Final Independent External Peer Review Report Detroit Temperature Control and Downstream Passage Environmental Impact Statement, Linn and Marion Counties, Oregon

Prepared by
Battelle Memorial Institute

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

Contract No. W912HQ-15-D-0001
Task Order: W912HQ19F0084

September 10, 2019

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Executive Summary

Project Background and Purpose

The Detroit Dam is one of 13 multipurpose dams in the Willamette River Basin. Completed in 1953, the project was constructed primarily for flood control and hydroelectric power generation, but other major benefits include recreation and conservation uses involving releases of stored water. There are small communities located downstream on the North Santiam River, with the largest being Stayton (population 7,644, approximately 44 miles downstream of Detroit). The city of Salem (population 167,419, approximately 60 miles downstream of Detroit) is along the Willamette River, just after the North Santiam joins the Willamette River. The Detroit Dam is a concrete dam, which includes a spillway, regulating outlets, penstocks, and a detached powerhouse.

The Detroit Dam is a concrete gravity dam that is 1,457 feet long with a maximum height of 450 feet above the lowest portion of its foundation. The spillway is a concrete ogee-type spillway with six tainter gates located in the middle of the dam. There are four regulating outlets: two at elevation 1,340 feet and two at elevation 1,265 feet, located directly below the spillway. A fifth outlet (at elevation 1,340 feet at the south end of the spillway) was meant for hydraulic model testing but was never or seldom used. This outlet may be used to pass fish, as it is not required to pass river flow from a dam safety perspective.

Two penstocks are located on the north side of the Detroit Dam spillway, with entrances at elevation 1,403 feet. They are steel pipes that daylight on the downstream side of the dam and provide water to two 50-megawatt Francis turbines in the powerhouse.

The Detroit Dam was originally classified as a Dam Safety Action Classification (DSAC) 3 based on the Screening Portfolio Risk Assessment completed in 2008. The primary reason for the DSAC 3 classification was spillway gate failure due to trunnion friction, spillway scour, seismic sliding failure of monoliths, and stability failure due to increased uplift conditions.

In July 2008, the National Marine Fisheries Service (NMFS) released its Biological Opinion (BiOp) on the effects of continued operations and maintenance of the U.S. Army Corps of Engineers (USACE) Willamette Valley Project on species listed for protection under the Endangered Species Act (ESA). Specific to Detroit Dam, the BiOp lists two Reasonable and Prudent Alternative (RPA) measures:

- RPA 5.2 requires investigation and implementation of improvements to downstream temperatures and total dissolved gas (TDG) exceedances in the North Santiam River for ESA-listed fish species. Interim temperature control operations have been attempted annually since 2008, utilizing existing project facilities and operating equipment. Operational temperature control only functions when the reservoir elevation is above the spillway crest, which limits its success. Furthermore, all water that

passes over the spillway results in forgone power. Both these items indicate the need for a structural solution.

- RPA 4.12.3 requires investigation and implementation of safely passing juvenile fish downstream of Detroit Dam.

The process of addressing the RPA measures started in 2010 with the development of an Engineering Documentation Report (EDR). The report identified an array of structural and operational alternatives to provide temperature control and downstream passage at Detroit Dam. In addition to developing and evaluating alternatives for these two actions, this effort also provided data to the Willamette Configuration/Operation (COP) team to enable the data to be evaluated throughout the entire Willamette Basin, not just Detroit Dam.

The EDR was completed in 2016. From these efforts, it was recommended that the Detroit Project Delivery Team (PDT) move forward with a selective withdrawal structure (SWS) for temperature control and two alternatives for fish collection: a weir box and a floating screen structure (FSS). Since juvenile fish are surface-oriented when migrating, the plan for the weir box was to use the surface flow into the SWS to allow a low-flow collector to trap the fish that enter the wet well of the SWS. As the weir box design progressed to a 60% design documentation report (DDR) level, the PDT found it very difficult, if not impossible, to achieve biologically effective hydraulic conditions. Therefore, a decision was made to stop work on the weir box DDR. The FSS is the recommended project for downstream fish passage. There are currently two DDRs in the final stages of review for the purpose of developing design criteria and details for the SWS and the FSS. Plans and specifications for the SWS are in the preliminary stage.

The main features of the SWS will be a tower-type structure, with weir gates that allow for either surface water or deep water to be taken from the reservoir into a wet well and pass through either the turbine units or a penstock bifurcation to provide the optimal water temperatures downstream. The FSS is a large floating structure that will screen all fish from entering the wet well of the SWS. The system will consist of all the gravity flow through the SWS and ultimately into the turbines or penstock bifurcation. Once collected in the FSS, the juvenile fish will be passed downstream by trucks or a bypass conduit.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Detroit Temperature Control and Downstream Passage (DSP) Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per U.S. Army Corps of Engineers (USACE) guidance (USACE, 2018). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2018) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: hydrology and hydraulic (H&H) engineering, economics, environmental law compliance, fisheries biology, and water quality disciplines. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the five-person Panel from this list.

The Panel received electronic versions of the decision documents (729 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2018) and OMB (2004), USACE prepared the charge questions, which were included in the draft and final Work Plans.

The USACE PDT briefed the Panel and Battelle during a kick-off meeting held via teleconference at the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, 15 Final Panel Comments were identified and documented. Of these, seven were identified as having medium significance, three had medium/low significance, and five had low significance.

Battelle received public comments from USACE on the Detroit Dam DSP EIS (approximately 109 pages of comments) and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Detroit Dam DSP EIS review documents. After completing its review, the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments.

Results of the Independent External Peer Review

The panel members agreed on their “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2018) in the Detroit Dam DSP EIS review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel’s findings.

Based on the Panel’s review, the report is well-written, and the document presented the material in a comprehensive and logical approach. However, the Panel identified multiple elements of the project where additional analysis is needed or where project findings and objectives need to be more clearly documented or revised.

Environmental: The Panel found the environmental analyses to be well thought out, thorough, and properly interpreted. The presentation of information provided a logical overview of how the final alternative was selected.

Several of the Panel's concerns were focused on the scenarios used for the temperature modeling and future management under the recommended project. The Panel noted that the modeling did not take into account extreme conditions such as droughts and floods (alone and in combination with seasonal weather [temperature] extremes) and believes that if these extreme conditions occurred, the ability of the SWS to maintain downstream temperatures within targets may be exceeded. The Panel is also concerned about the use of maximum temperature targets from the Willamette Fish Operations Plan for comparison to monthly average temperature predictions for the modeling for two reasons: the relationship of these temperature values to other temperature targets may cause confusion, and the maximum temperature targets do not address short-term fluctuations. The Panel also expressed concern about the limited discussion of impacts to other water quality parameters of concern (e.g., TDG, dissolved oxygen [DO], pH).

The Panel's review of risk and uncertainty noted that the recommended project does not include adaptive management in case important components of the recommended project do not work as assumed and designed, nor is there a monitoring plan to assess performance. When coupled with the limited information on the effectiveness of fish attraction for upstream and downstream migration, which is critical to the success of the project, the Panel remains concerned about the overall effectiveness of the plan as it moves forward.

The Panel also is concerned that USACE has not analyzed the potential for impacts to other aquatic species both upstream and downstream from the dam during and after construction, including 1) the identification of all species that may be affected; 2) an evaluation of how the recommended project would affect these other species; and 3) an assessment of how these species could affect the responses of the focal species.

Economics: The need for and intent of the decision to construct a temperature control and fish passage is clear and complete, and the methodologies and analyses seem appropriate to the Panel. The Panel noted two issues that need to be clarified regarding the economics analysis. First, based on the Panel's assessment of Executive Order (EO) 13783, the 3% discount applied to the computed Social Cost of Carbon is not allowed in this instance; therefore, the quoted Social Cost of Carbon amount is incorrect. Second, the DSP EIS does not explain how construction related to the proposed modifications will be funded.

Engineering: The Panel found the engineering assumptions used in the development of the designs, modeling, and evaluations to be both adequate and appropriate. The H&H modeling methodologies were also appropriate for this aspect of the analyses, and the modeling and execution were well done. The models used for the analysis and design are adaptable for further analysis, if deemed necessary. During the review, the Panel did not develop any comments specifically related to engineering concerns.

Table ES-1. Overview of 15 Final Panel Comments Identified by the Detroit Dam DSP EIS IEPR Panel

No.	Final Panel Comment
Significance – Medium	
1	The range of river conditions for assessing the efficacy of temperature management seems limited.
2	The use of maximum and minimum temperatures from the Willamette Fish Operations Plan as monthly temperature targets may cause confusion and inconsistencies with other temperature criteria.
3	Treatment of risk and uncertainty does not include a backup plan, discussion of interim measures during the construction period, an adaptive management (or similar) approach, and clearly defined monitoring plans for assessing performance.
4	The DSP EIS provides limited information on the effectiveness of fish attraction for upstream migration, and especially for downstream migration of juveniles, which are critical to the success of the project.
5	The DSP EIS does not provide complete information on the potential impacts of project operations on other aquatic species besides focal fish species in the reservoir and in the river above and below the dam.
6	The long-term and cumulative impacts of the project on the complete set of water quality parameters are not adequately addressed in the DSP EIS.
7	The analyses documenting the performance of the project for the likely future conditions under climate change are limited in scope.
Significance – Medium/Low	
8	The DSP EIS does not assess the biogeochemical impacts to TDG, DO, algal biomass, or pH.
9	The project impact assessment is not complete because several construction-related aspects of the project are not thoroughly evaluated in the document.
10	The DSP EIS does not address EO 13751, Safeguarding the Nation from the Impacts of Invasive Species (2016), with regard to invasive aquatic species.

Table ES-1. Overview of 15 Final Panel Comments Identified by the Detroit Dam DSP EIS IEPR Panel

No.	Final Panel Comment
Significance – Low	
11	Potential impacts to Detroit Lake from construction activities are not fully addressed in the DSP EIS.
12	The DSP EIS does not present information on the validation and calibration of the adaptive hydraulics (AdH) model and associated movable bed sediment transport module.
13	It is unclear how Alternatives CA2 and CA3 have equivalent impacts in temperature when CA2 corresponds to a 2-year drawdown and CA3 corresponds to a 1-year drawdown.
14	The application of a 3% discount to the computed Social Cost of Carbon does not follow EO 13783 dated March 28, 2017.
15	The DSP EIS states that some proposed modifications to the dam are already authorized but does not explain how construction related to those modifications would be funded.

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Appendix B. Identification and Selection of IEPR Panel Members for the Detroit Dam DSP EIS Project

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LIST OF ACRONYMS

2-D / 3-D	Two-Dimensional / Three-Dimensional
AdH	Adaptive Hydraulics
ATR	Agency Technical Review
BiOp	Biological Opinion
CFD	Computational Fluid Dynamics
COI	Conflict of Interest
COP	Configuration/Operation Plan
CWA	Clean Water Act
DrChecks	Design Review and Checking System
DDR	Design Documentation Report
DO	Dissolved Oxygen
DSAC	Dam Safety Action Classification
DSP	Downstream Passage
EA	Environmental Assessment
EC	Engineer Circular
EDR	Engineering Documentation Report
EIS	Environmental Impact Statement
EO	Executive Order
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
ESA	Endangered Species Act
FBW	Fish Benefits Workbook
FERC	Federal Energy Regulatory Commission
FSS	Floating Screen Structure
GSSHA	Gridded Surface-Subsurface Hydrologic Analysis
H&H	Hydrology and Hydraulic
HEC	Hydrologic Engineering Center
HEC-DSSVue	HEC-Data Storage System Visual Utilities
HEC-FDA	HEC-Flood Damage Reduction Analysis
HEC-FIA	HEC-Flood Impact Analysis

HEC-GeoHMS	HEC-Geospatial Hydrologic Modeling System
HEC-GeoRAS	HEC-Geospatial River Analysis System
HEC-HMS	HEC-Hydrologic Modeling System
HEC-RAS	HEC-River Analysis System
HEC-SSP	HEC-Statistical Software Package
HQ-USACE	USACE-Headquarters
HSI	Habitat Suitability Index
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
NED	National Economic Development
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
ODFW	Oregon Department of Fish and Wildlife
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
OMRR&R	Operations, Maintenance, Repair, Rehabilitation, and Replacement
PDT	Project Delivery Team
PNNL	Pacific Northwest National Laboratory
RPA	Reasonable and Prudent Alternative
SAM	Standard Assessment Methodology
SLAM	Species Lifecycle Analysis Module
SWAT	Soil and Water Assessment Tool
SWS	Selective Withdrawal Structure
TDG	Total Dissolved Gas
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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1. INTRODUCTION

The Detroit Dam is one of 13 multipurpose dams in the Willamette River Basin. Completed in 1953, the project was constructed primarily for flood control and hydroelectric power generation, but other major benefits include recreation and conservation uses involving releases of stored water. There are small communities located downstream on the North Santiam River, with the largest being Stayton (population 7,644, approximately 44 miles downstream of Detroit). The city of Salem (population 167,419, approximately 60 miles downstream of Detroit) is along the Willamette River, just after the North Santiam joins the Willamette River. The Detroit Dam is a concrete dam, which includes a spillway, regulating outlets, penstocks, and a detached powerhouse.

