This risks introducing a confusing and unnecessary analysis to TDG regulation that is not of any value. | | | |

## Final Panel Comment 11

**It is unclear why MO1, MO3, and MO4 were burdened with new irrigation diversions that are 25 times greater than those used for the Preferred Alternative.**

### Basis for Comment

The MO1, MO3, and MO4 alternatives each include new irrigation diversions of 1.15 million acre-feet (Maf) per year from Lake Roosevelt. The Preferred Alternative includes a much smaller new diversion volume of 45,000 kilo acre-feet (kaf) per year, which is 4% of the added diversion volume included in the MO alternatives. The added irrigation flows for the MOs represent an expansion of approximately 254,000 acres of irrigated cropland in the Bureau of Reclamation Columbia Basin Project. The positive economic effects of this increase in irrigated cropland are not discussed in the analyses of the MO alternatives. However, the negative socioeconomic effects of the loss of 47,800 acres of cropland associated with MO3 are evaluated in detail in the analysis of that alternative. This is an unequal treatment of the water supply benefits between the Preferred Alternative and the MO alternatives.

The new 1.15 Maf irrigation diversion under the MO alternatives would result in a 0.5% to 1% reduction in river flow volumes below Grand Coulee Dam. This reduced river flow would cause a small but readily quantified reduction in power generation, system reliability, and socioeconomic benefits under the MO1, MO3 and MO4 alternatives. These negative effects are not discussed in the analyses of MO1, MO3 and MO4. Concurrently, the Preferred Alternative enjoys the incremental generation, reliability, and socioeconomic benefits of not diverting this added 1.1 Maf from the river. This benefit under the Preferred Alternative is not discussed in the CRSO DEIS.

The Panel believes it is important to quantify the amount of this difference between alternatives, which the Panel understands to be in the range of 0.5% to 1.0% of the Federal Projects' annual power generation.

### Significance – Medium

The unequal examination of new irrigation diversions between the alternatives disregards positive benefits under the MO alternatives and overstates the relative benefits under the Preferred Alternative. As a result, this uneven treatment appears to inflate the economic justification of the Preferred Alternative and ignores likely benefits under the MO alternatives.

### Recommendations for Resolution

1. Describe in Chapter 3 the benefits that would accrue from the added irrigation diversions at Lake Roosevelt under MO1, MO3, and MO4. Explain why socioeconomic and regional benefits were not examined.

2. Explain in Chapter 3 that the power generation, regional cost of power, and related socioeconomic benefits would be slightly higher if the large irrigation expansion did not occur under MO1, MO3, and MO4.

3. Explain in Chapter 7 that the smaller new irrigation diversions from Lake Roosevelt would provide a small increase in CRS electric generation, loss of load probability (LOLP), and socioeconomic benefits due to about 1.1 Maf remaining in the river below Grand Coulee.

## Final Panel Comment 11

4. Quantify in Chapter 7 the difference in power generation, LOLP, and socioeconomic benefits that the 1.1 Maf difference in river flow represents.

5. Explain in Chapter 7 that this same small benefit would accrue under the MO alternatives if they also had irrigation diversions similar to that proposed under the Preferred Alternative.

## PDT Final Evaluator Response (FPC #11)

| | Concur | X | Non-Concur |
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Explanation: This language is in Chapter 7 and explains why the CBP diversion was decreased in the PA:

This operational measure was included in MO1, MO3, and MO4 where an additional 1.15 million acre-feet could be pumped from Lake Roosevelt at Grand Coulee above what was provided in the No Action. This measure was updated for the Preferred Alternative to pump up to 45,000 acre-feet of water above the No Action due to the uncertainty over the timing and extent of the development of new water supply projects for the full volume. Additionally, this measure would change the timing of delivery of recently developed water supplies for the Odessa Subarea of the Columbia Basin Project (164,000 acre-feet for irrigation and 15,000 acre-feet for M&I of the current supplies) from September and October to when the water is needed, on demand. The 45,000 acre-feet water supports near-term additional development of authorized project acres. Water pumped from Lake Roosevelt would be delivered as the demand arises during the irrigation season (March to October).

Because multiple factors contribute to the amount of water in the river and reservoirs that then translates into changes in power generation, etc, this was not explicitly called out in the EIS, though the H&H section explains the measures that lead to changes in flow and storage in each MO.

| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |
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Explanation: The increased irrigation deliveries described in MO1, M02, and M04 reflect the water needed to develop the remaining acres originally authorized for the Columbia Basin Project; only a portion of the authorized acres have been developed to date. The timing and method of development was unknown at the time of this EIS and therefore benefits of this additional water delivery were not quantified but impacts to river flows and associated resources that result from the additional water delivery were quantified. The uncertainty of the timing of water demand development and certainty of impacts contributed to the decision to decrease the amount of additional water delivery in the Preferred Alternative. Section 3.12.1.4 has been updated to acknowledge that the beneficial effects from the additional water supply measure are not analyzed. Section 3.12.1.4 and the Water Supply appendix explain the uncertainty associated with the new water deliveries.

| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
|---|---|---|---|---|

Explanation: The No Action Alternative largely captures the benefits of not including the additional water supply measures. The analysis of MO1, MO3 and MO4 demonstrates the impacts of delivering the additional water supply to the Columbia River flows, and impact to individual resources. This is explained in the individual resource sections. Because multiple factors contribute to the amount of water in the river and reservoirs that then translates into changes in power generation, etc, this was not

| PDT Final Evaluator Response (FPC #11) | | | | |
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| explicitly called out in the EIS, though the H&H section explains the measures that lead to changes in flow and storage in each MO. | | | | |
| **Recommendation 3:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The PA explains potential effects to these resources due to the combined effect of the measures in the PA. As with all other effects, it explains the difference to the NAA, not the other MOs. | | | | |
| **Recommendation 4:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The PA explains potential effects to these resources due to the combined effect of the measures in the PA. As with all other effects, it explains the difference to the NAA, not the other MOs. | | | | |
| **Recommendation 5:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: The No Action Alternative largely captures the benefits of not including the additional water supply measures. The analysis of PA demonstrates the impacts of delivering the additional water supply to the Columbia River flows, and impact to individual resources. This is explained in the individual resource sections for the PA. Because multiple factors contribute to the amount of water in the river and reservoirs that then translates into changes in power generation, etc, this was not explicitly called out in the EIS, though the H&H section explains the measures that lead to changes in flow and storage in the PA. | | | | |

| Panel Final BackCheck Response (FPC #11) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel concurs with the addition of text in Section 3.12.1.4 which clarifies that beneficial effects of the additional water supply diversion were not analyzed.<br><br>The Panel understands that further development of cropland in the Columbia Basin Project is uncertain, both in terms of its timing and the total acreage that may ultimately be developed. However, the relative magnitude of the two water volumes begs at least some mention that benefits of the increased pumping at Grand Coulee could be significantly larger than the cropland loss in Region C. Some mention of this should be presented in 3.12.2.2 for Region B. | | | |

