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VIA ELECTRONIC FILING

March 8, 2022

KIMBERLY D. BOSE
SECRETARY
FEDERAL ENERGY REGULATORY COMMISSION
888 FIRST STREET, NE
WASHINGTON, DC 20426

Re: Skagit River Hydroelectric Project, FERC Project No. 553-235 – Filing of Initial Study Report

Dear Secretary Bose:

In accordance with the Federal Energy Regulatory Commission's (FERC or Commission) regulations at 18 C.F.R. § 5.15(c)(1), the City of Seattle, Washington, through its City Light Department (City Light), hereby files with the Commission its Initial Study Report (ISR) for the relicensing of the Skagit River Hydroelectric Project (FERC Project No. 553) (Project).

The Project is located in the upper Skagit River Watershed. The Skagit River Watershed is within the traditional territory of several Indian Tribes and Canadian First Nations. The watershed and surrounding ecosystem supports vital runs of anadromous fish that are key to the cultural, spiritual, and economic health of Indian Tribes. These anadromous fish, especially Chinook Salmon, are also important to other area residents, endangered Southern Resident Orca whales, and the entire Puget Sound ecosystem. Recognizing this, the City of Seattle has embraced an ecosystem approach under which it looks beyond what is strictly required under the FERC study criteria and has focused its relicensing studies to inform decisions on operating the Project over the next 40-50 years.

The Project consists of three power generating developments on the Skagit River – Ross, Diablo, and Gorge – and associated lands and facilities. The Project also includes two City Light-owned towns, the North Cascades Environmental Learning Center, several recreation facilities, and several thousand acres of fish and wildlife mitigation lands. The three Skagit generating developments are hydraulically coordinated to act as a single project and supply approximately 20 percent of City Light's power requirements. The Project also plays an important role in the regional energy market by integrating renewable resources and providing generation reserves.

The current license for the Project expires on April 30, 2025. In January 2019, City Light began a voluntary Study Plan Development Process with resource agencies, Indian Tribes, Canadian First Nations, and other interested parties (collectively, licensing participants or LPs) in advance of the formal relicensing process to identify resource issues that warrant study during relicensing. City

Light filed a Notice of Intent to relicense the Project and Pre-Application Document (PAD) on April 27, 2020. Following the filing of its PAD, City Light continued meeting with LPs to discuss studies necessary to inform the relicensing process. City Light filed the Proposed Study Plan (PSP) on December 8, 2020. The PSP included a suite of 28 relicensing studies and responded to study requests from LPs. After extensive PSP meetings and careful review of LP comments on the PSP, City Light significantly expanded and modified its PSP in the Revised Study Plan (RSP) filed on April 7, 2021, which included a proposed suite of 33 relicensing studies. Following filing of the RSP, City Light continued to work with LPs to attempt to resolve outstanding areas of disagreement regarding the proposed studies. On June 9, 2021, City Light filed a "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" (June 9, 2021 Notice) detailing additional modifications to the RSP that were agreed to between City Light and supporting LPs. FERC issued its study plan determination on July 16, 2021, approving with modifications City Light's RSP. No study disputes were filed with FERC.

This ISR describes City Light's progress in implementing its relicensing studies included in the RSP and June 9, 2021 Notice, summarizes available data, and describes any variances from the approved study plans and proposed modifications to the ongoing studies.

Certain of the cultural resource study reports included in this ISR contain sensitive and confidential cultural resource information and are filed with the Commission as privileged. These documents have been labeled as CUI//PRIV—PRIVILEGED—DO NOT RELEASE.

Pursuant to 18 C.F.R. § 5.15(c)(2), within 15 days of filing this ISR, City Light will hold public ISR meetings with LPs and Commission staff to discuss the initial study results. The ISR meetings will be held virtually via Webex on March 21, March 22, and March 23, 2022. An initial agenda and instructions for joining the meetings is attached.

Within 15 days following the ISR meetings, City Light will file meeting summaries with the Commission. Within 30 days of City Light's filing of the ISR meeting summaries, stakeholders may file any disagreements with the meeting summaries, as well as any recommendations and associated justification for proposed modifications to ongoing studies or requests for new studies.

In addition to filing the ISR with the Commission, City Light will share the ISR with LPs and other stakeholders by posting the documents on City Light's Skagit Relicensing Public Documents Library web page at http://www.seattle.gov/light/skagit/Relicensing/default.htm.

City Light looks forward to continued collaboration with LPs and FERC staff in implementing the study program for the Project's relicensing. If there are any questions regarding this filing, please contact me by phone at (206) 304-1210 or by email at Chris.Townsend@seattle.gov.

Sincerely,

Chris Townsend (Mar 4, 2022 17:48 PST)

Chris Townsend
Director, Natural Resources and Hydro Licensing
Seattle City Light

Enclosures

cc: Distribution List (attached)

Skagit River Hydroelectric Project
Initial Study Report (ISR) Meeting Schedule

Time (PST)	**Monday, March 21 | *9:00 am – 4:00 pm*** **Meeting join link:** LINKED HERE **Call-in #:** +1-510-338-9438 USA Toll **Meeting #/Access Code:** 2556 885 8986 **Password:** PwphXJeA256 (79749532 from phones and video systems)	**Tuesday, March 22 | *8:45 am – 4:30 pm*** **Meeting join link:** LINKED HERE **Call-in #:** +1-510-338-9438 USA Toll **Meeting #/Access Code:** 2555 557 6348 **Password:** XTwnhh4T4R5 (98964448 from phones and video systems)	**Wednesday, March 23 | *8:45 am – 4:00 pm*** **Meeting join link:** LINKED HERE **Call-in #:** +1-510-338-9438 USA Toll **Meeting #/Access Code:** 2557 236 5576 **Password:** JiYpKdpm399 (54975376 from phones and video systems)
Morning Session	**Welcome and Introductions** ***Studies/Topics:*** • Operations Model (OM-01) • Instream Flow Model Development (FA-02) • Gorge Bypass Reach Hydraulic & Instream Flow Model Development (FA-05) • How the models work together • Additional Data Updates in ISR (Wood Management Update and Littoral Habitat Assessment)	**Welcome and Introductions** ***Studies/Topics:*** • Reservoir Tributary Habitat Assessment (FA-07) • Reservoir Native Fish Genetics Baseline (FA-06) • Reservoir Fish Stranding and Trapping Risk Assessment (FA-03) • Reservoir Shoreline Erosion (GE-01) • Sediment Deposition in Reservoirs Affecting Resource Areas of Concern (GE-03) • Geomorphology Between Gorge Dam & Sauk River (GE-04) • Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-of-Way (GE-02)	**Welcome and Introductions** ***Studies/Topics:*** • Synthesis and Integration of Available Information on Resources in the Lower Skagit River Study (SY-01) • Recreation Use and Facility Assessment (RA-01) • Gorge Bypass Safety and Whitewater Boating (RA-02) • Project Facility Lighting Inventory (RA-03) • Project Sound Assessment (RA-04) • Lower Skagit River Recreation Flow (RA-05)
Break	**12:00 – 12:45**: Lunch Break	**12:00 – 12:45**: Lunch Break	**12:00 – 12:45**: Lunch Break
Afternoon Session	**Welcome and Introductions** ***Studies/Topics:*** • Water Quality Monitoring Study (FA-01a) • Temperature Model Development Study (FA-01b) • Fish Entrainment Study (FA-08) • Fish Passage Study (FA-04)	**Welcome and Introductions** ***Studies/Topics:*** • Vegetation Mapping (TR-01) • Wetland Assessment (TR-02) • Rare, Threatened, and Endangered Plants (TR-03) • Invasive Plants (TR-04) • Marbled Murrelet (TR-05) • Golden Eagle Habitat Analysis (TR-06) • Northern Goshawk Habitat Analysis (TR-07) • Special-Status Amphibian (TR-08) • Beaver Habitat Assessment (TR-09) • Northern Spotted Owl Habitat Analysis (TR-10)	**Welcome and Introductions** ***Studies/Topics:*** • Cultural Resources Data Synthesis (CR-01) • Cultural Resources Survey (CR-02) • Gorge Bypass Reach Cultural Resources Survey (CR-03) • Inventory of Historic Properties with Traditional Cultural Significance (CR-04)

The intent of Skagit Relicensing ISR meetings is for City Light to provide updates on study implementation through the first study season. Presentations will outline study goals, objectives, methods, preliminary data (if available), variances, as well as the study schedule moving forward. The ISR reports will be available to the public via FERC's eLibrary under docket number P-553 on March 8, 2022.

Seattle City Light

Skagit Hydroelectric Project (FERC No. 553)
Initial Study Report Document Notice
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Initial Study Report Document Notice
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Initial Study Report Document Notice
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Initial Study Report Document Notice
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INITIAL STUDY REPORT

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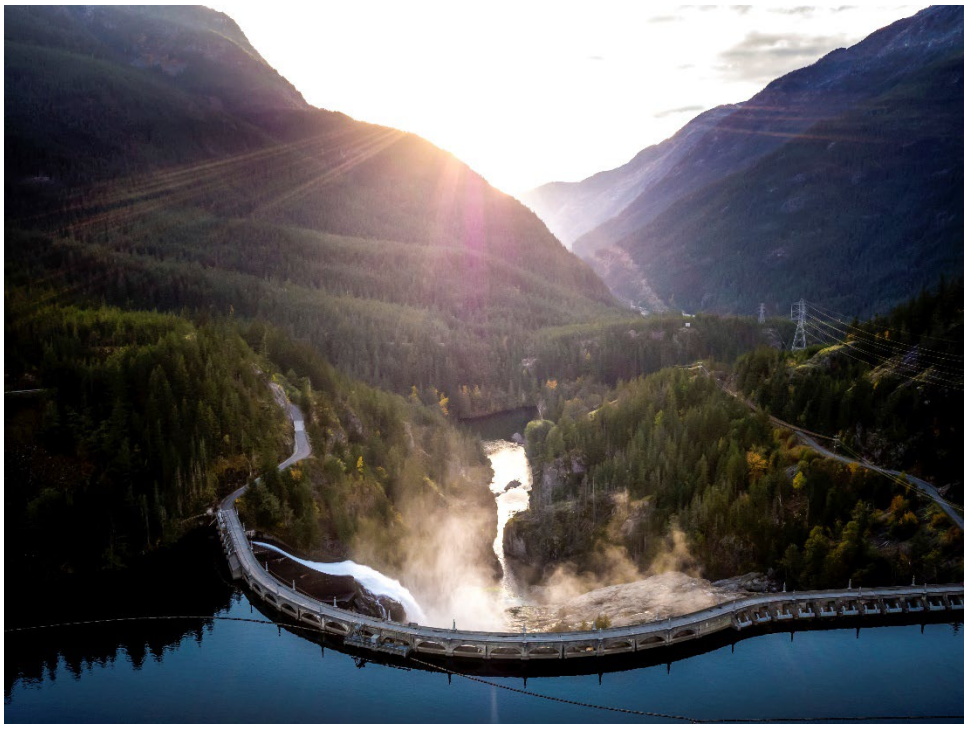

Seattle City Light

March 2022

TABLE OF CONTENTS

Section No.	Description	Page No.
Executive Summary		**ES-1**
1.0	**Introduction and Background**	**1-1**
1.1	Project Description	1-1
1.1.1	Project Location	1-1
1.1.2	Project Facilities	1-4
1.1.2.1	Ross Development	1-4
1.1.2.2	Diablo Development	1-5
1.1.2.3	Gorge Development	1-5
1.1.2.4	Transmission	1-6
1.1.2.5	Recreation Facilities	1-7
1.1.2.6	Fish and Wildlife Mitigation Lands	1-8
1.1.2.7	Project Boundary	1-8
1.1.3	Operations	1-9
1.1.3.1	Ross Development	1-9
1.1.3.2	Diablo Development	1-9
1.1.3.3	Gorge Development	1-10
1.1.3.4	Gorge Second Power Tunnel	1-11
1.2	Overview of the Integrated Licensing Process (ILP)	1-11
1.2.1	Initiation of the ILP	1-11
1.2.2	ILP Process Plan and Schedule	1-11
1.2.3	NOI and PAD	1-14
1.2.4	Commencement of Relicensing and Environmental Scoping	1-14
1.2.5	PAD and SD1 Comments and Study Requests	1-14
1.2.6	PSP	1-14
1.2.7	PSP Meeting	1-15
1.2.8	Comments on the PSP	1-15
1.2.9	RSP	1-15
1.2.10	RSP Comments	1-15
1.2.11	June 9, 2021 Notice	1-16
1.2.12	SPD and Study Disputes	1-16
1.2.13	Study Reporting and Study Plan Modification	1-16
1.2.14	DLA and FLA	1-17
2.0	**Relicensing Studies and Ongoing Data Collection Activities**	**2-1**
2.1	Relicensing Studies	2-1
2.2	Additional Technical Information	2-2

2.2.1 Hydraulic Connectivity Assessment of the Reach between Diablo Dam and Diablo Powerhouse 2-2
2.2.2 Woody Debris Management, Summary of Activities to Date 2-2
2.2.3 Littoral Habitat Analysis 2-2
2.3 Ongoing and Future Data Collection Activities 2-3
2.3.1 Landform Mapping 2-4
2.3.2 Food Web Study 2-4
2.3.3 2021 Flood Event 2-4
3.0 Review of Study Results 3-1
3.1 Cross Resource Integration of Study Results 3-1
3.2 Timing of Information Necessary to Inform Discussions Regarding PMEs 3-5
4.0 Status of Skagit Relicensing Collaborative Process 4-1
4.1 Collaboration with LPs to Date 4-1
5.0 Project Information 5-1
6.0 References 6-1

List of Figures

Figure No.	Description	Page No.
Figure 1.1-1.	Location map of the Skagit River Project.	1-3
Figure 3.1-1.	General sequence of steps, timeframes, and junctures for LP input related to relicensing studies, analysis and development of the DLA and FLA.	3-2
Figure 3.1-2.	Example conceptual workflow for development of resource measures and resource effects analysis using relicensing modeling tools.	3-4

List of Tables

Table No.	Description	Page No.
Table 1.2-1.	ILP milestones for the Skagit River Project through filing of the Final License Application (FLA).	1-11
Table 2.1-1.	Summary of studies included in this ISR.	2-1
Table 3.1-1.	Summary of models under development for operational scenarios to inform relicensing.	3-3
Table 5.0-1.	USGS RM and PRM system crosswalk.	5-1

List of Appendices

Appendix A	Conversion Table and Map Set of City of Seattle Datum to North American Vertical Datum of 1988 (NAVD 88)
Appendix B	June 9, 2021 Notice: Status Update
Appendix C	Hydraulic Connectivity Assessment of the Reach between Diablo Dam and Diablo Powerhouse Technical Memorandum
Appendix D	Woody Debris Management – Summary of Activities to Date Technical Memorandum
Appendix E	List of Meeting and Organizations Participating in the Work Groups, Technical Steering Committee, Advisory Roundtable, and Partners' Committee Meetings
Appendix F	City Light's Study Reports

List of Acronyms and Abbreviations

1-D .....one-dimensional

2-D .....two-dimensional

CFR.....Code of Federal Regulations

City Light.....Seattle City Light

CoSD.....City of Seattle datum

COVID-19.....Novel Coronavirus

DLA .....Draft License Application

Ecology .....Washington State Department of Ecology

ELC.....Environmental Learning Center

FERC.....Federal Energy Regulatory Commission

FLA.....Final License Application

FSA .....Fisheries Settlement Agreement

GIS .....geographic information system

GPS .....Global Positioning System

HEC-RAS .....Hydrologic Engineering Center River Analysis System

HWM .....high water marks

IHA .....Indicators of Hydraulic Alteration

ILP.....Integrated Licensing Process

ISR .....Initial Study Report

June 9, 2021 Notice....June 9, 2021 Notice of Certain Agreements on Study Plans for the Skagit Relicensing

kV.....kilovolt

LiDAR.....Light Detection and Ranging

LP.....licensing participant

MW .....megawatts

NAVD 88.....North American Vertical Datum of 1988

NGO.....non-governmental organization

NGS.....National Geodic Survey

Nlaka'pamux Nation..Coalition of Bands of the Nlaka'pamux Nation

NMFS.....National Marine Fisheries Service

NOI .....Notice of Intent

NPS .....National Park Service
NSO.....northern spotted owl
PAD.....Pre-Application Document
PME .....protection, mitigation, and enhancement
PRM .....Project River Mile
Project .....Skagit River Hydroelectric Project
PSP.....Proposed Study Plan
RLNRA .....Ross Lake National Recreation Area
RM .....river mile
ROW .....right-of-way
RSP .....Revised Study Plan
RTE.....rare, threatened, and endangered
SD1 .....Scoping Document 1
SD2 .....Scoping Document 2
SPD .....Study Plan Determination
SPU .....Seattle Public Utilities
SR.....State Route
U.S.C.....United States Code
UBCRM .....University of British Columbia Regime Model
USFS .....U.S. Forest Service
USGS .....U.S. Geological Survey
USR.....Updated Study Report

EXECUTIVE SUMMARY

The Skagit River Hydroelectric Project (Skagit River Project or Project) is located in the upper Skagit River Watershed. The Skagit River Watershed is within the traditional territory of several Indian Tribes and Canadian First Nations. The watershed and surrounding ecosystem support vital runs of anadromous fish that are key to the cultural, spiritual, and economic health of Indian Tribes. These anadromous fish, especially Chinook Salmon, are also important to other area residents, endangered Southern Resident Orca whales, and the entire Puget Sound ecosystem. Recognizing this, the City of Seattle has embraced an ecosystem approach wherein it looks beyond what is strictly required under the Federal Energy Regulatory Commission (FERC or Commission) study criteria and has focused its relicensing studies to inform decisions on operating the Project over the next 40-50 years.

The City of Seattle, through its City Light Department (City Light), is the licensee of the existing 700-megawatt (MW) Skagit River Project. The Project is located within the North Cascades National Park Complex and portions of Whatcom, Skagit, and Snohomish counties, Washington. The Project consists of three power generating developments on the Skagit River—Ross, Diablo, and Gorge—and associated lands and facilities. The Project was originally licensed in 1927 by FERC's predecessor agency, the Federal Power Commission. The Project was developed over a 42-year period, beginning with the construction of Gorge Powerhouse and a timber-crib dam in 1919, and finishing with the completion of the existing concrete-arch dam at the Gorge Development in 1961.

The Project generating facilities are entirely within the Ross Lake National Recreation Area (RLNRA), which is administered by the National Park Service (NPS) as part of the North Cascades National Park. Approximately one mile of Ross Lake, the upper-most Project reservoir, is in British Columbia and is part of the Skagit Valley Provincial Park. The roughly 60-mile stretch of the Skagit River several miles downstream of the Project is designated as a Wild and Scenic River and is managed by the U.S. Forest Service (USFS).

The three Skagit generating developments are hydraulically coordinated to act as a single project and supply approximately 20 percent of City Light's power requirements. The operational priorities for the Project are flood control, downstream fish protection, recreation, and power production. The Project also plays an important role in the regional energy market by integrating renewable resources and providing generation reserves.

Regionally, the Skagit River is a critically important resource. It is one of the largest rivers in Washington State and the only Puget Sound river that supports all five native salmonid species. It provides spawning, incubation, and rearing habitat for three federally listed threatened fish species—Chinook Salmon, steelhead, and Bull Trout—and is well-known for the large numbers of bald eagles that winter along the river and in its floodplain. The floodplain along the lower Skagit River contains rich agricultural land and supports thousands of migrating waterfowl and raptors.

The existing license for the Skagit River Project was issued May 16, 1995 and will expire on April 30, 2025. City Light is utilizing FERC's Integrated Licensing Process (ILP) to prepare its license

application. The Federal Power Act requires City Light to file its new license application with FERC by April 30, 2023.

City Light initiated the relicensing by filing a Notice of Intent (NOI) and Pre-Application Document (PAD) with the Commission on April 27, 2020. The PAD proposed 24 studies developed by City Light in consultation with licensing participants (LP) through a voluntary Study Plan Development Process. On June 26, 2020, FERC issued public notice of City Light's NOI and PAD, which kicked off the formal licensing proceeding and started the public comment period on the PAD. Concurrently, FERC issued Scoping Document 1 (SD1) to outline the subject areas to be addressed in its environmental analysis of the Project pursuant to the National Environmental Policy Act. Due to the Novel Coronavirus (COVID-19) pandemic, FERC waived public scoping meetings and a site visit, and solicited written comments, recommendations, and information on SD1. Based on comments filed with the Commission in response to the PAD and SD1, and LP study requests, the Commission revised SD1 by issuing Scoping Document 2 (SD2) on December 4, 2020.

City Light filed the Proposed Study Plan (PSP) on December 8, 2020. The PSP included a suite of 28 relicensing studies and responded to study requests from LPs. As required by FERC's ILP regulations at 18 Code of Federal Regulations (CFR) § 5.11(e), City Light held study plan meetings to discuss the PSP on January 6, and 12-14, 2021. These meetings were used to present the background, concepts, and studies described in the PSP and receive feedback from the LPs. In addition, City Light hosted ten additional topic-based meetings and several one-on-one meetings with LPs in late January through April 2021 which were aimed at resolving outstanding differences between City Light's proposed studies and LPs' study requests.

Following the PSP meetings and after careful review of LP comments on the PSP, City Light reevaluated its position with respect to relicensing studies, reassessed its longstanding relationships with LPs, and decided to prioritize its efforts toward resolving outstanding differences concerning the proposed studies. City Light decided to significantly expand and modify its PSP in the Revised Study Plan (RSP) to demonstrate its commitment to working with LPs to accommodate their interests and information needs. Following filing of the RSP, City Light continued to work with LPs to attempt to resolve outstanding areas of disagreement regarding the proposed studies. On June 9, 2021, City Light filed a "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" (June 9, 2021 Notice)[1] detailing additional modifications to the RSP agreed to between City Light and supporting LPs (which include the Swinomish Indian Tribal Community, Upper Skagit Indian Tribe, National Marine Fisheries Service [NMFS], NPS, U.S. Fish and Wildlife Service, Washington State Department of Ecology [Ecology], and Washington Department of Fish and Wildlife). FERC subsequently issued its Study Plan Determination (SPD) on July 16, 2021, approving with modifications City Light's RSP. No study disputes were filed with FERC.

This Initial Study Report (ISR) provides a description of City Light's progress in implementing its relicensing studies described in the RSP and the June 9, 2021 Notice, an explanation of variances from the approved study plans, and proposed modifications to the ongoing studies.

[1] Referred to by FERC in its July 16, 2021 Study Plan Determination as the "updated RSP."

While most studies will be completed prior to filing the license application, for a limited number of studies field work and continued analysis may continue into 2023. If this occurs, City Light and the LPs may request that the Commission not issue the "Ready for Environmental Analysis" notice until such studies are completed and any additional protection, mitigation, and enhancement (PME) measures are submitted to FERC.

Ultimately, the results of these studies will be comprehensively analyzed together with other available information, including that from the PAD, in order to evaluate the environmental effects of the Project proposal to be described in the license application. The license application will also include a description of any anticipated environmental impacts of continued operation of the Project, the incremental impact of any proposed equipment and/or capacity upgrades or redevelopment of Project works, implementation of PME measures, and any other proposed changes in Project operation. It is City Light's intent to engage in discussions with LPs with a goal of reaching mutual agreement on a comprehensive Project proposal, inclusive of appropriate PME measures, management plans, and a Project operations proposal to be presented in the license application. City Light will file a Draft License Application (DLA) with FERC no later than December 1, 2022 and a Final License Application (FLA) no later than April 30, 2023.

1.0 INTRODUCTION AND BACKGROUND

The Skagit River Hydroelectric Project (Skagit River Project or Project), owned and operated by the City of Seattle, through its City Light Department (City Light), is licensed by the Federal Energy Regulatory Commission (FERC or Commission) as Project No. 553. The existing license for the Skagit River Project was issued May 16, 1995 and will expire on April 30, 2025. In accordance with FERC regulations, City Light notified FERC on April 27, 2020 that it intends to apply for a new license for the Project. The Federal Power Act requires City Light to file its new license application with FERC by April 30, 2023.

In accordance with FERC regulations at 18 Code of Federal Regulations (CFR) Part 5, City Light is utilizing FERC's Integrated Licensing Process (ILP) for preparing its license application. This Initial Study Report (ISR) is being filed with FERC pursuant to 18 CFR § 5.15(c)(1) and the Process Plan and Schedule referenced in FERC's June 14, 2021 letter regarding Filing of Updated Revised Study Plan (see Table 1.2-1 in this ISR). Notification of availability of this ISR is also being distributed to state and federal agencies, Indian Tribes, Canadian First Nations, non-governmental organizations (NGO), and other interested parties (collectively, licensing participants [LP]).

1.1 Project Description

1.1.1 Project Location

The Skagit River Project is located in northern Washington State, across Whatcom, Skagit and Snohomish counties, and consists of three power generating developments on the Skagit River—Ross, Diablo, and Gorge—and associated lands and facilities (Figure 1.1-1). The Project generating facilities are in the Cascade Mountains of the upper Skagit River watershed, between Project River Miles (PRM) 94.5 and 127.9 (U.S. Geological Survey [USGS] river mile [RM] 94 and 127).[2] The Project has a total authorized installed capacity of 700.27 megawatts (MW).[3] Power from the Project is transmitted via two 230-kilovolt (kV) powerlines that span over 100 miles and end just north of Seattle at the Bothell Substation. The Project also includes two City Light-owned towns (Newhalem and Diablo), the North Cascades Environmental Learning Center (ELC), several recreation facilities, and several thousand acres of fish and wildlife mitigation lands.

The Project Boundary is extensive, spanning over 133 miles from the Canadian border to the Bothell Substation just north of Seattle, Washington. In addition, there are "islands" of fish and wildlife mitigation lands and recreation facilities within the Skagit, Sauk, and South Fork Nooksack watersheds that are also within the Project Boundary. Project generating facilities are entirely within the Ross Lake National Recreation Area (RLNRA), which is administered by the National Park Service (NPS) as part of the North Cascades National Park Complex. The RLNRA was established in 1968 in the enabling legislation for North Cascades National Park to provide for the "public outdoor recreation use and enjoyment of portions of the Skagit River and Ross,

[2] City Light has developed a standard Project centerline and river mile system to be used throughout the relicensing process, including the study program, to replace the outdated USGS RM system. Given the long-standing use of the USGS RM system, both it and the PRM system are provided throughout this document. For further details see Section 5.0 of this ISR.

[3] Authorized installed capacity values presented herein are those approved by the February 2, 2021 Order Amending License, Approving Revised Exhibits K and M, and Revising Annual Charges (174 FERC ¶ 62,066).

Diablo, and Gorge lakes." The legislation maintains FERC's jurisdiction "in the lands and waters within the Skagit River Hydroelectric Project," as well as hydrologic monitoring stations necessary for the proper operation of the Project (16 United States Code [U.S.C.] § 90d-4; Public Law 90-544. Sec. 505 dated October 2, 1968, as amended by Public Law 100-668. Sec. 202 dated November 16, 1988).

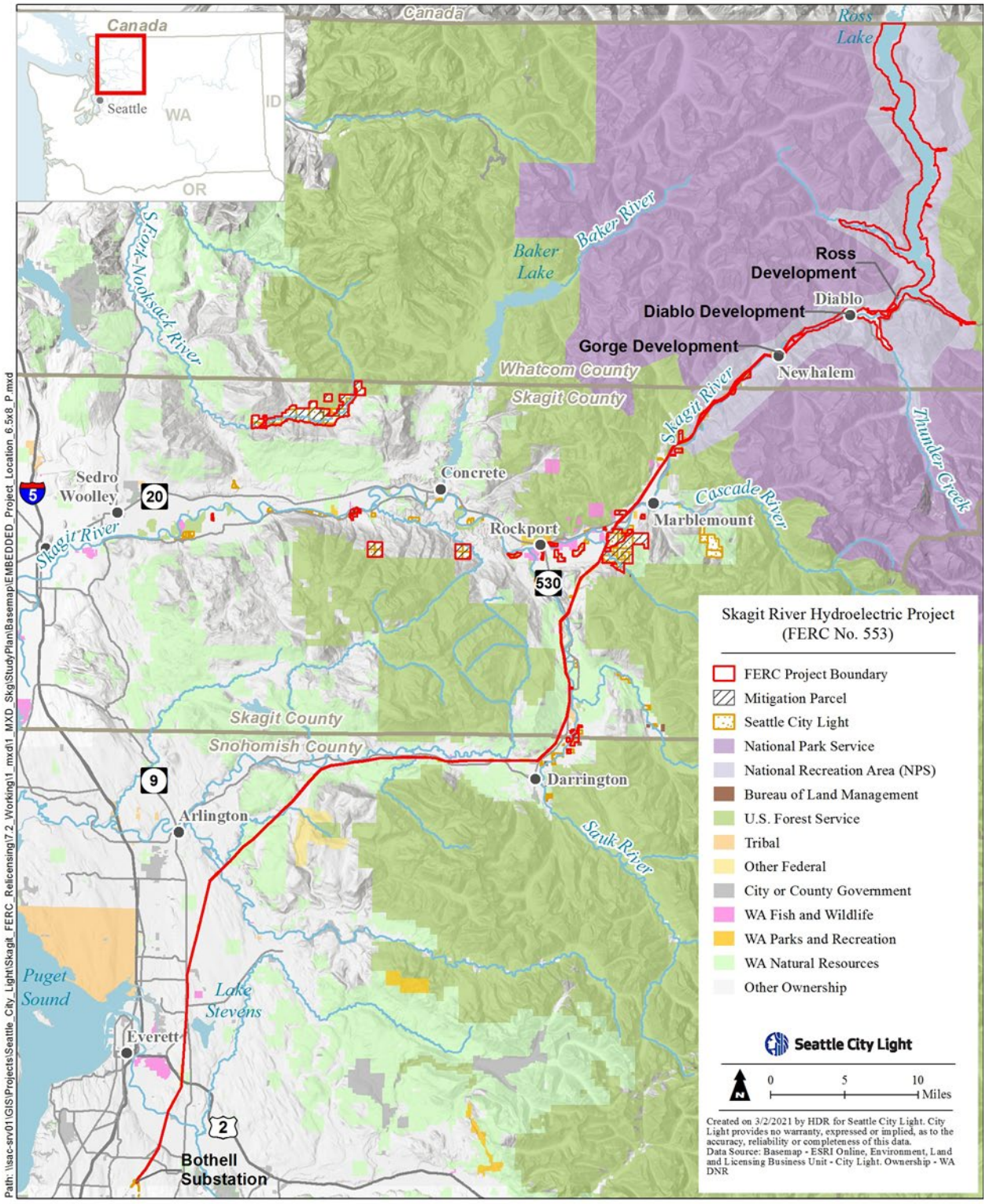

Figure 1.1-1. Location map of the Skagit River Project.

1.1.2 Project Facilities

1.1.2.1 Ross Development

The Ross Development is the furthest upstream of the three Skagit River Project developments; the powerhouse and nearby dam are about 11 miles north of Newhalem. Most of the water used for Skagit River Project power generation originates in high mountain basins surrounding Ross Lake and upstream along the Skagit River in British Columbia. The Ross Development is relatively inaccessible, especially by vehicle. The Ross Development can be accessed via Diablo Lake or by foot via the Ross Dam Trail, which is one mile long and drops 700 feet from a parking lot along State Route (SR) 20 at milepost 134. Another trail to the lake, the East Bank Trail, leaves SR 20 from the upper end of Ruby Arm. The only vehicle access to the reservoir is via a 40-mile-long gravel road from Hope, British Columbia, to Hozomeen at the very north end of the reservoir. The boat ramps at Hozomeen provide the only public launches for motorized boats.

Ross Powerhouse is about 1,100 feet downstream of Ross Dam, on the left bank at the eastern end of Diablo Lake. There are four Westinghouse generating units (Units 41, 42, 43, and 44), each with a nameplate rating of 112.5 MW. Units 42, 43, and 44 each have an authorized installed capacity of 91.875 MW, and Unit 41 has an authorized installed capacity of 76.875 MW, for a total authorized installed capacity of 352.5 MW at the development. Two concrete-lined power tunnels deliver water from the reservoir to four penstocks and into the powerhouse. There is no surge tank. Diablo Lake backs up to the base of Ross Dam and there is no bypass reach or section of free-flowing river between the two developments.

Ross Dam is immediately upstream of Ross Powerhouse at PRM 105.7 (USGS RM 105.1). At 540 feet from bedrock to crest, it is the highest of the three Project dams. The dam has two spillways—one on each side and each with six gates operated by an electric hoist. Two of the spill gates can be controlled remotely; the others are operated locally at the dam. In addition to the spillways, Ross Dam has two concrete lined power tunnel intake structures, two butterfly valves at the 1,346.2-foot North American Vertical Datum of 1988 (NAVD 88) (1,340-foot City of Seattle datum [CoSD]) level[4] and two hollow jet valves near the right bank at 1,275.2 and 1,260.2 feet NAVD 88 (1,269 and 1,254 feet CoSD). The two sets of valves can be opened to evacuate the reservoir once water levels drop below the level of the spill gates. On the top of the dam, a shed houses two hoists, one for each of the broome gates that close off the six-foot-diameter water supply pipes to the hollow jet valve. There is also a gantry crane used to raise and lower the broome gates that isolate the six-foot conduits for the butterfly valves. The road on top of the dam is used by City Light and NPS vehicles and is open to pedestrian use by the public.

At nearly 23 miles long, Ross Lake is the largest reservoir in western Washington. It extends into Canada approximately another 1 mile (24 miles total), with about 500 acres in British Columbia.

[4] City Light is in the process of converting Project information from its older vertical elevation datum (CoSD) to the more current and standardized elevation datum (NAVD 88). As such, elevations are provided relative to both data throughout this ISR. The conversion factor between CoSD and NAVD 88 varies depending on location. A table converting elevation values of common benchmarks, staff gages, and key Project features from CoSD to NAVD 88 and a map of the same features are appended to this ISR (Appendix A), both of which have been updated since the Pre-Application Document (PAD).

The reservoir has a surface area of 11,680 acres and storage volume of 1,435,000 acre-feet at the normal maximum water surface elevation of 1,608.76 feet NAVD 88 (1,602.5 feet CoSD).

1.1.2.2 Diablo Development

The Diablo Development is between the Ross and Gorge developments and in addition to generating power it reregulates flows between the other two developments. The powerhouse is on the north side of the Skagit River in the town of Diablo, about 4,000 feet downstream from Diablo Dam. Water from the reservoir to the powerhouse is conveyed by a single concrete lined tunnel for 1,900 feet that leads to four steel-lined penstocks. There is a surge tank located near the bottom end of the tunnel, uphill from the powerhouse.

Diablo Powerhouse holds two Westinghouse generators (Units 31 and 32) and each has a nameplate rating of 90 MW and authorized installed capacity of 78.035 MW. There are also two smaller, house-unit generators (Units 35 and 36), each with nameplate ratings and authorized installed capacities of 1.2 MW. Total authorized installed capacity at the development is 158.47 MW. A reinforced-concrete tailrace on the westerly edge of the powerhouse also serves to support transformers, a switching apparatus, and a crossing for a single-lane road.

Diablo Dam is located at PRM 101.6 (USGS RM 101.2), about five miles upstream of Gorge Dam and four miles downstream of Ross Dam. The concrete arch dam is 389 feet from bedrock to crest and has two spillways, one on each side, and a total of 19 spill gates—seven on the south spillway and 12 on the north. The three southern-most gates are automated via an electric hoist that can be locally or remotely operated. The remaining 16 gates are controlled locally at the dam using the "mule," an electric motor-driven hydraulic hoist that consists of two hydraulic cylinders to open or close the associated spill gate. The mule runs on rails along the road on top of the dam and is positioned over the desired gate. The lifting chains for the gates are accessed below the deck plates on the dam. A valve house on the face of the dam at elevation 1,050.65 feet NAVD 88 (1,044 feet CoSD) has four outlets—three butterfly valves that can evacuate water from the reservoir at levels below the spill gates and one Larner Johnson valve that is not used. There are two bifurcated intakes at the dam but only one is in use, as the second intake was for planned future expansion of the powerhouse and a second tunnel, which were never constructed. The crest of the dam also serves as a road that provides access to a boat house and other marine facilities and the ELC. The road across the dam is open to the public from 7am to 5pm.

Diablo Lake has a surface area of about 770 acres and gross storage of 50,000 acre-feet at a normal maximum water surface elevation of 1,211.36 feet NAVD 88 (1,205 feet CoSD). Under normal operations at both the Gorge and Diablo developments, there is a short section of free-flowing river between the Diablo tailrace and the upper end of Gorge Lake. This short riverine section of the Skagit River is backwatered by the powerhouse above the hydraulic control at the point of the Stetattle Creek confluence. This reach remains watered and connected under normal operations.

1.1.2.3 Gorge Development

Gorge Powerhouse is on the left bank (facing downstream) of the Skagit River just upstream of the town of Newhalem and is reached via a bridge across the river that connects to SR 20. The bridge is closed to the public. There are four Westinghouse generating units (Units 21, 22, 23, and 24). Units 21 and 22 each have a nameplate rating of 36.86 MW and authorized installed capacity

of 31.5 MW; Unit 23 has a nameplate rating of 36.86 MW and authorized installed capacity of 30.2 MW. Unit 24 is significantly larger, with a nameplate rating of 97 MW and an authorized installed capacity of 96.1 MW. Total authorized installed capacity at the development is 189.3 MW.

In addition to generating power, Gorge Powerhouse is responsible for regulating flows to the river downstream of the Project for fish protection, as stipulated by the current Project license. Units 21, 22, and 23 are each connected to steel-lined penstocks through 10-foot-diameter, biplane-type butterfly valves equipped with relief valves, which will discharge a maximum of 65 percent of the turbine flow at full-load rejection. Equipment has also been installed to allow these valves to open and stay open for any required period to maintain fish flows after a plant load rejection/shutdown. Unit 24 is connected to the steel-lined penstock through a 15-foot-diameter butterfly valve.

Water from Gorge Lake is conveyed via an intake structure in Gorge Dam into an 11,000-foot-long concrete lined power tunnel to the powerhouse. The power tunnel passes through the solid rock slope that is adjacent to the Skagit River and then splits into four penstocks. A surge tank and riser with restricted orifice is located at the lower end of the tunnel. There are also two adits that provide access to the power tunnel—one about halfway at Devil's Elbow and the other near Gorge Powerhouse.

Gorge Dam, located at PRM 97.2 (USGS RM 96.6), is about 2.5 miles upstream of Gorge Powerhouse and 4 miles downstream from Diablo Dam near Gorge Creek. The dam is a combination concrete arch and gravity structure that rises 300 feet from bedrock to crest. There are two spillways with gates that are operated by an electric hoist on top of the dam. One gate can be remotely controlled to a limited height; the other must be opened and closed locally at the dam. Training walls on either side of the spillway direct water into the river channel downstream. Two outlet valves on the face of the dam at elevation 770.3 feet NAVD 88 (764 feet CoSD) can be used to evacuate water from Gorge Lake below the spill gate level. There is a log chute that allows floating woody debris to be passed downstream of the Project.

Gorge Lake is 4.5 miles long and extends upstream to the base of Diablo Dam. At the normal maximum water surface elevation of 881.51 feet NAVD 88 (875 feet CoSD), the lake has a surface area of 240 acres and gross storage of 8,500 acre-feet. During normal operations, water from Gorge Dam is conveyed to the Powerhouse via the 11,000-foot-long power tunnel, creating a 2.5-mile-long bypass reach of the Skagit River between the dam and the powerhouse. This reach serves as the active spillway for Gorge Dam.