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RPA 4.12.3 requires investigation and implementation of safely passing juvenile fish downstream of Detroit Dam.

The process of addressing the RPA measures started in 2010 with the development of an Engineering Documentation Report (EDR). The report identified an array of structural and operational alternatives to provide temperature control and downstream passage at Detroit Dam. In addition to developing and evaluating alternatives for these two actions, this effort also provided data to the Willamette Configuration/Operation (COP) team to enable the data to be evaluated throughout the entire Willamette Basin, not just Detroit Dam.

The EDR was completed in 2016. From these efforts, it was recommended that the Detroit Project Delivery Team (PDT) move forward with a selective withdrawal structure (SWS) for temperature control and two alternatives for fish collection: a weir box and a floating screen structure (FSS). Since juvenile fish are surface-oriented when migrating, the plan for the weir box was to use the surface flow into the SWS to allow a low-flow collector to trap the fish that enter the wet well of the SWS. As the weir box design progressed to a 60% design documentation report (DDR) level, the PDT found it very difficult, if not impossible, to achieve biologically effective hydraulic conditions. Therefore, a decision was made to stop work on the weir box DDR. The FSS is the recommended project for downstream fish passage. There are currently two DDRs in the final stages of review for the purpose of developing design criteria and details for the SWS and the FSS. Plans and specifications for the SWS are in the preliminary stage.

The main features of the SWS will be a tower-type structure, with weir gates that allow for either surface water or deep water to be taken from the reservoir into a wet well and pass through either the turbine units or a penstock bifurcation to provide the optimal water temperatures downstream. The FSS is a large floating structure that will screen all fish from entering the wet well of the SWS. The system will consist of all the gravity flow through the SWS and ultimately into the turbines or penstock bifurcation. Once collected in the FSS, the juvenile fish will be passed downstream by trucks or a bypass conduit.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Detroit Temperature Control and Downstream Passage (DSP) Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS IEPR) in accordance with procedures described in the Department of the Army, USACE Engineer Circular (EC) *Review Policy for Civil Works* (EC 1165-2-217) (USACE, 2018) and the Office of Management and Budget (OMB) *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, and environmental analyses contained in the Detroit Dam DSP EIS IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Detroit Dam DSP EIS IEPR.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review, as described in USACE (2018).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, and environmental analyses of the project study. In particular, the IEPR

addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Detroit Dam DSP EIS was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-217). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: hydraulic and hydrology (H&H) engineering, economics, environmental law compliance, fisheries biology, and water quality. The Panel reviewed the Detroit Dam DSP EIS documents and produced 15 Final Panel Comments in response to 18 charge questions provided by USACE for the review. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-217), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2018) in the Detroit Dam DSP EIS IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the report is well-written, and the document presented the material in a comprehensive and logical approach. However, the Panel identified multiple elements of the project where additional analysis is needed or where project findings and objectives need to be more clearly documented or revised.

Environmental: The Panel found the environmental analyses to be well thought out, thorough, and properly interpreted. The presentation of information provided a logical overview of how the final alternative was selected.

Several of the Panel's concerns were focused on the scenarios used for the temperature modeling and future management under the recommended project. The Panel noted that the modeling did not take into account extreme conditions such as droughts and floods (alone and in combination with seasonal weather [temperature] extremes) and believes that if these extreme conditions occurred, the ability of the SWS to maintain downstream temperatures within targets may be exceeded. The Panel is also concerned about the use of maximum temperature targets from the Willamette Fish Operations Plan for comparison to monthly average temperature predictions for the modeling for two reasons: the relationship of these temperature values to other temperature targets may cause confusion, and the maximum temperature targets do not address short-term fluctuations. The Panel also expressed concern about the limited discussion of impacts to other water quality parameters of concern (e.g., TDG, dissolved oxygen [DO], pH).

The Panel's review of risk and uncertainty noted that the recommended project does not include adaptive management in case important components of the recommended project do not work as assumed and designed, nor is there a monitoring plan to assess performance. When coupled with the limited information on the effectiveness of fish attraction for upstream and downstream migration, which is critical to the success of the project, the Panel remains concerned about the overall effectiveness of the plan as it moves forward.

The Panel also is concerned that USACE has not analyzed the potential for impacts to other aquatic species both upstream and downstream from the dam during and after construction, including 1) the identification of all species that may be affected; 2) an evaluation of how the recommended project would affect these other species; and 3) an assessment of how these species could affect the responses of the focal species.

Economics: The need for and intent of the decision to construct a temperature control and fish passage is clear and complete, and the methodologies and analyses seem appropriate to the Panel. The Panel noted two issues that need to be clarified regarding the economics analysis. First, based on the Panel's assessment of Executive Order (EO) 13783, the 3% discount applied to the computed Social Cost of Carbon is not allowed in this instance; therefore, the quoted Social Cost of Carbon amount is incorrect. Second, the DSP EIS does not explain how construction related to the proposed modifications will be funded.

Engineering: The Panel found the engineering assumptions used in the development of the designs, modeling, and evaluations to be both adequate and appropriate. The H&H modeling methodologies were also appropriate for this aspect of the analyses, and the modeling and execution were well done. The models used for the analysis and design are adaptable for further analysis, if deemed necessary. During the review, the Panel did not develop any comments specifically related to engineering concerns.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

The range of river conditions for assessing the efficacy of temperature management seems limited.

Basis for Comment

Temperature management downstream of the dam is a major objective of the project, and the performance of the SWS (achieving temperature targets) should be robust to variation in environmental and river conditions. Extreme conditions, such as droughts and floods, alone and in combination with seasonal weather (temperature) extremes, may exceed the ability of the SWS to maintain downstream temperatures within targets. The use of warm and low-flow (dry) year-types in simulation analyses of downstream temperatures provides useful information on the performance of the SWS but only under some conditions likely to be encountered.

The results presented in the DSP EIS Appendix E, Water Temperature Simulations, and in the U.S. Geological Survey (USGS) report cited in the appendix show that temperature targets can be achieved for the specific year-types simulated. Figure 5.9 of the USGS report illustrates that the temperature management would be effective but does not provide information on the degree to which the SWS would 1) meet its operational capabilities, and 2) effectively manage temperature under other environmental conditions such as droughts and other situations that result in warmer river conditions.

Knowing the capacity of the SWS to perform successfully under more extreme river conditions (e.g., droughts, floods), and combinations of conditions (e.g., two years of drought, drought with warm summer and fall), would show the robustness of the structure for downstream temperature management. Further, it is anticipated that there will be warming and an increase in the frequency and/or severity of extreme events into the future under climate change, making determination of the capacity of the SWS to manage downstream temperatures and to confirm the robustness of the SWS even more important.

The consequences of achieving (or not achieving) the targets on the salmonids were well analyzed using the Fish Benefits Workbook (FBW) and Species Lifecycle Analysis Module (SLAM) models, but temperature effects were only partially included in those analyses. As a result, the full effects of temperature deviations on salmonids from target values are not assessed from the modeling results presented. The two salmonid models were very much focused on the effects of flow rather than temperature; therefore, there is uncertainty about the effectiveness of the SWS operations when temperatures hover or exceed targets.

Significance – Medium

Without clear analyses demonstrating that the SWS will, as designed, maintain downstream temperatures within target values under extreme conditions, the effectiveness of the SWS is uncertain.

Recommendations for Resolution

1. Revise the discussion of existing temperature analyses to clarify the seemingly different river conditions (year-types) simulated in Appendix E versus what is reported in the USGS report

Final Panel Comment 1
to provide a clear foundation for assessing what, if any, additional river conditions should be analyzed. 2. Consider simulating the effectiveness of the SWS under additional scenarios that focus on extreme conditions and combinations of conditions.

Final Panel Comment 2

The use of maximum and minimum temperatures from the Willamette Fish Operations Plan as monthly temperature targets may cause confusion and inconsistencies with other temperature criteria.

Basis for Comment

Multiple sets of temperature targets are presented in the DSP EIS (Table 13, page 3-127; Table 21, page 3-178; Table 23, page 3-188), and the final targets are monthly values that can mask finer-scale variation (daily, maximum, minimum) that can have important effects on salmonids.

The success of downstream temperature management was determined by comparing simulated temperatures to monthly average values. The monthly temperature targets used in analyses of temperature management were adapted from the Willamette Fish Operations Plan, Table NS-4, for the North Santiam Basin (page 3-187). Table NS-4 values are provided as a range of monthly maximum and minimum values. However, model analyses summarized in the DSP EIS (Tables 23, 24, 25, and 26) and illustrated in the Willamette Biological Opinion EDR (e.g., Figure 5-9) (provided by USACE as supplemental documentation) appear to be based on monthly averaged values.

The similarities and differences among the temperature targets (used in the analyses and proposed by others) and the approach used to implement the selected set of target values in the modeling to evaluate the SWS are confusing. It is difficult, with the information provided, to assess the consistency of the selected temperature targets with other criteria, such as the other temperature targets based on salmonids and Total Maximum Daily Load (TMDL) analysis that is based on 7-day averages of daily maximum values. Knowing the rationale and sensitivity of SWS operations on downstream temperature management to alternative temperature targets, and knowing how the simulated temperature would vary on finer time scales than monthly, would strengthen the evaluation of the performance of temperature management provided by the SWS.

During review of the public comments, the Panel noted that Kevin Malone requested analyses of the effects of temperature on the salmonids; asked for clarification on how the temperature targets were selected and how the results about project performance for downstream temperature management were interpreted; and suggested that the temperature effects (e.g., extremes) be viewed on a life-stage-specific basis.

Significance – Medium

Without explicit treatment of the effects of sub-monthly (e.g., daily) variation, combined with limited clarity on how the monthly temperature targets that were selected compare to other targets and were implemented in the modeling, confidence that the SWS will benefit the salmonids as predicted cannot be ensured.

Recommendations for Resolution

1. Confirm that the daily variation in simulated temperatures under SWS operations is well represented by the use of the monthly target values. For example, demonstrate that the

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monthly targets were set so that daily extremes within months were within biological tolerances of the salmonids.

2. Synthesize and compare the various temperature targets that have been proposed, including the selected targets, to enable easy determination of their consistency and level of protection.
3. Expand the interpretation of the temperature modeling analyses to assess the performance of the SWS relative to other targets and fine-scale temporal variation.

Final Panel Comment 3

Treatment of risk and uncertainty does not include a backup plan, discussion of interim measures during the construction period, an adaptive management (or similar) approach, and clearly defined monitoring plans for assessing performance.

Basis for Comment

The proposed project is a major investment in infrastructure that is designed to operate for decades into the future. Clarification and additional information on how risk and uncertainty related to the performance of the SWS and the FSS will be detected and then solved would increase confidence in the long-term effectiveness of the project.