## Final Panel Comment 12

**The use of monthly and weekly flows in the H&H models does not replicate local hydraulic conditions that would impact aspects of the quality and use of the CRSO environment by adult and juvenile fish during passage.**

### Basis for Comment

Overall, the H&H models focus on hydroregulation and flood risk management, where monthly and weekly flows are adequate for analysis. However, these flow periods are often inadequate to describe local hydraulic or hydrodynamic conditions that fish experience during both adult and juvenile fish passage where they continually make swim path decisions based on their local hydrodynamic conditions.

The CRSO DEIS and supporting documents do not discuss impacts from changes in spillway flows to adult and juvenile fish passage; exposure to TDG; potential for bed rock scour with increased spill levels; changes in powerhouse to spillway flow entrainment; and impact on overall downstream flow conditions, including near boat ramps, adult ladder entrances, and along shoreline protections such as rock revetment and stabilization structures.

### Significance – Medium/Low

Both numerical and laboratory models are required in order to develop detailed project designs, shape spillway operations for flexible spill conditions, and evaluate changes in downstream flow conditions, which are important factors for analyzing the CRSO environment.

### Recommendation for Resolution

1. Use a couple projects as “index” locations to more thoroughly assess the detailed hydrodynamic conditions near fish passage structures, spillway stilling basins, boat ramps, etc., and the impact of the changing flow conditions under the Preferred Alternative.

## PDT Final Evaluator Response (FPC #12)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: Estimated monthly and two week flows in of themselves does not describe the hydraulic characters. However, many of the key factors for differentiating among the alternatives were qualitatively described, to include adult passage delays, and tailrace eddies, that delay juveniles and increase their predation risk. They types of modeling necessary to address these factors in the tailraces is very expensive and often very difficult to validate. The Preferred Alternative includes and Adaptive Management Framework to address unintended consequences such as those that could arise from some the uncertainty in local hydraulics.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: All of the projects result in different local conditions. Modeling one or two site would have very little value in comparing system wide effects among the alternatives.

| Panel Final BackCheck Response (FPC #12) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The PDT's choice of using an Adaptive Management Framework to address unintended consequences is a satisfactory approach. | | | |

## Final Panel Comment 13

**The assessment of climate changes does not consider the adaptability of fish to changing climatic conditions.**

## Basis for Comment

The early life history of Columbia River salmonids is closely tied to the water temperatures they experience during incubation and intergravel rearing. However, salmonids and other fishes have been known to adapt to extended ranges of temperature.

The CRSO DEIS evaluation does not consider the adaptability of salmonid species to altered climatic and other habitat conditions. The various salmonid subspecies show substantial indication that species have historically adapted to fringe conditions to expand their occupation of adjacent habitats. The movement of salmonids to reoccupy the northern part of their existing range that provided no aquatic habitat during the Ice Age is one clear indication of the adaptability of these species.

Water temperatures do strongly influence reproductive timing as well as the development and survival of salmonid embryos and alevins. A degree or two increase in temperature beginning at the time of spawning may result in earlier hatching, emergence, and migration timing (possibly by several weeks). Times from spawning to emergence of alevins and subsequent migration are closely tied to the accumulation of degree-days by each fish. An increase in the accumulation of degree-days at the initiation of embryo development is likely to result in substantially earlier emergence of alevins, also perhaps by several weeks.

Increased temperatures may result in either earlier or later spawning dates, depending on species and other conditions. Higher temperatures can result in delayed adult migration to spawning areas, producing delayed spawning. If adult migrations are increased by slightly higher temperatures, earlier spawning together with a higher temperature (by a degree) at the time of spawning will result in the embryos accumulating substantially more degree-days by the historic date of spawning, followed by earlier emergence and migration.

Furthermore, changes in river flow (total discharge) are likely to occur with climate change. These changes may be sufficient to reduce juvenile migrant survival and delay adult migrations.

Also, the greatest effects of climate change may be the result of changes in ocean-rearing temperatures that influence the survival and growth of salmonids over one to three years. Ocean conditions are outside the area that can be influenced by the CRSO.

## Significance – Medium/Low

Adding information on the adaptability of fish will add useful considerations to the basic issue of climate change and make the analysis less susceptible to criticism. This additional information would also help demonstrate that the CRSO has limited capacity to alter the effects of climate change in the CRS.

## Recommendations for Resolution

1. Document the potential for the native species to adapt to changes in water temperatures with

| Final Panel Comment 13 |
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| climate changes in the CRSO DEIS.<br><br>2. Document the potential substantive changes in ocean conditions that may produce greater population changes than the CRSO area changes, and clarify that these changes are outside the capability of the CRSO to control. |

| PDT Final Evaluator Response (FPC #13) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The DEIS does not address the potential for salmon and steelhead to adapt to changing conditions. The salmon are well known to be quite plastic in many life history traits and have adapted to each local habitat. Water temperature, runoff timing, etcetera are very powerful selection forces so some degree of adaption could be expected. However, much of the recognized adaption of these cold water obligates has been in migration timing to allow success in the hot arid inland Columbia River basin. Meeting the challenges of higher temperatures and longer durations of warm water will be a challenge. | | | |
| **Recommendation 1:** | **X** | **Adopt** | **Not Adopt** |
| Explanation: It is possible some populations may adapt to changing condition. Additional information has been added in the Cumulative Effects chapter of the Final EIS when discussing climate change on anadromous fish. | | | |
| **Recommendation 2:** | **X** | **Adopt** | **Not Adopt** |
| Explanation: The projected changes in ocean temperatures and acidification will likely have a greater population effects on salmon and steelhead population than any of the EIS alternatives. Additional information has been added in the Cumulative Effects chapter when of the Final EIS when discussing climate change on anadromous fish. | | | |

| Panel Final BackCheck Response (FPC #13) | | |
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| **X** | **Concur** | **Non-Concur** |

## Final Panel Comment 14

**In evaluating the loss of LSR hydro generation (part of MO3), regional development of new renewable generation resources is not considered as the most likely replacement energy source.**

### Basis for Comment

As part of regional climate change policies, multiple state government and corporate initiatives are now developing new renewable electric generating resources. This new generation capacity will hasten the retirement of fossil fuel generation in the region. It also would likely replace the LSR hydro generation that would be lost as part of MO3.