1.1.2.4 Transmission

The Project Boundary includes approximately 351.83 circuit miles of primary transmission lines connecting the Project to the bulk electrical grid. The lines terminate at Bothell Substation, just north of Seattle; the substation is located partially within the Project Boundary. The other substation associated with the lines is North Mountain, outside of the town of Darrington, which is jointly owned by City Light and Snohomish Public Utility District and began operations in 1991. This substation gives City Light the ability to interconnect with other utilities to balance regional supply and demand, if needed. The North Mountain Substation is not a Project facility and is not within the Project Boundary.

The Project transmission lines are primarily on double-circuit steel lattice towers, although a few towers have been replaced with monopoles. The various components of this system are described below:

- From Ross Powerhouse, two 230-kV transmission lines (R1 and R2) run for about 3.8 miles along the west side of Diablo Lake, down the hillside past Diablo Dam to Diablo Switchyard.
- The 230-kV Diablo Switchyard is adjacent to Diablo Powerhouse and serves to connect the Ross, Diablo, and Gorge developments into the Skagit transmission system. The R1 and R2 lines from Ross terminate at the switchyard.
- From Diablo Switchyard, one 230-kV line (D4) runs for 5.8 miles and terminates at Gorge Switchyard, located just across the river from Gorge Powerhouse. The other three lines (D1, D2, and D3) run 87.5 miles to the Bothell Switching Substation.
- From the Gorge Switchyard, a single 230-kV line (GO-NM) runs 36.8 miles to the North Mountain Substation.
- From there, the NM-SN line extends for 40.6 miles to Bonneville Power Administration's Snohomish Substation and then another 7.6 miles to Bothell as SN-BO#1.

From Gorge Switchyard to North Mountain Substation, the D1, D2, D3, and GO-NM lines are mostly within the same right-of-way (ROW), although there are a few sections where the ROW splits, with two lines in each, due to topographical constraints. At the North Mountain Substation, the NN-SN line joins the three lines originating at Diablo (D1, D2 and D3) and runs in the same ROW. Similarly, the SN-BO#1 line joins the ROW from the Snohomish Substation to Bothell. From Ross Powerhouse to Bothell Substation, the ROW is approximately 100 miles long and ranges from 150 to 400 feet wide.

1.1.2.5 Recreation Facilities

City Light operates and maintains several educational, recreation, and interpretive facilities at the Project, including:

(1) North Cascades Environmental Learning Center;

(2) Skagit Tour Dock;

(3) West Ferry Landing;

(4) East Ferry Landing;

(5) Ross Lodge Picnic Shelter;

(6) Gorge Lake Boat Launch;

(7) Ladder Creek Falls Trail and Gardens;

(8) Trail of the Cedars;

(9) Gorge Powerhouse Overlook;

(10) Gorge Powerhouse Visitor Gallery;

(11) Skagit Information Center and restrooms;

(12) Newhalem General Store;

(13) Gorge Inn Museum;

(14) Newhalem Picnic Sites;

(15) Newhalem Parking Areas and complimentary vehicle charging station;

(16) Newhalem Interpretive Displays; and

(17) Newhalem Playground.

1.1.2.6 Fish and Wildlife Mitigation Lands

City Light owns multiple parcels of lands in the Skagit, Sauk, and South Fork Nooksack watersheds managed for wildlife and fish habitat, totaling approximately 10,804 acres. All of the fish and wildlife mitigation lands are within the current Project Boundary.[5]

1.1.2.7 Project Boundary

The Skagit River Project Boundary encompasses 32,773 acres and includes all Project facilities, including the dams, powerhouses, reservoirs, power tunnels, switchyards, transmission lines, and the towns of Newhalem and Diablo, as well as all fish and wildlife mitigation lands and Project recreation sites. It terminates in Washington State, at the U.S.-Canada border, and thus does not include all the lands and waters around and within Ross Lake. Most of the City Light-owned fish and wildlife mitigation lands, as well as the U.S. Forest Service (USFS)-managed Marblemount and Sauk River boat launches, are non-continuous features within the Project Boundary and are mapped as "islands."

The Skagit River Project encompasses 19,233.51 acres of federal lands administered by the NPS and USFS—19,007.01 acres that are non-transmission related, and 226.5 acres in the transmission line ROW.[6] The Project Boundary along Diablo and Gorge lakes extends about 200 feet (horizontal measurement) beyond the normal maximum water surface elevation. For Ross Lake, the Project Boundary was established to accommodate potential future development subject to the High Ross Treaty.[7] As a result, the Project Boundary around Ross Lake includes significant reaches of several of the major tributaries above the current normal maximum water surface elevation, including Big Beaver, Little Beaver, Lightning, and Ruby creeks. While included within the Project Boundary, lands associated with the inundation zone of High Ross (5,213.78 acres)[8]

[5] In 2020, City Light amended the Project Boundary to include additional fish and wildlife mitigation lands that were recently acquired under ongoing implementation of the existing license (April 1, 2020 request to amend Exhibit K, as modified in its August 19, 2020 Response to FERC's May 21, 2020 Additional Information Request). Project Boundary acreage values presented herein are those approved by the February 2, 2021 Order Amending License, Approving Revised Exhibits K and M, and Revising Annual Charges (174 FERC ¶ 62,066).

[6] In response to FERC's May 21, 2020 Additional Information Request, City Light submitted revised Exhibits K and M, which included updated federal lands values. Federal land acreage values presented herein are those approved by the February 2, 2021 Order Amending License, Approving Revised Exhibits K and M, and Revising Annual Charges (174 FERC ¶ 62,066).

[7] Plans to raise the height of Ross Dam by 125 feet, approved by the Federal Power Commission in 1977, were suspended with the signing of the High Ross Treaty in 1984.

[8] Per February 2, 2021 Order Amending License, Approving Revised Exhibits K and M, and Revising Annual Charges (174 FERC ¶ 62,066).

are not impacted by Project operations and therefore anticipated generally to be excluded from the geographic scope of relicensing studies.

In compliance with Article 201 of the FERC license, City Light pays reasonable annual charges for recompensing the United States for the use, occupancy, and enjoyment of its lands by hydropower licensees. Annual charges for the use of government lands are payable in advance and are based on an annual schedule of per-acre rental fees. For 2022 the total fee levied for the Skagit Project was $3,976,199.91 based on the Whatcom County rate of $297.60 per acre applied to 13,371.53 qualifying acres.

1.1.3 Operations

The three Project developments are hydraulically coordinated to operate as a single project. Project operation under the existing license is designed to meet and prioritize four objectives: (1) flood control; (2) salmon and steelhead protection flows downstream of Gorge Powerhouse; (3) recreation; and (4) power generation. To achieve these goals, City Light must adhere to specific license requirements for Ross Lake levels and for streamflows and ramping rates downstream of Gorge Powerhouse. This section describes typical current operations and does not describe variations due to extreme weather events such as heat waves and intense rain events.

1.1.3.1 Ross Development

Ross Lake, the impoundment created by Ross Dam, is the largest of the three Project reservoirs with a useable storage capacity of 1,052,000 acre-feet. City Light operates Ross Lake to provide storage for energy generation, downstream flood control, and recreation at the lake.

Under existing operations, Ross Lake is drawn down on a yearly basis during winter in order to capture flows from spring runoff and to provide for downstream flood control. The drawdown typically begins after Labor Day and continues until the lake reaches its lowest level in late March or early April. The current license requires City Light to draw down Ross Lake to a level that provides 60,000 acre-feet of storage for flood control by November 15 and 120,000 acre-feet by December 1, and to maintain this available storage through March 15.

Ross Lake levels are also managed to meet recreational needs, including access to 19 boat-in campsites with docks and pit toilets managed by NPS, during the summer months. The current license requires City Light to fill Ross Lake as soon as possible after April 15, achieve normal maximum water surface elevation depth by July 31, and maintain normal maximum water surface elevation depth through Labor Day.

City Light typically operates the Ross Powerhouse continuously to pass flow downstream, although it occasionally increases and decreases generation for short periods to help meet load-following demand or other Project purposes. Spills over Ross Dam are infrequent due to the large reservoir storage capacity. Spill is typically associated with gate testing and is usually short in duration and averages only a few cubic feet per second of flow per event.

1.1.3.2 Diablo Development

The Diablo Development is operated primarily to regulate flow between the Ross and Gorge Developments. Under normal operation, the reservoir level typically fluctuates between 4 and 5

feet per day. Because of its limited useable storage (8,820 acre-feet) relative to Ross Lake, the reservoir cannot absorb large fluctuations in flow under normal operations. Therefore, the Diablo Development spills much more frequently than the Ross Development, averaging about 30 days of spill per year. Spill generally occurs during periods of high runoff in the spring or early summer, or when the powerhouse units are offline or additional flow is needed to meet fish protection flows downstream of the Gorge Powerhouse.

Like the Ross Powerhouse, City Light typically operates the Diablo Powerhouse continuously to pass flow downstream, although it occasionally increases and decreases generation for short periods to help meet load-following demand or other Project purposes.

1.1.3.3 Gorge Development

The Gorge Development is operated primarily to regulate flows downstream of the powerhouse for salmon and steelhead protection in the upper Skagit River. The fish protection flow requirements are specified in the Revised Fisheries Settlement Agreement (FSA) Flow Plan that was developed in collaboration with Tribes and regulatory agencies and that was approved by a July 17, 2013 Commission order amending license. The fish protection flows are generally designed to: (1) limit maximum flows when salmon and steelhead are spawning to prevent redd building along the margins of the river where they could be subject to flow fluctuations or dewatering if flows are reduced; (2) maintain minimum flows throughout the incubation period to prevent desiccation of redds; and (3) limit ramping to protect sensitive life stages of salmon and steelhead from rapid increases or decreases in river flows.

To comply with the requirements of the FSA Flow Plan, City Light operates Gorge Lake and Powerhouse to provide a continuous, stable flow regime in the upper Skagit River. Reservoir fluctuations are limited to about 3 to 5 feet and City Light does not typically operate the powerhouse to meet load-following demand.

The Gorge Development creates a 2.5-mile-long bypassed reach of the Skagit River between the dam and powerhouse. There are no minimum or maximum flow requirements or ramping rates in the existing license for the Gorge bypass reach. Therefore, except during spill events at Gorge Dam, bypass reach flow is limited to accretion flow, spill-gate seepage, tributary input, and precipitation runoff. Spilling occurs on an unpredictable basis and can swiftly fill the bypass reach with flows in excess of 20,000 cubic feet per second recorded in this past year. Public access to the bypass reach is prohibited due to hazardous conditions.

Spill at Gorge Dam into the 2.5-mile-long Gorge bypass reach occurs any time that inflow exceeds the generating capacity of the powerhouse, or if additional flow is needed to meet fisheries protection flows in the upper Skagit River. These spill events typically occur between 14 and 61 days per year.

1.1.3.4 Gorge Second Power Tunnel

The current Skagit River Project license includes a second power tunnel at the Gorge Development, which has not yet been constructed.[9]

1.2 Overview of the Integrated Licensing Process (ILP)

1.2.1 Initiation of the ILP

Pursuant to 18 CFR § 5.5(a), City Light filed a Notice of Intent (NOI) to relicense the Project and a Pre-Application Document (PAD; City Light 2020a) with FERC on April 27, 2020. Copies of the NOI, PAD, and other relicensing filings can be accessed through FERC's e-library (www.ferc.gov/docs-filing/elibrary.asp) or the Skagit Relicensing Public Document Library on City Light's website (http://www.seattle.gov/light/skagit/Relicensing/default.htm).

1.2.2 ILP Process Plan and Schedule

Following City Light's filing of its NOI and PAD, several parties requested a modification of the ILP process plan and schedule presented in the PAD. FERC granted the extension request, in part, on June 25, 2020, in response to extension request letters by several agencies and Indian Tribes, City Light's June 16, 2020 support letter, and in light of extenuating circumstances of the Novel Coronavirus (COVID-19) pandemic on LP participation in the study planning phase of the ILP. As a result, FERC issued a modified ILP Process Plan and Schedule waiving the timing requirements of 18 CFR §§ 5.10, 5.11, 5.12, and 5.13, extending the due dates for each milestone up to the Director's Study Plan Determination (SPD) by 60 days, and maintaining the original deadlines for the ISR of March 8, 2022, and the Updated Study Report (USR) of March 8, 2023.

In addition, in response to various LP requests for extension of time to comment on the Revised Study Plan (RSP)[10] and City Light's June 9, 2021 filing of its "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" (June 9, 2021 Notice),[11] FERC subsequently issued modified ILP Process Plans and Schedules in letters dated April 6, May 17, and June 14, 2021. Table 1.2-1 details the current Process Plan and Schedule as established by FERC.

Table 1.2-1. ILP milestones for the Skagit River Project through filing of the Final License Application (FLA).

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date[1]	FERC Regulation
Filing of Notice of Intent (NOI) and Pre-Application Document (PAD)	City Light	As early as 5.5 years, but no later than 5 years prior to license expiration	4/27/2020	18 CFR §5.5 and §5.6
Initial Tribal Consultation Meeting(s)	FERC	No later than 30 days after filing NOI and PAD	5/27/2020	18 CFR §5.7

[9] A second power tunnel at the Gorge Development was authorized in a license amendment issued by FERC July 17, 2013 (144 FERC ¶ 62,044).

[10] Swinomish Indian Tribal Community letter dated April 2, 2021 (supported by Washington Department of Ecology [Ecology] and City Light in letters dated April 5 and 6, 2021, respectively), and the Coalition of Bands of the Nlaka'pamux Nation in letter dated May 12, 2021.

[11] Referred to by FERC in its July 16, 2021 SPD as the "updated RSP."

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date[1]	FERC Regulation
Notice of NOI/PAD and Issuance of Scoping Document 1 (SD1)	FERC	Within 60 days of filing NOI and PAD	6/26/2020	18 CFR §5.8
Scoping Meeting/Site Visit	FERC	Within 30 days of NOI/PAD notice and issuance of SD1	N/A Waived[2]	18 CFR §5.8(b)(viii)
Comments on PAD, SD1, and Study Requests	FERC, LPs	Within 60 days of NOI/PAD notice and issuance of SD1	10/24/2020	18 CFR §5.9
Issuance of Scoping Document 2 (SD2), if necessary	FERC	Within 45 days of deadline for filing comments on SD1	12/8/2020	18 CFR §5.10
File Proposed Study Plan (PSP)	City Light	Within 45 days of deadline for filing comments on PAD	12/8/2020	18 CFR §5.11(a)
Study Plan Meeting(s)	City Light	Initial meeting to be held within 30 days of filing PSP	1/7/2021	18 CFR §5.11(e)
Comments on PSP	FERC, LPs	Within 90 days after PSP is filed	3/8/2021	18 CFR §5.12
File Revised Study Plan (RSP)	City Light	Within 30 days of deadline for comments on PSP	4/7/2021	18 CFR §5.13(a)
Comments on RSP	All LPs, except the Coalition of Bands of the Nlaka'pamux Nation	Within 15 days following RSP	5/6/2021[3]	18 CFR §5.13(b)
	the Coalition of Bands of the Nlaka'pamux Nation		6/1/2021[4]	
File Updated RSP	City Light		6/9/2021[5]	18 CFR §5.13(a)
Comments on Updated RSP	LPs	Within 15 days of FERC's letter on Updated RSP	6/29/2021[5]	18 CFR §5.13(b)
Issuance of Study Plan Determination (SPD)	FERC	Within 30 days of RSP	7/16/2021[5,6]	18 CFR§ 5.13(c)
Conduct First Season of Studies	City Light		2021	18 CFR §5.15(a)
Initial Study Report (ISR)	City Light	Pursuant to the Commission-approved study plan and schedule provided in §5.13 or no later than 1 year after Commission approval of the study plan	3/8/2022	18 CFR §5.15(c)(1)
ISR meeting	City Light and LPs	Within 15 days of filing the ISR	3/23/2022	18 CFR §5.15(c)(2)
File ISR Meeting Summary	City Light	Within 15 days of study results meeting	4/7/2022	18 CFR §5.15(c)(3)

Significant Pre-filing Milestones	Responsible Party	Timeframe	Date[1]	FERC Regulation
File Meeting Summary disagreements[7]	LPs	Within 30 days of study results Meeting Summary	5/7/2022	18 CFR §5.15(c)(4)
File responses to Meeting Summary disagreements	City Light	Within 30 days of filing Meeting Summary disagreements	6/6/2022	18 CFR §5.15(c)(5)
Study Dispute Determination	FERC	Within 30 days of filing responses to disagreements	7/6/2022	18 CFR §5.15(c)(6)
Conduct Second Season of Studies	City Light		2022	18 CFR §5.15(a)
File Draft License Application (DLA)	City Light	No later than 150 days prior to the deadline for filing a new or subsequent license application	12/1/2022	18 CFR §5.16 (a)-(c)
Comments on DLA	LPs	Within 90 days of filing DLA	3/1/2023	18 CFR §5.16(e)
File Updated Study Report (USR)	City Light	Pursuant to the Commission-approved study plan and schedule provided in §5.13 or no later than 2 years after Commission approval	3/11/2023	18 CFR §5.15(f)
USR meeting	City Light and LPs	Within 15 days of USR	3/26/2023	18 CFR §5.15(f)
File USR Meeting Summary	City Light	Within 15 days of USR meeting	4/10/2023	18 CFR §5.15(f)
File Meeting Summary Disagreements[7]	LPs	Within 30 days of study results meeting summary	5/7/2023	18 CFR §5.15(f)
File Responses to Meeting Summary Disagreements	City Light	Within 30 days of filing meeting summary disagreements	6/6/2023	18 CFR §5.15(f)(5)
Study Dispute Determination	FERC	Within 30 days of filing responses to disagreements	7/6/2023	18 CFR §5.15(f)
File Final License Application (FLA)	City Light	No later than 24 months before the existing license expires	4/30/2023	18 CFR §5.17

1 If the due date falls on a weekend or holiday, the deadline is the following business day.
2 Due to the proclamation declaring a National Emergency concerning COVID-19, issued by the President on March 13, 2020, FERC waived § 5.8(b)(viii) of its regulations and does not intend to conduct a public scoping meeting.
3 As amended by the Commission's letter dated April 6, 2021, LPs had until May 6, 2021 (an additional 14 days) to file comments on the RSP.
4 As amended by the Commission's letter dated May 17, 2021, the Coalition of Bands of the Nlaka'pamux Nation had until June 1, 2021 (an additional 15 days from the date of FERC's letter) to file comments on the RSP.
5 As amended by the Commission's letter dated June 14, 2021, LPs had until June 29, 2021 (15 days from the date of FERC's letter) to file comments on the Updated RSP, after which the Commission was to issue its SPD by July 14, 2021, and mandatory conditioning agencies were to file any study disputes by August 3, 2021. No study disputes were filed. Deadlines for milestones beyond issuance of the SPD remain unchanged.
6 FERC issued its SPD on July 16, 2021, shifting the deadlines for the study dispute steps by two days.
7 Shaded actions are not necessary if there are no study or meeting summary disputes.

1.2.3 NOI and PAD

City Light filed a NOI and PAD with the Commission on April 27, 2020. The PAD serves as the first document in a phased process to provide the information necessary to both review existing conditions and inform development of a comprehensive proposal for Project operations, including protection, mitigation, and enhancement (PME) measures, over the term of the new license. The PAD also provides a preliminary assessment of known Project effects and proposed PME measures that may be implemented as a starting point for discussions with LPs. The PAD outlined goals and objectives of 24 studies that have since been further developed and expanded to 33 studies as presented in the RSP and this ISR.

1.2.4 Commencement of Relicensing and Environmental Scoping

On June 26, 2020, FERC issued public notice of the PAD and NOI and commencement of the relicensing pre-filing process, which kicked off the formal licensing proceeding and started the public comment period on the PAD. FERC's June 26, 2020 notice also designated City Light as FERC's non-federal representative for carrying out informal consultation pursuant to Section 7 of the Endangered Species Act and to fulfill its responsibilities under Section 106 of the National Historic Preservation Act. In addition, the notice requested that LPs provide comments regarding the PAD and provide study requests. Concurrently, FERC issued Scoping Document 1 (SD1) to outline the subject areas to be addressed in its environmental analysis of the Project pursuant to the National Environmental Policy Act.

Due to the proclamation declaring a National Emergency concerning COVID-19, issued by the President on March 13, 2020, FERC waived 18 CFR § 5.8(b)(viii) and notified the public that it does not intend to conduct a public scoping meeting or site visit to the Skagit River Project. Instead, FERC solicited written comments, recommendations, and information, on the SD1. If needed, a site visit may be held later in the study process.

On December 4, 2020, FERC issued its Scoping Document 2 (SD2) for the relicensing of the Project.

1.2.5 PAD and SD1 Comments and Study Requests

Pursuant to the current Process Plan and Schedule (Table 1.2-1), comments on the PAD and SD1 and study requests were due to FERC by October 24, 2020. City Light will address comments on the PAD or other comments that some LPs filed, that did not contain a study or information proposal, in future relicensing filings, such as the Draft License Application (DLA) or FLA.

1.2.6 PSP

In accordance with 18 CFR § 5.11(a) and pursuant to the current Process Plan and Schedule (Table 1.2-1), and building upon the existing information identified and summarized in the PAD and informed by the over 60 work group meetings held prior to filing of the Proposed Study Plan (PSP), City Light filed its PSP within 45 days after the deadline for filing comments on the PAD and SD1 and study requests, on December 8, 2020 (City Light 2020b).

1.2.7 PSP Meeting

In accordance with 18 CFR § 5.11(e) and pursuant to the current Process Plan and Schedule (Table 1.2-1), City Light was required to hold a Study Plan Meeting(s) within 30 days after the deadline for filing the PSP (no later than January 7, 2021). The purpose of the meeting is to clarify the intent and content of City Light's PSP and identify any outstanding issues or information needed with respect to the proposed studies. City Light held four days of meetings on January 6 and 12-14, 2021. Due to the COVID-19 public health emergency, the meetings were held virtually. The background, concepts, and studies described in the PSP were presented during the Study Plan Meetings.

In addition, City Light hosted ten additional topic-based meetings in late January through February 2021, in coordination with LPs and aimed at resolving outstanding differences between City Light's proposed studies and LPs' study requests. The agenda for those meetings were developed by the LPs at their request. In response to feedback on the PSP received during the 14 meetings with the LPs in January and early February 2021, City Light developed 15 issue resolution forms proposing compromises and providing additional information and modifications to a number of study requests, and circulated them to the LPs prior to the deadline for PSP comments. The commitments reflected in these issue resolution forms were incorporated into the RSP.

1.2.8 Comments on the PSP

In accordance with 18 CFR § 5.12 and pursuant to the current Process Plan and Schedule (Table 1.2-1), comments on City Light's PSP, including any revised information or study requests, were due to FERC within 90 days of the PSP being filed (no later than March 8, 2021). Commentors were requested to include an explanation of any study plan concerns and any agreements reached with City Light regarding those concerns. Proposed modifications to the PSP were requested to address the requisite Study Criteria as described in Section 4 of the RSP. See Appendix C of the RSP for a list of PSP comment letters provided by LPs.

1.2.9 RSP

In accordance with 18 CFR § 5.13(a) and pursuant to the current Process Plan and Schedule (Table 1.2-1), City Light filed its RSP within 30 days of the due date for comments on the PSP, on April 7, 2021 (City Light 2021). The RSP specifically addressed all comments received on the PSP. The RSP also included a description of the efforts made to resolve differences over study requests. For any requested study not adopted in full or in part in the RSP, City Light provided the rationale for its decision based on FERC Study Criteria.

1.2.10 RSP Comments

In accordance with 18 CFR § 5.13(b), comments on City Light's RSP, including any revised information or study requests, were due to FERC within 15 days of the RSP being filed (no later than April 22, 2021). On April 2, 2021, prior to City Light's filing of its RSP, the Swinomish Indian Tribal Community requested a modification of the ILP process plan and schedule to extend the RSP comment period by 14 days, supported by the Washington State Department of Ecology (Ecology) and City Light in letters dated April 5 and 6, 2021, respectively. FERC granted the extension request on April 6, 2021, extending the comment deadline to May 6, 2021, and

modifying subsequent steps through the study dispute process in the Process Plan and Schedule accordingly.

Subsequently, on May 12, 2021, the Coalition of Bands of the Nlaka'pamux Nation (Nlaka'pamux Nation) requested an additional extension request for RSP comments after the Nlaka'pamux Nation recently became aware of the Skagit River Project relicensing process, which FERC granted in a letter dated May 17, 2021, extending the comment deadline for the Nlaka'pamux Nation to June 1, 2021.

A total of 19 comment letters from federal and state agencies, Indian Tribes, Canadian First Nations, NGOs, and other LPs were filed with FERC. Comment letters and all documents filed with FERC can be accessed through FERC's eLibrary (www.ferc.gov/docs-filing/elibrary.asp) by searching under Docket P-553-235.

1.2.11 June 9, 2021 Notice

Following filing of the RSP, City Light continued to work with LPs to attempt to resolve outstanding areas of disagreement regarding the proposed studies. The ongoing discussions resulted in the filing of the "Notice of Certain Agreements on Study Plans for the Skagit Relicensing" with FERC on June 9, 2021. Updates on the commitments described in the June 9, 2021 Notice are provided within Appendix B and within the applicable study reports included in this ISR (Appendix F).

Additionally, in response to City Light's June 9, 2021 Notice, in a letter dated June 14, 2021, FERC agreed to assess the June 9, 2021 Notice (referred to by FERC as an "Updated RSP") in its SPD. As such, FERC provided 15 days for filing of comments on the Updated RSP (by June 29, 2021) and modified the Process Plan and Schedule through the study dispute process, accordingly.

1.2.12 SPD and Study Disputes

In accordance with 18 CFR § 5.13(c), FERC was to issue its SPD within 30 days of City Light's filing of the RSP (by May 7, 2021); however, given the multiple RSP comment deadline extensions, the deadline was delayed. The SPD was issued on July 16, 2021, approving with modifications City Light's RSP (filed April 7, 2021). No study disputes were filed.

1.2.13 Study Reporting and Study Plan Modification

Following the issuance of FERC's SPD, and as required by 18 CFR § 5.15, City Light has continued to engage with LPs in work group meetings to provide progress updates on study implementation. In addition, the work group meetings provided the venue to collaboratively refine the scope, methods, and implementation of the relicensing studies as described in the June 9, 2021 Notice. City Light agreed to significant modifications to some study plans at the request of LPs. Those modifications will be described in relevant sections of this report.

In accordance with 18 CFR § 5.15(c)(1) and (2) and (f), and pursuant to the current Process Plan and Schedule (Table 1.2-1), at the conclusion of each study season City Light is to file an ISR and USR and hold a meeting with LPs and FERC staff to discuss the initial and updated study results (ISR meeting and USR meeting), respectively. Accordingly, City Light is filing this ISR (due by March 8, 2022) and will file its USR (due by March 8, 2023) pursuant to FERC regulations. City

Light will submit all study documents that must be filed with FERC via FERC's e-library system (www.ferc.gov/docs-filing/elibrary.asp) as well as through the Skagit Relicensing Public Document Library on City Light's website (http://www.seattle.gov/light/skagit/Relicensing/default.htm).

City Light is to hold the ISR Meeting(s) within 15 days after the deadline for filing the ISR (no later than March 23, 2022). City Light has scheduled the meetings for March 21-23, 2022. Due to the COVID-19 public health emergency, the meetings will be held virtually with a draft agenda to be provided at least two weeks prior to the meetings.

Following the ISR Meetings, the FERC ILP regulations provide the opportunity for City Light and/or LPs to request modifications to the study plan in light of progress of the study program and results to date, either as part of City Light's ISR Meeting Summary (due 15 days after the meetings, by April 7, 2022; 18 CFR §§ 5.15(c)(3)) or if LPs file Disagreements/Requests to Amend Study Plan (due 30 days after filing of the ISR Meeting Summary, by May 7, 2022; 18 CFR §§ 5.15(c)(4)).

1.2.14 DLA and FLA

In accordance with FERC regulations, City Light will file a DLA (18 CFR § 5.16(a)-(c)) with FERC no later than December 1, 2022, and FLA (18 CFR § 5.17) no later than April 30, 2023. The license application will set forth City Light's Project proposal, including any changes to Project operations and proposed PME measures. Such measures may be described as proposed license articles or as draft management plans.

The license application will include a comprehensive analysis of existing information, including that from the PAD, combined with results from the studies implemented during the relicensing timeframe and other available information to evaluate the environmental effects of the Project proposal. The license application will also provide a description of any anticipated environmental impacts of continued operation of the Project, the incremental impact of any proposed equipment and/or capacity upgrades or redevelopment of Project works, implementation of PME measures, and any other proposed changes in Project operation. It is City Light's intent to engage in discussions with LPs with a goal of reaching mutual agreement on appropriate PME measures, management plans, and a Project operations proposal to be presented in the license application.

2.0 RELICENSING STUDIES AND ONGOING DATA COLLECTION ACTIVITIES

2.1 Relicensing Studies

This ISR includes reports for the 33 relicensing studies. Table 2.1-1 lists the studies and identifies the type of report based on the status of completion of the study.

Table 2.1-1. Summary of studies included in this ISR.

	Study Number and Title	Type of Report [1]
1.	CR-01 Cultural Resources Data Synthesis	Draft
2.	CR-02 Cultural Resources Survey	Interim
3.	CR-03 Gorge Bypass Reach Cultural Resources Survey (Bypass Cultural Resources Survey)	Draft
4.	CR-04 Inventory of Historic Properties with Traditional Cultural Significance Study (Properties with Traditional Cultural Significance Study)	Interim
5.	FA-01a Water Quality Monitoring Study (WQ Monitoring Study)	Interim
	FA-01b Water Quality Model Development Study (WQ Model Development Study)	Interim
6.	FA-02 Instream Flow Model Development Study	Interim
7.	FA-03 Reservoir Fish Stranding and Trapping Risk Assessment (Stranding and Trapping Assessment)	Interim
8.	FA-04 Fish Passage Technical Studies Program (Fish Passage Study)	Interim
9.	FA-05 Skagit River Gorge Bypass Reach Hydraulic and Instream Flow Model Development Study (Bypass Instream Flow Model Development Study)	Interim
10.	FA-06 Reservoir Native Fish Genetics Baseline Study (Reservoir Fish Genetics Study)	Interim
11.	FA-07 Reservoir Tributary Habitat Assessment	Interim
12.	FA-08 Fish Entrainment Study	Interim
13.	GE-01 Reservoir Shoreline Erosion Study	Interim
14.	GE-02 Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way Study (Erosion and Geologic Hazards Study)	Interim
15.	GE-03 Sediment Deposition in Reservoirs Affecting Resource Areas of Concern Study (Sediment Deposition Study)	Interim
16.	GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study (Geomorphology Study)	Interim
17.	OM-01 Operations Model Study	Interim
18.	RA-01 Recreation Use and Facility Assessment (Recreation Assessment)	Interim
19.	RA-02 Gorge Bypass Reach Safety and Whitewater Boating Study (Bypass Safety and Whitewater Boating Study)	Interim
20.	RA-03 Project Facility Lighting Inventory	Draft
21.	RA-04 Project Sound Assessment	Interim
22.	RA-05 Lower Skagit River Recreation Flow Study (Recreation Flow Study)	Interim
23.	SY-01 Synthesis and Integration of Available Information on Resources in the Lower Skagit River (Synthesis Study)	Interim
24.	TR-01 Vegetation Mapping Study	Draft

	Study Number and Title	Type of Report [1]
25.	TR-02 Wetland Assessment	Draft
26.	TR-03 Rare, Threatened, and Endangered Plants Study (RTE Plants Study)	Interim
27.	TR-04 Invasive Plants Study	Interim
28.	TR-05 Marbled Murrelet Study	Draft
29.	TR-06 Golden Eagle Habitat Analysis	Draft
30.	TR-07 Northern Goshawk Habitat Analysis	Draft
31.	TR-08 Special-status Amphibian Study	Interim
32.	TR-09 Beaver Habitat Assessment	Interim
33.	TR-10 Northern Spotted Owl Habitat Analysis (NSO Habitat Analysis)	Draft

1 Draft report for studies with completed field work; interim report for studies with additional results to report on and/or field work to be completed for the USR.

2.2 Additional Technical Information

In addition to the relicensing studies, additional information appended to this ISR includes a water level assessment completed between Diablo Dam and Diablo Powerhouse (Appendix C) and a memorandum related to Woody Debris Management (Appendix D). An update on a geographic information system (GIS) assessment of habitat in the reservoir littoral and varial zones, requested as part of FERC's SPD, is also described below.

2.2.1 Hydraulic Connectivity Assessment of the Reach between Diablo Dam and Diablo Powerhouse

As part of the June 9, 2021 Notice, City Light agreed to discuss instream flows below Diablo Dam over potential dewatering concerns in the riverine reach between Diablo Dam and Diablo Powerhouse. City Light has developed a hydraulic connectivity assessment of the reach between Diablo Dam and Powerhouse using Project operations data and an existing two-dimension (2-D) Hydraulic Model. A technical memorandum was completed and is appended to this ISR (Appendix C).

2.2.2 Woody Debris Management, Summary of Activities to Date

City Light manages woody debris at various locations in each of the Project reservoirs (Ross Lake, Diablo Lake, and Gorge Lake). Every year, woody debris accumulates in the lakes and requires removal to maintain dam and recreational safety. A memorandum discussing the most up to date summary of this task is appended to this ISR (Appendix D). The purpose of this memorandum is to summarize activities completed through December 2021 and provide information to support decisions for wood debris management on the reservoirs.

2.2.3 Littoral Habitat Analysis

As part of the June 9, 2021 Notice, and required in FERC's SPD, City Light agreed to conduct a GIS assessment of habitat in the reservoir littoral and varial zones. A Reservoir Littoral Habitat Evaluation technical memorandum is being developed. The purpose of this evaluation is to estimate the areal extent of littoral zone habitat around each of Ross, Diablo, and Gorge lakes and to evaluate the relationship between the extent of the littoral zone and reservoir water surface

elevation for each. The technical memorandum will summarize the methods used to conduct a GIS assessment of littoral zone habitat at different reservoir drawdown levels for each Project reservoir.

2.3 Ongoing and Future Data Collection Activities

City Light continues to collect, evaluate, and provide to LPs resource monitoring information from the Project in accordance with the terms of its current license. These study and information gathering activities are summarized in the following reports:

- Annual Project Expenditures Statement (April).
- Semi-annual Flow Compliance Report (April and October).
- Annual Non-flow Program Report (July).
- Steelhead Program.
- Chinook Research Program.
- Off-Channel Chum Habitat Development and Improvement Program.
- Diablo and Gorge Lake Fisheries.
- Erosion Control Report (every 2 years; May).
- Wildlife Report (every 5 years; April).
- Archaeological Report (every 5 years; May).
- Historical Report (every 5 years; May).

Further, through discussions with LPs in early study plan development and in response to comments received on the PSP, City Light and LPs have identified several information-gathering activities related to implementation of current license requirements that, while not included in the RSP, will inform current resource management activities and provide information relevant to the relicensing process and future management plans:

- Erosion monitoring at cultural resources sites around Ross Lake – City Light has contracted with NPS to conduct a geomorphology investigation and map erosion patterns in Ross Lake to aid in cultural resources protection. Through this effort, City Light and NPS are coordinating to update archaeological monitoring techniques and this new data will be used to improve efficacy of monitoring and help prioritize recommendations for stabilization of historic properties.
- Sediment deposition and management of historic properties – In response to NPS comments on the PSP, City Light will collect information at five locations in Ross Lake suggested for study by the NPS in their comments to the scope of the GE-03 Sediment Deposition Study. Data collected at these five additional sites will inform historic properties management and data collection will be done in coordination with archaeological monitoring. City Light has also expanded its existing partnership with NPS to include erosion evaluation and monitoring at cultural sites on Ross Lake as part of implementation of the Archaeological Resources Mitigation and Management Plan in 2022 and 2023. The data collected from this effort will be used to inform management actions under the current license and will be integrated into the Historic Properties Management Plan under the new license.

- Reed canary grass control – City Light and NPS are partnering on an inventory of known occurrences of reed canary grass and exploring treatment options.
- Recording observations of invasive bullfrogs – NPS, BC Parks, and City Light are collaborating on documenting bullfrog occurrences. Distribution information on bullfrogs may inform future partnership management actions.

2.3.1 Landform Mapping

The Memorandum of Agreement with NPS for the Landform Mapping Study is appended to the PAD (City Light 2020a). This study will provide a baseline map of land and channel forms within the channel migration zone of the Skagit River and will inform the GE-02 Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-Of-Way Study and the GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study (Geomorphology Study). As of the filing of this ISR, finalized landform maps were not available. Draft landform maps completed by the NPS were used to inform studies included in this ISR.

2.3.2 Food Web Study

During 2017-2018, City Light and the Skagit River Project Non-Flow Plan Coordinating Committee determined that an evaluation was needed to assess an observed demographic shift and apparent recruitment limitations in the Ross Lake Rainbow Trout population, thought to be related to the introduction of Redside Shiners[12] to the Project reservoirs. In 2018, City Light agreed to fund a comprehensive food web assessment. At City Light's request, the USGS developed a scope of work for a comprehensive study, i.e., Factors Limiting Native Salmonids above Skagit River Dams ("Food Web Study").

The goal of the Food Web Study is to identify and quantify factors that limit recruitment or production of native adfluvial salmonids in Project reservoirs and associated tributaries. The implementation of this study began in 2019 and field work will be completed in 2022.

As described in the FA-07 Reservoir Tributary Habitat Assessment interim report, City Light expanded the Food Web Study to conduct bioenergetic simulations in tributaries that have not already been modeled. In addition, City Light, USGS, and LPs have ongoing discussions in the Reservoir Work Group regarding how the results of physical habitat and bioenergetics assessments will provide information on the existing conditions in the Project reservoirs. City Light believes the Reservoir Work Group discussions provide an opportunity to discuss how the Food Web Study results will be used in conjunction with the relicensing studies to address reservoir-related issues.

2.3.3 2021 Flood Event

Flooding in the Skagit basin in November 2021 was of historic proportions. A recorded peak discharge of 63,400 cfs at USGS 12181000 (Skagit River at Marblemount, WA) on November 15 and 33,700 cfs at USGS 12178000 (Skagit River at Newhalem, WA) on November 16 were approximately 40-year and 25-year return interval floods respectively.

[12] Redside Shiners are members of the minnow family and are not native to the Upper Skagit River where they have been observed since approximately 2004.

Immediately following the flood, City Light staked or flagged a total of 35 high water marks (HWMs) in the field between the Sauk River confluence and Newhalem in two separate field trips, first on November 15, 2021 and again on November 30 – December 1, 2021. Elevations of those HWMs were determined by Real-time kinematic positioning Global Positioning System (GPS) or total station surveys.

Impact assessments of the November flooding on the hydraulic and habitat modeling as part of the FA-02 Instream Flow Model Development Study and the FA-05 Bypass Instream Flow Model Development Study are currently being planned for 2022 and will be reported on in the USR. City Light will collect additional topobathymetric Light Detection and Ranging (LiDAR) in spring 2022, which will provide information on geomorphic change resulting from the November 2021 flood. As part of the GE-04 Geomorphology Study, scour monitor arrays and particle tracer locations will be revisited during low-flow in summer 2022, which will provide information on bed mobilization during the large November 2021 flood flows. The sediment transport models developed as part of the GE-04 Geomorphology Study will be calibrated to the November 2021 flood.