The proposed project is an “all eggs in one basket” solution to the Reasonable and Prudent Alternatives (RPAs) that has a multi-year building period. There is no discussion of interim measures that would be taken during the long period of construction (before project is fully operational) to ensure that the species are not further negatively affected in the interim. In addition, there are other management activities occurring in the watershed that could affect the performance of this proposed project. If certain key assumptions used in the design and modeling, which dictate the effectiveness of the project, are not met as fully as expected, the DSP EIS does not explain what will happen subsequently. The project is complicated, with many operational steps that all need to perform as assumed. The resiliency and overall performance of the project will depend on the most underperforming step and possibly the combined effects of multiple moderately underperforming steps. Some key aspects of the project that are uncertain include the following:

(1) Unknown cushion in SWS operations to maintain the desired downstream temperatures, especially under extreme years (e.g., drought) and climate change.

(2) The assumed highly efficient fish attraction related to fine-scale fish behavior around structures (Minto Adult Fish Collection Facility; FSS for Trap and Haul). The assumption seems to be heavily based on limited hydro-acoustic and telemetry studies (pages 3-11, 3-165). The sensitivity of the assumed high efficiency of attraction to the specifics of the field studies and the environmental and operational conditions they were done under is not discussed or documented.

(3) The estimated route-specific passage and survival rates of the migrating juveniles used in the FBW and SLAM modeling. The estimates were based on limited data, especially for steelhead.

(4) The assumed very high survival of fish in Trap and Haul, and the likely highly variable survival and fitness of the released fish (e.g., survival and fitness can depend on where and when they are released) upstream of the Detroit Dam and their subsequent migration. Naturally derived fish have not been in the habitat upstream of the dam for a long time.

Because these assumptions are critical to the effectiveness of the entire project, additional analyses, pilot studies to test alternatives, and back-up plans seem appropriate. There is a short discussion of measuring performance (e.g., page 2-73) and some discussion of monitoring scattered throughout the DSP EIS. However, there is little discussion about steps to be taken if a problem were detected that diminished project performance, and little description of how redundancies and flexibility are built into the operations of the project. There is little formal assessment of steps to be taken in case the

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engineering does not perform as designed because key assumptions used in the modeling and biological analyses were consistently not met.

During review of the public comments, the Panel noted comments from the general public (Wayne Shilts and Jim Quiring) and a few entities (Willamette Riverkeeper and Native Fish Society with WildEarth Guardians and Northwest Environmental Defense Center) related to this issue.

Significance – Medium

Without adequate analyses demonstrating that the project will perform as designed when key assumptions are not met, combined with very limited or no descriptions about monitoring and adaptive management plans, project resiliency and overall project performance are uncertain.

Recommendations for Resolution

1. Discuss adaptive management and monitoring to assess performance once operational. Adaptive management, when properly planned and implemented, would be a way to deal with some of these risks and uncertainties.
2. Explain the degree of flexibility and/or redundancy in key aspects of the project that would result in successful performance when key assumptions are not fully met as anticipated, to better determine project resiliency.
3. Describe any interim management measures that could be taken to ensure protection of the species prior to the proposed project becoming fully operational.
4. Document in the Cumulative Effects section how the proposed project will be brought on-line in coordination with the other ongoing and planned activities in the watershed.

Final Panel Comment 4

The DSP EIS provides limited information on the effectiveness of fish attraction for upstream migration, and especially for downstream migration of juveniles, which are critical to the success of the project.

Basis for Comment

The attraction and efficiency of the FSS for ensuring highly effective capture and transfer of juveniles and their successful downstream migration is a function of multiple components that all must perform as assumed in the DSP EIS. The flow patterns and water velocities in the reservoir leading to the FSS are a key component in the overall efficiency. These flow patterns are themselves a function of the quantity of incoming flows, the location and quantities of the flows exiting the reservoir, the stage of the reservoir, and other environmental conditions such as weather.

The evaluation of the FSS in the DSP EIS assumed very high efficiencies of attraction for both adults going upstream (for which there is current experience) and for juveniles migrating downstream (which is based on the new proposed FSS). It seems reasonable to assume that the target velocities for the key species and life stages have been determined in consultation with resource agencies. An added complexity is the possibility that the flow rates and reservoir stages that affect the attraction velocity may have seasonal patterns, as does the migration of key species.

While it is likely that other analyses about the flow patterns and effectiveness of the attraction have been performed (e.g., using the computational fluid dynamics [CFD] models; analysis of other similarly designed systems), such information is not documented in detail in the DSP EIS. There are brief comments and limited discussions regarding this aspect of the design performance in the DSP EIS, but the information provided is mostly qualitative in nature and limited in depth and scope. In addition, the proposed post-construction field studies that will be used to evaluate the performance are discussed in Section 2.7.1.2, but the discussion does not provide specific details regarding potential adaptive management strategies that would be undertaken to enhance the performance.

Significance – Medium

Metrics and information for confirming the assumed high efficiencies of attraction of the fish, especially of the FSS, are limited in the DSP EIS but are critical to evaluation of the performance of the proposed project.

Recommendations for Resolution

1. Provide additional figures and tabulated values from the CFD model results relative to the target values, specifically (but not limited to) the approach velocities.
2. Expand the discussion regarding the potential success of the FSS by performing additional analyses and reporting any existing results not presented in DSP EIS; these results can include, but should not be limited to, CFD model results and lessons learned in the design from other fish collection projects.
3. Expand the discussion regarding the potential for improved performance of the FSS based on knowledge gained from the post-construction monitoring.

Final Panel Comment 4

4. Provide a plan for measuring performance of the FSS (page 2-73), including attraction (as well as survival during Trap and Haul and after release).
5. Document the success of the current adult migration efforts for enhancing upstream migration and explain how performance into the future will be quantified.

Final Panel Comment 5

The DSP EIS does not provide complete information on the potential impacts of project operations on other aquatic species besides focal fish species in the reservoir and in the river above and below the dam.

Basis for Comment

Potential impacts of construction and operation of the proposed project on non-fish species and special-status (threatened and endangered) species (fish and non-fish) other than the focal species (spring-run chinook; winter steelhead) are not evaluated in the DSP EIS. The expected impacts on these other species from the change in water temperature and the potential increase in populations of salmonids following project implementation are not discussed. Also lacking is an adequate assessment of how the proposed project could affect several other key (non-special status) fish species in the system. These impacts would result from 1) the operation of the SWS affecting downstream temperature and reservoir habitat for these other species, 2) the introduction of the focal species upstream of the dam, and 3) the resulting higher abundances of the focal species.

Section 3.8.1.3, page 3-169, discusses the possible impacts of summer steelhead (hatchery releases) on winter steelhead and impacts of possible interactions of the focal species with other fish species in the system and in the reservoir (e.g., Section 3.8.1.4, Pacific lamprey; Section 3.8.2.5, Kokanee). However, there is little evaluation of possible impacts of the project (operations; increasing focal species) on these other fish species and, in turn, how those impacts might feedback and affect the focal species. The present analyses do not sufficiently describe these possible interspecific interactions; rather, the analysis of impacts is limited to 1) assuming no or minor impacts based on their life history and similarity to the focal species, 2) declaring that conducting flow operations and achieving temperature targets will have minor impacts, or 3) stating that management will deal with any impacts that emerge (e.g., hatchery release of summer steelhead).

The DSP EIS documents also do not fully convey whether the U.S. Fish and Wildlife Service (USFWS) and Oregon Department of Fish and Wildlife (ODFW) have fully agreed that impacts on amphibians, mussels, and turtles in the river and riverine wetlands would be negligible to minor in scale. The DSP EIS refers to a future Biological Assessment under a Section 7 consultation for analyses of project impacts only on the two focal fish species (DSP EIS, Section 3.9.3). However, in the DSP EIS, there is no discussion about impacts to special-status species other than these named fish species. For example, impacts are not assessed for state-listed aquatic species (mussels, turtles, amphibians) reported to be found in the river below the dam (DSP EIS, Section 3.8.3).

In other places, the DSP EIS provides conflicting information about the species under review. For instance, the section on Wildlife (DSP EIS, Section 3.7) with its table of Wildlife Special Status Species (DSP EIS, Table 16) includes some analysis of impacts to aquatic amphibians and reptiles, whereas the section on Fish and Aquatic Species (DSP EIS, Section 3.8) does not include any analysis of potential impacts on non-fish species even though six non-fish aquatic species are identified as being present. The subsection on Other Aquatic Species (DSP EIS, Section 3.8.3) is limited to one sentence that identifies two amphibians already discussed in DSP EIS Section 3.7; one species of fish already discussed in DSP EIS Section 3.8.2; and three species of freshwater mussels which were not evaluated further. Furthermore, the information on the status of Oregon chub, bull trout, and western

Final Panel Comment 5

brook lamprey is not consistent between Table 17 and discussion in Sections 3.8 and 3.9 of the DSP EIS. The section on Threatened and Endangered Species (DSP EIS, Section 3.9) refers back to Section 3.8 for analysis of potential impacts to bull trout and Oregon chub; however, impacts to those two particular species are not considered in Section 3.8 of the DSP EIS.

During review of the public comments, the Panel identified members of the general public (Kevin Malone, Jerry Shinkle, Paul Dumanovsky, and Dale Burilson) and some organizations (Willamette Riverkeeper and Oregon Wild) that had similar comments as those noted here.

Significance – Medium

An analysis of potential impacts that considers all project activities (during both construction and operations phases) that could impact other aquatic species will increase confidence in the identification and future operations of the recommended project.

Recommendations for Resolution

1. Provide more documentation (including citations) to ensure that the discussion on the aquatic community downstream of the dam potentially affected by the project, which is currently limited to six species, is sufficiently comprehensive (DSP EIS, Section 3.8.3, page 3-177).
2. Provide more documentation and discussion in Sections 3.8.2 and 3.8.3 to explain why non-game fish are not currently distributed downstream of the dam.
3. Expand the discussion of potential impacts to turtles (in Section 3.7.4.7) if water temperatures are decreased downstream under the recommended project.
4. Provide citations in Section 3.9 to support the statement that the Federally listed Oregon spotted frog (*Rana pretiosa*) no longer occurs in the project area. Provide documentation that consultation with USFWS has been conducted for this species and that USFWS concurs that further impact analysis is not required.
5. Provide documentation that USFWS consultation has been completed with regard to potential impacts to amphibians with future operation of the FSS (per Section 3.7.4.4).
6. Revisit the USFWS evaluation of the “Foothill yellow-legged frog” (e.g., https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=D02G). Update Table 16 with current status of the species. Provide information on the baseline status of this species in Section 3.9 that is consistent with Section 3.8.3, and discuss the potential impacts of operations on this species, especially with regard to decreased water temperature, and alterations to the rest of the aquatic community which may cause changes to predation rates and competition for resources.
7. Analyze further the possible project impacts and interspecific interactions between the focal species and other fish species in Detroit Lake and upstream and downstream of the dam. Include the additional analysis and information in Section 3.8, and expand the impacts analysis in Section 3.9 to include those species.

Final Panel Comment 6

The long-term and cumulative impacts of the project on the complete set of water quality parameters are not adequately addressed in the DSP EIS.

Basis for Comment

Analysis of water quality in the DSP EIS primarily focuses on the impacts of the construction and operations of the project alternatives on temperature and to some extent on turbidity, with less attention given to TDG. The impacts arise from differing flow and pool elevations and withdrawal outflow depths, during construction and while meeting the required flow targets during operations. The water quality modeling used wet and cool years represented by 2011, and hot and dry years represented by 2015, to quantitatively assess the success of the recommended alternative—the SWS—on meeting downstream temperature targets. However, the assessment of project impacts on other water quality parameters such as TDG and turbidity was less extensive. Cumulative impacts of SWS operations on water quality with future loads anticipated from population growth, water use, point source loads, and climate change (e.g., Y2100 flows and heat loads) are not simulated in the DSP EIS.

Turbidity and TDG impacts are not analyzed explicitly in the North Santiam River below Big Cliff Dam. Similarly, impacts of SWS operations on other water quality parameters of interest such as DO, pH, and algal growth are not addressed.