The grid reliability and regional power system effects analysis for MO3 presents one very unlikely scenario where LSR hydro generation is replaced by conventional gas-fired generation. Given government/corporate mandates and the pace of new renewable generation sources, these fossil-fired replacements seem highly unlikely.

The replacement energy discussion in the MO3 analysis also suggests that BPA might be the developer of whatever replacement energy source is needed to replace the LSR hydro generation. That discussion confirms that a new Federal congressional authorization would be needed for BPA to develop such resources. Given ongoing resource development by others and the need for an act of Congress to allow BPA development, it seems also quite unlikely that BPA would carry out this energy development program.

### Significance – Medium/Low

The analysis of power generation impacts for MO3 would be more complete if it acknowledged that replacement energy sources for the lost LSR hydro generation would most likely be developed by others. Specifically, this replacement generation would likely be renewable energy developed according to an economic framework and schedule largely independent of the CRSO.

### Recommendations for Resolution

1. Edit the grid reliability and regional power system effects analyses to better describe the current regional development of renewable electric generation by entities external to the CRS.

2. State more clearly in the cost and LOLP analyses that replacement resources are likely to be developed by entities external to the CRS lead agencies.

| PDT Final Evaluator Response (FPC #14) | | | | |
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| **X** | **Concur** | | **Non-Concur** | |

Explanation: The underlying premise of the comment, that natural-gas may not be the likely replacement for the four lower Snake River dams' generation in some scenarios and that Bonneville may not be the entity acquiring the new resources, are already described in the EIS.

The *Base Case Methodology, Potential Resource-Replacement Portfolios*, in Section 3.7.3.1 p. 3-820 of the DEIS, describes that two potential resource replacement portfolios were developed, one being conventional least-cost (natural gas) and the other zero-carbon to serve as bookends for the cost analysis. These portfolios were developed to provide a range of potential resources that could be acquired by Bonneville or public power utilities to meet their supply obligations and return regional reliability to the level of the No Action Alternative. The source of data for these portfolios was the Council's 7th Power Plan and Mid-Term Update, which identifies natural gas as a primary resource. The EIS acknowledges, though, that future development of natural gas may be unlikely. Section 3.7.3.1, *Cost of Carbon Compliance* and *Availability of Coal Resources*, (beginning on p. 3-839 of the DEIS) describes changes in legislation and policy in the Northwest that make it unlikely that carbon-based resources would be built.

As to the question of who might develop the new resources, the EIS uses the word "acquire" but not "build" in the context of new generation for Bonneville. The comment is correct that Bonneville does not have authority to own any new resources; however, Bonneville has statutory authority to contract to acquire the output of a resource. The discussion under *Step 3* in Section 3.7.3.1, (particularly p. 3-821 in the DEIS) and a footnote acknowledge the details of how Bonneville would acquire new resources. Whether Bonneville would have to exercise its acquisition authority depends, in part, on its customers' elections for service as prescribed in Bonneville's current long term power sales contracts. If customers elect Bonneville to serve their requirements, then Bonneville is obligated, if needed, to acquire sufficient resources (*i.e.,* acquire output of specific resources or power from the short-term power market) to meet its power obligations. This could include acquisitions to replace the lost capability from the four lower Snake River dams in MO3. What resources Bonneville would acquire would depend on a host of factors not within the scope of the EIS, including cost effectiveness, availability, and capability. However, nothing in existing law would prohibit Bonneville from commencing statutory proceedings to acquire the output of resources that the Administrator determines are needed to meet his obligations, which could include output from a natural gas project.

| **Recommendation 1:** | **X** | **Adopt** | | **Not Adopt** |
|---|---|---|---|---|

Explanation: It should be noted that in Chapter 6 – Cumulative Effects includes Reasonable and Foreseeable Future Action (RFFA) 3: "New and Alternative Energy Development" that discusses the prevalence of new renewable development in the region. In addition to this existing discussion, new language will be added to Section 3.7.2.1 to describe the growth of renewable generation. Additional language will be added to Appendix H (Section 2.2) to describe the timeline for developing new resources, and it will include language to state that independent power producers are developing new renewable resources that may be used to replace hydropower generation if not already allocated to replace coal-based generation.

| **Recommendation 2:** | **X** | **Adopt** | | **Not Adopt** |
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| PDT Final Evaluator Response (FPC #14) |
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| Explanation: In Section 3.7.3.1 under base case methodology, Step 3, we intend to add clarifying language describing that whether Bonneville or its customers acquire replacement resources, it may entail entering into power purchase agreements with independent power producers.<br><br>Also, as noted in the Explanation for Recommendation 1, new language will be added in Appendix H to describe the timeline for developing new resources, and it will include language to state that independent power producers are developing new renewable resources that may be used to replace hydropower generation if not already allocated to replace coal-based generation. |

| Panel Final BackCheck Response (FPC #14) | | | |
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| **X** | **Concur** | | **Non-Concur** |

## Final Panel Comment 15

**The use of averages from a USACE nation-wide database for expenditure data may not accurately represent the average expenditures on a regional scale.**

### Basis for Comment

The expenditure data used in the recreation model are national averages. All the sites in the CRSO area are located in the northwestern United States. Ideally, the expenditure data should reflect the expenditures at the sites being evaluated. The nation-wide data should be stratified by region and expenditure types so that sites in the northwestern United States could be used. This approach would more accurately reflect the economic impacts of changes to recreation sites in the CRSO area.

### Significance – Medium/Low

Using expenditure data specific to the northwest region will yield the most accurate estimates possible of the economic impact of changes to recreation sites.