3.0 REVIEW OF STUDY RESULTS

3.1 Cross Resource Integration of Study Results

As part of the collaborative work group process, LPs noted the need for "cross-resource" integration analysis of study results and a process through which parties can work together to identify opportunities for a unified analytical approach and a comprehensive, ecologically sound Project proposal. City Light shares LPs' interest in an interdisciplinary, comprehensive review of information related to the Project. Another important consideration for development of a Project proposal is the context of study results and proposed PME measures in relation to other past and present projects and activities in the watershed.

City Light recognizes the complexity of resource issues under discussion in this relicensing process and anticipates structured discussions with LPs through work group meetings and other venues for consideration of existing information and study results in an ecosystem approach. LPs and City Light have begun discussions about potential analytical approaches that could be applied to create a shared set of evaluation criteria for parameters of concern and inform decision-making in the relicensing process.

One such approach is Structured Decision Making, an approach for careful and organized analysis of natural resource management decisions (Conroy and Peterson 2013). Based in decision theory and risk analysis, structured decision making encompasses a simple set of concepts and helpful steps, rather than a rigidly-prescribed approach for problem solving. City Light anticipates further discussions with LPs on how this or other analytical tools may be applied in the relicensing process to inform development of PME measures to be included in the license application.

Figure 3.1-1 shows the general timeframes and relationships between the steps involved in developing the DLA and FLA.

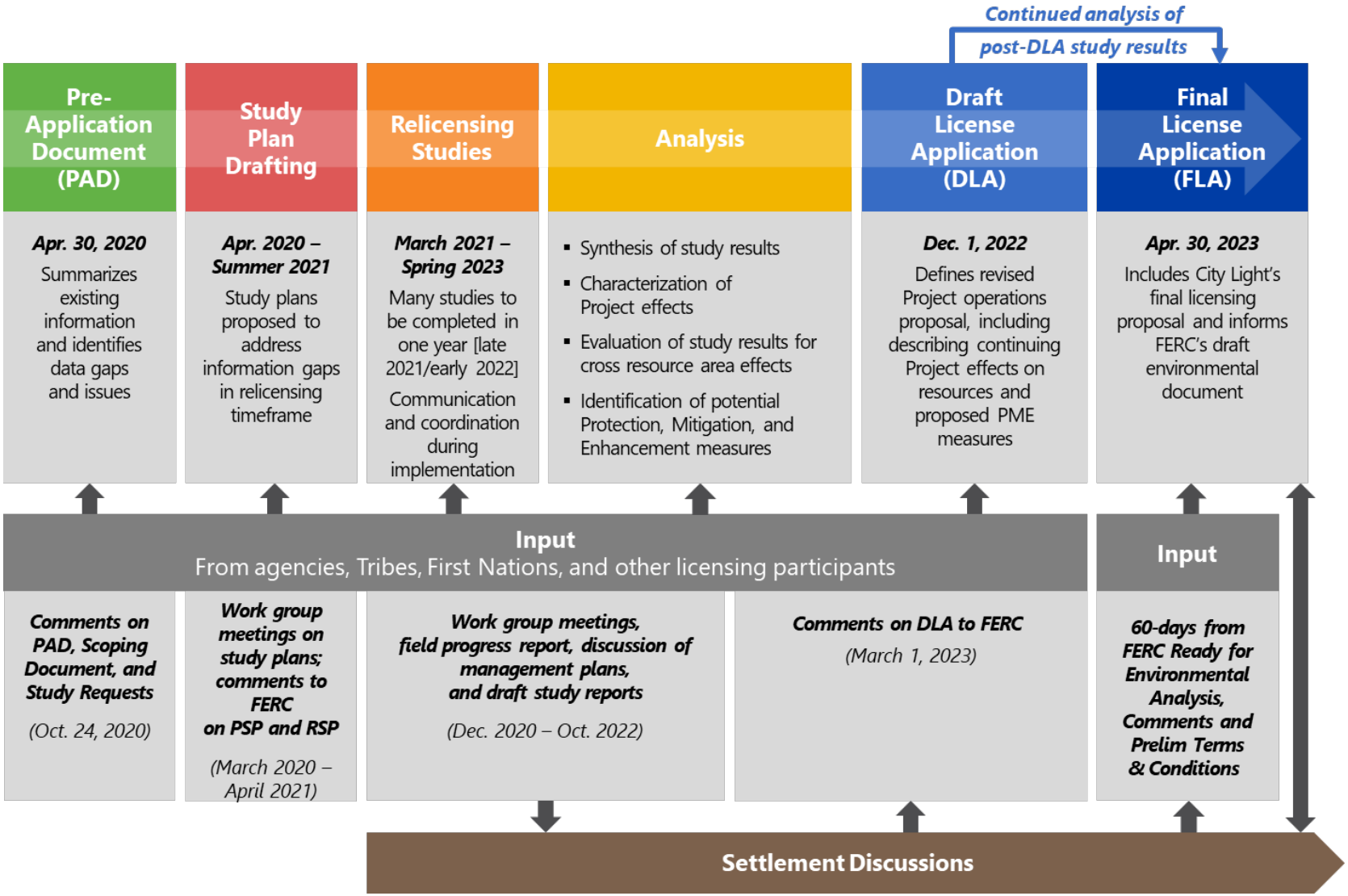

Figure 3.1-1. **General sequence of steps, timeframes, and junctures for LP input related to relicensing studies, analysis and development of the DLA and FLA.**

An important step in the relicensing process is to evaluate the potential for changed Project operations to achieve resource PME goals for the term of the new license. The relicensing study program includes development of several models that will allow for the development of operational scenarios and related analyses of potential beneficial or negative impacts to resources of interest. Table 3.1-1 below provides an overview of the models under development for relicensing, and more information about each model can be found in the respective study reports appended to this ISR (Appendix F).

Table 3.1-1. Summary of models under development for operational scenarios to inform relicensing.

Study	Model	Brief Description
FA-02	Hydraulic 2-D Model from Gorge Powerhouse to Confluence with Sauk River	Will provide information on the hydraulic characteristics of flows in the Skagit River (discharge, depth, and velocity, and their spatial and temporal variations).
FA-02	Integrated Habitat Model from Gorge Powerhouse to Confluence with Sauk	Will integrate hydraulic model outputs and observed characteristics of substrate and cover with biological (species, life stages, periodicities) and physical (depth and velocity) to develop updated flow-habitat relationships.
FA-05	Hydraulic 2-D Model from Gorge Dam to Gorge Powerhouse	Will provide information on the hydraulic characteristics of flows in the Skagit River Bypass Reach (discharge, depth, and velocity, and their spatial and temporal variations).
FA-05	Integrated Habitat Model from Gorge Dam to Gorge Powerhouse	Will integrate hydraulic model outputs and observed characteristics of substrate and cover with biological (species, life stages, periodicities) and physical (depth and velocity) to develop updated flow-habitat relationships.
OM-01	Operations Model	The Operations Model will provide simulations of existing and potential Project operations scenarios and provide information on reservoir elevations, instream flows and generation.
FA-01b	CE-QUAL-W2 Temperature, Thermodynamics, and Water Quality Model	These models will act as a tool in scenario analyses to evaluate impacts from the Project on aquatic resources related to water temperature, thermodynamics, and water quality.
GE-04	UBCRM[1] Model	This model assesses river hydraulic geometry and propensity for side channel or multi-channel morphologic adjustments based on prescribed hydrology and sediment loading scenarios.
GE-04	MAST one-dimensional (1-D) Model	This model will quantify width adjustments of the Skagit River to existing and potential future flow release scenarios and evaluate patterns of bed material mobility downstream of Sauk River.
GE-04	HEC RAS[2] 1-D Model	This model will quantify long-term channel bed and hydraulic profiles of the Skagit River.
GE-04	HEC RAS[2] 2-D Model	This model will quantify erosion and deposition processes related to key morphologic and habitat features identified at six subreaches identified in collaboration with LPs.
GE-04	Indicators of Hydraulic Alteration (IHA)	The IHA software package will be used 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.

1 UBCRM = University of British Columbia Regime Model.
2 HEC-RAS = Hydrologic Engineering Center River Analysis System.

Modeling tools identified in Table 3.1-1 are intended to provide LPs and City Light with comparative information on the effects of existing operations and potential operational scenarios for use in the evaluation of potential operational scenarios and PME measures to inform the development of the license application. Similarly, other models and studies may be used to answer questions and generate information tied to other areas of decision making. During 2022, while studies are still underway, City Light will work with LPs to integrate the modeling tools and relicensing studies, along with relevant existing information, to address specific resource issues as conceptually illustrated in Figure 3.1-2 below:

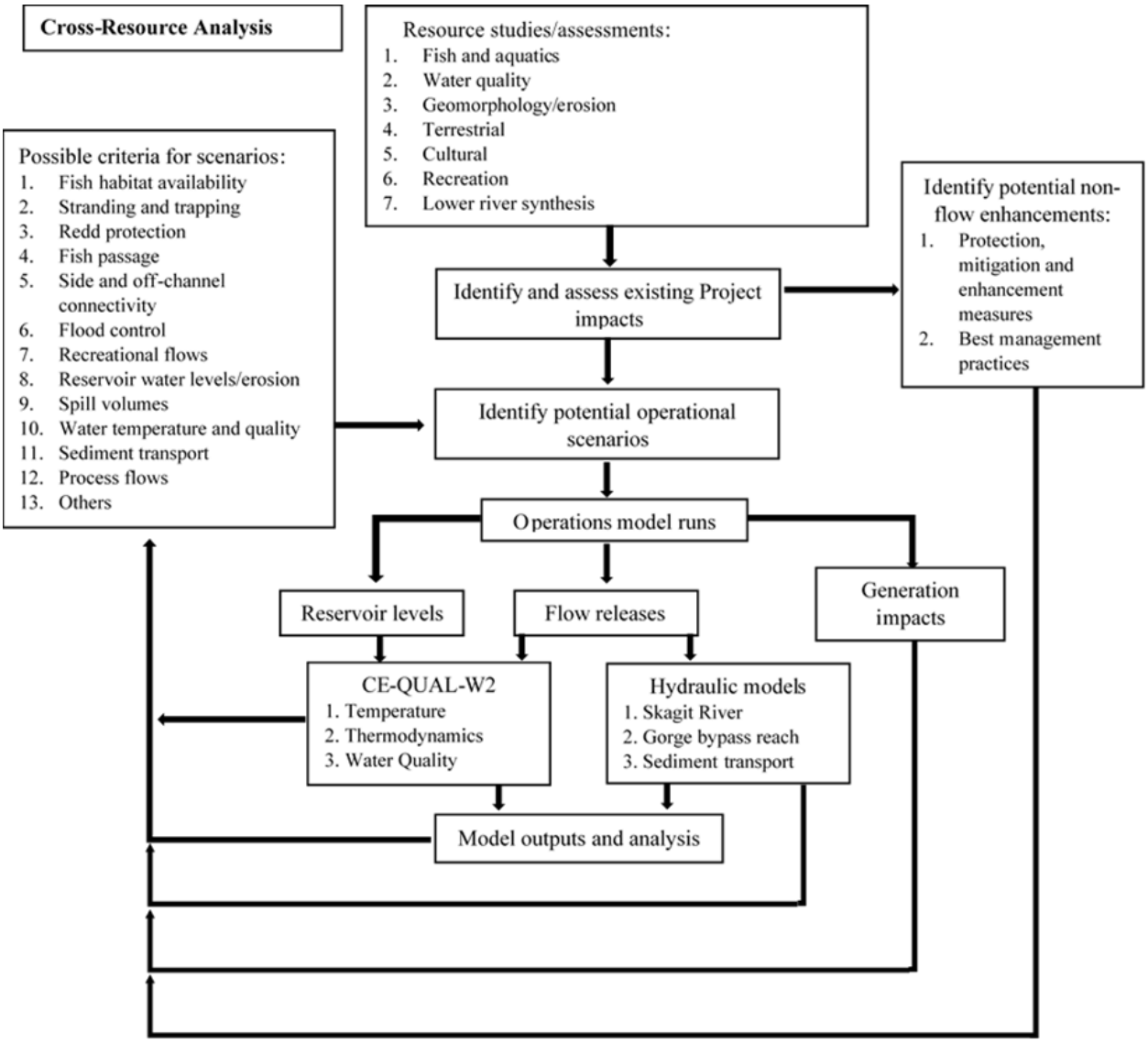

Figure 3.1-2. Example conceptual workflow for development of resource measures and resource effects analysis using relicensing modeling tools.

3.2 Timing of Information Necessary to Inform Discussions Regarding PMEs

The relicensing studies will be comprehensively analyzed together with existing information, including that from the PAD, to provide the information necessary to inform the characterization of Project impacts and identify appropriate PME measures relevant to those impacts and shared ecosystem management goals. Several of the studies are substantially complete in this ISR filing and can be used by City Light and LPs to review existing resource management measures under the current license and develop proposed resource management measures for the new license.

For a limited number of studies as identified in the interim reports in this filing, analysis for field study results may extend into late 2022 or early 2023, and final study results may not be available with adequate lead time to inform robust discussions regarding PME measures for inclusion in the license application. Final proposals related to these topics may be developed and submitted to FERC after the license application is submitted.

City Light and LPs may request that FERC delay a "Ready for Environmental Analysis" determination to allow development of PMEs that depend on studies that are not complete at the time the license application is submitted.

4.0 STATUS OF SKAGIT RELICENSING COLLABORATIVE PROCESS

4.1 Collaboration with LPs to Date

In January 2019, City Light began a voluntary Study Plan Development Process with LPs in preparation for initiating the relicensing process. The purpose of this early process was to provide a forum, structure, and additional time for discussion with LPs with the goal of identifying resource issues that may warrant study during relicensing. These discussions resulted in the development of a suite of issues and associated studies included in the PAD (City Light 2020a).

Following filing of its PAD, City Light continued meeting with LPs and provided early drafts of study plans for comment and discussion of studies necessary to inform the relicensing process. The proposed study plans in the PSP included documentation of comments received on these early drafts and City Light's responses, as well as responses to study requests filed with FERC by October 24, 2020.

After filing the PSP, City Light held the requisite PSP Meetings (January 6 and 12-14, 2021) followed by ten topic-based discussion meetings (January 26 and 28, and February 2, 4, 9, 11, 16, 18, 23, and 25, 2021) to continue efforts to resolve outstanding differences between City Light's proposed studies and LP study requests. In response to feedback received during the fourteen PSP Meetings with the LPs, City Light developed and circulated 15 issue resolution forms proposing compromises and providing additional information and modifications to its proposed studies in an effort to resolve differences over study requests.

Following the PSP meetings and after careful review of LP comments on the PSP, City Light reevaluated its position with respect to relicensing studies, reassessed its longstanding relationships with LPs, and decided to prioritize its efforts toward resolving outstanding differences concerning the proposed studies. City Light and the LPs agreed to restructure the collaborative process into its current structure to focus on study implementation and collaboration regarding June 9, 2021 Notice commitments. Under this structure, City Light and the LPs have organized themselves into the following groups:

- Partners' Committee;
- Advisory Roundtable;
- Technical Steering Committee;
- Cultural Resources Work Group;
- Fish Passage Work Group;
- Flows Work Group;
- Geomorphology Work Group;
- Integration/Roadmap Small Work Group;
- Operations Model Work Group;
- Recreation Work Group;

- Reservoir Work Group;
- Synthesis Study Work Group;
- Terrestrial Work Group; and
- Water Quality Work Group.

In addition, other work groups have been developed and meet on an as needed basis as identified in the RSP and as requested by LPs to coordinate regarding study implementation. These work groups, or sub-groups, consist of (but are not limited to):

- Fish Passage Agency Work Session; and
- Habitat Suitability Criteria Technical Group.

Nearly 50 organizations have participated in over 150 collaborative process discussions to date. Appendix E provides a list of meetings and organizations that participated in meetings through February 2022.

In 2022, City Light intends to continue to meet with technical Resource Work Groups to review progress on finalizing studies.

City Light will also work with Indian Tribes and agencies with regulatory authority to develop a process for the development of potential PMEs as part of a relicensing settlement process. City Light anticipates that the settlement process will include additional parties, including First Nations, NGOs, and others. The participants in this settlement process will work on the development of PMEs (including management plans) necessary to support a successful license proposal.

5.0 PROJECT INFORMATION

City Light has established a standard Project centerline and PRM for use throughout the Skagit River Project relicensing process. The common and static RM system will allow for study data and information to be collected, organized, analyzed, and shared in a consistent and standardized manner. The Project centerline extent is from the mouth of the mainstem Skagit River in Skagit Bay to approximately 5 miles upstream from the Canadian border. The centerline was delineated based on a combination of various available information sources: riverbed topography from recent bathymetric LiDAR data, ESRI World and Google Earth aerial imagery, and the U.S. Army Corps of Engineers' Skagit and Baker Projects Corps Water Management System.

Table 5.0-1 provides a cross-reference of USGS RM and PRM values for common Project and riverine features.

Table 5.0-1. USGS RM and PRM system crosswalk.

Project Component	USGS River Mile (RM)[1]	Project River Mile (PRM)
Sauk River confluence with the Skagit River	66.6	66.7
Marblemount (town)	78	78.3
Marblemount USGS gage 12181000	78.7	79
Newhalem USGS gage 12178000	93.7	94.3
Newhalem (town)	94	94.5
Gorge Powerhouse	94..2	94.7
Gorge Dam	96.6	97.2
Upstream end of Gorge Lake	99.8	100.4
Diablo (town)	100	100.6
Diablo Powerhouse	100.2	100.8
Diablo Dam	101.2	101.6
Upstream end of Diablo Lake	105	105.6
Ross Powerhouse	104.9	105.5
Ross Dam	105.1	105.7
Upstream end of Ross Lake in U.S.	127	127.9

1 River miles are approximate.

6.0 REFERENCES

Conroy, M.J., and J.T. Peterson. 2013. Decision making in natural resource management: a structured, adaptive approach. Wiley, Hoboken, New Jersey.

Seattle City Light (City Light). 2020a. Pre-Application Document (PAD) for the Skagit River Hydroelectric Project, FERC Project No. 553. April 2020.

_____. 2020b. Proposed Study Plan (PSP) for the Skagit River Hydroelectric Project, FERC Project No. 553. December 2020.

_____. 2021. Revised Study Plan (RSP) for the Skagit River Hydroelectric Project, FERC Project No. 553. April 2021.

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INITIAL STUDY REPORT

APPENDICES

INITIAL STUDY REPORT

APPENDIX A

CONVERSION TABLE AND MAP SET OF CITY OF SEATTLE DATUM TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

SKAGIT RIVER PROJECT ELEVATION TRANSFORMATION TABLE

City Light As-Built to NAVD 88 Datum
Last Revised 10/8/2020

Seattle Public Utilities (SPU) was tasked to densify the elevations on the Skagit River Hydroelectric Project from the established NAVD 88 benchmarks that was done in 2015 for the Height Modernization. These benchmarks were published by the NGS (National Geodic Survey). SPU used these published benchmarks to establish NAVD 88 elevations on a number of existing City Light benchmarks, staff gages, and elevations of powerhouses and top of dam elevations to obtain a comparison between the existing City of Seattle datum (CoSD) elevations from as-built drawings and the NAVD 88 datum. Below is the comparison of elevations of these items at each site on the Skagit River Hydroelectric Project.

Notes:

(1) All elevations are in U.S. Survey Feet.

(2) Refer to Geodetic Control Tables for each of the below networks.

(3) No guarantees are made for adjustment of feature elevations not listed in this table and additional survey may be required to determine current elevation of the feature in question.

(4) Above features are not to be used for survey control. All surveys shall use NGS benchmarks shown on Drawings D-44743 through D-44746.

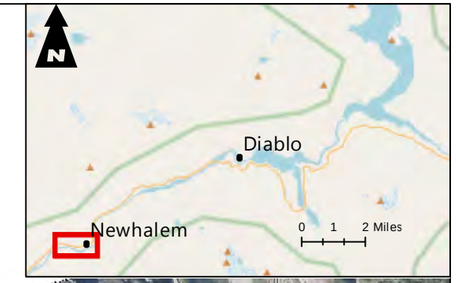
PtNo / Station	Control Network and Feature	Reference	As-Built CoSD El. (feet)	Surveyed El. in NAVD-88 (feet)	Delta (feet)	Notes
Newhalem						
910	Gorge Powerhouse Finish Floor	D-44944	515.75	521.97	+6.22	
911	Gorge Powerhouse Tailrace Staff Gage (Physical)	Physical Gage	501.00	507.34	+6.34	Survey is to physical gage.
912	Gorge Powerhouse Tailrace Staff Gage (Electronic)	Electronic Reading	492.02	498.50	+6.48	SPU Survey indicates Water El. 498.5 ft NAVD-88 at 1:19 PM on 9/30/2019. Lake water surface elevation electronically recorded at 492.02 ft City Light per PI data from Don Tinker.

PtNo / Station	Control Network and Feature	Reference	As-Built CoSD El. (feet)	Surveyed El. in NAVD-88 (feet)	Delta (feet)	Notes
905	Newhalem Skagit River Gage USGS Gage 12178000	Physical Gage USGS 12178000	488.00	494.20	+6.20	Datum of Gage is 407.7 ft above NAVD-88. 3 measurements made at 488.0 ft, 484.0 ft on gage, and benchmark on river gage building resulting in deltas of 6.20, 6.21, and 6.20 ft, respectively. 6.20 ft selected.
Gorge Dam						
1002	Top of Gorge Dam	D-49941	880.67	886.97	+6.30	SCL brass disc in concrete 2.5 ft east of D/S parapet wall.
GWTR	Gorge Lake Staff Gage	Electronic Reading USGS 12177700	871.26	877.77	+6.51	Datum of Gage is 6.51 feet above NAVD-88. 871.26 is electronic reading from powerhouse. Physical gage matched reading as of 5/21/2018.
Diablo (Powerhouse/Hollywood Townsite)						
2030	Diablo Powerhouse	RR Map El., FB 49A, PG10	892.39	898.77	+6.38	Finish floor elevation surveyed 897.42 (+6.42 ft). 6.38 feet selected based on brass cap.
WTR	Diablo Tailrace Elevation	Electronic Reading	876.22	882.48	+6.26	El. 876.22 is electronic reading from powerhouse. Physical gage matched (+6.30).
2027	Stetattle Creek Bridge	RR Map	890.78	897.16	+6.38	Based off of SCL Survey Field Book 49A, Page 9 using the Railroad (RR) Map Elevation.
Diablo Dam						
3008	Top of Dam (0+00 level pegging station)	D-44947	1218.00	1224.72	+6.72	Use +6.65 for Diablo Dam.
3009	Top of Dam (2+00 level pegging station)	D-44947	1218.00	1224.59	+6.59	Use +6.65 for Diablo Dam.

PtNo / Station	Control Network and Feature	Reference	As-Built CoSD El. (feet)	Surveyed El. in NAVD-88 (feet)	Delta (feet)	Notes
3007	SCL Benchmark NE end of bathrooms	Benchmark	1219.69	1226.01	+6.32	
3011	Diablo Lake Staff Gage (physical)	Physical Gage	1209.00	1215.37	+6.37	Upper panel replaced September 2020 and surveyed again by SPU 9/29/20.
3012	Diablo Lake Staff Gage (electronic)	Electronic Reading	1201.20	1207.56	+6.36	SPU Survey indicates Water El. 1207.56 ft NAVD-88 at 12:20 PM on 10/01/2019. Lake water surface elevation electronically recorded at 1201.20 ft SCL per PI data from Don Tinker.
	Diablo Intake	D-16717	1208.00			As surveyed on 9/29/20 by SPU, matched with staff gage (within a couple hundredths, actual value forthcoming in SPU report).
	Diablo Surge Tank					Placeholder - estimate of conversion values forthcoming in following SPU report.
Ross Dam (and Powerhouse)						
4009	Top of Dam at toe of D/S parapet wall	D-44952	1615.25	1621.45	+6.20	Upstream wall also had delta of +6.20 ft.
4017	Ross Powerhouse Finish Floor	D-44954	1236.50	1242.65	+6.15	
4011	Ross Lake Staff Gage	Physical Gage	1615.10	1621.36	+6.26	Survey is to physical gage. Electronic gage not verified and reportedly fluctuates.
4015	Ross Powerhouse Tailrace Staff Gage	Physical Gage	1205.00	1210.96	+5.96	Survey is to physical staff gage.

PtNo / Station	Control Network and Feature	Reference	As-Built CoSD El. (feet)	Surveyed El. in NAVD-88 (feet)	Delta (feet)	Notes
4016	Ross Powerhouse Tailrace Staff Gage	Electronic Reading	1203.71	1209.67	+5.96	SPU Survey indicates Water El. El.1209.67 ft NAVD88 at 11:06 AM on 10/03/2019. Tailrace water surface elevation electronically recorded to be 1203.67 ft City Light per PI data from D. Tinker. B. Vavrek verified that powerhouse reading matched with Operator Bob See and PI data per D. Tinker 9/28/20 @ 2:08 PM (1200.38 visual, 1200.38 powerhouse, ~1200.36 PI). Value matched to physical gage based on powerhouse reading and visual water level matching within 0.01 ft.

PLEASE NOTE:
1. All elevations are in US Survey Feet.
2. Refer to Geodetic Control Tables for each network.
3. Please contact SCL Technical Resources or SPU Surver for a densification in an area not referenced in this map.
4. All surveys shall use NGS benchmarks shown on Drawings D-44743 through D-44746.
5. Refer to 'Skagit Project Elevation Transformation Table' Rev. 10/08/2020 for Datum Conversion details. The following equation is used to convert between the City of Seattle (COS) Datum and NAVD-88 Datum:
COS Datum Elevation + Delta = NAVD-88.
6. No guarantees are made for adjustment of feature elevations not listed in above table and additional survey may be required to determine current elevation of the feature in question.
7. The survey reading for physical gage(s) was taken at a mark on the physical gage(s) and should NOT be used for the actual water surface elevation. As of 10/08/2020, SCL has not surveyed any water surface elevations.



Point No. 902
NAVD-88 Elev = 490.855'
No Convr available

Goodell Creek

Point No. 901
NAVD-88 Elev = 504.609'
No Convr available

Point No. 903
NAVD-88 Elev = 507.378'
No Convr available

Newhalem

Point No. 910
NAVD-88 Elev = 521.965'
COS datum + 6.22' = NAVD-88
Not an NGS BM

Point No. 912
NAVD-88 Elev = 498.50'
COS datum + 6.48' = NAVD-88
Electronic Reading

Point No. 900
NAVD-88 Elev = 529.914'
No Convr available

Point No. 911
NAVD-88 Elev = 507.34'
COS datum + 6.34' = NAVD-88
Physical Gage - Not a BM

Point No. 906
NAVD-88 Elev = 490.21'
No Convr available

Point No. 905
NAVD-88 Elev = 494.2'
COS datum + 6.2' = NAVD-88
Physical Gage - Not a BM

Newhalem Creek

Legend
- NGS BM
- Non NGS BM
- Datum Conversion Available

COS = City of Seattle

Seattle City Light

NAVD-88 Survey Elevations

Newhalem and vicinity

1:5,500

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

Note: This map is intended to compliment to but not to replace the following reports.
- Skagit Project Elevation Transformation Table' Rev. 10/08/2020
- Geodetic Control Reports for each network.

Non NGS Benchmarks have not been horizontally surveyed.

Created 10/8/2020 by Seattle City Light,
Environment, Land and Licensing Business Unit.

PLEASE NOTE:
1. All elevations are in US Survey Feet.
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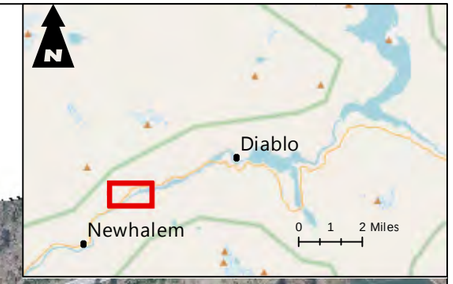

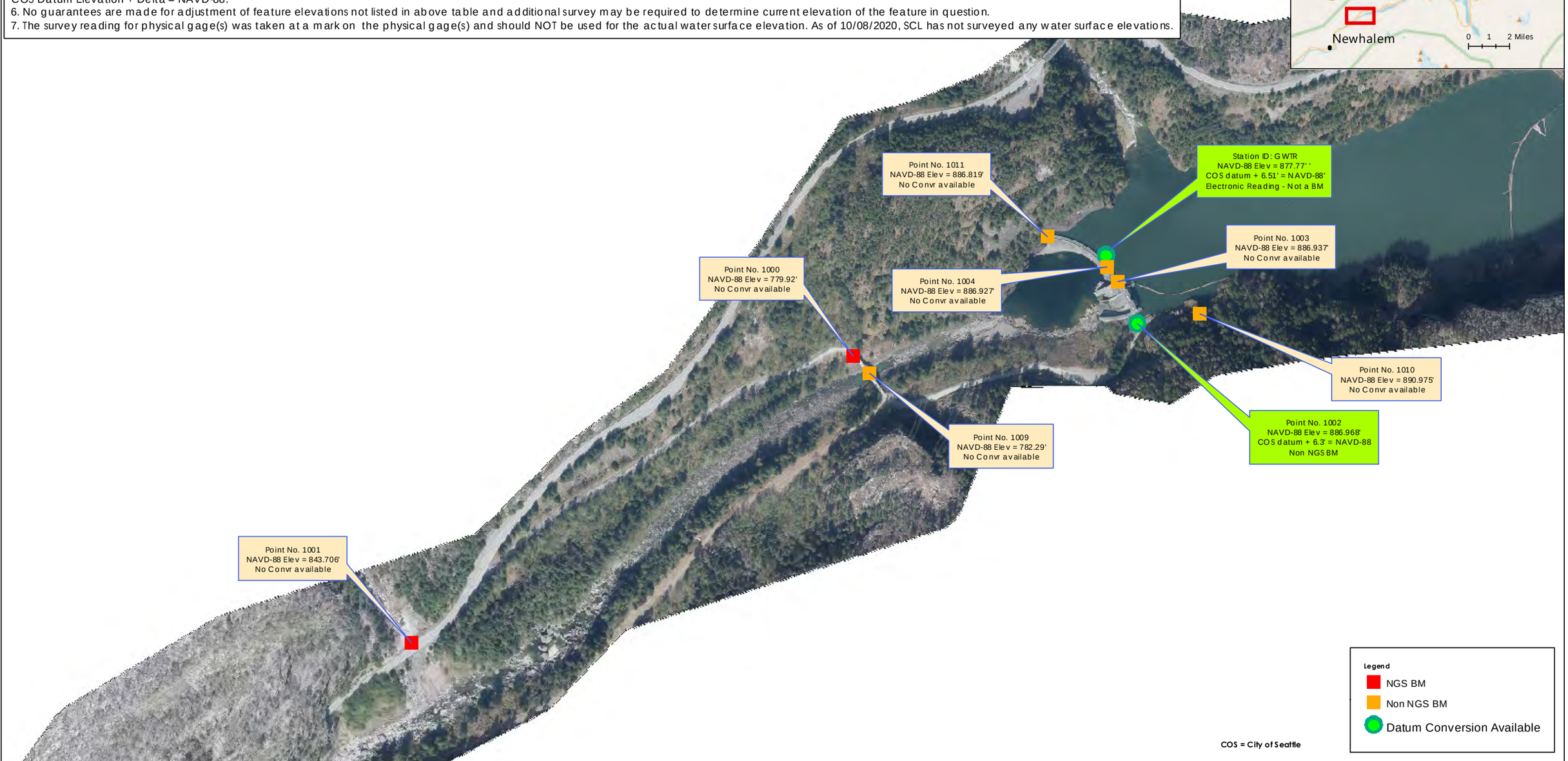

Legend
- NGS BM
- Non NGS BM
- Datum Conversion Available

COS = City of Seattle

Seattle City Light

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

NAVD-88 Survey Elevations

Gorge Dam and vicinity

1:5,500

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

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Created 10/8/2020 by Seattle City Light,
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SCL provides no warranty, expressed or implied,
as to the accuracy, reliability or completeness of this data.

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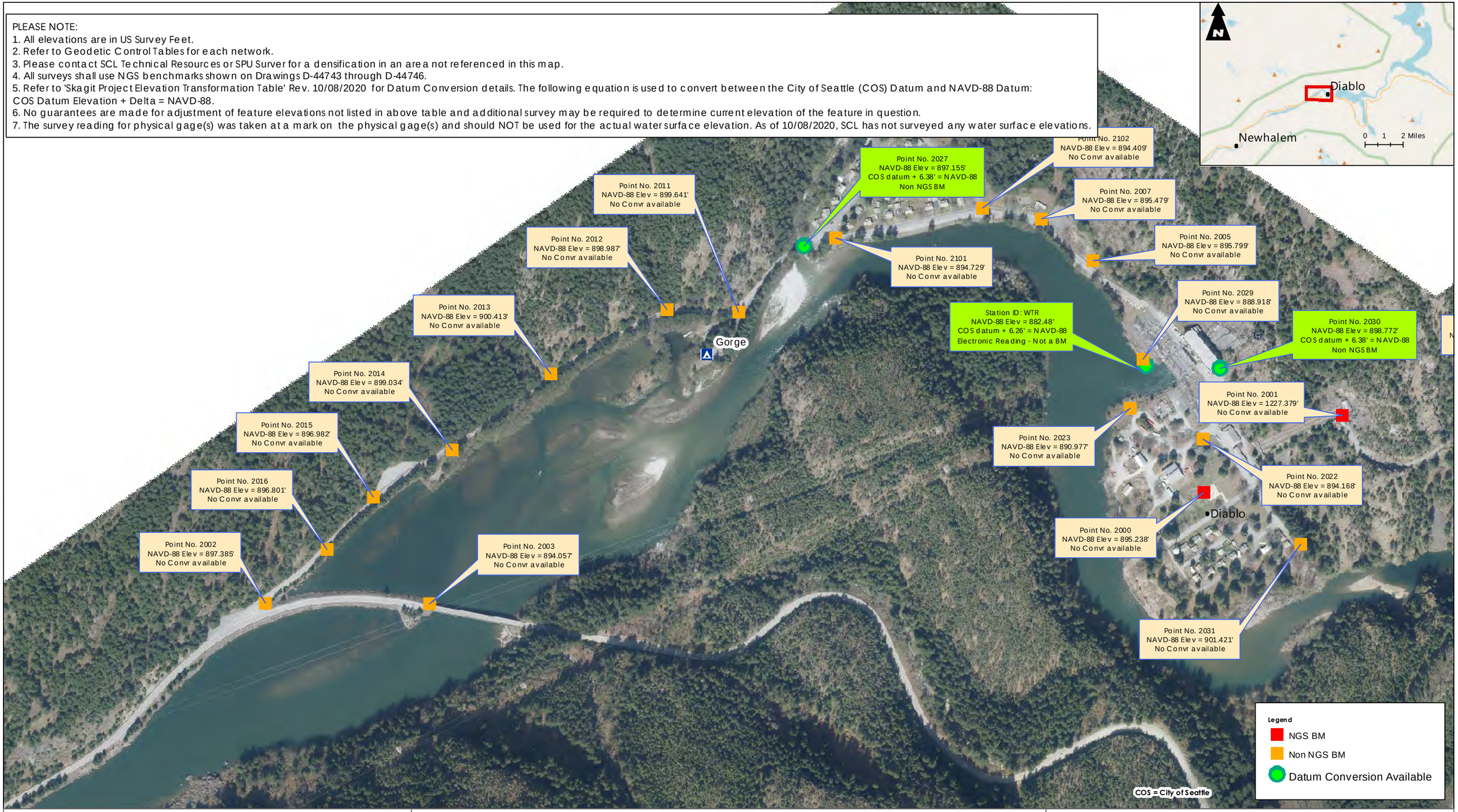
COS Datum Elevation + Delta = NAVD-88.
6. No guarantees are made for adjustment of feature elevations not listed in above table and additional survey may be required to determine current elevation of the feature in question.
7. The survey reading for physical gage(s) was taken at a mark on the physical gage(s) and should NOT be used for the actual water surface elevation. As of 10/08/2020, SCL has not surveyed any water surface elevations.



Seattle City Light

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

NAVD-88 Survey Elevations

Diablo Townsite and vicinity

1:5,500

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

Note: This map is intended to compliment to but not to replace the following reports.
• Skagit Project Elevation Transformation Table' Rev. 10/08/2020
• Geodetic Control Reports for each network.

Non NGS Benchmarks have not been horizontally surveyed.

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Environment, Land and Licensing Business Unit.
SCL provides no warranty, expressed or implied,
as to the accuracy, reliability or completeness of this data.

PLEASE NOTE:
1. All elevations are in US Survey Feet.
2. Refer to Geodetic Control Tables for each network.
3. Please contact SCL Technical Resources or SPU Surver for a densification in an area not referenced in this map.
4. All surveys shall use NGS benchmarks shown on Drawings D-44743 through D-44746.
5. Refer to 'Skagit Project Elevation Transformation Table' Rev. 10/08/2020 for Datum Conversion details. The following equation is used to convert between the City of Seattle (COS) Datum and NAVD-88 Datum:
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Point No. 3001
NAVD-88 Elev = 1213.912'
No Convr available

Point No. 3007
NAVD-88 Elev = 1226.008'
COS datum + 6.32' = NAVD-88
Non NGS BM

Point No. 3000
NAVD-88 Elev = 1226.674'
No Convr available

Point No. 3012
NAVD-88 Elev = 1207.56'
COS datum + 6.36' = NAVD-88
Electronic Reading - Not a BM

Point No. 3005
NAVD-88 Elev = 1228.088'
No Convr available

Point No. 3011
NAVD-88 Elev = 1215.37'
COS datum + 6.37' = NAVD-88
Physical Gage - Not a BM

Point No. 3009
NAVD-88 Elev = 1224.591'
COS datum + 6.59' = NAVD-88
Non NGS BM

Point No. 3006
NAVD-88 Elev = 1224.699'
No Convr available

Point No. 3008
NAVD-88 Elev = 1224.722'
COS datum + 6.72' = NAVD-88
Non NGS BM

Point No. 3010
NAVD-88 Elev = 1224.841'
No Convr available

Legend
- NGS BM
- Non NGS BM
- Datum Conversion Available

COS = City of Seattle

Seattle City Light

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NAVD-88 Survey Elevations

Diablo Dam and vicinity

1:5,500

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

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Non NGS Benchmarks have not been horizontally surveyed.

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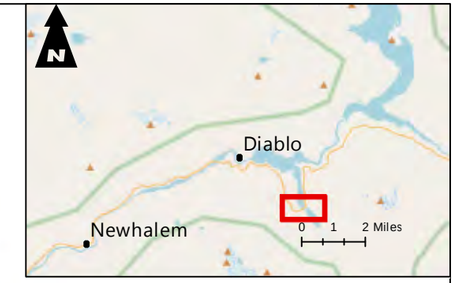

Colonial Creek N

Point No. 3004
NAVD-88 Elev = 1223.8'
No Convr available

Colonial Creek S

COS = City of Seattle

Legend
NGS BM
Non NGS BM
Datum Conversion Available

Seattle City Light

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NAVD-88 Survey Elevations

1:5,500

Thunder Arm

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

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• Geodetic Control Reports for each network.