The discussion in Section 4.2.1, Cumulative Impacts to Water Quality, lacks detail as to which water quality parameters may be adversely impacted by the development activities in the watershed. Similarly, detail is lacking to explain which water quality parameters will have cumulative beneficial impacts from “augmentation of sediment and wood” (DSP EIS, page 4-321).

During review of the public comments, the Panel noted that similar concerns about the adequacy of the cumulative impact analysis of the project on water quality were raised in two comment letters: the Willamette Riverkeeper letter and the Native Fish Society with WildEarth Guardians, and Northwest Environmental Defense Center letter.

Significance – Medium

The limited conditions used to analyze the impacts of the project on temperature, and the lack of treatment of other water quality parameters, precludes a full evaluation of the long-term and cumulative effects of the project.

Recommendations for Resolution

1. Add information about expected project impacts on turbidity and other water quality parameters and explain how these impacts are expected to occur into the future.
2. Evaluate the cumulative impacts of project operations across water quality parameters to identify combinations of large additive or synergistic effects (e.g., impacts/benefits to temperature TMDL for the Willamette/North Santiam).
3. Provide statements in the DSP EIS to the effect that feasibility of SWS operations in compliance with applicable water quality standards would be addressed through the Clean

Final Panel Comment 6

Water Act (CWA) Section 401 Water Quality Certification or the TMDL process for the Willamette/North Santiam basins.

4. If addressing the feasibility of the SWS meeting *current temperature targets* under *future climate conditions* is beyond the scope of this DSP EIS, then clearly state so in Sections 1 and 4 of the DSP EIS.
5. Expand the cumulative effects analysis (Section 4.2) to provide more detail on which water quality parameters will be impacted (adversely or beneficially) by future expected changes in land use and management in the watershed.

Final Panel Comment 7

The analyses documenting the performance of the project for the likely future conditions under climate change are limited in scope.

Basis for Comment

The possible effects of climate change on project performance are not discussed in sufficient detail. The DSP EIS mostly relies on the modeling analysis cited at Myers et al. (2018), which is noted as "under review." None of the results are reproduced in the DSP EIS, except for a few sentences stating that the project-related increase in dam survival offsets the assumed (acknowledged as likely underestimated) effects of climate change that results in reduced spawner abundance (see page 3-315 of the Configuration/Operation Plan [COP] Phase II Report provided by USACE as supplemental documentation). This type of analysis seems to be critical to assessing the resiliency and flexibility of the proposed project over its expected multi-decadal life. Without knowing the capability for the proposed project to manage warming and altered hydrology, and lacking plans for adaptive management and monitoring, the uncertainty about project resilience and performance under changing environmental conditions dictated by climate change is increased. This is recognized in the COP Phase II Report: *"Given the longevity of the alternative assumed (50+ years) and potential impact on the alternatives, the COP PDT considered climate change as a future risk factor and incorporated that understanding into the final evaluation of the alternatives*" (COP Phase II Report, page ES-6). However, the effects of climate change were then "*factored into the evaluations, albeit qualitatively"* (COP Phase II Report, page 2-28).

In terms of the final alternative selected (the SWS-FSS), the information provided is that this alternative (along with similar ones) "*provided the highest resiliency to climate change as they allowed for the most flexibility in pulling water from any reservoir elevation"* (COP Phase II Report, page 3-16). In addition, climate change was not included in the SLAM or FBW modeling analyses. A more thorough analysis of how the SWS-FSS configuration would actually perform under expected climate change, even if the effects are highly uncertain, seems warranted.

During review of the public comments, the Panel noted comments from Willamette Riverkeeper and Native Fish Society with WildEarth Guardians, and Northwest Environmental Defense Center related to this issue.

Significance – Medium

Without demonstrating that the selected combination of SWS-FSS has sufficient resiliency to accommodate the expected future conditions under climate change, the expected benefits to the salmonids in the long term can be questioned.

Recommendations for Resolution

1. Perform additional analyses (either by argument, by checking and superimposing expected climate change effects against existing modeling results, or by modeling new scenarios) that shows the resiliency of the proposed project under anticipated long-term future conditions.

Final Panel Comment 7

2. Demonstrate the capacity of the SWS to handle warmer conditions and altered flow patterns which, with an adaptive management plan and monitoring plans, can address some of the concerns related to the present limited treatment of climate change in the DSP EIS.

Final Panel Comment 8

The DSP EIS does not assess the biogeochemical impacts to TDG, DO, algal biomass, or pH.

Basis for Comment

Projections of water quality impacts were conducted using modeling-based analysis. Turbidity impacts were simulated using AdH, a 3D hydrodynamic model, and movable bed sediment transport simulations. A CE-QUAL-W2 model was used to simulate temperature impacts. SWS operations involve releasing euphotic zone water during the winter and spring months and gradually mixing in cooler bottom waters through the summer. The chemistry of water released through SWS operations is likely altered from operations that primarily release deep water under the no-action alternative. The significance is that this change in chemistry of released water under the SWS, including the release of warmer-temperature water earlier in the year, has the potential to impact water quality variables such as algae growth and DO in the lower Santiam River.

CE-QUAL-W2 is capable of simulating biogeochemistry including nutrients, algae, detritus, DO, and pH. However, these variables were not simulated. Appendix A, Interim Alternatives Report of the DSP EIS (page 21) states: “Although meeting the temperature control criteria is the primary driver for alternative formulation, the TDG criteria are utilized in formulation and screening.” However, no detailed information was provided on the impact of the project on TDG levels.

Significance – Medium/Low

A complete understanding of the potential biogeochemical impacts of SWS operations is necessary to completely understand the overall impacts under each alternative.

Recommendation for Resolution

1. Provide information in the DSP EIS on how the project will address impacts to other water quality variables such as DO, pH, and algae during construction and operation of the SWS.

Final Panel Comment 9

The project impact assessment is not complete because several construction-related aspects of the project are not thoroughly evaluated in the document.

Basis for Comment

Several construction activities that are identified in Section 2.7 as common to all action alternatives are not evaluated for potential impacts in the DSP EIS. These activities, and questions regarding several post-construction activities, include the following:

1. Constructing a new boat ramp, including whether it will be decommissioned at the end of construction or utilized throughout the operations phase
2. Rebuilding South Shore Road, including whether it will be decommissioned
3. Replacing the debris boom

The extent and duration of these potential impacts should be discussed to ensure completeness of the decision documents.

During review of the public comments, the Panel noted that the general public (Wayne Shilts) brought up similar questions about impacts of the new boat ramp and South Shore Road.

Significance – Medium/Low

An analysis of potential impacts that thoroughly evaluates all project activities during both construction and operations phases will increase confidence in the identification of the recommended plan.

Recommendations for Resolution

1. Evaluate potential impacts associated with constructing, operating, and decommissioning a new boat ramp throughout all phases of the project, and add that analysis to relevant subsections throughout Chapters 3 and 4.
2. Evaluate potential impacts associated with rebuilding and decommissioning South Shore Road and add that analysis to relevant subsections throughout Chapters 3 and 4.
3. Evaluate potential impacts associated with replacing the debris boom and add that analysis to relevant subsections throughout Chapters 3 and 4.

Final Panel Comment 10

The DSP EIS does not address EO 13751, Safeguarding the Nation from the Impacts of Invasive Species (2016), with regard to invasive aquatic species.

Basis for Comment

The DSP EIS does not evaluate whether invasive aquatic species 1) exist in the Detroit Lake and North Santiam River under baseline conditions, 2) have the potential to be introduced during construction and operations, 3) have the potential to spread during construction and operations, and 4) require mitigation measures over the life of the project.

Significance – Medium/Low

An analysis of potential impacts that takes into account the possible introduction and/or proliferation of invasive species during both construction and operations phases will increase confidence in the identification of the recommended project.

Recommendations for Resolution

1. Add a subsection to Section 3.8 called “Invasive Aquatic Species.” Describe the baseline condition, potential impacts, and environmental consequences. The discussion should address, at a minimum 1) prevention of the potential spread of invasive species via project-related boats and construction equipment; 2) potential for colonization of the North Santiam River by invasive brown trout downstream of the dams once cooler water temperatures are established; and 3) transport and spread of non-native fish and fish parasites as part of the fish trap and haul program.
2. Revise Section 3.11.5 to include invasive aquatic plant species.

Literature Cited

USACE (2016). Safeguarding the Nation from the Impacts of Invasive Species. Executive Order (EO) 13751. The White House, Office of the Press Secretary, Washington, D.C. December 5, 2016.

Final Panel Comment 11

Potential impacts to Detroit Lake from construction activities are not fully addressed in the DSP EIS.

Basis for Comment

The DSP EIS contains very little information about aquatic species and communities within Detroit Lake, with the notable exception of sport fish. It is difficult to determine if sessile and/or slower-moving animals will be adversely impacted by the noise and vibration associated with blasting and other construction activities. The DSP EIS also does not fully analyze potential impacts to aquatic species that could occur by dredging blast spoils from one location in the lake and dumping them elsewhere in the lake.

Significance – Low

An analysis of potential impacts that takes into account the potential impacts to aquatic species in Detroit Lake from all project activities during both construction and operations phases will increase confidence in the identification and operations effects of the recommended project.

Recommendations for Resolution

1. Revise Section 3.2 of the DSP EIS to include potential vibration impacts to sessile and/or slow-moving animals that might not be able to retreat from the blast areas.
2. Evaluate potential impacts associated with dredging and dumping blast spoils in Detroit Lake.
3. Revise Section 3.6 to include impacts to lake water quality associated with dredging and dumping.
4. Revise Section 3.8 to include analysis of all aquatic species in Detroit Lake.

Final Panel Comment 12

The DSP EIS does not present information on the validation and calibration of the adaptive hydraulics (AdH) model and associated movable bed sediment transport module.

Basis for Comment

It is customary and a standard practice to demonstrate model skill through a calibration/validation exercise, prior to predictive applications. This was done for the temperature model (USGS reports related to the CE-QUAL-W2 model); however, a similar skill assessment was not presented for the AdH model and associated sediment transport simulation at Detroit and Big Cliff Reservoir. Without this information, it is difficult to assess or quantify the model skill and accuracy of predicted turbidity results.

Significance – Low

Implementation and operation of the SWS will not result in drawdown or resuspension of sediments greater than the no action alternative.

Recommendation for Resolution

1. Discuss whether a calibration of the sediment transport model was conducted, and if not, why not.

Final Panel Comment 13

It is unclear how Alternatives CA2 and CA3 have equivalent impacts in temperature when CA2 corresponds to a 2-year drawdown and CA3 corresponds to a 1-year drawdown.

Basis for Comment

Alternatives CA2 and CA3 involve lake drawdown to the 1,300-foot elevation. DSP EIS Tables 23, 24, 25, and 26 show modeled temperatures for construction alternatives CA2 and CA3 together as a single line item. Yet CA2 corresponds to a 2-year drawdown, while CA3 would be accomplished in 1 year. It is unclear why the temperature impacts would be equivalent or why impacts under these two alternatives should be conflated when the drawdown scenarios differ.

Significance – Low

While impacts under CA3 may be different from CA2, any possibly discrepant impacts between the two is essentially immaterial because the recommended alternative, CA5 (SWS-FSS) and its operations, would not result in drawdown-related impacts to temperature.

Recommendation for Resolution

1. Explain why the Alternatives CA2 and CA3 scenarios are treated as steady-state, 1,300-foot simulation runs, rather than using dynamic elevation changes.

Final Panel Comment 14

The application of a 3% discount to the computed Social Cost of Carbon does not follow EO 13783 dated March 28, 2017.

Basis for Comment

Although calculated values for the Social Cost of Carbon are low, the 3% discount appears to be overstated according to EO 13783, dated March 28, 2017. The referenced order does not appear to allow the application of a 3% discount rate; therefore, the $11,618 amount shown in Table 9, page 2-102 of the DSP EIS and Table 47 on page 3-316 of the DSP EIS (as well as elsewhere) as the Social Cost of Carbon is incorrect.

