

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
August 8, 2022

OFFICE OF ENERGY PROJECTS

Project No. 553-235 – Washington
Skagit River Hydroelectric Project
Seattle City Light

VIA FERC SERVICE

Chris Townsend
Seattle City Light
700 5th Avenue, Suite 3341
Seattle, Washington 98104

**Reference: Determination on Requests for Study Modifications for the Skagit
River Hydroelectric Project**

Dear Mr. Townsend:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for Seattle City Light's (City Light) Skagit River Hydroelectric Project No. 553 (project), located on the Skagit River near the town of Newhalem in Whatcom, Skagit, and Snohomish Counties, Washington. The determination is based on the study criteria set forth in section 5.9(b) and 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

City Light filed its initial study report (ISR) on March 8, 2022, held ISR meetings March 21-23, 2022, and filed an ISR meeting summary on April 7, 2022.

Comments on the ISR and meeting summary were filed by the Skagit County Dike and Drainage District Flood Control Partnership (Partnership), Skagit County, Craig Cooper, Lydia Cooper, Mary Black, the Skagit Drainage and Irrigation Districts Consortium (Districts), the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (FWS), the Washington Department of Fish and Wildlife (Washington DFW), Swinomish Indian Tribe (Swinomish), American Whitewater, Upper Skagit Indian Tribe (Upper Skagit), Whoosh Innovations Inc., and the National Park Service (NPS).

City Light filed reply comments on June 6, 2022, and on June 10, 2022, City Light filed additional comments on the status of the Operations Model study.

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General Comments

Many comments do not specifically request additional studies or modifications to the approved studies, including: the presentation of data and results, edits and changes to the format of the ISR, off-license mitigation measures currently proposed or implemented by City Light, and the development of resource management plans or other protection, mitigation, and enhancement measures. This determination does not address these comments, but only addresses specific recommendations to modify the approved study plan or conduct new studies.

Lastly, this determination does not address comments requesting modifications to studies or portions of studies that were not required by the prior study determination, or issues that were already addressed in the prior study determination.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must include a demonstration that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in section 5.9(b).

As indicated in Appendix A, one requested study modification is adopted, one is adopted in part, and the remaining modifications are not approved. The three requests for new studies are not approved. The bases for these findings are explained in Appendix B. Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations; however, only the specific study criteria particularly relevant to the study in question are referenced in Appendix B.

Nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

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If you have any questions, please contact Matt Cutlip at (503) 552-2762 or email at matt.cutlip@ferc.gov.

Sincerely,

JOHN
WOOD

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by JOHN WOOD
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for

Terry L. Turpin

Director

Office of Energy Projects

Enclosures: Appendix A – Summary of Determinations on Requested Modifications to Approved Studies and Requests for New Studies
Appendix B – Staff Recommendations on Requested Modifications to Approved Studies and Requests for New Studies

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APPENDIX A**SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND REQUESTS FOR NEW STUDIES**

Study	Recommending Entity	Adopted	Adopted in Part	Not Adopted
1. Third Study Season <i>(multiple approved studies)</i>	NMFS, Washington DFW, Upper Skagit, Swinomish			X
2. Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-of-Way Study (GE-02)	Upper Skagit			X
3. Sediment Deposition in Reservoirs Affecting Resource Areas of Concern Study (GE-03)	Upper Skagit			X
4. Skagit River Geomorphology Between Gorge Dam and the Sauk River Study (GE-04)	Upper Skagit, NMFS			X
5. Operations Model Study (OM-01)	Skagit County, Partnership, Districts, NMFS, NPS, Upper Skagit			X
6. Lower River Synthesis Study (SY-01)	Skagit County		X	
7. Water Quality Monitoring Study (FA-01)	Washington DFW, NPS, FWS, Upper Skagit			X
8. Instream Flow Model Development	FWS, Swinomish,			X

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Study	Recommending Entity	Adopted	Adopted in Part	Not Adopted
Study (FA-02)	Upper Skagit			
9. Skagit River Gorge Bypass Reach Hydraulic and Instream Flow Model Development Study (FA-05)	Upper Skagit			X
10. Fish Entrainment Study (FA-08)	Washington DFW, NPS, Upper Skagit			X
11. Gorge Bypass Reach Safety and Whitewater Boating Study (RA-02)	American Whitewater	X		
12. Project Facility Lighting Inventory (RA-03)	NPS			X
13. Vegetation Mapping Study (TR-01)	Swinomish			X
14. Marbled Murrelet Study (TR-05)	FWS, NPS, Upper Skagit			X
15. Special-status Amphibian Study (TR-08)	NPS			X
16. Inventory of Historic Properties with Traditional Cultural Significance Study (CR-04)	Upper Skagit			X
17. Diablo Tailwater Reach Instream Flow Model (<i>new study</i>)	Washington DFW			X
18. Riverine Stranding and Trapping Studies (<i>new study</i>)	Washington DFW, FWS, NMFS, NPS, Upper Skagit			X
19. Additional Wildlife Studies (<i>new study</i>)	Swinomish			X

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APPENDIX B

STAFF RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND REQUESTS FOR NEW STUDIES

I. Requests for Study Modifications

Third Study Season

Requested Study Modifications

NMFS, Washington DFW, Upper Skagit, and Swinomish, state generally and specifically in comments on several studies (e.g., Water Quality Modeling Study FA-01, Lower River Synthesis Study SY-01, Cultural Resources studies CR-02 and CR0-4, Terrestrial Resources studies TR-05 and TR-08) that a third study season will be necessary before City Light's final license application will be ready for environmental review. The entities assert that a third study season is needed to allow sufficient time to acquire the necessary data and completely evaluate project effects.

Reply Comments

City Light states that "due to the challenges presented by the pandemic as well as the timing of the Study Plan Determination (July 16, 2021), a limited number of studies, field studies and analysis may extend into late 2022 or early 2023. For these studies, preliminary data and actionable findings will be available to inform development of the license application." City Light adds that "where it is determined that additional information is necessary to finalize PME measures, final proposals related to these topics may be developed and submitted to the Commission after the license application is submitted." In that case, it states that "City Light and the licensing participants (LPs) may request that the Commission not issue the "Ready for Environmental Analysis" (REA) notice until such studies are completed and submitted to the Commission." City Light says that this would ensure that it and the stakeholders have enough time to develop a complete record for the mandatory conditioning agencies, Washington Department of Ecology Section 401 Certification, and FWS/ NMFS Endangered Species Act consultation.

Discussion and Staff Recommendation

The REA notice is issued when Commission staff has determined that it has sufficient information to assess the licensing proposal before the Commission. That decision will be made once the updated study report (USR) and license application are filed and reviewed by

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Commission staff. Therefore, it would be premature for staff to opine on the need for studies on an application that has yet to be filed.

Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-of-Way Study (GE-02)

Background

The approved study plan required City Light to conduct a 2-phase assessment of project stream crossings to determine the characteristics and condition of project crossing structures (e.g., culverts) and to assess fish passage at those crossings that are located on known or potential fish-bearing streams.

Phase 1 was completed during the first study season and included: (1) inventorying all stream crossings and verifying their location using GPS, (2) determining whether each crossing is on a fish-bearing stream using the Washington Department of Natural Resources (Washington DNR) stream typing map, and (3) for stream crossings that were on streams not identified as fish-bearing by Washington DNR's stream typing map, collecting data on stream channel scour width and slope near the crossing structure to further evaluate whether it is likely to be used by fish. If a stream had a scour width of over 2 feet and a gradient of less than 20 percent it was characterized as potentially fish-bearing (Washington DFW, 2019). If the scour width was less than 2 feet or the gradient was over 20 percent, it was categorized as not fish-bearing (Washington DFW, 2019).

Phase 2, which will be implemented in 2022, includes conducting passage assessments at all project stream crossings on streams that were determined to be potentially fish bearing. To provide information on the relative benefits of fish passage improvements at the project stream crossings, City Light also committed in its updated Revised Study Plan (updated RSP)¹ to develop a map and Geographic Information System (GIS) database showing potential stream miles of habitat that are upstream of barriers through Light Detection and Ranging (LiDAR) analysis. The LiDAR analysis will be conducted in 2022, and all study results will be presented in the USR. City Light also stated in the updated RSP that it would confer with stakeholders on the need for additional ground-based aquatic habitat surveys upstream of culverts to further

¹ On June 10, 2021, City Light filed an updated RSP that reflects certain agreements on studies it has reached with the Swinomish, Upper Skagit, NMFS, NPS, FWS, Ecology, and Washington DFW. City Light and the licensing participants refer to this filing as Notice of Agreement (NOA). Here, we refer to that filing as the updated RSP, consistent with the terminology in the Commission's regulations and its treatment in the initial study determination.

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evaluate the aquatic habitat benefits of potential passage improvements, once the fish passage assessment results and LiDAR analysis are presented in the USR.

Requested Study Modification

Upper Skagit states that City Light's proposal to only evaluate habitat availability upstream of culverts using GIS tools (including LiDAR) is inadequate because past attempts to rely on GIS alone for these types of evaluations have been insufficient. Therefore, Upper Skagit requests that the study be modified to require field-based surveys of habitat upstream of culverts. Upper Skagit states that field surveys are consistent with Washington DFW's guidelines for evaluating culverts and are needed to validate the results of the GIS analysis and accurately quantify the amount and quality of habitat blocked by culverts. This information would inform prioritization of culverts to be removed or modified to enhance fish passage.

Reply Comments

City Light states that conducting field surveys to quantify fish habitat upstream of all culverts is beyond the scope of the study. City Light states that the purpose of the study is to identify where fish passage issues exist at road crossings with culverts. The next step (and beyond the scope of the study) is to evaluate aquatic habitat upstream of culverts to prioritize culvert replacements to enhance fish habitat.

Discussion and Staff Recommendation

Although Upper Skagit asserts that LiDAR is inadequate to evaluate habitat conditions upstream of culverts, it does not provide any specific information to support this assertion. The ISR reports that there are at least 32 road stream crossings on potential fish bearing streams that may or may not be passable. If the fish passage assessment suggests that all sites are unpassable, then Upper Skagit's requested modification would require City Light to conduct field surveys of fish habitat in all 32 streams upstream of the culverts, which would require considerably more effort and cost than a LiDAR analysis (section 5.9(b)(7)).

Although City Light proposes to use LiDAR to determine the amount of stream miles of habitat upstream of stream crossings, it does not identify any criteria it would use to make this determination. To ensure that there is sufficient information to determine the benefits of potential fish passage improvements across the affected tributary streams (section 5.9(b)(4)), we recommend that City Light include in the USR information on tributary basin drainage area and average channel slope (i.e., between the project stream crossing and any natural passage barriers upstream) based on the LiDAR analysis. Additionally, City Light should include in the USR its field measurements of stream scour width near the crossing structures that are located on fish

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bearing streams and identified as passage obstructions based on the Phase 2 assessment. Together this information should provide staff with sufficient information to assess the relative benefits to fish habitat of potential modifications to road stream crossings to enhance fish passage.

However, the approved study plan required City Light to evaluate crossings on private roads that are owned or maintained by City Light. In the ISR, City Light states that “some of these stream crossing structures may be on roads that are used by City Light but are owned and maintained by others.” It is not clear in the ISR which of these roads are project roads. Therefore, we recommend that City Light differentiate project versus non-project roads and the associated culverts identified in this study in the updated study report and license application. No other modifications to the study plan should be required.

Sediment Deposition in Reservoirs Affecting Resource Areas of Concern Study (GE-03)

Background

Sediment transported from Stetattle Creek into Gorge Reservoir has been accumulating on a delta (also known as “Stetattle Bar”) within the upper section of the reservoir near the Diablo dam tailrace. The accumulated sediment affects power generation at the Diablo powerhouse due to an increase in tailwater elevation. To determine the characteristics of the sediment deposited in the delta and assist in developing methods to manage the sediment, the approved study plan required City Light to: (1) evaluate the grain size of sediment input to the delta, (2) quantify the total volume of sediment deposition in the delta, and (3) estimate the rate and patterns of deposition. City Light also conducted a modeling analysis to evaluate flow levels in Stetattle Creek and the Skagit River that would mobilize different size classes of sediment.

Requested Study Modification

Upper Skagit states that the Stetattle Creek delta in the Diablo tailrace could provide productive spawning and rearing habitat for anadromous fish should they be passed upstream of Gorge Dam. Upper Skagit states that City Light should evaluate the potential to “synchronize flows from Diablo Dam and Stetattle Creek to help move sediment and increase hydraulic potential without destroying the fluvial nature of this segment of Gorge lake.”

Reply Comments

City Light states that Upper Skagit does not address any of the study request criteria in section 5.15(d); therefore, it is unclear how Upper Skagit wants the study to be modified. City

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Light adds that it has attempted to release high flows in the Diablo tailrace in the past to mobilize sediments in the Stetattle Creek delta, but these have caused minimal change to sediment deposited in the delta.

Discussion and Staff Recommendation

According to the ISR, under existing project operation, high flows in Stetattle Creek and high flows in the Skagit River in the Diablo Dam Tailrace are not coordinated. This is because when a large storm is forecast for the region, City Light typically draws down Gorge Reservoir to capture the anticipated high flows coming in from Stetattle Creek. During a storm event with high flows, Stetattle Creek deposits sediment in the delta at its confluence with Gorge Reservoir because flow from the Diablo powerhouse is relatively low from storing inflow upstream in Ross and Diablo Reservoirs. If the flood is very large and upstream reservoir storage fills, spill over Ross or Diablo Dams can occur, but this is generally well after the peak flow in Stetattle Creek.

Based on information in the ISR, the Diablo Powerhouse tailwater elevation has increased by about 6 feet from the mid-1990s to 2018. To improve generation, City Light tried to use spill flows from Diablo Dam to move the sediment on the delta. The first event was a spill of 22,800 cfs on June 20, 2007 which reduced the tailwater elevation by 9 inches. The second was a spill event of 32,000 cfs on June 28, 2007 which reduced the tailwater elevation by another 6 inches. There is no information on the duration of the spill events, but we assume that both occurred over the same duration since the goal was to try to evaluate whether intentional spills moved significant quantities of sediment on the delta. There is no information on the flow levels in Stetattle Creek at the time of the spill events because the creek is ungaged and City Light does not report the flow levels at the time of the spill events. However, because high flows in the creek and in the tailrace are not coordinated under existing operations, it is very likely that Stetattle Creek flows were low at the time of the spill events. Based on our review of these data, it appears that spill flows mobilized some sediment, but the second higher magnitude event moved less than the first, suggesting that subsequent events would be even less likely to significantly reduce sediment accumulation on the delta.

While Upper Skagit requests that City Light evaluate the potential to synchronize flows from Diablo Dam and Stetattle Creek to help move sediment, it does not explain how this evaluation should be completed.

To evaluate the benefits of coordinating spill events and high flows from Stetattle Creek would require flows that are not frequently available in Stetattle Creek. The sediment characterization data in the ISR show that Stetattle delta sediment grain sizes in three of the six sampling sites are at least 50% cobble or larger substrate. The sediment transport analysis in the ISR shows that Stetattle Creek flows of 2,000 cfs are needed to mobilize coarse gravel and

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smaller particles up to 64 millimeters (mm) in size in the delta, and that such flows occur about every 2 years. Flows of 5,000 cfs are needed to mobilize material up to boulder size (264 mm) in the delta, and these flows occur about once every 10 years. The largest boulders (greater than 512 mm) are mobilized at flows of 7,000 cfs, which occurs once about every 20 years. Trying to coordinate spills and high flows in Stetattle Creek that are sufficient to move most of the size classes of sediment (i.e., 5,000 cfs) could prove to be difficult and untimely. If such flows could not be coordinated, there would essentially be repeating efforts already implemented by City Light.