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Hidden Cove

Point No. 3003
NAVD-88 Elev = 1695.315'
No Convr available

Thunder Point

Legend
NGS BM
Non NGS BM
Datum Conversion Available

COS = City of Seattle

Seattle City Light

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NAVD-88 Survey Elevations

Diablo Overlook

1:5,500

500 250 0 500 1,000 Feet

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N

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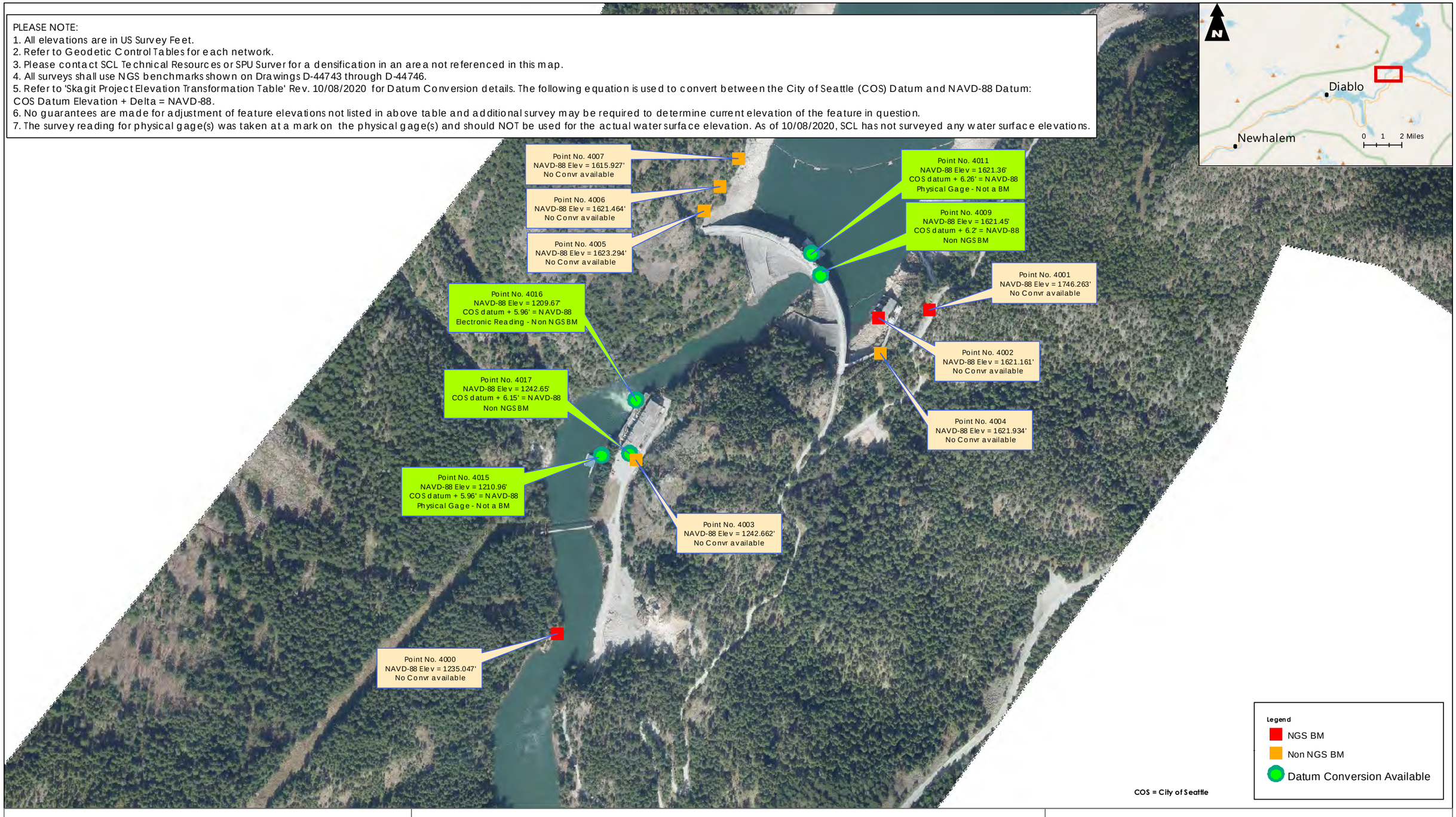

Seattle City Light

Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA

NAVD-88 Survey Elevations

Ross Dam and vicinity

1:5,500

500 250 0 500 1,000 Feet

All elevations in this map are current as of October 8, 2020.

N

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Non NGS Benchmarks have not been horizontally surveyed.

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INITIAL STUDY REPORT

APPENDIX B

JUNE 9, 2021 NOTICE: STATUS UPDATE

June 9, 2021 Notice: Status Update.

June 9, 2021 Notice Commitment	Status Update
FA-01a Water Quality Monitoring Study	
Seattle City Light ("SCL") will modify FA-01 to include development of a CE-QUAL-W2 model to evaluate temperature impacts from the Project on aquatic resources. SCL will seek and incorporate the input of Scott Wells and the Oregon and Washington USGS Water Science Centers in the development of the CE-QUAL-W2 model. The model will be developed and implemented within the two-year study timeframe. The CE-QUAL-W2 model will be used to evaluate, among other things, the impact of cold-water releases from Ross reservoir on fishery resources. Action item: SCL will schedule one or more workshops with the LPs, as needed, to collaborative develop this model.	All material related to the CE-QUAL-W2 model is housed in the accompanying FA-01b Water Quality Model Development Study Interim Report (City Light 2022a). Dr. Scott Wells is under contract to serve as an additional technical expert on CE-QUAL-W2 development. The CE-QUAL-W2 temperature model is expected to be developed and calibrated within the two-year timeframe, pending sufficient availability of input data. The model may be used to evaluate, among other things, the impact of cold-water releases from Ross Lake on fisheries resources. City Light is actively discussing CE-QUAL-W2 model development and calibration with LPs in a series of Water Quality Resource Work Group meetings.
SCL will provide a QAPP that meets Ecology's standards and judge existing data based on the QAPP. If the existing data cannot be confirmed, the data will be reviewed on a case-by-case basis in collaboration with the LPs. Action item: SCL to provide provisional data summary by the end of July 2021 to identify gaps and ensure those gaps are addressed through data collection in the study time frame, followed by a full summary in the Initial Study Report. Action item: The existing data will be reviewed to determine data gaps that need to be filled through the implementation of the study plan.	The QAPP, which is based on Ecology's Standard Operating Procedures, was included as an attachment to the FA-01a Water Quality Monitoring Study RSP. City Light submitted the provisional data summary to LPs on September 3, 2021. An updated water quality data summary and analysis is attached to this interim report.
SCL will modify FA-01 to clarify that SCL will evaluate measures of biological productivity including primary producers and will collaborate with the LPs to develop a sampling study. In addition, SCL will execute an expanded benthic macroinvertebrate sampling program to include the Project reservoirs, Skagit River to the estuary	City Light has worked with LPs in the Water Quality Resource Work Group to (1) develop a sampling plan that allows for the modeling of a range of water quality parameters, including nutrient dynamics to address questions of productivity, and (2) arrive at a sampling plan for BMI and invertebrate drift, in the Project reservoirs, tributaries to the reservoirs in the reservoirs' varial zones, and the Skagit River downstream of the Project, including a downstream expansion of sampling sites. As of the filing of this ISR, the scope of the WQ Monitoring Study has been significantly expanded in consultation with LPs to include additional data collection to support development and

June 9, 2021 Notice Commitment	Status Update
(through reference reach sampling mutually agreed to by SCL and the LPs), varying seasons, varying habitat types, and invertebrate drift. The sampling program will be developed in collaboration with the LPs and informed by NPS Appendix A.	calibration of the CE-QUAL-W2 model and BMI/invertebrate drift data.
SCL will modify the study plan to conduct an initial assessment of nitrogen and phosphorous in the Project Reservoirs, representative major reservoir tributaries, and Skagit River to the estuary (through mutually agreed sampling program including reference reaches). An assessment for nutrient data collection will be developed in coordination with tributary habitat sampling, water quality modeling, and the food web study. The sampling design will be developed in collaboration with the LPs. SCL will also modify the study plan to initiate modelling of nutrient and productivity components after 1) the CE-Qual-W2 model for temperature is developed, and 2) data sources and years available are evaluated against the objectives of the LPs. Concurrently SCL would continue to collect proposed water quality parameter data and develop the CE-Qual-W2 framework and integration with Operations model and other modelling tools in order to perform a sensitivity analysis to determine the accuracy and sensitivity of the tool (and data needs) for illustrating nutrient dynamics under alternative operational scenarios. SCL anticipates that this effort will be initiated during the second year of study and completed prior to the filing of the Updated Study Report.	City Light is currently discussing CE-QUAL-W2 model development and calibration in a series of Water Quality Resource Work Group meetings. One outcome of these discussions is the sampling plan being implemented to support model development that allows for the modeling of nutrient dynamics. A sampling plan that addresses information needs identified through the Water Quality Resource Work Group meetings will be provided to LPs in March 2022 and discussed at the April 2022 Water Quality Work Group meeting.
SCL will convene a workshop with concerned LPs to discuss parameters, frequency, monitoring locations, and temporal overlap with existing data. This workshop will occur in August 2021 after the data gaps in the QA/QC analysis are presented by SCL. The workshop will also identify the parameters to be modeled by CE-QUAL-W2, potential gaps in the	City Light is currently discussing CE-QUAL-W2 model development and calibration in Water Quality Resource Work Group meetings. As of the filing of this ISR, the scope of the WQ Monitoring Study has been significantly expanded in consultation with LPs, to include additional data to support development and calibration of the CE-QUAL-W2 model and BMI/invertebrate drift data. Existing data, as well as sampling already identified in the RSP, were factored into decision-making about what parameters should be sampled and the general locations of sampling.

June 9, 2021 Notice Commitment	Status Update
model, and the approach to filling the gaps. Where the model will not adequately describe the effects of Project operation scenarios on water quality parameters, empirical data collection requirements will be developed by SCL in collaboration with the LPs and informed by NPS Appendix A.	Refinements are underway to select final monitoring locations based on field reconnaissance.
FA-01b Water Quality Model Development Study	
Seattle City Light ("SCL") will modify FA-01 to include development of a CE-QUAL-W2 model to evaluate temperature impacts from the Project on aquatic resources. SCL will seek and incorporate the input of Scott Wells and the Oregon and Washington USGS Water Science Centers in the development of the CE-QUAL-W2 model. The model will be developed and implemented within the two-year study timeframe. The CE-QUAL-W2 model will be used to evaluate, among other things, the impact of cold-water releases from Ross reservoir on fishery resources. Action item: SCL will schedule one or more workshops with the LPs, as needed, to collaborative develop this model.	The CE-QUAL-W2 model of hydrodynamics and temperature is expected to be developed and calibrated within the two-year timeframe, pending sufficient availability of input data. The model may be used to evaluate, among other things, the impact of cold-water releases from Ross Lake on temperature in the reservoirs and river downstream. Dr. Scott Wells is under contract to serve as an additional technical expert on CE-QUAL-W2 development. City Light is actively discussing CE-QUAL-W2 model development and calibration with LPs in a series of Water Quality Resource Work Group meetings.
SCL will provide a QAPP that meets Ecology's standards and judge existing data based on the QAPP. If the existing data cannot be confirmed, the data will be reviewed on a case-by-case basis in collaboration with the LPs. Action item: SCL to provide provisional data summary by the end of July 2021 to identify gaps and ensure those gaps are addressed through data collection in the study time frame, followed by a full summary in the Initial Study Report. Action item: The existing data will be reviewed to determine data gaps that need to be filled through the implementation of the study plan.	The QAPP, which is based on Ecology's Standard Operating Procedures, was included as an attachment to the Water Quality Monitoring Study RSP. City Light submitted the provisional data summary to LPs on September 3, 2021. The full water quality data summary and analysis is attached to the FA-01a Water Quality Monitoring Study interim report.
SCL will modify FA-01 to clarify that SCL will evaluate measures of biological productivity including primary producers and will collaborate	City Light has worked with LPs in the Water Quality Resource Work Group to (1) develop a sampling plan that allows for the modeling of a range of water quality parameters, including nutrient dynamics to address questions of productivity, and (2) arrive at a sampling plan for BMI and

June 9, 2021 Notice Commitment	Status Update
with the LPs to develop a sampling study. In addition, SCL will execute an expanded benthic macroinvertebrate sampling program to include the Project reservoirs, Skagit River to the estuary (through reference reach sampling mutually agreed to by SCL and the LPs), varying seasons, varying habitat types, and invertebrate drift. The sampling program will be developed in collaboration with the LPs and informed by NPS Appendix A.[1]	invertebrate drift, in the Project reservoirs, tributaries to the reservoirs in the reservoirs' varial zones, and the Skagit River downstream of the Project, including a downstream expansion of sampling sites. As of the filing of this ISR, the scope of the WQ Monitoring Study has been significantly expanded in consultation with LPs to include additional data collection to support development and calibration of the CE-QUAL-W2 model and BMI/invertebrate drift data.
SCL will modify the study plan to conduct an initial assessment of nitrogen and phosphorous in the Project Reservoirs, representative major reservoir tributaries, and Skagit River to the estuary (through mutually agreed sampling program including reference reaches). An assessment for nutrient data collection will be developed in coordination with tributary habitat sampling, water quality modeling, and the food web study. The sampling design will be developed in collaboration with the LPs. SCL will also modify the study plan to initiate modelling of nutrient and productivity components after 1) the CE-QUAL-W2 model for temperature is developed, and 2) data sources and years available are evaluated against the objectives of the LPs. Concurrently SCL would continue to collect proposed water quality parameter data and develop the CE-QUAL-W2 framework and integration with Operations model and other modelling tools in order to perform a sensitivity analysis to determine the accuracy and sensitivity of the tool (and data needs) for illustrating nutrient dynamics under alternative operational scenarios. SCL anticipates that this effort will be initiated during the second year of study and completed prior to the filing of the Updated Study Report.	City Light has worked with LPs in the Water Quality Resource Work Group to (1) develop a sampling plan that allows for the modeling of a range of water quality parameters, including nutrient dynamics to address questions of productivity, and (2) arrive at a sampling plan for BMI and invertebrate drift, in the Project reservoirs, tributaries to the reservoirs in the reservoirs' varial zones, and the Skagit River downstream of the Project, including a downstream expansion of sampling sites. As of the filing of this ISR, the scope of the WQ Monitoring Study has been significantly expanded in consultation with LPs to include additional data collection to support development and calibration of the CE-QUAL-W2 model and BMI/invertebrate drift data.

[1] Taylor-Goodrich, K.F. Re: North Cascades National Park Service Complex comments on Seattle City Light's Revised Study Plan for the relicensing of the Skagit Project (#553), Appendix A. Letter to K.D. Bose, Secretary, Federal Energy Regulatory Commission, May 5, 2021.

June 9, 2021 Notice Commitment	Status Update
SCL will convene a workshop with concerned LPs to discuss parameters, frequency, monitoring locations, and temporal overlap with existing data. This workshop will occur in August 2021 after the data gaps in the QA/QC analysis are presented by SCL. The workshop will also identify the parameters to be modeled by CE-QUAL-W2, potential gaps in the model, and the approach to filling the gaps. Where the model will not adequately describe the effects of Project operation scenarios on water quality parameters, empirical data collection requirements will be developed by SCL in collaboration with the LPs and informed by NPS Appendix A.	City Light is currently discussing CE-QUAL-W2 model development and calibration in Water Quality Resource Work Group meetings. As of the filing of this ISR, the scope of the WQ Monitoring Study has been significantly expanded in consultation with LPs, to include additional data to support development and calibration of the CE-QUAL-W2 model and BMI/invertebrate drift data. Existing data, as well as sampling already identified in the RSP, were factored into decision-making about what parameters should be sampled and the general locations of sampling. Refinements are underway to select final monitoring locations based on field reconnaissance.
FA-02 Instream Flow Model	
City Light will use the decision-making/dispute resolution process being developed by City Light and the LPs in implementing the study.	Technical work group meetings with LPs are anticipated to continue throughout the study program through the established work groups. Dispute resolution procedures have been completed by the Partners' Committee.
As part of its FERC license application, City Light will integrate the results of all models and resource studies, including but not limited to GE-04, FA-01, and FA-02, to inform and evaluate the impacts of Project operations on aquatic habitat. City Light will schedule a workshop during Q4 2021 to develop a roadmap in collaboration with the LPs to guide this integration.	Integration discussions are ongoing. The first Study Integration Small Group meeting of LP technical committee representatives and City Light occurred in December 2021 and additional discussions will occur in 2022. These discussions will inform City Light's integration of relicensing studies and models.
At the next workgroup meeting, City Light and the LPs will collaborate to refine the framework and schedule of FA-02 and work together to identify any gaps and additional information needs to ensure collaborative development and implementation of the study.	Collaborative LP engagements are ongoing and anticipated to continue throughout the study program with a collaborative effort to track discussion topics for meetings maintained by the facilitation team. On-going workshops have been scheduled to allow engagement in the model development process. A separate but parallel collaborative HSC technical meeting series of LPs, City Light and its Consultant Team has been implemented for HSC development with meetings occurring 1-2 times/month since mid-2021 and culminating in consensus HSC in February 2022. As is needed, City Light, its technical team, and LPs are identifying and scheduling small technical working groups to discuss and resolve technical issues and questions as they arise (e.g., level logger subgroup meeting).
City Light will model to determine locations and	The development of the instream flow model is in process. The completed model may be used to

June 9, 2021 Notice Commitment	Status Update
methods for wood and sediment augmentation no later than 6 months following completion of the instream flow model. Based on the results of the modeling, City Light will implement a wood and sediment augmentation pilot program to be developed jointly by City Light and the LPs no later than 2023 (unless City Light and the LPs mutually determine that such a pilot program is unnecessary). City Light and the LPs expect that the augmentation pilot program will include monitoring, including monitoring downstream of the Sauk confluence, and will result in information to inform development of possible protection, mitigation, and enhancement ("PM&E") measures in the new license. The pilot program will include appropriate-sized wood to meet the objective of wood augmentation (i.e., representative of the size classes observed in the reservoirs). See Wald, A.R. 2009. Report of investigations in instream flow: High flows for fish and wildlife in Washington. Department of Fish and Wildlife, Olympia.	inform discussions to explore a wood and sediment augmentation pilot; modeling of sediment and wood is being addressed more directly in the Geomorphology Work Group and studies, which are explicitly evaluating channel morphologic sensitivity to interactions between process flow inputs of water, sediment, and wood. Cross-coordination between the instream flow modeling and the geomorphology technical teams is underway. A GE-04/FA-02 coordination workshop was held on October 12, 2021 and these topics will continue to be discussed at Geomorphology Work Group meetings. Preliminary results of the sensitivity analysis (using UBCRM and mobile bed HEC-RAS 1D, as explained in the GE-04 Geomorphology Study report) will be available in late Q3 2022 for consideration in the development of the pilot program in 2023.
City Light will continue current data collection/tagging of wood that is placed in the river under current programs and will disseminate data from these ongoing programs to the LPs as soon as practicable.	Reservoir wood data collection is ongoing and data from 2017 to present was provided to LPs in late June 2021 and raw data sheets were provided in December 2021. A memorandum report summarizing this task is included with the ISR. The instream wood tagging field work was initiated in 2021 and the topic was discussed at the October 12, 2021 Geomorphology Work Group meeting and is a topic for further discussion in 2022. Updates are provided in the ISR.
City Light will modify FA-02 to include an evaluation of the effects of the existing flow regime on aquatic resources to inform future flow regimes under the new license. City Light will also provide a qualitative evaluation of the effectiveness of individual mitigation projects on City Light and public lands based on best available data and best professional judgment. The	One of the objectives of the Instream Flow Model Development Study and other relicensing studies is to evaluate fish, aquatic and geomorphological resource conditions under the existing flow management program. Future flow scenarios will be evaluated during development of the license application. This task is not being addressed as part of the Instream Flow Model Development Study. However, City Light has begun a qualitative evaluation of the effectiveness of individual mitigation projects on City Light and public lands and will complete it during 2022.

June 9, 2021 Notice Commitment	Status Update
evaluation will include site tours and meetings with the LPs.	
City Light is working with the Instream Flow HSC technical team (including the LPs) to identify field validation studies. Currently, City Light is implementing a spring spawning field validation effort for steelhead. An upcoming workshop (mid-June) is planned for HSC development that will include the topic of field validation for summer rearing species of interest. City Light will circulate a discussion draft that includes selection of potential sampling sites (shared focus areas), sample methods, etc. in advance of the workshop.	Field validation studies were identified for focus species and life stages in collaboration with LPs as part of HSC technical team discussions that began in mid-2021 and were completed in early 2022. The field validation date collection activities identified by City Light and LPs were completed and included: a) Steelhead spawning (spring 2021); b) Chinook and Pink spawning (fall 2021); and c) Steelhead, Chinook, and Bull Trout juveniles (summer/fall 2021). A summary of field validation activities is included as Attachment J of the FA-02 Instream Flow Model interim report.
City Light will include continuous stage readers and temperature loggers in the floodplain to validate floodplain connectivity. The location and placement of continuous stage readers and temperature loggers will be agreed upon by City Light and the LPs in a future workshop.	Initial level logger installation locations were discussed with LPs in Fall 2021 and the logger (n=17) installation began in November 2021 and will continue through spring 2022. These data will also be used to support topobathymetric field verification and validation of these key floodplains from model outputs once the instream flow model is completed in Spring 2022.
Action item: City Light will convene workshops to discuss the influence of groundwater and utility of FLIR on hyporheic exchange (see Torgersen et al 1999 for FLIR methodology technique). The workshop will also address: 1) the crosswalk between the CE-QUALW2 model and other water quality parameters highlighted in the NPS Appendix A; and 2) the need for additional data collection. The LPs acknowledge they are not seeking installation of groundwater wells as part of this study. If warranted as a result of this study, City Light recognizes that may be necessary.	The initial discussions on FLIR occurred on October 21, 2021, with ongoing discussions on this topic occurring in subsequent work group meetings in 2022.
City Light will modify the study plan to provide topobathymetric field verification and validation at key floodplain areas after the initial model run. The key	Once the Upper Skagit Hydraulic Model is developed and calibrated (Spring of 2022), hydraulic model outputs for key floodplains (i.e., floodplains where stage and temperature monitoring are occurring) will be produced to support the topobathymetric field verification and validation in these

June 9, 2021 Notice Commitment	Status Update
floodplain areas will be identified by an initial model run with a moderate flow and relative elevation maps. City Light and the LPs recognize that ISF and water quality workgroups will be coordinated to integrate ISF model with offchannel/floodplain water quality parameters to assess habitat quality.	areas. Level logger data can be compared against modeled water surface elevations to verify accuracy of the terrain in these key floodplains.
As part of its FERC license application, City Light will integrate the results of all models and resource studies, including but not limited to GE-04, FA-01, and FA-02, to inform and evaluate the impacts of project operations on aquatic habitat. City Light will schedule a workgroup meeting during Q4 2021 to develop a roadmap to guide this integration.	Integration discussions are ongoing. The first Study Integration Small Group meeting of LP technical committee representatives and City Light occurred in December 2021 and additional discussions will occur in 2022. These discussions will inform City Light's integration of relicensing studies and models.
By relying upon focus areas in application of the 2-D transport model and using the instream flood model, City Light will assess floodplain flow conditions including shear stress and scour (per GE-04). As part of its FERC license application, City Light will integrate the results of GE-04 with the FA-02 hydraulic model and other available information to inform the impacts of process flows on anadromous salmon habitat and population productivities (per GE-04).	Focus areas for the application of the 2-D transport model have been selected in coordination with the Geomorphology Work Group to represent key habitat types and processes. The Instream Flow Modeling Team has begun working with the Geomorphology Modeling Team to coordinate use and/or modification of the instream flow model to support assessment of floodplain flow conditions including connectivity of seasonally-isolated habitat areas and shear stress and scour that may form new side channels.
City Light will clarify the study plan to provide topobathymetric field verification and validation at key floodplain areas after the initial model run. The key floodplain areas will be identified by an initial model run with a moderate flow and relative elevation maps. City Light and the LPs recognize that ISF and water quality workgroups will be coordinated to integrate ISF model with offchannel/floodplain water quality parameters to assess habitat quality.	Once the Upper Skagit Hydraulic Model is developed and calibrated (Spring 2022), hydraulic model outputs for key floodplains (i.e., floodplains where stage and temperature monitoring are occurring) will be produced to support the topobathymetric field verification and validation in these areas. Level logger data can be compared against modeled water surface elevations to verify accuracy of the terrain in these key floodplains. The Flows Work Group has discussed the information that the instream flow model will provide to inform floodplain connectivity discussions and potential future data collection or analyses at monthly meetings in 2021 and as recently as January 11, 2022.
As part of its FERC license application, SCL will integrate the results of all models and resource	Integration discussions are ongoing. The first Study Integration Small Group meeting of LP technical committee representatives and City Light occurred in December 2021 and additional

June 9, 2021 Notice Commitment	Status Update
studies, including but not limited to GE-04, FA-01, and FA-02, to inform and evaluate the impacts of project operations on aquatic habitat. SCL will schedule a workgroup meeting during Q4 2021 to develop a roadmap to guide this integration.	discussions will occur in 2022. These discussions will inform City Light's integration of relicensing studies and models.
Issue: Depict how study results and model outputs will be integrated with the Operations Model. Provide details as to how the different studies are going to feed into the Ops Model and how the results will be used. a) After the Year 1 studies and preliminary models have been developed, City Light provide a Proof of Concept demonstration to show how model results will be integrated with the Operations Model and the types of output information/data/mapping that will result. This should include outputs/inputs from other models. b) Agencies and LPs need to see and understand the modeling tools and outputs and the metrics that will be applied in decision making, BEFORE moving to operational scenario comparisons. June 9, 2021 Notice Modification: These issues will be addressed in the workgroup meeting during Q4 2021 to develop a roadmap to guide this integration. SCL will develop a projected climate change operations model from the base model. The climate change model will be developed collaboratively with the LPs using downscaled data from the UW climate impacts group and will be used to advise operations.	An Integration Small Group of LP technical committee representatives has met since December 2021. A Proof of Concept flow diagram of how the inputs and outputs of the models under development will support flow management questions in relicensing was shared with the LPs on January 13, 2022 and February 10, 2022. Discussions related to incorporation of UW's Climate Change Model (DSHVM) started in OM-01 Workshop #1 in June 2021. Various hydrology scenarios to represent potential climate change impacts will be developed collaboratively with the LPs using downscaled data from the DSHVM model to evaluate future operations.
Issue: Closely review and inspect the Effective Spawning Habitat Model and the FSA. a) The entire logic framework specified in the FSA and ESH should be described and discussed and updated as needed. b) Consider a decision support tool to assist in this endeavor. June 9, 2021 Notice Modification: These issues will be addressed in the workgroup meeting during Q4	The goal of this Instream Flow Model Development Study is to update the existing flow-habitat evaluation tool for the Skagit River between the Gorge Powerhouse and the confluence with the Sauk River. Integration discussions are ongoing. The first Study Integration Small Group meeting of LP technical committee representatives and City Light occurred in December 2021 and additional discussions will occur in 2022. These discussions will inform City Light's integration of relicensing studies and models.

June 9, 2021 Notice Commitment	Status Update
2021 to develop a roadmap to guide this integration.	
Issue: Discuss the need for fish species presence surveys in the Study Plan Reach (particularly spawning habitat) or an assessment of existing survey information for species of concern in order to include species in the instream flow model/HSC development: a) sea-run cutthroat (*Oncorhynchus clarki clarki*) b) Pacific lamprey (*Entosphenus tridentatus*) c) Salish sucker (*Catostomus* sp.) d) Dolly Varden (*Salvelinus malma*) e) western brook lamprey (*Lampetra richardsonii*) f) river lamprey (*Lampetra tridentate*) g) white sturgeon (*Acipenser transmontanus)* June 9, 2021 Notice Modification: Issue resolved. City Light and the LPs will be treating these species as present. City Light and the LPs will be selecting species for HSC analysis.	For the purposes of HSC development, City Light and LPs are treating these species (Sea-Run Cutthroat, Pacific lamprey, Salish Sucker, Dolly Varden, Western Brook Lamprey, River Lamprey, and White Sturgeon) as present. As such, presence surveys are not necessary and the HSC Technical Group selected/developed recommended HSC curves for these species/life stages as appropriate. The HSC Work Group has met regularly to address HSC curve evaluation and periodicity and final species/life stages were completed in February 2022.
Instream flows for below Diablo Dam will be addressed through the Instream Flow workgroup.	City Light has completed an evaluation to assess the potential for loss of hydraulic connectivity in the reach between Diablo Dam and Powerhouse using Project operations data and an existing HEC-RAS 2D Hydraulic Model. A technical memorandum was completed and included in the ISR.
SCL has committed in GE-04 to build a 1-D hydraulic model for areas below the Sauk confluence to the estuary. SCL will engage the LPs on designing and implementing the model. The pros and cons of a 1-D model and appropriateness for assessing habitat, including floodplain connectivity, will be discussed in the Instream Flow workgroup.	City Light and the LPs participating in the Geomorphology Work Group agreed to a suite of models to address areas below the Sauk confluence. Several models will be used – see Geomorphology Work Group meeting notes for specific scope and details of models discussed. The methodology for the planned modeling program is summarized in the GE-04 Initial Study Report.
FA-03 Reservoir Stranding and Trapping Risk Assessment	
SCL will 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	As of the filing of this report, City Light is coordinating with LPs to schedule a meeting to discuss concerns related to the existing methodology.

June 9, 2021 Notice Commitment	Status Update
methodology should be implemented prior to issuance of the new license.	
City Light to hold technical meetings with the LPs to review initial information to assess adequacy of that information in informing stranding evaluation (including tree size).	City Light held a technical meeting with the LPs in October 2021 to review initial information to assess adequacy of that information related to the spatial scale of data in informing stranding evaluation (including tree size). The available Ross Lake DEM appears adequate to evaluate standing and trapping and methods for interpreting DEM are described in this interim report.
Review 2021 sampling in U.S. for risk assessment to refine and inform the expansion to Canadian drawdown zone in 2022.	The GIS risk assessment study area includes the drawdown area in Canada.
LPs requested that the study results inform the development of PMEs inclusive of a reservoir drawdown rate that avoids, limits, or greatly reduces stranding of fish and juvenile amphibians; and identifies reservoir elevations that prove problematic for trapping of fish and juvenile amphibians.	City Light and LPs recognize that the study report will not include proposed PME measures related to stranding and trapping. However, the information presented in the USR will provide data necessary to develop such PMEs, as necessary.
City Light to clarify the methods section of this report that if maintenance drawdowns or lowering of reservoirs beyond normal operations occurs, City Light will attempt to perform opportunistic surveys as safety procedures allow.	City Light has clarified in the methods section of this report that if maintenance drawdowns or lowering of reservoirs beyond normal operations occurs, crew will attempt to perform opportunistic surveys as safety procedures allow.
FA-04 Fish Passage Technical Studies Program	
FA-04 Commitments	
City Light will identify fish passage flow windows at any partial potential impediments, which will be partially identified through modeling in FA-05 (Bypass Hydraulic Model).	Modeling under the FA-05 Bypass Instream Flow Model Development Study is currently underway and the final calibrated model will be available in early 2022. The identification of passable flows for upstream adult migration of target species in the Gorge bypass reach will be included in the Fish Passage Assessment of Existing Features in the Gorge Bypass Reach, which will commence in spring of 2022, with a draft report by July 2022.
City Light will provide an opportunity for LPs to identify alternatives and provide input on the fish passage feasibility study.	City Light and the study team have and will continue to engage the LPs throughout the Fish Passage Study during bi-weekly AWS meetings, and monthly technical workshops of the Fish Passage Work Group. In addition, the study team has and will continue to provide the LPs an opportunity to review and comment on all deliverables defined in Section 2.7 of the RSP. Through these engagements, reviews, and discussions, City Light has provided and will continue to provide the LPs with opportunities to identify alternatives and contribute to the study.

June 9, 2021 Notice Commitment	Status Update
City Light will assess overall feasibility of fish passage alternatives but without providing a feasibility engineering design (akin to a 30 percent engineering design level) for fish passage alternatives.	As reported in Section 2.6.1 of the RSP, concepts will be developed to a level consistent with generally accepted engineering practice for appraisal/reconnaissance level studies (e.g., U. S. Bureau of Reclamation 2012; U.S. Army Corps of Engineers (USACE) 2000; USACE 1999; AACE 2003). City Light will not provide 30 percent engineering designs for any alternative under the Fish Passage Facilities Alternatives Assessment.
City Light will modify FA-04 to clarify that the expert panel serves in an advisory capacity only and only for such study products for which review is requested. Protocols for requesting expert panel review, performance of reviews, and responses to reviews will be agreed to during the course of the study. The National Marine Fisheries Service ("NMFS") will not accept unsolicited expert panel advisory opinions.	As of this writing (March 2022), City Light and LPs have not convened an expert panel and do not intend to do so unless LPs specifically request it during future study stages. The rationale for this decision is based upon the NMFS statements in the June 9, 2021 Notice and FERC's SPD (2021) for the Skagit Project, which states: ▪ *Regarding City Light's proposal to convene an expert panel to review and evaluate study reports, there is no need for such a requirement. City Light's proposed fish passage study is consistent with accepted practices for evaluating fish passage feasibility and developing passage alternatives within the context of a hydroelectric licensing proceeding (section 5.9(b)(6)).* ▪ *Commission staff and stakeholders, including federal agencies and Indian tribes, will have the opportunity to review the study results and decide if it was completed as required by the study plan determination, and to determine whether it provides the information necessary to inform a licensing decision. Therefore, we do not recommend that City Light be required to convene an expert panel to review and provide opinions on the study results.*
Relevant Study Commitments under FA-05 to be Considered under FA-04	
City Light will allow for consideration of the following additional species for flows analysis of potential partial fish barrier passage: ▪ Pink Salmon ▪ Chum Salmon ▪ Sea-run Cutthroat ▪ Pacific Lamprey	These additional species will be considered for fish passage, targeted or incidental, under both elements of the Fish Passage Study.
City Light will consider the following species as present in the Gorge bypass reach: ▪ Pacific Lamprey ▪ Salish Sucker ▪ Dolly Varden	In response to LP requests during AWS meetings and FA-04 Workshops, City Light will consider incidental passage of Salish Sucker and Dolly Varden for both elements of the Fish Passage Study.[1]
City Light will address downstream and upstream passage at the plunge pool in the Gorge bypass reach to the extent necessary.	As part of stage 2 of the Fish Passage Facilities Alternatives Assessment (Concept Development Report), City Light will evaluate passage options in the plunge pool as related to potential upstream passage facilities, as applicable, at Gorge Dam.
Relative to a comment on the reliance of professional judgment on the outcomes of the passage flow	City Light has been collaborating with LPs throughout the study in workshops and bi-weekly AWS meetings. This commitment has been incorporated into the study implementation effort.

June 9, 2021 Notice Commitment	Status Update
assessment, City Light and the LPs recognize that there is a need for further dialogue about the use of best professional judgment for decision-making and the establishment of objective criteria for evaluating studies as well as implementation of the studies.	
FA-05 Skagit River Gorge Bypass reach Hydraulic Model and Instream Flow Model Development Study	
City Light will provide a planned higher flow event in summer/fall if opportunistic high flow is not available. The study report will assess impacts to fish migration, both beneficial and detrimental, of certain flow regimes.	Complete. A high flow event occurred in late-June/early-July 2021 with a maximum flow of about 7,400 cfs. The hydraulic model will be calibrated to water level data collected in the Existing Features during this event at sustained flows of about 4,800 cfs and 6,200 cfs. The hydraulic model developed as part of this study will be used to support an assessment of fish migration. However, the results of the fish migration assessment will be reported on in the USR for the FA-04 Fish Passage Study.
City Light will clarify the study plan to allow for consideration of additional species [pink salmon (*Oncorhynchus gorbuscha*); chum salmon (*O.keta*); sea-run cutthroat (*O. clarki clarki*); Pacific lamprey (*Entosphenus tridentatus*)] for passage analysis.	The additional species have been added to the list of target species to be considered for passage analysis under the FA-04 Fish Passage Study.
City Light and the LPs will be treating these species [Pacific lamprey, Salish sucker; Dolly Varden] as present. City Light and the LPs will be selecting species for HSC analysis.	The HSC Tech Group developed/recommended HSC curves for all three requested species. Details are provided below: a) Pacific lamprey (spawning and juvenile rearing life stages) – HSC curves were developed based on literature review of West Fork Hoquiam River, Chehalis River basin and Trapp Creek, Washington and Nicola/coastal Salmon River, British Columbia (Vadas 2021). b) Salish sucker (spawning and juvenile rearing life stages) – HSC curves were developed based on literature review from several sources in Washington State and western Canada and are largely based on research performed by Pearson et al. (2003). c) Dolly Varden (spawning, juvenile, and fry) – It is WDFW/Ecology's preference to use statewide Type 3 HSC curves when available. As a result, the recommended habitat modeling approach is to use the WDFW/Ecology Type 3 HSC curves for Bull Trout and Dolly Varden spawning and juvenile life stages (Beecher et al. 2016). HSC curves are not available from WDFW/Ecology for the fry life stage, therefore, the HSC Tech Group recommended using the Type 2 HSC curves from Crumley and Stober (1984) which relied on data from the Arctic Environmental Information and Data Center.
City Light will address downstream and upstream fish passage at the plunge pool to the extent	The potential for downstream and upstream fish passage at the plunge pool is being considered as part of FA-04 Fish Passage Study implementation.