The published amount shown in the referenced table is the same for all action alternatives and does not influence the screening. However, from a National Environmental Policy Act (NEPA) standpoint, including the published analysis indicates that at least one EO has not been complied with. If the DSP EIS were corrected to comply with EO 13783, it would then be in compliance will all executive orders.

Significance – Low

Because the calculated amount is the same for all action alternatives, the value for the Social Cost of Carbon does not impact the determination of the recommended plan.

Recommendation for Resolution

1. Confirm whether EO 13783 dated March 28, 2017, nullifies the analysis of the Social Cost of Carbon as presented, and if so, modify the DSP EIS as appropriate.

Literature Cited

USACE (2017). Promoting Energy Independence and Economic Growth. Executive Order (EO) 13783. The White House, Office of the Press Secretary, Washington, D.C. March 28, 2017.

Final Panel Comment 15

The DSP EIS states that some proposed modifications to the dam are already authorized but does not explain how construction related to those modifications would be funded.

Basis for Comment

The DSP EIS presents study authorization but does not appear to address whether significant features added to the project are covered under any existing authority or would require a new authority. It also does not explain how the funds necessary to construct the added features would be obtained. Depending on whether authorization of the project or of the funds necessary to construct the additions is needed, the construction schedule may be impacted. Specifically, clarifying the authorization and disclosing how funds would be obtained will provide a clearer understanding of the path forward.

The DSP EIS states in more than one place that the addition of hatcheries had to be authorized. This supports the concern regarding authorization, because if the hatcheries had to be authorized, then the currently proposed features may also need to be authorized. The structures proposed for Detroit Dam are new features that are not defined in the project's original authorization. Based on the kickoff meeting presentation by USACE to Battelle and the Panel, it would seem that the authority has been determined by the USACE Office of Counsel; if that is the case, including that determination in the document would provide clarity on the issue.

In addition, given the lack of stated authority for the project and a lack of stated funding appropriation, it is unclear from the documents what the source of funding is for this construction project. "OMRR&R" is normally defined as operations, maintenance, repair, rehabilitation, and replacement. The Panel does not see how a new and very costly feature falls under the definition of OMRR&R, if that is what is planned to be used. Therefore, disclosing how the project would be funded, including any cost sharing, in the DSP EIS would clarify any potential uncertainty surrounding authorization.

Significance – Low

Since the authorization and source of funding would not affect the choice of the preferred alternative, and the preferred plan is "construction in the wet," the impacts of a lengthened schedule would likely be minimal.

Recommendations for Resolution

1. Provide the authority that allows for the construction of the new features to the project.
2. Clarify the funding source for the added features.

5. REFERENCES

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16, 2004.

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USACE (2016). Safeguarding the Nation from the Impacts of Invasive Species. Executive Order (EO) 13751. The White House, Washington, D.C. December 5, 2016.

USACE (2017). Promoting Energy Independence and Economic Growth. Executive Order (EO) 13783. The White House, Washington, D.C. March 28, 2017.

USACE (2018). Water Resources Policies and Authorities: Review Policy for Civil Works. Engineer Circular (EC) 1165-2-217. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 20, 2018.

APPENDIX A

IEPR Process for the Detroit Dam DSP EIS Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the major milestones and deliverables of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement, Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS IEPR). Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on July 1 2019. Note that the actions listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on November 6, 2019. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the Detroit Dam DSP EIS IEPR

Task	Action	Due Date
1	Award/Effective Date	6/21/2019
	Review documents available	7/1/2019
	Public comments available	7/30/2019
	Battelle submits draft Work Plan[a]	7/2/2019
	USACE provides comments on draft Work Plan	7/10/2019
	Battelle submits final Work Plan[a]	7/15/2019
2	Battelle submits list of selected panel members[a]	7/8/2019
	USACE confirms the panel members have no COI	7/11/2019
3	Battelle convenes kick-off meeting with USACE	6/27/2019
	Battelle convenes kick-off meeting with panel members	7/24/2019
	Battelle convenes kick-off meeting with USACE and panel members	7/25/2019
4	Panel members complete their individual reviews	8/19/2019
	Panel members provide draft Final Panel Comments to Battelle	8/27/2019
	Battelle sends public comments to panel members for review	8/21/2019
	Panel confirms no additional Final Panel Comment is necessary with regard to the public comments	8/22/2019
	Panel finalizes Final Panel Comments	8/30/2019
5	Battelle submits Final IEPR Report to USACE[a]	9/10/2019
6[b]	Battelle convenes Comment Response Teleconference with panel members and USACE	10/22/2019
	Battelle submits pdf printout of DrChecks project file[a]	11/6/2019
	Contract End/Delivery Date	6/30/2020

[a] *Deliverable.*
[b] *Task 6 occurs after the submission of this report.*

At the beginning of the Period of Performance for the Detroit Dam DSP EIS IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 18 charge questions provided by USACE (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the review documents and reference/supplemental materials listed in Table A-2.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Review Pages
Draft Environmental Impact Statement Detroit Dam Downstream Fish Passage and Temperature Control	365
Appendix A. Detroit Downstream Passage Project Interim Alternatives Report	62
Appendix D. Numerical Modeling, Hydrodynamic and Mobile Bed Analysis Report, North Santiam River, Detroit Dam and Reservoir	25
Appendix E. Water Temperature Simulations	8
Appendix F. Hydropower Impacts	31
Appendix G. Regional Economic Impact Study – Socioeconomics Analysis Report	43
Appendix H. Regional Economic Impact Study – Recreation Analysis	21
Appendix I. Regional Economic Impact Study – Agricultural Analysis	31
Appendix J. - Regional Economic Impact Study – Municipal and Industrial Analysis	43
Appendix K. - Regional Economic Impact Study- Other Social Effects	50
Appendix M. Past, Present, and Reasonably Foreseeable Actions	10
Appendix O. Geologic Setting	7

Review Documents	No. of Review Pages
Appendix P. Hydrology and Hydraulics Analysis	26
Appendix Q Cultural Resources Context	7
Total Number of Review Pages	**729**
Supplemental Information[a]	
Appendix B: Comparative Analysis of FSS Construction Sites for Detroit Lake	21
Appendix C: Memorandum for Record: Characterization and Evaluation of Stored Sediments Potentially Released during the Proposed Detroit Reservoir Drawdown	51
Appendix L. 2016 Fish Salvage Plan for the Debris Removal and Intake Tower Trash Rack Repairs at Cougar Dam on the South Fork McKenzie River	5
Appendix N. Detroit Downstream Passage Project Public Scoping Report	42
Incorporated by Reference: Willamette Valley Projects Configuration/Operation Plan (COP) Phase II report	1,891
Incorporated by Reference: Willamette Biological Opinion Engineering Documentation Report Detroit and Big Cliff Long-term Temperature Control and Downstream Fish Passage	1,136
Appendix R. Public Comment[a]	108
Total Number of Reference Pages	**3,254**

[a] *Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.*

[b] *USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1. Battelle will in turn submit the comments to the IEPR Panel for review.*

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018 and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 18 panel member questions to USACE. USACE was able to provide responses to most of the questions during the teleconference and provided written responses to all the questions prior to the end of the review.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member should serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Detroit Dam DSP EIS IEPR:

- Lead Responsibility: For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
  1. Comment Statement (succinct summary statement of concern)
  2. Basis for Comment (details regarding the concern)
  3. Significance (high, medium/high, medium, medium/low, and low; see description below)
  4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
  1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
  4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
  5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 15 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received a pdf file containing 109 pages of public comments on the Detroit Dam DSP EIS from USACE. Battelle then sent the public comments to the panel members in addition to the following charge questions:

1. **Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**
2. **Has adequate stakeholder involvement occurred to identify issues of interest and to solicit feedback from interested parties?**

The Panel produced individual comments in response to the charge questions. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. Upon review, Battelle determined and the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments. However, the Panel noted that some of the issues raised in the public comments were similar to concerns raised in the IEPR Final Panel Comments and provided notations within the Basis for Comment noting the public concern.

A.6 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.7 Comment Response Process

As part of Task 6, Battelle will enter the 15 Final Panel Comments developed by the Panel into USACE's DrChecks, a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

APPENDIX B

Identification and Selection of IEPR Panel Members for the Detroit Dam DSP EIS Project

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B.1 Panel Identification

The candidates for the Detroit Temperature Control and Downstream Passage Environmental Impact Statement, Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS IEPR) Panel were evaluated based on their technical expertise in the following key areas: hydrology and hydraulic (H&H) engineering, economics, environmental law compliance, fisheries biology, and water quality. These areas correspond to the technical content of the review documents and overall scope of the Detroit Dam DSP EIS project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected five experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or COIs. These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate's employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

> "…when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied to any firm that serves in a joint venture, either as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon

1. Previous and/or current involvement by you or your firm in the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS) and related projects.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon

2. Previous and/or current involvement by you or your firm in ecosystem restoration in the area of the Willamette River above and below the Detroit Dam and around the confluence of the North Santiam River with the Willamette River.

3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects associated with or around the Detroit Dam.

4. Current employment by the U.S. Army Corps of Engineers (USACE).

5. Previous and/or current involvement with paid or unpaid expert testimony related to the Detroit Dam.

6. Previous and/or current employment or affiliation with members of the cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups *(for pay or pro bono):*
   - National Marine Fisheries Service
   - U.S. Fish and Wildlife Service
   - Oregon Department of Fish and Wildlife

7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the area of the Willamette River above and below the Detroit Dam and around the confluence of the North Santiam River with the Willamette River.

8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Portland District.

9. Previous or current involvement with the development or testing of models that will be used for, or in support of, the Detroit Dam DSP EIS project.

10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Portland District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Portland District. Please explain.

11. Any previous employment by USACE as a direct employee, notably if employment was with the Portland District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon
12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Portland District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning ecosystem restoration review and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the Detroit Dam DSP EIS project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Detroit Dam DSP EIS project.
17. Participation in relevant prior and/or current Federal studies related to the Detroit Dam DSP EIS project.
18. Previous and/or current participation in prior non-Federal studies related to the Detroit Dam DSP EIS project.
19. Has your research or analysis been evaluated as part of the Detroit Dam DSP EIS project?
20. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

Table B-1. Detroit Dam DSP EIS IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Hydrology and Hydraulic Engineering					
Bruce Halverson	Kleinschmidt Associates	Madison, WI	M.E., Civil Engineering	Yes	36
Economics					
David Bastian	Independent Consultant	Annapolis, MD	M.S., River Engineering	Yes	36+
Environmental Law Compliance					
Judith Dudley	Independent Consultant	Bellingham, WA	Ph.D., Biology (Ecosystems Ecology)	N/A	32
Fisheries Biology					
Kenneth Rose	Independent Consultant	Annapolis, MD	Ph.D., Fisheries Science	N/A	32
Water Quality					
Tarang Khangaonkar	Western Washington University	Bellingham, WA	Ph.D., Applied Marine Physics/Ocean Engineering	Yes	29

Table B-2 presents an overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. Detroit Dam DSP EIS IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Halverson	Bastian	Dudley	Rose	Khangaonkar
Hydrology and Hydraulic (H&H) Engineer					
Registered Professional Engineer	X				
Minimum 10 years of experience in hydraulic and hydrologic engineering	X				
Familiarity with the Willamette River Basin, Northwest hydraulics, and hydrology	X				
Familiarity with rivers with water control structures and sediment transport	X				
Familiarity with Hydrologic Engineering Center (HEC) models	X				
Recent knowledge of accepted and certified hydrologic, hydraulic, and sediment transport models	X				

Table B-2. Detroit Dam DSP EIS IEPR Panel: Technical Criteria and Areas of Expertise (continued).