### Recommendation for Resolution

1. Stratify the national expenditure data by region and use the northwest region averages in the recreation model.

## PDT Final Evaluator Response (FPC #15)

| | Concur | X | Non-Concur |
|---|---|---|---|

Explanation: The PDT agrees with the commenter that expenditure data would ideally reflect the expenditure profiles that are specific to the study sites or the Pacific Northwest.

| Recommendation 1: | | Adopt | X | Not Adopt |
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Explanation: While the PDT agrees that expenditure data would ideally reflect the expenditures at sites being evaluated in this EIS (or other similar sites in the northwestern United States), the Corps utilizes a nationwide expenditure profile for recreational visitor expenditures. The following revision has been made to Appendix M in order to clarify this point (changes shown in italics):

"The Corps' expenditure profile was developed for six visitor segments at all projects across the country from recent surveys at a range of sites.[10]

[10] *The Corps does not have expenditure profiles specific to sites in the Pacific Northwest or other regions, as the underlying surveys were not designed to generate regional-level profiles."*

| Panel Final BackCheck Response (FPC #15) | | | |
|---|---|---|---|
| **X** | **Concur** | | **Non-Concur** |
| Explanation: Given the information provided, the Panel concurs that the expenditure data cannot be stratified as recommended. We do, however, suggest the PDT further explain why it is not possible to stratify the national expenditure data by region. For example, is it because of the sampling methodology or because the survey instrument or something else. | | | |

## Final Panel Comment 16

**The system cost models do not communicate risk under the MO alternatives.**

### Basis for Comment

The estimated system costs under each alternative are divided into four categories: construction costs, capital costs, operation and maintenance costs (O&M), and mitigation costs (see Appendix Q, Table 7-2). All of these costs, with the exception of the mitigation costs, are presented as point estimates. The cost parameters in the models, however, are subject to fluctuations. Because each alternative employs different levels of inputs for construction, capital, and O&M, fluctuations in the cost of inputs will have different effects on the alternatives. The system cost models in the CRSO DEIS do not communicate how those parameter fluctuations would affect the system cost estimates.

As an example, O&M costs include the costs of dredging for navigation. To estimate the annual cost of dredging activity, the CRSO DEIS uses the average cost from 2011 to 2018, inflated to 2019 prices (Appendix Q, pages Q-5-2 and Q-5-3). It would not be difficult to use that same information to calculate the variance of the dredging costs and construct a confidence interval for the annual dredging costs.

### Significance – Medium/Low

Including parameter fluctuations in the models will provide decision makers a better understanding of the perceived accuracy of the point estimates.

### Recommendation for Resolution

1. Develop confidence intervals for the system costs of each alternative and report them in the CRSO DEIS.

## PDT Final Evaluator Response (FPC #16)

**X Concur** | **Non-Concur**

Explanation: The PDT agrees that the risk and uncertainty surrounding the CRSO implementation and system costs could be better communicated in the EIS. The PDT will revise the EIS (Section 3.19 and Appendix Q) to better describe risk and uncertainty regarding the cost estimates. Appendix Q, Chapter 1, second to last paragraph includes some description on uncertainty related to the development of the cost analysis and cost estimates. Some of the cost estimates include uncertainty, such as construction costs of the structural measures and the additional mitigation measures and the Fish and Wildlife Program costs.

For the construction cost estimates of the structural measures and the additional mitigation measures, a 50 percent contingency was added to the construction costs due to uncertainty surrounding the estimates and the preliminary designs. This is a standard approach for the cost engineers at the Corps Mandatory Cost Center of Expertise at the Walla Walla District, which was also reviewed and approved by Bonneville. Therefore, the cost estimates for these measures reflect conservative measures. Uncertainty surrounding the fish and wildlife mitigation costs was included in the cost estimates and is

**PDT Final Evaluator Response (FPC #16)**

reflected as a range for the Fish and Wildlife Program costs under MO2, MO3, MO4, and the Preferred Alternative.

Capital cost estimates and non-routine extraordinary (NREX) cost estimates are based on long-range forecasts of these capital and non-routine requirements to 2068. There are multiple areas of uncertainty related to these future costs, including equipment replacement and repair needs and timing, cost estimates of the capital requirements, and execution risk (i.e., planning timing, authorizations, and appropriations). Bonneville evaluates the uncertainty around individual investments in the short-term (one year out) to understand cost and schedule risk. However, any evaluation of the magnitude of uncertainty for the long-term plan would be speculative and is beyond the scope of this evaluation.

Additional information on risk and uncertainty regarding O&M costs was included in Appendix Q (Section 5.1) was included to reflect the variation in these costs over the past 3 to 5 years, where possible. Although the commenter is correct that some of the O&M costs are based on an average of the recent historic costs (updated to current price levels), other categories of these costs (for example, routine O&M for cultural resources, routine O&M costs for the Reclamation projects, navigation non-routine costs for Walla Walla District), are based on program and budget experts reviewing the historic costs and providing an expert judgement on the annual O&M costs for these programs and activities in the future. As described previously, specific uncertainty bounds or ranges for the NREX costs, which fall in the O&M category, cannot be estimated.

As a result of the above issues and considerations described above, additional description of risk and uncertainty regarding the implementation and system costs has been added to the EIS, although confidence intervals or ranges in these costs were not included in the cost estimates in the tables in Section 3.19 and Appendix Q.

The fourth paragraph of Section 3.19 and the Chapter 1 of Appendix Q includes the following additional description on risk and uncertainty:

***It should be noted that there are multiple areas of uncertainty related to the cost analysis in general. In fact, risk and uncertainty are inherent with any model that is developed and used for water resource planning. Much of the risk and uncertainty associated with modeling the costs stem from the assumptions that historic activities and costs would reflect cost estimates in the future. There are uncertainties in terms of the needs and timing of O&M, capital requirements, fish and wildlife mitigation, and construction costs of the structural measures; the cost estimates associated with those needs or requirements; and the execution risk associated with timing and the ability to obtain authorizations and appropriations to implement the alternatives, and others. Future costs can also be affected by technological advancements and cost efficiencies although any future changes in technologies are speculative. Additional descriptions on the risks and uncertainties surrounding the implementation and system cost categories are described in Appendix Q.***

Additional details have also been added in each of the sub-sections (structural measures, capital, O&M, mitigation) to describe uncertainty surrounding these cost estimates.