Further, the purpose of Upper Skagit's request is to improve spawning habitat near the delta in the Diablo Powerhouse Tailrace. As explained below in our discussion of Washington DFW's request for an instream flow modeling analysis in this reach, uncontrolled spills from Diablo Dam would likely scour any salmonid redds on the delta should they occur, negating any benefits to the salmonid spawning in the reach by synchronizing high flows. For these reasons, we conclude that we already have sufficient information to assess the spawning potential of the tailwater reach and that an evaluation to attempt to synchronize high flows events in Stetattle Creek and the Diablo Dam Tailrace would be unlikely to inform the development of license conditions to enhance salmonid spawning habitat in Gorge Reservoir (section 5.9(b)(4)). Therefore, we do not recommend requiring City Light to conduct such an evaluation.

Skagit River Geomorphology Between Gorge Dam and the Sauk River (Study GE-04)

Background

The approved study requires City Light to characterize the current aquatic habitat in the reach between Gorge Dam and the Sauk River and to evaluate how project operation influences the occurrence of high flows that could affect geomorphic processes, which will be used to evaluate the project's contribution to cumulative effects in the reach. Specifically, City Light is to: (1) collect and synthesize existing geomorphology and aquatic habitat studies, reports, and data; (2) analyze geomorphic change using channel migration and channel incision as metrics; (3) inventory the status of substrate in the Skagit River, side channels, tributary junctions, and unvegetated bars; (4) inventory the status of large wood debris (LWD) in the Skagit River and at tributary mouths; (5) investigate process flows for various geomorphic and habitat changes; (6) develop a 1-D sediment transport model; (7) develop a 2-D sediment transport model of select focus areas in the Skagit River; (8) conduct an Indicators of Hydrologic Alteration (IHA) analysis to investigate the timing and duration of different types of high flow events under unmanaged conditions to inform the development of potential process flow scenarios; and (9) monitor movement of gravel deposits, cobble deposits, and added large wood.

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City Light has collected and begun the synthesis of existing information, begun the inventory of large wood debris, and is in the process of developing models to evaluate geomorphic processes. As described in section 4.5.1 of the Geomorphology ISR, City Light will implement a suite of modeling tools to address areas between Gorge Powerhouse and the estuary. The modeling approach and suite of models that will be used were defined in consultation with stakeholders in workshops in July, September, and October 2021, and consultation and development of the tools is ongoing. The geographic extent of each modeling tool is described in section 4.5.1 of the Geomorphology Study ISR. Modeling tools to be applied downstream of the Sauk River confluence include UBCRM and MAST 1-D, which will extend to the gravel-sand transition at approximately project river mile 21. Project effects on fine sediment delivery to the estuary will be evaluated by combining watershed-scale sediment yield analysis (described in section 4.5.3 of the Geomorphology ISR) with evaluation of floodplain-channel sediment exchange using the MAST 1-D model.

Requested Study Modification

Upper Skagit requests that the geomorphic modeling and IHA analysis extend downstream of the Sauk confluence to at least Sedro-Woolley. Upper Skagit argues that 1-D geomorphic modeling is too limited in this reach to determine project effects on geomorphology and aquatic habitat in the Skagit River downstream of the Sauk. Upper Skagit asserts that this is a key gap in the study plan, especially because it believes the approximately 41-mile-long section of the river between the Sauk River and the city of Sedro-Woolley provides the greatest opportunity in freshwater to recover ESA-listed Chinook salmon. Upper Skagit contends that even a relatively small project impact that extends throughout this river section would have significant implications for Chinook recovery, as well as for productivity of other anadromous salmonid populations. Considering these concerns, Upper Skagit requests that City Light develop a schedule for filling these data gaps and that allows sufficient time for the data to be collected and used in settlement negotiations and development of license conditions.

NMFS requests that LWD and sediment studies extend to the Highway 9 Bridge in Sedro-Woolley to incorporate critical lower-river habitat for salmon spawning and rearing, in accordance with the ESA recovery plans and to ensure best available science.

Reply Comments

City Light states that quantifying project-related effects on anadromous fish resources in the lower Skagit River represents a significant scientific challenge given the multitude of factors interacting with resources and processes in the lower Skagit River. City Light indicates that it committed in the updated RSP to identifying studies that could be conducted in the second study season, but as noted in the ISR, its determination on additional field studies in the lower river, if

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any, is on hold until completion of the desk-top Lower River Synthesis Study SY-01 and other field studies and models. City Light states that it expects to determine if additional data collection is needed by the 4th quarter of 2022. If data gaps are identified that cannot be filled in the second year of study because they would take longer to complete, City Light states it would discuss a process for collecting such data with the stakeholders, which could include requesting that the Commission delay issuing the REA notice until such studies are complete.

Discussion and Staff Recommendation

City Light is in the process of completing the desktop Lower River Synthesis Study and developing the instream flow, IHA analysis, and sediment models as required by the approved study plan. Although these efforts have been delayed due to a variety of factors, City Light indicates that the models will be complete, and the preliminary results included in the USR. Because the data collection and model development are ongoing and there is insufficient information to determine whether and to what extent project effects on fish habitat and geomorphic processes extend into the lower river, it is premature to require City Light to expand these studies farther downstream now. Any modeling results presented in the USR can be reviewed to help inform the need for additional studies or expanded modeling. Therefore, no modifications to the study plan are needed at this time.

Operations Model Study (OM-1)

Background

The objective of the study is to develop a model that simulates project operation. The model would then be used to simulate potential future operating scenarios to evaluate the effects of alternative operating scenarios on generation, reservoir levels, and outflows from the project. That data could then be used to assess the effects of various operating scenarios on competing resources (e.g., water allocation, flood control, fish and wildlife habitat, instream flows, reservoir levels, wetland and floodplain connectivity, recreation, hydropower generation).

In the updated RSP, City Light committed to “develop a projected climate change operations model from the base model.” City Light proposed to develop the model using downscaled global climate model data from the University of Washington Climate Impacts Group.

City Light developed the operation model using the Computerized Hydro Electric Operations and Planning Software (CHEOPST[™]) model and has completed the verification steps to validate the model. Next steps include identifying and evaluating alternative operational scenarios in consultation with the licensing stakeholders. A scenario request form will be used to

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identify model scenarios in consultation with stakeholders. To help facilitate the consultation, a reoccurring monthly Operations Model Work Group Meeting is scheduled for every third Thursday of the month. Evaluation of operating scenarios and potential resource impacts will be done in coordination with other project models and resource study information. City Light proposes to develop a model output template to provide consistent information on modeling results for each of the scenarios evaluated.

*Modeling of Alternative Operating Scenarios*Requested Study Modification

Skagit County and the Partnership state that City Light should analyze and account for the impact of climate change on project operation rather than simply relying on status quo operations under the current license. To do so, Skagit County and the Partnership request that City Light evaluate their “Flood Storage Proposal” scenario as part of the Operations Model study. Specifically, the Flood Storage Proposal scenario includes drawing down Ross Reservoir earlier in the fall to about 1,592 feet by October 15 and 1,585 feet by November 1. This compares to existing conditions where Ross is typically drawn down to about 1,601 feet by October 15 and 1,599 feet by November 1. Skagit County and the Partnership state that their proposal was developed based on their understanding of major floods in the Skagit watershed, anticipated trends in inflow hydrographs shifting to earlier and larger flood events, an understanding of City Light’s existing operations, and uncertainty in the timing and magnitude of inflow hydrographs due to climate change. Skagit County and the Partnership also state that the Operations Model study is behind schedule because most of the study milestones, including alternative scenario evaluations, have yet to be completed. Skagit County and the Partnership therefore request that City Light revise the study plan to include a new schedule with clearly defined milestones and timelines for identifying alternative operating scenarios to be modeled and evaluated in concert with other study and model results.

Skagit County and the Partnership also state that City Light needs to make clear to stakeholders how many operational scenarios will be run, how those scenarios will be selected, and specifically how the operational scenarios will be evaluated. In addition, the Skagit County and the Partnership state that the ISR should have reported on the timeline for this work as it will inform settlement negotiations.

Reply Comments

City Light states that, as discussed at the May 19, 2022 Operations Model Workshop, it will continue to discuss, develop, and evaluate alternative operational scenarios with interested

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stakeholders in Operations Model workshops. City Light states that figure 3.1-2 of the Operations Model ISR shows possible criteria for evaluating scenarios informed by these discussions, which include in relevant part here: flood control, reservoir water levels/erosion, and spill volumes. City Light states that the number of scenarios to be evaluated and the metrics for evaluation will be determined collaboratively with stakeholders. City Light indicates that the USR will include a scenario documentation report that documents the process of developing and evaluating operational scenarios.

Regarding Skagit County and the Partnership's recommended Flood Storage Proposal, City Light states in its letter to the Skagit County and the Partnership filed on June 10, 2022 that "it has reviewed the scenario request submitted by the County and Partnership and it is currently working through the requested scenario analyses which will be completed and discussed at the June 16, 2022 Operations Model work group meeting." In the June 10, 2022 letter, City Light states that it will also discuss at the work group meeting and in subsequent meetings, this scenario and other potential alternative scenarios to account for other flow-related goals of the project.

Discussion and Staff Recommendation

We have reviewed City Light's meeting slides from the June 16, 2022 Operations Model work group meeting that were filed on July 19, 2022. The slides indicate that City Light has begun to analyze the Skagit County and Partnership Flood Storage Proposal operating scenario through the Operations Model, and the scenario was discussed with stakeholders at the meeting. Further, section 6.1 (*Next Steps*) of the OM-1 ISR indicates that:

"A scenario request form, similar to the example attached to the RSP, will be used to develop model scenarios in consultation with LPs [Licensing Participants]. To help facilitate the consultation with LPs, a reoccurring monthly Operations Model Work Group Meeting is scheduled for every third Thursday of the month. Evaluation of operating scenarios and potential resource impacts will be done in coordination with other Project models and resource study information. It is anticipated that a model output template will be developed to provide consistent information on modeling results for each of the scenarios evaluated."

This information indicates that City Light is implementing the Operations Model study as required by the approved study plan (section 5.15(d)), the process for stakeholders to request evaluation of alternative operating scenarios is clearly defined, and there is ample opportunity for stakeholders to submit alternative operating scenarios for City Light to evaluate and discuss at monthly workgroup meetings between now and the filing of the USR in March 2023. Therefore,

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there is no need to modify the study plan to include a new study schedule with clearly defined milestones for developing and evaluating alternative operating scenarios.

Climate Change Modeling

Requested Study Modification

NMFS states that City Light committed in the updated RSP to develop an additional base-case model scenario for the operations model that represents conditions under a future climate change scenario, but no update was provided on this task in the ISR. NMFS states that City Light should complete this task before the license application due date.

Upper Skagit states that running the current operations scenario using climate change data is a good place to start examining how project operations might fall short in protecting fish in the future. Upper Skagit adds that modeling should continue by developing a suite of operating scenarios that optimize operations for fish protection using the climate change data. This would be a precursory look at how the project might need to be changed in the future and will guide future scenarios over the course of the next license as actual climate trends develop.

The District and Partnership state that City Light has provided several presentations to stakeholders indicating their intent to use the Distributed Hydrology Soil Vegetation Model (DHSVM) as a tool for determining future potential inflows resulting from climate change on project operations, but the ISR does not mention the DHSVM or provide any additional information on how the future inflow scenario will be developed. The Districts and Partnership assert that there is a wealth of analytical tools and studies that demonstrate that inflows to the project are changing and will continue to change during the license period; specifically, trends in increased early season rain-on-snow events and the effects of glacial recession on early season inflow hydrology are well documented in multiple studies in the Skagit and Puget Sound and need to be utilized in the Operations Model.

Reply Comments

City Light states that alternative operational scenarios can be simulated using either the historical data sets or a potential future climate change flow series based on the DHSVM, both of which are available and have been provided to stakeholders via the web-based operations model. City Light adds that the DHSVM files and summaries are available via City Light's project SharePoint site.

Discussion and Staff Recommendation

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Although City Light provides no update in the ISR on the status of its updated RSP commitment to “develop a projected climate change operations model from the base model,” it indicates in its reply comments that it has developed climate change flow series data based on downscaled global climate models and the DHSVM. We have reviewed the climate change flow series that are available on City Light’s SharePoint site. The data consist of simulated future daily average flows for a period of record from 2011 to 2099 based on the CCSM4 global climate model, which appears to meet the intent of the approved study plan (section 5.15(d)). There are also about 113 years and 78 years of consecutive daily flow records for the USGS gages at Newhalem (just below Gorge Powerhouse) and Marblemount (about 16 miles downstream), respectively, that can be used to evaluate any actual changes in Skagit River flows over time. Additionally, as previously discussed, there is ample opportunity between now and the filing of the USR for stakeholders to develop alternative project operation scenarios, which could include scenarios that stakeholders develop to account for future changes in streamflow due to climate change. Therefore, no modifications to the study plan are needed.

*Operations Model Validation*Requested Study Modifications

Skagit County and the Partnership request that the Operations Model inflows be validated at a time interval that is meaningful for the successful operation of the Skagit Project prior to and during a flood event. The Skagit County and the Partnership state that the ISR documents the methods used to determine daily and monthly average flows, but does not provide any information or methods regarding sub-daily time steps necessary to evaluate project operations prior to and during floods.

Upper Skagit state that the study plan determination specified that City Light would use an hourly time step to assess the effects of project operation on environmental resources and flood management. Upper Skagit state that it is unclear whether City Light will accommodate this by dividing daily mean outputs into hourly increments, or if they will run the model hourly once they are confident in their model setup and validation. Upper Skagit assert that daily high and low flows need to be captured so it would be best to develop the model inputs as hourly intervals, rather than an hourly average based on mean daily flows.

Reply Comments

City Light states that, using the typical demand schedule outlined in the ISR, the Operations Model simulates project operations on an hourly timestep. However, typically, during a large flood event, project operation is driven by water allocation and not short-term

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decisions (e.g., hourly changes) based on pricing, demand, etc. City Light states that utilizing the daily average inflow dataset as the primary input, the Operations Model simulates operations to allocate water between reservoir storage and required outflow constraints (physical, environmental, and operational) while permitting generation. Therefore, the Operations Model was developed and validated for the allocation and balance of water at the project under typical operations as well as operations prior to and during large flood events. City Light asserts that the time interval for model simulation is explained in detail in section 5.2.4.6 of Attachment A to the Operations Model Study ISR.

Discussion and Staff Recommendation

As stated in section 4.0 of the Operations Model ISR, the model can predict reservoir elevation, head losses, net head, turbine and spill discharge, power generation, and other user-specified variables in a sub-daily time step of hourly (or higher resolution) increments. Further, section 5.1 states that the model predicts flow releases through the powerhouses (or spill) based on an hourly estimate of inflow, which it computes into a total daily flow volume available to route downstream, and then uses the daily flow available to predict flows releases on an hourly basis to maximize the amount of energy generated during peak daily demand. Therefore, it is our understanding that the modeling analysis is based on hourly inflow availability, and the model can predict flow releases at each development on an hourly basis (based on the hourly inflows). This modeling approach and time step should be sufficient to inform staff's analysis of project operations across the full range of hydrologic conditions including prior to and during floods (section 5.9(b)(4)). Accordingly, no modifications to the study plan are recommended.

Inflow Hydrograph Calculations

Requested Study Modification

NPS states that City Light should provide the specific calculations used for developing the synthetic hydrographs for all flow inputs (e.g., tributary or "lumped contributing areas") used in the model. NPS states that the flow data should cover the entire historic period of record developed for the operations model.