Technical Criterion	Halverson	Bastian	Dudley	Rose	Khangaonkar
Economist					
Minimum 10 years of experience conducting and reviewing regional economic impacts for an environmental impact statement (EIS) for Federal water resource projects		X			
Demonstrated experience in municipal and industrial water supply, regional economic impacts on recreation, agricultural economics		X			
Demonstrated experience in hydropower, including hydrocarbon greenhouse gas emissions, transportation economics, and socioeconomics		X			
Knowledge of the appropriate use of risk and uncertainty language in decision documents to effectively convey overall risks to the public and decision makers		X			
Environmental Law Compliance Specialist					
At least 15 years of experience directly related to water resources environmental evaluation or review and the National Environmental Policy Act (NEPA) process and analysis			X		
Biological or environmental background that is familiar with the project area and environmental impact analysis and mitigation			X		
Knowledge of Northwest biology, specifically of salmonid species (spawning, rearing, freshwater migration), Endangered Species Act (ESA), wetlands, riparian habitats, knowledge of riverine systems			X		
Knowledgeable in environmental/cultural legal compliance requirements			X		
Familiarity and experience with the Clean Water Act (CWA) and ESA			X		
Fisheries Biologist					
Minimum 10 years of experience and knowledge of downstream juvenile salmon passage at large dams (greater than 100 feet in height) in the Pacific Northwest				X	
Knowledgeable of fry, parr, and smolt salmon behavior in reservoirs and forebays				X	
Knowledgeable of how hydraulics, temperature, and other environmental conditions in forebays and dam facilities influence their passage efficiency and survival				X	

Table B-2. Detroit Dam DSP EIS IEPR Panel: Technical Criteria and Areas of Expertise (continued).

Technical Criterion	Halverson	Bastian	Dudley	Rose	Khangaonkar
Water Quality Specialist					
Must have 10 years of experience in modeling water temperatures and assessing other water quality parameters such as dissolved oxygen and algae production					X
Familiarity with CE-QUAL-W2 and general water temperature control requirements and operations in the Pacific Northwest					X

B.3 Panel Member Qualifications

Detailed biographical information on each panel member's credentials and qualifications and areas of technical expertise is summarized in the following paragraphs.

Name	**Bruce Halverson, P.E.**
Role	**Hydrology and Hydraulic Engineering**
Affiliation	**Kleinschmidt Associates**

Mr. Halverson, a senior engineering consultant with Kleinschmidt Associates, specializes in analyses of extreme hydrologic events and the quantification of their effects; risk analyses and the development of hydrologic and hydraulic designs; and the use of modeling systems. He earned an M.S. in civil engineering from Louisiana State University, is a registered P.E. in Illinois and Wisconsin, and is a Certified Floodplain Manager.

Mr. Halverson is Kleinschmidt's primary quality control reviewer and modeling strategist for all H&H projects. He has extensive experience with projects involving risk, uncertainty, frequency, and damage potential assessments, which includes having conducted hydrologic and hydrodynamic modeling after Hurricane Katrina for the USACE Interagency Performance Evaluation Task Force. He has extensive experience with hydrologic studies for watersheds across the United States, including several in the Pacific Northwest such as Laurance Lake (Clear Branch Dam) located in the Mount Hood National Forest, a dam rehabilitation project for which he was the lead H&H engineer. He was also the senior H&H engineer for a spillway improvement project for the Willamette Falls Dam near Oregon City.

Mr. Halverson has been the lead hydraulic engineer for several projects involving the design of fish passage components for existing hydropower dams. These projects are often challenging, given that the fish passage features are to be constructed in the same footprint as the spillway features, while simultaneously meeting criteria for fish passage and the hydraulic capacity of the spillway. Examples of these projects are Shickluna Hydro Project (Ontario), Tobique Narrows (New Brunswick), Blewett Falls (North Carolina), and the Milford/Orono/Stillwater Projects (Maine).

Mr. Halverson has experience with many different USACE Hydrologic Engineering Center (HEC) modeling packages: HEC-River Analysis System (HEC-RAS), HEC-Hydrologic Modeling System (HEC-HMS), HEC-Flood Damage Reduction Analysis (HEC-FDA), HEC-Geospatial River Analysis System (HEC-GeoRAS), HEC-Geospatial Hydrologic Modeling System (HEC-GeoHMS), HEC-Data Storage System Visual Utilities (HEC-DSSVue), HEC-Statistical Software Package (HEC-SSP), and their predecessor models. Mr. Halverson served as the lead H&H engineer for several 516(e) projects under contract to the Detroit District USACE. The goal of these 516(e) projects was to develop analysis tools to serve as a decision support system for the reduction of sediment loadings into the Great Lakes. Some of the watersheds and rivers were the St. Joseph (Michigan and Indiana), Grand (Michigan), Clinton (Michigan), and Menomonee (Wisconsin). These projects included many types of types of models and statistical analyses to evaluate the sediment-producing factors and the formulation of analysis strategies. The subsequent modeling components developed and delivered to watershed stakeholders included sediment delivery (Soil and Water Assessment Tool [SWAT]), channel aggradation/degradation with HEC-5 and HEC-RAS, and two-dimensional (2-D) modeling with USACE's Gridded Surface-Subsurface Hydrologic Analysis (GSSHA) model.

Mr. Halverson served as the modeling expert for the Chicago District USACE Technical Review Committee for Lake Michigan Diversion Accounting, for which his primary responsibility was to review procedures and models used to develop flow diversion quantities from Lake Michigan. He is a member of the Association of State Floodplain Managers, the Society of American Military Engineers, and the Association of State Dam Safety Officials.

Name	**David Bastian, P.E.**
Role	**Economist**
Affiliation	**Independent Consultant**

Mr. Bastian is an independent consultant and P.E. for David Bastian Consulting in Annapolis, Maryland. He specializes in USACE feasibility studies and their technical and policy compliance, adherence to plan formulation, and review of feasibility studies incorporating incremental cost analysis, ecosystem restoration, flood risk reduction, deep draft navigation, dredged material disposal, and hydraulic and river engineering. He earned his B.S. in civil engineering from the Georgia Institute of Technology and an M.S. in river engineering from Delft University, Holland.

Mr. Bastian has more than 36 years of experience with USACE and as a contractor/consultant on USACE projects involving feasibility studies and public works planning, all based on the USACE six-step planning process. As a reviewer at USACE-Headquarters (HQ-USACE), he was a practitioner and continues to have direct experience with Engineer Regulation (ER) 1105-2-100 as well as other USACE engineering regulations, manuals, and pamphlets, and continues to use and stay familiar with the "planning community toolbox." He co-authored the USACE Planner's Workshop Manual. His project history has resulted in his review of and collaboration on more than 100 USACE reports evaluating and comparing alternative plans. He understands the appropriate use of risk and uncertainty language in decision documents needed to effectively convey overall risks to the public and decision makers

Mr. Bastian has reviewed dozens of regional economic impact analyses associated with an environmental impact statement (EIS) for Federal water resource projects as a reviewer for the USACE and, within the last 10 years, as an IEPR panel member for the following ecosystem restoration projects:

- Malibu Creek Ecosystem Restoration Feasibility Study (Los Angeles District): Involved the removal of a dam to re-establish migratory opportunities of aquatic habitat. The primary purpose of the study was to restore aquatic habitat connectivity along Malibu Creek and tributaries, establish a more natural sediment regime from the watershed to the shoreline, and restore aquatic habitat of sufficient quality along Malibu Creek and tributaries. The goal was to sustain or enhance for indigenous populations of aquatic species about 15 miles of aquatic habitat that have been unreachable for many decades due to the dam. One of the significant parameters was water temperature.
- Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study (New York District): Involved a wide range (in scope and scale) of estuarine and riverine restoration components. One of its primary purposes was to reconnect and restore freshwater streams to the estuary to provide a range of quality habitats for aquatic organisms. One component included modification of rock weir for fish passage.
- Picayune Strand Restoration Project (Jacksonville District): Involved restoring freshwater wetlands as a component of the Comprehensive Everglades Restoration Plan. The specific restoration included building pump stations, spreader canal, and tie-back levee; plugging miles of canals to block flow; and removing and degrading 95 miles of roads and tram roads.
- Puget Sound Nearshore Study (Seattle District): Evaluated a suite of ecosystem restoration sites around the Puget Sound nearshore zone. The General Investigation was to evaluate problems and potential solutions of ecosystem degradation and habitat loss. The types of nearshore features identified for restoration included freshwater and tidal wetlands, coastal embayments, intertidal mudflats, reconnection of estuarine tidal channels, and sediment delivery from bluff-backed beaches. Included was the removal of fish passage and barriers, and reduction of habitat fragmentation to restore a highly degraded tributary to the Duwamish River as well as a new 1,000-foot channel with soil amendments and plantings.

Mr. Bastian has more than 20 years of experience in flood risk evaluation and has worked directly to identify and evaluate flood risk. For nine years, he was involved in the coastal economic evaluation for coastal Louisiana restoration, the greater New Orleans hurricane and storm damage risk reduction system, and four other study areas along the Louisiana and Texas coasts. His extensive review experience includes the Delaware River Basin Comprehensive Flood Risk Management Interim Feasibility Study and Integrated Environmental Assessment for New Jersey (2016); Souris River Basin Integrated Feasibility Report/Environmental Assessment (2017); Upper Turkey Creek, Johnson & Wyandotte Counties, Kansas, Flood Risk Management Project; and Kansas Citys Local Flood Protection Project (2005-2006). He helped author the report, provided technical and policy guidance, and supervised District staff in revising a feasibility report concerning a major metropolitan levee system upgrade for Kansas City, Kansas, and Kansas City, Missouri. On the Topeka Local Flood Damage Reduction Project (2006-2007), he provided technical, policy, and writing guidance to the District for design deficiency, levee system upgrade, and flood risk reduction study. For the Mississippi River Levee System (Units L-455 & R471-460), St. Joseph, Missouri/Elwood, Kansas (2006-2007) study, he provided technical and policy compliance for a flood risk reduction study involving a portion of the levee system.

Mr. Bastian is familiar with large, complex Civil Works projects with high public and interagency interests through his extensive involvement with the Louisiana Coastal Study area pre- and post-Hurricane Katrina. He is familiar with USACE flood risk and hurricane/coastal damage risk reduction analysis and economic benefit calculations, including the use of standard USACE computer programs such as the HEC-Flood

Impact Analysis (HEC-FIA) modeling program. He has reviewed HEC-FIA and other model applications and their outputs for several flood risk reduction projects for technical economic justification.

During his career, Mr. Bastian has developed economic input databases for deep-draft navigation studies at the Institute for Water Resources (IWR) (1980-1987); evaluated deep draft economic feasibility for enlarging the Panama Canal (1987-1993); reviewed feasibility studies for economic justification (1993-1998) at HQ-USACE; and reviewed and/or authored planning and economic analyses for various USACE projects (2001-present), including hurricane and storm damage risk reduction analyses for the New Orleans District, its architectural/engineering firms, and non-Federal sponsors (2006-2011).

Since 1993, Mr. Bastian has reviewed USACE studies with a focus on evaluating and comparing alternative plans for compliance with plan formulation processes, procedures, and standards. Since 2001, he has participated in the preparation of the Kansas Citys, Turkey Creek, Texas City, and Boardman flood risk management and post-Hurricane Katrina and Texas City hurricane and storm damage risk reduction studies. He also has reviewed the Blanchard environmental restoration study and various dam safety studies regarding plan formulation compliance and economic justification.

While at HQ USACE and as a contractor/consultant on USACE projects, Mr. Bastian applied ER 1105-2-100 (Principles and Guidelines) to projects subject to Civil Works project evaluations, all of which involved the six-step planning process. During his career, he has reviewed and collaborated on more than 100 USACE reports evaluating and comparing alternative plans. He also has had direct experience with other USACE engineer regulations, manuals, and pamphlets and was the co-author of the USACE Planner's Workshop Manual.

Mr. Bastian has evaluated and conducted National Economic Development (NED) analysis procedures as they relate to flood risk management and to hurricane and coastal storm damage risk reduction. Specifically, for the Kansas Citys, Turkey Creek, Texas City, and Boardman studies, he evaluated traditional NED plan benefits associated with flood risk management and evaluated application of HEC-FDA software.