June 9, 2021 Notice Commitment	Status Update
necessary.	
Address process flows Study Requests specifically: a) Which flows activate channel forming, channel maintenance, and channel flushing flows and upstream (probably covered) and outmigration of fish, and b) Look at magnitude, duration, frequency, seasonality, and timing (rate of change)	The data and analyses being conducted for the GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study will support identification of flow scenarios to meet these interests and the available data will be discussed at Geomorphology Work Group meetings after the ISR.
City Light and the LPs recognize that there is a need for further dialogue about the use of best professional judgment for decision-making, such as passage flow assessment, and the establishment of objective criteria for evaluating studies as well as implementation of the studies.	Incorporated in the FA-04 Fish Passage Study implementation effort. City Light continues to work with LPs during biweekly Agency Work Sessions in support of this study.
FA-06 Reservoir Native Fish Genetics Baseline Study	
City Light will modify study plan to collect juvenile fish at spawning grounds for genetics baseline as part of field sampling program in Year 2. Action item: City Light to modify study plan and circulate to LPs after FERC's issuance of the study plan determination.	This was incorporated to the objectives listed in the ISR.
City Light will modify study plan to expand sample collection/coordination of existing samples and activities and analysis out of basin and above/below dams.	This was incorporated to the objectives listed in the ISR.
City Light will clarify study plan to explain the role of the expert panel. The LPs and City Light agree that: 1) the expert panel will serve in an advisory role, and 2) the expert panel will include experts from fields other than genetics.	Clarification on the role of the Expert Panel was incorporated in the ISR. Expert Panel members include geneticists and ecologists from agencies and academia.
City Light will modify FA-06 to provide that City Light will seek input from LPs and advice from an expert panel on whether and how genetics	This was incorporated to the objectives listed in the ISR. LPs developed a memo titled "Genetics Focused Questions Related to the Management of Fish Stocks Associated with Skagit Hydroelectric Project" which was provided to City Light and the Expert Panel for consideration. Discussions on

June 9, 2021 Notice Commitment	Status Update
information or other monitoring methods can be used to inform future evaluation of reservoir fish abundance, habitat use, and migration timing.	refining management questions of interest are ongoing between LPs and the Expert Panel and will be considered by City Light once finalized.
City Light will modify study plan to collect juvenile fish at spawning grounds for genetics baseline as part of field sampling program in Year 2. Action item: City Light to modify study plan and circulate to LPs after FERC's issuance of the study plan determination.	This was incorporated to the objectives listed in the ISR.
FA-07 Reservoir Tributary Habitat Assessment	
City Light will move forward with NetMap and commence scheduling collection of LiDAR during Q4 2021. City Light will collaborate with the LPs to determine where additional LiDAR data is needed in tributaries, including within Canada, based on review of existing LiDAR and existing NetMap information.	IP modeling is underway, and results will be evaluated with LPs to determine if there is a need to conduct Light Detection and Ranging (LiDAR) in Canada or the U.S.
City Light will clarify that FA-07 will analyze tributary habitat in Canada and on U.S. Forest Service lands consistent with the list provided by LPs.	The scope of this study's assessment has been modified to include not only the streams identified in the RSP but also those in Canada and the U.S. identified by LPs in their study requests.
City Light will add Gorge reservoir to the Food Web study with the methodology to be determined based on LP discussion with Dave Beauchamp.	Meetings are underway to discuss an approach to assessing food web dynamics in Gorge Lake. NOTE: The Reservoir Tributary Habitat Assessment addresses reservoir tributary habitat capacity only. Bioenergetics results for tributaries derived by the U.S. Geological Survey (USGS), namely estimated growth potential in streams, will be used to refine the estimates of capacity derived from the Unit Characteristic Method (UCM). However, results that pertain specifically to reservoirs will be included in the USGS Food Web Study report.
Action Item: City Light will give a presentation on how CE-QUAL modeling in combination with bioenergetics work could be used to address issues such as zooplankton prey availability in the reservoirs.	Discussions are underway with LPs in FA-01a Water Quality Monitoring Study workshops to agree on benthic macroinvertebrate (BMI) and invertebrate drift sampling strategies. Data from this sampling will inform the Food Web Study. Discussions are underway between City Light and LPs to determine how reservoir and riverine nutrient dynamics will be evaluated with the CE-QUAL-W2 model, after which any remaining data

June 9, 2021 Notice Commitment	Status Update
City Light will modify the study plan to clarify that it will evaluate macroinvertebrate and zooplankton prey availability in all reservoirs for integration in the food web analysis, incorporation into the CE-QUAL or other modeling efforts, and collect additional data to inform that modeling effort based upon input from LPs. See also modifications to FA-01 regarding nutrient dynamics.	needs pertaining to zooplankton will be addressed by sampling. Results of reservoir BMI and drift sampling will be reported in the FA-01a Water Quality Monitoring Study report for the USR and, as appropriate, the USGS Food Web Study report.
Link prey availability and project operations with hydrodynamic or productivity model.	The hydrodynamic model is linked to operations (operations dictate flows that serve as input to the CE-QUAL-W2 model) both for evaluating existing operations and potential future operating scenarios.
City Light will adopt the methodology referenced by NMFS in its study plan to quantify habitat.	The methodology identified by NMFS, i.e., following the procedures of Burnett et al. (2007) and Cooper et al. (2020) was used as the basis of the RSP, as indicated in the RSP objectives shown above.
Action item: City Light will review reports referenced by USIT and evaluate whether there is a proposal it could make based on those reports that would be responsive. City Light will conduct GIS assessment of habitat in the littoral and varial zone in 2021 and evaluate and determine parameters and metrics for representative field sample frames if warranted to evaluate habitat quality in a workshop with the LPs. Meeting proposed for Q3 2021.	This LP request for a GIS assessment of habitat in the littoral and varial zone was also required by FERC in its SPD and is being conducted as a standalone desktop analysis. A draft technical memorandum of results is expected early in 2022.
City Light will modify the study plan to include anadromous and non-native species.	As of the drafting of this ISR, NetMap IP modeling is nearing completion for Chinook and Coho salmon and steelhead. IP modeling for Sockeye Salmon will begin when a parameterized model is created for this species. Evaluation of tributary production potential of Bull Trout, Rainbow Trout, Dolly Varden, and Brook Trout is included in the scope of the Food Web Study, so these species are already being addressed.
City Light will clarify the study plan to address this issue [i.e., conduct field verification of a subset of habitat to correct modeling errors].	The Reservoir Tributary Habitat Assessment study design specifically contains an extensive field survey component, which will be framed based on the results of the IP modeling.

June 9, 2021 Notice Commitment	Status Update
City Light will discuss with USGS incorporation of [existing continuous temperature and drift sampling] data or collection of new data on a subset of tributaries to address this issue. This is consistent with how the methodology that will be used by Cooper et al. as well (related to the IP and tributary assessment). City Light will collaborate with LPs on next steps after the results of IP modeling are available. City Light acknowledges that in the event that additional sampling is warranted, City Light will develop such sampling in collaboration with the LPs- as informed by NPS Appendix A.	Along with temperature data collected by USGS, there are numerous tributary and reservoir sites where ongoing temperature monitoring is being conducted. Analysis of an extensive dataset containing the results of past and ongoing temperature monitoring will be presented in the FA-01a Water Quality Monitoring Study Interim Report for the ISR (City Light 2022a). Temperature data that have undergone Quality Assurance/Quality Control analysis will be available for multiple studies, including the Food Web Study and Reservoir Tributary Habitat Assessment. Drift data collected as part of the FA-01a Water Quality Monitoring Study and the Food Web Study will inform bioenergetics modeling.
City Light will [incorporate] this [i.e., evaluate competition with redside shiner and juvenile salmonids in reservoirs] in the food web study scope and provide cross- reference to specific provisions of the study plan, and will revisit with LPs after a plan to evaluate prey resources availability is developed.	This is a central element of the Food Web Study and will be discussed in the Food Web Study report.
City Light will conduct GIS assessment of habitat in the littoral and varial zones in 2021 and collaboratively evaluate and determine parameters and metrics for representative sampling of habitat quality in a workshop with LPs. Meeting proposed for Q3 2021.	This LP request for a GIS assessment of habitat in the littoral and varial zone was also required by FERC in its SPD and is being conducted as a standalone desktop analysis. A draft technical memorandum of results is expected early in 2022.
City Light will hold a workshop to address this [i.e., refine methods of assessing habitat production potential] issue.	Three workshops have been held with LPs, and others are scheduled, to refine the spatial scope and methods for this study.
FA-08 Fish Entrainment Study	
Issue: Add PIT mark recapture monitoring in Diablo and Gorge. June 9, 2021 Notice Modification: See below.	City Light is working on expanding the acoustic telemetry program to include a greater range of fish species and sizes.
Issue: Water quality information should be collected at Ross Forebay	Relevant to the CE-QUAL-W2 model (FA-01).

June 9, 2021 Notice Commitment	Status Update
June 9, 2021 Notice Modification: The CE-QUAL-W2 commitments should address this. SCL will discuss and confirm sampling locations in reservoir forebays with LPs.	
SCL will collaborate with LPs on the existing acoustic study to include a broader, and inclusive range of fish species, life stages, sizes, and sample sizes at all Project reservoirs.	City Light is working on expanding the acoustic telemetry program to include a greater range of fish species and sizes.
SCL will clarify the study plan to specify that the desktop study will be completed during the first year of study and will be used to inform the need for further entrainment studies (including potentially mark recapture and other studies) during the second year of study and potentially a longer-term study. SCL will collaborate with the LPs on study design for future entrainment studies. SCL will convene a workshop with the LPs to address study design issues associated with future entrainment studies during Q4 2021 or Q1 2022. SCL will clarify the study plan to provide that the desktop study will take into account project design (specifically, in the power tunnel below the intakes).	Clarified in the study report that the desktop entrainment evaluation will be used to inform the need of a field-based entrainment study, which will be decided following the filing of the ISR in March 2022. If a field-based study is needed, City Light will collaborate with LPs on the study design.
SCL will clarify the study plan to provide that a goal of the study is to inform future assessments of passage, abundance, migration, and survival through entrainment and entrainment of each potential downstream passage route: turbines, spillway, bypasses or gates, for all size classes of Bull Trout, native fishes, and nonnative fishes at each of the unique structures at all three projects.	Clarified in the study report that methods for the desktop entrainment analysis included native and nonnative fishes for all life stages and size ranges, as well as multiple passage routes through the Project facilities.
Issue: USIT requests to include Chinook, Steelhead, Coho, and Sockeye, and depending on the results of the FA-04/FA-05 passage assessment, Pink and Chum into the desktop exercise.	These species were incorporated to the desktop entrainment qualitative risk assessment.

June 9, 2021 Notice Commitment	Status Update
June 9, 2021 Notice Modification: SCL will clarify the study plan to include these species.	
Action item: After FERC issues the Study Plan Determination, SCL to have call with the Washington Department of Fish and Wildlife ("WDFW") and USIT regarding additional technical references.	City Light will discuss relevant technical references with WDFW and USIT if necessary following LP review of the ISR (which contains cited literature) filed March 2022.
GE-02 Erosion and Geologic Hazards at Project Facilities and Transmission Line Right-of-Way Study	
Status of Project-related townsites and study routes modifications identified in the June 9, 2021 Notice.	
SCL will clarify the study plan to provide that it will follow WDFW guidelines for determining fish-use potential. See WDFW, 2019 Fish Passage Inventory Assessment, and Prioritization Manual at 2-4. Olympia, Washington.	This commitment is incorporated into the methods for this study and will be completed during the 2022 analysis period (see Section 5.1.2 of this study report referring to WDFW, 2019 Fish Passage Inventory Assessment, and Prioritization Manual at 2-4. Olympia, Washington).
SCL will clarify the study plan to include a barrier inventory and assessment on mitigation lands and maintenance areas. With respect to mitigation lands, the inventory will be limited to active roads and will not include abandoned roads (which have been abandoned pursuant to Washington State Forest Practice Standards).	The barrier inventory and assessment is being conducted on mitigation lands and maintenance areas as well as other roads study routes associated with the Project as described in Section 3.0 of this study report. With respect to mitigation lands, the inventory is limited to active roads and will not include abandoned roads (which have been abandoned pursuant to Washington State Forest Practice Standards).
SCL will consult with the LPs to clarify the barrier status for specific fill and levee locations during study implementation (Goodell Creek alluvial fan, Stetattle Creek, and other sites identified by the LPs).	City Light will consult with the LPs in 2022 to clarify the barrier status for specific fill and levee locations.
SCL proposes to develop an inventory of culverts and potential stream miles of habitat (through LiDAR analysis) for consultation with the LPs on the need for habitat surveys. SCL cannot commit to field-based habitat surveys of blocked habitat because of the volume of culverts and uncertainties as to the number of culverts that are fish-blocking barriers and the amount of habitat above those	The Phase II Fish Passage Assessment, which will be completed in 2022, will identify culverts and other study route stream crossing structures that are potential barriers to fish migration. Using this data, City Light will develop a map and GIS database showing potential stream miles of habitat that are upstream of barriers through LiDAR analysis. City Light proposes to report on the results of the assessment and LiDAR-based map of streams in the USR and confer with the LPs on the need for additional ground-based habitat surveys.

June 9, 2021 Notice Commitment	Status Update
barriers. Because of this, SCL proposes to report on the results of the studies in the Initial Study Report and confer with the LPs on the need for habitat surveys based upon the results of the studies.	
Status of channel migration and stream crossing modifications identified in the June 9, 2021 Notice.	
City Light proposes that the existing geographic scope is adequate to cover relevant geomorphic processes and controls at the reach level in order to screen for geomorphic impacts associated with the Project. SCL will confer with the LPs to determine whether there is a need at specific locations to adjust the geographic scope to implement this screening. At specific locations identified through the study that will require interventional management, SCL will commit to assess the risk to towers and facilities, watershed-scale influences on fluvial processes, potential channel changes, sediment delivery, and other elements through discussion with the LPs towards developing site specific plans.	The geographic scope of the study at specific locations is under discussion with LPs within resource workgroups.
GE-03 Sediment Deposition in Reservoirs Affecting Resource Areas of Concern	
Assess sediment sequestration quantity and character in all three project reservoirs; add a comprehensive sediment survey in reservoirs. City Light will quantify sediment supply of all size ranges (i.e., grain size distribution estimate) into Ross, Diablo, and Gorge Reservoirs as an annual rate by using the existing DHSVM model, historical contours, and updated bathymetry information. Workgroup will discuss sediment size and characterization available from DHSVM model.	Upon further analysis, the DHSVM model is not an appropriate tool to use to estimate sediment supply to the reservoirs so it will not be used for this study. Instead, the comparison of historical contours with updated bathymetry will be used as well as a fine sediment yield regression relationship that is being developed as described in the November 9, 2021 Geomorphology Work Group Standing Meeting. The regression relationship will provide a better estimate of sediment yield to reservoirs than the DHSVM model. Both of these analyses will be completed in 2022 and reported in the USR.
Assess deposition and erosion in the drawdown zone. City Light will clarify that mapping of the sediment	Sediment erosion and deposition zones within the drawdown zones will be mapped using remote sensing and field-based methods in 2022 and reported in the USR. Details of methodology are being developed in consultation with LPs through Geomorphology Work Group consultation.

June 9, 2021 Notice Commitment	Status Update
and erosion deposition zone and tributaries are part of the existing scope of the study. Any remaining gaps will be addressed during implementation.	
Use a 1-D backwater model instead of the geomorphic 'inflection point" to estimate the magnitude and location of the reservoir backwater effect. City Light will expand the scope of GE-03 to include this modeling. City Light and the LPs recognize that there are limitations on the ability to calibrate aspects of this model.	Based on further analysis, City Light proposes that the reservoir backwater effect will be analyzed in the four delta study areas using the most appropriate method for each particular area as follows: ▪ Hozomeen inlet: the detailed topographic data needed to develop a 1-D topographic model for the Skagit River would extend into Canada and is not available. Therefore, a 1-D HEC-RAS model will not be developed. ▪ Sourdough Creek: the longitudinal profile measured from 2018 LiDAR and 2021 survey data shows that due to the steep gradient of Sourdough Creek, and the grade control/drop at the existing road crossing structure, the backwater effect cannot extend up Sourdough Creek (see Section 5.3). A 1-D HEC-RAS model is not needed, and there is no hydrologic data to calibrate the model. ▪ Thunder Arm: a 1-D HEC-RAS model will be developed in 2022 for Thunder Arm. This is appropriate because Thunder Creek is relatively low gradient, there is evidence of backwater effects (see Section 5.2) and there is existing detailed topographic (LiDAR) and hydraulic (USGS gage) data available for Thunder Creek to enable calibration of the model. Stetattle Creek: a 2-D HEC-RAS model (more detailed than a 1-D HEC-RAS model) has been developed as part of a previous study and will be used to analyze backwater effects.
GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study	
City Light will develop a 1-D HEC RAS model for stream flow from the Sauk to the estuary and work with technical experts and LPs to identify robust sampling of mutually agreed to measurement endpoints within reference reaches within major reach segments. City Light will incorporate Jon Riedel's (NPS) work and the full range of hydrology and operations will be modeled. City Light will convene workshops to address the technical issues such as channel migration, LWD, suspended sediment transport and washload, and off-channel habitat associated with the modeling effort or other additional modeling efforts.	As described in Section 4.5.1 of the Geomorphology Study Report, 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 were defined in consultation with LPs in workshops in July, September, and October 2021, 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 Report. Tools for application downstream of the Sauk include UBCRM and MAST 1-D, which will extend to the gravel-sand transition at approximately PRM 21. The rational for using MAST 1-D in leu of HEC-RAS 1-D is explained in Section 7.3 of the Geomorphology Study Report. Project effects on fine sediment delivery to the estuary will be evaluated by combining watershed-scale sediment yield analysis (Section 4.5.3 of the Geomorphology Study Report) with evaluation of floodplain-channel sediment exchange using the MAST 1-D model.

June 9, 2021 Notice Commitment	Status Update
City Light will modify the study plan to include collaboration with the LPs to look for opportunities to incorporate sediment modeling in reference reaches below the Sauk to the estuary.	
Regarding LPs' comments regarding LWD inventory, this is a topic of the lower river synthesis study. To the extent the synthesis study identifies a data gap, City Light will work collaboratively with the LPs to address it (including but not limited to the Watershed Council) Middle Skagit River Restoration Plan, aerial photos, etc.).	This is a topic for discussion after the ISR (March 2022) to be informed by the outcomes of the SY-01 Synthesis and Integration of Available Information on Resources in the Lower Skagit River [downstream of the Sauk], which is currently underway.
City Light will provide LPs with its existing inventory of LWD in the three project reservoirs by no later than August 1, 2021 and conduct an annual inventory of inputs during the study period.	Reservoir wood data collection is ongoing and data from 2017 to present was provided to LPs in late June 2021 and raw data sheets were provided in December 2021. A memorandum report summarizing this task is included with the ISR.
City Light will convene a workshop with the LPs during the fourth quarter of 2021 to collaboratively develop strategies for short-term and long-term management of woody debris in the reservoirs and transport of woody debris to the lower river.	This topic was discussed at the November 2021 Geomorphology Work Group meeting and is a topic for further discussion in 2022.
Action item: LPs will work with City Light within the next 30 days to develop protocol for wood crew to enumerate woody debris coming into reservoir.	City Light provided the data form to LPs and collected additional wood data on Ross Lake in August with right-of-way crews responsible for corralling woody debris. These additional data are included as part of the ISR
City Light will convene workgroup meetings to clarify expected capabilities of sediment transport and morpho-dynamic models for predicting changes to channel morphology.	This topic was discussed at the October 2021 Geomorphology Work Group meeting.
City Light will calibrate sediment transport models to at least the 10-year recurrence interval (subject to available data) and calibrate sediment transport model to help predict where sediment would be stored. If necessary, City Light will provide controlled releases to assist in calibrating the model.	Topic for on-going discussion at Geomorphology Work Group meetings, which began at July 2021 meeting. Discussions will continue into 2022. The sediment transport models will be calibrated to the November 2021 flood, which ranges from approximately a 2-yr natural flow condition recurrence interval event at the Newhalem Gage to approximately a 50-yr recurrence interval event at Marblemount. Repeat topobathymetric LiDAR bracketing this flood (2017/18 and 2022) and the empirical bed mobility observations described in Section 4.5.2 of the Geomorphology Study Report

June 9, 2021 Notice Commitment	Status Update
Such controlled releases will be designed in a manner as to not contribute to downstream property damage or risk to health and human safety.	will provide that calibration information.
City Light will model to determine locations and methods for wood and sediment augmentation no later than 6 months following completion of the instream flow model. Based on the results of the modeling, City Light will implement a wood and sediment augmentation pilot program to be developed jointly by City Light and the LPs no later than 2023 (unless City Light and the LPs mutually determine that such a pilot program is unnecessary). City Light and the LPs expect that the augmentation pilot program will include monitoring, including monitoring downstream of the Sauk confluence, and will result in information to inform development of possible PM&E measures in the new license.	The development of the FA-02 Instream Flow Hydraulic Model is in process. The completed model may be used to inform discussions to explore a wood and sediment augmentation pilot; modeling of sediment and wood is being addressed in the Geomorphology Work Group meetings and this Geomorphology study, which is explicitly evaluating channel morphologic sensitivity to interactions between process flow inputs of water, sediment, and wood. Cross-coordination between the instream flow modeling and the geomorphology technical teams is underway. A GE-04/FA-02 coordination workshop was held on October 12, 2021 and these topics will continue to be discussed at Geomorphology Work Group meetings. Preliminary results of the sensitivity analysis (using UBCRM and mobile bed HEC-RAS 1-D, as explained in the Geomorphology Study Report) will be available in late Q3 2022 for consideration in the development of the pilot program in 2023
City Light will continue current data collection/tagging of wood that is placed in the river under current programs and will disseminate data from these ongoing programs to the LPs as soon as practicable. The results of GE-04 and the other studies will be used to inform sediment and wood augmentation throughout the Skagit River system. City Light will provide LPs information about current data collection/tagging of wood as soon as practicable. The Federal and state resource agencies will consider what information and permitting is needed to implement the augmentation pilot program. City Light will work cooperatively with LPs to ensure timely implementation of the pilot program with all required permits in place.	LWD data tagging/tracking field effort of 37 reservoir wood pieces at the Agg pond is in progress and is described in this study report. Wood tagging topic has been an on-going discussion at Geomorphology Work Group Meetings. Future action item (2023) depending on the results of the relicensing studies. LWD data tagging/tracking field effort of natural large wood pieces and reservoir wood pieces is in progress and is described in this study report. Wood tagging topic has been an on-going discussion at Geomorphology Work Group Meetings. Topic for future discussions at Geomorphology Work Group meetings.

June 9, 2021 Notice Commitment	Status Update
City Light will convene technical workshops with the purpose of expanding the scope, and changing and/or adding proposed tagging/monitoring of tributary sediment deposits to more tributaries, including downstream of Sauk Confluence.	Topic of ongoing and future discussions at Geomorphology Work Group meetings. City Light expanded the scope of particle tracing activity to include Ladder Creek, Newhalem Creek, Goodell Creek, one riffle crest near County Line, and Bacon Creek (including tracers on the fan and upstream of the SR 20 bridge).
City Light will include continuous stage readers in selected off-channel habitats in the floodplain to validate floodplain connectivity. The location and placement of stage readers will be agreed upon by City Light and the LPs in a future workshop. Action item: City Light will convene workshops to discuss the influence of groundwater and utility of FLIR on hyporheic exchange and in the selection of study reaches.	19 level logger sites were selected with LPs to build upon the existing network of six sites maintained by SRSC. Two sites were omitted due to results of cultural resource review and constraints with private property such that the revised plan calls for installation of 17 sites. Site 10 is tentative pending coordination with the Marblegate community. Eleven level logger sites were installed through February 1, 2022. Fieldwork planned for installation of six remaining sites in winter-spring 2022. The initial workshop on FLIR occurred on October 21, 2021, with ongoing discussions on this topic occurring in subsequent work group meetings in 2022.
By relying upon focus areas in application of the 2-D transport model and using the instream flood model, City Light will assess floodplain flow conditions including shear stress and scour.	This issue was considered in the list of questions to be addressed by the proposed model suite being developed for the Geomorphology Study, presented at the October Geomorphology Work Group meeting.
As part of its FERC license application, City Light will integrate the results of GE-04 with the FA-02 hydraulic model and other available information to inform the impacts of process flows on anadromous salmon habitat and population productivities.	Future action item to be addressed as part of the license application (2023).
City Light will clarify the study plan to describe metrics available in the IHA software and will apply it to process flows. See Wald, A.R. 2009. Report of investigations in instream flow: High flows for fish and wildlife in Washington. Department of Fish and Wildlife, Olympia.	Potential metrics to be discussed at a work group meeting following LP review of the ISR (Q2 2022).
City Light and the LPs will develop in the workshop a suite of metrics to illustrate longitudinal disturbance regimes.	A GE-04/FA-02 workshop and data needs discussion was held on October 12, 2021 and discussions continue at the Geomorphology Work Group meetings.
City Light will modify the study plan to include flows necessary to inundate habitat features in the validation discharge data set (off-channel).	Once the FA-02 Instream Flow Model Development Study Hydraulic Model is developed and calibrated (first quarter of 2022), hydraulic model outputs for key floodplains (i.e., floodplains with stage and temperature monitoring are occurring) will be produced to support the topobathymetric

June 9, 2021 Notice Commitment	Status Update
	field verification and validation in these areas. Level logger data can be compared against modeled water surface elevations to verify accuracy of the terrain in these key floodplains.
City Light will quantify sediment supply into Ross Reservoir as an annual rate by using the existing DHSVM model and historical contours and bathymetry information.	Review of available information discussed at Fall 2021 work group meetings with further discussion in Q1 2022. During work group meetings in Fall 2021, DHSVM was determined to not be the preferred tool for this; rather, a regression relation to predict basin-scale fine sediment yield is being developed and will be compared to information on historical bathymetric changes.
This issue [process flows] has been resolved through commitments with respect to integration. That is, as part of its FERC license application, City Light will integrate the results of GE-04 with the FA-02 hydraulic model and other available information to inform the impacts of process flows on anadromous salmon habitat and population productivities.	Future action item (2022-2023). Development of alternative flow management scenarios, including process flows and associated sediment transport flows, will be analyzed as part of a series of proposed Geomorphology Work Group meetings to evaluate Project operations in late 2022.
As part of a Q3/4 workshop, City Light will address the simulation of added sediment, flow, and log jams in the model mesh via scenarios developed in coordination with the LPs. Otherwise, this issue is addressed by topic above and via scenarios implemented in the study plan.	Topic for ongoing Geomorphology Work Group meetings.
Issue: Adjust modeling focus areas so they are scaled to channel dimensions (e.g., 10-20x channel width) depending on process to be modeled June 9, 2021 Notice Modification: This issue will be resolved in a workshop.	As described in Section 4.5.1 of the Geomorphology Study Report, City Light is applying a suite of modeling tools to address areas below the Sauk confluence. The suite of models was discussed with LPs in workshops in July, September, and October 2021. The length of each model domain will be designed to capture the process of interest and minimize boundary condition effects on those processes. Given a characteristic channel width of 200 to 500 ft, the planned 1- to 2-mile model domain length will be 10 to 50 times the channel width.
Issue: Adjust study to characterize sediment supply from the Sauk so that we could assess the potential for bed aggradation in the Skagit at the confluence and the associated changes in dynamics from the upstream reach. June 9, 2021 Notice Modification: Action item: City Light to contact NPS, USIT, and Skagit River System Cooperative to resolve this outstanding issue.	City Light will reach out to NPS, Upper Skagit Indian Tribe and SRSC regarding this action item in 2022.
Issue: Link sediment modeling with the development of data on flows.	As described in Section 4.5.1 of the Geomorphology Study Report, City Light is applying a suite of modeling tools to address areas below the Sauk confluence. A key input to these models will be

June 9, 2021 Notice Commitment	Status Update
June 9, 2021 Notice Modification: City Light will link sediment modeling with the development of data on flows.	estimated existing conditions and alternative process flow regimes.
Issue: Explore use of 2-D Hec-Ras model in focus reaches to inform the 1-D model. June 9, 2021 Notice Modification: This issue will be addressed through workshops.	As described in Section 4.5.1 of the Geomorphology Study Report, City Light is applying a suite of modeling tools to address areas below the Sauk confluence. The suite of models was discussed with LPs in workshops in July, September, and October 2021 and will include six 2D focus reaches above the Sauk river.
City Light will hold workshop with those who have recent expertise in sediment and/or wood-transport modeling.	Susannah Erwin and Wes Lauer have participated in 2021 Geomorphology Work Group meetings. City Light expects they will continue to engage as available.
Issue: Need an empirical model to capture dynamic balance between floodplain formation on bars and destruction at eroding banks and avulsions. June 9, 2021 Notice Modification: Action item: City Light to contact NPS, USIT, and Skagit River System Cooperative to resolve this outstanding issue.	As described in Section 4.5.1, City Light is applying a suite of modeling tools to address areas below the Sauk confluence. The suite of models was discussed with LPs in workshops in July, September, and October 2021 and will include a MAST 1-D model intended to explicitly evaluate the dynamic balance between floodplain formation on bars and erosion by lateral channel migration.
City Light will map vegetation areas within the bank full from aerial photography and through a period of record.	Vegetated bars and forested islands were mapped from the time series of aerial imagery as described in Section 4.1.1. Evaluation of the potential for future large wood loading from bank erosion planned for 2022 (Section 6.1.7 of the Geomorphology Study Report).
SY-01 Synthesis and Integration of Available Information on Resources in the Lower Skagit River	
City Light acknowledges Project effects in the Lower Skagit River, which includes the area from the confluence of the Skagit River and the Sauk River downstream to the mouth of the Skagit River estuary, can be detected.	City Light acknowledges that such effects can be detected.
City Light will perform the SY-01 synthesis study as proposed in RSP.	The Synthesis Study is being implemented as proposed in the RSP with modifications as described within this study report.
City Light will perform additional data field studies in year 2 to fill data gaps in SY-01 that are not addressed in the synthesis study or in other studies below the Sauk River (identified above).	On hold awaiting the results on the desktop analysis portion of the Synthesis Study. A determination of data collection needs as part of the Synthesis Study will be made in Q4 2022.

June 9, 2021 Notice Commitment	Status Update
City Light will consolidate results of the synthesis study and baseline data collected in other studies that extended below the Sauk in the SY-01 study report to identify Project effects below the Sauk.	On-going action item to be completed as study results become available and in coordination with this Synthesis Study.
Results of the study will be shared with the LPs and will inform the long-term ecosystem adaptive management and monitoring program and mitigation for project impacts below the Sauk.	On-going action item to be completed as study results become available and in coordination with this Synthesis Study.
City Light will clarify the study plan to indicate that data collection in the Lower River will be addressed through other study plans.	Incorporated into the Synthesis Study effort.

INITIAL STUDY REPORT

APPENDIX C

HYDRAULIC CONNECTIVITY ASSESSMENT OF THE REACH BETWEEN DIABLO DAM AND DIABLO POWERHOUSE TECHNICAL MEMORANDUM

Technical Memorandum

Date:	Tuesday, March 08, 2022
Project:	Skagit River Hydroelectric Project
To:	Seattle City Light
From:	Mercedes Valdez – HDR Water Resources Engineer, P.E. Jenn Gagnon – HDR Water Resources Engineer, P.E. Bao Le – HEC, Senior Consultant
Subject:	**Hydraulic Connectivity Assessment of the Reach between Diablo Dam and Diablo Powerhouse**

Purpose and Background

Seattle City Light (City Light) requested HDR Engineering, Inc. conduct an analysis to evaluate the conditions under which and the potential frequency for the loss of hydraulic connectivity within the reach between Diablo Dam and Diablo Powerhouse (Diablo Reach). This technical memorandum presents the results of the assessment.

Diablo Dam, located at Project River Mile (PRM) 101.6 (U.S. Geological Survey [USGS] river mile 101.2), is about 4,000 feet upstream from the Diablo Powerhouse. The powerhouse, which is located in the town of Diablo, was completed in 1936 and holds two Westinghouse generators (Units 31 and 32), each with current authorized installed capacities of 90 megawatts (MW) and two small unit generators (Units 35 and 36), with capacities of 1.2 MW each. The Diablo Reach is relatively inaccessible because of its location in a steep rocky canyon. The upper section of the reach is defined by a slot canyon comprised of deep pools, vertical rock walls, and canyon walls narrowing to less than 15 feet in width. Only small watercraft can navigate to the base of Diablo Dam.

The hydraulic assessment described in this memo determined a condition (i.e., loss of hydraulic connectivity) that can only arise if Diablo Powerhouse outflows are non-existent or very low, while simultaneously there are insufficient releases from the spill gates or mid-level outlets of Diablo Dam. This scenario is extremely unusual and would only feasibly occur during the very short periods of time between an unscheduled full Diablo Powerhouse outage, and the time it takes to open spill gates to maintain river flows. In the event of an unscheduled full powerhouse outage, minimum river flows would need to be returned as soon as practicable as Gorge Lake provides minimal storage with which to maintain minimum river flows; approximately about eight hours, depending on the required minimum flow and Gorge Lake water surface elevation (WSE).

Should an unscheduled full Diablo Powerhouse outage occur, a City Light Hydro Operator would be immediately tasked to patrol the reach below Diablo Dam and open spill gates to restore river flow. In the event of a power failure, a standby diesel generator remains at Diablo Dam to ensure that spill gates can be operated should dam power not be available. Additionally, the mid-level outlets of Diablo Dam are capable of maintaining river flow and can be opened manually, if needed. Finally, in the event of multiple failures, overtopping of Diablo Dam would occur in a relatively short amount of time. Therefore, a zero-flow condition would be exceptionally unlikely to persist for more than the time it would take to have an operator report to site, patrol the reach, and start flow releases from the dam (typically 1-2 hours).

Observationally, based on boat-based inspection of the reach immediately below the dam (conducted during “black start tests” requiring short duration scheduled outages of the full powerhouse) short-duration, full plant outages do not create a situation that results in any significant impacts to hydraulic connectivity.

Assessment Approach and Results

The desktop assessment methodology consisted of four steps:

(1) Conduct a backwater analysis using WSE data in combination with HEC-RAS modeling to identify the threshold WSE under which a zero flow condition, the Diablo Reach would begin to lose hydraulic connectivity;
(2) Evaluate Diablo Powerhouse generation discharge data to identify simulations representing the full range of generation conditions for use as inputs in the HEC-RAS model;
(3) Conduct HEC-RAS model runs using both the threshold WSE (Step #1) and the different Diablo Powerhouse operations simulations (Step #2) to identify powerhouse operations at the threshold WSE that may promote loss of hydraulic connectivity in the Diablo Reach; and
(4) Conduct a reoccurrence frequency analysis of the Diablo Powerhouse operations data to assess how often the loss of hydraulic connectivity in the Diablo Reach may have occurred historically.

Backwater Analysis to Identify Threshold Water Surface Elevation

City Light provided a HEC-RAS model that covered approximately 2 riverine miles of the Skagit River between the toe of Diablo Dam and the northern end of Gorge Lake, just south of North Cascade Highway State Route (SR) 20 bridge. The HEC-RAS model was developed using available Light Detection and Ranging (LiDAR), bathymetry, and available “green LiDAR” to supplement pockets closer to Diablo Dam where bathymetry data was unavailable. The two-dimensional (2-D) grid originally began approximately 0.5 miles below Diablo Dam. HDR extended the 2-D grid to include the area beginning at the toe of Diablo Dam and updated the model to HEC-RAS Version 6.1, the current available version at the time of this analysis. Figure 1 provides a view of the maximum extent of the 2-D model.

Historical WSE data was obtained from City Light as hourly data with a period of record (POR) beginning January 1, 1997, and extending to August 9, 2021, for both the Gorge Lake and Diablo Powerhouse tailrace locations. The hourly data was calculated to daily averages for use in this assessment.

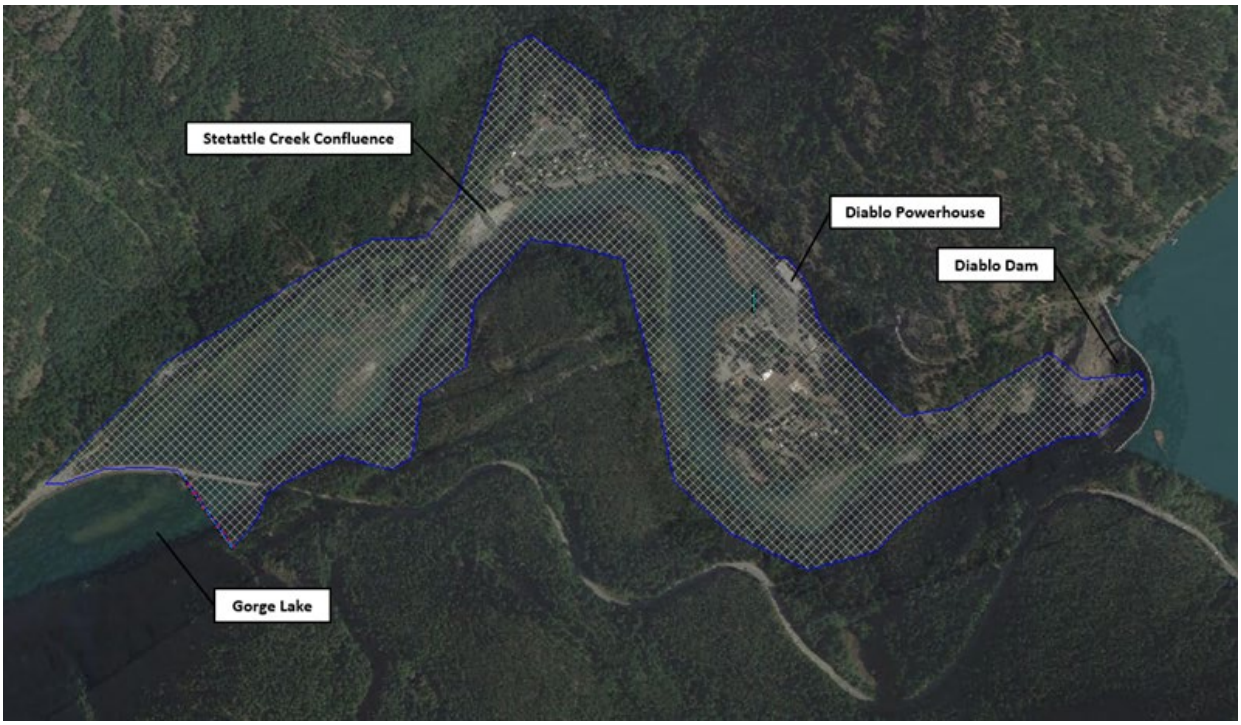


Figure 1. HEC-RAS 2-D model extent.

After review of WSE datasets from both locations and identification of minimum reported Gorge Lake elevation data outside of the normal standard operating range (due to drawdowns associated with Federal Energy Regulatory Commission [FERC] required gate testing), minimum WSE data for the Diablo Powerhouse tailrace was selected for use in the assessment.

To establish the threshold WSE at which loss of hydraulic connectivity would occur in the Diablo Reach, HEC-RAS model simulations were run iteratively over a range of elevations under zero flow conditions, starting with the Diablo Powerhouse daily 24-year (full POR) minimum of 869.3 feet North American Vertical Datum of 1988 (NAVD 88), then ranging from the 10-year minimum WSE of 878.4 to elevation 879 feet. These simulation results showed that an elevation of 878.5 feet NAVD 88 was determined to be the threshold WSE under which the reach would experience loss of hydraulic connectivity; specifically in the deep pools upstream of the Diablo Powerhouse and was therefore set as the threshold WSE within the HEC-RAS model's 2-D computation grid.

Figures 2 and 3 indicate that at elevations above 878.5 feet NAVD 88 the riverine reach between the Diablo Powerhouse and the toe of Diablo Dam is fully connected based on HEC-RAS modeling.

Figures 2 and 3 suggest potential loss of reach connectivity in the area that is circled in red on Figure 2, however, in discussions with City Light staff, this may be due to limitations of the digital elevation model (DEM) used in the HEC-RAS model where the river is comprised of vertical rock walls. City Light routinely navigates this area and reports that this location, though narrow, is deep and would not become disconnected as suggested in Figures 2 and 3. Photographs 1 through 3 (found at the end of this memo), illustrate how this section of the reach narrows and rock outcrops overhang the channel, likely limiting the bathymetry collected during development of the DEM. The photographs demonstrate the deep pools and reach connectivity in this area near Diablo Dam. The pools reportedly range from 4 to 6 feet deep in the shallower areas and 10 to 15 feet (or more) in the narrow pool section closer to Diablo Dam (Vavrek 2022).

Figure 2. Initial WSE 878.5 NAVD 88 showing pockets of potential loss of connectivity within the reach above Diablo Powerhouse. Red circle identifies area where loss of connectivity in model output is likely an artifact of insufficient coverage in model DEM. Areas of loss hydraulic connectivity at downstream locations are based upon sufficient DEM coverage.

Figure 3. Initial WSE set to elevation 879 feet NAVD 88 to show connectivity within river reach above Diablo Powerhouse.

Diablo Powerhouse Operational Conditions

As described above, Diablo Powerhouse generation discharges consist of the individual flow from four generating units including two Westinghouse generators (Unit 31 and 32) and two small unit generators (Units 35 and 36). Four scenarios were identified to represent the full range of potential Diablo Powerhouse operational conditions to be used as inputs into the HEC-RAS model:

(1) Zero flow released from Diablo Powerhouse.
(2) Average discharge from operation of the two small units (35 and 36) at Diablo Powerhouse.
(3) Average discharge from operation of the two small units (35 and 36) and one of the two large generators (31 or 32) at Diablo Powerhouse.
(4) Maximum discharge from the powerhouse based on the peak operation of all four generation units.