Section 4.1.1. (Capital Costs) of Appendix Q includes the following additional description:

**PDT Final Evaluator Response (FPC #16)**

***Capital cost estimates are based on long-range forecasts of these capital requirements to 2068. There are multiple areas of uncertainty related to these future costs, including equipment replacement and repair needs and timing, cost estimates of the capital requirements, and execution risk (i.e., planning timing, authorizations, and appropriations). Bonneville has begun a process to evaluate how well the individual investments in the short-term (one year out) align with the cost estimates; however, any evaluation of the magnitude of uncertainty would be speculative and is beyond the scope of this evaluation.***

Section 5.1.1.1 (Routine O&M) of Appendix Q includes the following additional description:

***To better understand the variation and uncertainty regarding routine O&M costs, an evaluation was completed on the standard deviation and 95 percent confidence interval for the O&M costs that used 5 years of historic data. Average routine O&M costs for all of the Corps projects (updated to 2019 price levels and not including cultural resource O&M) were estimated to be $237.1 million annually based on 5 years of cost data from 2013 to 2017. From these five years of data, the standard deviation was estimated to be $9.2 million with a 95 percent confidence interval that ranges from $229.0 million to $245.2 million.***

Section 5.1.1.2 (NREX) of Appendix Q includes the following additional description:

***NREX cost estimates are based on long-range forecasts of these non-routine requirements to 2068. There are multiple areas of uncertainty related to these future costs, including equipment replacement and repair needs and timing, cost estimates of the non-routine requirements, and execution risk (i.e., planning timing, authorizations, and appropriations). Bonneville has begun a process to evaluate how well the individual investments in the short-term (one year out) align with the cost estimates; however, any evaluation of the magnitude of uncertainty would be speculative and is beyond the scope of this evaluation.***

Section 5.1.1.3 (Navigation) of Appendix Q includes the following additional description:

***To better understand the variation and uncertainty regarding navigation costs, an evaluation was completed on the standard deviation and 95 percent confidence interval for the Portland District dredging costs, which was based on 3 years of historic data. Average Portland District dredging costs were estimated to be $67.1 million annually, with a standard deviation of $4.1 million and a 95 percent confidence interval that ranges from $62.5 million to $71.7 million.***

Section 6.1.1 (Fish and Wildlife Costs) of Appendix Q includes the following additional description:

Funding decisions for the Bonneville F&W Program are not being made as a part of the CRSO EIS process. However, a range of potential F&W Program costs are included to inform the broader cost analysis for each alternative in the EIS***.***

Section 6.1.2 (Costs for Additional Mitigation Measures) of Appendix Q includes the following additional description:

Structural mitigation measures were estimated by the cost engineers at the Mandatory Cost Center for Expertise, while on-going system annual system costs were developed with input from programs, operations and cost engineering. ***A contingency of 50 percent was added to all construction estimates based on preliminary designs, scope, and uncertainty surrounding the construction***

| PDT Final Evaluator Response (FPC #16) | | | | |
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| ***estimates and in consultation with Bonneville. A 50 percent contingency is typical for this level of scope and cost engineering estimate development.*** | | | | |
| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: Descriptions of risk and uncertainty surrounding the implementation and system costs have been included in Section 3.19 and Appendix Q. However, confidence intervals or ranges in these costs were not included in the cost estimates in the tables in Section 3.19 and Appendix Q due to the difficulty and speculation in estimating these ranges across an array of cost data sources. It should also be noted that the decision-making associated with the EIS and selection of the Preferred Alternative considered a comparison of the costs across the alternatives, including comparing the action alternatives with the No Action Alternative. All of these costs include a level of uncertainty; it is the general relative changes across the alternatives that was considered in the decision-making process. | | | | |
| **Panel Final BackCheck Response (FPC #16)** | | | | |
| **X** | **Concur** | | **Non-Concur** | |

## Final Panel Comment 17

**The IMPLAN analysis for the power generation and transmission model was not modeled properly.**

### Basis for Comment

The IMPLAN analysis was done at the state level and then aggregated to the study region. IMPLAN allows for models to be run at various spatial scales—single county, multi-county regions within a state, multi-county regions across states, state-level, multi-state regions, etc. The IMPLAN analysis for the CRSO DEIS ran separate state-level analyses and then totaled the results. This approach does not account for the economic inter-connection across state lines. The proper approach would be to run a regional IMPLAN model incorporating all counties in the study area into a single region.

### Significance – Medium/Low

Changing the structure of the IMPLAN analysis from separate state-level analyses to a single regional analysis will provide more accurate estimates of the economic impacts under each alternative.

### Recommendation for Resolution

1. Run a regional IMPLAN model for the power generation and transmission model.

## PDT Final Evaluator Response (FPC #17)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: Thank you for reviewing the IMPLAN modeling approach and providing thoughtful comments. It is correct that the current IMPLAN modeling analysis is conducted at the state level. This means that the power rate effects rely on state-level spending and state-specific multiplier data to quantify indirect and induced impacts, and results are then summed across states to estimate a total effect. We agree that this approach results in some unaccounted for direct and induced effects that occur due to interconnected businesses that are affected outside of the state. This is referred to as “leakage” in the context of regional economic modeling.

While we recognize there are alternative ways to model the multiplier effects, we disagree that the current approach is improper. The choice of region size in IMPLAN necessitates a tradeoff between minimizing leakage and minimizing “aggregation bias” (i.e., the loss of detail in IMPLAN when aggregating industries across regions, in this case states). Our current approach takes spending effects at the state level, apportions them to industries based on state-specific data on electricity purchases, and applies multipliers from IMPLAN that are specific to each industry in each state. This approach better targets the direct spending effects to the appropriate industries, and makes use of more precise state specific-industry multipliers to minimize aggregation bias. If we were instead to combine all the states into one region, we would reduce leakage but also reduce the precision of our estimates.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

| PDT Final Evaluator Response (FPC #17) | | | |
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| Explanation: See explanation above. | | | |
| **Panel Final BackCheck Response (FPC #17)** | | | |
| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel is able to concur given the clarification provided. | | | |

## Final Panel Comment 18

**The CRSO DEIS does not include any information on the potential for earthquakes and any resulting impacts to the Columbia River area under the No Action Alternative or the action alternatives assessed.**

### Basis for Comment

Earthquakes are known to occur in the study area. The CRSO DEIS does not address potential adverse effects if earthquakes were to impact the Columbia River area. The potential for earthquakes causing ground shaking and increased shoreline slope instability, including landslides and erosion, is not discussed. The resulting shoreline instability could increase sediment supply, transport, and turbidity, as well as trigger reservoir surge waves. Potential adverse effects from the combined effect of climate change (e.g., affecting reservoir drawdowns and soil and groundwater conditions per Chapter 4, Table 4-8) and earthquake loading are not addressed in the CRSO DEIS, nor are potential adverse effects to major structures (dams, locks, or other large structures) discussed.