Mr. Bastian's previous employment at USACE included positions as Deputy Chief of Staff for Support, Office Chief of Engineers; Assistant Director of Civil Works, Office Chief of Engineers; technical and policy compliance review expert, Washington Level Review Center; and navigation research, USACE Institute for Water Resources. He has served as a USACE Washington-level technical and policy compliance review expert and managed interdisciplinary reviews of more than 70 feasibility reports.

Mr. Bastian is a member of the American Society of Civil Engineers, the American Association of Port Authorities, the Permanent International Association of Navigation Congresses, and the Western Dredging Association.

Name	**Judith Dudley, Ph.D.**
Role	**Environmental Law Compliance Specialist**
Affiliation	**Independent Consultant**

Dr. Dudley, an independent consultant specializing in environmental impact analysis, ecological risk assessment, aquatic ecology, and water quality assessments, has more than 32 years of experience directly related to environmental evaluation or review. She earned her M.S. in biological sciences (aquatic

ecology) from the University of Pittsburgh in 1983, and a Ph.D. in biological science (ecology) from Boston University in 1991. She has experience in field surveys, soil/sediment/water analyses, bioassays, biological community surveys, bioaccumulation modeling, nutrient modeling and best management practice evaluation, artificial stream studies, data analysis, and coordination of data collection by volunteers.

Dr. Dudley has contributed to permitting efforts with myriad state and Federal agencies on issues ranging from National Environmental Policy Act (NEPA) compliance, to Clean Water Act (CWA) permits and compliance studies, to Endangered Species Act consultations. She is experienced in conducting NEPA impact assessments, including cumulative effects analysis, and has provided senior technical support and management on NEPA projects for such Federal agencies as the U.S. Department of Veterans Affairs (National Cemetery Administration facility siting projects), USACE (Base Realignment and Closure actions), National Park Service (facility construction projects), Department of Housing and Urban Development (urban redevelopment), Federal Aviation Administration (facility siting), and others. As the Principal Scientist, Dr. Dudley was responsible for providing technical oversight of two NEPA environmental assessments (EAs) that were prepared concurrently in support of site selection for construction of a $3.7 billion steel and stainless-steel processing plant in the southeastern United States. The alternate sites were each more than 3,000 acres, with substantial wildlife and wetlands issues, located on the banks of large rivers. The EAs included the CWA §401 and §404 permitting support documents, including the wetlands mitigation plans. USACE issued a Finding of No Significant Impact, and the project was constructed at the preferred site in Alabama.

Dr. Dudley's specific experience related to Endangered Species Act (ESA) compliance has included numerous Section 7 consultations at sites across the United States, including several salmon-habitat restoration projects in Washington state. These projects have addressed potential impacts on marine and freshwater species at upland and aquatic sites. Several of these projects also required that Dr. Dudley conduct consultations on essential fish habitat to complete the required interagency impact assessment review.

In Oregon, Dr. Dudley was the lead scientist responsible for a NEPA-compliant EA conducted for the U.S. Department of Veterans Affairs for expansion of the Willamette National Cemetery. She also designed and initiated long-term receiving water studies for the National Council (of the Pulp and Paper Industry) for Air and Stream Improvement, Inc., at sites on the Mackenzie and Willamette Rivers in Oregon. These studies involved monitoring water quality, primary production, and benthic invertebrate and fish community diversity at pulp and paper mill receiving waters, in addition to conducting acute and chronic effluent bioassay tests. Dr. Dudley has also conducted a technical critique of an agency-issued ecological risk assessment at a Superfund site on the Willamette River for one of the Potentially Responsible Parties. Receptors evaluated in the risk assessment included salmonids and other aquatic species as well as birds and fur-bearing mammals. Dr. Dudley identified technical weaknesses in the baseline ecological risk assessment report.

CWA compliance projects that Dr. Dudley has either managed or served as a senior scientist have included:

§ 303	Permit Modification, Evaluation of Phosphorus in Power Plant Fly Ash Effluent
§ 304	Seminole Reservation Numeric Nutrient Criteria Development Plan.
§ 316(a)	Environmental Monitoring for NPDES Permit Support, Coal-fired Power Plants

§ 316(b) Comprehensive Demonstration Studies, Coal-fired Power Plants

§ 319 Watershed Evaluations and Nutrient Reduction Evaluations, Orange County

§ 401 Coffeen Lake, Phosphorus and Mercury Modeling and Evaluations

§ 402 Environmental Monitoring for NPDES Permit Support

§ 404 Mangrove Restoration Permitting and Protected Species Survey, MacDill AFB

Dr. Dudley served on an IEPR Panel for USACE as a subcontractor to Battelle to review the Kansas Citys, Missouri and Kansas, Section 216 Flood Risk Management Project Phase 2 Feasibility Report. Her particular responsibility was to evaluate the environmental impact assessment process. As part of her review, she identified deficiencies in the ESA and Fish and Wildlife Coordination Act compliance processes, which the USACE was able to address promptly and prior to completing the IEPR process.

Name	**Kenneth Rose, Ph.D.**
Role	**Fisheries Biology**
Affiliation	**Independent Consultant**

Dr. Rose is the France-Merrick Professor in Sustainable Ecosystem Restoration at Horn Point Laboratory of the University of Maryland Center for Environmental Science. Previously, Dr. Rose was a Professor in the Oceanography & Coastal Sciences Department, and Associate Dean of Research in the School of the Coast and Environment at Louisiana State University. He earned his Ph.D. in fisheries from the University of Washington in 1985 and has over 30 years of experience in fish biology, ecology, and population dynamics, including broad experience researching estuarine and coastal fisheries.

Dr. Rose has worked extensively with fisheries and Chinook salmon and has published more than 100 papers on ecological modeling and fish population dynamics. In addition, he taught a graduate course on “Population Dynamics Modeling” while at Louisiana State University; participated in the independent review panel of the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan Biological Opinion on Salmon, 2009; participated in the Klamath River Expert Panel, Scientific Assessment of Two Dam Removal Alternatives on Chinook Salmon (2011); and served as chairperson of the Salmonid Integrated Life Cycle Models Workshop convened by the Delta Science Program (2011). Dr. Rose also served as a member of the Review of the SALSIM Population Model for Fall-Run Chinook in the San Joaquin River (2012).

Dr. Rose is familiar with USACE calculation of the evaluation of environmental benefits. He was a member of the team that applied the Habitat Suitability Index (HSI) to coastal Louisiana planning; was co-author on papers that used HSI for crappie and smallmouth spawning models in U.S. reservoirs and trout population dynamics in streams; and is familiar with the Wetland Value Assessment methodology from several earlier reviews.

Dr. Rose is experienced evaluating, conducting, and implementing NEPA impact assessments and was an expert to the United States Environmental Protection Agency on revisions to the 316b assessments. He has also reviewed multiple EISs related to small and large projects, including the Mississippi River Gulf Outlet Ecosystem Restoration Study River. He has also participated in multiple review panels for large-scale EISs, biological opinions, and Section 7 consultations. He is experienced in performing cumulative effects analyses for complex public works projects with competing trade-offs and participates

in multiple review panels and committees for the San Francisco Delta, including the National Academy of Sciences committee on Sustainable California Bay-Delta, the Independent Science Board of the CALFED Bay Authority (2004-2006) and the Independent Review Panel of the Delta Risk Management Strategy for the San Francisco Bay Ecosystem (2007).

Dr. Rose is experienced with the California Environmental Quality Act and has been a member of several review panels for Biological Opinions, Habitat Conservation Plans, and EISs in California, including the Science Advisory Panel for the Santa Clara Habitat Conservation Plan and Natural Community Conservation Plan (2006) and the Bay Delta Conservation Plan Steering Committee (2007-2009). Dr. Rose was a participant in a workshop on Developing Conceptual Ecological Models for Coastal Louisiana (Baton Rouge, 2008). He was an external peer reviewer for model certification of USACE's EnviroFish model and the Standard Assessment Methodology (SAM) and SAM Electronic Calculation Template. He also was a member of the Bay-Delta Independent Science Expert Panel on Fishery Resources to advise the California State Water Resources Control Board (2012).

Dr. Rose is a Fellow at the American Association for the Advancement of Science; received the Award of Excellence from the American Fisheries Society for lifetime achievement in 2014; and has been an editor for the Canadian Journal of Fisheries and Aquatic Sciences, San Francisco Estuary and Watershed Science, Transactions of the American Fisheries Society, and Fisheries Research.

Name	**Tarang Khangaonkar, Ph.D., P.E.**
Role	**Water Quality Specialist**
Affiliation	**Western Washington University**

Dr. Khangaonkar is a research professor at the Huxley College of the Environment, Department of Environmental Sciences, at Western Washington University. He is also Principal Program Manager specializing in integrated coastal ocean modeling at Pacific Northwest National Laboratory (PNNL). He provides senior leadership to PNNL's activities in numerical modeling studies related to coastal ocean hydrodynamics, water quality, sediment transport, and fate and transport analysis. He has more than 29 years of experience with various types of models capable of modeling circulation and water quality kinetics and has been involved with several water quality management studies. They include simulating temperature response; calculating dissolved oxygen (DO) depletions, sediment deposition, long-term effluent flushing and pH buffering; and performing diffuser design optimization. Many of these studies have been water quality impact assessments in support of hydropower Federal Energy Regulatory Commission (FERC) relicensing, mixing zone analyses for National Pollutant Discharge Elimination System (NPDES) permitting, and Total Maximum Daily Load (TMDL) assessments.

In response to a growing demand by the statewide community for a practical oceanographic modeling tool for water quality and ecosystem management, Dr. Khangaonkar and his team have led the development of a high-resolution, three-dimensional (3-D) finite volume hydrodynamic and transport model for the Pacific Northwest region of Puget Sound & Georgia Basin (the Salish Sea), through support from the EPA and in collaboration with the Washington State Department of Ecology. This model includes a comprehensive biogeochemical component and is becoming a "workhorse" for the analysis of water quality and circulation, nutrient pollution management, and response to sea level rise, climate change, and ocean acidification. Dr. Khangaonkar and his team have already conducted numerous applications of this tool to assist with nearshore habitat restoration planning and design, analysis in support of re-establishment of fish migration pathways, and assessment of basin-wide water quality impacts.

Dr. Khangaonkar currently serves on a steering committee for the Puget Sound Ecosystem Monitoring Program–Modeling work group and is helping shape the region's ecosystem modeling and analysis activities through a collaborative effort between agencies (EPA, Ecology, National Oceanic and Atmospheric Administration, Washington Department of Fish and Wildlife, and others).

Dr. Khangaonkar has worked with various water quality models throughout his career, including the CE-QUAL-W2 model. For a commercial client, he upgraded the temperature and water quality models of Lake Billy Chinook, Lake Simtustus, and Reregulation Reservoir impounded by three dams associated with the Pelton Round Butte Hydroelectric Project, Deschutes River, Oregon, using CE-QUAL-W2. He also conducted an assessment of natural temperatures that would occur without the dams. The results showed that there was significant influence of an external source of heat to the system through ground water.

As part of a FERC re-licensing team, Dr. Khangaonkar is currently managing the water quality model development and preparation of the associated CWA 401 Water Quality Certificate for the Clackamas River System. CE-QUAL-W2 was used to develop a temperature and water quality model of the system using synoptic data collected over a two-year period. The study shows that the effect of operations on water quality is limited since the system is oligotrophic and is little affected by changes in the flow regimes due to the operation of the dams. The water quality in general is very good with high DO and low algal growths. The assessment of the impact on in-stream and discharged waters is in progress.

Dr, Khangaonkar is a founding member of the Skagit Climate Science Consortium, a scientific body of technical experts from academia and Federal and state agencies, focused on climate change effects on the Skagit watershed.

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APPENDIX C

Final Charge for the Detroit Dam DSP EIS IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement, Linn and Marion Counties, Oregon

This is the final Charge to the Panel for the Detroit Dam DSP EIS IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on July 8, 2019. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The Detroit Dam is one of 13 multipurpose dams in the Willamette River Basin, and construction was completed in 1953. The project was constructed primarily for flood control and hydroelectric power generation, but other major benefits include recreation and conservation uses involving releases of stored water. There are small communities located downstream on the North Santiam River, with the largest being Stayton (population 7,644, approximately 44 miles downstream of Detroit). The city of Salem (population 167,419, approximately 60 miles downstream of Detroit) is along the Willamette River, just after the North Santiam joins the Willamette River. A major feature is a concrete dam, which includes a spillway, regulating outlets, penstocks, and a detached powerhouse.