Reply Comments

City Light states that the flow series utilized in the model, including actual historical flow series and the DHSVM flow series, have been provided to stakeholders via the web-based model. Additionally, the DHSVM files and summaries are available via the project SharePoint site. City Light states that it will also provide the actual historical flow series via the SharePoint site. City Light states that the historical hydrologic daily flow series was developed from publicly available

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USGS data. The development of this historical daily flow is explicitly detailed in Appendix 1 of Attachment A to the OM-01 Operations Model Study ISR. City Light asserts that Appendix 1 was written so that the methodologies could be replicated by others if desired.

Discussion and Staff Recommendation

As City Light points out, Appendix 1 of Attachment A to the Operations Model ISR describes the methods and calculations it used to estimate tributary inflows and accretion for each of the river reaches relevant to the modeling analysis. It also describes the period of record it used to develop inflows for each reach. We have reviewed this information and conclude that the description of the methods/calculations meet the requirement in the approved study plan and are sufficient to understand how the operations model was constructed (section 5.15(d)). Therefore, no modifications to the study plan are needed.

Water Balance Tracking

Requested Study Modifications

NPS states that several significant assumptions are made in the model regarding tributary inflow to the project reservoirs and the reaches between the reservoirs. NPS asserts that an additional quantitative assessment is needed to understand how well the water balance approach that is implemented in the model is capturing tributary inflow. Therefore, NPS requests that City Light develop metrics to quantitatively assess how well the model tracks the water balance in the system (e.g., inflows and outflows, reservoir storage, evaporation) on seasonal and annual bases, as well as by reservoir (i.e., inflows to Ross, Diablo, and Gorge reservoirs). NPS states that the assessment should identify strengths and shortcomings in tracking the water balance for the Skagit system. NPS asserts that developing a better understanding of the shortcomings of how well the model replicates the water balance will provide needed insight into developing alternative scenarios and potentially incorporating future climate conditions.

Reply Comments

City Light states that additional information on water balance tracking will be provided in the USR. Specifically, the USR will provide examples of simulated and actual operation deviations and the source of those deviations, such as drawdown for maintenance operations. City Light states that given the limited available hydrologic data within the project basin, water balance of the project is and will be compared based on reservoir operations (lake levels) and total project outflows (captured by the USGS gage Skagit River at Newhalem 12178000).

Discussion and Staff Recommendation

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Because the Operations Model study is ongoing and City Light has yet to provide the additional information on water balance tracking, it is premature to determine how well the model tracks water balance through the project. We expect that the water balance information when presented in the USR, will either confirm that the model and methods are sufficient to address this issue or that alternative methods of analysis are needed to develop an accurate model. Therefore, no modifications to the study plan are needed at this time.

Lower River Synthesis Study (SY-01)Background

The goal of the approved study is to compile, analyze, and summarize available data and studies on anadromous fish in the Skagit River watershed, characterize factors affecting these populations, and develop hypotheses on the potential impacts of the project and other contributing factors in the watershed. The literature review would help to identify potential data gaps, if any, that are needed to evaluate project effects on aquatic habitat in the lower Skagit River from the Sauk River confluence to the Skagit delta and estuary, including several tributaries to the Skagit River in this reach.

The study was divided into four steps: (1) data compilation, (2) data analysis, (3) identification of factors affecting the target species by reach and life stage, and (4) identification of key uncertainties for each of these factors and the information needed to address/reduce the uncertainties. The four steps were intended to be completed within the first study season, which would allow time for the information to be used to help guide decision-making on any needed field data collection during the second study season.

The ISR notes the following major variances from the approved study plan that have affected study implementation to-date:

(1) The study area was expanded to include the Swinomish River delta and portions of the Stillaguamish River delta, and nearshore habitats in Skagit Bay and Padilla Bay, based on preliminary data review and comments from stakeholders during the preliminary Synthesis Study Work Group meeting. City Light states that these adjustments to the study area are designed to better capture the extent of habitat that support target species and life stages produced by the Skagit River (e.g., geomorphic delta extent and nearshore habitats) as well as capturing major sources of potential variation of influences on resource conditions in the lower Skagit River (e.g., the Sauk River); and

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(2) During the initial work group meeting associated with this study in June 2021, stakeholders expressed an interest in modifying the study's approach to provide for a study team to execute the study and convene regular work group meetings to collaborate with stakeholders. Following this meeting and issuance of the Study Plan Determination on July 16, 2021, City Light identified a qualified principal investigator to begin the study in the fall of 2021. Given the delayed timing of study implementation, the schedule for completing step 1 is now planned for September 2022, while the remaining steps, which are largely contingent on the results of step 1, will be implemented between June 2022 and March 2023, with initial discussions on the need for additional lower river field studies to occur by December 2022.

*Geographic Scope*Requested Study Modification

Skagit County states that the study plan determination approved Study SY-01 with the understanding that the study would "identify the project's potential contribution to those factors affecting [the] life stages of anadromous fish resources and identify data gaps related to the evaluation of the project's effects." Skagit County asserts that the ISR unilaterally expanded the scope of Study SY-01 beyond the intent of the approved study by incorporating the Skagit estuary, the marine environment, and portions of the Samish River Basin, a neighboring watershed. Skagit County states that the ISR proposes to analyze, among other things, species-limiting factors, regional activities and land uses, and ocean conditions. Skagit County asserts that in a licensing process and study program that is already highly complex, it does not understand the purpose behind a study, "pursued under the rubric of the FERC process, that seeks to explore issues and geographic areas wholly unconnected with the Project and its impacts."

Skagit County points out that any studies in the estuary, marine waters, or other river basins seem to conflict with FERC's conclusion in Scoping Document 2 that there is no project nexus to the lower Skagit River or estuary, let alone other watersheds or marine areas. Therefore, Skagit County states that it doesn't understand the purpose of the study, and requests that City Light revise the study plan to provide significantly more detail on the methods and assumptions it used to expand the study area.

Reply Comments

City Light did not specifically respond to this comment.

Discussion and Staff Recommendation

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Contrary to Skagit County's assertion, the Commission's Scoping Document 2 did not state that there is no project nexus to the Lower Skagit River; rather, it stated that the downstream extent of project effects has yet to be determined. Regardless, the study plan determination approved the SY-01 study's original geographic scope as set forth in section 2.5 of the RSP, which specifically includes the Skagit River from the Sauk River confluence to the Skagit delta and estuary and numerous tributaries to the Skagit River. The RSP did not specify a boundary for the "Skagit delta and estuary", but City Light has agreed to include the Swinomish River delta and Stillaguamish River delta as well as nearshore habitats in Padilla Bay which would extend beyond the study area for the "Skagit delta and estuary" that were proposed in the approved study plan. Although City Light states in the ISR that it included these areas "to better capture the extent of habitat that support target species and life stages produced by the Skagit River," it is our understanding based on aerial imagery that none of these areas are specifically located within the Skagit delta and estuary,² and we don't see how habitat conditions within these marine areas in Puget Sound relate to the effects of project operation or the development of license conditions (section 5.9(b)(5)). Therefore, we do not recommend adopting City Light's proposal in the ISR to include in the SY-01 study area the Swinomish and Stillaguamish River deltas or nearshore habitats in Padilla Bay. Nonetheless, City Light is free to do so on its own.

*Evaluation of Non-Project Activities*Requested Study Modification

Skagit County states that it has tried for generations to successfully preserve the Skagit Valley's agricultural land base against urban sprawl and other incompatible uses while balancing the needs of the fisheries resource. Skagit County states that "it strongly opposes the conversion of viable Skagit farmland as offsite compensatory mitigation for distant urban areas' unrelated activities, ancillary political objectives, and the like." Accordingly, Skagit County requests that Study SY-01 be amended to clarify that the study is concerned solely with quantification and analysis of project impacts and no other actions unrelated to project operation. Conversely, if the study plan is not amended as requested by Skagit County, then it recommends that it be revised to include a compilation and analysis of comprehensive anadromous fish harvest data. Skagit County states that analysis of coded wire tag data recovered in West Coast marine and in-river fisheries shows that over 80% of the available summer/fall Skagit Chinook harvest occurs in the ocean. As such, Skagit County asserts that best available science strongly suggests that excessive marine harvest is the principal limiting factor in Skagit Chinook recovery and available

² The ISR refers to the "Swinomish River delta" but this location is not clearly defined in the ISR and appears to refer to the deltas on the north and south sides of the Swinomish Channel. Swinomish Channel is an approximately 11-mile-long navigation channel that connects Padilla Bay to the north and Skagit Bay to the south.

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in-river tribal Treaty harvest. Therefore, to the extent that City Light intends to pursue a comprehensive analysis of all Skagit anadromous species and the main factors limiting their recovery, the study should be modified to incorporate comprehensive marine and in-river harvest data.

Reply Comments

City Light did not specifically respond to this comment.

Discussion and Staff Recommendation

Although the approved study plan notes that there are many factors that could be affecting anadromous fish populations in the Skagit River Basin, as explained in section 2.1 of the RSP, the primary objective of the study is to compile existing information on habitat conditions in the lower river that might be affecting anadromous fish populations and could be related to project operation. This information would then be used to determine whether data gaps exist that need to be filled through additional studies or modeling efforts to understand potential project effects in the lower river. Examples of the specific habitat parameters that are the subject of the study include: water quality, habitat availability, wood and sediment transport, riparian habitat, and floodplain conditions. While it's reasonable to conclude that any of these specific habitat parameters could be related on some level to project operation, this would not be the case for marine and in-river fish harvest data, neither of which is related to project operations or effects (section 5.9(b)(5)). Given the lack of a nexus between marine and in-river fish harvest data and the effects of project operation, there is no need to modify the study plan to require compilation of this data.

Natural Hydrograph

Requested Study Modification

Skagit County states that SY-01 should be revised to include an evaluation of Skagit Project operations on flows as a predicate to any further review of potential project effects in the lower river or beyond. Skagit County states that river discharge is a "super-determinate" of habitat, and it understands that the Skagit Project can regulate flows and modify the natural hydrograph for the benefit of instream resources. For this reason, Skagit County requests that SY-01 be modified to include a discussion of the natural (unregulated hydrograph) as compared to the modified hydrograph to evaluate potential benefits of project operations on the lower river and estuary.

Reply Comments

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City Light did not specifically respond to this comment.

Discussion and Staff Recommendation

The approved study plan already requires a comprehensive set of studies and models (e.g., instream flow models, geomorphology studies, sediment transports models, water quality monitoring and model) to evaluate the flow-related effects of project operation on aquatic habitat and environmental resources. However, the baseline for evaluating project effects at relicensing is existing conditions, which includes the presence of the project as it currently operates, not the “natural” hydrograph, which would be the theoretical condition that would exist in the absence of the hydropower project. Therefore, there is no need to modify the study plan to require City Light to compare the actual hydrograph under current project operation to the theoretical unregulated hydrograph that would exist in the absence of the project.

Stakeholder Outreach

Requested Study Modification

Skagit County states that Study SY-01 should be revised to include community, landowner, and special purpose district outreach. Skagit County asserts that City Light has dramatically and unilaterally changed the Skagit Project study area, and City Light has not done any outreach to local stakeholders, landowners, or organizations that would be affected by habitat work on the broad multi-watershed area within the geographic scope of analysis for Study SY-01. Skagit County states that any discussion of habitat projects or settlement agreements that affect either private farmland or diking and drainage infrastructure must include broader community input. Skagit County asserts that City Light lacks authority to unilaterally modify/setback existing dikes, levees, or drainage infrastructure, which is typically required for habitat enhancement projects in estuaries, because this infrastructure is owned, operated, and maintained by special purpose districts.

Reply Comments

City Light did not specifically respond to this comment.

Discussion and Staff Recommendation

At this point in the licensing process, we are not aware of any specific habitat enhancement measures that City Light is proposing in the lower Skagit River as part of the proposed relicensing action that would affect farmland or diking and drainage infrastructure.

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Therefore, there is no basis for requiring City Light to conduct community, landowner, or special purpose district outreach to notify these entities of such measures. Accordingly, no modifications to the study plan are needed.

Water Quality Study (FA-01)

Background

As required by the approved study plan, City Light continuously monitored water temperature at six locations in the Skagit River between Gorge Powerhouse and a point just below the Baker River confluence at the town of Concrete. City Light is also developing a hydrodynamic water quality model (CE-QUAL-W2) to further evaluate water temperatures, and specifically the effects of cold-water releases from the reservoirs on temperatures in the Skagit River between Gorge Powerhouse and just downstream of the Baker River confluence.

City Light completed one year of continuous temperature monitoring during the first study season and proposes to continue the continuous monitoring through the spring of 2023 as required by the approved study plan. Development of the water temperature component of the CE-QUAL-W2 model is ongoing but is planned for completion by the end of the second study season.

Downstream Extent of Water Quality Model

Requested Study Modifications

Washington DFW, NPS, FWS, and Upper Skagit all recommend extending the water quality model to the Highway 9 bridge in the city of Sedro-Woolley (about 31 miles downstream of the town of Concrete). Washington DFW and Upper Skagit state that the reach between the Baker River confluence and Sedro-Woolley contains some of the best spawning and rearing habitat on the Skagit River for anadromous salmonids and information on this reach is needed to identify project effects and inform the development of protection measures. NPS states that to fulfill its commitment in the NOA, City Light needs to either extend the water quality model to Sedro-Woolley or collect additional empirical water quality data “to inform the utility of extending the model to this point.”

FWS states that it understands City Light’s concerns regarding the difficulty of isolating Baker River flows from project-controlled flows, but believes this is not a sufficient reason for not extending the modeling effort down Sedro-Woolley because flows and water quality inputs from the Baker River are predictable and regulated by Puget Sound Energy’s operation of the Baker Hydroelectric Project.

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Reply Comments

City Light states that it agreed to develop a CE-QUAL-W2 model to evaluate potential temperature impacts from the project on aquatic resources as part of the updated RSP and, at the request of stakeholders, even extended the modeling efforts to the town of Concrete at project river mile 54 from its originally proposed confluence with the Sauk. City Light states that potential project effects on water temperature downstream of Concrete would be difficult to discern due to intervening influences, such as operations of the Baker River Hydroelectric Project and agricultural and municipal runoff. City Light states that modeling downstream to the town of Concrete is more than sufficient to evaluate potential project effects on temperature in the Skagit River.

City Light states that the stakeholders have not demonstrated that the water quality model was developed in a manner inconsistent with the approved study plan (section 5.15(d)), nor have they identified significant new information material to the study objectives or an identified project effect that warrants expansion of the water quality data collection or modeling effort. Accordingly, City Light does not agree to extend the water quality sampling or CE-QUAL-W2 modeling farther downstream below the town of Concrete.

Discussion and Staff Recommendation

Although the initial study plan determination did not evaluate recommendations to extend the water temperature model downstream of the town of Concrete because there were no stated disagreements about the downstream extent of the model at that time, it did evaluate recommendations for water temperature monitoring at additional sites all the way downstream to the Skagit River estuary. As stated in the initial determination, available water temperature data downstream of the project “show that water temperatures in the Skagit River below Gorge are generally cold and consistently meet levels established by the state water temperature standards.³ Therefore, there is no evidence that the project is causing significant adverse effects on water temperatures below the project, and NMFS, NPS, and Upper Skagit have not demonstrated that the project is adversely affecting water temperatures at sites farther downstream than City Light’s

³ The Washington State temperature standard for the Skagit River during the summer specifies that the 7-day average daily maximum temperature should not exceed 16°C from June 15 to September 1.