The Panel believes that the CRSO DEIS should include explicit discussion, including recognition and consideration, of potential earthquake effects. Adequate discussion could be limited to expert geotechnical engineering and geologic interpretation with reference to regional seismicity and historic earthquake effects. However, a seismic risk analysis would help in quantifying uncertainty.

### Significance – Medium/Low

A discussion of potential adverse impacts due to earthquake activity would support the overall decision-making process.

### Recommendations for Resolution

1. Discuss the regional seismicity and the potential for future earthquakes to adversely affect shoreline erosion (and consequential effects), CRS structures, and the CRSO.
2. Discuss how potential future earthquakes could affect the natural, social, and economic environment under the alternatives, including the Preferred Alternative.
3. Consider conducting a formal seismic risk analysis.

### PDT Final Evaluator Response (FPC #18)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: Earthquake effects were not considered in evaluating any of the alternatives. The measures considered do not result in an increase in water levels that would saturate potentially liquefiable soils or increase soil pressure on the shoreline slopes, which would result in an increase in expected slope instability during an earthquake event. While this could be discussed, there is no expected change in consequences from seismic events for any of the alternatives.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

| PDT Final Evaluator Response (FPC #18) | | | | |
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| Explanation: Regional seismicity was not part of the scope of this study. Each of the Columbia River System projects in this study has a current seismic analysis as a part of their respective Dam Safety program. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: There is no expected change in consequences from seismic events for any of the alternatives. | | | | |
| **Recommendation 3:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: None of the alternatives negatively affect or change the risk from a seismic event and the information was not included in this analysis. | | | | |

| Panel Final BackCheck Response (FPC #18) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel accepts the PDT's explanations and suggests that those explanation be included in the final EIS to demonstrate that potential earthquake effects and concerns were recognized and generally considered (as stated above) and judged to not significantly affect the alternatives. | | | |

## Final Panel Comment 19

**It is unclear how risk and uncertainty have been integrated into the complex adaptive system managed under the CRSO.**

### Basis for Comment

The CRSO represents a complex adaptive management system that presents great challenges to usefully conceptualizing, communicating, and integrating risk and uncertainty to inform decision making. While risk and uncertainty associated with economic and power generation metrics seem to be well discussed, the Panel did not see a clear discussion of how the aggregate or overall risk and uncertainty inherent in the CRSO was characterized and considered or evaluated. The Panel did not see an explicit basis for (or explanation and summary of) an overall integration of risk and uncertainty for each alternative, including the Preferred Alternative.

### Significance – Medium/Low

The aggregate risk and uncertainty associated with CRSO is important to understanding the CRSO and differences between alternatives, including the Preferred Alternative.

### Recommendations for Resolution

1. Discuss the overall or aggregate risk and uncertainty associated with the CRSO, including the alternatives, differences between alternatives, and the Preferred Alternative.

2. Provide a formal basis for aggregating risk and uncertainty in the evaluation of the alternatives.

## PDT Final Evaluator Response (FPC #19)

| | Concur | X | Non-Concur |
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Explanation: Most of our understanding of potential changes to resources of implementing different operational measures is well understood. MO1, MO2, and MO4 operate within ranges we have historically operated within, and was used to interpret modeling results to describe the cumulative impacts. The exception is in the fish response, and in particular, response of anadromous migrating fish to spill levels, TDG, and the hypotheses of latent mortality. Structural uncertainty relates to breaching the earthen embankments of the federal dams and the short and long term impacts to natural resources as well as to regional economies and social welfare. The team used a previous reservoir drawdown pilot study on the lower Snake River and previous dam breaching activities for empirical data to identify potential short term effects along with supplemental modeling. We used the best available, current models to understand changes to hydrology, water quality, navigation and transportation, recreation, air quality, power production and fish responses. Even so, each model can introduce an element of uncertainty. There are also conditions outside of the federal actions, such as climate change, changes to power production from carbon, gas, wind, and future demands and how the region will meet those demands, changes in development, etc, which the team tried to anticipate and modeled in the analysis.

Throughout the resources discussions in the EIS, these uncertainties were discussed. We have also

| PDT Final Evaluator Response (FPC #19) |
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| added a discussion to the EIS in the fish methodology section to discuss the uncertainty in the modeling. For the Preferred Alternative, we will implement an adaptive management plan to adjust operations should it be needed after monitoring fish responses and address the uncertainty in the models. This plan is in Appendix R.<br><br>For the aggregate risk and uncertainty, the MO3 alternative is the only alternative with significant uncertainty and is highest risk. The EIS describes short term, major adverse impacts to the natural environment as a result of significantly adverse water quality and sedimentation mobilization. For long term benefits to be achieved, fish would have to overcome a 2 to 7 year of adverse conditions, and other entities outside the co-leads would have to take actions to remove contaminated sediments and ground water contaminated areas for fish, wildlife and human health. For regional economy to thrive, the assumption is that different transportation routes will be expanded and permitted to meet demand; irrigators and local municipalities are assumed to extend water intake pipes and wells. State and local governments would shore up roads and maintenance for increased traffic. Boat ramps and docks would have to be constructed by local entities to access water for both recreation and tourism. Environmental conditions would depend on changes in city development, climate change, and ocean conditions. Power reliability is uncertain. Economic analysis projects greatest job loss, while at the same time could have the biggest impact to tourism for sport fishing and bring greater numbers of culturally significant salmon to the Snake River. This alternative, however, has the greatest potential for fish benefits specifically for Snake River anadromous species and resident fish, which makes it an attractive alternative. These themes of risk are discussed throughout the resource analysis, environmental justice section, and in mitigation discussions, where the agencies are clear to indicate that implementing MO3 would require a significant response of the region to take additional actions if adverse effects are to be minimized. It is because of this reliance on actions and conditions outside the co-lead agencies control and the potential biological and social impacts that this alternative has the greatest uncertainty and risk.<br><br>The preferred alternative will be implemented using a robust monitoring plan to help narrow the uncertainty between the two fish response models and to determine how effective increased spill can be towards increasing salmon and steelhead returns to the Columbia Basin. The framework for the adaptive management process is detailed in Appendix R, Part 2 Process for Adaptive Implementation of the Flexible Spill Operational Component of the Columbia River System Operations EIS. It is the intention of the co-lead agencies to engage regional state, tribal, and federal biologists in the development of an appropriate adaptive management process utilizing their respective salmonid management expertise. The goal of that adaptive management process would be to consider additional opportunities to further the effectiveness of the operation while maintaining the goals of the flexible spill operation: additional improvements for salmon and steelhead, maintain opportunities to operate the CRS for hydropower generation in a flexible manner that provides value to the Northwest, is implementable by the dam operators, and provides opportunity to reduce uncertainty and improve the learning opportunities around how operations of the CRS can influence the magnitude of latent mortality effects. The co-lead agencies have not made any determinations on what the preferred approach would be for a regionally developed study plan, and intend to develop that study jointly with regional experts. Unforeseen outcomes or unintended consequences will be monitored and adjusted using current in-season management teams such as the Technical Management Team. |