The dam is a concrete gravity dam that is 1,457 feet long with a maximum height of 450 feet above the lowest portion of its foundation. The spillway is a concrete ogee-type spillway with six tainter gates located in the middle of the dam. There are four regulating outlets, two at elevation 1340 and two at elevation 1265 located directly below the spillway. A fifth outlet at elevation 1340 at the south end of the spillway was meant for hydraulic model testing but was never or hardly used. This outlet may be used to pass fish, as it is not required to pass river flow from a dam safety perspective.

There are two penstocks on the north side of the spillway with entrances at elevation 1403; they are steel pipes that daylight on the downstream side of the dam and provide water to the two 50 megawatt Francis turbines in the powerhouse.

The Detroit Dam was originally classified as a Dam Safety Action Classification 3 based on the Screening Portfolio Risk Assessment completed in 2008. The primary reason was spillway gate failure due to trunnion friction, spillway scour, seismic sliding failure of monoliths, and stability failure due to increased uplift conditions.

In July 2008, the National Marine Fisheries Service (NMFS) released its Biological Opinion (BiOp) on the effects of continued operations and maintenance of the U.S. Army Corps of Engineers' (USACE) Willamette Valley Project on species listed for protection under the Endangered Species Act (ESA).

Specific to Detroit Dam, the BiOp lists two Reasonable and Prudent Alternative (RPA) measures:

- RPA 5.2 requires investigation and implementation of improvements to downstream temperatures and Total Dissolved Gas (TDG) exceedances in the North Santiam River for ESA-listed fish species. Interim temperature control operations have been attempted annually since 2008, utilizing existing project facilities and operating equipment. Operational temperature control only functions when the reservoir elevation is above the spillway crest, which limits the operational temperature controls

success. Furthermore, all water that is passed over the spillway results in foregone power. Both these items indicate the need for a structural solution.

- RPA 4.12.3 requires investigation and implementation of safely passing juvenile fish downstream of Detroit Dam.

This process started with the development of an Engineering Documentation Report (EDR). The report started in 2010 and identified an array of structural and operational alternatives to provide temperature control and downstream passage at Detroit Dam. In addition to developing and evaluating alternatives for these two actions, this effort also provided data to the Willamette Configuration and Operation Team (COP) to enable the data to be evaluated throughout the entire Willamette basin, not just Detroit Dam.

The EDR was completed a few years ago. From these efforts, it was recommended that the Detroit PDT move forward with a selective withdrawal structure (SWS) for temperature control and two alternatives for fish collection; a weir box and a floating screen structure (FSS). Since juvenile fish are surface oriented when migrating, the plan was for the weir box to use the surface flow into the SWS to allow a low flow collector to trap the fish from inside the wet well of the SWS. As the weir box design progressed to a 60% DDR level, the PDT found it very difficult, if not impossible, to achieve biologically effective hydraulic conditions. Therefore, a decision was made to stop work on the weir box DDR. The FSS is the recommended alternative for downstream fish passage. There are currently two DDRs in the final stages of review for the purpose of developing design criteria and details for the SWS and the FSS. Plans and specifications for the SWS is beginning.

The main features of the SWS will be a tower type structure, with weir gates that allow for either surface water or deep water to be taken from the reservoir into a wet well and pass through either the turbine units, or a penstock bifurcation to provide the optimal water temperatures downstream. The FSS is a large floating structure that will screen all fish from entering the wet well of the SWS. The system will consist of all the gravity flow through the SWS and ultimately into the turbines or penstock bifurcation. Once collected in the FSS, the juvenile fish will be passed downstream either by trucks or a bypass conduit.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon (hereinafter: Detroit Dam DSP EIS IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to "assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions" (EC 1165-2-217; p. 39) for the decision documents. The IEPR will be limited to technical review and will not involve

policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-217 (p.41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts				
		H&H Engineer	Economist	Environ. Law Compliance Specialist	Fisheries Biologist	Water Quality Specialist
Draft Environmental Impact Statement Detroit Dam Downstream Fish Passage and Temperature Control	365	365	365	365	365	365
Appendix A. Detroit Downstream Passage Project Interim Alternatives Report	62	62	62	62	62	62
Appendix D. Numerical Modeling, Hydrodynamic and Mobile Bed Analysis Report, North Santiam River, Detroit Dam and Reservoir	25	25				25
Appendix E. Water Temperature Simulations	8				8	8
Appendix F. Hydropower Impacts	31			31	31	31
Appendix G. Regional Economic Impact Study – Socioeconomics Analysis Report	43		43	43		
Appendix H. Regional Economic Impact Study – Recreation Analysis	21		21	21		
Appendix I. Regional Economic Impact Study – Agricultural Analysis	31		31	31		
Appendix J. - Regional Economic Impact Study – Municipal and Industrial Analysis	43		43	43		
Appendix K. - Regional Economic Impact Study- Other Social Effects	50		50	50		
Appendix M. Past, Present, and Reasonably Foreseeable Actions	10			10		
Appendix O. Geologic Setting	7			7		
Appendix P. Hydrology and Hydraulics Analysis	26	26	26	26	26	26
Appendix Q Cultural Resources Context	7			7		

Review Documents	No. of Review Pages	Subject Matter Experts				
		H&H Engineer	Economist	Environ. Law Compliance Specialist	Fisheries Biologist	Water Quality Specialist
Total Number of Review Pages	**729**	**478**	**641**	**696**	**492**	**517**
Supplemental Information						
Appendix B: Comparative Analysis of FSS Construction Sites for Detroit Lake	21	21	21	21	21	21
Appendix C: Memorandum for Record: Characterization and Evaluation of Stored Sediments Potentially Released during the Proposed Detroit Reservoir Drawdown	51	51				51
Appendix L. 2016 Fish Salvage Plan for the Debris Removal and Intake Tower Trash Rack Repairs at Cougar Dam on the South Fork McKenzie River	5			5	5	
Appendix N. Detroit Downstream Passage Project Public Scoping Report	42	42	42	42	42	42
Incorporated by Reference: Willamette Valley Projects Configuration/Operation Plan (COP) Phase II report	1,891	1,891	1,891	1,891	1,891	1,891
Incorporated by Reference: Willamette Biological Opinion Engineering Documentation Report Detroit and Big Cliff Long-term Temperature Control and Downstream Fish Passage	1,136	1,136	1,136	1,136	1,136	1,136
Appendix R. Public Comment[a]	100	100	100	100	100	100
Total Number of Reference Pages	**3246**	**3241**	**3190**	**3195**	**3195**	**3241**

* Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

** Page count for public comments is approximate. USACE will submit public comments to Battelle, who will in turn submit the comments to the IEPR Panel.

Documents for Reference

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- USACE Climate Change Adaptation Plan (June 2015)

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents and may be revised if review document availability changes. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with MS Word (Office 2003).

Task	Action	Due Date
Attend Meetings and Begin Peer Review	Subcontractors complete mandatory Operations Security (OPSEC) training	8/17/2019
	Battelle sends review documents to panel members	7/19/2019
	Battelle convenes kick-off meeting with panel members	7/22/2019
	Battelle convenes kick-off meeting with USACE and panel members	7/23/2019
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	8/1/2019
Prepare Final Panel Comments	Panel members complete their individual reviews	8/15/2019
	Battelle provides talking points for Panel Review Teleconference to panel members	8/19/2019
	Battelle convenes Panel Review Teleconference	8/20/2019
	Battelle provides Final Panel Comment templates and instructions to panel members	8/21/2019
	Panel members provide draft Final Panel Comments to Battelle	8/23/2019
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	8/24/2019 – 9/2/2019
	Panel finalizes Final Panel Comments	9/3/2019
Review Public Comments **	Battelle receives public comments from USACE	7/30/2019
	Battelle sends public comments to Panel	8/19/2019
	Panel completes its review of public comments	8/22/2019
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	8/23/2019
	Panel drafts Final Panel Comment for public comments, if necessary	8/28/2019
	Panel finalizes Final Panel Comment regarding public comments, if necessary	8/30/2019
Review Final IEPR Report	Battelle provides Final IEPR Report to panel members for review	9/5/2019
	Panel members provide comments on Final IEPR Report	9/9/2019
	*Battelle submits Final IEPR Report to USACE	9/11/2019
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	9/18/2019
Comment/ Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	9/20/2019
	Battelle convenes teleconference with Panel to review the Comment Response process	9/20/2019

Task	Action	Due Date
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	10/4/2019
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	10/10/2019
	USACE PCX provides draft PDT Evaluator Responses to Battelle	10/11/2019
	Battelle provides draft PDT Evaluator Responses to panel members	10/16/2019
	Panel members provide draft BackCheck Responses to Battelle	10/21/2019
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	10/22/2019
	Battelle convenes Comment Response Teleconference with panel members and USACE	10/23/2019
	USACE inputs final PDT Evaluator Responses to DrChecks	10/30/2019
	Battelle provides final PDT Evaluator Responses to panel members	10/31/2019
	Panel members provide final BackCheck Responses to Battelle	11/5/2019
	Battelle inputs panel members' final BackCheck Responses to DrChecks	11/6/2019
	*Battelle submits pdf printout of DrChecks project file	11/7/2019
	Contract End/Delivery Date	6/30/2020

* Deliverables

** Battelle will provide public comments to panel members after they have completed their individual reviews of the project documents to ensure that the public comment review does not bias the Panel's review of the project documents.

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and alternative analysis. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however, you may still comment on them. Please feel free to make any relevant and appropriate comment on any

of the sections and appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-217).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager, Lynn McLeod (mcleod@battelle.org), for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (mcleod@battelle.org), immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report but will remain anonymous.

Please submit your comments in electronic form to the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

Independent External Peer Review of the Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Review Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Review Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Review Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Review Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on whether a particular alternative should be implemented or present findings that become “directives” in that they call for modifications or additional studies or suggest new conclusions and recommendations. In such circumstances the Review Panel would have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

The Review Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

Broad Evaluation Review Charge Questions

1. Is the need for and intent of the decision document clear?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical issues?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:

3. Project evaluation data used in the study analyses
4. Economic, environmental, and engineering assumptions that underlie the study analyses
5. Economic, environmental, and engineering methodologies, analyses, and projections

6. Models used in the evaluation of existing conditions, conditions under the no action alternative, and economic or environmental impacts of the action alternatives
7. Methods for integrating risk and uncertainty
8. Formulation of alternative plans and the range of alternative plans considered
9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
12. Assess the considered and preferred alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

Specific Technical and Scientific Review Charge Questions

13. Does the economic analysis appropriately assess the economic direct and indirect impacts on hydropower, agriculture, municipal and industrial water supply, and recreation? Do the inputs, outputs, and technical assumptions of this models used appear reasonable?
14. Does the cumulative effects analysis adequately describe the potential past, present, and reasonably foreseeable future actions that may result in cumulative effects with the project, and are the cumulative effects adequately addressed?

Summary Questions

15. Please identify the most critical concerns (up to five) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.
16. Please provide positive feedback on the project and/or review documents.

Public Comment Questions (provided to the Panel separately for their review of the public comments)

17. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall project?
18. Has adequate stakeholder involvement occurred to identify issues of interest and to solicit feedback from interested parties?

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APPENDIX D

Conflict of Interest Form

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David Kaplan
USACE, Institute for Water Resources
June 20, 2019
C-2

Conflicts of Interest Questionnaire

Independent External Peer Review

Detroit Temperature Control and Downstream Passage Environmental Impact Statement (EIS), Linn and Marion Counties, Oregon

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Courtney Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **brooksc1@battelle.org**

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) **No** Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? **No** Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? No **Yes** (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? **No** Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

No additional information to report.

Courtney M. Brooks
Courtney Brooks

June 20, 2019
Date

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

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It can be done