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proposed monitoring locations.⁴ Further, the water quality data and modeling results from City Light's proposed study should be sufficient to assess the project's contribution to water temperature conditions in the lower river downstream of three major tributaries. If the monitoring results reported in the ISR and USR indicate that there are unforeseen effects on water temperatures at City Light's sampling sites at the lower end of the study area (e.g., below the Baker River confluence), then additional sampling can be considered in subsequent study seasons."

Based on our review of the water temperature monitoring data presented in the ISR, the data continue to show that water temperatures in the Skagit River, including at sampling sites that are the farthest downstream near Concrete, are generally cold and consistently below the maximum temperature levels established by the state water temperature standards. Only one of the water temperature monitoring sites (SKAGIT 6) located at project river mile (PRM) 60.8 showed elevated water temperatures that exceeded levels established by the state standards. However, as explained in the ISR, elevated water temperatures recorded at SKAGIT6 are unique to this location and are not evident at the sites immediately upstream and downstream (PRM 69.3 and 54.5, respectively). The ISR states that these elevated temperatures may reflect localized pooling caused by sediment deposition at the monitoring site, which City Light intends to evaluate and address during the second study season. Therefore, the temperature monitoring data in the ISR do not show that the project is causing significant adverse effects on water temperatures at the downstream extent of the study area; thus, there is no evidence to suggest there is a need to extend water quality monitoring or the water temperature model farther downstream (section 5.9(b)(4)). Accordingly, we do not recommend extending the water temperature model an additional 31 miles downstream to Sedro-Woolley.

*Off-channel Habitat Water Quality Monitoring*Requested Study Modification

Upper Skagit states that flow enhancement measures under a new license (instream flows, process flows) would affect water quality conditions in off-channel and floodplain habitats, and it is necessary to evaluate how changes in the flow regime will influence water quality. Upper Skagit states that "water quality monitoring in floodplain habitats will also aid in cross-validating CE-QUAL-W2 modeling efforts by collecting data where the W2 model will not be characterizing Project effects to water quality conditions." Therefore, Upper Skagit recommends that City Light conduct water quality monitoring, including nutrient data, in floodplain habitats.

⁴ The proposed monitoring locations extend about 40 miles downstream and include sampling sites below three large tributaries to the Skagit River (i.e., Cascade, Sauk, and Baker Rivers).

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Reply Comments

City Light states that it is addressing water quality in off-channel habitats in two ways: (1) water level loggers installed at 16 off-channel locations and proposed for installation at 4 additional off-channel locations will provide concurrent water level and temperature data that can be used to link conditions in off-channel areas to mainstem flows, and (2) off-channel locations near the mainstem are being evaluated for inclusion in the CE-QUAL-W2 model. Initial selection of locations to include in the model will be based on information collected as part of a separate study being funded by City Light as part of current license implementation (Evaluation of Off-Channel Chinook habitats) and the GE-04 Study. City Light states that it will confer with Upper Skagit Indian Tribe to confirm which off-channel areas can and will be modeled.

Discussion and Staff Recommendation

Upper Skagit does not specify which water quality parameters should be included in the expanded water quality monitoring in off-channel habitats, nor does it specify which sites should be sampled or the level of sampling effort. Regardless, except for temperature monitoring in off-channel habitats, the Commission's initial study plan determination already evaluated the adequacy of City Light's proposed water quality monitoring program for all other parameters (e.g., TDG, turbidity, macroinvertebrates, nutrients) downstream of Gorge Powerhouse, including off-channel habitats. The determination concluded that City Light's monitoring program as described in the RSP was sufficient to inform staff's analysis of project effects.

Regarding temperature monitoring in off-channel habitats, City Light's proposal to install at least 16 temperature loggers in off-channel habitats is a reasonable level of sampling effort that should provide sufficient information to inform our analysis of differences between main channel and off-channel water temperatures. For example, if the data show that water temperatures in the off-channel sites are substantially higher in the summer than the main channel, then there could be a need for higher flows to ensure that the off-channel sites are connected to the main channel flow to reduce water temperatures (section 5.9(b)(4)). Therefore, we recommend adopting City Light's proposed off-channel temperature monitoring. No other modifications to the study plan are recommended.

Total Dissolved Gas Monitoring

Requested Study Modifications

Upper Skagit states that data collected by City Light indicates elevated total dissolved gas (TDG) values in the Gorge bypassed reach during spill. Therefore, it requests that City Light

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extend TDG sampling farther downstream in the Gorge bypassed reach, below Diablo Dam, and below Ross Dam. Upper Skagit asserts that elevated TDG values make it necessary to fully evaluate the entire spatial extent of TDG effects in the bypassed reach, and to determine if those effects occur upstream when Ross and Diablo Dams are spilling.

Reply Comments

City Light states that TDG has been and will continue to be sampled longitudinally throughout the Gorge bypassed reach and in Gorge Reservoir downstream of Diablo Powerhouse. However, City Light does not propose to sample TDG in Diablo Reservoir below Ross Dam because spills are infrequent at Ross Dam due to Ross Lake's large storage capacity. Specifically, spills at Ross Dam are typically associated with gate testing, are of short duration, and average only a few cubic feet per second. During the period of 2014-2018, Ross Dam spilled 20 times; 11 of these occurred in August 2015 during the Goodell Fire, which disrupted project operation and transmission, and are not reflective of normal conditions.

Discussion and Staff Recommendation

The ISR shows that City Light has and will continuously monitor TDG at three locations (upper, middle, and lower sections) in the approximately 2.5-mile-long Gorge bypassed reach during the second study season. Similarly, City Light has and will continuously monitor TDG in the Diablo Powerhouse tailrace in Gorge Lake during the second study season. Therefore, there is no reason to modify the study to conduct additional sampling in the Gorge bypass and in the Diablo powerhouse tailrace as suggested by Upper Skagit.

Regarding monitoring below Ross Dam, spill is typically the source of elevated TDG levels in dam tailraces and, as City Light points out, Ross Dam spill is infrequent. Section 3.5.1 of the PAD indicates that Ross Dam spilled 20 total days from 2014-18 and 11 of these events were associated with an emergency (Goodell Creek Wildfire). The remaining spill events were spread out over 2014 and 2016-2018, typically occurring 1 or 2 days per year and including very low volumes of flow averaging between less than 1 and 5 cfs. Based on these data, there is no reason to believe that infrequent and minimal spill flows at Ross Dam would be causing elevated TDG in the Ross Dam tailrace (section 5.9(b)(4)). Therefore, we do not recommend requiring City Light to conduct TDG monitoring in the Ross Dam tailrace.

Instream Flow Model Development Study (FA-02)

Background

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The approved study plan requires City Light to develop an instream flow model to evaluate flow and aquatic habitat relationships for the Skagit River in the approximately 29-mile study reach between Gorge Powerhouse to a point just downstream of the confluence with the Sauk River. The modeling platform to be used is the U.S. Army Corps of Engineers' (Corps) 2-dimensional HEC-RAS unsteady flow hydraulic model. Specifically, City Light is required to: (1) develop topography and geometry data; (2) specify boundary conditions; (3) collect field data on river stage, mapping substrate and cover, depth, velocity, and discharge data at agreed-upon transects; (3) calibrate and validate the model; (4) develop habitat suitability criteria (HSC); and (5) conduct consultation workshops with stakeholders during model development to solicit input and report results. The focus of the hydraulic model will be on the in-channel portion of the mainstem Skagit River corridor, and any side channels identified by the study team as having significant habitat value; however, to assess off-channel habitat and floodplain connectivity, the model will also include, in lesser detail, the overbank floodplain out to the valley side walls.

In the updated RSP, City Light proposed to “Consider a forward looking infrared (“FLIR”) mapping survey (perhaps seasonally during periods when greatest differential in temperatures would be expected to occur) throughout the entire Project reach to identify potential groundwater sources/upwelling as detected by thermal differences.” City Light would fulfill this commitment by convening “workshops to discuss the influence of groundwater and utility of FLIR on hyporheic exchange (see Torgersen et al 1999 for FLIR methodology technique).” The approved study plan required City Light to conduct these workshops.

As stated in the ISR, data collection for the Instream Flow Model Development Study is substantially complete, while analysis is ongoing. Outstanding analysis includes finalizing calibration of the hydraulic models and completion of the fish habitat modeling analysis.

City Light convened a workshop with stakeholders on March 22, 2022, to discuss the potential benefits of FLIR surveys.

Hydraulic Roughness Values

Requested Study Modification

The Swinomish states that HEC-RAS (and its predecessor HEC-2) has been widely recognized and accepted for studying flood flows to map floodplain inundation (100-year flood and Probable Maximum Flood) and to design hydraulic structures in a riverine environment; however, HEC-RAS has not been widely applied to study instream flows. The Swinomish assert that the two-dimensional version of HEC-RAS proposed for this study does not allow for varying hydraulic roughness (Manning's n) with flow, and it expects roughness to range from relatively low (under high flow conditions) to relatively high (under low flow conditions). The Swinomish

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states that this limitation could be overcome by developing a low flow model (with high hydraulic roughness values), a mid-flow model (with intermediate hydraulic roughness values), and a high flow model (with low hydraulic roughness values). The Swinomish assert that this relatively modest addition to the modeling effort would provide substantial benefit and should be prioritized.

Reply Comments

City Light acknowledges the inability to modify hydraulic roughness with flow using HEC-RAS. City Light states that it addressed this issue by creating separate models with unique roughness values for each of the four calibration flows (i.e., low, moderate, high, and bankfull). From these, it created models with unique roughness values (interpolated from the four calibration discharge models) for the 12 flows run through the habitat model. City Light states that this approach will be detailed in the model calibration report that will be filed with the USR.

Discussion and Staff Recommendation

Because the instream flow model study is ongoing, it is premature to determine the adequacy of City Light's methods for addressing hydraulic roughness in each of the different model runs. The model calibration report expected to be included in the USR could be used to determine whether the methods are sufficient to address this issue and whether alternative methods are needed to develop an accurate model. Therefore, no modifications to the study plan are needed.

FLIR Surveys

Requested Study Modifications

Upper Skagit states that project flow releases affect connectivity to off-channel floodplain habitats, where groundwater upwelling can create a strong influence on temperature and nutrient availability. Upper Skagit states that it is important to identify these areas because of the habitat they provide for spawning and rearing anadromous salmonids. Therefore, to develop a better understanding of locations along the river where groundwater upwelling occurs, Upper Skagit recommends that City Light conduct FLIR surveys.

FWS states that although temperature monitoring equipment has been deployed throughout the Skagit River, major tributaries, and select floodplain channels, these efforts are not sufficient to comprehensively identify or characterize groundwater inputs across the length of the Skagit River. FWS asserts that understanding where these areas occur within the landscape can help inform flow scenarios in the instream flow model to show when and where surface

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water periodically connects to off-channel areas with groundwater upwelling to maximize salmonid spawning and rearing habitat. FWS also states that groundwater surveys should be conducted along the reservoir shorelines to identify potential spawning habitat within the reservoirs. Therefore, FWS recommends that City Light conduct FLIR imaging surveys from the U.S./Canada border in Ross Reservoir downstream to at least the Sauk River confluence. FWS states that the surveys should occur during the summer of 2022 when the contrast between groundwater and surface water temperatures are at their highest levels.

The Swinomish also recommends that City Light conduct a FLIR survey during the summer along the entire river including the floodplain below the project as well as around all three of the project reservoirs. The Swinomish states that it and other stakeholders have made a clear case of the important contribution FLIR brings to an ecosystem understanding of project impacts. Specifically, the Swinomish contends that FLIR surveys have a clear nexus to the Skagit Project and are relevant to several ongoing riverine studies including FA-01 (Water Quality), FA-02 (Instream Flow), and GE-04 (Geomorphology) because they will provide an indication of the spatial extent to which groundwater-surface water exchange is occurring in the Skagit River under existing operations. The Swinomish states that FLIR surveys will also identify potential shoreline spawning habitats in the reservoirs as indicated by areas of groundwater upwelling. The Swinomish asserts that, although there are no relicensing studies explicitly studying groundwater-surface water interactions, there are connections between surface and subsurface/hyporheic flows in river systems, and these “connections most certainly exist in the Skagit River and can be and are influenced by SCL operations.” The Swinomish states that Sawyer et al. (2009) demonstrated the types of impacts dam operations can have on hyporheic exchange in the riparian zone of a regulated river, and these impacts can occur within the main channel of the river as well as off-channel and floodplain habitats; however, the extent of these effects has never been determined.

The Swinomish states that the following information that would be gained from a FLIR survey: (1) a map of existing groundwater influences that are important for fish habitat; (2) a calibration aid for the water temperature model; (3) “a more complete, largely synoptic picture of thermal patterns of the entire reach of the Skagit River influenced by SCL operations;” and (4) a list of specific areas of interest for future monitoring during the license term. The Swinomish estimates that the cost of a FLIR survey for entire river and floodplain below the project would be between \$60,000 and \$100,000.

Reply Comments

City Light states that the collection of FLIR data is not necessary to complete relicensing studies. City Light asserts that “in order to develop a meaningful relationship between Project operations and the effects of surface flow on groundwater dynamics, FLIR would need to be

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applied over a range of flows. Conducting a single FLIR analysis during 2022, as requested by LPs, would not provide sufficient additional value to support an analysis of Project effects and identification of PME to include in the new license. City Light recognizes the value of identifying and mapping undetected sources of groundwater influx but has determined that such mapping would be better suited to supporting development of habitat enhancement measures following issuance of the new Project license.”

City Light then states that the application of FLIR to project reservoirs should be considered a new study request under 18 C.F.R. § 5.15(e); however, the stakeholders’ request does not meet the Commission’s criteria for a new study at this point in the ILP. City Light asserts that the stakeholders “have not identified any material changes in the law or regulations applicable to the information request. Nor have they established why the goals and objectives of the FA-01 Water Quality Monitoring and Water Quality Model Development studies, FA-02 Instream Flow Model Development Study, and GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study could not be met with the approved study methodology. Finally, the LPs have not explained why the request was not made earlier or identified any significant changes in the project proposal or that significant new information material to the study objectives has become available.”

City Light adds that Ross Lake, which has by far the most shoreline of the reservoirs, is operated as a flood control facility, and therefore, is subject to large fluctuations in water surface elevation. City Light states that the large fluctuations are primarily to support the U.S. Army Corps of Engineers’ flood management actions in the Skagit River Basin. City Light states that it believes that a “one-time application of FLIR would be of little value in identifying PMEs that would influence Corps drawdown requirements for flood risk mitigation.”

Discussion and Staff Recommendation

FWS and the Tribes reason that a FLIR survey is needed primarily to identify locations along the Skagit River below the project where groundwater influx occurs because they believe that these areas are important for fish spawning and rearing habitat. However, FWS and the Tribes do not provide any specific evidence that groundwater upwelling sites are a critical variable for determining fish habitat use in the Skagit River, especially when compared to other known microhabitat variables that influence fish habitat site selection and are being evaluated as part of the instream flow modeling analysis (e.g., depth, velocity, substrate, cover). Additionally, although FWS and the tribes state that the FLIR survey is needed to evaluate water temperatures throughout the river, City Light is already monitoring water temperatures in the main channel of the river and in select off-channel habitats. It is also developing a water temperature model to specifically evaluate the effects of project operation on water temperatures downstream. The results from these studies should be sufficient to inform our analysis of the effects of project flow

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releases on fish spawning and rearing habitat availability in the Skagit River downstream of the project (section 5.9(b)(4)). For these reasons, we do not recommend requiring City Light to conduct a FLIR survey along the river and floodplains downstream of the project.