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

| PDT Final Evaluator Response (FPC #19) | | | | |
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| Explanation: See explanation above. | | | | |
| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |
| Explanation: Chapter 7 has a discussion of the choice between alternatives, how they meet the purpose and needs, and overall objectives. While we concur the risk and uncertainty is not compared in the document, it is discussed throughout the presentation of resources effects and mitigation. Additionally the plan for managing the greatest risk, benefits for fish, is described in the preferred alternative and detailed in Appendix R. | | | | |

| Panel Final BackCheck Response (FPC #19) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel accepts and appreciates the PDT's clarifying and summarizing explanations, and suggests that the content of the (clarifying and summarizing) discussion be added to the final EIS. | | | |

## Final Panel Comment 20

**It is unlikely that the relatively small-scale habitat restorations proposed will restore historic levels of the fish stocks on the Columbia River tributaries due to large watershed impacts from various human activities prior to and since dam construction.**

### Basis for Comment

Remedial actions supported by the CRSO would provide benefits to salmonid habitat, but such actions would not reverse the legacy effects of human modification of the Columbia River watershed. These effects began with great over-harvest of the salmonid resources in the 1800s. In fact, changes to the salmonid populations occurred in the 1800s prior to any substantial alteration of the Columbia River Basin by dams and other human impacts to the Columbia River Basin. Prior to 1890, fish stocks in a number of Columbia River tributaries had been depleted by various human actions prior to dam construction:

- Intense commercial, recreational, and subsistence fishing and mixed stock fishing.
- Habitat degradation caused by farming, logging, ranching, and urban growth.
- Water withdrawal for agricultural, municipal, and commercial uses.
- Tributary channel alteration, diking, and riparian corridor modifications.

The following are several examples of documented early historic large-scale changes to the salmonid populations.

> "A remarkable deficiency in the yield of salmon in the Clackamas River in 1876 aroused the persons employed in the canning trade on the river to use all practicable measures of relief" (Baird, 1879).
>
> "While salmon used to ascend the Yakima and its tributaries in large numbers, they have fallen off of late years." (Gilbert & Evermann, 1895).
>
> "It is now very doubtful whether a hatchery located at any point on this stream could depend for spawn on the fish which ascend the stream itself" (Gilbert & Evermann, 1895).
>
> "…salmon were abundant in the Columbia at Kettle Falls as late as 1878. Since then there has been a great decrease. They have been scarce since about 1882; since 1890 there have been scarcely any at Kettle Falls." (Gilbert & Evermann, 1895).

The small-scale habitat restoration actions now available to the CRSO are not adequate to deal with the large-scale impacts of early Columbia River watershed degradation.

### Significance – Medium/Low

The suggested additions will help reviewers understand the limited ability of the river managers to reverse the historic alterations to the salmon populations and their habitat by basic and widespread effects of the human population in the Columbia River Basin and the historic over harvest.

## Final Panel Comment 20

### Recommendation for Resolution

1. Discuss pre-1930 changes to Columbia River salmonid populations to provide understanding that the CRSO actions have limited capacity to restore historic conditions.

**Literature Cited**

Baird, S. F. (1879). Report of the Commissioner of fish and fisheries. Part B-The propagation of food-fishes in the waters of the United States. United States Commission of Fish and Fisheries. p. 31-32.

Gilbert, C. H., and B. W. Evermann (1895). A report upon investigations in the Columbia River basin, with descriptions of four new species of fishes. Pages 169-207 in: Bulletin of the United States Fish Commission XIV, for 1894.

### PDT Final Evaluator Response (FPC #20)

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| X | **Concur** | | **Non-Concur** |

Explanation: The purpose of the CRS EIS is to update operation and configuration of the 14 dams operated as a system, while meeting the fish and wildlife authorized purposes of the dams as well as relevant law, most notably, the Endangered Species Act (ESA). Recovery of salmon and steelhead population is not the purpose, nor a requirement of the EIS. Under the section 7 of the ESA, the operation and maintenance of the CRS may not jeopardize the existence of any species listed under the ESA, or destroy or adversely modify designated critical habitat of any listed species. Recovery is a shared responsibility, led by NOAA Fisheries to address the myriad factors affecting the listed species.

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| **Recommendation 1:** | X | **Adopt** | | **Not Adopt** |

Explanation: Chapter 1 of the EIS will be updated to mention the broad and significant declines of salmon the occurred by 1895 due to overharvest and extensive habitat modifications throughout the Columbia River Basin as noted by Gilbert and Evermann, 1895.

### Panel Final BackCheck Response (FPC #20)

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| X | **Concur** | | **Non-Concur** |

## Final Panel Comment 21

**Several definitions, terms, and comparisons used in the CRSO DEIS in regard to TDG supersaturation are incorrect and misleading.**

### Basis for Comment

The definition of TDG supersaturation provided in the Executive Summary (text box, page 14; Chapter 1, page 14) is not correct. TDG supersaturation in not an "amount"; it is the level of dissolved air that the water would hold relative to equilibrium at the water body's surface pressure under the recorded temperature and barometric pressure conditions. A range of amounts of dissolved air can produce the same level of TDG supersaturation under various temperature and atmospheric pressure conditions.