To calculate HEC-RAS model discharge values for these four scenarios, the available historical Diablo Powerhouse discharge data was obtained from City Light as hourly data and then was calculated to daily averages. The daily average discharge from each of the generation units was assessed to determine the average discharge data for each unit over the most recent 10-year POR. Table 1 shows the minimum, average and maximum recorded unit discharge from 2011 to 2021.

Table 1. Average, minimum and maximum discharge of Diablo Powerhouse generation units from August 2011 to 2021.

Unit	Minimum Discharge (cfs)	Average Discharge (cfs)	Maximum Discharge (cfs)
Unit 31	0	1,851	3,777
Unit 32	0	1,848	4,059
Unit 35	0	7	47
Unit 36	0	9	42
Plant	0	3,716	7,824

The average flow for each of the units was used for the four scenarios as summarized in Table 2.

Table 2. Diablo Powerhouse discharge values for each HEC-RAS model simulation.

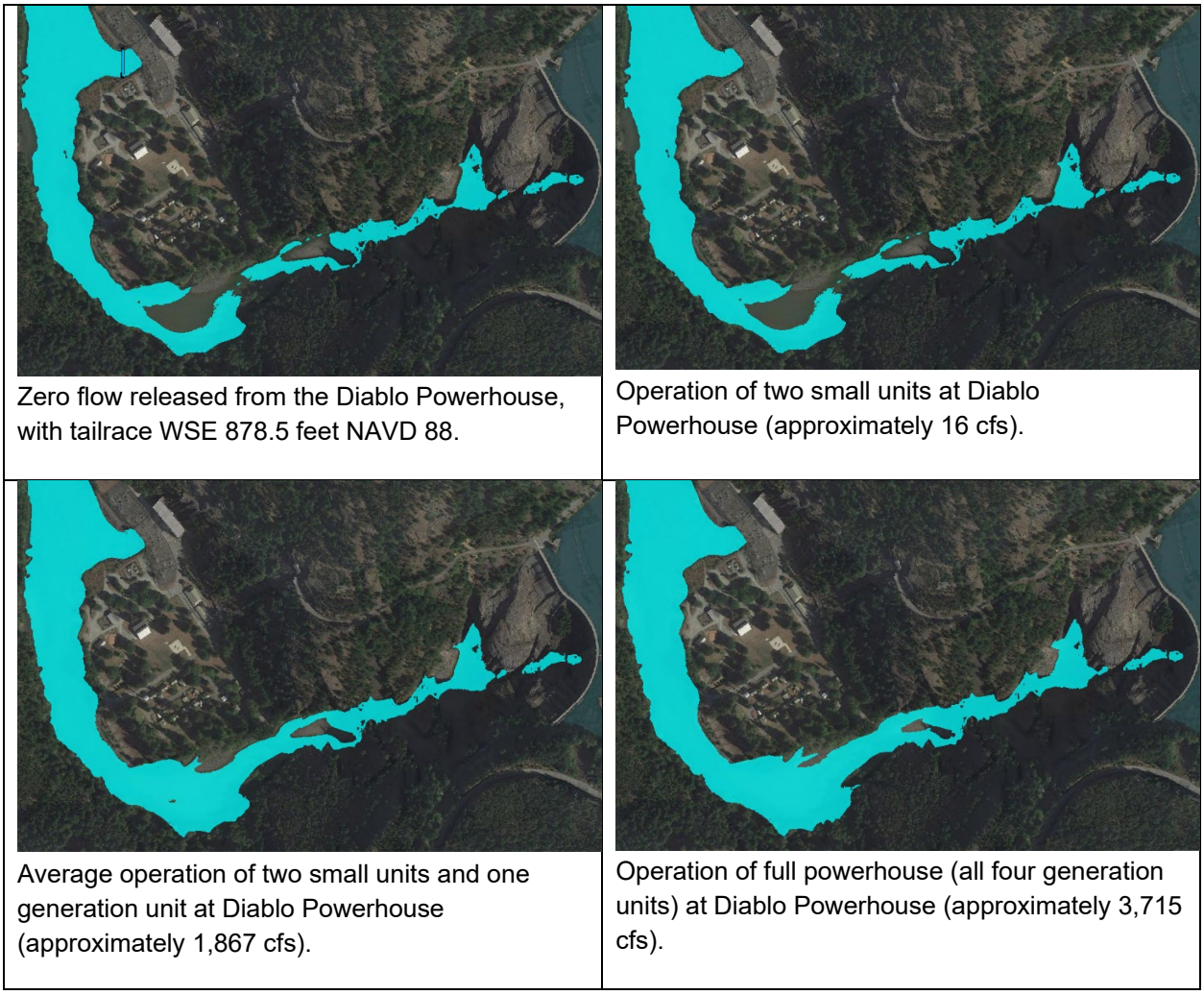
Unit	Total Discharge (cfs)
Zero Powerhouse Discharge	0
Two Small Units (Unit 35 + Unit 36)	16
Two Small Units and One Generation Unit (Unit 35 + Unit 36 + Unit 31)	1,867
Full Powerhouse (All four Generation Units)	3,716

For these four scenarios, an inflow boundary condition was used within the HEC-RAS model to simulate the Diablo Powerhouse discharge and were input as hourly data which remained constant for the entirety of the simulation.

HEC-RAS Modeling

Each of the four scenarios began with the Diablo Powerhouse tailrace set to the threshold WSE within the river at which the reach between Diablo Dam and Diablo Powerhouse experiences loss of hydraulic connectivity, elevation 878.5 feet NAVD 88. Figure 4 shows a plan view comparison of the HEC-RAS

model's wetted reach connectivity results under each scenario. Results indicate that discharges from the two small units do not allow for sufficient backwater into the river reach when the Diablo Powerhouse tailwater WSE reaches the low elevation of 878.5 feet NAVD 88, however operation of two small units and one large unit (1,867 cfs) provides sufficient discharge to maintain hydraulic connectivity from the toe of Diablo Dam downstream to the Diablo Powerhouse. It is noted that in areas closest to Diablo Dam, there are still riverine areas which appear to be disconnected, however, as discussed above, these areas are assumed to be limited by the available bathymetry data within the reach.



Zero flow released from the Diablo Powerhouse, with tailrace WSE 878.5 feet NAVD 88.

Operation of two small units at Diablo Powerhouse (approximately 16 cfs).

Average operation of two small units and one generation unit at Diablo Powerhouse (approximately 1,867 cfs).

Operation of full powerhouse (all four generation units) at Diablo Powerhouse (approximately 3,715 cfs).

Figure 4. Comparison of HEC-RAS model's wetted reach connectivity results under each scenario.

Reoccurrence Frequency Analysis

Determination of the minimum WSE in which the reach experiences potential loss of hydraulic connectivity allowed for a reoccurrence frequency analysis to be conducted of the historical WSE data recorded at Diablo Powerhouse tailrace. Table 3 shows the results of a review of the available 24-year POR and Figure 5 shows a plot of the daily average tailrace WSE with the days below the threshold elevation 878.5 feet NAVD 88 highlighted.

In addition to the determination of the frequency of the Diablo tailrace WSEs falling below 878.5 feet NAVD 88, the frequency of discharge flow from Diablo Powerhouse falling below the amount of flow released by two small units and one large unit (1,867 cfs) occurring concurrently with the minimum WSE is summarized in Table 3.

Within the previous 24-years and most recent 10-years, the Diablo Powerhouse tailrace WSE fell below the threshold elevation 878.5 feet NAVD 88 a total of 271 days and 34 days, respectively. During these days, the Diablo Powerhouse generation discharges that would promote loss of hydraulic connectivity (i.e., releases of less than 1,867 cfs) occurred a total of one day and zero days within the past 24 and most recent 10-years, respectively. On this one day of occurrence in the last 24 years, hydraulic and operational conditions existed where there was the potential for loss of hydraulic connectivity in the Diablo Reach.

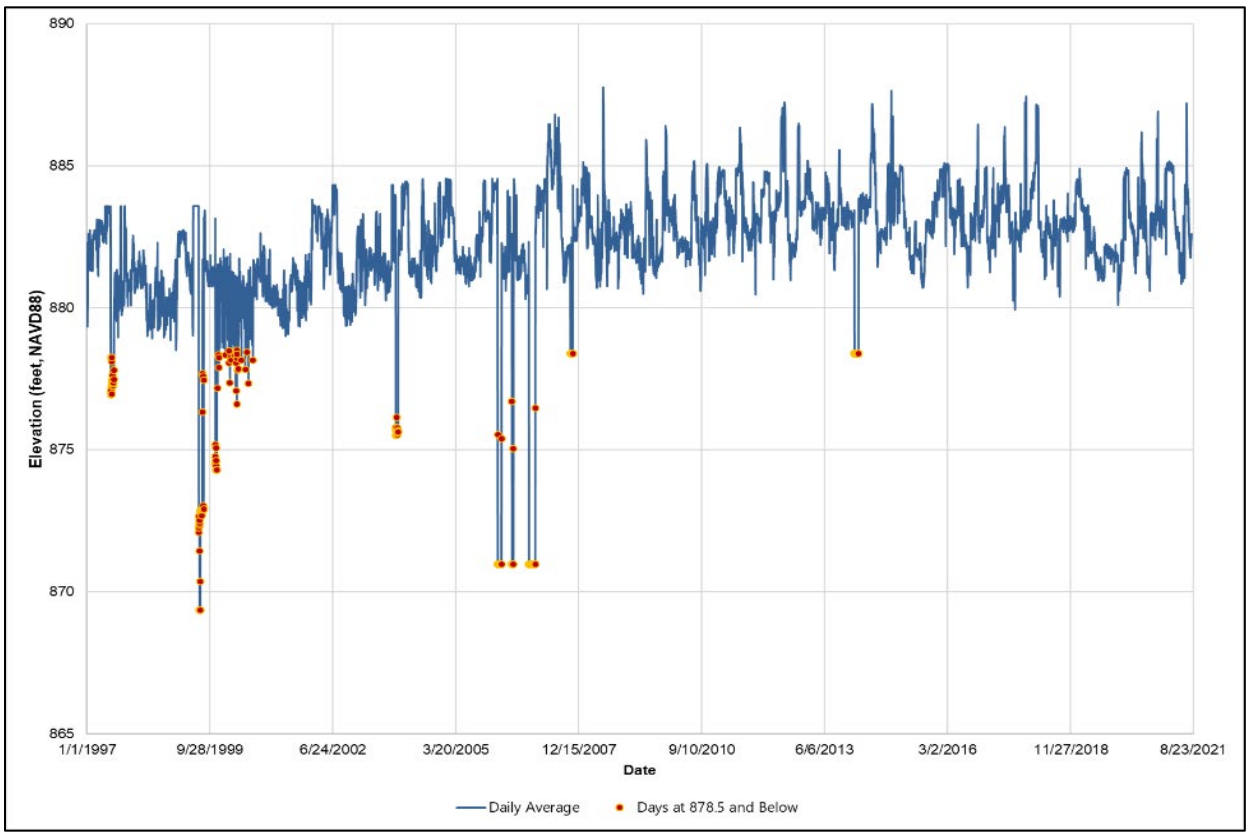


Figure 5. **Diablo tailrace daily average WSE.**

Table 3. **Frequency analysis of days Diablo Powerhouse tailrace falls below daily average of 878.5 feet NAVD 88.**

Frequency	Full POR (1997 to 2021)	10-Year POR (2011-2021)
Number of Days tailrace water surface below Elevation 878.5 feet	271	34
Number of Days tailrace water surface below Elevation 878.5 and Diablo Powerhouse discharge below 1,867 cfs.	1	0

Conclusion

This hydraulic and operational analysis evaluated the potential loss of hydraulic connectivity in the reach between Diablo Dam and Diablo Powerhouse under varying conditions. However, in using the results to assess the potential impacts to fisheries resources it is important to note:

(1) That this a conservative desktop analysis that does not consider standard operating procedures (SOPs) that would result in the release of water from Diablo Dam spillways under no flow conditions at the Diablo Powerhouse. In reality, during the rare instances where Diablo Powerhouse discharges are under extremely low or zero flow (i.e., powerhouse outage; conditions that may promote loss of hydraulic connectivity in the Diablo Reach) flow must be quickly restored to meet downstream minimum flow requirements, either by increasing Diablo Powerhouse generation or by passing water via the Diablo Dam spillway. Typical response times to an unplanned plant outage are two hours or less, a period that does not provide enough time for loss of connectivity.

(2) That the loss of connectivity in this reach is not the same as dewatering (complete absence of refugia) of this reach. The desktop analysis in combination with the Project SOPs indicate that dewatering of this reach would not occur.

With regards to the potential for fish stranding and trapping, under potential operating scenarios where loss of hydraulic connectivity could occur, the hydraulic modeling results indicate that even in the most extreme scenario (zero Diablo Project flow releases at WSE 878.5 feet NAVD88), the reach continues to maintain significant wetted area and that areas of lost connectivity would be in the upper half of the Diablo Reach (from the bend to Diablo Dam). This part of the reach is comprised of numerous pools with depths ranging from 4 to 15+ feet (Vavrek 2022) and becomes steeper in slope as you move upstream with the area in the vicinity of Diablo Dam being defined by a slot canyon comprised of vertical rock walls. In the rare event that loss of connectivity would occur (one day over the last 24 years), the risk of fisheries resource impacts due to stranding and trapping is low. This part of the reach contains areas with slopes greater than the typical range of 4 to 6 percent where stranding is identified as a risk (Bauersfeld 1978; Beck 1989; Bell et al. 2008). The availability of numerous deep pools serves as refugia from predators. Given operations protocols to restore flows to this reach, any event would be of a short duration (1-2 hours) where degradation of water quality conditions would not be a concern.

Photograph 1: View looking upstream at Diablo Dam, demonstrating the reach is confined by rock outcroppings that provide narrow and deep pools.

Photograph 2: View looking upstream at Diablo Dam, demonstrating the reach is confined by rock outcroppings that provide narrow and deep pools.

Photograph 3: View looking downstream from Diablo Dam, demonstrating the reach is confined by rock outcroppings that provide narrow and deep pools. The rock outcroppings overhang the reach, which would have provided limitations of available bathymetry during terrain development.

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Bauersfeld, K. 1978. Stranding of Juvenile Salmon by Flow Reductions at Mayfield Dam on the Cowlitz River. WDF, Olympia, WA, Tech. Rep. 36:36pp.

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INITIAL STUDY REPORT

APPENDIX D

WOODY DEBRIS MANAGEMENT – SUMMARY OF ACTIVITIES TO DATE TECHNICAL MEMORANDUM

WOODY DEBRIS MANAGEMENT
SUMMARY OF ACTIVITIES TO DATE MEMORANDUM

SKAGIT RIVER HYDROELECTRIC PROJECT
FERC NO. 553

Seattle City Light

Prepared by:
HDR Engineering, Inc.

March 2022

1.0 INTRODUCTION

The Skagit River Hydroelectric Project (Project) is located in Snohomish, Skagit, and Whatcom counties in north-central Washington. Operated by the publicly owned electric power utility, Seattle City Light (City Light), the Project consists of three facilities along 33 miles of the Skagit River: Ross, Diablo, and Gorge, each with an associated dam, powerhouse, and reservoir (lake).

While not an explicit condition in the current Federal Energy Regulatory Commission (FERC) operating license, City Light manages woody debris at various locations in each of the Project reservoirs (Ross Lake, Diablo Lake, and Gorge Lake). Every year, woody debris accumulates in the lakes and requires removal to maintain dam and recreational safety. The ultimate objective of wood management in the Project reservoirs is to ensure full functionality of the spillway gates to prevent overtopping or uncontrolled releases; reduce the risk of log damage to Project infrastructure; and limit interactions with boats. Woody debris can get caught in the spillway gates preventing closure or opening, enter the intakes and damage the turbines, or physically damage external dam parts. Due to the volume of accumulated debris on Ross Lake in particular, City Light has identified wood loading on the dam structure as a significant dam failure mode requiring ongoing management and surveillance.

Until 2009, woody debris from Ross Lake was collected and burned along the Skagit River near the Canadian border. Crews transported the wood to the north end of the lake, where it was temporarily stored in a pen (Hozomeen Debris Pen) on the west side of the lake; the wood stored in the pen was burned on an annual basis. However, City Light voluntarily ceased wood burning at Hozomeen in 2009 and has since bagged wood debris and stored it in pens, where much of it has remained. In 2013, City Light initiated a pilot program that included removing wood from the southern end of Ross Lake and transporting it for placement into the Skagit River below Gorge Dam. This pilot program is still in operation, although City Light is seeking new alternatives for managing the woody debris, including on the north end of the lake.

Since 2017, City Light crews have tallied total quantities for specific wood categories collected at each lake during annual wood management efforts, which include high-quality large wood, low-quality large wood, medium-sized wood pieces, and small wood debris. The size and associated percent composition of woody debris ranges from small, kindling-like pieces to large (up to 50-foot-long or more) old-growth trees with rootwads attached.

As described in detail in a summary of Project wood management activities from 2017-2020 (included as Attachment A to this memorandum), wood in Ross Lake is currently stored in various locations around the lake, including Hozomeen Debris Pen, Dry Creek, Roland Bay, and Green Point. The duration of wood storage varies across these locations. Wood is stored permanently at Dry Creek and Roland Bay for reed canarygrass suppression. Storage at the Hozomeen Debris Pen is a stopgap measure due to constraints of woody debris removal associated with the north end of Ross Lake. The Green Point location is utilized for temporary storage prior to extraction. Woody debris that is extracted from the south end of Ross Lake and Diablo Lake is eventually transported to the Skagit River Aggregate Storage Facility (Agg Ponds). City Light continues to manage woody debris as described above.

The purpose of this memorandum is to summarize the current Project woody debris management process and to present a summary of woody debris collection, transport and placement activities that have been completed from 2017 to 2021. This memorandum will also support decisions for Project reservoir woody debris management and may inform ongoing relicensing studies that consider large wood enhancement activities in the Skagit River downstream of the Project.

2.0 SUMMARY ACTIVITIES TO DATE

2.1 Overview of Current Woody Debris Management Processes and Data Collection

In June 2021, the consultant team and City Light developed a summary of Project wood management activities conducted from 2017-2020 (included as Attachment A to this memorandum). Attachment A summarizes current woody debris management processes specific to Ross, Diablo, and Gorge lakes, including wood collection and holding procedures, wood extractions, storage, and transport of woody debris.

The wood management memorandum also provides labor and fuel estimates for woody debris management at Ross Lake based on a 2013-2014 analysis, which tracked the collection and transport expenditures associated with the removal and relocation of woody debris from Ross Lake to the Agg Ponds near Newhalem. Labor and fuel costs for the summer 2020 to winter 2021 woody debris management season for Ross and Diablo lakes were also provided in the memorandum.

Based on the summer 2020 – winter 2021 wood collection at Ross Lake, additional labor and equipment suggestions are included in Attachment A of this memorandum, including purchasing or rental of a clam shell bucket for future woody debris extraction, and continued use of a 30-cubic-yard dump truck to expedite wood removal and transport on the Ross Haul Road.

2.2 Current Woody Material Data Collection and Recommendations for New Data

To inform future wood management strategies, City Light coordinated with geomorphologists involved in several relicensing studies, most specifically, GE-04 Skagit River Geomorphology Between Gorge Dam and the Sauk River Study (Geomorphology Study), to determine if the collection of additional data might inform future management decisions pertaining to large, high-quality wood collected annually from each reservoir. In response to that coordination, City Light produced a brief document that recommended data to be collected for large wood that met specific parameters that would be considered "high quality," including:

- Logs greater than 20 feet long and greater than 12 inches in diameter; or
- Logs that are either 20 feet long or 12 inches in diameter.

Additional data recommended for collection for large, high-quality wood included length and diameter categories, presence of a rootwad, and decay classification. The data collection recommendations are included as Attachment B of this document.

Both the wood management memorandum and the recommendations for new data collection for large, high-quality wood were provided to licensing participants (LP) for review and comment in June 2021. No comments were received for either document, therefore, the recommendations for additional data collection for large, high-quality wood were implemented for Ross Lake in summer 2021.

2.3 Ross Lake Summer 2021 Wood Collection Activities

In response to the wood data collection recommendations, City Light and consultant team staff recorded the recommended data for large, high-quality wood during collection activities on Ross Lake in July and August 2021. Bag quantity information was recorded for six of the bags collected. Of the wood collected, approximately 11 percent (155 cubic yards) of the 1,400 cubic yards collected was classified as high quality large woody debris.[1] Data from those wood classification tasks are included as Attachment C of this document.

2.4 Woody Debris Extraction from Ross Lake

In November 2021, City Light initiated the extraction of wood collected on Ross Lake that was temporarily stored at the Green Point storage area, and it was transferred to the temporary upland staging area adjacent to the lake along the Ross Haul Road. This wood was transferred to the Agg Ponds in December 2021.

2.5 Summary of 2017-2021 Wood Collection and Extraction for Ross and Diablo Lakes and Skagit River Placement

In preparation for a Project relicensing Geomorphology Work Group Meeting held on November 9, 2021, City Light summarized all wood collections and extractions from Ross and Diablo lakes, and subsequent Skagit River placements from data obtained during the 2017-2021 collection years (Table 2.5-1). This data was summarized from the annual woody debris tracking sheets, which are included in Attachment D of this document.

[1] Large woody debris quantities were calculated for 6 of the 8 bags collected. Bag quantity information was not recorded on data sheets for wood collected July 26, through July 31, 2021. One bag collected on August 7, 2021 was saved as boom longs.

Table 2.5-1. Ross and Diablo lakes wood collection, holding, and Skagit River wood placement.

Event	2017	2018	2019	2020	2021
Ross Lake Collection					
Collection dates	July and August 2017	July and August 2018	No wood collected due to low summer water level	July 1 – August 31, 2020	July 21 – August 10, 2021
Bags collected	4	6	N/A	10	8
CY per bag	250	250	N/A	250	250
Total quantity collected (CY)	1,000 CY	1,200-1,500 CY	N/A	2,500 CY	2,000 CY
Location and volume stored in Ross Lake (not later extracted from lake)	Roland Bay – 2 bags (500 CY)	Hozomeen – 3 bags (750 CY) Roland Bay – 1 bag (250-300 CY)	N/A	Hozomeen – 7 bags (1,750 CY)	Hozomeen – 3 bags (1,000 CY) Dry Creek – 1 bag (500 CY)
Temporary storage location and volume	Green Point – 2 bags (500 CY)	Green Point – 2 bags (500 CY)	N/A	Green Point – 3 bags (750 CY)	Green Point – 2 bags (500 CY)
LWD used for log booms or bags	Yes	Yes	N/A	Yes	Yes
Quantity	2 or 3	8 or 9		5	5
Ross Lake Extraction					
Dates extracted	November – December 2017	November – December 2018	N/A	November 2020	November 2021
Dates transported to Aggregate Ponds	June 2019[2]	June 2019[1,2]	N/A	November 10 – December 14, 2020	December 2021
Total quantity for extraction	500 CY	500 CY	N/A	750 CY	500 CY
% high-quality large wood[3, 4]	0%	0%		30%	10%
% low-quality large wood[4]	5%	5%		10%	30%
% medium woody debris[4]	10%	10%		10%	30%
% small woody debris[4]	85%	85%		50%	30%
Total # intact rootwads[4]	5	1		50	1
Total loads to Aggregate Ponds	40 loads (~350 CY)[2] (approximately 150 CY deteriorated over 2 years)	40 loads (~350 CY)[2] (approximately 150 CY deteriorated over 2 years)	N/A	56 loads (~600 CY[5])	40 loads (~500 CY)

Event	2017	2018	2019	2020	2021
Diablo Lake Collection					
Collection dates	N/A. No wood collected in 2017	September 2018	N/A. No wood collected in 2019	June 2020	N/A. No wood collected in 2021
Bags collected	N/A	N/A	N/A	1 bag	N/A
Total quantity collected (CY)	N/A	70 CY	N/A	200 CY (20 loads)	N/A
Location and volume stored in Diablo Lake (not later extracted from lake)	N/A	0 CY	N/A	0 CY	N/A
Temporary storage location and volume	N/A	Mouth of Sourdough Creek; 70 CY	N/A	Mouth of Sourdough Creek; 200 CY	N/A
LWD for log booms or bags	N/A	No	N/A	No	N/A
Diablo Lake Extraction					
Dates extracted	N/A	September 2018	N/A	June 2020	N/A. No wood extracted from Diablo Lake
Dates transported to Aggregate Ponds	N/A	September 2018	N/A	June 1-4, 2020	N/A
Total quantity for extraction	N/A	70 CY	N/A	200 CY	N/A
% high-quality large wood	0%	2%		60%	0%
% low-quality large wood	0%	12%		10%	0%
% medium woody debris	0%	12%		20%	0%
% small woody debris	0%	75%		10%	0%
Total # intact rootwads	0	0		10	0
Total quantity to Aggregate Ponds	N/A	70 CY	N/A	200 CY	N/A
Total quantity wood placed in river at Aggregate Ponds (from Ross and Diablo)					
	350 CY	420 CY	N/A	800 CY	500CY

Note: CY = cubic yards; LWD = large woody debris; N/A = not applicable.

1 Wood transported was from earlier year extraction activities.

2 Approximately 150 CY deteriorated over 2 years.

3 Extracted high quality wood over 12 feet long is cut to fit in dump truck for transport to Aggregate Ponds.

4 Note that these percentages reflect all collected wood on Ross Lake, not just wood that was extracted. The year 2021 is an exception to this, as 2021 data reflects the wood extracted from Ross Lake only.

5 Although 750 CY were transported to Green Point for extraction, only 600 CY were extracted as 3 logs were used at the Diablo Fuel Dock Mitigation Site.

3.0 Next Steps

City Light proposes to discuss potential future management options with LPs to eliminate floating wood from the Project reservoirs to reduce the threat of woody debris to Project infrastructure. Future management strategies would avoid long-term storage of wood and would include cost-effective methods to eliminate the wood in an environmentally sustainable manner, if possible. Potential uses of the wood in situ (i.e., within the reservoirs) should be considered, in addition to other disposal methods.

4.0 REFERENCES

HDR. 2019. Ross Lake Debris Disposal Study – Final Report. June 21, 2019.

WOODY DEBRIS MANAGEMENT
SUMMARY OF ACTIVITIES TO DATE MEMORANDUM

ATTACHMENT A

SKAGIT RIVER HYDROELECTRIC PROJECT – OVERVIEW OF CURRENT WOOD MATERIAL MANAGEMENT PROCESSES AND DATA COLLECTION

Skagit River Hydroelectric Project - Overview of Current Woody Material Management Processes and Data Collection

1.0 INTRODUCTION

The Skagit River subbasin is host to a variety of hydroelectric projects, the largest of which is the Skagit River Hydroelectric Project (Project) located in Snohomish, Skagit, and Whatcom Counties in north-central Washington. Operated by the publicly owned electric power utility, Seattle City Light (City Light), the Project consists of three facilities along 33 miles of the Skagit River: Ross, Diablo, and Gorge, each with a dam, powerhouse, and reservoir (lakes).

Every year, large amounts of woody material accumulate in the lakes and require removal to maintain dam and recreational safety. Until 2009, woody material from Ross Lake was collected and burned along the Skagit River near the Canadian border. A Canadian crew was hired to collect wood in the north end of the lake, while City Light crews collected wood in the south end. Both crews transported the wood to the north end of the lake where it was temporarily stored in a pen (Hozomeen Debris Pen) on the west side of the lake. The Canadian crew annually burned all the wood stored in the pen. However, City Light ceased wood burning at Hozomeen in 2009 and has since stored woody material and used its own Right-of-Way (ROW) crew to bag woody material and drag it to pens where much of it has remained. The size of woody material ranges from small, kindling-like pieces to large (up to 50-foot) old-growth trees with root balls attached. Wood is currently being stored in various locations around the lake, including the following: the Hozomeen Debris Pen for an indefinite term; Dry Creek and Roland Bay permanently; and Green Point temporarily for subsequent extraction. The Green Point extraction location is the middle of the boom that spans the lake from Green Point. The permanent nature of Dry Creek and Roland Bay are for the purpose of reed canarygrass suppression. Storage at the Hozomeen Debris Pen is merely a stopgap measure due to constraints of woody material removal associated with Ross Lake. These constraints are summarized in Section 2.1 below.

The purpose of this memorandum is to summarize City Light's current wood management processes at Ross Lake, Diablo Lake, and Gorge Lake to inform management options relevant to a future Project Federal Energy Regulatory Commission (FERC) operating license.

2.0 CURRENT WOODY MATERIAL MANAGEMENT PROCESSES

City Light manages woody material at various locations in each of the Project reservoirs including Ross Lake, Diablo Lake, and Gorge Lake (Figure 1 and Figure 2). Woody material management at Ross Lake differs from that at the other two reservoirs, due both to the quantity of accumulating debris in each reservoir, and specific features at the dams. Gorge Dam contains a wood chute that shunts woody material downstream, where it accumulates in a bypass reach until City Light spills water, at which point it reenters the recruitment process. Diablo Lake is accessible by road, which facilitates vehicular removal of woody material that is collected from the lake by boat.

Since 2017, City Light crews report total quantities for specific wood categories collected at each lake during annual wood management efforts. For Ross and Diablo, data is reported on tracking sheets spanning from the summer of one year to the winter of the next. For instance, the 2017-2018 reporting year includes collection data from the summer of 2017, transportation in fall 2017, and placement in the Skagit River in winter 2018. Data collected from the 2017-2021 management seasons is presented in Appendix A. When reporting data, City Light currently classifies wood into the following categories[1]:

- High-quality large wood:
  - Pieces greater than 20 feet (ft.) long and greater than 12 inches (in.) diameter; or,
  - Pieces less than 20 ft. long that contain an intact rootwad.
- Low-quality large wood: Pieces 8 to 20 ft. long and less than 12-in. diameter
- Medium sized wood: Pieces 6-8 ft. long and 8-12 in. diameter
- Small wood debris: Pieces 0-10 ft. long and less than 8 in. diameter

In Ross Lake, collected woody material from the north end of the lake is indefinitely[2] stored at Hozomeen and permanently stored at Dry Creek and Roland Bay (Figure 1 and Figure 2). Material that is extracted from the south end of Ross Lake, as well as from Diablo Lake, is eventually transported to the Skagit River Aggregate Storage Facility (Aggregate Ponds) located downstream and along the right bank of the river about two miles southwest of the town of Newhalem (Figure 2). Woody material management processes for each lake are described in the following sections.

[1] Beginning in the summer of 2021, City Light may collect additional data for wood exceeding 20 feet in length and 12 inches including expanded length and diameter categories and log decay status

[2] Woody material stored at Hozomeen will eventually be moved or processed on or offsite in a manner to be determined.

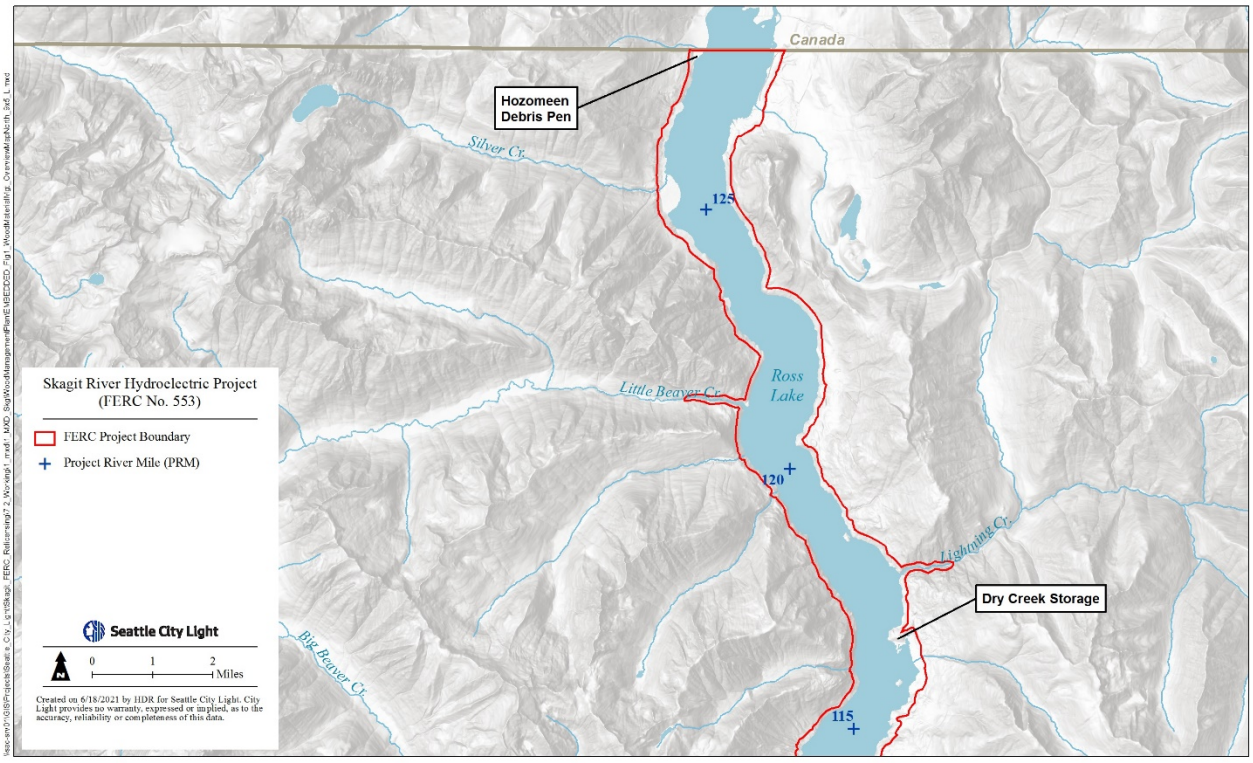

Figure 1. Skagit Project woody material management overview map – North (Ross Lake).

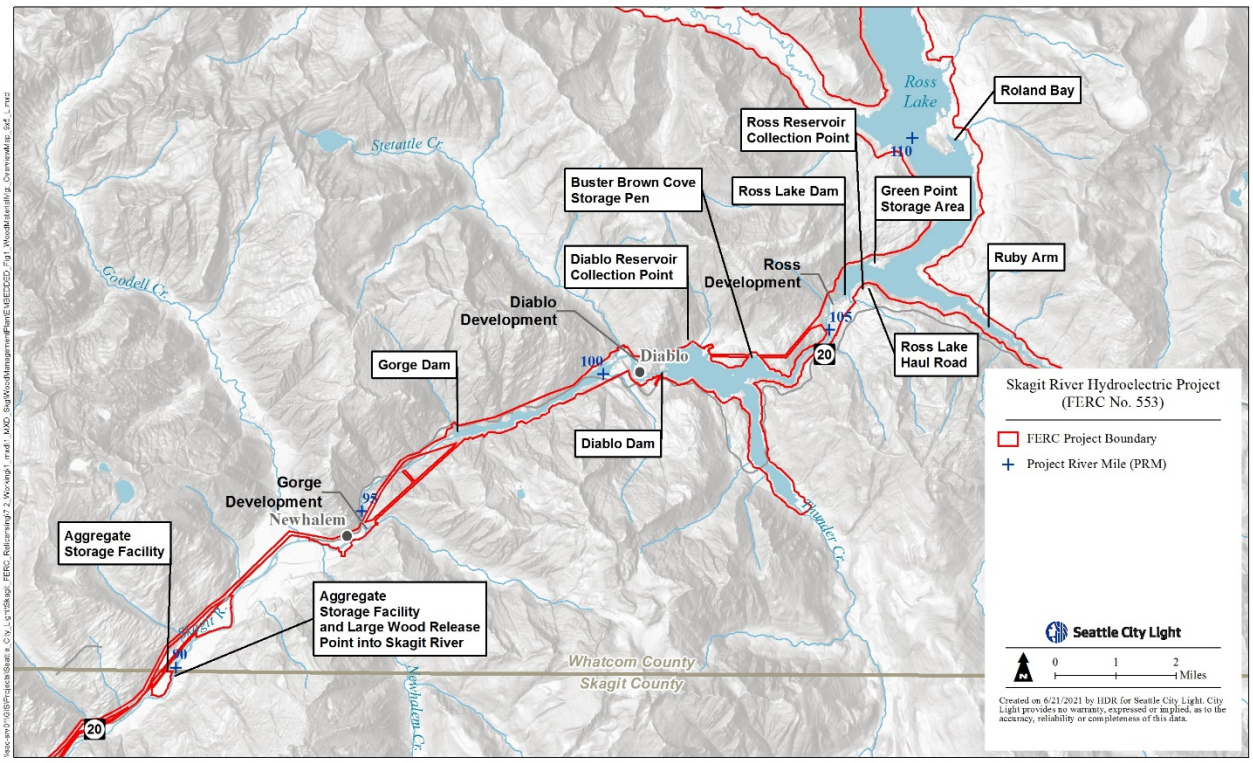

Figure 2. Skagit Project woody material management overview map – South.

2.1 Ross Lake Wood Material Management

Ross Lake wood management is constrained by accessibility and seasonality. Ross Lake is accessible to vehicles solely via the Silver-Skagit Road in Canada near Hozomeen or by being barged across Diablo Lake; otherwise, Ross Dam is accessible only by boat or foot. An isolated haul road (the "Ross Haul Road") exists between the barge landing on Diablo Lake and the southeast end of Ross Lake, where Ross Lake Resort has a boat dock.

Woody material is collected by boat in July, when lake levels are highest. Woody material is collected on the north and south ends of the lake, but not typically from the middle of the lake. After collection, woody material is towed to various storage pens on the lake depending upon the lake location, end use, and availability of "boom sticks," all of which are described in the following sections. In the winter, wood stored at the temporary holding pen is extracted from Ross Lake and transported via the haul road to a barge on Diablo Lake, and then hauled to the Aggregate Ponds for placement in the Skagit River.

To collect the wood, two boats and 5 – 6 crew members are used over a period of approximately 2 weeks. Collection is hazardous as staff are required to enter the water, often to move large logs into position within floating containment "bags," which are floating wood material fields contained by log booms. Each bag typically contains about 250 cubic yards (CY) of woody material. Woody material removal from Ross Lake averages about 4 to 6 bags per year (1000 to 1500 CY). Annual collection data from 2017 to 2021 is presented in Appendix A.

Wood management processes specific to the north end collections, south end collections, and extraction efforts are described below.

2.1.1 North End Collection and Holding

Woody material from the north end of Ross Lake is currently collected and held at the Hozomeen Debris Pen, an indefinite-term storage pen anchored just south of the Canadian border at the northwestern upstream end of the lake (Figure 3). The Hozomeen Debris Pen is on the opposite shore as the Hozomeen Campground, administered by the National Park Service (NPS), and is located south of the British Columbia (BC) Provincial Park Hozomeen Recreational area. The Hozomeen area has limited access through Canada, open only during late spring to early fall via a 37-mile gravel road (Silver-Skagit Road). The surface water elevation of Ross Lake is managed for flood control, power production, and in-stream flows, so the Hozomeen Debris Pen is only accessible from the U.S. by boat during the summer when the lake elevation is high. During the winter, the lake is drawn down for flood control and woody material is beached on the shoreline.

The Hozomeen Debris Pen holds an estimated 27 acre-feet of wood with a 9-acre surface area. The quantity of high-quality large wood collected in the north end of the lake varies annually. The annual load of new wood entering the lake fluctuates with storms and is estimated to be in the range of 1,000 to 1,700 CY. In some years, only a few high-quality large wood pieces are collected that are over 20 ft. long and 12 in. wide, while in other years up to 20 such pieces might be collected. These logs are usually set aside to be used by City Light and the NPS as boom logs. Similarly, the collection of logs with intact rootwads varies widely. Typically, between 1 and 5 such high-quality logs are collected annually in Ross Lake. See Appendix A for wood collection data.