Similarly, FWS and the Tribes argue that a FLIR survey around the project reservoirs is needed to identify potential shoreline spawning habitats as indicated by areas of groundwater upwelling, presumably to inform introduction of sockeye salmon to the reservoirs, which is the only species that we are aware of that consistently spawns in lake and reservoir shoreline habitats.⁵ Although FLIR surveys could potentially identify areas close to the water surface where upwelling might occur, we don't see how the information to be gained from the survey would provide any information on the extent (i.e., magnitude and duration) of groundwater upwelling flows throughout the sockeye spawning and incubation period, or other factors such as substrate, shoreline slope, etc., all of which would be needed to determine the potential suitability of any upwelling sites (should they occur) for sockeye spawning. Further, the project reservoirs are not located in areas that were natural lake systems prior to project construction and it seems unlikely that significant groundwater upwelling areas would occur around the current water levels of the reservoir shorelines, most of which would have historically been upland environments located several hundred feet above the riverbed. For these reasons, we conclude that the reconnaissance level information to be gained by a FLIR survey of the project reservoirs is unlikely to provide information sufficient to inform the analysis of reservoir shoreline habitat availability and/or introduction of sockeye salmon to the project reservoirs, and therefore, is not worth the cost of about \$100,000 to complete the survey (section 5.9(b)(7)). Accordingly, we do not recommend requiring City Light to conduct a FLIR survey of the project reservoirs.

Gorge Bypassed Reach Instream Flow (Study FA-05)

Background

The approved study plan requires City Light to develop a flow/habitat model for the Gorge bypassed reach (defined as the reach between Gorge Dam and Gorge Powerhouse) and to develop the hydraulic data necessary to support an evaluation of fish passage at two suspected fish barriers in the bypassed reach. Specifically, City Light must: (1) develop and calibrate a numerical hydraulic model (or models) of the Gorge bypassed reach; (2) integrate the hydraulic model outputs and observed characteristics of substrate and cover with biological (fish species, life stages, periodicities) and physical (depth, velocity) criteria to develop flow-habitat relationships for the Gorge bypassed reach; and (3) apply the model to provide hydraulic data to

⁵ Sockeye salmon are primarily a lake-dependent species and there is no evidence that we are aware of that this species ever occurred in the Skagit River at the project because there is no information suggesting that natural lakes occurred in the Skagit River at the project location.

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support the evaluation of fish passage, particularly at two previously identified potential upstream passage barriers within the Gorge bypass reach located approximately 0.6 and 1.3 miles upstream from Gorge Powerhouse.

This is a two-year study, and the data collection is substantially complete, while analysis is ongoing. At the time of the ISR filing, the only outstanding data collection item was to retrieve the water level loggers in spring 2022 and to download their recorded values. Outstanding analyses include finalizing calibration of the hydraulic model and completing the fish habitat and fish passage modeling analyses.

Sediment and LWD Augmentation Modeling

Requested Study Modification

Upper Skagit states that the bypassed reach fish passage assessment will not be complete without a hydraulic model that can predict how potential sediment and LWD augmentation under a new license could affect velocities, drops, and flow paths through the bypassed reach passage obstructions. Upper Skagit states that this could be accomplished by manipulating the topographic mesh of the model to include predicted changes in sediment aggradation and LWD accumulations. Upper Skagit therefore requests that City Light provide a schedule for completing this modeling, which it asserts is needed to inform settlement negotiations, license application development, and the application to Washington Ecology for the section 401 water quality certification for the project.

Reply Comments

City Light states that the primary goal of Study FA-05 is to develop a flow/habitat evaluation tool for the Gorge bypassed reach and to develop hydraulic data necessary to support an evaluation of fish passage at two identified impediments in the Gorge bypassed reach. City Light states that once the study is complete (i.e., the model has been developed), it will be used to support additional discussions regarding hydraulic conditions and aquatic habitat within the Gorge bypassed reach. City Light asserts that, while the primary purpose of the model is not to evaluate sediment and LWD augmentation and process flow scenarios (these are potential PME measures), the model, as developed, has utility to assist in evaluation of other project-related interests identified by stakeholders in future discussions.

Discussion and Staff Recommendation

It is unclear based on City Light's response whether it intends to complete the requested evaluation as part of the relicensing studies or at some future point in time. Regardless, we have

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reviewed the FA-05 study ISR which includes numerous photographs of the two passage impediments. The photographs show that substrate at the two impediments is dominated by large boulders and bedrock and both impediments are void of LWD accumulations, likely because LWD and most smaller substrates such as gravel are transported through these features by high water velocities during spill events. Therefore, even if sediment and LWD augmentation occurs in the bypassed reach in the future as part of a PME measure, it is unlikely that substantial quantities of these materials would accumulate or otherwise affect fish passage or hydraulic conditions through the passage impediments. For these reasons, modeling of future potential augmentation of sediment and LWD is not needed to inform our analysis of fish passage through the bypassed reach (section 5.9(b)(4)). Accordingly, we do not recommend requiring that City Light develop a schedule for incorporating future potential sediment or LWD augmentation into the bypassed reach hydraulic model and fish passage evaluation.

Elwah Dam Removal

Requested Study Modifications

Upper Skagit states that City Light should use information from the Elwah Dam removal (i.e. fish passage through steep gorges) to help guide and cross-validate evaluations of fish passage through existing features of the Gorge bypassed reach.

Reply Comments

City Light did not specifically respond to this comment.

Discussion and Staff Recommendation

Upper Skagit do not explain how City Light should use information from the Elwah Dam removal to aid in the evaluation of fish passage through the Gorge bypassed reach, nor do they address any of the study criteria in their request. Given the vagueness of the recommendation, we have no basis for requiring it. However, we suspect that to the extent such information is available and applicable to the site, City Light would consider it.

Fish Entrainment Study (FA-08)

Background

The approved study required City Light to conduct a desktop evaluation of potential fish entrainment and impingement at the Ross, Diablo, and Gorge Developments to evaluate injury and mortality through the powerhouses and spillways. Specifically, City Light is required to: (1)

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describe the physical characteristics of the project powerhouses and intake structures; (2) summarize water quality conditions in the vicinity of the intake structures; (3) estimate intake velocities at each of the powerhouse intake structures; (4) describe the fish community and compile a target species list for entrainment and impingement analyses; (5) characterize the risk of impingement to target species based on intake velocities, trash rack bar spacing, and target species life history information and estimated swim speeds; (6) characterize the risk of turbine and non-turbine (e.g., spillway) entrainment to target species based on body size, life stage, periodicity, habitat requirements, and passage route; (7) conduct a literature review and desktop analysis of historical turbine entrainment and entrainment survival studies to estimate turbine entrainment and entrainment survival at each of the developments; (8) estimate probability of passage and survival for target species using site-specific physical and operational parameters and the FWS's Turbine Blade Strike Analysis Model (TBSA); and (9) provide an overall qualitative summary of entrainment and impingement potential for target species.

City Light asserts that it has completed the desktop evaluation as required and concludes that entrainment of dolly varden, bull trout, and rainbow trout is likely low based on the design and operations of each project facility, fish species' habitat preferences and behavior within the reservoirs, and fish population abundance of the Skagit system. City Light also considered the entrainment potential for salmon and steelhead if passage is required. City Light concludes that the existing layout of the project intakes minimize entrainment and impingement risk.

Additional Non-Turbine Mortality Sources

Requested Study Modification

Washington DFW states that City Light's mortality estimates were derived from the FWS's TBSA Model, but the model does not account for delayed mortality and thus delayed mortality is not considered in the study results. Washington DFW asserts that fish entrained into the intakes or spillways suffer from both direct (i.e., instantaneous) mortality and delayed mortality caused by injuries sustained during passage (e.g., descaling and abrasions). Washington DFW states that juvenile fish such as fry have a greater risk of entrainment and have the least ability to avoid obstacles encountered during passage through project facilities such as abrasive cement and rock, changing water pressures, and shear stresses along intake tunnels. Washington DFW states that City Light should reconsider the impacts from project facilities such as power tunnels and pipelines that are located between the intakes and turbines on fish injury and mortality. Washington DFW states that, for example, the Gorge power tunnel and penstock represents an exceptionally long 2-mile journey for a fry or juvenile fish. Therefore, Washington DFW requests that City Light continue its desktop entrainment evaluation during the second study season and include a more detailed explanation based on scientific literature on delayed

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mortality rates, as well as potential injury and mortality of fish due to passage through intake tunnels.

Reply Comments

City Light states that the results of Study FA-08 indicate that fish entrainment into project facilities is low, especially for native trout and char, and that delayed mortality would likely be experienced by an even smaller proportion of these low numbers of entrained fish. City Light asserts that existing information also indicates delayed mortality is not expected to significantly affect fish populations or the fish community of the project reservoirs. For an example, City Light states that data from acoustic tagging and monitoring activities of bull trout under the current license have not identified any delayed mortality of tagged fish that passed project dams. Therefore, City Light states that Study FA-08 is complete and the entrainment risk analyses were conducted consistent with the approved study methodology and with methods used for desktop entrainment studies conducted at other hydroelectric projects (section 5.9(b)(6)).

Discussion and Staff Recommendation

City Light derived its mortality estimates for fish entrainment based on FWS's TBSA modeling analysis, which is a generally accepted practice for evaluating the immediate survival rates for fish entrained at a hydroelectric project (section 5.9(b)(6)). However, as Washington DFW notes, the study results do not account for other potential sources of mortality besides turbine blade strike nor do they account for delayed mortality. Although it's possible that passage through the turbines and power tunnel could cause additional injury and mortality due to other factors such as barotrauma or abrasions from striking the rock walls of the tunnel, Washington DFW does not provide any evidence that this is occurring. Vikstrom et al. (2020) attempted to verify the mortality estimates of turbine blade strike models with field data collected using acoustic telemetry methods and to determine whether blade strike or other variables (e.g., barotrauma, passage through power tunnels, shear stresses) were the primary source of mortality. The study was conducted at two hydroelectric projects in Sweden using juvenile and adult Atlantic salmon and anadromous brown trout. One of the two projects was a high head dam (i.e., about 246 feet of hydraulic head) with an approximately 2.5-mile-long tunnel that fish passed through before reentering the river below the project. The results showed that blade strike models developed for Francis turbines provide reliable estimates of mortality for juvenile salmon and trout, with model values being within 3% of estimated mortality rates based on the field telemetry studies. Vikstrom et al. (2020) states that "the fact that the blade strike models in our study succeeded in predicting the mortality of smolt suggests that injury by rotating turbine blades is the main cause of mortality for juvenile salmonids passing through Kaplan and Francis turbines at our study sites. This conclusion is particularly noteworthy for the Francis turbines at the Stornorrfor Hydropower Station, given the high head of the turbine, which increases the risk

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of barotrauma, as well as the 4 km underground tunnel that the smolt needs to navigate after passing the dam.” Vikstrom et al. (2020) also found no evidence of delayed mortality on survival during their study.

Therefore, there is sufficient existing information from the literature and City Light’s ongoing acoustic telemetry study of adult bull trout in the project reservoirs to assess these potential effects (section 5.9(b)(4)). Accordingly, we do not recommend requiring City Light to continue the desktop study during the second study season to modify the results to account for delayed mortality and other non-turbine sources of injury such as power tunnels.

*Use of Bull Trout Telemetry Data*Requested Study Modification

NPS states that the data referenced from the bull trout acoustic telemetry study are unpublished and it is unknown how many of the fish that were tagged died after being released or dropped their tags. NPS asserts that it is also uncertain how many of the acoustic receivers were fully operational during the period of record described in the study report. Therefore, NPS recommends that future use of these data be based on a standardized data set that has been screened for quality control following established guidelines and broadly accepted methods.

Reply Comments

City Light argues that the acoustic data sets are standardized and based upon procedures originally used by the FWS (2013) to establish a biological opinion and an incidental take statement for bull trout. City Light states that the internal acoustic tags transmit an ultrasonic signal at approximately two-minute intervals for a period of about two years. City Light indicates that a total of 42 bull trout were initially tagged in Ross Lake in 2009 as part of a study to better define seasonal habitat use and evaluate the potential entrainment through the turbines and over the spillway; all 42 bull trout were detected continuously at different locations during fall 2009 through the winter of 2012 indicating good tag retention and survival of the tagged fish. One individual was determined to have died since the transmitter remained in the vicinity of the same receiver until the transmitter battery lost power. Since the initial tagging effort, City Light asserts that the tracking program has been standardized and expanded with installation of additional receivers including locations below each dam and is being further expanded to include other fish species (e.g., rainbow and cutthroat trout). City Light states that table 2.2-2 provides the number of active tags in each reservoir from 2015 to 2020. City Light asserts that results of the ongoing acoustic study provide an annual assessment of potential turbine and spillway entrainment and survival to inform incidental take estimates and development of license conditions; this information is available in annual reports submitted to FWS. City Light states

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that the ongoing acoustic tracking study has been expanded beyond the initial tagging effort to include additional fish species to further inform potential turbine and spillway entrainment risk at the project facilities.

Discussion and Staff Recommendation

We have reviewed the most recent acoustic tagging monitoring results filed in the project record in April of 2022.⁶ We agree with City Light that the study methods as described in the report are consistent with accepted practices and are sufficiently reliable to inform a NEPA analysis and develop license conditions (section 5.9(b)(6)). Therefore, we do not recommend that City revise the study to incorporate methods “based on a standardized data set that has been screened for quality control following established guidelines and broadly accepted methods.”

Additional Anadromous Species

Requested Study Modifications

Upper Skagit states that additional anadromous species should be incorporated into the entrainment analysis and added to the target species periodicity table 5.4-1, specifically including summer steelhead and spring Chinook.

Reply Comments

City Light states that neither summer steelhead nor spring Chinook salmon are present in the project reservoirs or in the Skagit River in the vicinity of the project. City Light states that the Puget Sound Technical Recovery Team identified 22 independent Chinook salmon populations within five biogeographic regions in the Puget Sound Evolutionarily Significant Unit (Ruckelshaus et al., 2006). Six of these are located within the Skagit Basin, but distinct populations of spring Chinook were only identified in the upper Sauk and upper Cascade Rivers. For summer steelhead, City Light states that the viability of the summer steelhead population in the Skagit River is unknown; there is no summer steelhead hatchery program and no allowable harvest of wild summer steelhead. Further, despite extensive surveys, the only location where summer-run steelhead are currently known to spawn is from RMs 8.0 to 11.6 of Finney Creek. City Light adds that the final list of target species evaluated in this study was formed with input from stakeholders.

Discussion and Staff Recommendation

⁶ See Annual Incidental Take Report for 2021 – Bull Trout Skagit River Hydroelectric Project (FERC 553) Seattle City Light, filed on April 1, 2022.

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As City Light points out, neither spring Chinook nor summer steelhead are known to occur in the upper Skagit River near the project. Therefore, there is no reason to include them in the entrainment analysis or periodicity table. The entrainment analysis considered summer Chinook and winter steelhead. Should any entity recommend that spring Chinook or summer steelhead be collected elsewhere in the basin and passed upstream of the dams, sufficient information exists in the literature, the PAD, and from the entrainment study results for summer Chinook and winter steelhead to evaluate the potential for entrainment and mortality of these fish at the project (section 5.9(b)(4)). Accordingly, no modifications to the study plan are recommended.

*Additional Life Stages*Requested Study Modifications

Upper Skagit states that the entrainment risk evaluation for anadromous salmonids was only conducted for smolts; however, early life stages of juvenile salmonids in the Skagit River have been known to emigrate from tributary habitats and rear in the mainstem and floodplain habitats before migrating to the estuary. Therefore, Upper Skagit recommends that salmon and steelhead early life stages (fry) be included in the entrainment analysis. Upper Skagit also recommends that the entrainment analysis include potential outmigration of steelhead kelts from the project reservoirs.