Further, the correct term for the biological malady produced by TDG supersaturation is gas bubble *disease*, not gas bubble *trauma*. Both of these terms have been used in recent literature dealing with TDG supersaturation, but use of the term trauma is incorrect.

### Significance – Medium/Low

The suggested changes will correct errors that perpetuate misunderstandings regarding TDG supersaturation.

### Recommendation for Resolution

1. Correct these definitions in the CRSO DEIS.

## PDT Final Evaluator Response (FPC #21)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: The co-lead agencies agree that the TDG definition the commenter provides is correct and more precise. However, NEPA documents are to written in plain language to be understood by the general public. We believe, the description is sufficiently accurate for the purposes of the EIS.

The term gas bubble trauma will be retained as both gas bubble disease and gas bubble trauma are commonly used in the literature, the condition fits within the definitions of both disease and trauma, a change will not improve clarity of the document, nor would change effect decisions.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: See Explanation above.

## Panel Final BackCheck Response (FPC #21)

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| | **Concur** | **X** | **Non-Concur** |

| Panel Final BackCheck Response (FPC #21) |
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| Explanation: Explanation not valid. The term “trauma” is no more likely to be understood by members of the general public than the word “disease”. Over a period of approximately 50 years we have found that non-technical people have difficulty understanding the role of hydrostatic pressure and depth in total dissolved gas supersaturation and gas bubble disease. However, we have not encountered any difficulty in their understanding the technical terminology that would avoid its use in the EIS. |

## Final Panel Comment 22

**Chapter 2 of the CRSO DEIS does not discuss increased access by white sturgeon to upstream habitat due to removal of the LSR dams.**

### Basis for Comment

Chapter 2, Alternatives, of the CRSO DEIS does not mention white sturgeon for the LSR dam removal alternative. The analysis of the effects of dam removal on white sturgeon, found later in the CRSO DEIS, should be summarized here and in the MO3 summary. Dam breaching would restore connections to the functionally isolated reservoir reaches of the LSR and increase access to upstream habitat, an important benefit likely of interest to many readers of the MO3 summary who may not read the entire CRSO DEIS.

### Significance – Low

Although the suggested addition to Chapter 2 and the MO3 summary will not alter the alternatives analysis, it may avoid unnecessary controversy among those who only read that far.

### Recommendation for Resolution

1. Summarize the analysis of the effects of dam removal on white sturgeon found in Chapter 2 of the CRSO DEIS.

## PDT Final Evaluator Response (FPC #22)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: None of the resources analyzed are described in Chapter 2 - Alternatives. The alternatives only described the measures that are included in each alternative. There is no discussion of effects to any of the resources. This information is included in Chapter 3 – Affected Environment and Environmental Consequences.

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| **Recommendation 1:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: To be consistent with the format of the EIS, this information is not discussed in Chapter 2, but is included in Chapter 3. The EIS includes the necessary analysis to evaluate and compare each of the alternatives. It meets legal and policy requirements for an EIS.

## Panel Final BackCheck Response (FPC #22)

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| **X** | **Concur** | | **Non-Concur** |

Explanation: With the additional information provided by the PDT during the Comment Response Teleconference, the Panel understands the USACE response and Concurs.

## Final Panel Comment 23

**Discussions of some topics seem fragmented and distributed throughout the CRSO DEIS in a way that makes it difficult to capture and appreciate details and reach full understanding of the impacts.**

### Basis for Comment

The CRSO DEIS presents an enormous volume and complexity of information to digest and understand. Comprehension was difficult for some topics (e.g., H&H, environmental and cultural resources) because discussions seemed out of balance or inconsistent between the main text and supporting appendices. For example, the Panel noticed less detail or different emphasis in the appendices than in the main text, or inconsistent discussions on the same topic in different sections of the main text. The appendices did not provide enough supporting information to assist in determining project impacts to resources identified in the various alternatives. The incompleteness of the Table of Contents added to the sense of fragmented discussions because lower-level headings were not included (or were invisible in the Adobe PDF version available to the general public), making it difficult to pinpoint the locations of related discussions and consolidate understanding.

### Significance – Low

The fragmented discussions undermine the clarity and comprehensibility of the CRSO DEIS.

### Recommendations for Resolution

1. Expand the Table of Contents to include all enumerated headings in the main text and appendices.
2. Edit the main text and appendices to provide a consistent and balanced level of detail and discussion, and consolidate fragmented discussions where and as appropriate.

## PDT Final Evaluator Response (FPC #23)

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| | **Concur** | **X** | **Non-Concur** |

Explanation: We agree that the overall length of the document is long and difficult to review due to the complex nature of the subject matter and broad geographic scope of the EIS. However, the document contains the necessary information to fully evaluate each alternative while meeting all policy and legal requirements.

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| **Recommendation 1:** | **X** | **Adopt** | | **Not Adopt** |

Explanation: The Table of Contents has been expanded to include subheadings and appendices to aid in finding detailed conversations pertinent to the conclusions of the report.

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| **Recommendation 2:** | | **Adopt** | **X** | **Not Adopt** |

Explanation: The discussions in the EIS were scaled to the appropriate level based on the significance of changes to the resources, the resource significance, or to discuss the drivers of changes to other resources, such as in the case of hydrology and hydraulics, which is the basis of understanding both

| PDT Final Evaluator Response (FPC #23) |
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| operations and changes to resources. Additionally, the technical details and reports were provided in the appendices, and pertinent information brought forward into the body of the EIS to complete the effects determination. The EIS is scaled to information pertinent for the public to understand effects analysis and basis of the decision, and not be duplicative of the back ground information. For those readers that are interested on the more technical analysis of running models and data sheets, the information is available in the appendices. The panel did not specifically identify fragmented discussions to resolve; however the EIS has been updated based on public comment and cooperating agency feedback which may have resolved this stated concern. |

| Panel Final BackCheck Response (FPC #23) | | | |
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| **X** | **Concur** | | **Non-Concur** |
| Explanation: The Panel is pleased to learn that the TOC will be expanded as recommended. The Panel is satisfied that the PDT understands its general concern with the readability and understandability of the DEIS and assumes that the updated, final EIS will have adequately resolved those shortcomings. | | | |