Currently, high-quality large wood that is transported to the Hozomeen Debris Pen typically remains there in storage indefinitely. Wood from Hozomeen is not currently transported by boat to the southern end of the lake. The pen reached capacity a few years ago; however, a log boom broke open and woody material floated into the lake, which temporarily opened more holding capacity. In the large wood tracking data form recently completed for the 2020-2021 season (summer 2020 to winter 2021, see Appendix A), the City Light ROW crew reported that the Hozomeen Debris Pen is nearing capacity and has approximately 1-2 years of storage capacity remaining. After Hozomeen fills, material likely will be towed to one of two additional woody material storage pens. One pen is located at Dry Creek (approximately 5-acre surface area) and another at Roland Bay (approximately 1-acre surface area, Figure 3).

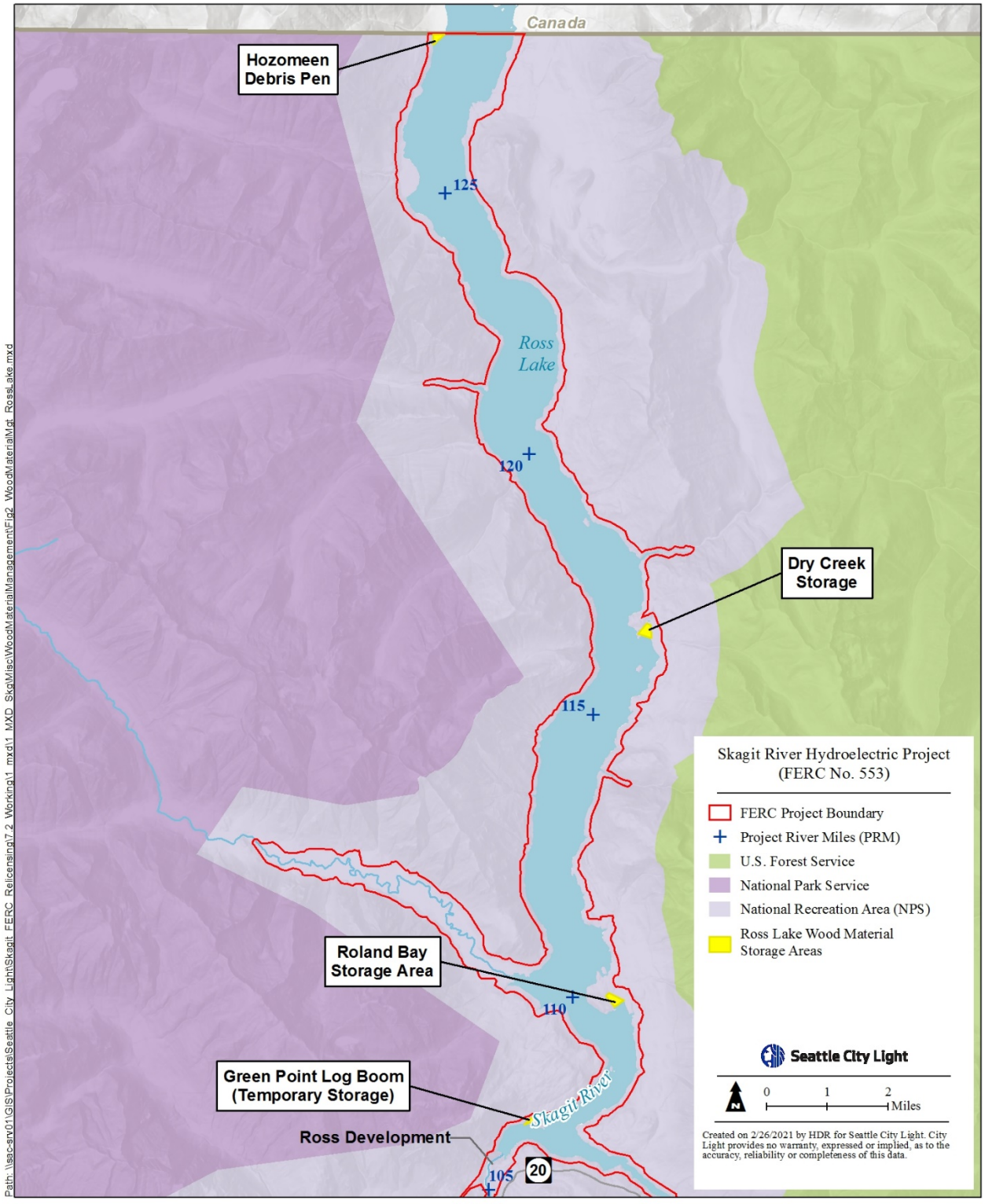

Figure 3. **Ross Lake woody material storage areas, showing Hozomeen Debris Pen, Dry Creek, Roland Bay, and Green Point.**

2.1.2 South End Collection and Holding

Woody material collected from the south end of Ross Lake is transported to one of three areas: Dry Creek, Roland Bay, or Green Point (Figure 3). Wood is transported to Dry Creek if there is no capacity at Hozomeen. Dry Creek is a permanent storage area located south of Lightning Creek on the east side of the lake. It was originally established in 2006 for invasive management at the request of the NPS. Wood is transported to Roland Bay if there is not enough "boom sticks" to temporarily store at Green Point for subsequent extraction. Roland Bay is a permanent storage area located on the east side of the lake. It is bounded by Roland Point and forms the confluence of Ross Lake and Roland Creek. Like Dry Creek, it was selected because it is a natural depository for woody material blown off the lake. Wood stored at Dry Creek and Roland Bay remains in Ross Lake in perpetuity.

Green Point is a temporary storage area located northeast of Ross Dam, across the lake from the Ross Haul Road (Figure 3). Woody material stored at Green Point is typically held there until October 31, to avoid interfering with Ross Lake Resort's twice-daily portage and dock operations, after of which the wood is extracted from the lake.

2.1.3 Wood Extraction from Ross Lake and Transport to Lake Diablo

After October 31, the City Light ROW boat crew drags wood from the Green Point storage area to the extraction point along the Ross Haul Road (Figure 3). A land-based excavator removes wood from the boat and places it along the shoreline for loading onto dump trucks. Because Ross Haul Road cannot accommodate large logging trucks, large woody material (both high- and low-quality) must be cut into 12 ft. pieces to fit on the trucks. Following loading, wood material is trucked approximately 0.5 miles along the Ross Haul Road and offloaded to an emergency helipad landing area, where it is temporarily stored for several days until all wood is extracted from the lake. Once all wood is extracted, wood stored at the helipad site is re-loaded onto trucks for transfer to the Diablo Lake East Barge Landing (see Figure 4). Therefore, woody material is handled twice during this extraction and transport stage, which is a costly and time-consuming process constrained by remote site conditions, steep access, and snow in the late fall.

Once wood arrives via truck at Diablo Lake's East Barge Landing, it is loaded onto a barge and transported to the West Barge Landing near the Diablo Boathouse (Figure 4). From there, the dump truck drives off the barge and transports the wood via road and Highway 20 to the Aggregate Ponds. Prior to transport, some of the larger pieces of wood may be selected out and used as log booms or "boom sticks" for storage and collection bags in Ross and Diablo Lake. Any future changes to woody material management must consider this "boom stick" use and the costs associated with replacement of such wood if it is not available from Ross Lake.

It should also be noted that the number of bags extracted annually from Ross Lake is limited by the quantity of log booms available at the south end of the lake. Although four to six bags are typically collected in Ross Lake, annually, only approximately two bags of woody material can be extracted from Ross Lake per year. To increase extraction quantities, ROW crews would have to construct additional booms from the collected woody material. This would require additional staff and the availability of suitable wood for log boom construction.

2.2 Diablo Lake Wood Material Management

Unlike Ross Lake, woody material can be collected at any time of the year on Diablo Lake. City Light's ROW crew uses boats to collect floating woody material in a "bag," and then drags the bag to Buster Brown Cove (Figure 4). All categories of woody material are stored inside the cove or attached to log booms just outside the cove. During extraction, an excavator positioned along the shoreline near Sourdough Creek removes wood from the storage area and places it directly into a dump truck staged on existing roads. Like wood extracted from Ross Lake, high- or low-quality large wood is cut into 12 ft. pieces prior to loading and transported to the Aggregate Ponds for later placement into the river. High quality wood from Diablo Lake is rare, however. Woody material removal from Diablo Lake averages about 2 to 3 bags per year (500 to 750 CY). Annual collection data from 2017 to 2021 is presented in Appendix A.

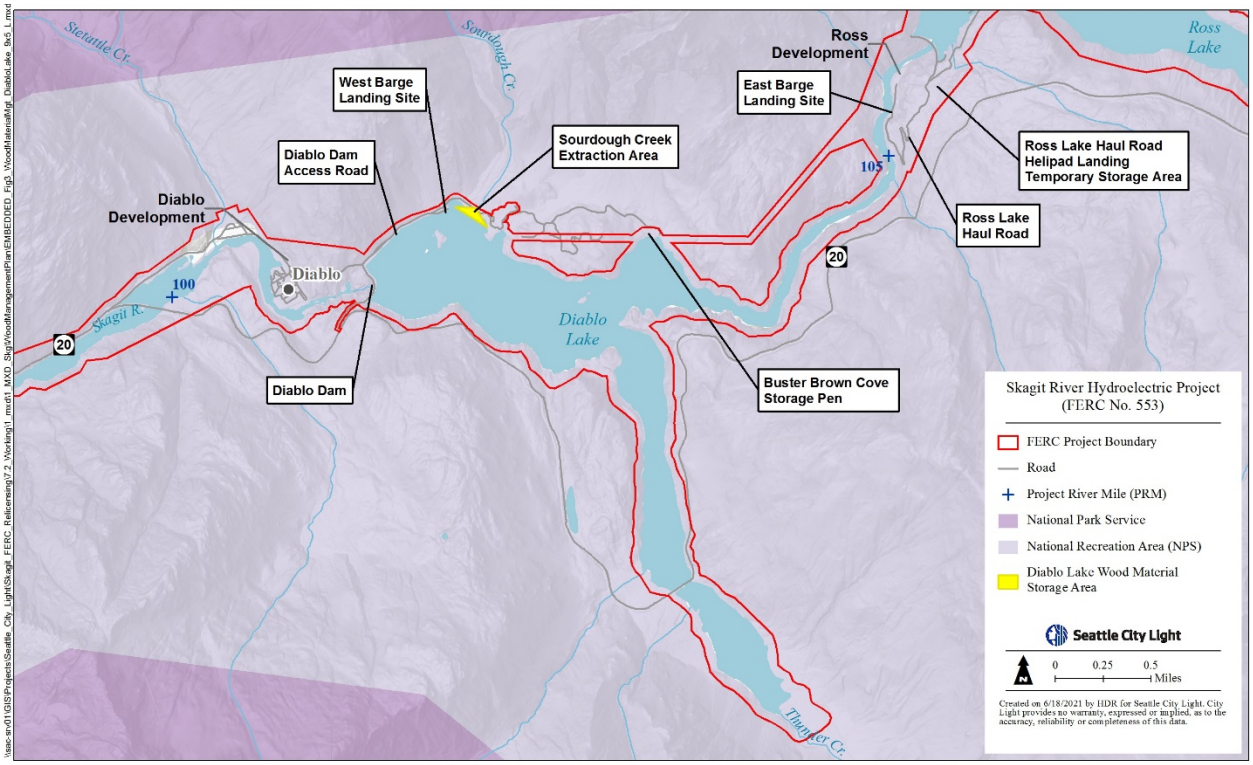

Figure 4. Diablo Lake woody material management barge, holding, and transfer sites.

2.3 Gorge Lake Wood Material Management

The Gorge Dam contains a wood chute (Figure 5) that shunts small- and medium-sized woody material (about 2 to 3 bags per year, or 500 to 750 CY) downstream, where it accumulates in the bypass reach until City Light spills water, at which point it reenters the Skagit River recruitment process. Available data for log chute wood management from 2017-2021 is presented in Appendix A. Although not yet included in the data, City Light recently has started to place collected wood from the trash rack into the Skagit River with the rest of the collected wood at the Aggregate Ponds (depicted in Figure 5). This quantity averages approximately 20 CY per year. Woody material from the trash rack tends to be fresher, less deteriorated material.

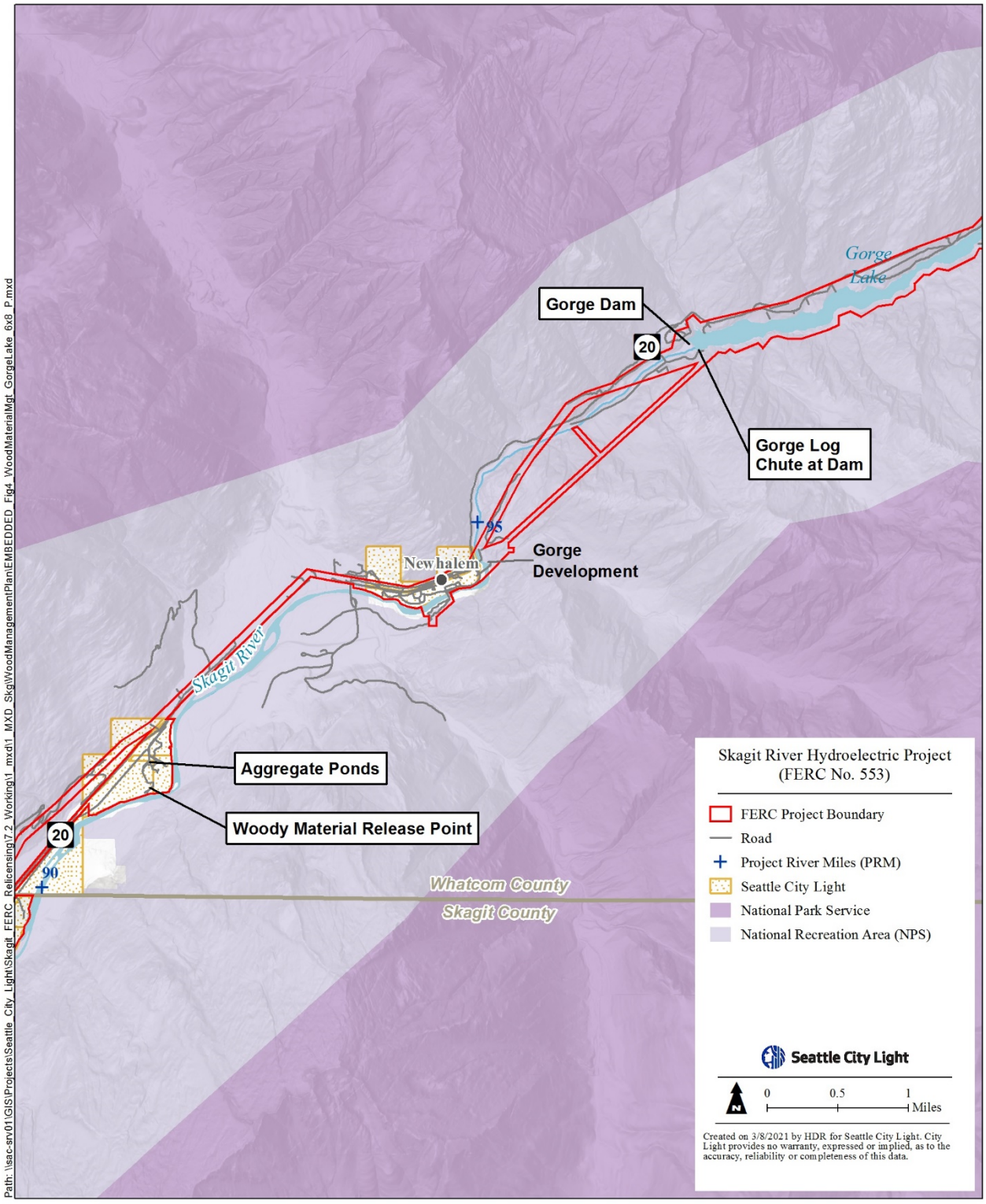

Figure 5. **Gorge Lake Dam, log chute, Aggregate Ponds, and woody material release location on Skagit River near Newhalem.**

3.0 LABOR AND FUEL ESTIMATES FOR WOODY MATERIAL MANAGEMENT

The labor, equipment, and fuel costs associated with woody material management for the Skagit Project have been evaluated during several years of management operations. A pilot study was conducted from 2013 to 2014 to track expenditures for the movement of woody material from Ross Lake to the Aggregate Ponds. For the 2020-2021 season, ROW crews tracked labor, equipment expenses, and fuel consumption for all activities reported in Appendix A for that season.

3.1 2013-2014 Pilot Study

In 2013, City Light initiated a pilot study to track the collection and transport expenditures associated with the removal and relocation of woody material from Ross Lake to the Aggregate Ponds near Newhalem. Initially, the pilot program evaluated the cost to mechanically remove the woody material and evaluate the feasibility of continuing the practice. The pilot program called for collecting up to 3 bags/year on the lake and transporting the bags to Green Point. Under the pilot program, the material would be loaded and transported like the current practice. This included loading the material into dump trucks and transporting along the Ross Haul Road and onto a barge at the East Barge Landing on Diablo Lake. The barge would carry the trucks to the West Barge Landing and transport wood via Highway 20 to the Aggregate Ponds for temporary storage. The material would be sorted and would be: 1) released back to the Skagit River, 2) chipped, or, 3) reused for log booms.

In July 2013, three bags of wood debris were collected by City Light ROW and boat operators on Ross Lake. Two of the bags were stored in pens on the lake and one bag was transported to Green Point. In January and February 2014, the wood stored at the Green Point was removed and transported to the Ross Haul Road and transferred to 17 dump trucks. Those trucks were barged across Diablo Lake then trucked to the Aggregate Ponds. The truck hauling time was about 2.5-3 hours for one complete round with two trucks. The total volume of wood transported was estimated to be about 170 CY. The wood was not inventoried, but some of the wood was held at the Aggregate Ponds, a portion was returned to the river, and a portion was chipped and spread. It is estimated that approximately 909 crew hours were required to complete this effort from 2013 through 2014 (Table 1).

Table 1. Estimated City Light crew hours and fuel consumption to complete woody material collection in ross lake, storage, extraction, and transport to the Aggregate Ponds from July 2013 to February 2014.

City Light Labor Category and Crew Hours	
City Light Crew	**Pilot Total Hours**
Skagit Boat Crew	56.5
Skagit Drivers Equipment and Truck	36
Skagit Maintenance Laborers	171
Skagit Heavy Equipment Operators	176.4
Skagit Right of Way	469.3
Total	**909.2 Hours**

Equipment Use and Fuel Consumption	
Equipment	**Fuel Consumption (gallons)**
Excavator	100
Dump Trucks	75 gallons per truck x 17 = 1,275
Row Work Boat	20
Tugboat	300
Total	**1,695 gallons**

The 2013-2014 year of the pilot project mechanically removed and transported about 10 to 20 percent of the annual woody material load from Ross Lake to the Aggregate Ponds at Newhalem. The quantity of accumulated wood and the lack of accessibility for transport contribute significantly to costs.

3.2 2020-2021 Season Labor Hours and Equipment Costs

City Light ROW crews recently tracked fuel and labor costs for the 2020 – 2021 season of woody material management for Ross Lake and Diablo Lake. Ross Lake collection and extraction data reported by City Light (see Appendix A) represents two years of woody material management (2019 and 2020) because the summer water surface elevation on Ross Lake was too low to permit collection in 2019. Therefore, no wood was collected from Ross Lake in 2019. Woody material was collected and stored in Ross Lake in July and August of 2020 and extracted and transported to Diablo Lake in November 2020. Woody material was also collected and removed from Diablo Lake in 2020 and transported to the Aggregate Ponds from June 2-4, 2020. Crew hours, equipment costs, and fuel consumption for 2020 Ross Lake collection, storage, extraction, and transport to Aggregate Ponds, and transport of wood collected from Diablo Lake to the Aggregate Ponds in June of 2020 is provided below (Table 2). See Appendix A for more details.

Table 2. City Light ROW Crew and PSM labor hours and equipment costs and fuel consumption for Ross and Diablo Wood Material Management for 2020-2021 season activities.

City Light Labor Category and Crew Hours		
City Light ROW Crew		**Hours**
ROW Senior		233
ROW worker		280
ROW worker		184
ROW worker		307
Total		**1004 hours[1]**
Heavy Equipment Operator Crew		
Crew Chief		**163**
Operator		**130**
Operator		**170**
Total PSM Hours		**465 hours[2]**
Equipment Use, Costs, and Fuel Consumption		
Equipment	**Rental Costs**	**Fuel Consumption (gallons)**
Excavator (CAT 320)	NA	150

Excavator (CAT 313)	NA	150
93 CAT Loader	NA	100
12 CY Dump Truck	NA	650
12 CY Dump Truck	NA	650
Row Work Boat	Not reported	Not reported
Tugboat	NA	600
Fuel Truck	$2,500	Not reported
30 CY dump truck	$8,000	100
Total (without work boats and fuel truck)		**2,400 gallons**

[1] ROW crew hours for 2020 Ross Lake and Diablo Lake woody material management.

[2] PSM hours (465 hours).

3.3 Labor and Equipment Needs

The City Light crews for the 2020 Ross Lake wood extraction season reported that the excavators used for woody material extraction were not efficient and recommended that a clam shell bucket be rented or purchased in the coming years. The crew also indicated that more personnel is required to effectively manage wood and that the quantity of material collected is based on labor resources and the duration at which the lake is high enough to capture floating debris. Once the lake level drops, material becomes lodged on the banks and more effort is required to collect the wood. In 2020, 6 ROW crew members were working in the northern end of Ross Lake at the Hozomeen Debris Pen and 3-6 ROW crew members were working in the southern end. More material would be collected if more crew were available.

In 2020, for the first time, City Light rented a 30 CY dump truck and fuel truck to facilitate Ross Lake wood extraction. This equipment improved the efficiency of wood material removal and transport, and expedited extraction before winter conditions became prohibitive. As reported in Appendix A, Ross Lake wood extraction required 6 days of labor with the 30 CY dump truck and fuel truck. The crew estimated that the extraction effort would have taken 20 days without the 30 CY dump truck (i.e., if two 12 CY dump trucks were solely used for extraction, per typical operations).

4.0 RECOMMENDATIONS FOR FUTURE WOODY MATERIAL MANAGEMENT

As stated previously, as of this writing in the spring of 2021, the Hozomeen Debris Pen is nearing capacity and has approximately 1-2 years of storage capacity remaining. Thus, future studies of wood material management operations are necessary to address storage and collection constraints, as well as alternative uses. City Light proposes to work collaboratively with Licensing Partners, including the National Park Service, to explore ways to improve woody material management strategies and consider beneficial uses of high-quality wood in the Skagit River watershed.

APPENDIX A. WOODY MATERIAL MANAGEMENT DATA FOR THE SKAGIT HYDROELECTRIC PROJECT: ROSS LAKE, DIABLO LAKE, GORGE LAKE, AND AGGREGATE PONDS (YEARS 2017-2021)

Information presented in the following tables was compiled using data from unpublished wood tracking forms populated by City Light ROW crew during wood management seasons 2017 through winter 2021.

Table A-1. Ross Lake wood collection, holding, and extraction data from summer 2017 through winter 2021.

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Ross Lake Wood Collection				
Collection Dates	July and August	July and August	No wood collected due to low summer water level[1].	July 1 – August 31[2]
Total Workdays	21 days	25 days	0 days	25 days (10-12-hour workdays)
Bags Collected	4	6	NA	10
CY per Bag	250	250	NA	250
Total Quantity Collected (CY)	1000 CY	1200-1500 CY[3]	NA	2500 CY[4]
Location and Volume Stored in Ross Lake (not later extracted from lake)	Roland Bay - 2 bags (500 CY)	Hozomeen - 3 bags (750 CY) Roland Bay - 1 bag (250-300 CY)[5]	NA	Hozomeen – 7 bags (1,750 CY)
Temporary Storage Location and Volume	Green Point - 2 bags (500 CY)	Green Point - 2 bags (500 CY)	NA	Green Point – 3 bags (750 CY)
LWM for Log Booms or bags?	Yes[6]	Yes[7]	NA	Yes[8]
Quantity	2 or 3	8 or 9		5
Intact Rootwads?	No	No		No
Total Quantity for Extraction?	500 CY	500 CY	NA	750 CY
Equipment Used			NA	
Work Boats & #	Yes, 3	Yes, 3	NA	Yes, unknown
Chainsaws & duration	Yes, 21 days	Yes, 25 days	NA	Unknown
Dump truck (30 CY) & #	No	No	NA	Yes, 1[9]
Dump truck (12 CY) & #	Yes, not reported	Yes, not reported	NA	Yes, unknown
Excavators	Yes, not reported	Yes, not reported	NA	Yes, unknown
Fuel Cell and Truck & #	No	No	NA	Yes, one
Ross Lake Wood Extraction and Transport				
Dates Extracted	November – December 2017	November – December 2018	NA	November 9-17
Total Workdays	10	10	NA	6
Total Quantity Extracted	500 CY	500 CY	NA	600 CY
Extraction Location	North end Ross Haul Road	North end Ross Haul Road	NA	North end Ross Haul Road
Temporary Storage at Helipad?	Yes; 500 CY	Yes, 500 CY	NA	Yes, 600 CY

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Quantity?				
Dates Transported to Aggregate Ponds	June of 2019	June of 2019	NA	November 10 – Dec 14, 2020
Days to Transport to Aggregate Ponds	11 days total transport	11 days	NA	18 days
Total Quantity to Aggregate Ponds	350 CY[10]	350 CY[11]	NA	600 CY[12]
Equipment and Days to Extract and Transport to Aggregate Ponds			NA	
Excavator	21 days	21 days		18 days
Front end loader	11 days	11 days		9 days
12-yd dump truck	21 days (2 trucks)	21 days (2 trucks)		18 (2 trucks)
Tugboat	1 day	1 day		18 days
80-ton barge	1 day	1 day		18 days
Workboat	10 days	10 days		7 days (2 boats)
Chainsaw	10 days	10 days		6 days
30 CY Dump Truck (rental)				6 days
500 gal. Fuel Cube and Truck (rental)				18 days
Total Loads to Aggregate Ponds	40 loads (~350 CY)	40 loads (~4350 CY)	NA	56 loads (~600 CY)

Notes:

1 Due to the extremely low water level in the summer, no wood was collected in 2019. City Light ROW crews only collected ¼ bag of debris floating in front of Ross Dam and forebay in front of Green Point for Resort boats. Crews did not remove anything beached along banks because the water level was not going to get high enough to dislodge material. The ¼ bag that was collected near the dam was floated to the Green Point boom, where it was maintained under retrieval and extraction in 2020.

2 Data represents 2 years of debris collection (2019 and 2020) for Ross Lake because the water level was too low to collect in 2019.

3 Bag broke at Hozomeen, collected (3 bags collected on north end of lake, much of it came out of the broken bag, ~250 CY per bag.

4 Seven bags at Hozomeen, 3 bags down south.

5 Wood at Roland Bay is permanently stored by permission from NPS; there is no real purpose for it. May also be permanently stored at the mouth of Dry Creek in some years.

6 City Light kept at Roland Bay for boom logs.

7 NPS used 6 high quality logs for boom logs at Lightning Creek dock; City Light kept 2-3 at Roland Bay for boom logs.

8 Five logs stored at Ross lake Resort for future resort use.

9 A single 30 CY dump truck has been used to transfer between the extraction point the helipad only; two 12 CY dump trucks then move the wood from the helipad to the Aggregate Ponds.

10 Of total 1500 CY extracted; 150 CY deteriorated over the 2 years stored at helipad area.

11 Of total 1500 CY extracted; 150 CY deteriorated over the year stored at helipad area.

12 Three logs used at Diablo fuel dock mitigation site.

Table A-2. Diablo Lake wood collection, storage, and extraction data from summer 2017 through winter 2021.

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Diablo Lake Wood Collection				
Collection Dates	NA. No wood collected in 2017	September 2018	NA. No wood collected in 2019.	June 2020
Total workdays	NA	10	NA.	8 days[1]
Bags Collected	NA	NA	NA	1 bag
Total Quantity collected (CY)	NA	70 CY	NA	200 CY (20 loads)
Location and Volume stored in Diablo Lake (not later extracted from lake)	NA	0 CY	NA	0 CY
Temporary Storage Location and Volume	NA	Mouth of Sourdough Creek; 70 CY	NA	Mouth of Sourdough Creek; 200 CY
LWD for log booms or bags?	NA	No	NA	No
Quantity				
Intact Rootwads?				
Total Quantity for extraction?	NA	70 CY	NA	200 CY
Equipment Used				
Work Boats (#)		Yes, 2 (used every day for 10 days)		Yes, 2 boats
Excavators (#)				Yes (2)
12 CY dump trucks (#)				Yes (2)
Diablo Lake Wood Extraction and Transport				
Dates Extracted	NA	September	NA	June of 2020
Total Workdays	NA	3 days	NA	3 days
Total Quantity Extracted	NA	70 CY	NA	200 CY
Extraction Location	NA	Mouth of Sourdough Creek	NA	Mouth of Sourdough Creek
Temporary Storage Elsewhere? Quantity?	NA	No	NA	No
Dates Transported to Aggregate Ponds	NA	September[2]	NA	June 1-4, 2020

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Days to transport to Aggregate Ponds	NA		NA	3 days
Total quantity to Aggregate Ponds	NA	70 CY	NA	200 CY
Equipment and Days to Extract and Transport to Aggregate Ponds				
Excavator (#)	NA	5 days (1)	NA	3 days (2)
Front end loader (#)	NA	5 days (1)	NA	NA
12-yd dump truck (#)	NA	5 days (1)	NA	3 days (2)
Workboat (#)	NA	2 days (1)	NA	2 days (4)
Total Loads to Aggregate Ponds	NA	8 loads	NA	20 loads

Notes:

[1] Collection included 5 days @5 staff for ROW and 3 days @3 staff for PSMs.

[2] Woody material was extracted from water, placed in a pile, then placed into dump trucks for transport.

Table A-3. Gorge Lake wood management data from summer 2017 through winter 2021.

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Gorge Lake Wood Removal	10 CY max removed a few times/year	10 CY max removed a few times/year	0 collected from lake due to weather.	2 bags collected in the spring (~500 CY) in March or April passed through log chute at same time of collection. 2 bags collected in the fall. Will pass at end of November (about 500 CY).
Gorge Lake Log Chute Activity	25 CY spilled down chute	25 CY spilled down chute	0 CY down log chute.	1,000 CY
Gorge Lake Trash Rack	No data.	No data.	No data.	~20 CY

Table A-4. Skagit River wood placement in Aggregate Ponds from summer 2017 through winter 2021.

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Total quantity wood taken to Aggregate Ponds	350 CY	420 CY	NA[1]	800 CY[2]
Placement Dates	February 10-12, 2020	February 10-13, 2020	NA	November 17 - December 14
Date: wood quantity (CY)	February 10: 116 CY	February 10: 105 CY		November 18: 180 CY
	February 11: 116 CY	February 11: 105 CY		November 19: 180 CY
	February 12: 116 CY	February 12: 105 CY		November 30: 180 CY
		February 13: 105 CY		December 1: 48 CY
				December 3: 24 CY
				December 7: 96 CY
				December 8: 24 CY
				December 10: 96 CY
				December 14: 60 CY
				December 16: 20 CY
Equipment used (# days)			NA	
Excavator (#)	4 days (1)	5 days (1)		18 days (1)
Front end loader (#)	4 days (1)	5 days (1)		9 days (1)
12-yard dump truck (#)	1 day (1)	1 day (1)		
Flow when placed in river	8,000 cfs	8,000 cfs	NA	Not reported
Total quantity wood placed in river at Aggregate Ponds	350 CY	420 CY	NA	800 CY
Diablo Lake Wood (Collected from Diablo)			NA	
% high quality large wood	0%	2%		60%
% low quality large wood	0%	12%		10%
% medium woody material	0%	12%		20%
% small woody material	0%	75%		10%
Total # intact rootwads	0	0		10

Event	Year (Summer Year 1 – Winter Year 2)			
	2017-2018	2018-2019	2019-2020	2020-2021
Ross Lake Wood (Collected from Ross)[3]			NA	
% high quality large wood	0%	0%		30%[4]
% low quality large wood	5%	5%		10%
% medium woody material	10%	10%		10%
% small woody material	85%	85%		50%
Total # intact rootwads	5	1		50

Notes:

1 Wood was placed in the Skagit River at the Aggregate Ponds from material collected from the reservoirs in 2017 and 2018; however, nothing was placed from 2019 or 2020.

2 Data represents 2 years of debris (2019 and 2020) for Ross Lake because the water level was too low to collect in 2019.

3 All wood extracted from Ross Lake is cut to 12' pieces for loading onto haul trucks.

4 In the summer of 2020, 30% of the woody material extracted from Ross Lake was larger than 12 in. diameter. About 40-50 were over 20 feet long but had to be cut to 12 ft. for loading onto dump trucks and subsequent transport. The quantity of logs exceeding 20 ft. is relatively typical considering 2020 collections represented two collection years (no collection occurred in 2019 due to low lake levels). However, the logs, on average, had a larger diameter than is typical.

WOODY DEBRIS MANAGEMENT
SUMMARY OF ACTIVITIES TO DATE MEMORANDUM

ATTACHMENT B

SKAGIT RIVER HYDROELECTRIC PROJECT – CURRENT WOODY MATERIAL DATA COLLECTION AND RECOMMENDATIONS FOR NEW DATA

Skagit River Hydroelectric Project – Current Woody Material Data
Collection and Recommendations for New Data

1.0 INTRODUCTION

The Skagit River subbasin is host to a variety of hydroelectric projects, the largest of which is the Skagit River Hydroelectric Project (Project) located in Snohomish, Skagit, and Whatcom Counties in north-central Washington. Operated by the publicly owned electric power utility, Seattle City Light (City Light), the Project consists of three facilities along 33 miles of the Skagit River: Ross, Diablo, and Gorge, each with a dam, powerhouse, and reservoir (lakes).

City Light manages woody material at various locations in each of the Project reservoirs including Ross Lake, Diablo Lake, and Gorge Lake. Since 2017, City Light crews report total quantities for specific wood categories collected at each lake during annual wood management efforts. When reporting data, City Light currently classifies wood into the following categories:

- High-quality large wood:
  - Pieces greater than 20 feet (ft.) long and greater than 12 inches (in.) diameter; or,
  - Pieces less than 20 ft. long that contain an intact rootwad.
- Low-quality large wood: Pieces 8 to 20 ft. long and less than 12-in. diameter
- Medium sized wood: Pieces 6-8 ft. long and 8-12 in. diameter
- Small wood debris: Pieces 0-10 ft. long and less than 8 in. diameter

2.0 NEW DATA RECOMMENDATIONS

In addition to the woody material data currently collected at Ross, Diablo, and Gorge lakes, City Light proposes to collect the following additional data:

- Length Class
  - A = 20-50 feet
  - B = 50-100 feet
  - C = over 100 feet
- Diameter Class:
  - 1 = 12-18 inches
  - 2 = 18-24 inches
  - 3 = 24-36 inches

- 4 = over 36 inches

- Presence of root wad
- Decay class categorization, based on the following categories:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Sources:

Robison, E. G. and R. L. Beschta. 1990. Characteristics of Coarse Woody Debris for Several Coastal Streams of Southeast Alaska, USA. Canadian Journal of Fisheries and Aquatic Sciences 47: 1684-1693.

Hedman, C.W., D.H. Van Lear, and W.T. Swank. 1996. In-stream large woody debris loading and riparian forest seral stage associations in the southern Appalachian Mountains. Canadian Journal of Forest Resources. 26: 1218-1227.

These additional metrics for wood exceeding 20 feet in length and 12 inches in diameter will better inform future uses of such wood pieces for habitat restoration, reed canarygrass suppression, or other potentially valuable uses in the Skagit River watershed. These metrics were developed in collaboration with geomorphologists and biologists familiar with the Skagit River and current wood collection activities.