Reply Comments

City Light states that although there are no anadromous salmonids present in the project reservoirs, table 5.4-7 of the Study FA-08 ISR includes the early life stages (fry) for chum and pink salmon. For the other anadromous salmonid species, City Light states that all generally out-migrate at the smolt stage so there is no reason to specifically assess entrainment risk for fry life stages of these species. City Light states that if fish passage were successfully established, the primary life stages of anadromous salmonids at risk of entrainment are: (1) juvenile Chinook, coho, and sockeye salmon smolts; (2) adult winter steelhead trout kelts; and (3) juvenile chum and pink salmon fry. City Light states that out-migrating salmon smolts or fry are likely to experience higher susceptibility to approach velocities near intake structures due to their limited swim burst speed at these life stages. However, their association with the upper water column minimizes the risk of entrainment at the deep-water intakes except during periods of maximum reservoir drawdown which happens infrequently. City Light states that winter steelhead kelts out-migrate at depths according to a specific thermal range, and therefore, the position of kelts and proximity to intakes and/or fish passage facilities is influenced by ambient conditions. City Light states that the presence of these species in the project reservoirs are assumed to only occur

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with the installation of fish passage technologies at project facilities approved by agencies/co-managers to provide safe passage to out-migrating fish and minimize entrainment risk. Since fish passage facilities (including juvenile bypass systems) are not currently available at the project, there is no entrainment risk for anadromous salmonids at the project, regardless of life stage.

Discussion and Staff Recommendation

As City Light points out, none of the anadromous salmonids that it included in the entrainment analysis currently occur in the project reservoirs. Therefore, there is zero risk of entrainment for the early life stages of any anadromous species or winter steelhead kelts at the project. Nevertheless, should City Light propose or any entity recommend that anadromous salmonids be passed upstream of the project, information included in the study report for pink and chum salmon fry coupled with other available information from the literature on fry behavior, swim speeds, and body sizes will be sufficient to inform our analysis of entrainment risk for these early life stages, regardless of species (section 5.9(b)(4)). Similarly, there is sufficient information in the literature to assess body sizes and swim speeds for winter steelhead kelts to use in staff's entrainment analysis for this species should it be needed (section 5.9(b)(4)). Accordingly, no modifications to the study plan are needed.

Reevaluation of Entrainment Risk

Requested Study Modification

NPS states that the entrainment study results presented in the ISR are based on faulty assumptions that have resulted in a flawed assessment of entrainment. NPS asserts that the study conclusion that "few species or life stages have elevated risk (i.e., moderate or high) of entrainment or impingement" is not accurate because the analysis assumes that juvenile and early life stages of fish are not present in the reservoirs. NPS states that this assumption is not supported by Washington DFW and NPS findings which have reported large numbers of salmonid fry migrating into Ross Reservoir (Johnston, 1989), small <100 mm salmonids caught in gillnets (Anthony et al., 2019), and large numbers of small fish observed during a drawdown stranding event in Gorge Reservoir (Rawhouser, 2019).

NPS and Upper Skagit state that the study conclusions also assume that fish would avoid penstock intakes and spillways, but this is a flawed assumption because it does not consider the life history strategies that could potentially encourage fish to enter those structures to exploit anadromous, fluvial, and/or adfluvial life history strategies. NPS and Upper Skagit state that large emigrations of fish from the project reservoirs were documented by Johnston (1989) when approximately 16,000 fish emigrated from Ross Reservoir through spill into Diablo and Gorge

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Reservoirs in 1972. NPS and Upper Skagit assert that out-migrating fish such as those that emigrated in 1972 could actively swim into penstock intakes. Therefore, NPS states that “the conclusions in the ISR are not accurate, and the entrainment rates should be adjusted accordingly.” Upper Skagit disagrees that the study is complete and asserts that “many of the desktop study components need to be reevaluated;” Upper Skagit also requests that City Light “meet with LPs to discuss this study in detail.”

Reply Comments

City Light states that its life history assessments are based on published data. City Light asserts that section 5.4.1 and table 5.4-1 and Attachment C of the Entrainment Study ISR provide additional details regarding seasonal habitat associations by life stage and references for resident trout species in the project reservoirs. City Light states that the early life stages (eggs, alevins and/or fry, juveniles) of the trout species found within the reservoirs typically remain in the spawning streams prior to entering the reservoirs as young adults, thus minimizing the risk of entrainment and impingement. Rearing habitats for eggs and alevins are not available for salmonids within the reservoirs, and as such, eggs and alevins are not expected to occur within the reservoirs where they would be susceptible to entrainment and impingement. City Light asserts that occasionally, fry and juveniles may enter the reservoir early for increased food availability or be washed downstream from natal spawning locations during unusually high rain events. However, fry and juveniles generally remain nearshore and around shallow, structurally complex habitats to avoid predation, although they may venture into the upper water column in search of food. City Light states that given their habitat and feeding preferences, the risk of entrainment to juvenile trout and char at the project’s deep-water intakes is low. Therefore, City Light asserts that, although entrainment can occur, the overall relative risk of entrainment remains low. City Light states that spillway entrainment is generally minimized because spills are infrequent and of short duration, and the relatively large numbers of trout documented out-migrating from Ross Reservoir during 1972 occurred during an extreme spill event that lasted for 60 days and does not represent typical conditions or operations at the project. City Light states that trout may be susceptible to increased turbine entrainment during drawdowns that reduce surface water elevations; however, drawdowns of this magnitude are infrequent and have only happened three times over the current license period (City Light, 2020).

Discussion and Staff Recommendation

Except for Johnston (1989), we are unable to review the reports cited by NPS because they are unpublished and, to our knowledge, are not publicly available. Regardless, while we agree that there is some information in Johnston (1989) indicating that the early life stages of some salmonids are present in the reservoirs, we don’t see how their presence in the reservoirs would alter the conclusions of the entrainment risk assessment. This is because, other than one

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event in 1972 when Johnston (1989) estimated that 16,000 fish of unspecified size passed over the Ross Lake spillway during an unusual extended spill event averaging 8,250 cfs over 60 days, there is no evidence that juvenile or adult salmonids are congregating near the intakes or spillways or passing downstream through the dams in large numbers. In the case of the 1972 Ross spill event, as City Light points out, this was an extremely unusual spill and entrainment event and does not represent typical conditions or operation. Johnston (1989) also describes an unusual spill event at Ross in 1971, albeit of lower magnitude and duration than the 1972 event. The 1971 event averaged 4,463 cfs of spill for 41 days and resulted in no detectable spillway entrainment. Therefore, we disagree with NPS and Upper Skagit that available information suggests that the entrainment risk assessment is inaccurate and should be adjusted. Overall, the ISR entrainment risk assessment for the reservoir fish species is sufficient to inform our analysis (section 5.9(b)(4)). Therefore, we do not recommend requiring City Light to reconsider and adjust the entrainment study results based on the information provided by NPS and Upper Skagit.

Vegetation Mapping Study (TR-01)

Background

To characterize existing vegetation in the project area, the approved study plan required City Light to identify and map vegetation composition and overstory structure using existing data, remote sensing methods, and models. The study area for the Vegetation Mapping Study is approximately 145,400 acres and consists of land within the project boundary, the area within 0.5 mile of the project boundary, and the channel migration zone (CMZ) from Gorge Powerhouse to the confluence of the Sauk and Skagit Rivers. A total of 35 unique cover types were mapped in this study.

Requested Study Modification

The Swinomish state that that City Light's vegetation mapping study employs widely accepted methods to map coarse-scale vegetation structure over large areas, but a fine-scale habitat assessment of mitigation lands is needed to evaluate the potential of mitigation lands to support species of concern and serve as replacement for loss of high-quality, contiguous riparian habitat. The Swinomish state that fine-scale habitat components such as snag or downed log presence, tree species identification or understory composition are important for special status wildlife and is needed to develop management plans.

Reply Comments

City Light states that additional vegetation data was collected at 255 sites within and near the FERC project boundary as part of the TR-01 Vegetation Mapping study during field

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verification efforts to supplement the mapping effort at certain locations. These metrics include the following: 1) cover estimates of co-dominant species of each stratum – tree, shrub, and groundcover; 2) common plant species in each stratum; 3) sample measurements of diameter-at-breast-height (dbh) for codominant trees; 4) incidental observations of special features, such as areas of high snag density, beaver activity, wildlife sightings, and similar items; and 6) observations of plant species that Indian Tribes and Canadian First Nations consider as culturally important. A list of these culturally important species was created based on feedback from the Stillaguamish Tribe of Indians, the Sauk-Suiattle Indian Tribe, the Swinomish, the Upper Skagit, and the Nlaka’pamux Nation Tribal Council. In addition, the TR-02 Wetland Assessment, TR-03 Rare, Threatened, and Endangered Plants Study, and TR-04 Invasive Plants Study also gathered data on vegetation and habitats in the mitigation lands.

Discussion and Staff Recommendation

Although the Swinomish are correct in describing the general approach in TR-01 as coarse scale, the study covers almost 150,000 acres and a fine scale approach would not be cost effective or even feasible over such a large area. The Swinomish do not suggest any specific methodologies that should be included. As we said in the initial study determination, management of project land can affect whether the lands achieve specific management goals and project purposes (e.g., improve elk foraging habitat). However, here, specific land management objectives for project lands have not been established but will be in collaboration with licensing participants. The vegetation mapping study was conducted as approved (section 5.15(d)) and the information City Light gathered in conjunction with other approved studies (occurrence of invasive species, available spotted owl habitat) is sufficient to describe existing conditions and to develop appropriate management objectives and actions to achieve those objectives (section 5.15(e)). Therefore, we do not recommend modifying the vegetation mapping study to include additional fine scale habitat assessments.

Marbled Murrelet Study (TR-05)

Background

In Washington, marbled murrelets, a federally threatened species, usually nest in older forests dominated by conifers and exhibit strong site fidelity to nesting areas and appear to nest in alternate years. The approved study plan required City Light to map potentially suitable marbled murrelet nesting habitat and to assess the likelihood of marbled murrelet nesting through peak nesting season (May – July 2021) radar and audio-visual surveys. The habitat mapping study area consists of land within the project boundary as well as land within 0.5 mile of the boundary (about 142,088 acres). The radar and audio-visual surveys focused on those areas near project facilities and existing and likely future maintenance and construction noise sources. As

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approved, this study is intended to be a 1-year study, but if 2021, is deemed a poor nesting season for marbled murrelets in Washington State, an additional year of radar and audio-visual surveys may be necessary in 2022.

Requested Study Modification

FWS states that regardless of the quality of the breeding year, an additional season of radar and audio-visual surveys is needed to better understand the destination/nesting locations of murrelets in this landscape for two reasons. FWS first explains that as outlined in its comments on the PSP and RSP, marbled murrelets do not nest every year; multiple years of survey will ensure that murrelet activity within the project boundary is accurately characterized. Thus, multiple years of surveys are recommended by Pacific Seabird Group Methods for Surveying Marbled Murrelets in Forests (Evans Mack et al., 2003). FWS adds that, “the ISR states that no murrelet-type targets detected by radar exhibited circling flight paths, which is typically indicative of nesting activity; instead, these targets were using the waterways as travel corridors to transit through the project boundary. The ISR draws no conclusions as to where these murrelet-type targets might be traveling to or from. An additional season of radar and audio-visual surveys would be useful in determining where these murrelets may be nesting, which would be useful for developing license conditions and management plans. Therefore, FWS request that the study be modified to include an additional year of radar and audio-visual surveys.”

NPS and Upper Skagit state that they support FWS’s request for additional radar and audio-visual surveys for marbled murrelet.

Reply Comments

City Light states that the purpose and intent of the TR-05 Marbled Murrelet Study is to determine where murrelet activity and potential occupancy is located in the study area (i.e., likelihood of presence) and where potential nesting habitat exists within 0.5 mile of locations where most project noise generation occurs. City Light adds that purpose is not to determine occupancy in specific stands and not to assess presence of murrelet activity throughout the project boundary. City Light argues that the Pacific Seabird Group Survey Protocol does not determine murrelet nest locations, but it only determines whether birds are present in the canopy (occupied behaviors). No murrelet-type targets detected by radar exhibited circling flight paths, which during the breeding seasons, suggests nesting activity. Most targets (92 percent) exhibited straight flight paths and were also documented over water (not land), further indicating these targets were using the waterways for transiting the area. City Light asserts that the findings of this study indicate with high confidence that a very small number of marbled murrelets are likely using the upper Skagit River, Diablo Lake, and Ross Lake waterways as travel corridors to transit

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the project. Based on these results, City Light does not believe that follow-up surveys are warranted to identify likely nesting stands. For locations near the project but outside of the radar survey study areas, City Light could assume occupancy and determine if best management practices (BMPs) can be applied to avoid project effects. City Light states that for most project activities, knowledge of the general location of potential nesting habitats will be sufficient to implement BMPs. For future new construction or vegetation clearing activities within a certain distance of suitable habitat, City Light would assume that the habitat is occupied until a protocol survey is conducted to verify absence.

Discussion and Staff Recommendation

The study was conducted as approved and there is nothing in the record to suggest that it was a poor nesting season for marbled murrelets in Washington State or that the study was conducted under anomalous conditions (section 5.15(d)). Sufficient information exists to identify and characterize suitable marbled murrelet nesting habitat and to identify potential project effects on these habitats by assuming that these habitats are occupied. City Light has committed to developing and implementing BMPs to avoid project impacts where possible based on this assumption. Therefore, we do not recommend modifying TR-05 to require an additional year of radar and audio-visual surveys.

Special Status Amphibians Study (TR-08)

Background

The goals of the approved Special-Status Amphibian Study are to: (1) identify areas of potentially suitable breeding habitat for federally threatened Columbia spotted frog and state-listed Oregon spotted frog within the study area; (2) assess the likelihood that either species occurs in areas where there is activity related to project operations and maintenance (O&M), including at project recreation facilities; (3) document occurrences of the state-listed western toad and the locations and types of habitats used around the study area; and (4) collect relevant information on populations where these species are found, including numbers, life stages, habitat, and locations. The study area is defined as lands and waters within the project boundary with an emphasis on locations where suitable habitat and potential project effects may intersect. This includes areas on the fringes of the project reservoirs (including depressions in drawdown zones and littoral zones), project recreation facilities, areas adjacent to project facilities, wetlands within the transmission line rights-of-way, wetlands affected by ongoing project operations, and wetlands hydrologically connected to the Skagit River between Diablo Powerhouse and the Sauk River confluence.

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City Light states it conducted the surveys as required. No special-status amphibians were detected during site visits along the project transmission line ROW. Western toads were observed at the County Line Ponds and at the large Newhalem Pond. In its study report, City Light states that although not required by the study plan, it proposes to conduct additional site visits in 2022.

Requested Study Modification

NPS requests a second year of surveys “from a spatially distributed randomly selected set of habitats within the [North Cascades National] Park.” The NPS states that a second set of surveys is needed to determine the detection efficiency of the surveys and the site occupancy, which is necessary to meet the study goal to “assess likelihood either species occurs” in the habitats surveyed. Additionally, NPS recommends that the study include the Canadian portion of the Ross Reservoir. NPS states this is necessary to meet Goal 3 of the study which describes the study area to include “seasonally-available habitats in the drawdown zone of Ross Lake.” NPS states that its observations in this area and along the border have found significant numbers of Western Toad, ranid frogs, and salamanders.

Reply Comments

City Light states that while areas north of the international border are outside of FERC or other U.S. agencies’ jurisdiction, it has already gathered existing reports on amphibians for the Skagit Valley Provincial Park to provide additional information to address this area. City Light adds that it cannot collect field data in Canada, but it is exploring options to obtain information on wetlands and amphibians north of the international border through coordination with the Skagit Environmental Endowment Commission (SEEC) and BC Parks. City Light believes that this can be accomplished outside the relicensing study program.

City Light states that it is conducting a second year of surveys targeted to areas where additional information would be beneficial to understanding habitat use and life history phenology of amphibians in the project vicinity (e.g., County Line and Newhalem Ponds). The surveys would include day and night surveys in the drawdown zone at the north end of Ross Lake near the border to assess use of borrow pits, pools, or other habitats that could be available to Columbia spotted frogs or other amphibians during the oviposition period. However, City Light adds that the study is not intended to document amphibian occurrences within the National Park outside of areas that may be affected by project O&M nor does the study require surveys of habitats that are not suitable for the target species. City Light states that most habitat within the project vicinity in Ross Lake National Recreation Area (RLNRA) is not suitable breeding habitat for the target species or other amphibians. City Lights asserts that potential breeding habitat for spotted frogs is scarce or absent in most of the study area and is largely limited to the extreme north end of Ross Lake, mostly north of the international border.

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City Light adds that although NPS contends that a random survey is necessary to determine “detection efficiency” and “site occupancy,” surveys of unsuitable habitats are not justified. City Light states that the comment also implies that the target species are difficult to document or unpredictable in occurrence, neither of which is accurate if surveys are conducted at the appropriate time. City Light states that it has made multiple and specific requests for information regarding the results of amphibian surveys conducted by NPS at Ross Lake in 2021 and no information, except for general statements to City Light on June 24, 2021 that certain species were found, has been shared with City Light. Nevertheless, City Light is conducting additional field work in 2022 to look for breeding sites for the western toad on Ross Lake because the information from the NPS was provided too late for follow-up visits in 2021 before rising water levels flooded these sites.

Discussion and Staff Recommendation

As we explained in the initial study determination regarding fish stranding studies, City Light could on its own initiative expand the study area to include the Canadian portion of Ross Lake; however, the Commission has no authority to require City Light to implement studies in Canada. Staff’s analysis of project effects on amphibian habitat in the Canadian portion of Ross Lake will be based on the study results obtained from the U.S. side of the border and other available existing information. Sufficient information exists to describe wetland and amphibian habitats in the upper reaches of the Ross Lake. City Light’s proposed additional studies in 2022 within US portion of Ross Lake would add to the knowledge base. Therefore, we do not recommend requiring City Light to conduct further studies in Canada.

It is not entirely clear what NPS means by conducting additional surveys in “spatially distributed randomly selected set of habitats within the Park.” Regardless, because the targeted species have specific aquatic habitat requirements, those habitats do not exist throughout most of the study area, and the targeted species were not detected in many of the targeted survey sites, it is unlikely additional surveys would result in any additional observations. Determining survey efficiency/detection probability requires an experimental design and multiple surveys of the same location under controlled conditions with a known number of target species/individuals present, which would be costly. However, this level of precision is not needed for our analysis of project effects. Because the existing results and planned future data collections will be sufficient for our analysis, we do not recommend modifying TR-08.

Gorge Bypass Reach Safety and Whitewater Boating Study (RA-02)

Background

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The approved Gorge Bypass Reach Safety and Whitewater Boating Study required City Light to evaluate the recreational whitewater boating potential of the Gorge bypassed reach. This included assessing the suitability of the flows for boating and any potential constraints to providing boating flows such as project operation and safety issues.

The study consists of three levels of data collection: (1) a Level 1 desktop analysis, including literature reviews, structured interviews, an assessment of hydrology Gorge Dam spill gate operations, an assessment of physical characteristics of the river channel and river access, and identifying regulatory agency resource management goals and tribal interests; (2) a Level 2 field reconnaissance of a planned spill to evaluate navigability and whitewater difficulty, and estimate a suitable range of flows for Level 3 investigation if warranted; and (3) a Level 3 multiple controlled flow evaluation using a team of boaters paddling two to four flows based on flow volumes identified from the Level 2 field reconnaissance. Six criteria were used to determine whether to proceed to subsequent study levels: (1) does the Gorge bypass reach contain rapids suitable for whitewater boating; (2) is access to the river feasible; (3) can potential effects on natural and cultural resources be resolved for next level of proposed study; (4) do agency regulations and/or Tribal concerns prohibit further investigation; (5) are project operations capable of providing opportunistic spills in a range suitable for whitewater boating; and (6) are there opportunities to coordinate with other studies? City Light completed the Level 1 and 2 assessments, and in the ISR City Light recommended proceeding to the Level 3 analysis that would evaluate four flows ranging from 750 cfs to 2,250 cfs in succession over a two-day period. In February 2022, City Light informed the various tribes during a Cultural Resources Work Group meeting of the recommendation to proceed to the Level 3 analysis and reviewed the study methods with the various tribes. In March 2022, after the ISR was finalized for publication, Upper Skagit notified City Light that it opposed implementing the Level 3 Multiple Flow Evaluation. During the ISR meeting, City Light announced that, because of Upper Skagit Tribe's concern, the Level 3 evaluation would not be pursued at this time and that additional communication needs to occur with the cultural resource leads and Indian Tribes prior to implementing the Level 3 multiple flow evaluations.

Requested Study Modification

American Whitewater states that based on the results of Level 1 and Level 2 phases of study, the Level 3 multiple flow evaluation is warranted. American Whitewater states that it understands Upper Skagit have concerns with proceeding to Level 3 assessment before other cultural resource issues are addressed with City Light; however, no information has been provided documenting the substance of the concerns. American Whitewater adds that it understands that City Light is not moving forward with the Level 3 Multiple Flow Evaluations now and encourages City Light to consult further with Upper Skagit to resolve their concerns. However, American Whitewater, emphasizes that the study should be completed before the

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Commission issues its REA notice. American Whitewater adds that they have accepted City Lights' invitation to participate in settlement negotiations, and "this process may reveal creative approaches to address our interest in evaluating opportunities for whitewater boating on a timeline and in a manner that is appropriately respectful of Tribal interests and concerns."

NPS states that City Light should suspend the third phase of the study out of respect for the cultural sensitivity of the Skagit Gorge.

Reply Comments

In its reply comments, City Light again states that "per feedback from the Upper Skagit Indian Tribe, City Light will not be moving forward with phase 3 of the RA-02 Gorge Bypass Reach Safety and Whitewater Boating Study."

Discussion and Staff Recommendation

Phase 1 and 2 study results clearly show that the Gorge bypassed reach could provide whitewater boating opportunities, that the bypassed reach is accessible, that project operations could provide boating flows, and a controlled flow boating study is warranted to further identify possible boating flows. While Upper Skagit has stated it has concerns with the Level 3 controlled flow boating study because of the cultural sensitivity of the Gorge bypass, it has not stated what those sensitivities are or how the study would affect cultural resources, particularly considering that other field studies requested by the Upper Skagit are ongoing in the reach. While City Light indicates it will continue to work with Upper Skagit to resolve their concerns before implementing the Level 3 assessment, it does not provide a schedule for doing so. Because we have no basis for not requiring the Level 3 assessment and the information from the Level 3 assessment will be needed to process the license application and determine if and what flows should be provided in the Gorge bypass reach, we recommend that City Light implement the Level 3 multiple flow evaluation as outlined in the ISR and that it evaluate the four planned spills recommended in the ISR : 750 cfs, 1,250 cfs, 1,750 cfs, and 2,250 cfs.

Project Facility Lighting Inventory Study (RA-03)

Background

The approved lighting study required City Light to: (1) to identify project facilities within RLNRA that utilize outdoor nighttime lighting and describe the characteristics of the luminaires, and (2) describe outdoor lighting needs at each project facility and the operating periodicity, design, and intensity of lights being used. City Light was to conduct daytime and nighttime site visits to catalog the physical characteristics of lights that did not have existing documented

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information (e.g., building lighting plans). All outdoor luminaires in the study area were to be cataloged for the purpose of creating an “As-Found” lighting document to serve as a record of existing luminaires. Representative luminaires were to be photographed, and data recorded, including field notes with supplemental observations. Luminance and illuminance measurements were to be recorded for representative luminaires, and for luminaires that were easily accessible for accurate measurements. Data on luminaires were to be collected using a digital data collection tool (i.e., ESRI Collector for ArcGIS). The study area includes all project facilities within the project boundary within the RLNRA that utilize lighting at night. This includes generating facilities (powerhouses and dams); operations and maintenance support areas; Diablo and Newhalem town sites; and transmission, transportation (vehicle and boat) and communications infrastructure including high tension transmission towers, Diablo and Ross Lake Boathouses, radio antennae and microwave repeaters, and visitor service and recreation areas (ELC, Ladder Creek Falls Trail and Gardens).

City Light completed the inventory, described representative luminaries, measured luminance and illuminance of representative lights, and identified those lights that are necessary for project operation, safety, and security purposes. City Light also identified those lights that are inappropriate by current standards of technology and could be modified to better fit the surrounding context area or facility. In the ISR, City Light states that the study is complete.

Requested Study Modification

NPS requests that City Light redeploy to visit sites that were not visited during the first study season to meet the goals of the inventory, better describe how many fixtures are associated with each lighting unit and identify which lights impact water bodies in the project boundary.

Reply Comments

In its reply comments, City Light explains that the North Cascades Institute Environmental Learning Center (ELC) was not visited during the 2021 field inventory as the facility was closed due to the COVID-19 pandemic. However, City Light coordinated with the ELC Director of Operations to inventory the lighting at the ELC which is described in the ISR. Section 5.9 in the ISR states that all the lighting (i.e., trail lighting, porch lighting, and limited architectural lighting) is LED, full cut-off, and on a timeclock control system that automatically turns the lights off at 11:00 p.m. when the ELC facility is in use. In addition, the ELC has received a Leadership in Energy and Environmental Design (LEED) silver rating for its level of sustainability, which includes features to minimize the use/need for lighting. Given the information in the ISR and the ELC’s LEED silver rating, City Light does not believe that redeploying to visit the ELC facility is warranted. During the ISR meeting, City Light said it

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would follow up with the NPS regarding other sites that may have been inaccessible during the 2021 study season.

City Light states that providing quantities of existing luminaire types was not a part of the required study. City Light states that the lighting inventory included in the ISR identifies and describes typical luminaire type characteristics. City Light asserts that it has identified all luminaire types, source quantities per typical luminaire type, and luminaires with multiple sources that are typical for the project. According to City Light, the identification of lights impacting bodies of water was not part of the study's goals and objectives. City Light believes it has implemented the study consistent with the approved study plan and under normal environmental conditions and the study is now complete.

Discussion and Staff Recommendation

Our review of the study results indicates that City Light inventoried all sites identified in the study plan, except for the ELC. Although City Light was not able to inventory the ELC, sufficient information exists to characterize the existing lighting at the ELC and determine whether additional measures may be needed to meet park management objectives of reducing light pollution. Therefore, we do not recommend redeploying survey crews to document conditions at the ELC. City Light has agreed to follow up with the NPS to identify any additional sites that may have been missed. If sites at the project facilities were missed, we recommend that City Light inventory those sites and include the required information as needed in the updated study report.

Contrary to City Light's assertion, the approved study plan required City Light to "inventory all outdoor luminaires in the study area" and gather data, including, in relevant part: (1) quantity (number of lamps [bulbs]); (2) locations (including estimated height of luminaire to the ground); (3) condition of existing luminaires (qualitative description of condition of structure [broken, corrosion, requiring replacement, etc.], age of luminaire [if available]); (4) lighting distribution (e.g., directional floodlight, light focused below luminaire, etc.); (5) nighttime lighting documentation; (6) shielding (is the lamp housed in a full cutoff luminaire or does the light produce direct glare and/or trespass outside the task area); (7) illuminance; and (8) luminaire control method. While City Light gathered information on typical luminaries at the sites, it does not appear that City Light quantified the number of light fixtures at each site. Regardless, we do not need that level of precision for our NEPA analysis because the information City Light obtained is sufficient to identify the types of luminaries that exist, problems with existing luminaries, and the types of measures that can be implemented to correct those issues to better align with park management goals and project safety requirements.

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The approved study plan did not require identifying which lights impact water bodies at the project and NPS does not explain why this information is warranted or why it did not request this information earlier (section 5.15(e)). The focus of the survey was to identify those lighting fixtures that affect the night sky, not surface water bodies. Therefore, we have no basis for recommending that City Light identify those luminaries that shine on the lake surface.

Inventory of Historic Properties with Traditional Cultural Significance Studies (CR-04)

Background

The approved study required City Light to (1) define the Area of Potential Effect (APE); (2) identify historic properties with traditional cultural significance located within the APE by interviewing participating native tribes and Canadian First Nations; (3) consider and review previous National Register of Historic Properties (NRHP) eligibility evaluations within the APE to determine if additional evaluation efforts are needed; (4) review gathered data and information, conduct additional site visits and pedestrian survey, if necessary, and identify and document, as appropriate, historic properties with traditional cultural significance in areas of the APE where Project effects or reasonably foreseeable; (5) apply the NRHP Criteria for Evaluation outlined at 36 CFR § 60.4 to evaluate the significance of identified properties for inclusion in the NRHP in areas of the APE where project effects or reasonably foreseeable; and (6) evaluate the integrity of each significant property following NRB 15 and 38; and (7) document these evaluations.

City Light defined the APE and developed the research design in consultation with tribes, Canadian First Nations, and the State Historic Preservation Officer (SHPO). The SHPO concurred with the APE on June 23, 2021. As of December 1, 2021, seven Indian Tribes and Canadian First Nations have elected to participate in the ethnographic study. Two of the participating Indian Tribes and Canadian First Nations are completing the study with their own in-house expertise and five of the participating Indian Tribes and Canadian First Nations are working with consulting ethnographers. One community, the Nlaka'pamux Nation Tribal Council, has initiated their field study and will continue in the second study season. Ongoing work will continue in the second study season to complete the development of the research design, gather data and information, document and evaluate historic properties with traditional cultural significance, evaluate Project effects, and complete reporting.

Requested Study Modification

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Upper Skagit states that to proceed, “it will be critical to develop a clear methodology that provides the Tribe (and other LP's) with the steps that City Light will use to clarify the meaning of ‘focus evaluation efforts on individual resources’ eligibility’ in its compliance with Sec. 106 guidelines.” Its concerns appear to stem from footnote 3, pg. 4-4 of CR-04 that states “because resources do not need to be listed in the NRHP to be considered a historic property, it is the intent of this study to focus evaluation efforts on individual resources’ eligibility for inclusion in the NRHP.” Upper Skagit state that “the intended meaning here is unclear given that resources can retain significance as parts of larger property types, such as districts, multi-property listings, and traditional cultural landscapes. City Light’s methodology to not document inventory results and significance assessments of historic properties of traditional cultural importance on National Register registration forms, deviates from best practices in meeting agency Section 106 obligations. The absence of a clear alternative methodology describing how City Light will compile, assess significance and effects, recommend treatments of the inventoried resources, and provide for their review, creates confusion as to next steps and exactly how the USIT’s inventory of its TCP resources will be considered by City Light.”

Reply Comments

City Light explained in its meeting summary that the intent of the statement: “focus evaluation efforts on individual resources’ eligibility” is to provide clarification on this aspect of Section 106 compliance (as described in 36 C.F.R. § 800.4). City Light asserts it is “implementing the cultural relicensing studies as outlined in the Revised Study Plan (RSP), which follows the steps in 36 C.F.R. § 800.4 and §800.5 to identify historic properties and assess adverse effects. Accordingly, historic property categories include districts, sites, buildings, structures, and objects, as outlined in National Register Bulletin 15 and as defined at 36 C.F.R. § 800.16(l). As described in the CR-04 Inventory of Historic Properties with Traditional Cultural Significance study plan, this includes considering properties that have significance as traditional cultural properties and traditional cultural landscapes. Successful compliance with the Section 106 process does not require resources to go through the nomination process to be listed in the National Register.”