WOODY DEBRIS MANAGEMENT
SUMMARY OF ACTIVITIES TO DATE MEMORANDUM

ATTACHMENT C

WOOD COLLECTION DATA SHEETS

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Shelly Adams	Reservoir: Ross	Bag #: 1	Date:

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3*]	Wood Cut During Collection? (Y/N)
Ruby Arm		A	1	N	IV	Y
		A	1	N	III	Y
		A	2	N	III	
		A	1	N	IV	Y
		A	1	N	IV	
		A	2	N	II	
		A	1	N	V	
		A	1	N	V	
		A	2	N	V	
		A	2	N	IV	
		A	1	N	IV	
		A	2	N	I	
		A	1	N	IV	
		A	1	N	IV	Y
		A	2	N	IV	
		A	3	N	III	

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:
*None actually dark

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: ___10%__
% Low quality LWD[5]: __30%___
% Medium debris: __30%___
% Small trash debris: ___30%__
# Low quality root wads[6]: ___1__
Total volume in bag[7]: __200___ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Andrew Zitkovich	Reservoir: Ross	Bag #: 2	Date: 7/23/2021

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
Green Point		A	1	Y	II	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet

[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches

[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: _____

% Low quality LWD[5]: _____

% Medium debris: _____

% Small trash debris: _____

Low quality root wads[6]: _____

Total volume in bag[7]: _____ CY

[4] Wood that is 20' long *and* 12" diameter

[5] Wood that is either 20' long *or* 12" diameter

[6] Root wads that are not high quality LWD

[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name:	Reservoir:	Bag #:	Date: 7/26/2021 7/29/2021

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
Boundary Bay	Hozomeen	A	1		III	Y
		A	2		IV	Y
		A	2		IV	Y
		A	1		IV	Y
		A	2		IV	Y
		A	2		V	Y
		A	2		IV	Y
		A	2		V	Y
		A	2		V	Y
		A	2		IV	Y
		A	2		IV	Y
		A	2		V	Y

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet

[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches

[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: _5____

% Low quality LWD[5]: _30____

% Medium debris: ___30__

% Small trash debris: ___35__

Low quality root wads[6]: __6___

Total volume in bag[7]: ___200__ CY

[4] Wood that is 20' long *and* 12" diameter

[5] Wood that is either 20' long *or* 12" diameter

[6] Root wads that are not high quality LWD

[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: A. Zilkovick	Reservoir: Ross	Bag #:	Date: 7/30/21 - 7/31/21

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
Winnebago Flats - East landing	Hozomeen	A	2	N	V	N
		A	2	N	V	N
		A	1	Y	III	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: _____
% Low quality LWD[5]: _____
% Medium debris: _____
% Small trash debris: _____
# Low quality root wads[6]: _____
Total volume in bag[7]: _____ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Adam Adkinson/Tyler McClure	Reservoir: Ross	Bag #: 3	Date: 7/31/21 and 8/3/21

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
North Boundary Bay/East Landing	Dry Creek	A	2	N	III	N
		A	1			N
		B	1	Y		Y
		A	1			N
		B	2			N
Starting at 48.99482, -121.09413 and moving down reservoir directly across from Hozomeen	Dry Creek	A	3	N	IV	Y
		A	1	N	III	N
		A	1	N	III	N
		A	3-2	Y	IV	Y
		B	1	Y	IV	N
		B	1	N	II	N
		A	1	N	V	N
		A	2	N	III	N (kept to use as boom log, not included in bag)

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet

[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches

[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: 10_____

% Low quality LWD[5]: __40___

% Medium debris: ____35_

% Small trash debris: ___15__

Low quality root wads[6]: ___40_

Total volume in bag[7]: _250____ CY

[4] Wood that is 20' long *and* 12" diameter

[5] Wood that is either 20' long *or* 12" diameter

[6] Root wads that are not high quality LWD

[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Tyler McClure	Reservoir: Ross	Bag #: 4	Date: 8/4/21 – 8/5/21

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
Directly across reservoir from Hozomeen. Starting at 48.993042, -121.094224 and ending collection at 48.986830 and -121.097134	Dry Creek	A	2-1	N	III	Y
		A	1	N	V	Y
		A	1	Y	IV	N
		A	3	Y	III	N
		A	3-1	N	V	N
		A	2	N	V	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: _5____
% Low quality LWD[5]: ___45__
% Medium debris: __30___
% Small trash debris: ___20__
# Low quality root wads[6]: ___26_
Total volume in bag[7]: __250___ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Tyler McClure	Reservoir: Ross	Bag #: 005	Date: 8-6-2021

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
48.961676, -121.103378 in bay opposite of East Landing. All of bag acquired at this spot.	Hozomeen Pen	B	3	N	V	Y
		A	3	Y	IV	N
		B	2	N	I	N
		A	1	N	V	N
		A	3	N	III	N
		A	1	N	V	N
		A	1	N	IV	N
		A	1	N	III	N
		A	1	N	III	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: __25___
% Low quality LWD[5]: __35___
% Medium debris: __25___
% Small trash debris: __15___
# Low quality root wads[6]: _15____
Total volume in bag[7]: __250___ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Tyler McClure	Reservoir: Ross	Bag #:n/a	Date: 8/7/2021

***Weather did not permit debris gathering on 8/7/21. Saved as boom logs, no bag for the day.**

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
¼ mile north of Silver Creek across reservoir from Hozomeen	Hozomeen	A	1	N	III	N
		A	1	N	III	N
		A	2	N	III	N
		A	2	N	II	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: __N/A___
% Low quality LWD[5]: __ N/A ___
% Medium debris: __ N/A ___
% Small trash debris: ___ N/A __
# Low quality root wads[6]: _ N/A ____
Total volume in bag[7]: _ N/A ____ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

Classification Table: Large Quality Wood over 20 feet long and 12 inches in Diameter

Classifier Name: Tyler McClure	Reservoir: Ross	Bag #: 006	Date: 8/8/21 – 8/9/21

Approximate Collection Location	Wood Storage Destination	Length Class[1]	Diameter Class[2]	Root Wad? (Y/N)	Decay Class[3]	Wood Cut During Collection? (Y/N)
48.984661, -121.098507 directly across reservoir from Hozomeen	Hozomeen	A	2-1	Y	IV	N
		A	1	N	III	Y
		B	1	Y	III	Y
		B	2-1	N	III	Y
		A	1	Y	III	N
		A	1	N	III	N
		A	2-1	Y	IV	N
		B	1	N	III	N
		A	1	N	V	N
		A	1	N	II	N

[1]Length Class: A = 20-50 feet; B = 50-100 feet; C = over 100 feet
[2]Diameter Class: 1 = 12-18 inches; 2 = 18-24 inches; 3 = 24-36 inches; 4 = over 36 inches
[3] See Decay Class table (below) for definitions:

Decay Class	Bark	Twigs	Texture	Shape	Material Color
I	Intact	Present	Intact	Round	Original Color
II	Intact	Absent	Intact	Round	Original Color
III	Trace	Absent	Smooth, some surface abrasion	Round	Darkening
IV	Absent	Absent	Abrasion; some holes and openings	Round to Oval	Dark
V	Absent	Absent	Vesicular; many holes and openings	Irregular	Dark

Bag quantities:

% High quality LWD[4]: __10___
% Low quality LWD[5]: __25_
% Medium debris: __45___
% Small trash debris: ___20_
# Low quality root wads[6]: __35___
Total volume in bag[7]: __250___ CY

[4] Wood that is 20' long *and* 12" diameter
[5] Wood that is either 20' long *or* 12" diameter
[6] Root wads that are not high quality LWD
[7] Assumption that a normal sized bag is 250 CY

WOODY DEBRIS MANAGEMENT
SUMMARY OF ACTIVITIES TO DATE MEMORANDUM

ATTACHMENT D

LARGE WOODY DEBRIS TRACKING

Large Woody Debris Tracking

Summer 2017 – Winter 2018

Ross Lake Collection and Extraction

Collection

1. Approximate dates LWD collected on lake: July and August
   a. From these dates, approximately how many days worked total? ~21 days
2. Total quantity of LWD collected on lake: 4 bags ~1000 CY* (~250 CY for bag)
3. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., Hozomeen, weed suppression areas, etc.)? 2 bags (~500 CY)
   a. From the above quantity, list locations and quantities:
      Location: Roland Bay (2 bags) Quantity: 500 CY
      Location: _____ Quantity:_____CY
      Roland Bay – wood is permanently stored there by permission from NPS, no real purpose for it.
4. Where was LWD stored until it could be later extracted from the Lake?
      Location: Green Point (2 bags) Quantity: ~500 CY
      Location: Quantity:_____CY
      Location: _____ Quantity:_____CY
      Dry Creek is another temporary (and permanent) storage spot.
5. Was any LWD used as boom logs or for bags? X Yes No
   a. If so, how many? __2-3_____
   b. If so, did any have intact rootwads? ____Yes _X___No
   2-3 City Light kept at Roland Bay for boom logs.
6. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: 2 bags (~500 CY)
7. What equipment was used for work: 3 work boats, chain saws for 21 days

Extraction and Transport

8. Approximate dates LWD extracted from lake: November and December, 2017
   a. From these dates, approximately how many days worked total? 7-10 days (assume 10 for table below)
9. Total quantity of LWD extracted from lake: ~500 CY
10. Location LWD was extracted from: North end of Ross Haul Road
11. Was LWD temporarily stored somewhere before taking to Agg Ponds? X Yes ____No
    a. If so, where? Ross Haul Road emergency helipad landing
    b. How much? ~500 CY
12. Dates LWD transported to Agg Ponds: June 2019.
13. Days to transport to Agg Ponds: 11 days to transport.
14. Quantity of LWD transported to Agg Ponds? 350 CY because some deteriorated over two years.
    a. If above quantity does not match Question 6, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)
Deterioration and chipped for erosion control of helipad	150 CY

15. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day
Excavator	21	1
Front end loader	11	1
12 yard dump trucks	21	2
Tugboat	1	1
80-ton barge	1	1
Workboat	10	1
Chainsaw	10	1

16. Total loads taken to Agg Ponds: __40_____

Diablo Lake Collection and Extraction

Collection

17. Approximate dates LWD collected on lake: **Did not need to collect on Diablo Spring/Summer 2017**
    a. From these dates, approximately how many days worked total? **0**
18. Total quantity of LWD collected on lake: **0 CY**
19. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., erosion control, restoration, weed suppression areas, etc.)? **0** CY
    a. From the above quantity, list locations and quantities:
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
20. Where was LWD stored until it could be later extracted from the lake?
       Location: _____Quantity: _____CY
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
21. Was any LWD used as boom logs or for bags? ____Yes **X** No
    a. If so, how many? _____
    b. If so, did any have intact rootwads? ____Yes ____No
22. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: **0 CY**
23. What equipment was used for work: **N/A**

Extraction and Transport

24. Approximate dates LWD extracted from lake: **Did not extract in 2017-2018**
    a. From these dates, approximately how many days worked total?
25. Total quantity of LWD extracted from lake: **0 CY**
26. Location LWD was extracted from: **N/A**
27. Was LWD temporarily stored somewhere before taking to Agg Ponds? ____Yes **X** No
    a. If so, where? _____
    b. How much? _____CY
28. Dates LWD transported to Agg Ponds: **N/A.**
29. Quantity of LWD transported to Agg Ponds? **0 CY**
    a. If above quantity does not match Question 21, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

30. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day

31. Total loads taken to Agg Ponds: **0 CY**

Skagit River Placement and Summary

32. Total quantity of LWD taken to Agg Ponds: **350 CY**
    a. If not the sum of quantities from Questions 13 and 28, explain why:
    _____
33. Dates LWD placed into the river at the Agg Ponds: **February 10-17, 2020 (3 days for 2017)**
    a. If more than a week of separation between days that LWD was placed in the river, include quantities per day:

Dates Placed in Skagit River	Quantity (CY)	Flow (cfs)
February 10	~116	~8,000
February 11	~116	~8,000
February 12	~116	~8,000

Equipment*	Days	Quantity/Day
Excavator	4	1
Front end loader	4	1
12 yard dump trucks	1	1

*Includes covering area with woodchips following placement into river.

34. Flow when LWD was placed in river: **~8,000 cfs**
35. Total quantity of LWD placed into the river at the Agg Ponds: **350 CY**
    a. If quantity does not match Question 32 explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

36. From the quantity in Question 29 (Diablo Lake debris):
    a. Percent high quality[1] large woody debris: ____0_____%

b. Percent low quality large woody debris: ____0_____% 8'-20' long and less than 12" diameter
c. Percent medium size woody debris: _____0_____% 6-8' long and 8"-12"wide
d. Percent small trash woody debris: _____0____% 0-10' and less than 8" wide
    i. Note: quantities from a, b, c, and d should add to 100.
e. How many total intact root wads? ____0_____

37. From the quantities of Questions 2 and 9 (Ross Lake debris):
    a. Percent high quality[1] large woody debris: _____0_____%
    b. Percent low quality large woody debris: _____5_____%
    c. Percent medium size woody debris: _____10_____%
    d. Percent small trash woody debris: ____85_____%
        i. Note: quantities from a, b, c, and d should add to 100.
    e. How many total intact root wads? ____5_____

38. Comments, suggestions, issues regarding the LWD program this year:
    Everything that was transported in 2019 was wood collected from 2017 (~500 CY) and 2018 (500 CY).

39. Gorge Lake Notes: Removed couple times/year max of 10 CY yards. Spilled 25 CY down log chute.

Assumptions:

The years of this report extend from summer to winter of the following year; for instance, the 2017-2018 reporting year includes collection from the lakes in the summer of 2017, transportation in Fall 2017, and placement in the Skagit River in Winter 2018.

1 Bag = 250 cubic yards (CY)

[1]Definition of high quality: 12" in diameter and greater than 20' in length; or less than 20' in length if the root wad is attached.

Mobilization: one day to mobilize and one day to demobilize for all equipment for each phase (collection, extraction, transportation, and placement into the Skagit River).

Everything that crews transported in 2019 was wood collected in 2017 (~500 CY) and 2018 (500 CY).

Crews are limited each year from pulling out more wood because he only has enough booms to pull out 2 bags at the lower end of the lake. He would have to make more from the woody debris to pull out more.

In 2017 only approximately one intact root wad. Varies between 1 and 5 annually. 2-20 12" and 20' long every year, but these are set aside for boom logs.

Cut all debris down to 12' to get into truck.

Large Woody Debris Tracking

Summer 2018 – Winter 2019

Ross Lake Collection and Extraction

Collection

1. Approximate dates LWD collected on lake: July and August
   a. From these dates, approximately how many days worked total? ~25 days
2. Total quantity of LWD collected on lake: 6 bags ~1200-1500 CY*
   *Bag broke at Hozomeen, collected (3 bags collected on north end of lake, much of it came out of the broken bag, ~250 CY per bag)
3. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., Hozomeen, weed suppression areas, etc.)? 4 bags (~1000 CY)
   a. From the above quantity, list locations and quantities debris went:
      Location: Hozomeen pen (3 bags) Quantity:750 CY
      Location: Roland Bay (1 bag) Quantity: 250-300 CY
      Roland Bay – wood is permanently stored there by permission from NPS, no real purpose for it. May also be permanently stored at the mouth of Dry Creek in some years.
4. Where was LWD stored until it could be later extracted from the Lake?
      Location: Green Point (2 bags) Quantity: ~500 CY
      Dry Creek is another temporary storage spot.
5. Was any LWD used as boom logs or for bags? X Yes No
   a. If so, how many? See below
   b. If so, did any have intact rootwads? ____Yes _X__No
   NPS used 6 high quality logs for boom logs at Lightning Creek dock. City Light kept 2-3 at Roland Bay for boom logs.
6. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: 2 bags (~500 CY)
7. What equipment was used for work: 3 work boats, chain saws for 25 days

Extraction and Transport

8. Approximate dates LWD extracted from lake: November and December 2018
   a. From these dates, approximately how many days worked total? 7-10 days (assume 10 for table below)
9. Total quantity of LWD extracted from lake: ~500 CY
10. Location LWD was extracted from: North end of Ross Haul Road
11. Was LWD temporarily stored somewhere before taking to Agg Ponds? __X_Yes ____No
    a. If so, where? Ross Haul Road emergency helipad landing
    b. How much? ~500 CY
12. Dates LWD transported to Agg Ponds: June 2019.
13. Days to transport to Agg Ponds: ___11 Days__
14. Quantity of LWD transported to Agg Ponds? 350 CY because some deteriorated over two years.
    a. If above quantity does not match Question 6, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)
Deterioration and also chipped for erosion control at helipad	150 CY

15. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day
Excavator	21	1
Front end loader	11	1
12 yard dump trucks	21	2
Tugboat	1	1
80-ton barge	1	1
Workboat	10	1
Chainsaw	10	1

16. Total loads taken to Agg Ponds: __40_____

Diablo Lake Collection and Extraction

Collection

17. Approximate dates LWD collected on lake: 1 time in September
    Typically between March – September, could go out several times on Diablo Lake.
    a. From these dates, approximately how many days worked total? 10 days (includes extraction time for ROW crew, also).
18. Total quantity of LWD collected on lake: 70 CY
19. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., erosion control, restoration, weed suppression areas, etc.)? 0 CY
    a. From the above quantity, list locations and quantities:
       Location: _____ Quantity:_____CY
20. Where was LWD stored until it could be later extracted from the lake?
    Location: By mouth of Sour Dough Creek Quantity: 70 CY
21. Was any LWD used as boom logs or for bags? ____Yes X No
    a. If so, how many? _____
    b. If so, did any have intact rootwads? ____Yes ____No
22. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: 70 CY
23. What equipment was used for work: 2 work boats (boats used every day of 10 days)

Extraction and Transport

24. Approximate dates LWD extracted from lake: September
    a. From these dates, approximately how many days worked total? 3 days
25. Total quantity of LWD extracted from lake: 70 CY
26. Location LWD was extracted from: Along shoreline adjacent to mouth of Sourdough Creek
27. Was LWD temporarily stored somewhere before taking to Agg Ponds? ____Yes X No
    a. If so, where? _____
    b. How much? _____CY
28. Dates LWD transported to Agg Ponds: September. LWD is extracted from water, placed in a pile, then placed into dump trucks for transport.
29. Quantity of LWD transported to Agg Ponds? 70 CY
    a. If above quantity does not match Question 21, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

30. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day
Excavator	5	1
Front-end loader	5	1
Dump truck	5	1
Work boat	2	1

31. Total loads taken to Agg Ponds: **8**

Skagit River Placement and Summary

32. Total quantity of LWD taken to Agg Ponds: **420 CY**
    a. If not the sum of quantities from Questions 13 and 28, explain why:
    _____
33. Dates LWD placed into the river at the Agg Ponds: **February 10-17, 2020 (4 days for 2018)**
    a. If more than a week of separation between days that LWD was placed in the river, include quantities per day:

Dates Placed in Skagit River	Quantity (CY)	Flow (cfs)
February 10	~105	~8,000
February 11	~105	~8,000
February 12	~105	~8,000
February 13	~105	~8,000

Equipment*	Days	Quantity/Day
Excavator	5	1
Front end loader	5	1
12 yard dump trucks	1	1

*Includes covering area with woodchips following placement into river.

34. Flow when LWD was placed in river: **~8,000 cfs**
35. Total quantity of LWD placed into the river at the Agg Ponds: **420 CY**
    a. If quantity does not match Question 32 explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

36. From the quantity in Question 29 (Diablo Lake debris):
    a. Percent high quality[1] large woody debris: ____2_____%
    b. Percent low quality large woody debris: ____12_____% 8'-20' long and less than 12" diameter

c. Percent medium size woody debris: _____12_____% 6-8' long and 8"-12"wide
d. Percent small trash woody debris: _____75_____% 0-10' and less than 8" wide
    i. Note: quantities from a, b, c, and d should add to 100.
e. How many total intact root wads? _____

37. From the quantities of Questions 2 and 9 (Ross Lake debris):
    a. Percent high quality[1] large woody debris: _____0_____%
    b. Percent low quality large woody debris: _____5_____%
    c. Percent medium size woody debris: _____10_____%
    d. Percent small trash woody debris: ____85_____%
        i. Note: quantities from a, b, c, and d should add to 100.
    e. How many total intact root wads? ____1_____

38. Comments, suggestions, issues regarding the LWD program this year:
    Everything that was transported in 2019 was wood collected from 2017 (~500 CY) and 2018 (500 CY).

39. Gorge Lake Notes: Removed couple times/year max of 10 CY yards. Spilled 25 CY down log chute.

Assumptions/Notes:
The years of this report extend from summer to winter of the following year; for instance, the 2018-2019 reporting year includes collection from the lakes in the summer of 2018, transportation in Fall 2018, and placement in the Skagit River in Winter 2019.

1 Bag = 250 cubic yards (CY)

[1]Definition of high quality: 12" in diameter and greater than 20' in length; or less than 20' in length if the root wad is attached.

Mobilization: one day to mobilize and one day to demobilize for all equipment for each phase (collection, extraction, transportation, and placement into the Skagit River).

Everything that crews transported in 2019 was wood collected in 2017 (~500 CY) and 2018 (500 CY).

Crews are limited each year from pulling out more wood because he only has enough booms to pull out 2 bags at the lower end of the lake. He would have to make more from the woody debris to pull out more.

Rootwads vary in quantity between 1 and 5 annually. 2-20 12" and 20' long every year, but these are set aside for boom logs.

Cut anything down to 12' to get into truck.

Large Woody Debris Tracking

Summer 2019 – Winter 2020

Ross Lake:

Due to the extremely low water level in the summer, nothing was collected for removal. The crews only collected ¼ bag of debris floating in front of Ross Dam and forebay in front of Green Point for Resort boats. They didn't remove anything stuck along banks because they knew the water level would never get that high last year. The ¼ bag was floated to the Green Point boom and will await retrieval next year. Some of the small stuff may have gotten out.

Diablo Lake:

Didn't round up or collect any wood from Diablo Lake in 2019. Wasn't enough to be concerned with.

Ross Lake Collection and Extraction

Collection

1. Approximate dates LWD collected on lake: N/A
   a. From these dates, approximately how many days worked total? _____ days
2. Total quantity of LWD collected on lake: _____0___ bags _____0_____ CY
3. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., Hozomeen, weed suppression areas, etc.)? _____CY
   a. From the above quantity, list locations and quantities:
      Location: _____ Quantity:_____CY
      Location: _____ Quantity:_____CY
      Location: _____ Quantity:_____CY
4. Where was LWD stored until it could be later extracted from the Lake?
      Location: _____ Quantity:_____CY
      Location: _____ Quantity:_____CY
      Location: _____ Quantity:_____CY
5. Was any LWD used as boom logs or for bags? ____Yes ____No
   a. If so, how many? _____
   b. If so, did any have intact rootwads? ____Yes ____No
6. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: _____CY
7. What equipment was used for work: _____

Extraction

8. Approximate dates LWD extracted from lake: ___N/A_____
   a. From these dates, approximately how many days worked total? _____ days
9. Total quantity of LWD extracted from lake: ____0_____ CY
10. Location LWD was extracted from: _____
11. Was LWD temporarily stored somewhere before taking to Agg Ponds? ____Yes ____No
    a. If so, where? _____
    b. How much? _____CY
12. Dates LWD transported to Agg Ponds: _____
13. Days to transport to Agg Ponds: _____
14. Quantity of LWD transported to Agg Ponds? _____CY
    a. If above quantity does not match Question 6, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

15. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day

16. Total loads taken to Agg Ponds: ____0_____

Diablo Lake Collection and Extraction

Collection

17. Approximate dates LWD collected on lake: ___N/A_____
    a. From these dates, approximately how many days worked total? _____ days
18. Total quantity of LWD collected on lake: ___0_____ bags _____0_____ CY
19. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., erosion control, restoration, weed suppression areas, etc.)? _____CY
    a. From the above quantity, list locations and quantities:
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
20. Where was LWD stored until it could be later extracted from the lake?
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
       Location: _____ Quantity:_____CY
21. Was any LWD used as boom logs or for bags? ____Yes ____No
    a. If so, how many? _____
    b. If so, did any have intact rootwads? ____Yes ____No
22. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: _____CY
23. What equipment was used for work: _____

Extraction and Transport

24. Approximate dates LWD extracted from lake: __N/A_____
    a. From these dates, approximately how many days worked total? _____ days
25. Total quantity of LWD extracted from lake: ____0_____ CY
26. Location LWD was extracted from: _____
27. Was LWD temporarily stored somewhere before taking to Agg Ponds? ____Yes ____No
    a. If so, where? _____
    b. How much? _____CY
28. Dates LWD transported to Agg Ponds: _____
29. Quantity of LWD transported to Agg Ponds? _____CY
    a. If above quantity does not match Question 21, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

30. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day

31. Total loads taken to Agg Ponds: ____0_____

Skagit River Placement and Summary

32. Total quantity of LWD taken to Agg Ponds: ___0*____CY
    a. If not the sum of quantities from Questions 13 and 28, explain why:
    _____
33. Dates LWD placed into the river at the Agg Ponds:___N/A_____
    a. If more than a week of separation between days that LWD was placed in the river, include quantities per day:

Dates Placed in Skagit River	Quantity (CY)	Flow (cfs)

Equipment*	Days	Quantity/Day

*Includes covering area with woodchips following placement into river.

34. Flow when LWD was placed in river: _____cfs
35. Total quantity of LWD placed into the river at the Agg Ponds: ___0____CY
    a. If quantity does not match Question 32 explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)

36. From the quantity in Question 29 (Diablo Lake debris):
    a. Percent high quality[1] large woody debris: _____%

b. Percent low quality large woody debris: _____%
c. Percent medium size woody debris: _____%
d. Percent small trash woody debris: _____%
    i. Note: quantities from a, b, c, and d should add to 100.
e. How many total intact root wads? _____

37. From the quantities of Questions 2 and 9 (Ross Lake debris):
    a. Percent high quality[1] large woody debris: _____%
    b. Percent low quality large woody debris: _____%
    c. Percent medium size woody debris: _____%
    d. Percent small trash woody debris: _____%
        i. Note: quantities from a, b, c, and d should add to 100.
    e. How many total intact root wads? _____

38. Comments, suggestions, issues regarding the LWD program this year:
    *Wood was placed in the Skagit River at the Agg Ponds although it was debris collected from the reservoirs in 2017 and 2018, just nothing from 2020. (See data forms for 2017 and 2018 that included 500 CY for each year.)

39. Gorge Lake Notes: 0 CY down log chute. 0 collected from lake due to weather.

Assumptions/Notes:
The years of this report extend from summer to winter of the following year; for instance, the 2019-2020 reporting year includes collection from the lakes in the summer of 2019, transportation in Fall 2019, and placement in the Skagit River in Winter 2020.

1 Bag = 250 cubic yards (CY)

[1]Definition of high quality: 12" in diameter and greater than 20' in length; or less than 20' in length if the root wad is attached.

Mobilization: one day to mobilize and one day to demobilize for all equipment for each phase (collection, extraction, transportation, and placement into the Skagit River).

Crews are limited each year from pulling out more wood because he only has enough booms to pull out 2 bags at the lower end of the lake. He would have to make more from the woody debris to pull out more.

Cut anything down to 12’ to get into truck.

Large Woody Debris Tracking

Summer 2020 – Winter 2021

Ross Lake Collection and Extraction

Note: This year represents 2 years of debris (2019 and 2020) for Ross Lake because the water level was too low to collect in 2019.

Collection

1. Approximate dates LWD collected on lake: _July 1 – August 31_____
   a. From these dates, approximately how many days worked total? _25 (10-12 hour days)____days
2. Total quantity of LWD collected on lake: _10__bags _2500_ CY*
   *Describe here if any came out of the previously broken pen at Hozomeen: 7 bags at Hozomeen, 3 bags down south.
3. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., Hozomeen, weed suppression areas, etc.)? 7 bags 1,750 CY*
   a. From the above quantity, list locations and quantities debris went:
      Location: Hozomeen (7 bags) Quantity: 1,750 CY
      Location: _____ (__ bags) Quantity: ___ CY
      Location: _____ (__ bags) Quantity: ___ CY
4. Where was LWD stored until it could be later extracted from the Lake?
      Location: _Green Point (3 bags) Quantity: ~750 CY
      (e.g., Dry Creek is a temporary storage spot.)
5. Was any LWD used as boom logs or for bags? X Yes ___ No
   a. If so, how many? 5 logs, stored at Ross lake Resort for later reuse, but Resort can use if they want.
   b. If so, did any have intact rootwads? ____Yes X No
   c. Were any logs used somewhere else, or by, any other parties? Explain: Maybe Ross Lake Resort
6. Subtracting quantities from questions 3 and 5, quantity of LWD available for extraction: 3 bags 750 CY
7. What equipment was used for work: _____ for ___ days
   Work Boats, 30 CY yard dump truck, 2 12-yard dump trucks, excavator, wheeled excavator. Note: the 30 CY dump truck is not street legal and was only used to transport from the extraction point to the temporary storage location. Then it was loaded from extraction point into street legal 12 CY dump trucks to be transported to the Agg Ponds.

Extraction and Transport

8. Approximate dates LWD extracted from lake: November 9-17_____
   a. From these dates, approximately how many days worked total? ____6_ days
9. Total quantity of LWD extracted from lake: __600____ CY
10. Location LWD was extracted from: _Ross Lake Resort Dock at upper end of haul road. _____
11. Was LWD temporarily stored somewhere before taking to Agg Ponds? X_Yes ____No
    a. If so, where? upland woody debris temporary storage area (emergency helipad along haul road)
    b. How much? 600 CY
12. Dates LWD transported to Agg Ponds: November 10-December 14, 2020
13. Days to transport to Agg Ponds: 18 Days
14. Quantity of LWD transported to Agg Ponds? 600 CY
    a. If above quantity does not match Question 6, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)
Diablo Fuel Dock mitigation site	3 logs

15. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day
Excavator	18	1
Front end loader	9	1
12 yard dump trucks	18	2
Tugboat	18	1
80-ton barge	18	1
Workboat	7	2
Chainsaw	6	1
30 CY Dump Truck (Rental)	6	1
500 gallon fuel cube and truck (rental)	18	1

16. Total loads taken to Agg Ponds: 56 (600 CY)_____

Diablo Lake Collection and Extraction

Collection

17. Approximate dates LWD collected on lake: June 2020
    a. From these dates, approximately how many days worked total? 8_days (@ 8 guys) (include PSM and ROW crew). Collection was 5 days @5 guys for ROW and 3 days @3 guys for PSMs
18. Total quantity of LWD collected on lake: 1 bag, 200 CY (20 loads)
19. From the above quantity, what volume was stored permanently and not later extracted from lake (e.g., erosion control, restoration, weed suppression areas, etc.)? 0 CY
    a. From the above quantity, list locations and quantities:
       Location: _____ Quantity:_____CY
20. Where was LWD stored until it could be later extracted from the lake?
       Location: Sourdough Creek area Quantity: 200 CY
21. Was any LWD used as boom logs or for bags? ____Yes X No
    a. If so, how many? _____
    b. If so, did any have intact rootwads? ____Yes ____No
22. Subtracting quantities from questions X and X, quantity of LWD available for extraction: 200 CY
23. What equipment was used for work: 2 Workboats, 2 excavators, 2-12 CY dump trucks.

Extraction and Transport

24. Approximate dates LWD extracted from lake: __June 2020_____
    a. From these dates, approximately how many days worked total? 3 @ 3 guys days (repetitive from #17 above)
25. Total quantity of LWD extracted from lake: 200 CY
26. Location LWD was extracted from: Diablo Lake Collection Point (by mouth of Sourdough Creek)
27. Was LWD temporarily stored somewhere before taking to Agg Ponds? ____Yes _X__ No
    a. If so, where? _N/A_____
    b. How much? _N/A_____CY
28. Dates LWD transported to Agg Ponds: _June 1 – 4, 2020_____

29. Quantity of LWD transported to Agg Ponds? 200 CY
    a. If above quantity does not match Question 21, explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)
N/A	

30. Equipment used to extract and transport LWD to Agg Ponds, include quantity machines per day:

Equipment	Days	Quantity/Day
Excavator	3	2
Front-end loader	N/A	
Dump truck (12 CY)	3	2
Work boat	2	4
(work boat does not include the initial collection)		

31. Total loads taken to Agg Ponds: 20 loads (200 CY)

Skagit River Placement and Summary (Diablo and Ross Lakes)

This year represents 2 years of debris (2019 and 2020) for Ross Lake because the water level was too low to collect in 2019.

32. Total quantity of LWD taken to Agg Ponds: 800 CY
    a. If not the sum of quantities from Questions 13 and 28, explain why:

    _____

33. Dates LWD placed into the river at the Agg Ponds: _November 17-December 14_____
    a. If more than a week of separation between days that LWD was placed in the river, include quantities per day:

Dates Placed in Skagit River	Quantity (CY)	Flow (cfs)
November 18	180 CY	
November 19	180 CY	
November 30	72 CY	
December 1	48	
December 3	24	
December 7	96	
December 8	24	
December 10	96	
December 14	60	
December 16	20	

Equipment*	Days	Quantity/Day
Excavator	18	1
Front end loader	9	1

*Includes covering area with woodchips following placement into river.

34. Flow when LWD was placed in river: _____ cfs
35. Total quantity of LWD placed into the river at the Agg Ponds: 800 CY
    a. If quantity does not match Question 32 explain why and include quantities:

Other Use of LWD	Quantity (indicate CY or # logs)
N/A	

36. From the quantity in Question 29 (Diablo Lake debris):
    a. Percent high quality[1] large woody debris: ~60 %
    b. Percent low quality large woody debris: ~10% 8'-20' long and less than 12" diameter
    c. Percent medium size woody debris: ~20 % 6-8' long and 8"-12"wide
    d. Percent small trash woody debris: ~10 % 0-10' and less than 8" wide
        i. Note: quantities from a, b, c, and d should add to 100.
    e. How many total intact root wads? 10

37. From the quantities of Questions 2 and 9 (Ross Lake debris):
    a. Percent high quality[1] large woody debris: 30 %
    b. Percent low quality large woody debris: 10_%
    c. Percent medium size woody debris: __10_____%
    d. Percent small trash woody debris: ____50_____%
        i. Note: quantities from a, b, c, and d should add to 100.
    e. How many total intact root wads? ~50

38. Comments, suggestions, issues regarding the LWD program this year:
More help. Quantity of collection is based on labor resources and how long the lake is kept up (because it is floating and not stuck on the bank, requiring more effort). At Hozomeen had 6 guys, at southern end had 3-6 guys. If we want more debris collected, need more guys.

This was the first year we rented the 30 CY dump truck and fuel truck and was helpful for efficiently transporting the material and removing before winter conditions set in. (Probably would have taken 20 days without the 30 CY and only the 2-12 CY dump trucks as normal).

This is the first year fuel and labor costs were tracked closely.

Hozomeen is nearing capacity again after losing much of the stored debris. 1-2 years left. After Hozomeen fills, will be towed to Dry Creek for permanent storage.

Debris ratio between north and south ends of Ross Lake changes based on resources, weather, lake elevation, etc. at time of collection.

Gorge Lake

Log chute: 1,000 CY total
2 bags collected in the spring (~500 CY) March or April) passed through log chute at same time of collection. 2 bags collected in the fall. Will pass at end of November (about 500 CY).

Assumptions/Notes

This year represents 2 years of debris (2019 and 2020) for Ross Lake because the water level was too low to collect in 2019.
30% of the woody debris extracted in 2020 was larger than 12" diameter. About 40-50 were over 20 feet long but had to be cut for transport. This is a normal quantity, but this year the logs had a larger diameter.

The years of this report extend from summer to winter of the following year; for instance, the 2018-2019 reporting year includes collection from the lakes in the summer of 2018, transportation in Fall 2018, and placement in the Skagit River in Winter 2019.

*1 Bag = 250 cubic yards (CY)

[1]Definition of high quality: 12" in diameter and greater than 20' in length; or less than 20' in length if the root wad is attached.

Mobilization: one day to mobilize and one day to demobilize for all equipment for each phase (collection, extraction, transportation, and placement into the Skagit River).

Crews are limited each year from pulling out more wood because only enough booms to pull out 2 bags at the lower end of the lake. Would have to make more from the woody debris to pull out more.

Cut all wood down to 12' to get into truck.

Rental Costs:
Fuel Truck: $2500
30 CY dump truck: $8,000

Fuel Costs:
Excavator (CAT 320): 150 gallons
Excavator (CAT 313): 150 gallons
93 CAT loader: 100 gallons
12 CY Dump Truck: 650 gallons
12 CY Dump Truck: 650 gallons
30 CY Dump Truck (rental): 100 gallons
Tugboat: 600 gallons
Work boats: ?

Total without work boats: 2400 gallons

We need a better attachment – clam shell bucket – for extraction. Will explore renting one next year – if it works out we'll pursue purchasing one.

PSM Labor Hours for Ross and Diablo debris:

Title	Hours

PSM Crew Chief	163
PSM	130
PSM	170
Total hours:	465 hours (~$23,000 not loaded labor).

On Diablo debris we removed it from the lake and transported to Agg Pond on June 2, 4 and 4th of 2020.
Here is the Row crews hours for 2020 for Ross And Diablo debris:
Row Senior-233 hours
Row worker-280
Row worker-184
Row worker-307
Total-1004

INITIAL STUDY REPORT

APPENDIX E

LIST OF MEETINGS AND ORGANIZATIONS PARTICIPATING IN THE WORK GROUPS, TECHNICAL STEERING COMMITTEE, ADVISORY ROUNDTABLE, AND PARTNERS' COMMITTEE MEETINGS

Table E-1. List of Steering Committee and Partner Committee Meeting Dates.

2019	2020	2021	2022
2/12/19	1/23/20	3/26/21	1/12/22
4/17/19	3/12/20	5/19/21	1/26/22
6/19/19	4/8/20	5/24/21	2/9/22
9/4/19	5/20/20	6/30/21	2/23/22
10/9/19	7/22/20	7/14/21	3/9/22
11/6/19	11/10/20	7/28/21	
12/5/19		8/11/21	
		8/25/21	
		10/6/21	
		10/20/21	
		11/3/21	
		12/15/21	

Table E-2. List of Technical Steering Committee Meeting Dates.

2021	2022
7/8/21	1/13/22
9/9/21	2/10/22
11/16/21	
12/9/21	

Table E-3. List of Advisory Roundtable Meeting Dates.

2021	2022
9/22/21	1/26/22
11/17/21	

Table E-4. List of Cultural Resources Work Group Meeting Dates.

2019	2020	2021	2022
1/29/19	3/19/20	4/14/21	2/23/22
3/18/19	5/4/20		
5/21/19	6/22/20		
8/7/19	9/14/20		
10/16/19	11/16/20		

Table E-5. List of Fish & Aquatics Related Meeting Dates (Consisting of the Fish & Aquatics Work Group, Flows Work Group, Reservoir Work Group, and Water Quality Work Group).[1]

2019	2020	2021	2022
1/29/19	3/31/20	4/4/21	1/18/22
3/18/19	5/5/20	5/17/21	1/25/22
4/9/19	6/2/20	7/13/21	2/15/22
5/20/19	6/24/20	7/14/21	
7/29/19	9/16/20	8/12/21	
	11/18/20	8/24/21	
		8/26/21	
		10/1/21	
		10/20/21	
		10/25/21	
		10/26/21	
		11/2/21	
		11/22/21	
		11/23/21	
		12/7/21	
		12/20/21	

1 Table is not inclusive of Habitat Suitability Criteria Workshops that occurred in 2021 and 2022. Please see the FA-02 Instream Flow Model Development Study Interim Study Report for meeting dates.

Table E-6. List of Fish Passage Meeting Dates.[1]

2019	2021	2022
10/3/19	7/15/21	2/24/22
10/30/19	9/23/21	
	12/16/21	

1 Table is not inclusive of Agency Work Sessions that occurred in 2021 and 2022. Please see the FA-04 Fish Passage Technical Studies Program Interim Study Report for meeting dates.

Table E-7. List of Integration/Roadmap Small Work Group Meetings.

2021	2022
12/7/21	1/13/22
12/15/21	2/10/22
	2/28/22

Table E-8. List of Geomorphology Work Group Meeting Dates.

2019	2021	2022
4/15/19	7/20/21	1/11/22
5/28/19	7/27/21	2/8/22
6/25/19	9/28/21	
	10/12/21	
	11/9/21	

Table E-9. List of Operations Modeling Work Group Meeting Dates.

2021	2022
6/28/21	1/20/22
12/16/21	2/17/22

Table E-10. List of Recreation Work Group Meeting Dates.

2019	2020	2021	2022
1/29/19	3/24/20	9/2/21	2/8/22
3/19/19	5/7/20	11/4/21	3/8/22
5/22/19	6/25/20		
7/31/19	9/17/20		
	11/19/20		

Table E-11. List of Synthesis Study Work Group Meeting Dates.

2021
6/30/21
12/15/21

Table E-12. List of Terrestrial Work Group Meeting Dates.

2019	2020	2021	2022
1/29/19	3/17/20	8/17/21	1/19/22
3/19/19	5/6/20	8/31/21	2/3/22
5/21/19	6/30/20	9/23/21	
7/30/19	9/15/20	10/7/21	
10/15/19	11/17/20		

Table E-13. List of Topic-Based Issue Resolution Meeting Dates (to resolve differences between LP study requests and City Light's proposed relicensing study program).

2021
1/26/21
1/28/21
2/2/21
2/4/21
2/9/21
2/11/21
2/16/21
5/26/21
5/27/21
5/28/21
6/1/21
6/2/21
6/4/21
6/7/21

Table E-14. List of organizations participating in the relicensing meetings through February 2022.

Organization
Access Fund
American Canoe Association
American Rivers
American Whitewater
City of Mount Vernon
Confederated Tribes of the Colville Reservation
Lummi Nation
National Marine Fisheries Service
National Parks Conservation Association
Nlaka'pamux Nation
Nlaka'pamux Nation Bands Coalition
Nooksack Indian Tribe
North Cascades Conservation Council
North Cascades Institute
Samish Tribe
Sauk-Suiattle Indian Tribe
Skagit County
Skagit County Dike District Partnership
Skagit Drainage and Irrigation District Consortium
Skagit Environmental Endowment Council
Skagit Fisheries Enhancement Group

Organization
Skagit River System Cooperative
Snohomish County
Snoqualmie Indian Tribe
Stillaguamish Tribe of Indians
Stó:lō Nation
Suquamish Tribe
Swinomish Indian Tribal Community
Trout Unlimited
Ts'elxwéyeqw Tribe (Stó:lō Nation)
U.S. Army Corps of Engineers
U.S. Bureau of Indian Affairs
U.S. Department of the Interior
U.S. Federal Energy Regulatory Commission
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Geological Survey
U.S. National Park Service
University of British Columbia
Upper Skagit Indian Tribe
Virginia Tech University
Washington Climbers Coalition
Washington Department of Archaeology and Historic Preservation
Washington Department of Ecology
Washington Department of Fish and Wildlife

INITIAL STUDY REPORT

APPENDIX F

CITY LIGHT'S STUDY REPORTS