Discussion and Staff Recommendation

City Light is conducting these studies in accordance with the approved study plan and section 106 criterion. The eligibility of any identified historic properties, including traditional cultural properties and traditional cultural landscapes, need to be determined; however, it is not required that these be listed in the National Register as noted by City Light. Therefore, there is no need to modify the study for the reasons explained by City Light.

II. New Study Requests

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Diablo Reach Instream Flow Model

Background

The Diablo Dam tailwater reach of Gorge Reservoir is a little over one mile long and is divided into two sections: the first section extends about 0.7 mile from the base of the dam to the Diablo Powerhouse, the second section extends from Diablo Powerhouse about 0.4 mile downstream to an area of sediment deposition where Stetattle Creek enters Gorge Reservoir, which City Light refers to as “Stetattle Bar”.

In the updated RSP, City Light committed to discuss instream flows in the tailwater reach of Diablo Dam as part of stakeholder workgroup meetings.

New Study Request

Washington DFW recommends that City Light conduct an instream flow modeling study to evaluate flows in the Diablo tailwater reach that maximize potential fish spawning or rearing habitat in this reach. Washington DFW states that Gorge Reservoir contains very limited fish habitat in tributaries, and consistent fluvial habitat in the tailwater reach would provide important habitat that is underrepresented in Gorge Reservoir. Washington DFW believes that the information would help to inform the reintroduction of anadromous salmonids into Gorge Reservoir.

Reply Comments

City Light states that in accordance with the updated RSP, it agreed to discuss instream flows below Diablo Dam because of potential dewatering concerns in the section between Diablo Dam and Diablo Powerhouse when the powerhouse trips off-line and flows are not immediately spilled at the dam. City Light states that it developed a hydraulic connectivity assessment of this section using project operation data and an existing two-dimensional hydraulic model; the results are appended to the ISR (Appendix C). City Light asserts that the hydraulic model shows that the hydraulic control created by Stetattle Bar causes velocities to slow and creates a backwatering effect between the dam and the Diablo Powerhouse tailrace. The model shows that hydraulic connectivity is maintained between the dam and powerhouse under existing project operations.

City Light states that water surface elevations in the tailwater section between the powerhouse and Stetattle Creek are dependent primarily upon the amount of flow discharged through the powerhouse. Powerhouse flows transition shortly downstream of Stetattle Bar to a

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complete lacustrine environment near the State Route 20 bridge. City Light argues that instream flow modeling to evaluate fish habitat in the Diablo tailwater reach is not appropriate because water surface elevations are relatively invariable throughout the tailwater reach under different flows due to the lacustrine conditions that prevail.

City Light adds that under current project operations, the tailwater reach remains watered, hydraulically connected, and already supports rearing, foraging, and migration for reservoir fish species (and would continue to do so if anadromous species were introduced). Further, project biologists have not identified any significant areas of potential spawning habitat in Gorge Reservoir, including the tailwater reach. Lastly, City Light asserts that Diablo Dam and Diablo Powerhouse operations vary in response to unplanned outages and the need to meet project purposes such as flood control, dam safety, and operation and maintenance activities. City Light states that it does not support evaluating potential alternatives to enhance/encourage fish spawning habitat in this reach due to the potential for project operations to adversely affect habitat conditions (e.g., unplanned high flow releases scouring redds).

Discussion and Staff Recommendation

Conducting an instream flow modeling analysis in the tailwater reach downstream of Diablo Powerhouse to evaluate potential salmonid spawning habitat enhancement opportunities would not provide useful information, because this area has relatively invariable surface elevations and therefore is not the type of riverine stream segment where salmonid spawning habitat models are typically applied (section 5.9(b)(6)). Further, uncontrolled spills from Diablo Dam would likely scour any salmonid redds in the reach, which would negate any benefits to the salmonid spawning in the reach resulting from changes to project operations designed to improve salmonid spawning. For these reasons, we conclude that we already have sufficient information to assess the spawning potential of the tailwater reach and that an instream flow habitat modeling study in this location would be unlikely to inform the development of license conditions to enhance salmonid spawning habitat in Gorge Reservoir (section 5.9(b)(4)). Therefore, we do not recommend requiring City Light to develop an instream fish habitat model for the Diablo tailwater reach.

Riverine Stranding and Trapping Studies

Background

City Light conducted stranding studies in the 1980s to evaluate fish stranding risk in the Skagit River below Gorge Powerhouse and to develop operational measures to reduce fish stranding. Some components of the stranding studies were repeated in 2016-2018 pursuant to a

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2012 NMFS Biological Opinion for a license amendment issued by the Commission on July 17, 2013.

City Light did not propose any additional studies in the RSP to reevaluate fish stranding risk below Gorge. However, in the updated RSP, City Light stated that it would “modify a study plan (likely not FA-03) to include a reevaluation of the existing methodology for assessing downstream salmonid and other fish stranding, trapping, and predation risk. Prior to completion of the study, SCL will meet with the LPs to assess whether changes in the existing methodology should be implemented prior to issuance of the new license.”

New Study Requests

Washington DFW states that City Light’s existing ramping rate regime might not be sufficient to protect juvenile fish from stranding because the methodology used to set ramping rates is obsolete and the problem areas for fish stranding might have changed over time. Therefore, Washington DFW recommends that City Light conduct new ramping rate studies using methods from the Washington State Instream Flow Guidelines (Beecher and Caldwell, 2022).

Specifically, the Instream Flow Guidelines recommend: (1) selecting critical stranding sites with high risk of stranding potential and confirm final selection of critical sites during a site visit with agency staff; (2) establishing transects at each critical site and collect stage-discharge measurements at each; (3) developing a 3-flow stage-discharge model that covers the range of flows over which the ramping events are expected to occur; (4) developing a detailed cross-sectional profile at each transect; (5) identifying critical flow thresholds such as flows that coincide with inflection points on the cross-sectional profile; and (6) conducting dye studies over a range of flows to evaluate the influence of discharge on water travel time to provide a preliminary estimate of necessary duration of flow continuation at the powerhouse to prevent reaches from drying up in the event of an emergency shutdown.

NPS and FWS state that City Light indicated in the updated RSP that it would propose a modification to the approved study plan to include a reevaluation of the existing methodology for evaluating juvenile fish stranding below the project, but this did not occur. NPS and FWS assert that the current methodology for fry stranding surveys was developed several decades ago (Beck 1989), and it is necessary to reevaluate the methodology to ensure that it is consistent with currently accepted scientific practices across the region. Therefore, NPS and FWS request that City Light conduct a new study to evaluate stranding and trapping risks in the Skagit River below the project.

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Upper Skagit requests that City Light reevaluate the efficacy of current stranding/trapping methods for evaluating stranding/trapping risk in the Skagit River below Gorge Dam because new methods to evaluate stranding are available and conditions in the river have changed since the prior studies were completed. Specific methods would include: (1) surveyors proactively looking for stranded fish by turning over rocks; (2) beginning surveys immediately after changes in ramping operations (not several days after operational changes); (3) adjusting methods to reflect changes in life history (i.e. spawning/incubation/emergence timing); (4) expanding the geographical scope of surveys based on results from FA-02/GE-04; (5) incorporating FA-02/GE-04 results into overall stranding risk assessment; and (6) adjusting methods based on changes in climate conditions and river geomorphic conditions since previous methods were developed.

NMFS requests that City Light conduct a new stranding and trapping study, stating that “flows and associated operations model will conform to as yet unidentified model parameters, including flooding, floodplain inundation, spawning habitat protection, etc., [such that] an evaluation of stranding and trapping associated with those flows, including downstream of Gorge Dam, is a necessary study.”

Reply Comments

City Light states that it implements a stranding and trapping monitoring program under the current FERC license, as required by the Fisheries Settlement Agreement and as updated in the 2012 NMFS Biological Opinion. City Light states that current monitoring program methods are based on decades of investigations of the potential for the project to cause stranding and trapping in the Skagit River. City Light states that the culmination of historic investigations is described in Beck (1989) and represents the best available method for accurately estimating and monitoring stranding risk throughout the downstream reach of the Skagit River. City Light asserts that the methods used for testing the effects of different flow regimes, ramping rates, and daily amplitude variability, which are described in Beck (1989) and the NMFS Monitoring Plan,⁷ are specifically designed to operate in a dynamic river system. Two main categories of variability are considered in the methodology: natural effects, such as fish size, bar slope, substrate size, time of day, and species; and anthropogenic effects, such as ramping rate, amplitude, and total discharge. City Light contends that the advantage of this approach is that the monitoring and results consider the potential for changing river morphology and are repeatable across space and time. City Light states that the current approach results in an index of relative stranding and trapping risk defined as “number of stranded fish per 100 feet of dewatered bar.” City Light states that periodic monitoring efforts are implemented under the guidance of the current license Flow Coordinating Committee (FCC) comprising representatives

⁷ The Monitoring Plan was filed on March 10, 2014 and describes the methods that City Light must implement to evaluate stranding risk in the Skagit River below Gorge.

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of City Light and the stakeholders. City Light states that it believes that concerns with historic studies, monitoring methods, and the need for reevaluation all can be raised and discussed within the FCC framework under the current license and need not be reevaluated as part of relicensing studies. City Light adds that current monitoring results indicate a level of stranding risk which is lower than the rate which is described in Beck (1989), indicating that the fry protection measures are effective and that the monitoring approach can detect changes in relative risk.

For these reasons, City Light asserts that the agencies and Tribes have not demonstrated that the current stranding and trapping methods are ineffective such that there is a need for new stranding studies in the river below Gorge.

Discussion and Staff Recommendation

The agencies and Upper Skagit's primary justification for requesting new stranding studies is that the methods City Light currently uses to assess stranding and trapping risk are ineffective simply because they were developed in the 1980s. However, the agencies and Upper Skagit provide little specific reasoning as to why the studies are insufficient for evaluating stranding risk. Upper Skagit raises a few specific issues, for example, stating that "surveys [should] look more proactively for stranded fish by turning over rocks," but Upper Skagit doesn't explain why this is needed. Presumably Upper Skagit believes that City Light's study methods do not account for all stranded fish because they are not looking hard enough. However, the study design is not intended to document every stranded fish. Rather, the study design is intended to assess overall stranding risk, and it does so by combining the potential for stranding based on channel characteristics (e.g., gravel bars with slopes less than 5% have a significantly greater risk than steep banks with larger substrates) with other risk factors such as species, life stage, flow-related operations, diel differences in fish behavior, and season. This is an accepted study approach that is consistent with other stranding evaluations conducted at hydroelectric projects (section 5.9(b)(6)) (see Stillwater Sciences, 2006). City Light's methods also provide a metric, reported as the number of stranded fish per 100 feet of bar habitat, which enables a comparison of stranding risk across years.

Additionally, only Washington DFW recommends a specific methodology to be implemented. Based on our review, Beecher and Caldwell (2022) includes some similar study components to City Light's methods (e.g., identification of critical stranding sites), but only includes hydraulic modeling to identify flow thresholds where stranding might occur and, unlike City Light's methods, doesn't include any field studies to evaluate stranding risk. Further, Washington DFW's recommended methods include dye studies to evaluate the "necessary duration of flow continuation at the powerhouse to prevent reaches from drying up in the event of an emergency shutdown;" however, as explained in the PAD, Gorge Powerhouse

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is already equipped with valves that provide flow continuation for any required period to provide flow if the generating units trip off-line. For these reasons, we do not believe Washington DFW's recommended methods would be more beneficial than City's Light's methods for assessing stranding risk below the project.

Lastly, the agencies and Upper Skagit do not provide any evidence such as recent documented occurrences of significant fish stranding events that suggest that City Light's ongoing stranding study methods are inaccurate or underreport fish stranding risk levels. For these reasons, we conclude that we have no basis for requiring City Light to develop and implement new stranding studies. Accordingly, we do not recommend requiring it to do so.

Additional Special Status Terrestrial Species Studies

New Study Request

The Swinomish recommends that similar survey efforts for marbled murrelet, golden eagle, northern goshawk, beaver, special status amphibians, and spotted owl be conducted for the following special status and culturally important wildlife species: mountain goat, elk, black-tailed deer, American pine marten, gray wolf, grizzly bear, Canada lynx, and wolverine. The Swinomish reason that infrastructure and activities associated with City Light's facilities disrupts wildlife habitat and movement. Specifically, the cumulative impacts of the artificial reservoirs, recreation associated with Ross Lake National Recreation Area ("RLNRA"), climate change and concentrated project impacts along Highway 20, which is the closest east-west wildlife movement corridor, may present insurmountable barriers for some wildlife species and substantially inhibit others. The Swinomish argue that while the existing studies sufficiently address concerns related to marbled murrelet, golden eagle, northern goshawk, beaver, special status amphibians, and spotted owl, the studies offer little relevant information to address concerns about the many other special status and culturally significant species, landscape connectivity across the greater landscape, or a pathway to improve the conservation value of mitigation lands.

Reply Comments

City Light does not believe additional relicensing studies are warranted for these individual species as there is no evidence that the project has an adverse effect on wildlife movement or connectivity in the region. Nonetheless, City Light states that it understands the LPs' desire for more information on wildlife in the vicinity of the project to assist with management decisions. However, City Light believes that data obtained from the existing studies (TR-01 Vegetation Mapping Study, TR-02 Wetland Assessment, TR-04 Invasive Plants Study, GE-02 Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-of-Way

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Study, TR-05 Marbled Murrelet Study, TR-09 Beaver Habitat Assessment, and TR-10 Northern Spotted Owl Habitat Analysis) and from other efforts outside the relicensing process can be used to describe the habitat needs and develop management plans for project lands, including the transmission line rights-of-way and the mitigation lands. For example, City Light says that it will continue to fund relevant research under its Wildlife Grant Program in the current license, and the data from those studies will be integrated into the relicensing process, as appropriate. City Lights states that it is also willing to help fund NPS and Washington DFW helicopter surveys to count the number of adult and young goats and collect spatial information about their habitat use; those surveys are scheduled for July 2022, but funding assistance has not been requested.

Discussion and Staff Recommendation

The Swinomish do not describe how the studies should be conducted or explain why the request for studies of these species were not requested earlier (section 5.15(e)(2)). As we said in the initial study determination, sufficient information exists to describe the current populations of mountain goats, marten, lynx, and wolverine at the project. And, while reservoir fluctuations can result in an area devoid of vegetation within the drawdown zone, there is no evidence to indicate that the fluctuations or the presence of the project is isolating or hindering movement of mountain goats, marten, lynx, or wolverine (section 5.9(b)(5)) for the reasons described in the initial study determination. Similarly, sufficient information exists to describe elk, black-tailed deer, gray wolf, and grizzly bear populations in the project area. These species have large home ranges, good dispersal abilities, and have not been shown to have their movements disrupted by existing or proposed project facilities/operations. As we concluded in the initial study determination, data to quantify the drawdown zone and the potential changes in vegetative cover that may result from changes in project operations will be gathered in TR-01, *Vegetation Mapping Study*, and TR-02, *Wetlands Assessment Study*, which should be sufficient to inform any license recommendations to benefit wildlife movement (section 5.9(b)(4)). Therefore, we do not recommend requiring City Light to conduct additional studies on mountain goat, elk, black-tailed deer, marten, gray wolf, grizzly bear, Canada lynx, and wolverine.

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